U. S. P A T E N T S

MILK AND HANDLING OF MILK

MISCELLANEOUS

Patent	Subject	Author	Date
1,214,168	Edible container	Johnson	Jan. 30, 191
1,407,400	Preservative waterproof and moldproof compound for wrapped food products and method of producing the same.	Ferrari	Feb. 21, 192

5140

Miscellaneous

1,214,168

L. V. JOHNSON & O. H. BENSON.
EDIBLE CONTAINER.
APPLICATION FILED OCT. 14, 1916.

1,214,168.

Patented Jan. 30, 1917.

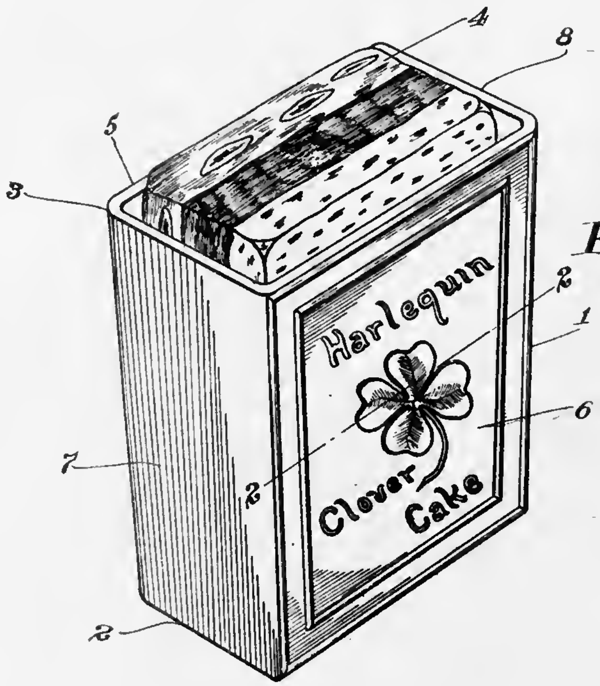


Fig. 1.

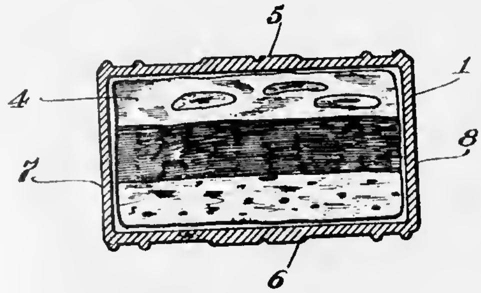


Fig. 2.

Witnesses.
Porter H. Flautt
Alice G. Donegan

Inventors
Otis Harper Benson
and
Leonard Vernon Johnson
By Edwin P. Samuels
Attorney

UNITED STATES PATENT OFFICE.

LEONARD VERNON JOHNSON AND OTIS HARPER BENSON, OF ST. MICHAELS, MARYLAND.

EDIBLE CONTAINER.

1,214,168. Specification of Letters Patent. Patented Jan. 30, 1917.

Application filed October 14, 1916. Serial No. 125,530.

To all whom it may concern:

Be it known that we, LEONARD VERNON JOHNSON and OTIS HARPER BENSON, citizens of the United States of America, and residents of St. Michaels, Talbot county, State of Maryland, have invented certain new and useful Improvements in Edible Containers, of which the following is a specification.

The use of an edible cone as a receptacle for an order of ice cream is well known. Such cones are used by practically all small dealers who sell cheap ice cream which is handled in bulk as distinguished from that which comes in small hard pressed rectangular blocks which are usually separately wrapped, and each of which contains one order of ice cream. These blocks are sometimes of a single flavoring; more often, they are made up of a mixture of several different flavors and colors and are known as "harlequin" blocks.

While the cones adapted to be filled each with a measure of soft ice cream sold in bulk are popular with the trade which patronizes the small confectionery stores and country groceries, they are not acceptable for use at private entertainments where various people not experienced in such matters fill the cones, nor do they meet the requirements of the large soda fountains and other distributers whose customers require a higher grade of commodity more temptingly served. Under such circumstances, the block ice cream is much more easily sold and in all instances it is more easily handled as it comes all wrapped and measured. The objection to it is on the ground that hitherto fore it was necessary to serve the block ice cream with dish and spoon which must be washed and dried fast enough to meet the demands of the customers. This circumstance not only puts a limit on the speed with which service may be accomplished but raises a question of sanitation as it is difficult to sterilize the ware with sufficient rapidity to meet the demands of rush hours at a popular soda fountain, or the crowd that must be served at various entertainments.

With these facts in view, the applicants have devised an edible container for block ice cream which eliminates the necessity for washing both dishes and spoons. The wrapped blocks sold by most dealers are of uniform size or may easily be so made and obtained. For convenience in handling the blocks, which are always rectangular, the applicants have devised a cake container which is also rectangular and preferably slightly tapered so as to give it some draft. and of dimension such that it fits snugly over the ice cream blocks with only a slight clearance and makes it possible to handle the blocks with convenience and comfort and with no considerable chance of spilling any of the contents of the container.

To give the heat applied in cooking easy access to the dough and to give the cake a pleasing appearance, various raised patterns may be introduced and the container may be made of any preferred cake, as nabisco and the like.

In the accompanying drawing, we have shown an edible ice cream block container constructed in accordance with my invention.

Figure 1 is a perspective view of the container with a block of ice cream; and Fig. 2 is a horizontal section.

The drawing shows a container 1 of approximately a rectangular form, preferably being slightly tapered from the bottom 2 to the top 3, the top dimensions being larger than the corresponding bottom dimensions so as to give the container draft and make it easy to remove from the mold.

As has been already pointed out, the container is of dimensions to receive the article known in the trade as a harlequin block, of course including blocks of single flavor, of the size in which they come wrapped ready for serving. The ice cream block in the present instance is indicated by reference character 4. As shown, in the preferred form of the invention, the block has about a quarter of an inch clearance all around.

The cake may be made corrugated or given any pleasing design, as shown.

For convenience in removing the cake from the mold, preferably the two opposite surfaces 5 and 6 only are made corrugated, the other two sides 7 and 8 being plain.

The cake may be of any constituency. It is referred to in the claims as baked and pressed or molded and pressed, this meaning that the baking process is practically completed within the mold and that the cake rises or swells to fit the mold producing a product which is not dense or solid but porus and at the same time may be referred to as pressed in that the surfaces conform to the surfaces of the mold and are ordinarily slightly confined by the mold in baking.

The terms molded and baked or pressed and baked serve to distinguish from the doughnut-like cakes formed by dipping an internal mold or former in dough and then dipping it in hot fat until the dough adhering to the mold becomes partly baked and is disengaged from the mold and the cooking completed by boiling or frying in the fat.

This cake is not pastry in the ordinary sense of the term which means pie-crusts and the like consisting principally of grease and flour, but a dry cake.

The manner of serving has already been fully discussed.

We have thus described our invention specifically and in detail in order that its nature and operation may be fully understood; however, the specific terms herein are used descriptively rather than in their limiting sense and the scope of the invention is defined in the claims.

We claim:

1. An edible container for ice cream of pressed cake and of rectangular form to receive and fit the commercial single order rectangular ice cream block.

2. In combination, a commercial single order rectangular ice cream block and an edible container for the same of molded and baked cake, the container being of substantially rectangular cross section to fit the block and slightly tapered as to its vertical section.

Signed by us at St. Michaels, Talbot county, Maryland, this 11th day of October, 1916.

LEONARD VERNON JOHNSON.
OTIS HARPER BENSON.

Witnesses:
CURTIS B. SEWELL,
E. K. SMITH.

Miscellaneous

1,407,400

C. L. Roadhouse

UNITED STATES PATENT OFFICE.

CHARLES G. FERRARI, OF PHILADELPHIA, PENNSYLVANIA.

PRESERVATIVE WATERPROOF AND MOLDPROOF COMPOUND FOR WRAPPED FOOD PRODUCTS AND METHOD OF PRODUCING THE SAME.

1,407,400. Specification of Letters Patent. **Patented Feb. 21, 1922.**

No Drawing. Application filed April 13, 1921. Serial No. 461,046.

To all whom it may concern:

Be it known that I, CHARLES G. FERRARI, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Preservative Waterproof and Moldproof Compounds for Wrapped Food Products and Methods of Producing the Same, of which the following is a specification.

My invention has for its object the provision as an article of manufacture, of elastic or yielding preservative mixtures so compounded as to become homogeneous and for applying to foil wrapped food products, as cheeses, as well as yeast and other similar products, to prevent growth of aerobic molds, the absorption by the wrapped products of undesirable odors, as well as for rendering proof of such food packages against moisture or air.

Hitherto it was the general custom to put up cheese, such as the cream, ancre, Neufchâtel, as well as other brands or types, in a foil wrapper, but by sudden changes of temperature or climatic conditions the aerobic molds formed quickly and not only deteriorated the products, but transformed them into a condition rendering such unsafe for use. This has particularly happened in summer weather. In the past in some cases paraffin-wax was employed around the wrapped products, but this has not been an assured success, because not pliable or elastic in application, for it is found when becoming hard the wrapped products cracked so that there was created rapid deterioration as well as undesirable odors and growth of aerobic molds rendering such products highly unsafe for use. Such products so wrapped and treated it was found keep but a short time and hence heavy losses in the past have been sustained.

To overcome the foregoing objectionable as well as serious features, and to preserve food products of a character, readily spoiling by exposure, thus rendering unfit for use, is the purpose of my present invention.

My invention will be better understood as to the character thereof from the following description of the same.

The compounding of the mixture in one form which has been found for some time past highly efficient, is as follows:—

Mineral oil	3.5%
Paraffin-wax	87.5%
Beeswax	5.0%
Paracoumarone resin	4.0%
	100%

The mineral oil is technically liquid petrolatum and is known under the appellation of petrolatum liquidum, liquid paraffin and mineral oil. It is a mixture of liquid hydrocarbons obtained chiefly from petroleum, a colorless, transparent, oily liquid free or nearly so from fluorescence, odorless, as well as tasteless when cold. Its specific gravity varies between 0.828–0.905 at 25° centigrade. The preferred oil to be used has a specific gravity of approximately 0.86.

The paraffin-wax used is a purified mixture of solid hydrocarbons usually obtained from petroleum, is colorless, and is more or less translucent and odorless, as well as tasteless. It is slightly greasy to the touch. The paraffin preparation has a melting point at about 52° centigrade.

The beeswax is the pure yellow beeswax containing no impurities, such as added paraffin-wax.

The paracoumarone resin used is a synthetic compound having an approximate melting point of 90° to 100° centigrade. Physically it is brittle, amorphous, resembles rosin somewhat and is a dark reddish brown. The source is from the polymerization of aromatic naphthas and technically it consists essentially of a mixture of polymerization products of coumarone, indene and their homologs. Practice has demonstrated that its use is preferable to ordinary rosin or colophony, because it contains essentially no material which is volatilized during the heating of the wax mixture and also because of its remarkable chemical inertness. Ordinary rosin partly decomposes, yielding volatile products and leaving a gummy resinous residue in the bottom of the mixture which is annoying because of its adherence to the sides and bottom of the container and because the initial properties of the mixture are thus disturbed.

The employment in the preservative compounded mixture of the mineral oil is to give a soft coat-like mixture and one highly pliable. The beeswax aids in a similar manner and in addition imparts to the compounded mixture a certain toughness which is decidedly advantageous to the same. The resin serves to make the wax-like mixture adhere firmly to the wrapped cheese, food, yeast or other similar products, and likewise to strengthen the same so contained for preservation, shipment or handling in a sanitary or hygienic manner.

The foregoing described ingredients entering into the composition of the compounded mixture of my said invention it has been found by extended practice to give most desirable results by mixing in any well known type of steam jacketed kettle in which they respectively, melt and form a homogeneous mixture at about 100° centigrade. The extreme temperature for coating the foil wrapped product, such as cheese or yeast, is between 110° and 120° centigrade. Within range of the recited temperatures the wrapped products will have a thin coating provided them, in a very pliable condition. Physically when cold or more or less set, it is of a light amber color and has a melting point at about 52.5° centigrade. The mixture in its liquefied condition is of a dark brown color.

It has been found that the hereinbefore described compounded preservative mixture for the purposes defined possesses the following decidedly advantageous features.

First. It is very pliable in application to packaged food products, permitting of very considerable bending, without cracking, as well as clinging or adhering to the foil or other type wrapper to which applied. Moreover, it enters the pores of the wrapper, thus sealing the product completely, as practice has demonstrated, to the surrounding air. By the exclusion of the air is absolutely prevented growth of aerobic molds, particularly on soft cheese, cream cheese, Neufchâtel cheese and ancre cheese, thus making it possible to keep the same from molding for periods of months, maintained at ordinary temperatures or under refrigerating conditions. The use of the compound does not so completely close the package as to make tearing of the foil difficult to open the package at the seams.

Second. This compounded preparation is transparent, thus allowing the label to be clearly observed. The coating is also waterproof.

Third. If stored in a damp place, it is equally efficient in preventing encroachment of molds to the cheese from outside sources, as well as preventing absorption of undesirable odors.

Fourth. It is found it will prevent the growth of aerobic molds on any food products in wrapped form. Moreover, if accidentally ingested, it does not harm the human system. It dries with greater eagerness than ordinary waxes, particularly in a current of air. Again it does not stick tenaciously to other objects, when partially cool, if placed against them.

Fifth. It will not prevent changes in any food product due to the bacterial activity of facultative aerobes or anaerobes.

From the foregoing it will be understood that the hereinbefore recited exact percentages of ingredients employed in the compounding of the said preservative mixture may be subject to variations from those given and still be effective for required results. Also, if one or more of the ingredients is or are used with properties different from those described by the foregoing formula, the proportions may be varied. In a similar manner the ingredients are capable of substitution by other similar elements, as a different resin or wax, and a preservative mixture similar in physical properties to the original formula as hereinabove given and equally efficient results be obtained.

Having thus described the nature and objects of my invention, what I claim as new and desire to secure by Letters Patent is:—

1. As an article of manufacture, a preservative waterproof and mold proof compounded mixture composed of mineral oil, paraffin-wax, beeswax and resin in proportions substantially as described and for the purposes set forth.

2. As an article of manufacture, a preservative waterproof and moldproof compounded mixture, composed of mineral oil, paraffin-wax, beeswax and paracoumarone resin compounded under heat in proportions substantially as hereinbefore described and for the purposes set forth.

3. As an article of manufacture, a preservative waterproof and moldproof compounded mixture, composed of mineral oil, paraffin-wax, beeswax and paracoumarone resin compounded and combined under steam heat in proportions substantially as hereinbefore described to provide a homogeneous waterproof and moldproof mixture, as and for the purposes set forth.

4. The method of producing a preservative waterproof and moldproof compounded mixture which consists in treating under heat mineral oil, paraffin wax, beeswax and resin in respective proportions substantially as set forth to thereby transform into a homogeneous waterproof and moldproof mixture and then applying at a temperature above that at which compounding of the mixture was effected, substantially as and for the purposes set forth.

5. The method of producing a preservative

waterproof and moldproof compounded mixture which consists of treating mineral oil, paraffin wax, beeswax and paracoumarone resin in respective proportions substantially as set forth and under steam heat at about 100° centigrade to thereby transform into a substantially homogeneous mixture and then applying at a temperature ranging between 110° and 120° centigrade in the coating of a wrapped food article to be sealed to air as well as the growth of aerobic molds, substantially as set forth.

In witness whereof, I have hereunto set my signature in the presence of two subscribing witnesses.

CHARLES G. FERRARI.

Witnesses:
J. WALTER DOUGLASS,
ROSE E. MCCARTHY.

C. L. Roadhouse

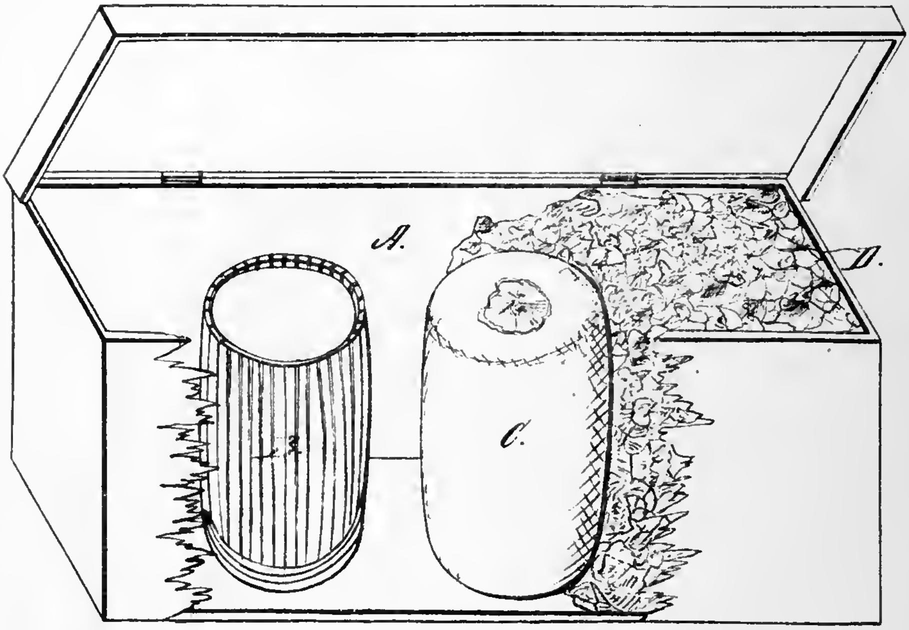
BUTTER

Patent	Subject	Author	Date
25,672	Mode of restoring rancid butter.	Prentiss	Oct. 4, 1859.
171,532	Improvement in processes of preserving butter.	Saoc	Dec. 28,1875.
226,467	Preservation of butter.	Wilkins	Apr. 13, 1880.
232,051	Method of pruifying rancid butter.	Morris	Sept. 7,1880.
240,126	Preserving butter.	Harger	Apr. 12, 1881.
559,634	Compound for purifying butter	Terman	May 5, 1896.
624,891	Compound for removing taint of onions or weeds from butter.	Bately	May 9, 1899.
689,292	Process for preserving butter.	Meulemeester	Dec. 17, 1901.

J. W. Prentiss,

Purifying Butter.

No. 25,672. Patented Oct. 4, 1859.



Witnesses:
James G. Gridley
H W Boardman

Inventor:
J W Prentiss

UNITED STATES PATENT OFFICE.

JOSIAH W. PRENTISS, OF PULTNEY, NEW YORK.

MODE OF RESTORING RANCID BUTTER.

Specification of Letters Patent No. 25,672, dated October 4, 1859.

To all whom it may concern:

Be it known that I, JOSIAH W. PRENTISS, of Pultney, in the county of Steuben and State of New York, have invented a Method of Restoring Rancid Butter in the Firkin, which I have described in the following specification and illustrated in its accompanying drawings with sufficient clearness to enable competent and skilful workmen in the arts to which it pertains or is most nearly allied to make and use my invention.

My said invention consists in the mode hereinafter described, of employing the well known disinfectant qualities of charcoal in restoring rancid butter without removing the butter from the firkin; which I accomplish by first removing one of the heads and all of the hoops except just enough of the lower ones to hold the remaining head, inclosing the firkin thus prepared in a sack of a texture sufficiently close to prevent the passage of broken charcoal, and surrounding the firkin so prepared and inclosed with broken charcoal, as hereinafter more fully set forth.

The devices which I employ in carrying my invention into practice are represented in the accompanying drawings in perspective, the front of the box being broken away to allow the representation of the interior parts.

A is a box or bin for containing charcoal, which box may be made of any form and size that may be required to suit the circumstances of the case and to contain the necessary amount of this disinfectant to accomplish the purpose to be realized.

B is the keg or firkin in which the butter is contained, supposed to be of the form and size usually employed in packing butter for market. As represented, all the hoops except two or three of the bottom ones are removed, and also the upper head of the firkin, to open the joints of the firkin and allow the disinfectant properties of the charcoal to act upon the butter without removing the butter from the firkin, and by so opening the keg, the space around the butter is sufficiently opened for this purpose, and the necessary atmospheric circulation is provided for. Having thus prepared the firkin, I then inclose it in a sack or bag C, which may be made of any common material used for making bags. It should however be sufficiently open in its texture to allow the gases to circulate, without being so much so as to allow the charcoal to come in contact with the butter. The mouth of the bag having been carefully closed, I place the firkin in the box A, fill the space around it with broken charcoal, and having carefully closed the box, allow the whole to remain undisturbed for about eight days, in which time I find by practice that the charcoal will usually absorb from the butter the impure acids and gases from which its unpleasant taste and the disagreeable effluvia proceed. In extreme cases and under certain circumstances a longer time may be required, while under more favorable conditions, and where the butter is but little changed, a less time may very often be quite sufficient for the purpose. It is well known that butter in the firkin frequently from some fault in the firkin or other cause becomes slightly damaged upon the outside while the interior of the mass retains nearly or quite its primitive sweetness, and the restoration of the outer strata is all that is required. By this arrangement this is accomplished without removing the butter from the firkin, which is a very great advantage, for the less butter can be handled after once packed till it is used the better, and besides, the saving of handling avoids expense. It is further to be considered that the unpacking and re-packing of butter has a tendency to injure its appearance even if it did no other harm, and spoils its sale in the market.

It is well known that charcoal is a disinfectant, and I make no claim to its use for purifying purposes.

The object and purpose of my invention is to purify rancid butter in the keg or firkin, and it is to the mode described of accomplishing this purpose that my invention is strictly confined. I am aware however that there may be slight variations in the process, which, not being in any respect material, do not change the invention, which my improvement would of course include, as for example the use of a sheet or other cloth in place of the sack which I generally employ.

The particular improvement which I claim as having been originally and first invented by me, is—

The mode described of restoring rancid butter in the firkin by removing the hoops so as to open the joints, inclosing it in a bag or other textile fabric, and then surrounding the whole with charcoal, substantially as hereinbefore described and for the purpose set forth.

J. W. PRENTISS.

Witnesses:
JAMES F. GRIDLEY,
H. W. BOARDMAN.

171,532

UNITED STATES PATENT OFFICE.

FREDERIC H. L. C. SACC, OF NEUFCHATEL, SWITZERLAND.

IMPROVEMENT IN PROCESSES OF PRESERVING BUTTER.

Specification forming part of Letters Patent No. **171,532**, dated December 28, 1875; application filed November 4, 1875.

To all whom it may concern:

Be it known that I, FREDERIC H. L. C. SACC, of Neufchatel, in the Swiss Republic, have invented a certain new and useful Process of Preserving Butter, of which the following is a specification:

In my process I avail myself of the antiseptic properties of alcohols, which prevent that change in the nitrogenous or azotic elements of butter which produces rancidity.

My process consists in malaxating or intimately mixing butter with, say, two per cent., more or less, in weight, of alcohol at 90° centesimal—that is to say, ninety per cent. pure alcohol. The butter thus prepared is put in suitable receptacles, such as earthen, glass, metal, or wooden vessels.

When it is desired to use the butter it is washed by kneading in fresh water, after which it will be found as fresh and pure as though newly made.

By the process above described the butter may be preserved for an indefinite length of time. I have thus kept butter for two years or more absolutely intact and pure.

I can make use of all alcohols, either pure or mixed with coloring or aromatic matters.

I do not claim, broadly, the use of alcohol as a preservative for butter; but

I claim—

The described process of preserving butter by mixing the same with two per cent. of alcohol at 90° C., as set forth.

In testimony whereof I have hereunto signed my name this 3d day of November, A. D. 1875.

FREDERIC SACC.

Witnesses:
R. A. PIPER,
W. H. L. LEE,
H. GAULLIEW.

226,467

UNITED STATES PATENT OFFICE.

THOMAS F. WILKINS, OF LONDON, ENGLAND.

PRESERVATION OF BUTTER.

SPECIFICATION forming part of Letters Patent No. 226,467, dated April 13, 1880.

Application filed December 3, 1879. Patented in England June 23, 1879.

To all whom it may concern:

Be it known that I, THOMAS FOSTER WILKINS, of Upper Baker street, London, in the county of Middlesex and Kingdom of England, have invented certain new and useful Improvements in the Preservation of Butter, which are fully set forth in the following specification.

This invention relates to the preservation of butter by means of glacial metaphosphoric acid.

In carrying out my invention I take of glacial metaphosphoric acid in solution, say, twenty-four grains of acid for every pound of butter. This solution I thoroughly mix, blend, and incorporate with the butter by any suitable means. The preservative process is then complete, and the butter thus prepared may be placed in any suitable vessel for domestic or commercial purposes.

Instead of applying the glacial metaphosphoric acid in solution, I may apply it in a solid crushed state.

The strength of the solution will vary according to circumstances and requirement—say from three drams to one ounce to the ounce of water.

I would observe that it is preferable that the butter should be treated with the preservative agent as soon after it is taken from the churn as possible, and that the butter be thoroughly freed from buttermilk; also that the flavor will be improved by the addition of a small quantity of salt.

Having now described the nature of my invention and in what manner the same is or may be performed, I would have it distinctly understood that I do not confine myself to the relative proportions hereinbefore given, as such may be varied to suit various kinds of butter, the length of time for which it is desired to preserve the butter, the atmospheric conditions under which it is prepared, and other causes. The proportion of the preservative agent will not, however, in any case exceed one dram to one pound of butter.

I am aware that phosphates and phosphites have been long known as antiseptics, and also that metaphosphoric acid in solution has been proposed as a preservative for fish, vegetables, and fruits, and for hardening fats by being melted therewith. Such I do not claim as my invention, nor would such means or methods be applicable to the preservation of butter.

The mechanical admixture of the metaphosphoric acid with the butter as carried out in practicing my invention effects the preservation of the butter by bringing the reagent in contact with the caseine and other substances which would otherwise putrefy.

I claim as my invention—

As a new article of manufacture, butter containing metaphosphoric acid intimately incorporated therewith, whereby the butter is preserved, substantially as set forth.

THOMAS FOSTER WILKINS.

Witnesses:

WILLIAM EDWARD GEDGE,

JOHN FOSTER LENNOX SYKES.

232,051

Butter

UNITED STATES PATENT OFFICE.

JAMES CHESTON MORRIS, OF PHILADELPHIA, PENNSYLVANIA.

METHOD OF PURIFYING RANCID BUTTER.

SPECIFICATION forming part of Letters Patent No. 232,051, dated September 7, 1880.

Application filed June 10, 1880. (No specimens.)

To all whom it may concern:

Be it known that I, JAMES CHESTON MORRIS, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented an Improvement in Purifying Rancid Butter, of which the following is a specification.

The object of my invention is to restore to its original purity and sweetness butter which has become rancid; and this object I attain by treating the rancid butter with boracic acid or its compounds in the manner hereinafter set forth.

In carrying out my invention I first make a saturated solution, in water, of boracic acid, employing, by preference, three hundred and twenty (320) grains of boracic acid to the pound of butter. The rancid butter is then thoroughly worked in this solution, the operation being continued until all parts of the mass are exposed to the action of the solution.

I have found, in practice, that with a solution of the above-mentioned strength five minutes generally suffices to insure the effective action of said solution on the butter, although if the solution is of a weaker character than that mentioned a longer time will be necessary.

After being subjected to the action of the boracic-acid solution the butter is thoroughly washed in pure water, so as to free the mass from the acid and the butyrates and other impurities which have been freed from the butter by the action of the acid thereon, the impurities, with the acid, being held in solution or suspension by the water, thus leaving the butter in a sweet and wholesome state and ready for treatment with salt or coloring-matter, as when freshly gathered from the churn.

The same solution may be used to treat successive batches of butter until it becomes so affected by the impurities which have been extracted from the butter as to fail to properly perform its duty, in which case the solution may be subjected to distillation or other process, whereby the boracic acid is recrystallized and recovered.

Compounds of boracic acid—such, for instance, as biborate of soda—may in some cases be used in place of the acid itself, although the use of the latter is preferred.

I am aware that boracic acid is well known as an antiseptic, and that its use has hitherto been proposed for preventing the souring of milk and for preserving other articles of food from putrefaction; but I am not aware that it has heretofore been known that butter, after it once became rancid, could be deprived of its impurities and rendered sweet and wholesome by treatment with the acid. Hence,

I claim as my invention and desire to secure by Letters Patent—

The within-described improvement in the art of purifying rancid butter, said improvement consisting in subjecting the butter to the action of a solution of boracic acid or its compounds, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

J. CHESTON MORRIS.

Witnesses:

JAMES F. TOBIN,

HARRY SMITH.

240,126

UNITED STATES PATENT OFFICE.

JOHN HARGER, OF TORONTO, ONTARIO, CANADA.

PRESERVING BUTTER.

SPECIFICATION forming part of Letters Patent No. 240,126, dated April 12, 1881.

Application filed August 11, 1880. (No specimens.) Patented in Canada July 10, 1880.

To all whom it may concern:

Be it known that I, JOHN HARGER, of Toronto, in the Province of Ontario, Dominion of Canada, have invented a new and useful Improvement in Preserving Butter, of which the following is a specification.

The object of this invention is to prevent butter from becoming rancid, and to preserve its flavor, so that it will remain sweet for a long time even in very warm weather.

The invention consists in the mode of preserving butter by incorporating with the milk or cream before churning, and with the butter after churning, boracic acid dissolved in hot glycerine, and sulphate of potassium dissolved in boiling water, as will be hereinafter fully described.

In carrying my invention into practical effect I dissolve one pound of boracic acid in five pounds of hot glycerine. I next dissolve one pound of sulphate of potassium in five pounds of boiling water. These two solutions I then pour together to form my preserving compound.

When the milk or cream is placed in the churn for churning I add thereto two table-spoonfuls of the compound for each gallon of milk or cream. The quantity of the solution used may be varied according to the season of the year, a little more being used in very warm weather and a little less when the weather is cooler. When the butter has been produced and the buttermilk worked out I add to the butter two table-spoonfuls of the compound for each pound of butter, and thoroughly work it into the butter. Butter thus treated will keep fresh and sweet for a long time in any climate.

In defining my invention more clearly with respect to the prior state of the art, I would state that I am aware that borax has been dissolved in glycerine for preserving fruit, and that sulphate of potash has been used for assisting in the preservation of milk. I do not know, however, that free boracic acid has ever been used in connection with sulphate of potash for preserving the butter by treatment of the same direct or by preliminary treatment of the butter-globules in the cream.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. The mode of preserving butter by incorporating with the milk or cream, before churning, and with the butter after churning, boracic acid dissolved in hot glycerine and sulphate of potassium dissolved in boiling water, substantially as herein shown and described.

2. The mode of preserving butter by incorporating with the milk or cream, before churning, boracic acid dissolved in hot glycerine and sulphate of potassium dissolved in boiling water, substantially as herein shown and described.

3. The mode of preserving butter, substantially as herein shown and described, by incorporating with the butter, after churning, boracic acid dissolved in hot glycerine and sulphate of potassium dissolved in boiling water, as set forth.

4. The herein-described composition of matter to be used for the preservation of butter, consisting of boracic acid dissolved in hot glycerine and sulphate of potassium dissolved in boiling water, in the proportions specified.

Dated at Toronto, Canada, August 2, 1880.

JOHN HARGER.

Witnesses:
J. T. CARTER,
JOS. PEASE.

559,634

United States Patent Office.

JAMES W. TERMAN, OF NEW SHARON, IOWA, ASSIGNOR OF ONE-HALF TO D. CHAMPLAIN, OF COLFAX, IOWA.

COMPOUND FOR PURIFYING BUTTER.

SPECIFICATION forming part of Letters Patent No. 559,634, dated May 5, 1896.

Application filed September 28, 1895. Serial No. 563,962. (No specimens.)

To all whom it may concern:

Be it known that I, JAMES W. TERMAN, a citizen of the United States of America, residing at New Sharon, in the county of Mahaska and State of Iowa, have invented a new and useful Composition of Matter to be Used for Purifying and Preserving Butter and Milk, of which the following is a specification.

My object is to provide in suitable quantities and in suitable sealed packages a manufacture adapted to be handled advantageously as merchandise to be used in the manner hereinafter set forth.

My composition consists of the following ingredients, combined in the proportions stated, viz: boracic acid, one (1) pound; sorghum-sugar, one-fourth ($\frac{1}{4}$) pound; burnt alum, one-fourth ($\frac{1}{4}$) pound; saltpeter, one-eighth ($\frac{1}{8}$) pound; pea-flour, three (3) ounces. These ingredients are to be thoroughly mingled by agitation.

In using the above-named composition to purify and preserve ten (10) pounds of fresh butter I place it in a non-corrosive vessel and then place the vessel in another water-tight vessel of corresponding shape, but of larger diameter, so that water can be filled in between the two vessels, and then place the vessels on a stove and boil the water sufficiently to bring the butter in the inner vessel to eighty (80) or ninety (90) degrees of heat. Then remove it from the fire and add one-half ($\frac{1}{2}$) ounce of the composition and stir it in the butter that has been thus sterilized and made an emulsion. After standing five or ten minutes, skim off all foreign matter that rises to the top and then pour the butter into a suitable vessel, and when cold it will be ready for use. If it is to be kept for future use, it should be hermetically sealed while hot. The antiseptic substances in the composition are thus utilized in destroying the life of all micro-organisms that may exist in the matter treated and the pea-flour in the composition will be liberated by the heat, and, being of less specific gravity than butter and milk, will rise to the top and carry therewith dead microbes and other foreign matter, so that such impurities that gather and adhere to the flour will be readily skimmed off from the top of the substance treated and purified. It is therefore obvious that the pea-flour or its equivalent is an active and essential ingredient in accomplishing the purposes contemplated by my invention.

Stale or rancid butter should be treated in the same way, but to ten (10) pounds of butter one (1) ounce or more of the composition (according to the condition of the butter) should be added and the butter heated to one hundred (100) degrees or more.

Columbia or other suitable coloring-matter and salt may be added to the butter in such quantities as desired at the same time the composition is stirred in.

To purify and preserve sweet milk, treat it in the same manner as fresh butter and add my composition in about the same proportions given for fresh butter.

Bacteria or other micro-organisms that may exist in butter and milk are thus certainly destroyed and the pure sterilized food used without danger of causing disease in those who partake thereof.

What I claim as new, and desire to secure by Letters Patent of the United States therefor, is—

The herein-described composition of matter to be used for purifying butter and milk, consisting of boracic acid, sorghum-sugar, burnt alum, saltpeter and pea-flour, in about the proportions specified.

JAMES W. TERMAN.

Witnesses:
JOHN W. CARR,
H. H. HAMMOND.

624,891

UNITED STATES PATENT OFFICE.

STEPHEN SAMUEL BATELY, OF MITCHELL, SOUTH DAKOTA, ASSIGNOR TO LILLY BATELY, OF SAME PLACE.

COMPOUND FOR REMOVING TAINT OF ONIONS OR WEEDS FROM BUTTER.

SPECIFICATION forming part of Letters Patent No. 624,891, dated May 9, 1899.

Application filed November 6, 1896. Serial No. 611,246. (No specimens.)

To all whom it may concern:

Be it known that I, STEPHEN SAMUEL BATELY, a citizen of the United States, residing at Mitchell, in the county of Davison, State of South Dakota, have invented a new and useful composition of matter to be used for cleansing and purifying butter and removing therefrom all onion and weedy flavors and unnatural taints during the process of churning, of which the following is a specification.

My composition consists of the following ingredients combined in the proportions stated, viz.: nitrate of potash, thirty grains; bicarbonate soda, fourteen grains; borax, fourteen grains; powdered slaked lime, two grains. These ingredients are to be thoroughly mingled and mixed.

In using the above composition caution must be taken that the churn, vat, or other vessel in which the cream is placed be thoroughly clean. Scald the churn, vat, or other vessel with boiling water or steam and rinse with cold water before using. Immediately after skimming reduce the temperature of the cream to 54° Fahrenheit and add salt heavily until the cream in the vat or vessel is thoroughly brined, stir thoroughly and frequently, allowing the temperature of the cream to gradually rise to 60° Fahrenheit and hold at that temperature until the cream is ripe, and then place the cream in the churn. Further precaution must be taken after placing the cream in the churn that its temperature be from 58° to 60° Fahrenheit. Then add the necessary color. In order to insure the desired results, now mix from one to two drams of the composition to each gallon of cream in the churn. If the cream be strongly flavored with onions, weeds, or other foreign matter, it is advisable to use proportionately more of the composition, and then the temperature of the cream should be made proportionately lower. After the butter is separated from the milk in small globules of about the size of a pin-head do not draw off the buttermilk, but dilute it in the churn by adding about one-third the quantity of clear cold water at a temperature of 54° Fahrenheit and turn the churn very slowly by hand ten or twelve times, then draw off one-half of the buttermilk through a strainer and dilute the remainder with clear cold water at a temperature from 50° to 52° Fahrenheit and turn the churn very slowly by hand ten or twelve times, then draw off all the buttermilk and add clear cold water at a temperature of 48° to 50° Fahrenheit until the butter floats in the churn, then turn the churn very slowly by hand for five minutes, and then draw off the water through a strainer. Wash the butter in this way once or twice or until such time as the water drawn from the butter is absolutely clear. The butter will then be perfectly sweet.

The buttermilk being very salty should be diluted with the wash-water from the churn before being given to hogs.

By the use of the above composition and making of the butter as above specified it will be cleansed of all foreign tastes and flavors and will retain its natural flavor.

What I do claim, and desire to secure by Letters Patent of the United States, is—

The herein-described composition of matter for purifying milk, cream or butter, which consists of nitrate of potash, bicarbonate soda, borax, and powdered slaked lime combined in the proportions and in the manner specified.

STEPHEN SAMUEL BATELY.

Witnesses:
J. L. HANNITT,
HOYT COX.

689,292 Butter

UNITED STATES PATENT OFFICE.

EMILE DE MEULEMEESTER, OF BRUSSELS, BELGIUM, ASSIGNOR TO FORCE SOCIÉTÉ ANONYME, OF ANTWERP, BELGIUM.

PROCESS OF PRESERVING BUTTER.

SPECIFICATION forming part of Letters Patent No. 689,292, dated December 17, 1901.

Application filed August 23, 1901. Serial No. 73,058. (No specimens.)

To all whom it may concern:

Be it known that I, EMILE DE MEULEMEESTER, gentleman, a subject of the King of Belgium, residing at 62 Rue de Neuchatel, Brussels, in the Kingdom of Belgium, have invented an Improved Process of Preserving Butter, of which the following is a specification.

This invention relates to a process for preserving butter, which is based upon the property possessed by gum-arabic of rendering the water or the milk contained in butter non-fermentable.

The researches of Fehling have established the fact that gum-arabic and its concentrated solutions are not fermentable, and numerous experiments which I have made have demonstrated that by mixing powdered gum-arabic with butter in the requisite proportions for absorbing the water contained in the latter (about four per cent.) the butter may be kept for a long period without becoming rancid. In addition to this with a small admixture of salt the butter preserves its aroma. Nevertheless this method of procedure presents the disadvantage that it necessitates too large a proportion of gum-arabic and that this gum should be exempt from impurities. Now it is difficult to procure pure gum in large quantities, and its price would speedily become prohibitive if the consumption became large. In order to obviate these disadvantages, I proceed in the following manner: I dissolve raw gum-arabic in water and filter the solution in order to remove impurities—such as fragments of bark, dust, &c.—contained in the gum. I then mix the filtered solution with the butter and finally extract the excess of liquid contained in the mixture. By way of example I will describe a method of carrying my invention into practice which has given the desired result.

Raw gum-arabic is dissolved in water in the proportion of one part, by weight, of gum for two parts of water, and the solution is filtered in a filter-press, the frames of which are provided with a fabric sufficiently close for retaining the dust mixed with the gum. This solution is mixed with the butter, in the proportion of about six to ten liters of solution for one hundred kilograms of butter, in a suitable mixing-machine, and when the mixture has become thoroughly intimate it is caused to pass between two hollow cylinders arranged in juxtaposition and rotating in opposite directions. The surface of these cylinders is perforated in order to permit the liquid expressed from the mixture to escape. The cylinders are covered with a permeable fabric, so as to prevent the butter from entering these perforations. As butter ordinarily contains from ten to fifteen per cent. of water, this proportion is raised to sixteen to twenty-two per cent. by the addition of the gum-arabic solution, and this excess of water is readily removed by causing the butter to pass once or twice between the pressing-cylinders. Operating in this manner, a portion of the gum-arabic is removed with the water, and the proportion of gum remaining in the butter may readily be reduced to one per cent. as against the proportion of four per cent. given by the method of treating butter with gum-arabic in powder. Before mixing with the butter the filtered solution of gum-arabic there is added to this latter the quantity of salt necessary for imparting to the butter the degree of saltness which it is desired to obtain. I have found that an addition of salt in the proportion of one-half to one part per one hundred parts of butter has the property of preserving the aroma of this latter when it is treated with gum-arabic in accordance with this invention.

I do not limit myself to a particular form of apparatus for carrying my invention into practice nor to the proportions of the various ingredients which have been given by way of example; but

What I claim as my invention is—

1. A process for the preservation of butter consisting in dissolving gum-arabic in water, in eliminating from this solution the impurities originally contained in the gum, in mixing this solution with the butter to be treated, then in removing from the mixture a portion of the water originally contained in the butter and a portion of the gum-arabic solution which has been added to the butter substantially as described.

2. A process for the preservation of butter consisting in preparing a solution of gum-arabic in water in the proportion of one part

by weight of gum for two parts of water, in filtering this solution, in mixing the butter to be treated with this solution in the proportion of six to ten liters of the solution for one hundred kilograms of butter and in submitting the mixture to pressure in order to express a portion of the water originally contained in the butter and also a portion of the gum-arabic solution which has been mixed therewith substantially as hereinbefore described.

In testimony whereof I have hereunto set my hand, in presence of two subscribing witnesses, this 9th day of August, 1901.

EMILE DE MEULEMEESTER.

Witnesses:

H. J. E. KIRKPATRICK,
GREGORY PHELAN.

CHEESE

Patent	Subject	Author	Date
146,851	Improvement in preparing rennet for making cheese, etc.	Widger	Jan. 27, 1874.
1,163,066	Cheese.	Carpenter	Dec. 7, 1915.
1,186,524	Process of sterilizing cheese and an improved product produced by such process.	Kraft	Dec. 23, 1919.
1,334,693	Process of making Emmenthal or Swiss cheese.	Doane	Mar. 23, 1920.
1,350,870	Process of sterilizing and packaging cheese.	Kraft	Aug. 24, 1920.
1,368,624	Cheese and process for sterilizing same.	Garstin	Feb. 15, 1921.
1,374,141	Process of sterilizing cheese.	Eldredge	Apr. 5, 1921.
1,389,095	Swiss cheese and method for sterilizing the same.	Carpenter	Aug. 30, 1921.
1,389,577	Cheese and process for sterilizing the same.	Carpenter	Sept. 6, 1921.
1,400,171	Process of preparing cheese.	Kraft	Dec. 13, 1921.

146,851

Cheese

UNITED STATES PATENT OFFICE.

MINERVA A. WIDGER, OF DE KALB, ASSIGNOR OF ONE-HALF HER RIGHT TO DAVID F. BARCLEY AND MARCUS MALLORY, OF ELGIN, ILLINOIS.

IMPROVEMENT IN PREPARING RENNET FOR MAKING CHEESE, &c.

Specification forming part of Letters Patent No. **146,851**, dated January 27, 1874; application filed December 13, 1873.

To all whom it may concern:

Be it known that I, MINERVA A. WIDGER, of De Kalb, in the county of De Kalb and State of Illinois, have invented a new and useful Process for Increasing the Coagulating Properties of Rennet; and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable others skilled in the art to which my invention appertains to compound the ingredients employed, and to use the same.

My invention relates to a process for increasing the coagulating properties of rennet used in coagulating milk for the manufacture of cheese; and to that end it consists in the employment of a solution composed of nitrate of potassa and alcohol, which is applied to the green rennet, together with a proper proportion of common salt. The rennet, when sufficiently dry, is cut in pieces and placed in a tight vessel, and a quantity of sweet whey or water added. The whole is then allowed to remain a given time, when the required quantity of liquid to be used is strained off, adding each day to the remaining liquid a quantity of sweet whey or water equal to the amount of liquid used.

In carrying out my invention, take of pulverized nitrate of potassa, two parts, and alcohol, one part, each by weight, mix the same together and add a sufficient amount of water to dissolve the nitrate of potassa. To each green rennet apply two ounces of common fine salt, and one ounce of the solution, distributing the same evenly over the rennet; then hang the same in a warm dry place and allow it to remain for about thirty days, by which time it will be properly cured.

To use the rennet, take about the following proportions—that is to say—take five rennets, cut them in pieces and place in a tight vessel, add two quarts of sweet whey or water, let it remain for about three days, stirring the same each day, when it will be ready for use.

To each two thousand pounds of milk, heated in the usual manner, add one-half pint of the strained liquid, allowing the milk to remain for thirty minutes, when the same will be properly coagulated.

To obtain the full strength of the rennet, add each day to the liquid remaining in the vessel a quantity of sweet whey or water, equal to the amount taken from the vessel, together with a small quantity of salt, until it is found that its coagulating properties are decreasing; then remove the rennet and add a new amount, as at first.

It is found, by actual experiment, that the coagulating properties of rennet cured in a solution of nitrate of potassa, alcohol, and salt, as specified, are much greater than with those cured in the usual manner—that is to say, the coagulating properties of one rennet is equal to that of three. This is produced by preventing the rennet from becoming decomposed while being cured or soaked for use, thereby preserving the full strength. This may be accomplished by other solutions than that formed of the ingredients mentioned—that is to say, in place of the nitrate of potassa, or in admixture with it, the nitrates of soda, lime, or magnesia may be used, which will have the same chemical action on the rennet, thereby preserving the same.

I do not wish to confine myself to this process for curing green rennets only, as the same may be used with rennets cured in the usual manner and with a like result, the same preventing the rennet from decomposing while being soaked for use. In this latter case the same quantity of the solution is added when the rennet is put in soak, adding a small quantity of the solution each day as the liquid is used.

Having described my invention, I claim—

The process of increasing the coagulating properties of rennet by the use of nitrate of potassa and alcohol, or their equivalents, applied to the green rennet or used with previously-cured rennets, in the manner specified.

The above specification of my process signed by me this 8th day of December, 1873.

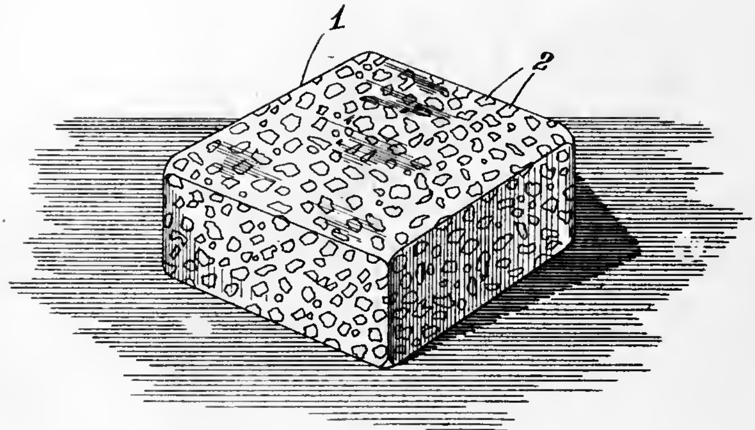
MINERVA A. WIDGER.

Witnesses:
ELI B. GILBERT,
M. E. NEARING.

1,163,066

L. E. CARPENTER.
CHEESE.
APPLICATION FILED MAR. 30, 1915.

1,163,066. Patented Dec. 7, 1915.



Witnesses:
Fred Roegers.
Matthew Monahan

Inventor
Linn E. Carpenter.
By his Attorney
Walton Harrison

UNITED STATES PATENT OFFICE.

LINN EUGENE CARPENTER, OF EAST ORANGE, NEW JERSEY.

CHEESE.

1,163,066. Specification of Letters Patent. Patented Dec. 7, 1915.

Application filed March 30, 1915. Serial No. 18,016.

To all whom it may concern:

Be it known that I, LINN EUGENE CARPENTER, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Cheeses, of which the following is a specification.

My invention relates to cheeses, and among the objects I seek to accomplish are the following: I. To give the cheese an improved taste and a distinctive flavor. II. To prevent, or at least retard, the decomposition of the cheese—especially in instances where the cheese is soft or has an unstable composition such as ordinarily invites rapid decay. III. To confer upon the cheese a heterogeneous texture, so as to prevent it from becoming pasty. IV. To give the cheese a distinctive and attractive appearance.

I begin with a cheese body, which may itself be a finished cheese. I prefer to use a so-called soft cheese, because of the richness of its flavor. Cream cheese answers the purpose admirably. Cream cheese, as its name implies, is made from materials containing an excess of cream, and because of this fact is not only soft but unstable. Under ordinary conditions, it does not stay fresh very long, especially in warm weather. The decomposition of cheese of this kind is perhaps not properly designated as putrefaction. Even after undergoing partial decomposition the cheese is still edible, but owing to the gradual accumulation of various organic acids within the cheese body the taste of the latter is greatly impaired, and the flavor is no longer uniform for cheeses of the same kind or even for different parts of an individual cheese. Again, the partial decomposition tends to separate the liquid from the solid portions, and to cause the evolution of odoriferous gases. The taste of lactic acid begins to predominate, and gives the cheese a sour taste. While lactic acid is itself healthy, the sour taste due to its formation under conditions here contemplated is objectionable.

What I seek to do, therefore, is to distribute throughout the cheese body a comminuted, edible, organic material capable of not only acting as a preservative of the cheese, but also of conferring upon the latter an agreeable flavor, thus overcoming the flavor of badly-tasting acids therein contained. For this purpose I use ordinary preserved cherries, which I cut or comminute into little bits and work into or mix with the cheese body, and so distribute with approximate uniformity throughout the mass thereof.

Reference is made to the accompanying drawing forming a part of this specification, and in which like letters indicate like parts, the figure being a perspective of a bar of cheese made in accordance with my invention.

The body appears at 1, and at 2 are shown the bits or pieces of cherries, which are distributed throughout the mass or substance of the bar, as nearly uniform as practicable. The particular specimen here shown is a so-called package cheese; that is, a flat bar or small brick-like member adapted to be wrapped in tin foil or otherwise protected until ready for immediate use. My improved cheese, however, can be put up in any other form desired.

As a typical illustration, I will use cream cheese. This is soft, as above indicated. To each ninety pounds of the cheese body I use ten pounds of ordinary preserved cherries, such for instance as are usually sold as bottled cherries. These are so commonly known as to need no description. As originally prepared they are seeded, and then with about ten per cent. by weight of sugar they are cooked, after which they are bottled. I take these preserved cherries, run them through a sausage grinder and thus cut them into bits, and then mix these bits with the cream cheese. The entire mass is now worked up, and next passed between rollers and finally cut or molded into bars or bricks, as shown in the drawing.

The completed bar of cheese contains by weight about ten per cent. of the comminuted cherries, about one per cent. of the entire mass or ten per cent. of the contained cherries being sugar.

In the cheese thus prepared the flavor is very pleasant, as the taste of the cheese body blends harmoniously with the taste of both the sugar and the cherries. The cherries have antiseptic properties, and this is also true of the sugar. Hence, the cherries thus used have a tendency to preserve the cheese body. By actual trial I have found that the comminuted cherries preserve the entire mass of the cheese body, though not in actual contact with the mass at every point therein.

Each bit or portion of cherry appears to have a tendency to preserve portions of the cheese body close to it, though not resting directly against it. In other words, each bit of cherry tends to preserve all the material contained in a miniature zone of larger size than the bit of cherry.

I find that a cheese, treated as above described, will last twice as long, before undergoing a given degree of decomposition, as if not so treated.

Because of the heterogeneous character of the finished article, it is not pasty and can not readily become so. It retains all the richness of flavor peculiar to a cream cheese or other soft cheese, and it has a marked tendency to maintain its original consistency and its general appearance unchanged for a relatively long period of time.

I claim:—

1. A cheese, comprising a cheese body having its mass interspersed throughout with comminuted cherries.

2. A cheese comprising a soft cheese body having its mass interspersed with comminuted cherries.

3. A cheese comprising a body of cream cheese having its mass interspersed with comminuted cherries.

4. A cheese comprising a cheese matrix interspersed with distinct bodies of appreciable size, each of said bodies consisting of a vegetable substance sweetened with a flavoring material.

5. A cheese body comprising a matrix of cream cheese interspersed with distinct bodies of readily noticeable size, each of said bodies consisting of a vegetable substance sweetened with sugar.

6. A cheese comprising a cheese body flavored with preserved cherries.

7. A cheese comprising a cream cheese body containing cherries.

8. A cheese comprising a cream cheese body interspersed with comminuted cherries preserved in sugar.

9. A cheese comprising a cream cheese body interspersed with comminuted cherries preserved in sugar, in the proximate portion of nine parts of said cheese body to one part of said cherries, by weight.

10. A cheese, comprising a cheese body interspersed throughout with comminuted cherries preserved in sugar, the proximate proportions, by weight, being one part of sugar, nine parts of cherries and ninety parts of said cheese body.

Signed in the presence of two subscribing witnesses.

LINN EUGENE CARPENTER.

Witnesses:
J. F. WHITNEY,
L. E. BUCKBEE.

1,186,524

C. L. Roadhouse
Cheese

This patent is ...

UNITED STATES PATENT OFFICE.

JAMES LEWIS KRAFT, OF CHICAGO, ILLINOIS, ASSIGNOR TO J. L. KRAFT & BROS. CO., A CORPORATION OF ILLINOIS.

PROCESS OF STERILIZING CHEESE AND AN IMPROVED PRODUCT PRODUCED BY SUCH PROCESS.

14,777. Specification of Reissued Letters Patent. **Reissued Dec. 23, 1919.**

No Drawing. Original No. 1,186,524, dated June 6, 1916, Serial No. 86,764, filed March 25, 1916. Application for reissue filed October 16, 1919. Serial No. 331,721.

To all whom it may concern:

Be it known that I, James Lewis Kraft, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and Improved Processes of Sterilizing Cheese and Improved Products Produced by Such Processes, of which the following is a specification.

This invention relates to an improved process of sterilizing cheese to render it permanently keeping, and to the product thereby produced.

The chief object of the invention is to convert cheese of the Cheddar genus into such condition that it may be kept indefinitely without spoiling, under conditions which would ordinarily cause it to spoil, and to accomplish this result without substantially impairing the taste of the cheese. Incidentally, the process has a marked value in that it has the effect of permanently arresting the curing or flavor-development of the cheese, from which it follows that the cheese may be brought to the precise stage of ripening desired and then permanently arrested and kept in that stage or condition until consumed.

The invention consists in the matter hereinafter described and more particularly pointed out in the appended claims.

It is common knowledge that various feed products may be sterilized by the application of heat and then hermetically sealed under sterilized conditions and so rendered permanently keeping. But the attempt to apply such treatment to cheese of the Cheddar genus has invariably resulted in failure, so far as rendering the product permanently keeping is concerned.

It is a well known fact that cheese of the Cheddar genus cannot be heated to a temperature much above its melting point without disintegrating and permanently losing its true cheesy character. That is to say, the melted cheese becomes stringy and the casein and fats separate and cannot be returned to their original combined true cheese form and homogeneous condition. For this reason it has been impossible to treat such cheese to a high sterilizing temperature without spoiling it, and a completely sterilized, that is to say, a permanently keeping cheese of the Cheddar genus has not been produced prior to my discovery.

I understand that various cheeses, especially of the soft varieties, such as Camembert, Limburger, Brie, etc., which in the advance stages of curing become liquid or semi-liquid, have been made permanently keeping by sterilizing with heat and sealing hermetically under sterilized conditions. I believe the explanation to be that in the process of making and curing soft cheeses of the varieties stated, all those bacteria which can only be killed by heat of a comparatively high degree, have been killed off, (possibly by a toxic condition of the cheese as regards such bacteria, developed by the curing) while the remaining bacteria are all such as may be killed at a relatively low temperature,—a temperature below that at which the cheese will disintegrate and be spoiled. Hence, sterilization of these cheeses has been possible. On the other hand, in case of cheese of the Cheddar genus, the making and curing or ripening does not eliminate bacteria present and which require a relatively high temperature to kill them, and it follows that a high temperature for sterilizing is imperative, and coupled with such high temperature treatment, some treatment which will prevent the high temperature from spoiling or disintegrating the cheese. Out

I have discovered that cheese of the Cheddar genus may be prevented from disintegrating under the action of heat of as high temperature as 175° F. or even more, by subjecting the mass to proper agitation and stirring continuously or substantially continuously throughout the period beginning with the application of heat to the cheese, and continued until it has reached the necessary temperature and been maintained at that temperature amply long enough to insure thorough sterilization. A temperature of 175° F. maintained for a period of ten or fifteen minutes is ample to insure thorough sterilization.

In carrying out my improved process, a preferred way is substantially as follows: The cheese having been made and cured to the desired stage in the usual or any suitable way, the bandages are removed and the cheese cut up into small pieces, preferably by the use of a suitable slicing machine; the cutting up being desirable to facilitate the stirring in the early stages and to allow the heat to penetrate quickly and with approximate uniformity. The cut up cheese is placed in a steam jacketed or hot water jacketed kettle, or other suitable heating device, wherein it may be subjected to the desired temperature without scorching. The kettle or other receptacle in which the cheese is treated is desirably equipped with mechanical stirrers, though stirring might be performed manually. The steam, hot water, or other source of heat, is then applied gradually to the vessel and the temperature raised until the contents of the kettle reach approximately 175° F. at approximately which temperature it is held for a period sufficient to effect complete sterilization, usually for approximately fifteen minutes. While the cheese is being melted and while it is held at sterilizing temperature, it is actively stirred or agitated by suitable stirrers, and this treatment results in maintaining the mixture homogeneous, prevents it from losing its true cheese character and causes it to retain its homogeneous condition when cooled. After complete sterilization is assured, the liquid cheese is run off into suitable containers and, ordinarily, hermetically sealed under sterile conditions. After it has cooled it possesses its original flavor unimpaired, or substantially unimpaired, and its texture is homogeneous and substantially the same as it was before the treatment, excepting, of course, the elimination of such cellular cavities as may have existed in the cheese. The hermetically sealing under sterilized conditions is preferably and readily accomplished by drawing off the cheese into thoroughly clean cans or jars and sealing these while the cheese still remains at a sterilizing temperature. The subsequent cooling of the contents of the containers produces a partial vacuum and causes atmospheric pressure to supplement the mechanical pressure through which the seal is effected; such vacuum sealing being well understood in the art of canning and packaging fluids.

In the use of the term "Cheddar genus" I refer to all the cheeses, however named, made by a Cheddar process. The group of so-called American cheeses are typical examples of the Cheddar genus.

I claim:

1. The improved process of rendering cheese of the Cheddar group permanently keeping, which consists in heating and melting the cheese, actively stirring it while melted, and while thus maintained in homogeneous condition, raising its temperature to such degree as to effect complete sterilization, and then inclosing it in protective containers under sterilized condition.

2. The improved process of rendering cheese of the Cheddar genus permanently keeping, which consists in heating it to approximately 175° F., retaining it at such raised temperature for a substantial period, agitating or stirring the cheese during the treatment with heat, and finally placing it while sterile in suitable sterilized hermetically sealed containers.

3. As a new article of manufacture, completely sterilized cheese of the Cheddar genus.

4. As a new article of manufacture, a hermetically sealed completely sterilized package of cheese of the Cheddar genus.

5. As a new article of manufacture, a hermetically sealed completely sterilized package of non-liquid homogeneous cheese of the Cheddar genus.

6. As a new article of manufacture, a packaged product, comprising homogeneous sterilized cheese of the Cheddar genus, inclosed in a hermetically sealed container.

7. As a new article of manufacture, cheese of the Cheddar genus, homogeneous and so sterilized as to be permanently keeping.

8. The improved process of rendering cheese of the Cheddar group permanently keeping, which consists in heating the cheese, meanwhile actively stirring it to maintain it in homogeneous condition, raising its temperature to such a degree as to effect sterilization throughout and then inclosing it in protective containers.

9. The method of treating cheese of the Cheddar group which consists in heating the same to a temperature of approximately 175° F., maintaining at least said temperature for not less than ten minutes and actively stirring the cheese during said heat treatment.

10. The improved process of rendering cheese of the Cheddar group permanently keeping which consists in heating the cheese to approximately 175° F., maintaining at least said temperature for not less than ten minutes whereby sterilization is effected, actively stirring the cheese during said heat treatment to prevent disintegration, and inclosing said cheese in a protective container.

11. As a new article of manufacture cheese of the Cheddar genus homogeneous in texture, sterile, and permanently fixed against further ripening.

12. The improved process of rendering cheese of the Cheddar group ripened to the desired flavor permanently keeping, which consists, after the cheese has been ripened to a desired stage, in heating the cheese meanwhile actively stirring it to maintain it in homogeneous condition, and raising its temperature to such a degree as to effect steri-

C. L. Roadhouse

lization throughout and arrest further ripening.

13. The improved process of rendering cheese of the Cheddar group ripened to the desired flavor permanently keeping, which consists, after the cheese has been ripened to a desired stage, in heating the cheese, meanwhile actively stirring it to maintain it in homogeneous condition, raising its temperature to such a degree as to effect sterilization throughout and arrest further ripening, and inclosing the same in hermetrically sealed containers.

14. The improved process of rendering cheese of the Cheddar genus permanently keeping, which consists in comminuting the cheese, heating the same sufficiently to effect sterilization and actively stirring the material during the time of heating thereby producing a homogeneous mass and maintaining the cheese texture.

15. The improved process of rendering cheese of the Cheddar genus permanently keeping, which consists in comminuting the cheese, heating the same to approximately 175° F., maintaining at least said temperature for not less than ten minutes, actively stirring the material during said heating to prevent disintegration and effect homogeneity and inclosing the same in hermetically sealed containers.

JAMES LEWIS KRAFT.

1,334,693

-C. L. Roadhouse

UNITED STATES PATENT OFFICE.

CHARLES F. DOANE, OF EUREKA, CALIFORNIA.

PROCESS OF MAKING EMMENTHAL OR SWISS CHEESE.

1,334,693. Specification of Letters Patent. **Patented Mar. 23, 1920.**

No Drawing. Application filed May 23, 1919. Serial No. 299,124.

To all whom it may concern:

Be it known that I, CHARLES F. DOANE, residing at Eureka, in the county of Humboldt and State of California, have invented certain new and useful Improvements in Processes of Making Emmenthal or Swiss Cheese; and I do hereby declare the following to be a full, clear, and exact description of the same.

At the present time the manufacture of Emmenthal cheese (made and marketed in the United States under the name of domestic Swiss) is a highly developed art requiring great skill, acquired through long experience, to secure average results. Practically all of the Swiss cheese makers in the United States are men who learned the art usually in Switzerland. The length of time required to learn the art, and the very hard hours of labor required to manufacture the product, under the usual method, has discouraged residents of the United States from learning the business.

The skill acquired in learning Swiss cheese making is largely in the ability to tell when the curd is ready to dip from the whey and in adjusting the cooking temperature. If the curd is dipped too soon, glaesler, or blind cheese, may result. If the time is too long and the curd becomes too dry, the rind will peel while the cheese is being handled in the press, and the cheese may crack badly in the curing room. Either of these conditions, resulting from too long or too short cooking, is very serious. A difference in time of a very few moments frequently results in failure.

It is doubtful if any one unfamiliar with cheese curds of any kind can acquire the requisite skill in less than two years, though an experienced maker of American, or cheddar, cheese may acquire the skill in one year. In Switzerland apprenticeships of a number of years are required. The inspector of Swiss cheese factories for the Wisconsin Dairy and Food Commission has advocated the establishment of a State Swiss cheese factory for instructional purposes. He urged that in case such a factory was established, at least three years' experience in a Swiss cheese factory be required for entrance to the instructional courses, on the ground that this length of time was required to master the primary knowledge of cheese making.

With the present knowledge and practice of Swiss cheese making, probably not more than ten per cent. of this type of cheese made in the United States would grade "fancy", or would be a satisfactory substitute for the imported cheese, which in turn is the best, from the standpoint of the American consumer, of the cheese made in Switzerland. It is not unusual in Wisconsin for a factory operated by an experienced and capable cheesemaker to fail to turn out a single fancy cheese in the course of a season, and it is extremely unusual for a factory to make as much as fifty per cent. of cheese of this grade in one season. Factories making an unusually large percentage of the best grade one year may not make as much as ten per cent. of the same grade the year following, though operated by the same man.

The objects mainly sought to be attained by the present invention are:

Firstly, to provide a process which will render unnecessary that high degree of skill and experience which has heretofore been necessary to produce cheese of "fancy" grade.

Secondly, to provide a process with which cheese of a much higher average quality can be produced than with processes heretofore practised.

Thirdly, to eliminate losses due to deterioration, cracking, swelling, etc., in the curing stages.

Fourthly, to provide a process in which the product is rendered more rubbery and elastic, the distribution of the eyes is made more uniform, and the eye formation is carried to a higher development without danger of cracking the rind.

Fifthly, to provide a process with which the uniformity and average flavors may be controlled and modified.

To the above ends, this invention consists in certain novel modifications or variations in the usual process in connection with certain additional steps or manipulation of the milk and curd, all as will be hereafter pointed out in such wise as to be readily understood by those skilled in the art of Swiss cheese making.

In its broader aspect, the process of the present invention involves a step of preliminary preparation of the milk by heat whereby the subsequent cooking time and temperature become factors which in practice can be determined by comparatively unskilled operatives, or reduced to a time and temperature basis applicable in substantially all conditions met with in commercial practice. In other words, a standard of temperature and of cooking time becomes practicable, with little or no danger of spoiling the batch, without the highly technical skill heretofore essential for practically successful results.

The following is an example of proven practice giving temperature and time which are preferred because of the excellence of the results, but which are subject to considerable variation with good results, in some instances desirable where different texture and flavor are desired.

The milk from any source, in which lactic acid development is not excessive, and having the requisite butter fat content, is raised in temperature to approximately 143° F., preferably in a known creamery apparatus, such as a continuous heater. If heated to a higher degree—say 155° F.—the indications are that immediate cooling is desirable, but at lower temperatures (and the indications are that temperatures as low as 135° F. may be employed) the temperature may be maintained for a considerable period without injury.

After being held for approximately thirty minutes, the milk should be cooled to a temperature desirable for bacterial culture inoculation, an effective temperature being below 90° F., or approximately 88° F., and at this time the milk may be pumped into the usual steam jacketed round bottom kettles.

The bacterial cultures and a salt or acid are preferably added either simultaneously or successively before the rennet, or other known casein-coagulating enzyms, to impart the capacity of forming a curd which is less sensitive to over cooking in the subsequent cooking stages. This is conveniently accomplished by addition of hydrochloric acid or salt (NaCl). Hydrochloric acid of commercial strength answers well, and about 110 c. c. are added to 1650 pounds of milk, for example, in each kettle. The acid is diluted with cold water—say two gallons—so as to prevent coagulation before it is thoroughly mixed with the batch of milk.

The bacterial cultures of two different organisms are then added. These cultures are characterized by the production of a high percentage of lactic acid at high temperatures, even up to the cooking temperatures subsequently employed, and by the production of the eyes and characteristic Swiss cheese flavors.

The first culture may be recognized as *Bulgaricus*, and it is added to the batch in the proportion of, say, two quarts of milk diluted with two gallons of cold water.

The existence and action of the other organism or organisms having the stated characteristics is recognized and proven, but at this time a specific identifying name is not recognized. It, or they, may be provided by adding 30 grams of ground Swiss cheese to 1500 c. c. of sterilized whey, and developing for a period of about 24 hours. This quantity is added to each batch.

The organisms last referred to have been isolated, developed in sterile media, and dried. The indications are that the dried product will enable the commercial operations to be carried on with an increased certainty of result, but the identification, isolation, development, etc., of these characteristic Swiss cheese bacteria or organisms constitutes no part of my invention and is not claimed herein.

After slightly warming the milk, say to bring it to a temperature of approximately 95° F., about 110 c. c. of rennet extract is added to each batch.

The milk is "set" for about thirty minutes; *i. e.*, coagulation takes place, and then the curd is cut, the temperature at this time, owing to radiation losses, being a few degrees lower than 95° F., last above referred to, although this is of no moment. The cutting is done with the customary harp in both directions, and the cut curd is stirred for about five minutes with the scoop to bring up any large chunks and the latter are cut with the scoop. Following this, stirring with the harp is continuous until the particles are fairly small—say approximately the size of kernels of corn.

About twenty minutes after the first cutting, steam is applied and the curd is brought up to approximately 130° F. The period required to attain this temperature being about thirty minutes. During the heating, and continuing for, say, forty minutes after the said temperature has been reached, active stirring with a standard whip stirrer is continued, when the curd should be ready for dipping.

Contrary to prior practice, considerable variations in temperatures and time are permissible under all conditions in cooking under present process without injuriously affecting the product, and it may be noted that the time given is comparatively long and the temperature comparatively high, but the practical results have been excellent. Any conditions in the milk heretofore causing uncertainty in result unless the cooking temperature and the dipping time were performed exactly right, are overcome. It will, therefore, be seen that with the present process, certainty in results is assured under all conditions, and the operations may be reduced to a time and temperature basis within wide limits which can be followed readily by comparatively unskilled operators.

Subsequent steps in the process are briefly as follows:

The curd is dipped, or seined, with a linen cloth of open mesh, preferably by removing the entire mass of curd in one dip, and the curd is placed in a hoop and pressed to give form to the cheese. The formed curd is turned and cloth changed about four times at intervals of about one hour, and the pressing is continued for about twenty hours longer.

The now formed cheese is placed in a brine tank for, say, 48 hours, to form a hard rind, and is then placed in a cold room (56° F. to 60° F. or thereabout). After this it is placed in a warm room (68° F. to 72° F. or thereabout) where eyes are fully developed, and it is then returned to a cold room until flavor and texture are developed. The time period may be three or four months for all shelf or room handling, and during this period the cheese should be turned, washed and salted every other day.

While it may not yet be stated as a fully determined fact, it is believed the excellence of the product and the latitude permissible in the time and temperature ranges at the periods where heretofore the highest skilled operators could not be certain of the result, are due to the physical changes wrought in the milk in the initial step or steps of the process, but it is not desired that the claims should be limited, except where so specified, to the particular time and temperature stated, especially in those portions of the process which substantially conform to prior practice.

The term "rennet" is employed herein as representative of known enzyms which are casein coagulants adapted to be used in cheese manufacture.

"Cooking", as the term is used herein, is that part of the process in cheese making where the curd is given the desired firmness and the moisture or whey is expelled from the curd particles by the application of heat through an extended period of time.

What I claim is:

1. A process of making cheese of the Emmenthal or Swiss type which consists in preliminarily heating the milk to a temperature between 134° and 155° F., cooling the same, adding rennet thereto and forming a curd, and finally cooking the curd by the application of heat to give the desired firmness and expel the moisture or whey from the curd particles.

2. A process of making cheese of the Emmenthal or Swiss type, embodying the steps of preliminarily heating the milk to a temperature above that of the subsequent cooking temperature of the curd, and not in excess of approximately 155° F., the duration of the heating period being inversely in proportion to the temperature employed, cooling the milk, adding rennet thereto to form a curd, and finally cutting, stirring and cooking the curd.

3. A process of making cheese of the Emmenthal or Swiss type which consists in heating the milk to a temperature between 134° and 155° F., cooling the same, adding thereto an acid or salt having the property of restoring or increasing rennet action, also adding thereto bacterial cultures capable of producing a high percentage of lactic acid at high temperatures and operating to produce eyes and characteristic Swiss cheese flavor in the cheese; adding rennet; allowing the curd to set; cutting, stirring and cooking the curd; and finally withdrawing and forming the curd into cheese.

4. A process of making cheese which consists in heating the milk to approximately 143° F., cooling the same, adding thereto an acid or salt having the property of restoring or increasing rennet action and also adding thereto bacterial cultures capable of producing a high percentage of lactic acid at high temperatures and operating to produce eyes and characteristic Swiss cheese flavor in the cheese; adding rennet; allowing the curd to set; cutting the curd; stirring and cooking the curd at a temperature of approximately 130° F., and finally withdrawing and forming the curd into the cheese.

CHARLES F. DOANE.

1,350,870 C. L. Roadhouse

Cheese

UNITED STATES PATENT OFFICE.

JAMES L. KRAFT, OF CHICAGO, ILLINOIS.

PROCESS OF STERILIZING AND PACKAGING CHEESE.

1,350,870. Specification of Letters Patent. **Patented Aug. 24, 1920.**

No Drawing. Application filed October 18, 1919. Serial No. 331,632.

To all whom it may concern:

Be it known that I, JAMES L. KRAFT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented or discovered a certain new and Improved Process of Sterilizing and Packaging Cheese, of which the following is a specification.

This invention or discovery relates to an improved process of sterilizing and packaging cheese, and applies more specifically to the treatment of cheese of the Cheddar genus. I have heretofore patented a somewhat similar process of sterilizing cheese, in my Patent No. 1,186,524, dated June 26, 1916, which process has proven very successful and gone into extended use. My present invention or discovery effects certain economies in cost of treatment, shortens the time during which highly skilled supervision of the process is required, and tends to better retain and preserve the more delicate flavors of the cheese.

With the foregoing and other objects in view, the invention consists in the matter hereinafter described, and more particularly pointed out in the appended claims.

As clearly set forth in my patent above referred to, the fundamental difficulty of sterilizing cheese of the Cheddar genus by heat is in keeping the cheese from disintegrating, *i. e.*, preventing the butter fat from separating from the casein when the cheese is heated to the necessary sterilizing temperature. I have now discovered how to so treat the cheese as to raise its disintegration-temperature-point above the temperature required to effectively sterilize it, and to effect this result by a low temperature treatment;—a temperature considerably below that at which effective sterilization can be secured.

Describing the preferred way of carrying out the process, I select cheese of the desired kind, condition and degree of ripeness and, after removing the bandages, comminute the cheese, usually by the use of an ordinary cheese slicing or grinding machine. I next place the cheese in a steam or water-jacketed kettle or other suitable heating vessel, wherein it may be subjected to the required temperature without scorching. The kettle or other heating vessel is preferably equipped with mechanical stirrers, by which the cheese may be stirred actively while undergoing treatment, but the stirring may be done manually with a paddle, spoon or other suitable implement.

The steam, hot-water, or other kind of heat is applied to the vessel and the temperature of the contents thereof gradually raised until the cheese is thoroughly melted. While the cheese is being melted it is actively stirred and this stirring is continued until the cheese reaches the proper condition sought by this step. The temperature of the cheese is raised to about 120° to 140° Fahrenheit, after reaching which temperature the heat is so regulated as to prevent it from rising much higher; but the temperature is maintained for a period and until the cheese reaches a condition which I term a stably-homogenized condition. The heat-and-stirring treatment is then stopped. This stably-homogenized condition has been reached, and is shown, when the cheese appears smooth and homogeneous throughout, and has a marked viscous consistency, so that it can be drawn out, while hot, into long attenuated strings like taffy or very thick syrup. Ordinarily, the homogeneous treatment will require from 30 to 50 minutes to raise the temperature of the cheese to the desired point, and a further treatment of from 10 to 15 minutes to bring it to a fully stably-homogenized condition.

At the conclusion of the homogenizing step, the cheese is in condition to withstand an indefinitely continued temperature of 212° F., or more, without disintegration or separating out of its butter fat, although it be subjected to such heat without stirring or agitation.

The cheese is next placed in cans, jars, or other containers, capable of being hermetically sealed, and after being sealed is processed to effect sterilization.

To secure effective sterilization so as to insure permanent keeping qualities in the cheese under all climatic conditions, it must be brought to a temperature of about 175° F. and kept at or above that temperature for about fifteen minutes, although a somewhat lower temperature, say 160° F., continued for a longer time, say twenty or thirty minutes, is usually sufficient to effectively sterilize.

Accordingly, after the cheese has been put in containers and sealed, I put it in a steam chamber, or hot water, and subject it to the above described sterilizing heat for the requisite period. I do not find it necessary, or even desirable, to leave the cans unsealed while being processed, as is sometimes done, but, of course, this way of proceeding is feasible, in which case each can or container must be sealed while the contents are in sterile condition.

Treating the cheese at a low temperature only while exposed to atmospheric and undergoing stirring or agitation, and subjecting the cheese to the required higher sterilizing temperature under sealed condition, minimizes the changes in flavor of the cheese due to heating it. That is to say, my present process, I believe, preserves the delicate flavors of the cheese somewhat better than does the process of my Patent No. 1,186,524. Because the open heating is at a lower temperature and for a shorter period, any possible change of flavor due to heat is minimized, and less moisture and less of the aroma of the cheese are expelled and lost. Inasmuch as skilled or expert supervision is required only during the period of the homogenizing step, a saving is effected in that respect. The possibility of infection while the cheese is being canned or packaged is avoided, since the sterilization is effected after the canning is completed.

The herein described process of stably-homogenizing cheese is useful and valuable without carrying the cheese through the subsequent canning and sterilizing steps. Cheese thus stably-homogenized will keep as well and perhaps somewhat better than ordinary untreated cheese, without being sterilized, and it may be kept for a long time if placed in the proper containers which are not air-tight. Such cheese is admirably adapted for making Welsh rarebits and other foods in which the cheese is cooked, for the reason that it melts and blends, or mixes with the other ingredients without disintegrating or becoming lumpy or grainy.

It will be obvious that the process herein described may be modified somewhat without departing from the invention.

I claim as my invention:

1. The process of putting up cheese of the Cheddar genus, which consists in melting the cheese, actively stirring it while melted, and while below a temperature at which effective heat sterilization would take place, until brought to a stably-homogenized condition, then placing it in suitable containers and subjecting it to heat sufficient to effectively sterilize and render the cheese permanently keeping in all climatic conditions so long as it remains hermetically sealed.

2. The process of treating cheese of the Cheddar genus, which consists in melting the cheese, and actively stirring it while melted and while below a temperature at which effective heat sterilization would take place, until brought to a stably-homogenized condition.

3. The process of putting up cheese of the Cheddar genus, which consists in comminuting the cheese, then melting the cheese, actively stirring it during melting, while melted, and while maintained at a temperature below that at which effective heat sterilization would take place, until brought to a stably-homogenized condition, then placing it in suitable containers, sealing it therein, and subjecting said sealed containers and the contents to heat sufficient to effectively sterilize and render the cheese permanently keeping in all climatic conditions so long as it remains hermetically sealed.

4. The process of putting up cheese of the Cheddar genus, which consists in melting the cheese, actively stirring the cheese during melting and while melted and maintained at a temperature between 120° F. and 150° F. until brought to a stably-homogenized condition, then placing it in suitable sealed containers and subjecting it to a temperature in excess of 160° F. maintained for a period of not less than fifteen minutes.

JAMES L. KRAFT.

1,368,624 C. L. Roadhouse

UNITED STATES PATENT OFFICE.

GEORGE HERBERT GARSTIN, OF SIDNEY, NEW YORK, ASSIGNOR TO PHENIX CHEESE COMPANY, A CORPORATION OF NEW YORK.

CHEESE AND PROCESS FOR STERILIZING SAME.

1,368,624. Specification of Letters Patent. **Patented Feb. 15, 1921.**

No Drawing. Application filed October 28, 1920. Serial No. 418,320.

To all whom it may concern:

Be it known that I, GEORGE HERBERT GARSTIN, a British subject, residing at Sidney, in the county of Delaware and State of New York, have invented certain new and useful Improvements in Cheeses and Processes for Sterilizing the Same, of which the following is a full, clear, and concise description.

My invention relates to the sterilization of cheeses by means of heat applied thereto under proper conditions, the purpose of my improvement being to so prepare the cheese as to give it, when melted and poured into cans, a suitable degree of smoothness and homogeneity, and to enable the cheese, after being thus poured into the cans and during the subsequent step of sterilization by heating, to maintain its smoothness and homogeneity.

My invention further contemplates improvement of cheese by increasing its digestibility and by adding to it a small proportion of a medicinal substance which is harmless and has the properties of a mild laxative and a liver tonic.

My invention is based in part upon the discovery that the properties above set forth as desirable in the cheese are produced by adding to the cheese a small proportion of a salt of orthophosphoric acid.

Under the present practice of sterilizing cheese by heat the cheese is ground up, heated to a temperature somewhat higher than its melting point, stirred for a time by mechanical stirrers, poured into cans and sealed. The cans containing the cheese are then placed in a sterilizer and there heated for a sufficient length of time varying with the character of the cheese, the size of the cheese mass, and within proper limits the temperature, to complete the work of sterilization.

In carrying out the steps of the process just mentioned, however, there arises a difficulty in maintaining the cheese homogeneous. As soon as the cheese is heated to a temperature much above its melting point and high enough to enable it to be poured into cans, the cheese begins to disintegrate. That is to say, the heat causes the butter fats to separate from the casein and to float upon the surface thereof. Except under special conditions it is not an easy matter to prevent this disintegration of the cheese, or to cause the butter fats and casein, after their disintegration, to reunite into a homogeneous mass of the requisite smoothness. For this purpose it has in some instances been advisable to add to the cheese some material for use as a mulsifier.

I find that tertiary sodium phosphate (Na_3PO_4), designated in the *United States Pharmacopœia* as medicinal sodium phosphate and which is the neutral salt of orthophosphoric acid, is an ideal substance for the purpose of maintaining the homogeneity of the cheese and of accomplishing the other results above contemplated. It is used to the best advantage upon cheeses which have no material acid qualities. English dairy cheese and other cheeses of the Cheddar genus, if not unduly aged, and various other kinds of cheeses if not rendered acid either by fermentation or by the use of a sour curd, may be treated in connection with the tertiary sodium phosphate.

I also find that if a cheese, for instance an English dairy or other cheese of the Cheddar genus, is very old and over-ripe and thus has become slightly alkaline owing to the presence of ammonia, it is practicable to use the acid sodium phosphate (NaH_2PO_4), or in other words the primary sodium phosphate, to accomplish the result.

I proceed as follows:

To each 100 pounds of cheese, ground up or otherwise comminuted, I add 5 pounds of the sodium phosphate and 5 to 10 pounds of water, the sodium phosphate being in the form of a dry powder which dissolves in the water and therewith becomes incorporated in the cheese. The cheese mass is now placed in a steam-jacketed kettle and stirred by mechanical stirrers until formed into a smooth, semi-liquid mass having the consistency of very thick, condensed milk and entirely free from all lumps. The mass should be heated and stirred as described until it reaches a temperature of about 180 degrees Fahrenheit, the time being preferably from thirty to forty-five minutes. However, the length of time required to bring the mass to the required degree of smoothness is a matter of experience and judgment on the part of the operator, and of course varies with the kind and condition of the cheese. The object is to obtain a smooth, semi-liquid mass of the consistency of condensed milk and which will readily flow into tin cans, and for this purpose the temperature and the length of time required for the purpose may be varied as required.

The cheese mass is next caused to flow into tin cans which are paper lined, and the cans are closed and sealed in the conventional manner, usually upon an automatic sealing machine. The seal should be hermetical.

Next the cans, now filled and sealed, are placed in a sterilizer and subjected to a temperature of 230 degrees Fahrenheit for a period of time, varying from forty minutes for cans of small size to an hour and a half for cans of large size—say five pounds capacity. However, a somewhat lower degree of heat coupled with a longer time or a somewhat higher degree of heat with a shorter time, can accomplish approximately the same result.

This completes the sterilizing process.

I find that by treating the cheese as above described its flavor is not impaired and is changed but slightly if at all, and that its odor is not affected, or at least not affected injuriously.

The precise manner in which the sodium phosphate acts upon the cheese is problematical. It seems probable, however, that it acts upon the albumin contained, and its effect upon the casein is quite marked, as the entire cheese mass is converted into a smooth mass, and is easily digested.

It seems highly probable that the sodium phosphate has a food value, as both sodium salts and potassium salts are found in the human body and are considered essential thereto.

While my invention may be used to advantage in connection with cheeses of many different varieties, it is peculiarly well adapted for use with cheeses of the Cheddar genus, including English dairy. It is also well adapted for use with cheeses of the Swiss and Camembert types.

During the process above described there is a little evaporation of the water during the time in which the cheese is heated before the cans are sealed. In the finished article, the percentage of the contained sodium phosphate is approximately five per cent. This percentage may be varied within narrow limits, but if the content of the sodium phosphate be less than five per cent. there is danger of impairing the homogeneity of the cheese mass, either before or after it is poured into cans.

The cheese treated and canned as above described is in appearance, taste and smell very much like cheese sterilized in the manner well known in this art.

I do not limit myself to the exact process or to the specific article above described, as variations may be made therefrom without departing from my invention, the spirit of which is commensurate with my claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. The method, herein described, of treating cheese; which consists in comminuting the cheese, adding to it a small proportion of sodium phosphate, and sterilizing the resulting mass.

2. The process, herein described, of treating cheese; which consists in comminuting the cheese, adding to it approximately five per cent. by weight of sodium phosphate, and sterilizing the resulting mass.

3. The process herein described of treating cheese: which consists in comminuting the cheese, melting and stirring said cheese, adding to said cheese a salt of orthophosphoric acid, and sterilizing the resulting mass.

4. As an article of manufacture, cheese containing a salt of phosphoric acid and sterilized.

5. As an article of manufacture, sterilized cheese containing tertiary sodium phosphate.

6. As an article of manufacture, a cheese of the Cheddar genus containing a salt of orthophosphoric acid and sterilized.

7. As an article of manufacture, a cheese of the Cheddar genus containing sodium phosphate and sterilized.

8. As an article of manufacture, English dairy cheese containing sodium phosphate and sterilized.

9. As an article of manufacture, a sterilized cheese of the Cheddar genus containing sodium phosphate and hermetically sealed in a can.

GEORGE HERBERT GARSTIN.

1, 374, 141

E. L. Roadhouse
Cue

UNITED STATES PATENT OFFICE.

ELMER E. ELDREDGE, OF SIDNEY, NEW YORK.

PROCESS OF STERILIZING CHEESE.

1,374,141. Specification of Letters Patent. **Patented Apr. 5, 1921.**

No Drawing. Application filed September 24, 1919. Serial No. 326,038.

To all whom it may concern:

Be it known that I, Elmer E. Eldredge, a citizen of the United States, residing at Sidney, State of New York, have invented new and useful Improvements in Processes of Sterilizing Cheese, of which the following is a specification.

This invention relates to a process of sterilizing cheese and the product which is obtained thereby and has for its object the provision of a process whereby the cheese may be completely sterilized in such a manner that the disintegration of the cheese is prevented and a cheese mass produced of a good body and texture and very palatable.

In my previous application Serial No. 303,391, filed June 11, 1919, I have described a process for sterilizing cheese which consists essentially in the following steps:—

The cheese is trimmed and ground or sliced into small particles after which it is placed in a mixing kettle and about two per cent. of sodium citrate by weight and a small amount of water is added, after which the material is brought to a temperature of about 170° F. While it is in the melted condition it is then poured into containers which are hermetically sealed. The containers after being filled and sealed in the manner described, are then placed in a steam retort and the temperature of the container and its cheese content is raised to about 240° F. where it is maintained for a period of time sufficient to completely sterilize the cheese. In practice it is found advisable to maintain this temperature of approximately 240° F. until the center of the cheese has been maintained at this temperature for about 20 minutes. The duration of the sterilizing treatment is therefore determined by the size of the can or package of cheese, the larger size containers requiring a greater time for complete sterilization.

In this process I have described that by adding the two per cent. of sodium citrate by weight to the cheese mass, the constituents of the cheese are prevented from disintegrating as for example, the fats and casein will not separate out and this is true even when the sealed container and its cheese contents is raised to a temperature of approximately 240° F.

In my prior process I have described that sodium citrate or sodium lactate are the only ingredients which may be added to the cheese mass and which to my knowledge will prevent the disintegration of the cheese. I have discovered however, that there can be substituted for the sodium citrate or the sodium lactate, other chemicals which will react with the cheese in the same manner and prevent the disintegration of the cheese.

Accordingly, therefore, the present invention consists in the process as above outlined with the exception that, instead of adding 2% by weight of sodium citrate or sodium lactate, I use in place of these salts approximately 2% by weight of sodium phosphate. This chemical is added to the cheese while in the mixing kettle, as previously described, and I have found that by the use of this chemical instead of sodium citrate, the separation of the cheese mass into its constituents is prevented and, in fact, a cheese obtained which has a good body and is very palatable. Therefore, it is my intention to claim the process above described in combination with the use of the chemical described, as will be clear from the scope of the claims appended hereto.

I claim,

1. In a process of sterilizing cheese, the steps which comprise mixing approximately 98% of the cheese with 2% of sodium phosphate, then heating the mass to a sterilizing temperature.

2. In a process of sterilizing cheese, the steps which comprise mixing approximately 98% of cheese with approximately 2% of sodium phosphate, then heating the mass and while in a melted condition packing it in containers and thereafter sealing the containers and finally raising the temperature of the container and its contents to a sterilizing temperature and maintaining this temperature for a sufficient period of time to sterilize the cheese.

3. In a process of sterilizing cheese, the steps which comprise mixing approximately 98% of cheese with approximately 2% of sodium phosphate, then heating the mass and while in a melted condition packing it in containers and thereafter sealing the containers and finally raising the temperature of the container and its contents to approximately 240° F. and maintaining this temperature for a sufficient time to sterilize the cheese.

4. In a process of sterilizing cheese, the steps which comprise mixing approximately 98% of cheese and 2% by weight of sodium

phosphate, then heating the mass and while in a melted condition packing it in containers and thereafter sealing the containers and finally raising the temperature of the container and its contents to a sterilizing temperature and maintaining this temperature for a sufficient period of time to sterilize the cheese.

5. In a process of sterilizing cheese, the steps which comprise mixing approximately 98% of cheese with 2% by weight of sodium phosphate, then heating the mass and while in a melted condition packing it in containers and thereafter sealing the containers and finally raising the temperature of the container and its contents to approximately 240° F. and maintaining this temperature for a sufficient period of time to sterilize the cheese.

6. A sterilized cheese mass consisting substantially of 98% of cheese and 2% of sodium phosphate.

ELMER E. ELDREDGE.

C. L. Readhouse
Chem.

1,389,095

UNITED STATES PATENT OFFICE.

LINN EUGENE CARPENTER, OF EAST ORANGE, NEW JERSEY, AND ELMER ELLSWORTH ELDREDGE, OF SIDNEY, NEW YORK, ASSIGNORS TO PHENIX CHEESE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

SWISS CHEESE AND METHOD FOR STERILIZING THE SAME.

1,389,095. Specification of Letters Patent. **Patented Aug. 30, 1921.**

No Drawing. Original application filed June 21, 1915, Serial No. 35,477. Renewed March 14, 1918, Serial No. 222,514. Divided and this application filed March 14, 1918. Serial No. 222,312.

To all whom it may concern:

Be it known that we, LINN EUGENE CARPENTER and ELMER ELLSWORTH ELDREDGE, both citizens of the United States, the former residing at East Orange, in the county of Essex and State of New Jersey, and the latter residing at Sidney, in the county of Delaware and State of New York, have invented new and useful Improvements in Swiss Cheeses and Methods for Sterilizing the Same, of which the following is a specification.

This application is a division of our application Serial No. 35,477, filed June 21, 1915, for cheeses and processes for sterilizing the same.

Our invention relates to the sterilization of cheeses, and more particularly cheeses of the type known commercially as Swiss cheeses, in order to prevent or at least greatly lessen the tendency thereof to decay, and to destroy any disease germs therein contained.

We also seek to improve the flavor and the appearance of the cheese, and to render its texture homongeneous and uniform.

We have made the discovery that quite a large variety of cheeses, differing considerably in kind, may by comparatively simple and inexpensive treatment be given remarkable powers for resisting decay, and that by such treatment the cheese is otherwise greatly improved in many ways, principally by ridding it of certain kinds of undesirable bacteria.

We have also made the discovery that the basic material to be operated upon to produce the results desired may be either cheese of a single kind or a mixture of cheeses of different kinds, and that for some purposes a mixture of cheeses is preferable.

For Swiss cheese, we proceed as follows: We first grind the cheese, for instance in a sausage grinder, and add two or three per cent., by weight, of sodium citrate and eight to ten per cent., by weight, of water. We also add two per cent., by weight, of No. 1 Neufchâtel cheese. The mass is now heated to approximately 165 degrees Fahrenheit, and stirred violently, while this temperature is maintained for thirty minutes. Dry salt is now added, sufficient in quantity to render the flavor saline to any extent desired. The mass is found to be soft and plastic, and all of the water it contains is diffused uniformly as moisture. The last step is to pour into molds or boxes.

Citrates having alkaline bases other than sodium may be substituted for the sodium citrate and in some instances the alkaline salt may be dispensed with altogether. The stirring, however, is quite essential in order to promote circulation and thus insure that every particle of the cheese is subjected to an adequate degree of heat. The stirring also tends to prevent the heat from burning the cheese or causing its disintegration.

In this connection we call attention to a fact which may be readily confirmed by casual observation, namely, that when cheese of any kind is heated under ordinary conditions, it is broken up and changed greatly in character. For instance, in making Welsh rarebit, where the cheese is simply heated in a frying pan to a temperature approximating the boiling point for water, the resulting mass is resolved into a viscous, adhesive yellowish material accompanied by a quantity of free butter fat. Again, if a piece of cheese be heated to almost any temperature a little below the boiling point of water, the cheese will become grainy and lose a part of its flavor.

We have made the discovery that if the temperature used for heating be carefully adjusted as above described, a cheese may be sterilized or pasteurized, yet without being broken up or having any of its ingredients separated from others. The particular temperature for this purpose varies slightly under different conditions and with different cheeses, but allowing for this fact there is usually a proximate critical temperature at which the greatly desired result is easily accomplished.

In instances where two kinds of cheese are mixed, a single common temperature suffices for the mixture. Generally the mixture desired contains a soft cheese and a relatively small proportion of a harder cheese.

The steps such as grinding, adding water and salt and pouring into molds or boxes, though usually desirable in practice, are not in every instance absolutely necessary. The stirring, however, is essential.

What is claimed and what is desired to be secured by United States Letters Patent is:—

1. As an article of manufacture a sterile cheese containing a preponderance of Swiss cheese, a small percentage of some other cheese capable of mixing therewith into a homogeneous mass, and a small percentage of sodium citrate.

2. The method, herein described, of treating cheese, which consists in grinding Swiss cheese, adding thereto a small percentage of sodium citrate, water and Neufchâtel cheese, heating the mass to approximately 165 degrees Fahrenheit for about thirty minutes, and stirring the mass constantly while thus heated.

3. As an article of manufacture, a cheese of the Swiss genus, sterilized sufficiently to enable it to keep indefinitely under ordinary climatic temperatures, said cheese having a homogeneous texture.

4. As an article of manufacture, a cheese of the Swiss genus, so far sterilized as to enable it to keep under ordinary climatic temperatures, said cheese being inclosed in a container and having a homogeneous texture.

5. As an article of manufacture, a cheese mass containing a preponderance of a cheese of the Swiss genus, said cheese mass being inclosed in a container and sufficiently sterilized to keep indefinitely under ordinary climatic temperatures.

6. As an article of manufacture, a cheese mass sufficiently sterilized to keep indefinitely under ordinary climatic temperatures, said cheese mass containing a preponderance of Swiss cheese and a small percentage of another cheese.

7. The method herein described of treating a cheese mass containing a preponderance of cheese of the Swiss genus, which consists in heating the cheese actively stirring it while thus heated, the temperature being maintained sufficiently high and the heating and stirring being continued for a sufficient length of time to render the cheese mass permanently keeping, and inclosing the cheese mass in a container.

In testimony whereof we have hereunto signed our names, this 5th day of March, 1918.

LINN EUGENE CARPENTER.
ELMER ELLSWORTH ELDREDGE.

L. Roadhouse

1,389 577

L. E. CARPENTER AND E. E. ELDREDGE.

CHEESE AND PROCESS FOR STERILIZING THE SAME.

APPLICATION FILED JUNE 21, 1915. RENEWED MAR. 14, 1918.

1,389,577 Patented Sept. 6, 1921.

Fig. 1.

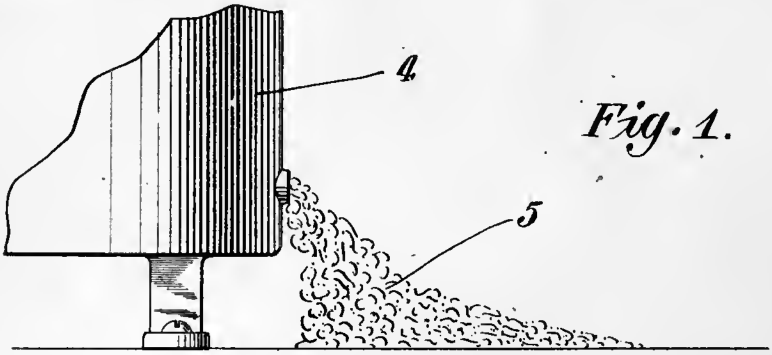


Fig. 2.

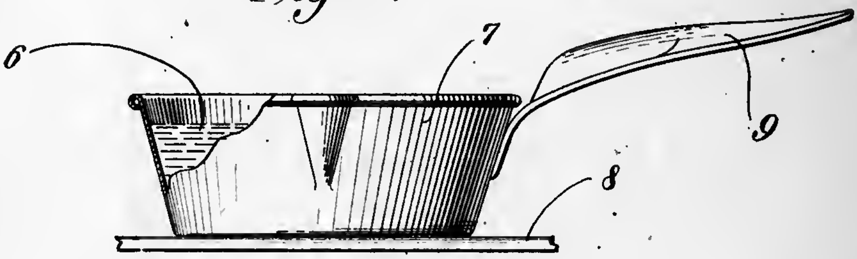
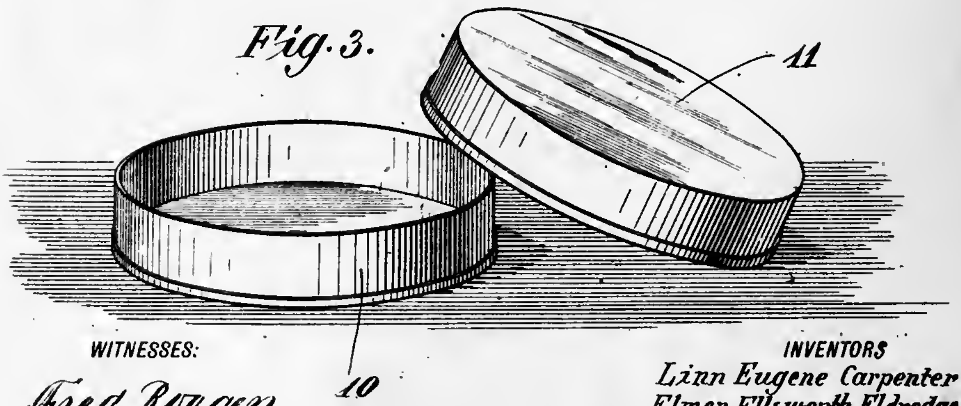


Fig. 3.



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UNITED STATES PATENT OFFICE.

LINN EUGENE CARPENTER, OF EAST ORANGE, NEW JERSEY, AND ELMER ELLSWORTH ELDREDGE, OF NEW BERLIN, NEW YORK, ASSIGNORS TO PHENIX CHEESE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

CHEESE AND PROCESS FOR STERILIZING THE SAME.

1,389,577. Specification of Letters Patent. **Patented Sept. 6, 1921.**

Application filed June 21, 1915, Serial No. 35,477. Renewed March 14, 1918. Serial No. 222,514.

To all whom it may concern:

Be it known that we, LINN EUGENE CARPENTER and ELMER ELLSWORTH ELDREDGE, both citizens of the United States, the former residing at East Orange, in the county of Essex and State of New Jersey, and the latter residing at New Berlin, in the county of Chenango and State of New York, have invented new and useful Improvements in Cheeses and Processes for Sterilizing the Same, of which the following is a specification.

Our invention relates to the sterilization of cheeses, in order to prevent or at least greatly lessen the tendency thereof to decay, and also to improve the cheese by the destruction of disease germs therein contained.

We also seek to improve the flavor and the appearance of the cheese, and also to render its texture homogeneous and uniform.

We have made the discovery that quite a large variety of cheeses differing considerably in kind, may by comparatively simple and inexpensive treatment be given remarkable powers for resisting decay, and that in doing this the cheese is otherwise greatly improved in many ways, principally by ridding it of certain kinds of undesirable bacteria.

We have also made the discovery that the basic material to be operated upon to produce the results desired may be either cheese of a single kind or a mixture of cheeses of different kinds, and that for some purposes a mixture of cheeses is preferable.

Our invention may be practised in several ways differing slightly in detail, and varied to suit cheeses of many different kinds. It is impracticable to describe every possible application which the invention may assume. However, we will describe a specific instance which may be considered as typical.

No particular form of apparatus is essential to our invention, but for the sake of clearness we disclose a few mechanical devices which may be conveniently employed in connection with our process.

Reference is made to the accompanying drawing forming a part of this specification and in which like letters indicate like parts.

Figure 1 is a fragmentary view of a grinding device, and quantity of cheese being ground thereby.

Fig. 2 is a perspective of a heating vessel used for heating the materials, and a spoon for stirring them while thus heated.

Fig. 3 is a perspective of a box for receiving a quantity of the finished product, this box also serving the purpose of a mold.

We will describe our invention as associated with the cheese known as Camembert. This is a rather soft cheese, often shipped and sold in metallic boxes, and under normal conditions does not keep very long unless maintained at a low temperature. Ordinarily this cheese is covered with a moldy crust, or dirty-looking skin, which is unfit to be eaten, and is stripped off when the cheese is placed upon the dining table.

We take the commercial Camembert cheese just as we find it in the market and first remove the mold or crust. Next we grind the cheese in a mill. A sausage grinder 4 will answer the purpose. The ground cheese 5 is homogeneous and throughout is smooth to the touch. We now add one-tenth of one per cent. by weight, of sodium citrate in the form of a liquid, and one to five per cent. by weight of cheddar cheese, which should also be ground, as above described with reference to the Camembert.

The entire mass 6 is next placed in a heating vessel 7, provided with a handle 9, and heated in a hot water bath to 170 degrees Fahrenheit, this temperature being steadily maintained for thirty minutes, during which period the mass is stirred constantly by aid of a spoon. No water need be added, the moisture originally contained in the materials, if maintained, being sufficient. The mass 6, being now plastic and soft, is poured into molds, one of which appears at 10, and which may conveniently be the boxes in which the cheese is to be marketed. Each box is provided with a cover 11.

It is preferable, though not essential, that the boxes be made of tin plate or other sheet metal. It is not at all necessary that the boxes be air tight.

It has been ascertained upon actual trial that as the temperature is gradually raised to 150 degrees the fat at first has a tendency to separate from other parts, but between 150 and 170 degrees the fat reunites with the other parts and the mass gradually becomes homogeneous.

The completed product is a cheese having the appearance of the finest Camembert. It is smooth in appearance and to the touch. It is free from all granular particles, and its flavor is practically identical with that of a high grade of Camembert. It differs from Camembert, however, in that it is less pasty, slightly firmer and more resilient. It differs quite radically from Camembert in another particular which is all-important, namely, it is sterilized of decay germs, and of various kinds of disease-bacteria. It may be kept for long periods of time without taking any subsequent precaution to protect it from the air—at least nothing more than keeping it in a box which is not air tight. It may be removed from the box and exposed directly to the air, even in warm weather, and yet it will keep for a relatively long time.

As will be readily understood from the foregoing, we have found that by adding certain ingredients to the cheese at the right stage, and by heating the mass to a moderate temperature for a short time, we produce a pasteurized cheese having improved texture and exceptional keeping qualities—the cheese thus produced being free of disease-bacteria.

Citrates having alkaline bases other than sodium may be substituted for the sodium citrate and in some instances the alkaline salt may be dispensed with altogether.

In this connection we call attention to a fact which may be readily confirmed by casual observation, namely, that when cheese of any kind is heated under ordinary conditions, it is broken up and changed greatly in character. For instance in making Welch rarebit, where the cheese is simply heated in a frying pan to a temperature somewhat higher than the boiling point for water, the resulting mass is resolved into a viscous, adhesive yellowish material floating in clear oil. Again, if a piece of cheese be heated to almost any temperature a little below the boiling point of water, the cheese will become grainy and lose a part of its flavor. We have made the discovery that if the temperature used for heating be carefully adjusted as above described, the cheese may be sterilized or pasteurized, yet without being broken up or having any of its ingredients separated from others. The particular temperature for this purpose varies slightly under different conditions and with different cheeses, as above explained, but allowing for this fact there is a proximate critical temperature at which the greatly-desired result is easily accomplished.

In instances where two kinds of cheese are mixed, as above described, a single common temperature suffices for the mixture. The mixture desired contains a soft cheese and a relatively small proportion of a harder cheese.

The steps such as grinding, adding water and salt and pouring into molds or boxes, though usually desirable in practice, are not in every instance essential.

What is claimed and what is desired to be secured by United States Letters Patent is:—

1. The method herein described, of treating cheese, which consists in grinding the cheese, adding to it a small proportion of an alkaline citrate, heating the mass to a temperature high enough to destroy undesirable bacteria contained in the cheese but not sufficiently high to disintegrate the cheese, and maintaining the temperature until the cheese is sterilized.

2. The method, herein described, of treating cheese, which consists in adding to the cheese a small proportion of an alkaline citrate, heating the mass to a temperature of 165 to 170 degrees Fahrenheit, and maintaining the temperature for approximately thirty minutes.

3. The method, herein described, of treating cheese, which consists in adding thereto a small proportion of sodium citrate, heating the mass to a temperature of 165 to 170 degrees Fahrenheit and maintaining this temperature for thirty minutes.

4. The cheese mass herein described, containing sterilized cheese and sodium citrate.

5. The method herein described of treating cheese which consists in mixing Camembert cheese with one to five per cent. by weight of cheddar cheese, adding one-tenth of one per cent. by weight of sodium citrate and heating the mass for thirty minutes at a temperature of 170 degrees Fahrenheit.

6. As an article of manufacture, a cheese of the Camembert genus, sterilized sufficiently to enable it to keep indefinitely under ordinary climatic temperatures, said cheese having a homogeneous texture.

7. As an article of manufacture, a cheese of the Camembert genus, so far sterilized as to enable it to keep under ordinary climatic temperatures, said cheese being inclosed in a container and having a homogeneous texture.

8. The method herein described of treating a cheese mass containing a preponderance of cheese of the Camembert type, which consists in heating the cheese mass to a temperature of about 170 degrees Fahren-

heit and thus melting it, stirring the cheese mass for about thirty minutes while maintaining it at said temperature, and pouring the cheese mass into containers.

9. The method herein described of treating a cheese mass containing a preponderance of cheese of the Camembert genus, which consists in heating the cheese, actively stirring it while thus heated, the temperature being sufficiently high and the heating and stirring being continued for a sufficient length of time to render the cheese permanently keeping, and then inclosing the cheese mass in a container.

In testimony whereof we have hereunto signed our names.

LINN EUGENE CARPENTER.
ELMER ELLSWORTH ELDREDGE.

C. L. Readhouse

C. L. Roadhouse

J. L. KRAFT.
PROCESS OF PREPARING CHEESE.
APPLICATION FILED FEB. 21, 1921.

1,400,171. Patented Dec. 13, 1921.

Fig. 1.

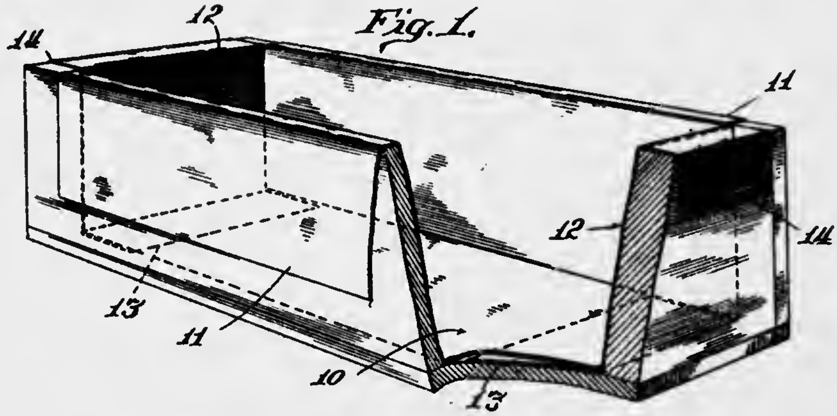
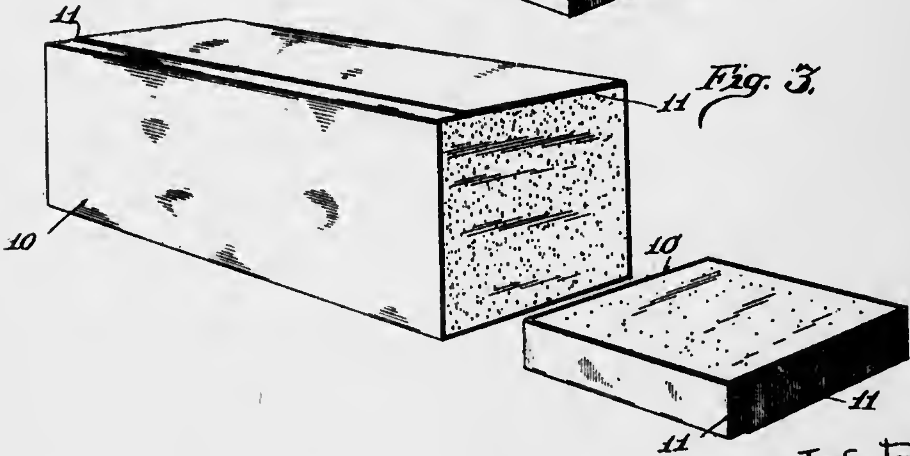


Fig. 2.

Fig. 3.



Inventor
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By Fisher Towle Clapp & Soans
Attorneys

UNITED STATES PATENT OFFICE.

JAMES L. KRAFT, OF CHICAGO, ILLINOIS.

PROCESS OF PREPARING CHEESE.

1,400,171. Specification of Letters Patent. Patented Dec. 13, 1921.

Application filed February 21, 1921. Serial No. 446,674.

To all whom it may concern:

Be it known that I, JAMES L. KRAFT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented or discovered a certain new and Improved Process of Preparing Cheese, of which the following is a specification.

My invention relates to improvements in process for preparing cheese and has particular reference to a method of preparing for sale in convenient units cheese of a normally solid variety such as "American" cheese, which has been manufactured according to the Cheddar or analogous process in the ordinary country cheese factory.

With respect to the preliminary steps of my improved process, reference may be had to Patent No. 1,323,869, issued to me December 2, 1919, for process for treating cheese, in which patent I described a method of remaking from cheese of the character above referred to, cheeses similar to those of the Edam or Gowda types. Although the method of manufacturing such cheeses, as set forth in my previous patent above referred to, is eminently feasible and successful, it will be understood that the demand for Edam and Gowda cheeses is rather limited in this country compared with the demand for standard American cheese in other shapes.

It has been recognized for some time that there would be an extensive market for American cheese put up in relatively small units if it were possible to manufacture such units successfully and of such form as to be convenient to handle by the retailer and consumer without waste. It will be understood that on account of the round or curved shape of the ordinary American cheese heretofore manufactured and because of the presence of a hard rind unpalatable to most people, there has been substantial wastage of cheese, which wastage is obviously greater in a small cheese than in a large one.

Hence, it will be apparent that the principal objects of my invention are to prepare cheese of the type described, in units of such size and shape that can be readily sold to the smallest retailer without cutting the cheese or breaking the package; to provide such cheese units so prepared and packaged that the retailer can cut off and sell to the consumer any desired weight or quantity while at the same time drying out or spoilage of the unsold cheese is practically eliminated; to provide a cheese of the American variety which shall be free from objectionable rind or inedible skin; to provide cheese units which as such shall be practically odorless and also which will not absorb extraneous objectionable odors; to provide cheese units which may be stored for periods of many weeks without substantial drying out or other deterioration or loss of texture or flavor; to provide a cheese package which shall be highly attractive in appearance while at the same time being practical and convenient to handle, distribute and market both at wholesale and at retail; to provide an improved process of producing and preparing such units and in general to provide an improved product and process of the character referred to.

In the drawings which accompany this application I have illustrated in a conventional manner a packaged cheese unit prepared according to my invention.

In said drawings—

Figure 1 is a perspective view of the empty container, a corner of same being broken away.

Fig. 2 is a perspective view of the finished package.

Fig. 3 is a perspective view of the block after removal from the container.

In practising my invention, I employ initially the preliminary steps of my previously patented process. However, in view of the fact that according to the present invention I desire and secure an entirely different product, the later steps of the previous process are not followed, an entirely different process or method being practised for finishing the cheese.

In practising my improved process a number of cheeses of a normally solid variety, such as Cheddar, selected according to flavor, percentage of butter fat, condition of cure, etc., are cut up into small strips or chunks and comminuted in any suitable grinding machine. A charge of the ground up cheese is then introduced into a suitable mixing and heating vessel, said vessel being preferably provided with a jacket by means of which steam or circulating hot water may be employed to raise the temperature of the vessel. The vessel should also be provided with the necessary stirring devices consisting preferably of a set of power driven rotary paddles and a coöperating set of stationary or oppositely rotating paddles.

The inner receptacle is preferably equipped with a suitable cover to retain heat and also to prevent undue evaporation of moisture, it being understood that in order to facilitate the practising of the process and to secure proper texture and consistency of the final product a substantial percentage of water may be added to the comminuted cheese during or before the application of heat. The charge of comminuted cheese in the receptacle is heated gradually by turning on the steam or circulating hot water which supplies the outer jacket and during the application of heat the stirring devices are operated preferably continuously throughout the duration of the process or until the further application of heat is discontinued.

After the heat has been applied for a certain length of time, for example for from fifteen to thirty minutes, and the temperature has been raised from the ordinary room temperature to in the neighborhood of 130° to 150° F., the comminuted cheese mass has attained a plastic consistency somewhat like that of ordinary baker's dough, and in order to secure cheese of the finest flavor and texture the application of heat should preferably be discontinued when this stage has been reached. If the heating be continued further, for instance to 160° or 180° F., the rubber-like or doughy character of the cheese disappears, the fluidity increases until a creamy consistency results, and the resulting product, although quite edible and palatable, does not possess the texture which is ordinarily associated with that type of cheese which is being treated.

It will, of course, be understood that the handling of the heated material may be made somewhat easier by carrying the heat a little further than I have indicated, thereby securing a somewhat more fluid and more easily handled material. However, from the standpoint of flavor and texture I have found it desirable not to exceed a temperature of 150° F.

After the cheese mass has been heated sufficiently and has reached the desired consistency, the application of further heat is suspended, the material being now ready for the finishing steps of the process.

I have in readiness a number of containers each adapted to hold the desired quantity of the finished cheese. A convenient package for many purposes is one which will snugly contain a block weighing about five pounds and of cross section such that the cheese may be cut into slices of the right size to make ordinary sandwiches. The outer container which I use in practising my invention preferably has rigid sides and in the preferred form shown comprises a wooden box of the required cubical content. These boxes are made up in advance, the covers being left off, and before the cheese is introduced into the containers the boxes are lined with tinfoil.

Such lining preferably comprises a wide strip or sheet 10 having flaps 11 long enough to overlap substantially when folded over the top of the cheese, end strips 12 being also used to cover the ends of the brick, the lower end of each end piece having a part 13 overlapping with the bottom of the main strip 10 and also having an upper extension 14, which is arranged to fold over the top of the block and overlap the upper portions of the said main sheet 10. It will be understood that by the use of the three sheets of tinfoil comprising the main sheet 10 and the two end sheets 12, the block of cheese may be completely incased on all six sides.

Before placing the hot plastic or fluid cheese into the open box containers the mass is subdivided into portions of the desired weight, in the present instance five pounds. Each five-pound batch or unformed mass of cheese is then introduced directly into the container and after waiting a few seconds to permit the mass to flow into the corners of the container, the projecting side flaps and end flaps of the tinfoil are folded over the top of the brick. The cover is then pressed down upon the top of the block and nailed onto the box, which thus serves as a mold as well as a container for the finished package. When cooled it is ready for distribution to the trade or for immediate consumption, if desired.

The tinfoil lining with which the hot cheese mass comes directly into contact, sticks to the outer surfaces of the block, and when the block of cheese contracts slightly, which occurs on cooling, the tinfoil will follow the brick. Hence, there will be no tendency of the tinfoil to stick to the surfaces of the boards which form the rigid container.

Cheese put up according to my improved process will keep in a satisfactory manner without appreciable deterioration for a period of upward of three months, provided, of course, that it be kept in a reasonably cool place and in a reasonably dry atmosphere. Also, as an important feature of my invention, owing to the fact that the process has a substantial curing effect, the product is edible and palatable within a few hours after it has been packaged even if prepared largely from fresh or uncured cheeses.

The tinfoil coating on the block, although permitting the necessary slight "breathing" action, substantially prevents evaporation of the moisture present in the cheese. It also prevents the cheese from absorbing any objectionable extraneous odors which may be present in the wood of the box or in the place of storage and it also substantially does away with the rather penetrating cheesy smell which is usually in evidence where ordinary cheese is stored.

The package itself is of an attractive and practical character, and presents many advantages over the previous methods of distributing cheese to the trade. For instance, the manufacturer's trade-name or other descriptive data may be branded or printed on the outside of the box or on the inner covering of the cheese itself. The box is of such size that the retail purchaser may be served directly from such package, thereby insuring against substitution or palming off of different or inferior product.

There is also no waste in selling or serving the cheese. Usually the customer who goes into a retail store will purchase not more than from a half to two pounds of cheese at a time. It is a simple matter for the retailer to pry off the lid of the box and invert the latter, whereupon by reason of the contraction of the brick in cooling and because of the smooth tinfoil coating, the block will fall freely from the box, making it possible for the storekeeper to cut off from the end any desired thickness. It is not necessary to remove the tinfoil before slicing off the amounts purchased; in fact, I prefer not to disturb the tinfoil for the reason that it is a substantial protection against undue drying out of the cheese when the block is removed from the container.

It will be manifest that the block of cheese in its tinfoil wrapper presents a highly attractive appearance in the show case or other place where the cheese is displayed for sale. I find as a matter of fact that retailers of cheese packaged according to my improved process are enabled to secure a very substantial increase in price over that which they can secure for ordinary cheeses of the same general class from which my improved units are prepared.

It will be understood that the scope of my invention must be determined by reference to the appended claims, said claims being construed as broadly as possible consistent with the state of the art.

I claim:

1. The improvement in the art of preparing cheese of a normally solid variety, which consists in comminuting cheese which has previously been manufactured in a country factory, stirring and heating the same until the mass has attained a uniform consistency and is capable of flowing to assume the shape of a container, and inclosing definite portions of the fluid mass while still heated in substantially rigid containers lined with sheet material which will stick to the cheese rather than to the walls of the container and will contract with the cheese and which material is substantially impervious to moisture.

2. The improvement in the art of preparing cheese of a normally solid variety, which consists in comminuting previously manufactured cheese, stirring and heating the same until the mass has attained a uniform consistency and is capable of flowing to assume the shape of a container, and inclosing a definite portion of the fluid mass, while still heated, in a rectangular mold lined with metal foil, forming on cooling, a finished mercantile unit from which the retailer may cut slices or sections of like area and of different thicknesses to suit the particular weights desired by the consumer.

3. The improvement in the art of preparing cheese of the Cheddar genus which consists in comminuting cheese which has been previously manufactured in a country cheese factory, stirring and heating the same until the mass has attained a uniform consistency and is capable of flowing to assume the shape of a container and inclosing a definite portion of the fluid mass, while still heated, in a rectangular wooden box lined with metal foil, and permitting the package to cool and thereby causing the metal foil to stick to the material and contract with same on cooling, the cooled package constituting a finished article of merchandise in condition to be shipped without further boxing and from which the resultant foil-coated block of cheese may be readily removed by the retailer for the purpose of severing from said block slices of like area and of different thickness to suit the particular weights desired by the consumer.

JAMES L. KRAFT.

C. L. Roadhouse

MILK

Patent	Subject	Author	Date
175,760	Improvement in preparation of Koumiss.	Rohland	Apr. 4, 1876.
170,003	Improvement in preserving milk against injury by transportation.	Lester	Nov. 16, 1875.
173,105	Improvement in compositions for preserving milk.	Barney	Feb. 8, 1876.
250,294	Compound for preserving milk and cream.	Slutz	Nov. 29, 1881.
267,043	Preserving milk.	Von Roden	Nov. 7, 1882.
277,352	Method of preserving milk.	Scherff	May 8, 1883.
308,421	Apparatus for preserving milk,	Meÿenberg	Nov. 25, 1884.
308,422	Process of preserving milk.	Meÿenberg	Nov.25, 1884.
327,023	Preservative for milk.	Sanborn	Sept. 29, 1885.
358,213	Process of preserving milk.	Meyenberg	Feb. 22, 1887.
364,579	Process for preserving milk.	Dahl	Je. 7, 1887.
602,315	Process for preserving milk.	Fernandez	Apr. 12, 1898.
713,841	Process for preserving milk.	Birchmore	Nov. 18, 1902.
714,510	Process of aerating and preserving milk.	Nash	Nov. 25, 1902.
867,641	Apparatus for concentrating milk.	Campbell	Oct. 8, 1907.
929,464	Dipping device for bottles or jars.	McGinnis	Jl. 27, 1909.
994,641	Process of retaining milk in fresh condition.	Hansen	Je. 6, 1911.
1,000,409	Preserving milk.	Howe	Aug. 15, 1911.
1,005,275	Process for treating milk.	Mollinger	Oct. 10, 1911.
1,008,063	Process for preserving milk.	Pusey	Nov. 7, 1911.
1,069,096	Milk-modifier.	Alberty	Aug. 5, 1913.

MILK (Continued)

Patent	Subject	Author	Date
1,073,135	Manufacture of a salutary drink from dairy residues.	Jolles	Sept. 16, 1913.
1,080,204	Process for producing casein preparations.	Dunham	Dec. 2, 1913.
1,080,920	Manufacture of alimentary products.	Muller	Dec. 9, 1913.
1,057,519	Process for preserving milk.	Atkins	Apr. 1, 1913.
1,083,659	Process for curdling milk.	Brensike	Jan. 6, 1914.
1,085,380	Whey emulsion.	Downham	Jan. 27, 1914.
1,091,054	Composition for producing lactic food products.	Frederiksen	Mar. 24, 1914.
1,092,616	Process of treating milk and milk products.	Wieda	Apr. 7, 1914.
1,094,380	Process of treating milk and other liquids.	Tait	Apr. 21, 1914.
1,101,044	Fermented-milk food product and process of making the same.	Thoumaian	Je. 23, 1914.
1,120,330	Medicated food product.	Odle	Dec. 8, 1914.
1,125,692	Method for the utilizing of skim-milk and in milk composition.	Kitchen	Jan. 19, 1915.
1,126,429	Process for making casein from buttermilk.	Eilersen	Jan. 26, 1915.
1,126,734	Desicated milk product and process for producing same.	Dunham	Feb. 2, 1915.
1,139,031	Manufacture of artificial milk.	Gössel	May 11, 1915.
1,143,516	Method of making a whole-milk product.	Dunn	Je. 15, 1915.
1,157,976	Method of preserving milk and milk products.	Davis	Oct. 26, 1915.
1,159,455	Lacteal mixture and method of making the same.	Wieda	Nov. 9, 1915.
1,160,086	Moldable milk product and method of making the same.	Knudsen	Nov. 9, 1915.
1,175,876	Method of treating milk.	Sinclair	Mar. 14, 1916.
1,178,808	Method of treating milk.	Kitchen	Apr. 11, 1916.
1,181,219	Milk product.	Goucher	May 2, 1916.

MILK (Continued)

Patent	Subject	Author	Date
1,190,369	Process of making artificial cream.	Beckman	Jl. 11, 1916.
1,193,477	Food product and method of producing the same.	Crary	Aug. 1, 1916.
1,197,270	Method of preserving milk.	Davies	Sept. 5, [illegible]
1,200,782	Apparatus for manufacturing milk.	Von Rigler	Oct. 10, 1[illegible]
1,230,091	Food composition.	Kitchen	Je. 12, 191[illegible]
1,230,817	Food	Barnett	Je. 19, 1917.
1,230,479	Self-preserving acid milk and process of making the same.	Grelck	Je. 19, 1917.
1,255,483	Process of canning milk.	Startzenbach	Feb. 5, 1918.
1,272,035	Milk-food product and method of making the same.	Grelck	Jl. 9, 1918.
1,274,218	Process of making and new food product of milk.	Turney	Jl. 30, 1918.
1,274,748	Process of treating milk.	Nielsen	Aug. 6, 1918.
1,274,750	Process of treating milk and the like.	Nielsen	Aug. 6, 1918.
1,284,751	Process of treating milk.	Mussino	Nov. 12, 1918.

Milk

UNITED STATES PATENT OFFICE.

ROBERT ROHLAND, OF NEW YORK, N. Y.

IMPROVEMENT IN PREPARATION OF KOUMISS.

Specification forming part of Letters Patent No. **175,760**, dated April 4, 1876; application filed February 21, 1876.

To all whom it may concern:

Be it known that I, ROBERT ROHLAND, of the city and State of New York, have invented an Improvement in the Manufacture of Koumiss, of which the following is a specification:

The nutritious beverage made by the Tartars from mare's milk, and known as "Koumiss," is possessed of very useful medicinal properties. The carbonic acid that exists in the same is produced by fermentation, and it is difficult to check this fermentation at the proper time; hence the bottles containing the same are liable to burst, and the caseine is lumpy and does not mix uniformly, but has to be agitated before being used.

The object of my invention is to make the koumiss complete and uniform, so that there will not be any change by fermentation, or by the lapse of a reasonable time between the manufacture and use of the article. By this improvement the koumiss is adapted to being transported, the bottles are not liable to burst, and the beverage is more palatable than that heretofore made.

I employ either fresh cow's milk or condensed milk in the manufacture of the koumiss. If condensed milk is used I add about four times its bulk of warm water, and dissolve in it sugar until the saccharometer indicates 8.6°, and if fresh milk is used about one-quarter its bulk of warm water is to be added with the sugar, the object being to render the liquid of a composition similar to mare's milk. I now add yeast in about the proportion of one ounce compressed yeast, or three table-spoonfuls of fresh liquid yeast, to four and a half gallons, tasteless and colorless yeast preferred, and stir the same well and place it in a warm place, say, 65° to 70° Fahrenheit, and allow it to ferment, and agitate it from time to time and skim off the butter and other floating particles, and allow the fermentation to proceed eight or ten hours, and filter the liquid through a clean piece of muslin in order to remove a part of the caseine, and allow the fermentation to proceed until it is exhausted. The liquid is now charged with carbonic-acid gas in any of the known agitators similar to those used in the manufacture of soda or mineral water, and the material should be subjected to a pressure of about one hundred and fifty pounds for siphons and fountains, and fifty to eighty pounds for bottles. This operation prevents any further fermentation, and fully saturates the liquid with carbonic-acid gas. This is very important, as the koumiss is preserved, and its medicinal properties promoted by the carbonic acid. A uniform amount of carbonic acid is introduced into the koumiss, and the pressure will be easily determined, so that risk of the bottles bursting is prevented.

The koumiss is free from the lumpy disagreeable appearance usual in consequence of the precipitated caseine, as such caseine is dissolved fully by the carbonic acid, and the koumiss remains uniformly liquid, or nearly so.

This koumiss can be kept in any suitable vessels. It may be bottled like soda-water or champagne, or it may be drawn off through siphons or fountains, so as to be convenient for use as a beverage, with all the effervescing properties of soda-water, and with the nutritive and medicinal properties of koumiss.

The koumiss may be mixed with milk charged with carbonic acid, or there may be sirups and flavoring extracts added, either in the liquid, or, preferably, into the tumbler receiving the liquid.

I do not claim the manufacture of koumiss from cow's milk; neither do I claim the introduction of carbonic acid into milk by agitation.

I claim as my invention—

The method herein described of manufacturing koumiss by fermentation, and the introduction of carbonic acid, substantially as set forth.

Signed by me this 16th day of February, A. D. 1876.

ROBERT ROHLAND.

Witnesses:
GEO. D. WALKER,
CHAS. H. SMITH.

170,003

Nov. 1875

UNITED STATES PATENT OFFICE.

JOHN H. LESTER, OF NEW YORK, N. Y.

IMPROVEMENT IN PRESERVING MILK AGAINST INJURY BY TRANSPORTATION.

Specification forming part of Letters Patent No. **170,003**, dated November 16, 1875; application filed October 26, 1875.

To all whom it may concern:

Be it known that I, JOHN HENRY LESTER, of the city, county, and State of New York, have discovered a new and useful Improvement in the Method of Preserving Milk from Injury by Transportation; and I hereby declare that the following is a full, clear, and exact description thereof.

Heretofore it has been found impossible to transport milk for any considerable distance in warm weather for two reasons: the jolting of the vehicles of transportation keeps up such constant agitation that the milk is soon churned; contact with the atmosphere speedily sours it.

I obviate both these causes of destruction by so compressing the milk, by the aid of a force-pump or other means, within a strong and air-tight can, that the milk becomes so nearly a solid body as practically to prevent all movement. This, however, does not prevent the rising of the cream, which form is perfect in flavor, and not inferior to cream formed in the ordinary way, while the milk left after its removal is thought to be better than other milk which has traveled any distance, and in such manner that the milk and cream will be churned together. I have found from twenty to sixty pounds to the square inch pressure produces the desired result. However, I do not limit myself to just this, my main idea being to prevent the movement of the milk as much as possible within the vessel.

It is one of the advantages of my process that this natural action is not interfered with or disturbed, but goes on during transportation, just as if the milk were at rest in a dairy. If the temperature of the car in which it may be is as low as in a dairy, it will keep as long. By this process injury of the milk by electricity is also completely prevented.

I do not confine myself to the use of cans such as are now commonly used in the transportation of milk, but propose to use vessels of any kind so constructed as to admit of the desired amount of pressure, and afford the greatest convenience and economy.

What I claim, and desire to secure by Letters Patent, is—

The process herein described for preserving milk against injury by transportation or otherwise, which consists in forcing milk into an air-tight vessel, thereby presenting, as nearly as possible, a body immovable within the receptacle containing the same, substantially as specified.

JOHN HENRY LESTER.

Witnesses:
S. J. GORDON,
JOHN W. RIPLEY.

173,105

Milk

UNITED STATES PATENT OFFICE.

W. SCOTT BARNEY, OF BALTIMORE, MARYLAND.

IMPROVEMENT IN COMPOSITIONS FOR PRESERVING MILK.

Specification forming part of Letters Patent No. **173,105**, dated February 8, 1876; application filed August 30, 1875.

To all whom it may concern:

Be it known that I, W. S. BARNEY, of Baltimore, State of Maryland, have invented certain new and useful Improvements in Preserving Milk; and do hereby declare that the following is a full, clear, and exact description thereof.

The nature of my invention consists in a new, cheap, and simple process for preserving milk sweet and fresh for a limited period by the addition to the same of a few simple chemicals that shall prevent the milk from becoming sour, but shall not injure the milk as an article of food, nor be in the slightest degree detrimental to the health of the consumer. All dealers and consumers of milk understand and appreciate the difficulties attending their efforts to preserve milk sweet even for a few hours during the summer season, and when brought from a distance is often found, upon its arrival, unfit for delivery to consumers, thereby entailing great loss upon the producer and serious inconvenience to the public.

My invention will, to a great extent, overcome all the above-named objections and difficulties, and has no objectionable features, as the chemicals in the quantities used are not detrimental to health; but sour milk is when fed to infants, and is decidedly unpalatable to adults.

In order to enable others skilled in the art to make and use my invention I will now proceed to describe the manner in which the same may be carried into effect.

I dissolve in a sufficient quantity of water the following-named ingredients, and add the same, when thoroughly dissolved, to thirteen gallons of milk, or in the same proportion for a greater or less quantity: Salt, (chloride of sodium,) three ounces; sugar, (saccharum,) four ounces; saleratus, (bicarbonate of potash,) one ounce; saltpeter, (nitrate of potassa,) one-fourth ounce.

I do not confine myself to the exact proportions in the above formula, as the proportions may be varied somewhat.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

The within-described composition for the prevention of souring of milk, the composition consisting of salt, sugar, saleratus, and niter, substantially in the proportions specified.

In testimony that I claim the foregoing I have hereunto set my hand and seal this 30th day of August, 1875.

W. SCOTT BARNEY.

Witnesses:
GEO. H. MELLEN,
E. L. SCHMIDT.

250 2--

Milk

UNITED STATES PATENT OFFICE.

FRANK M. SLUTZ, OF KANSAS CITY, MISSOURI.

COMPOUND FOR PRESERVING MILK AND CREAM.

SPECIFICATION forming part of Letters Patent No. 250,294, dated November 29, 1881.

Application filed September 10, 1881. (No specimens.)

To all whom it may concern:

Be it known that I, FRANK M. SLUTZ, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Compositions for Preserving Milk and Cream; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a new and useful ~~composition for preserving milk and cream,~~ whereby it will remain sweet and pure from thirty-six to forty-eight hours longer than will milk without the preservative added, and which composition will not affect any of the beneficial properties of the milk in the least. In boiling it does not separate, while it freezes better in the manufacture of ice-cream than milk without the composition.

My composition consists of the following ingredients, combined in about the proportions stated, viz: sixty grains baking-soda, eighty grains common salt, eight grains burnt sugar dissolved in small quantity of water, twenty grains cream-tartar, five grains of saltpeter dissolved in gill of water, one-half pound of good white sugar. Dissolve the above composition in pure water, and add to ten gallons sweet milk or cream.

In cities where milk is necessarily kept for a number of hours before delivery to customers, and is often shipped long distances to wholesale dealers, my improved composition will prove of great value, as it will enable the consumer to be furnished with pure sweet milk that may be kept over night.

My improved composition will have a tendency to drive out of the market "chalk and water" and injurious adulterations, by enabling large dealers to ship in pure milk from longer distances, and keep it sweet for a longer time.

In fresh, warm milk there is a great amount of animal heat, and on this account in warm weather milk "taints" or sours very quickly, and cannot be canned or put into closed vessels until after it is cooled. Experience has demonstrated that the cream-of-tartar has the effect of counteracting this tendency to taint, ~~while the small~~ quantity used will not coagulate the milk, and if it be added to the compound the compound may be put into the milk while it is yet warm, thereby obviating the necessity of artificially cooling the milk.

I am aware that a chemical preparation for preserving butter and meat consisting of the following ingredients: common salt, twelve parts; saltpeter, three parts; loaf-sugar, four parts; soda, one part; water, one hundred and thirty-seven parts, is old, and such I distinctly disclaim as not of my invention.

Having thus fully described my invention, I claim and desire to secure by Letters Patent—

The herein-described composition for preserving milk and cream, consisting of soda, common salt, burnt sugar, cream-tartar, saltpeter, and white sugar dissolved in water, substantially in about the proportions specified.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK M. SLUTZ.

Witnesses:
JOHN W. BEEBE,
WM. B. TEASDALE

Milk

267,043

UNITED STATES PATENT OFFICE.

HEINRICH W. L. OTTO VON RODEN, OF HAMBURG, GERMANY.

PRESERVING MILK.

SPECIFICATION forming part of Letters Patent No. 267,043, dated November 7, 1882.

Application filed March 15, 1882. (No specimens.) Patented in England November 14, 1881, No. 4,982.

To all whom it may concern:

Be it known that I, HEINRICH WILHELM LUDWIG OTTO VON RODEN, a subject of the Emperor of Germany, residing at Hamburg, in the German Empire, have invented certain new and useful Improvements in Preserving Milk; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

Heretofore milk has been preserved either in a condensed state or by adding antiseptic chemicals. Both methods injure the taste of milk thus preserved, which can very seldom be used to replace fresh milk.

The object of my invention is to preserve milk in such a manner as not to alter its taste and to leave it in such a degree of liquidity as to allow its immediate use after opening the bottles or vessels containing such milk.

To carry my invention into effect I strain fresh milk, directly after milking, and fill it in glass bottles or other vessels, with the precaution of not filling full the entire interior of the bottle, but leaving it empty about one-sixth. Then I add some fine salad-oil, just enough to cover the surface of the milk about one-twelfth of an inch, and heat the bottles prepared in this manner about half an hour in a water bath. The heat must be regulated in such a manner as not to be less than 158° and not more than 176° Fahrenheit. Then the fire is removed and the water in the bath slowly cooled to 104°. After taking away the oil from the milk by means of a siphon or a glass syringe, or by any other convenient apparatus, the bottles are closed by good plugs, either of cork or rubber, which should be fastened with wire. Then the closed bottles are heated again in the water bath during an hour to 194° to 208° of Fahrenheit, and at last cooled in the bath to 86°.

I do not limit myself to the application of salad-oil, but any other equivalent thereof may be used which will protect the surface of the milk against the entry of air after removing the air contained in the fresh milk by heating, as above described, only the natural film of butter, which is produced in heating milk being excluded to form an object of my invention; also, any other means of heating the vessels to the mentioned degrees may be employed which will replace the water bath in a satisfactory manner.

Having thus fully described my invention, what I desire to claim and secure by Letters Patent is—

In the process of preserving milk by bottling, the method of excluding air prior to sealing, which consists in covering the milk with a film or layer of edible oil during the first heating, then removing the same, sealing, and reheating.

HEINRICH WILHELM LUDWIG OTTO VON RODEN.

Witnesses:

J. W. BAILEY,

ALEXANDER SPECHT.

277,352

Milk

UNITED STATES PATENT OFFICE.

EDUARD SCHERFF, OF WENDISCH BUCHHOLZ, PRUSSIA, GERMANY.

METHOD OF PRESERVING MILK.

SPECIFICATION forming part of Letters Patent No. 277,352, dated May 8, 1883.

Application filed June 23, 1882. (No specimens.) Patented in Germany February 20, 1880, No. 15,341; in France April 7, 1881, No. 142,183, and in England February 14, 1882, No. 717.

To all whom it may concern:

Be it known that I, EDUARD SCHERFF, a subject of the King of Prussia, residing in the town of Wendisch Buchholz, have invented certain new and useful Improvements in the Preservation of Milk, (for which I have received Letters Patent in the German Empire, No. 15,341, bearing date February 20, 1880, and in France, No. 142,183, bearing date April 7, 1881;) and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My said invention relates to improvements in the preservation of milk.

According to my German Patent No. 15,341 I employ the following method: Cold milk is filled in bottles and closed by means of a cork, which is cut off level with the mouth of the bottle, and a disk of cork of such size laid over the mouth of the said bottle that the mouth of the bottle is well covered, when the said disk is pressed firmly on the mouth of the bottle by means of one of the well-known lever-stopping devices. The bottles are now placed in an upright cylindrical receptacle provided with thermometer and manometer, the bottom and sides of which are provided with a serpentine tube. The bottom of the receptacle is covered with water, and the receptacle is then hermetically closed. Steam of more than two atmospheres' pressure is admitted at the lower part of the coil or serpentine tube, so that the water is rapidly brought to the boiling-point and heats the said coil or serpentine tube, so that the steam produced near the same can ascend, where the said steam is condensed by contact with the cold milk until the temperatures of the source of the heat and of the milk are uniform. As soon as a pressure of two atmospheres is reached the steam is cut off, so that the milk is subjected to a steam and air bath of about 100° centigrade temperature. If cold water is now admitted through the serpentine tube or coil, the manometer will in a short time show no extra pressure, during which time the bottles are slowly cooled. This produces a difference in pressure, so that the milk is so forced through the pores of the cork, which were opened by the preceding operation, that the said milk penetrates to the surface of the said cork, where butter is deposited and albumen precipitated through the tannin of the cork. The bottles are now removed from the apparatus and placed in a cool position. The milk cools, and air enters through the cork into the vacuous space so created, from which said air the sporules or germs are so perfectly filtered that the milk cannot be spoiled or injured thereby. The cork closure filters the sporules or germs; but as they remain in the said cork disk they would germinate rapidly and find their way through the cork. For this reason the cork disk, and the germs or sporules with the same, is removed, and the entrance of all further spores prevented by immediately coating the cork with paraffine.

Having now described my said invention and the means of carrying the same into effect, I desire it to be understood that what I claim, and desire to secure by Letters Patent, is—

The process of preserving milk, which consists in subjecting such milk in a tightly-corked receptacle in boiling water, then cooling the milk by cold water, or otherwise, forcing the cream through the cork, whereby the albumen is precipitated, reducing the temperature still further, whereby a vacuum is produced in the bottle and air permitted to enter, such air being filtered by passing through the cork which closes the bottle, and then coating the said cork with paraffine, substantially for the purpose set forth.

EDUARD SCHERFF.

Witnesses:

J. L. BIBO,

EDWIN A. BRYDGES.

(No Model.)

J. MEYENBERG.

APPARATUS FOR PRESERVING MILK.

No. 308,421. Patented Nov. 25, 1884.

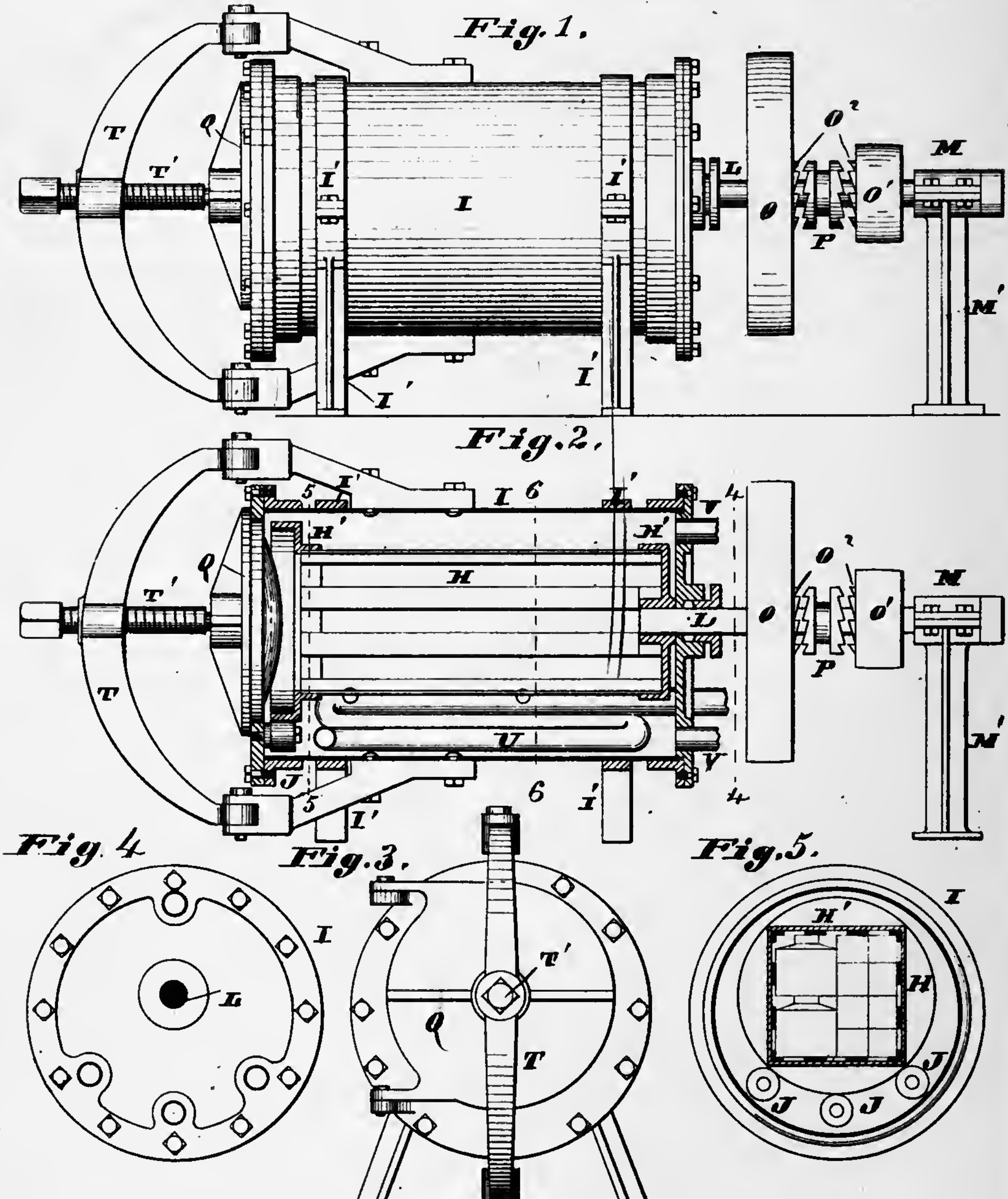
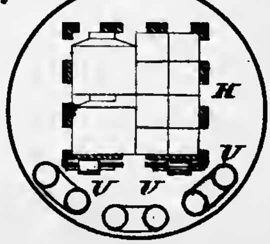


Fig. 6.



Attest;
Charles Pickles
Geo. L. Wheelock

Inventor;
Jno. Meyenberg
By Knight Bros
Attys

UNITED STATES PATENT OFFICE.

JOHN MEYENBERG, OF ST. LOUIS, MISSOURI.

APPARATUS FOR PRESERVING MILK.

SPECIFICATION forming part of Letters Patent No. 308,421, dated November 25, 1884.

Application filed February 16, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOHN MEYENBERG, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Apparatus for Preserving Milk, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a side view of the condenser. Fig. 2 is a longitudinal section of same. Fig. 3 is an end view. Fig. 4 is a transverse section taken on line 4 4, Fig. 2. Fig. 5 is a similar view taken on line 5 5, Fig. 2, and Fig. 6 is a similar view taken on line 6 6, Fig. 2.

The milk is put into cans of desired sizes, which are hermetically sealed and placed in a frame, H, (see Figs. 2 and 5,) which consists of bars connected by heads H'. This frame is inclosed by a cylinder, I, held in supports I'. One end of the frame is supported within the cylinder on friction-rollers J, journaled in one head of the cylinder. (See Fig. 2.) The other end of the frame is supported on one end of a driving-shaft, L, passing through the other head of the cylinder. The outer end of the shaft is supported in a journal-box, M, on a standard, M'. On this shaft are two loose driving-pulleys, O O', one of them being large and the other small, and both of them being provided with notches or teeth O^2, to engage a sliding clutch, P, arranged to turn with the shaft. Both pulleys are provided with driving-belts, and by connecting one or the other of them to the shaft by the sliding clutch the frame H may be turned fast or slow, as desired. The frame H can be removed from the cylinder, to be filled with cans, through an opening which can be closed by a door, Q, held in place by a swinging frame, T, and a screw, T'. The interior of the cylinder may be heated by steam passing through pipe or pipes U, and may be cooled by air entering through pipes V. Before the cans are placed in the frame H they are immersed in water and the milk cooled to a temperature of about 35°. The milk may be put into open cans and cooled off and then be put into tight cans, as stated. The tight cans should not be quite filled with the milk, so that the milk can move when the frame H is turned. It is better that the cans should have very little, if any, contact one with another in the frame H. When the cans are put in the frame and the cylinder closed, the frame being supported within the cylinder, as shown in Fig. 2, steam is admitted to the pipe or pipes U, heating the interior of the cylinder. The frame is simultaneously turned slowly, about two or three revolutions per minute. This is continued about thirty minutes, (the temperature should not exceed 218° to 228°,) and then the steam is turned off and the pipe or pipes U cooled by water being passed through them or it. At the same time air is admitted to the interior of the cylinder through the pipes V. The frame is then turned quickly for fifteen minutes, more or less, during which time the milk is cooled to a temperature of 25° or 30°. The cans are then taken out and examined to see if there is any leakage, which will show whether or not they were hermetically sealed. The cans can then be stored away and the milk will keep good for years.

I claim as my invention—

1. The combination of the revolving frame adapted to receive cans, the outer inclosing-cylinder, and the air and steam pipes, arranged and operating substantially as and for the purpose set forth.

2. The combination of the revolving frame H, cylinder I, surrounding the frame, steam-pipes U within the cylinder beneath the frame, air-pipes entering one end of the cylinder, and a door at the other end of the cylinder, through which the frame passes, as set forth.

JOHN MEYENBERG.

In presence of—

GEO. H. KNIGHT,
SAML. KNIGHT.

308,422

Mill

UNITED STATES PATENT OFFICE.

JOHN MEYENBERG, OF ST. LOUIS, MISSOURI.

PROCESS OF PRESERVING MILK.

SPECIFICATION forming part of Letters Patent No. 308,422, dated November 25, 1884.

Application filed July 9, 1884. (No specimens.)

To all whom it may concern:

Be it known that I, JOHN MEYENBERG, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Process of Condensing Milk, of which the following is a full, clear, and exact description.

In carrying my invention into effect I heat the milk as it comes from the cows with steam out of contact with the milk, the milk being stirred and exposed to the air until about one-sixth of its volume is evaporated. Next the milk is cooled out of contact with the air by cold water, while the stirring is continued, the milk of course being out of contact with the water. Next all vapors and air that might be generated are withdrawn from the milk by exhaustion. This operation prevents all changes or the formation of germs of fermentation. The milk is next cooled down to from 100° to 105° Fahrenheit. Then it is twice strained and condensed to the desired consistence under *vacuo* to from one-fourth to one-half of its original volume, until the condensing operation is finished, to prevent contact of the milk with the atmosphere, for the purpose set forth. After this operation the milk is drawn off and cooled by cold water, (and while being continually stirred) down to from 50° to 60° Fahrenheit. After this the milk is put into tight cans of different sizes, as demanded by the trade or customers may want it, being careful not to fill them completely, as there is some room needed in the can for the motion of the milk in the next process. The cans are then hermetically sealed and continually agitated by revolving them, and heated by steam to not over 240° Fahrenheit, kept at that temperature for a short time, and then cooled down with cold air to about 60° Fahrenheit. This last cooling process must be done quickly. After this the cans are examined to discover if all are air-tight, and if so are then ready for the market.

I am aware that milk to be preserved and condensed has been heated beneath the boiling-point of 212° Fahrenheit, to fit it for evaporation *in vacuo*.

I am also aware that the milk has been stirred while being heated.

I am also aware that milk has been put into cans, hermetically sealed, and heated while the cans have been revolved. Such steps in the process, therefore, I do not claim, broadly.

I claim as my invention—

1. The process for condensing and preserving milk herein described, which consists in heating the milk by steam out of contact therewith while the milk is exposed to the air and stirred, until about one-sixth of its volume is evaporated, then cooling the milk while the stirring is continued and the vapors and air are being drawn off by exhaustion, continuing the cooling down to about 100° or 105° Fahrenheit, then straining it, then condensing it *in vacuo* down to about one-half or one fourth of its original volume, then cooling it down to about 50° or 60° Fahrenheit, while still stirring it, and finally canning it, as set forth.

2. The process for condensing and preserving milk herein described, which consists in heating the milk by steam out of contact therewith while the milk is exposed to the air and stirred, until about one-sixth of its volume is evaporated, then cooling the milk while the stirring is continued and the vapors and air are being drawn off by exhaustion, continuing the cooling down to about 100° or 105° Fahrenheit, then straining it, then condensing it *in vacuo* down to about one-half or one-fourth of its original volume, then cooling it down to about 50° or 60° Fahrenheit while still stirring it, then canning it without quite filling the cans, then hermetically sealing the cans, agitating the cans of milk while exposed to heat of not more than 240° Fahrenheit, and finally cooling them down to from about 50° to 60° Fahrenheit, as set forth.

JOHN MEYENBERG.

In presence of—

GEO. H. KNIGHT,

SAML. KNIGHT.

327,023

UNITED STATES PATENT OFFICE.

SAMUEL SANBORN, OF SAN FRANCISCO, CALIFORNIA.

PRESERVATIVE FOR MILK.

SPECIFICATION forming part of Letters Patent No. 327,023, dated September 29, 1885.

Application filed May 27, 1885. (No specimens.)

To all whom it may concern:

Be it known that I, SAMUEL SANBORN, a citizen of the United States, and a resident of the city of San Francisco, county of San Francisco, and State of California, have invented a new and useful composition of matter for the purpose of preserving milk; and I hereby declare the following to be a full, clear, and exact specification thereof.

My composition consists of the following ingredients: sugar, salt, nitrate of potash, soda, hyposulphite of soda, and sulphite of lime, to be combined in about the following proportions: sugar, six pounds; salt, two pounds; nitrate of potash, four ounces; carbonate of soda, one ounce; hyposulphite of soda, three ounces; sulphite of lime, two ounces. All of these are to be dissolved in sufficient water to make the whole amount to three gallons of the preservative. One gill of this preservative will keep three gallons of milk for several days in very warm weather.

The sugar and salt, when used in the proportions in which I use them in my preservative, take away the peculiar taste that would be present in the milk were the other ingredients used without the sugar and salt.

I am aware of a preservative patented by William Ross, January 1, 1867, and bearing the number 60,942; but I find that my preservative will keep milk sweet much longer than Ross's, from the fact that my preservative contains hyposulphite of soda and sulphite of lime, which Ross's does not, and the particular proportions in which I combine the ingredients in my preservative causes the elements to so act upon each other that no unpleasant taste is produced in the milk.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

The preparation for keeping milk sweet, consisting of sugar, salt, nitrate of potash, carbonate of soda, hyposulphite of soda, and sulphite of lime, in the proportions substantially as herein described.

In witness whereof I have hereunto set my hand.

SAMUEL SANBORN.

Witnesses:
JOHN DIXON,
CLARENCE SANBORN.

358,213

UNITED STATES PATENT OFFICE.

JOHN MEYENBERG, OF HIGHLAND, ILLINOIS.

PROCESS OF PRESERVING MILK.

SPECIFICATION forming part of Letters Patent No. 358,213, dated February 22, 1887.

Application filed June 12, 1886. Serial No. 204,987. (No specimens.)

To all whom it may concern:

Be it known that I, JOHN MEYENBERG, of Highland, in the county of Madison and State of Illinois, have invented certain new and useful Improvements in Processes of Preserving Milk, of which the following is a specification.

This invention relates to an improved process of preserving milk after the same has been condensed *in vacuo* and canned; and the invention consists of the process herein described of preserving milk after condensing the same *in vacuo* and canning the same by subjecting the cans in a hermetically-closed chamber to a vacuum by exhausting the air, then subjecting them to an air-pressure of about two atmospheres, next heating the air in the chamber by admitting steam to a temperature not exceeding 235° Fahrenheit while rotating the cans, and finally quickly cooling the same.

Heretofore milk was subjected to a much higher temperature than I use. In the process used heretofore the milk was boiled a considerable length of time in the open air until it was reduced about one-sixth of its volume. It was then cooled slowly to about 100° Fahrenheit and then brought into the vacuum-pan. This process requires much time, gives the milk a yellowish color and a peculiar taste. For preserving the milk it has been customary heretofore to use hot water, in which the milk-cans were placed and heated, and also by which the milk was heated to about 240° Fahrenheit, kept at this temperature for about twenty minutes, and agitated.

In carrying out my invention, the milk in its fresh state is boiled and condensed *in vacuo* to a suitable consistency. The milk is then slowly cooled and placed into cans of larger or smaller size, as required by the trade, which cans are then hermetically sealed in the usual manner. They are next placed into a drum to which rotary motion can be imparted, which drum is located in a hermetically-closed chamber. This chamber is connected to an air-pump of simple construction, which can be used as a suction and force pump, and the same worked as a suction-pump until a vacuum of about two atmospheres is established in the chamber. The cans are subjected to this pressure for some time for the purpose of testing them as to their being properly closed. Any leaking cans are removed, so that only hermetically-closed cans are subjected to the process. The air-cock of the chamber is then opened and air forced into the chamber by the air-pump until a pressure of about two atmospheres is produced in the same. This pressure also serves for testing the tightness of the cans, as by the exterior pressure any imperfectly-closed or leaking cans can be readily discovered and removed. The air in the chamber is then slowly heated by admitting a sufficient quantity of steam into the same until a temperature of about 230° to 235° Fahrenheit is obtained in the chamber, care being taken that this temperature of 235° Fahrenheit is not exceeded. While exposed to this temperature the cans are rotated by the drum and exposed to said temperature for about twenty-five to thirty minutes, after which they are quickly cooled by admitting water or other cooling medium.

By the thorough testing of the cans, which is accomplished by exposing the same first to a vacuum and then to an air-pressure of two atmospheres, they are fully tested as to their tightness. Any imperfectly-sealed cans are excluded from further treatment and carefully sealed, so as to be subjected to the vacuum and air-pressure with the next set of cans. The temperature of 235° Fahrenheit, to which the cans are exposed, is sufficient to destroy the fermenting germs contained in the same, while the milk is not burned and spoiled, which would be the case if a higher temperature than 235° Fahrenheit would be employed. By this temperature no "burned" taste is imparted to the milk, and the original color, smell, and taste of the same retained. Milk thus condensed without sugar can be preserved for any length of time and shipped to any climate without undergoing any change in color and quantity.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

The process herein described of preserving milk after the same has been condensed *in vacuo*, which consists in subjecting the cans in a hermetically-closed chamber to a vacuum of about two atmospheres pressure; secondly, subjecting them to an air-pressure of about two atmospheres; thirdly, heating the air in the chamber to a temperature not exceeding 235° Fahrenheit while continually rotating the cans, and, finally, quickly cooling the milk, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JOHN MEYENBERG.

Witnesses:
JULES A. ROHR,
BERNART SIDLER.

364,579

UNITED STATES PATENT OFFICE.

KRISTIAN GERHARD DAHL, OF DRAMMEN, NORWAY.

PROCESS OF PRESERVING MILK.

SPECIFICATION forming part of Letters Patent No. 364,579, dated June 7, 1887.

Application filed October 4, 1886. Serial No. 215,255. (No specimens.) Patented in England August 26, 1886, No. 10,903; in France September 14, 1886, No. 178,501; in Belgium September 14, 1886, No. 74,528; in Germany September 14, 1886, No. 39,796; in Canada, October 13, 1886, No. 25,115, and in Austria-Hungary January 23, 1887, No. 36,626.

To all whom it may concern:

Be it known that I, KRISTIAN GERHARD DAHL, a subject of the King of Sweden and Norway, residing at Drammen, Norway, have invented certain new and useful Improvements in a Process for Preserving Milk, (for which Letters Patent have been granted in Great Britain, No. 10,903, dated August 26, 1886; in France, No. 178,501, dated September 14, 1886; in Belgium, No. 74,528, dated September 14, 1886; in Germany, No. 39,796, dated September 14, 1886; in Austria-Hungary, No. 36,626, dated January 23, 1887, and in Canada, No. 25,115, dated October 13, 1886;) and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

Through the researches and experiments of Pasteur and others it has for several years been known that the developed living organisms in milk are destroyed at a much lower temperature than the germs of such organisms.

The object of this invention is to provide means whereby milk may be preserved indefinitely without rendering it unpalatable by treatment at high temperature, without condensing the same, and without mixing therewith a preservative of any kind.

After extensive experiments, extending over a period of several years, I have found that milk can be preserved by treating it at such temperatures as will not render it unpalatable, although these temperatures are not sufficiently high to destroy the germs of the microbe or organisms, yet they are high enough to destroy the living microbes or organisms present.

I have found that I can destroy the living microbes, as well as their germs, by treating the milk under occlusion of atmospheric air by first heating it to that degree that will destroy the living organisms, then lowering the temperature to that point which is most conducive to the development of the germs into living organisms, to be again destroyed as before, and repeating this operation to insure the entire destruction of all the germs contained in the milk, which may then be kept indefinitely, of course under occlusion of atmospheric air, without the admixture therewith of a preservative agent.

The invention therefore consists, essentially, in the process of treating milk under occlusion of atmospheric air at such temperatures as will destroy the living organisms therein, then bringing the milk to a temperature that is most conducive to the development of the germs into living organisms, allowing the milk to stand at such temperature to develop the germs, and then increasing the temperature to destroy the living organisms developed, and repeating this operation once or twice, substantially as hereinafter described, and as set forth in the claims.

The milk as it comes from healthy cows is strained and cooled down at once to about 10° or 15° centigrade in vessels intended for transport from the stable or other place to the factory where the milk is to be treated. In the factory I put the cooled milk into the vessels in which the milk is supplied to the consumer. I prefer to put the cooled milk into small flat or shallow carefully-cleaned "tins" or boxes made of tinned iron and which are only used once; or, I may put the milk into larger vessels, which, when used, are returned empty to the factory for refilling. These larger vessels are by preference square in section, and having two opposite sides bulged in slightly for the purpose of making allowance for expansion caused by increase of temperature. If I use the large vessels, I first carefully clean them and then dry and heat them in a hot-air chamber at about 150° centigrade for about one and one-half hour, which drying may be done the day before the treatment begins, the vessels being kept there till wanted; or they may meanwhile be kept in a place where the air is perfectly pure and cool, and hence free from germs of living organisms.

The aforesaid small or large vessels, having been filled with the cooled milk, are then at once hermetically sealed and exposed to a temperature of about 70° centigrade in a suitable heating-vessel for the space of about one and three-fourths hour, whereby the bacteria contained in the milk are, as I believe, killed. I then cool them down to about 40° centigrade, and keep them at that for about one and three-fourths hour for the purpose of quickly developing the remaining germs, as I believe, whereupon they are quickly heated up to about 70° centigrade for the purpose of killing the developed germs or bacteria, as I believe. I have found it advisable to repeat this operation once or twice. The last heating to 70° should, however, only be for about half an hour. There may then be some remaining organisms which, however, as I believe, are not so much developed as to have formed any germs, and these organisms are killed by raising the temperature to 80° or 100°, which maximum must be kept for about one-half or three-fourths hour. The milk is now, as I believe, free from living bacteria and germs of same. The vessels are then cooled down to 15°, or less.

For the purpose of ascertaining and regulating the temperature with large tins I use a tin of the same size filled with water and fitted with a thermometer. The time is reckoned from the moment that the thermometer shows the right temperature. For small tins this is unnecessary.

I may add that whether my aforesaid theory is right or wrong, one thing is certain—viz., that the milk so treated will keep, and that result has not heretofore, to my knowledge, been obtained; and I have, moreover, done this with varying quantities of milk up to fifty liters. The time which the aforesaid process or alternating treatment takes varies slightly in accordance with the size of the vessels, and may, with the larger vessels, be performed in about nine hours. The temperatures given must, however, be adhered to, else the process is a failure.

In order quickly to bring the temperature down to 40°, the cooling-water must evidently be much colder than 40°, and when the temperature approaches the 40° I let steam into the heating-vessel until the temperatures in it and in the tins become alike. If I, for instance, heat from 40° to 70°, I accelerate this process by sending up the temperature in the heating-vessel to about 80°, and then regulate by means of the aforesaid thermometer; but with small tins the thermometer is superfluous, as the tins quickly acquire the same temperature as the liquid in which they are immersed in the heating-vessel.

By using milk-vessels with flat sides or ends, the expansion caused by increase of temperature is allowed for, and I also gain the important advantage that if an expansion should take place after the process is completed it would indicate that the process in that case, from some carelessness or accident, was a failure, because gas-pressure had been produced in the vessel, and I may thus reject such tins and prevent disappointment of the consumer.

Having fully described my invention, what I desire to claim and secure by Letters Patent is—

The herein-described process of preserving milk, which consists in first cooling the freshly-obtained milk to about 10° or 15° centigrade, then subjecting the same to the following treatment under occlusion of atmospheric air, to wit: first heating to about 70° centigrade for about one and three-quarters hour, then reducing the temperature to about 40° centigrade, and keeping same at that temperature for about the same period of time, and repeating this treatment, the last heating lasting for about one-half an hour, then subjecting the milk to a temperature of from 80° to 100° centigrade for about one-half an hour, and finally reducing the temperature to about 15° centigrade, substantially as and for the purpose specified.

KRISTIAN GERHARD DAHL.

Witnesses:

O. WINGE,

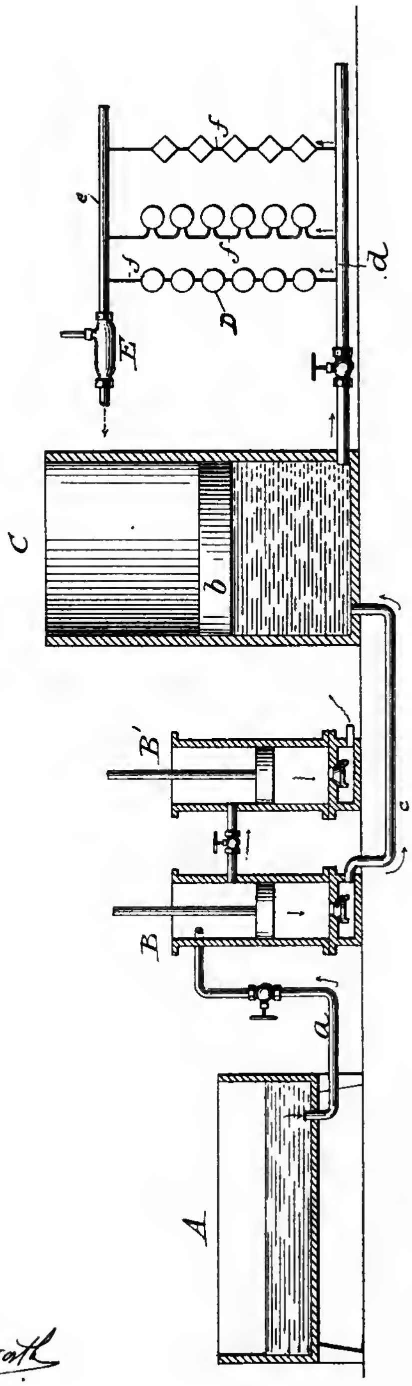
A. BÖDTKE.

(No Model.)

A. FERNANDEZ.

PROCESS OF PRESERVING MILK.

No. 602,315. Patented Apr. 12, 1898.



Witnesses
Sidney P. Hollingsworth
Neil R. Parkins

Inventor:
Aurelio Fernandez
by C. H. W. T. Howson
Attorneys.

UNITED STATES PATENT OFFICE.

AURELIO FERNANDEZ, OF SANTIAGO, CHILE.

PROCESS OF PRESERVING MILK.

SPECIFICATION forming part of Letters Patent No. 602,31[illegible], dated April 12, 1898.

Application filed July 16, 1897. Serial No. 644,786. (No specimens.)

To all whom it may concern:

Be it known that I, AURELIO FERNANDEZ, a citizen of the Republic of Chile, residing at Santiago, Chile, have invented certain new and useful Improvements in Preserving Milk, of which the following is a specification.

My invention relates to a process for preserving milk indefinitely in its natural state without adding any substance whatsoever thereto by exhausting the gases contained therein and then canning and sterilizing it, which process can be carried on without changing any of its properties and without exposure to the air.

This invention is an improvement on that of Letters Patent granted to Enrique Taulis for a process of and apparatus for sterilizing milk, dated July 28, 1896, and numbered 564,851, which process I have simplified by doing away with the filtration of the milk through charcoal, the pasteurizer, the refrigerator, the introduction of steam into the cans before filling them, and the pumps which force the entrance of the milk into the cans, and I have added to it an air-exhauster or vacuum-machine, which, before the cans are filled with milk, extracts the air from them, making a vacuum, and draws the milk into the cans by the continued operation of the air-exhauster. In this manner I fill the cans with milk without its having come in contact with the air.

In carrying out my improved process the milk to be preserved is first poured into a receptacle of convenient size, from which it passes by a pipe to a suitable exhaust or vacuum apparatus, by means of which the air and gases contained in the milk are removed. The purified milk is then forced into a storing-tank ready for canning. For the purpose of properly packing in a convenient form the purified milk, so it may be readily handled, I unite by means of small pipes a series of cans of a convenient size, one end of each series being connected to a pipe running from the storage-tank, the other end of each of said series being joined to an air-exhauster of approved type. The pipe leading from the storage-tank to the cans is provided with a valve, which being closed the air is by means of the said air-exhauster exhausted from the cans, after which the milk is drawn under the influence of the vacuum from the storage-tank to the cans, filling every part of them. The connections between the cans are then hermetically closed and the cans separated, after which they are introduced into a suitable apparatus for heating and thereby sterilizing the purified milk.

The accompanying drawing shows an apparatus adapted to the carrying out of my improved process.

A is the primary milk-receptacle; B, the vacuum apparatus, connected to the receptacle A by a pipe *a*, and C the storage-tank, having an air-tight movable cover *b*, the tank being united to the vacuum apparatus B by a pipe *c*.

B′ is a secondary vacuum apparatus which takes the gases extracted from the milk in B.

D represents series of cans connected to a pipe *d*, leading from the storage-tank, and to a pipe *e*, closed at one end and provided at the other with an air-exhauster or vacuum-pump E. The several cans of the series are joined by the tubes *f*, which, after the vacuum has been made in the cans and they have been filled, are closed, after which the cans are separated. The pipes are provided with suitable valves for manipulation during the several operations described.

Having thus described my invention, I claim—

The herein-described process of preserving milk which consists, first, in submitting milk at normal temperature to reduced pressure for the removal of all gases therefrom; then introducing the purified milk at normal temperature, solely by means of a vacuum and without exposure to the atmosphere, into a series of connected air-exhausted cans; then hermetically sealing each can of said series of filled cans; then separating the series into individual cans, and finally subjecting the milk within the said sealed and separated cans to sterilization by heat alone, substantially as set forth.

In testimony whereof I have hereunto set my hand, in the city of Baltimore and State of Maryland, this 15th day of July, 1897.

AURELIO FERNANDEZ.

Witnesses:

A. V. GANA,

HARRY W. RODGERS.

713,841

Milk

UNITED STATES PATENT OFFICE.

WOODBRIDGE H. BIRCHMORE, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO CLARKSON A. COLLINS, OF NEW YORK, N. Y.

PROCESS OF PRESERVING MILK.

SPECIFICATION forming part of Letters Patent No. 713,841, dated November 18, 1902.

Application filed March 19, 1902. Serial No. 98,942. (No specimens.)

To all whom it may concern:

Be it known that I, WOODBRIDGE H. BIRCHMORE, a subject of the King of Great Britain, residing in the borough of Brooklyn, city of New York, county of Kings, and State of New York, have invented certain new and useful Improvements in Processes of Preserving Milk, of which the following is a specification.

While my invention may be applied generally to any liquid which it is desired to preserve from the action of destructive bacilli, it is more especially intended to be applied to the preservation of milk, the importance of accomplishing which is well understood. Heretofore an attempt has been made to accomplish this by a process which consists of the steps, in the order named, of charging the liquid into a suitable air-tight vessel, forcing in a sterile gas under pressure sufficient to expel the liquid from the vessel, and finally subjecting the vessel and its contents to a pasteurizing temperature. This process has, however, proven commercially impracticable because of the abnormally great amount of breakage of the glass containing vessels when subjected to the temperature essential to the pasteurization of the liquid. I have discovered that this breakage is due to the strain upon the vessel caused by the expansion of the gas, already under pressure within the vessel, when the necessary degree of heat is applied and that by subjecting the vessel to a pasteurizing-heat before the introduction of the gas the liquid is equally well preserved and the breakage of the vessels in the course of heating is avoided.

My process is designed to be practiced in connection with an air-tight distributing vessel having an outlet-valve, such as the siphon-bottle illustrated in the drawing, in which the milk is contained under gas-pressure sufficient to expel it therefrom, so that it can be drawn in successive portions as required for consumption without access of the external atmosphere to the portion remaining.

As a preliminary step I prefer to sterilize the interior of the vessel before filling it with milk, as by forcing steam into or through it, to the end of destroying any disease-germs that might be contained in it. The milk is then charged into the vessel in the desired quantity, space being left for the presence of gas under pressure sufficient to expel the milk from the bottle. The milk is then pasteurized in the well-known manner by raising it to a proper temperature under 212° Fahrenheit, as is well understood. After the milk is pasteurized a sterile or sterilized gas is forced into the vessel until pressure sufficient to serve to expel the milk from the bottle as required for use is attained. Any sterile gas, such as atmospheric air sterilized by heat, that will not be readily absorbed by and will not act deleteriously upon the milk may be employed. The milk is then ready for use and may be drawn from the bottle as required.

By means of my invention not only is the milk freed from destructive bacilli and protected from contamination by contact with the atmosphere when drawn in successive portions, but its pasteurization is effected without the prohibitive breakage of the containing vessels which has hitherto attended all attempts to practice such a process. The advantages of this will be readily apparent to those skilled in the art.

What I claim as new, and desire to secure by Letters Patent, is—

The process of preserving milk for use in successive portions which consists in sterilizing an air-tight containing vessel having an outlet-valve, charging the milk into such vessel, pasteurizing the milk in the vessel and finally forcing into the vessel a sterile gas under pressure sufficient to expel the milk therefrom.

In testimony whereof I have hereunto subscribed my name this 10th day of March, A. D. 1902.

WOODBRIDGE H. BIRCHMORE.

Witnesses:

CLARKSON A. COLLINS,
WILLIAM J. KINDGEN.

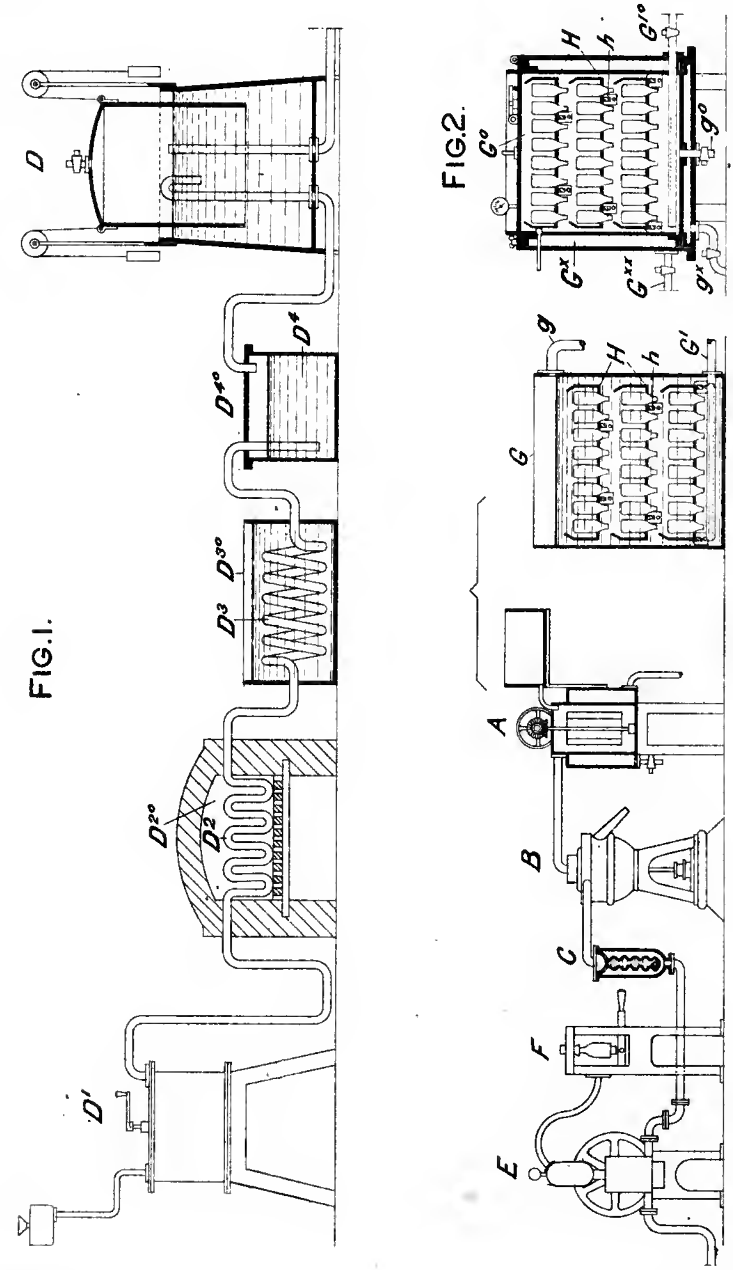
No. 714,510. Patented Nov. 25, 1902.

R. G. NASH.

PROCESS OF AERATING AND PRESERVING MILK.

(Application filed Dec. 28, 1897.)

(No Model.)



Witnesses.

Thos. P. Eland.

E. K. Wood.

Inventor.

Richard Gransen Nash

per G. G. Hardingham

Attorney.

UNITED STATES PATENT OFFICE.

RICHARD GRAINGER NASH, OF LUCAN, NEAR DUBLIN, IRELAND.

PROCESS OF AERATING AND PRESERVING MILK.

SPECIFICATION forming part of Letters Patent No. 714,510, dated November 25, 1902.

Application filed December 28, 1897. Serial No. 663,880. (No specimens.)

To all whom it may concern:

Be it known that I, RICHARD GRAINGER NASH, a subject of Her Majesty the Queen of Great Britain and Ireland, residing at Finnstown House, Lucan, near Dublin, Ireland, have invented certain new and useful Improvements in the Aeration and Preservation of Milk, (for which I have obtained Letters Patent in Belgium, No. 130,850, dated September 25, 1897, and for which I have applied for Letters Patent in Great Britain, No. 14,209, to bear date June 26, 1896,) of which the following is a specification.

This invention relates to an improved process of aerating and preserving milk; and it consists in separately sterilizing the carbonic-acid gas, oxygen, atmospheric air, or other gas employed in aerating and the milk prior to their commixtion, the bottled or decanted mixture being, moreover, subjected to treatment with a view to its complete sterilization.

In the accompanying drawings, Figure 1 illustrates a diagrammatical view of a series of appliances adapted for treating milk according to my improved method. Fig. 2 is a section of an alternative form of apparatus for employment in finally heating and completing sterilization of the bottled or decanted mixture.

A is a heater; B, a separator; C, a cooler. D is a receiver for gas or air.

E is an aerating-machine, and F a bottling-machine.

G is the apparatus employed for completing the sterilization of the bottled mixture.

According to my improved method the milk, (which may be "new" milk, "skimmed" or separated milk or whey, but preferably separated milk,) to which water or other liquid may be added, is first partly sterilized by heating it in a receptacle A to a temperature of 156° to 160° Fahrenheit. The milk may then be again subjected to the action of a cream-separator B and then cooled by means of the cooler C, same consisting of a coil immersed in ice or cold water or other suitable cooling appliance, the temperature of the milk being hereby reduced to about 40° Fahrenheit.

The aerating-gas may be carbonic acid, oxygen, air, or other suitable medium. When carbonic acid is used as the aerating medium, the gas having been produced by any known method, as at D', is sterilized in the following manner: On leaving the generator D' it is first caused to pass through a coil D^2, containing any suitable purifying agent and which is maintained at a red heat in a closed chamber D^{20}. This coil D^2 may, however, be heated by means of steam or by being immersed in boiling water. The gas is then cooled by causing the same to pass through a coil D^3, submerged in cold water in a tank D^{30}. Any bacteria contained in the gas being thus destroyed and any bad flavor or other objectionable qualities it may have possessed having been removed the gas is then washed by passing it through a bath D^{40}, containing sterilized water or other suitable purifying liquid or substance D^4, the quality of the gas being hereby further improved. The gas thus sterilized and washed is then charged, by means of a suitable aerating-machine or pump E, into the milk, and the mixture is decanted or bottled with the aid of a bottling-machine F.

By treating the milk in the manner above described a large portion of the bacteria is destroyed, the curdling of the milk upon its coming into contact with the gas is prevented, and any objectionable flavor the milk may have possessed or acquired is removed. By adding soda, potash, or other suitable substance and sugar in the proper proportions—for example, about one and one-half drams of potash and three drams of sugar to each gallon of milk—I find curdling of the mixture is prevented, and if sterilized water in the proportion of about one quart of water to each gallon of milk be added the flavor of the mixture is improved and rendered similar to the ordinary soda and milk mixture.

If it be desired to impart a flavor to the milk, the flavoring matter, which may be in any convenient form, such as an essence, is preferably added to the sterilized water D^4 in the bath or tank D^4, to be taken up by the gas in its passage therethrough prior to the gas being forced into the milk. In place of or in addition to the flavoring matter an alkali, such as bicarbonate of soda, may be added, the alkali acting as a corrective of any acid tendency in the milk. Instead of flavoring the gas on its passage through the sterilized water the aerating-gas may be passed through or over the flavoring-essence. The flavoring matter or essence may in some instances be added to the milk; but I have found that when adding some flavoring matters to the milk instead of to the gas the tendency has been to curdle the milk. Under certain circumstances this mode of procedure is therefore unadvisable. If desired, a suitable quantity of sugar may be added to the milk.

In order to produce a creamy "head" on the aerated milk, and thus to improve its appearance when served for consumption, a suitable essence, such as commonly employed in the manufacture of aerated waters, may be added. If not already flavored as previously described, a little ginger or other flavoring-essence may be added to the milk before bottling.

The charged bottles containing the sterilized and aerated mixture are placed in a bath G, containing water, which is raised by suitable means to a temperature of about 160° Fahrenheit for about thirty minutes and cooled as quickly as possible for the purpose of completing the process of sterilization. The heating of the bath may be effected by passing steam or hot water therein by means of the pipe G', the cooling being accomplished by shutting off the flow of steam or hot water and admitting cold water into the bath by means of the same pipe, the latter being provided with a two-way cock for use in effecting the desired object. The bottles are contained on trays H, furnished with handles for facilitating their insertion in and removal from the vessel and are supported by transverse bars h or brackets. g is an overflow-pipe.

The completion of the sterilization of the mixture may, however, be carried out in a jacketed vessel G°, to which steam is admitted by way of the pipe G'°, and wherein the temperature is raised, say, to 150° or 212° Fahrenheit or thereabout, the charged bottles being maintained at this temperature for one hour or thereabout. The steam is then shut off and the contents of the vessel cooled by supplying cold water to the jacket $G^{\times}$ by means of the pipe $G^{\times\times}$.

g° $g^{\times}$ are drain-pipes for the interior of the vessel and the jacket, respectively.

The temperatures and duration of heating at any of the stages may be varied to suit requirements, as also the pressure at which the bottling is effected. In hot weather, or if the mixture be required for consumption in hot climates, the water in the bath may be raised to a temperature of about 212° Fahrenheit for about twenty minutes, the temperature being then lowered to 90° Fahrenheit or thereabout. After an interval the temperature is again raised to about 212° Fahrenheit for about twenty minutes and then lowered as quickly as possible.

If the mixture be required for keeping a considerable time, I find it advantageous to reheat it after an interval of about twenty-four hours or forty-eight hours from the first heating, the temperature of the vessel or bath being again raised to 212° Fahrenheit and then reduced as rapidly as possible. Any fresh germs which may have developed in the interval between the first and second heating are hereby destroyed. This process of reheating may be repeated as often as circumstances may require. In certain states of the weather a lower temperature than 212° Fahrenheit will suffice, and the periods during which the heat is maintained may also be varied.

Before commencing operation the apparatus, bottles, and other receptacles should be sterilized.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The improved process of aerating and preserving milk, substantially as herein described, consisting in partially sterilizing skimmed or separated milk by heating it to a temperature of 150° to 160° Fahrenheit cooling the same to about 40° Fahrenheit by means of a coil immersed in ice; sterilizing the aerating-gas by causing the same to pass through a heated coil in a closed chamber, then through a coil submerged in cold water, then passing the gas through a bath of sterilized water containing a flavoring-essence; charging the partially-sterilized milk with the sterilized gas, bottling the aerated mixture, subjecting the bottled mixture in a closed vessel for about one hour to a temperature of 150° to 212° Fahrenheit and then rapidly cooling the same; a sterilized aerated beverage being thus obtained.

2. In the process of aerating and preserving milk, passing the aerating-gas through a heated coil in a closed chamber, then through a coil submerged in cold water, then through a bath of sterilized water, substantially as set forth.

3. In the process of aerating and preserving milk, sterilizing and flavoring the aerating-gas and partially sterilizing the milk, then charging the latter with the sterilized gas, substantially as set forth.

RICHARD GRAINGER NASH.

Witnesses:
A. DONN PIATT,
NEWTON B. ASHBY.

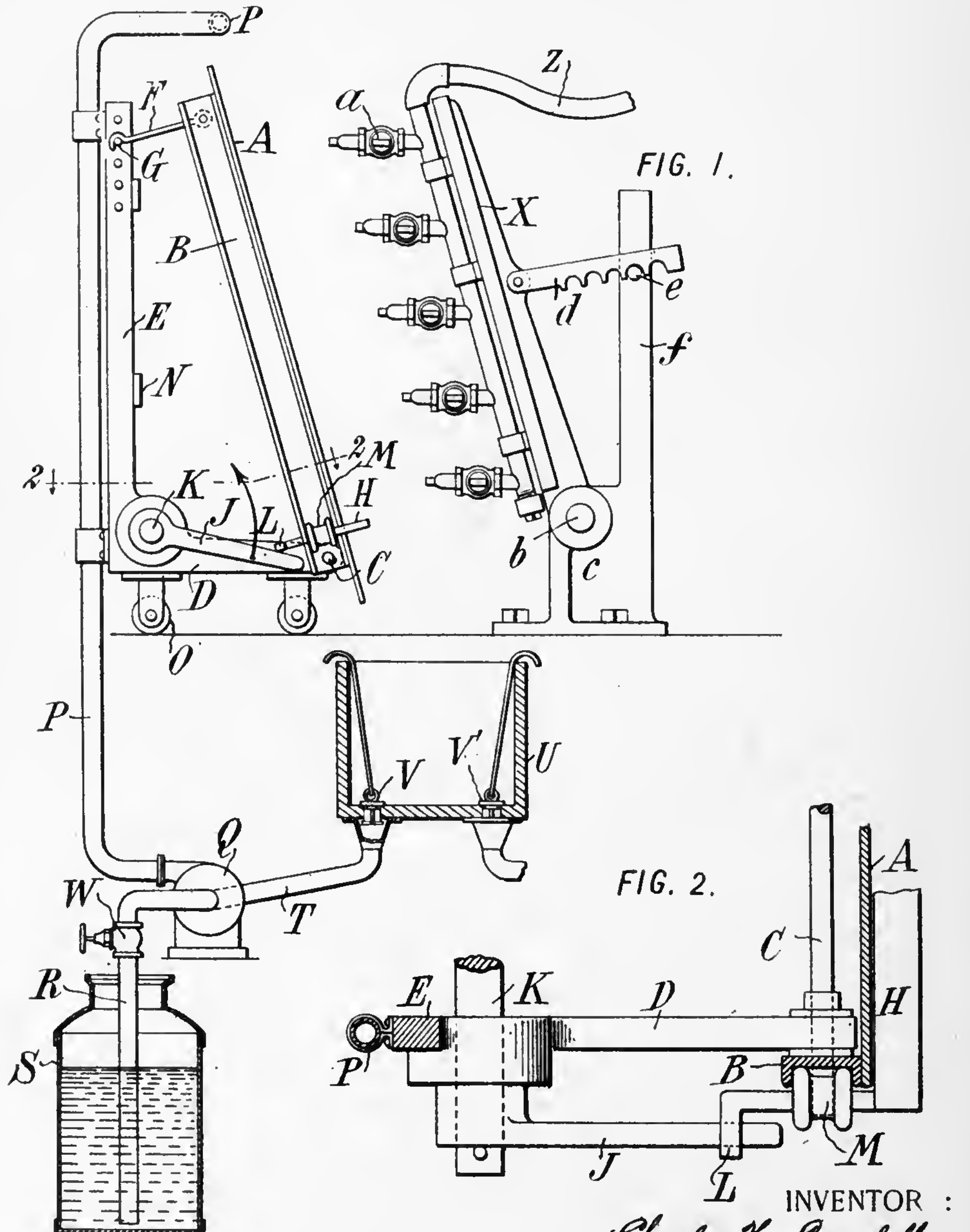
No. 867,641. PATENTED OCT. 8, 1907.

C. H. CAMPBELL.

APPARATUS FOR CONCENTRATING MILK, &c.

APPLICATION FILED OCT. 3, 1906.

2 SHEETS—SHEET 1.



WITNESSES:

Fred White

René Bruine

INVENTOR:

Charles H. Campbell,

By Attorneys,

Arthur C. Fraser & Usina

No. 867,641. PATENTED OCT. 8, 1907.

C. H. CAMPBELL.

APPARATUS FOR CONCENTRATING MILK, &c.

APPLICATION FILED OCT. 3, 1906.

2 SHEETS—SHEET 2.

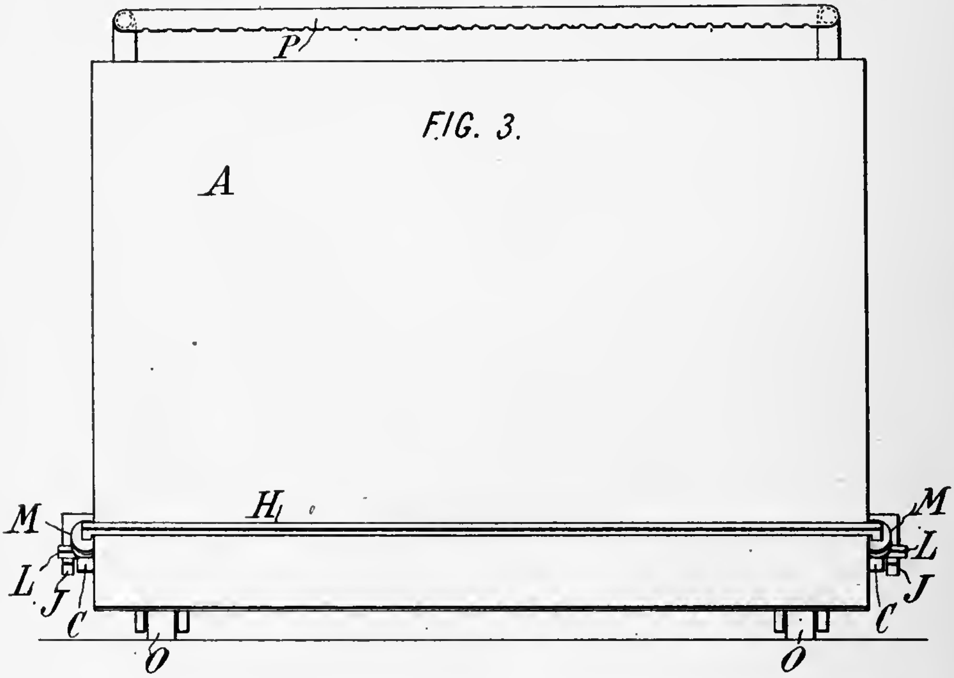
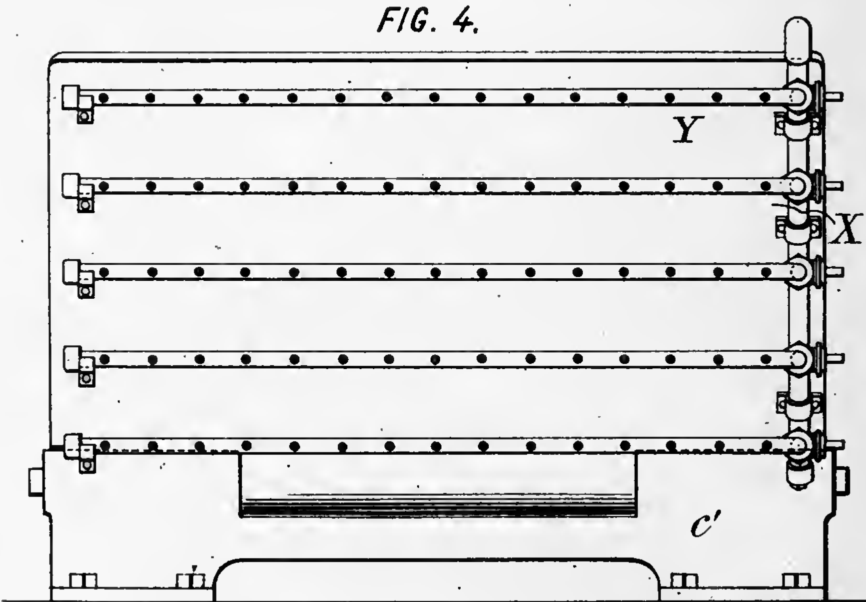


FIG. 3.

FIG. 4.



WITNESSES:

Fred White

René Bruine

INVENTOR:

Charles H. Campbell,

By Attorneys,

Arthur C. Fraser Ullmina

UNITED STATES PATENT OFFICE.

CHARLES H. CAMPBELL, OF NEW YORK, N. Y.

APPARATUS FOR CONCENTRATING MILK, &c.

No. 867,641. **Specification of Letters Patent.** **Patented Oct. 8, 1907.**

Application filed October 3, 1906. Serial No. 337,320.

To all whom it may concern:

Be it known that I, CHARLES H. CAMPBELL, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Apparatus for Concentrating Milk, &c., of which the following is a specification.

This invention aims to provide an improved apparatus for concentrating various liquids, being especially adapted for concentration of milk from the ordinary extremely liquid condition to a semi-liquid or doughy mass or to substantial or complete dryness.

The apparatus is extremely simple and cheap, and is particularly advantageous on account of the ease with which it may be kept clean, and with which it may be adjusted to secure a more or less rapid concentration, and a concentration to a greater or less degree.

The milk is run in a coating or film over an inclined support which is fixed in position during use, and the heat used in concentrating it is applied to the surface of the milk instead of to the support over which it runs, as has been proposed in previous machines. By reason of the low conductivity of the atmosphere in contact with the surface of the milk, the milk is prevented from being raised to an extremely high temperature at any point so as to burn it or cause it to become seriously caked on its support. The support is adjustable toward and from the source of heat, and the temperature is variable from the top to the bottom of the support. By varying the inclination of the support also, the relative temperatures at different points may be varied, and the rate of speed with which the milk flows may be increased or diminished in order to effect a greater or less degree of concentration.

The accompanying drawings illustrate more or less diagrammatically an apparatus embodying the invention.

Figure 1 is a side elevation showing certain parts in section; Fig. 2 is an approximately horizontal section on the line 2—2 in Fig. 1; Fig. 3 is a face elevation of the support which carries the milk; Fig. 4 is a face elevation of the heater.

Referring to the embodiment of the invention illustrated, the support comprises a flat sheet of metal A arranged in an inclined approximately vertical position. The support may be mounted at opposite sides upon channel irons B, the lower ends of which are pivoted as at C to the horizontal arms D of end frames which have also vertical arms E to which the upper ends of the channels B are adjustably connected, as for example by means of hooks F pivoted at one end to the channels B and adapted to hook at their opposite end over any one of a series of pins G at different heights on the vertical frames E.

A scraper H is arranged to move up and down over the lower portion of the support where the milk becomes so thick as not to run down easily, this scraper being reciprocated at intervals either by hand or automatically. A suitable automatic means comprises arms J at opposite ends of a rotating shaft K, these arms engaging arms L connected to the ends of the scraper H, and passing through guide rollers M which travel up and down in the grooves of the channels B. The arms J rotate slowly in the direction of the arrow in Fig. 1, and move the scraper H about half way up the support and then allow it to fall by gravity, the arms J engaging it again at the end of a revolution, and the rollers being stopped by the extended ends of the pivot C.

The end frames E may be connected to each other by means of cross braces N as well as by the shafts C and K, and are preferably mounted on rollers O to permit the support to be moved toward or from the heater bodily.

Instead of being a perfect plane, the support A may be curved in vertical section, the lower part being nearly or quite vertical, while the upper part departs more largely from the vertical so as to compensate for the more easy flow of the more liquid milk at the top of the support.

The milk may be fed to the support through a perforated pipe P, which is bent at its ends and extends down to the discharge end of a pump Q, the inlet end of which may be connected to a pipe R adapted to extend into a milk can or other receptacle S, or it may be alternately connected by means of suitable valves to a pipe T into which milk is discharged from a vessel U arranged below the lower edge of the support A. If the valve V of the vessel U be opened and the valve W be closed, then after the milk has passed over the support A and been partially concentrated, it will be again conducted to the top of the support and run down to be further concentrated. In the usual operation, however, the valve V will be closed and the valve W opened, so that the pipe R will take up fresh milk and the desired concentration will be effected in one passage over the plate A, so that the milk which is run first into the receptacle U will be of the desired degree of concentration. If it is desired to desiccate this milk, it may be conducted from the vessel U by way of valve V′ to any suitable desiccating apparatus, such as drying trays or the cylindrical apparatus described in Patent No. 668,162. The pipe P may be fastened upon the upright portions E of the main frame, and the pump Q may also be attached to this main frame so as to move with it, although for the sake of clearness the pump is shown separately in the present case. Where the pump is separate from the main frame, a portion of the pipe P must be flexible to allow of the bodily adjustment referred to.

The heating of the milk may be effected in a great variety of ways. I have shown for this purpose a stand-and X carrying at different heights a series of perforated pipes Y similar to those used in gas heated ovens, these pipes being supplied with gas from a main Z, and being provided each with a valve a, so that the supply of gas may be varied as desired. Ordinarily it will be greatest for the uppermost of the pipes Y, and will vary gradually to the lowest, so as to neutralize the greater tendency of the milk to burn as it becomes thicker. In case the adjustment of the valves a is not sufficient to effect the desired variation in temperatures between the top and the bottom, or in case a heating means is used which is not adapted to regulation by such valves, the standard X will be pivoted at b upon a base c, and will be angularly adjustable, the angle being determined for example by a notched link d engaging a pin e on an arm f extending upright from the fixed base c. The pipe Z may be flexible to allow of the desired adjustment. The particular value of this adjustment lies in the ability to vary temperature at different heights without at the same time varying the rapidity with which the milk runs down its support. Especially when concentrating milk it is important to avoid such a high temperature as will injure the solids as by coagulating the albumen. The coagulation, however, takes place at a lower temperature, where the mass has little water in it, than where the mass has a large quantity of water. Therefore the desired concentration can be more quickly effected by using the highest temperature which for the condition of the milk at any moment will just fall short of coagulation. As shortness of time is of the greatest importance in the concentration of milk, it being often impossible to get milk perfectly fresh, this adjustability of the degree of temperature is a particularly valuable feature of the machine.

The degree of concentration may be carried to any desired point, even to the point of complete dryness, on the support A. Likewise the scraper H may be arranged to move up the support to any desired height.

What I claim is:—

1. An apparatus for concentrating milk including in combination an approximately vertical inclined support, stationary in operation and adjustable in inclination, means for supplying the milk to the top of said support so that it spreads thereon and runs down the support in a thin coating, and a heater opposite the face of the inclined support so that the milk is heated to a higher degree than its support.

2. An apparatus for concentrating milk including in combination an inclined support, means for supplying the milk to the top of said support so that it spreads thereon and runs down the support in a thin coating, and a heater opposite the face of the inclined support so that the milk is heated to a higher degree than its support, said heater comprising heating devices at different elevations and adapted to be adjusted to different intensities opposite the portions of the milk of different degrees of concentration.

3. An apparatus for concentrating milk including in combination an inclined support, means for supplying the milk to the top of said support so that it spreads thereon and runs down the support in a thin coating, and a heater opposite the face of the inclined support so that the milk is heated to a higher degree than its support, and a scraper arranged to scrape the concentrated milk from the support.

4. An apparatus for concentrating milk including in combination a sheet A constituting a support and arranged in an inclined approximately vertical position and adapted to be adjusted in inclination, means for supplying milk to the top of said support so that it spreads thereon and runs down the support in a thin coating, and a heater opposite the face of the inclined support and comprising a standard X carrying a series of heating devices at different heights.

5. An apparatus for concentrating milk including in combination a support comprising a sheet A, end frames having horizontal arms D and vertical arms E, the sheet A being pivoted near its lower edge to the horizontal arms D, and means for attaching the upper part of the sheet to the vertical arms E and at different distances therefrom so as to vary the inclination, a pipe P arranged to distribute milk upon the sheet A, and a pump Q for forcing the milk through said pipe P.

6. An apparatus for concentrating milk including in combination a support comprising a sheet A, end frames having horizontal arms D and vertical arms E, the sheet A being pivoted near its lower edge to the horizontal arms D, and means for attaching the upper part of the sheet to the vertical arms E and at different distances therefrom so as to vary the inclination, a pipe P arranged to distribute milk upon the sheet A, a pump Q for forcing milk through said pipe P, a receptacle U arranged below the sheet A to receive the material therefrom, and connected with the pump Q to permit the reconcentration of said material.

7. An apparatus for concentrating milk including in combination a stationary inclined support, means for supplying the milk to the top of said support so that it spreads thereon and runs down the support in a thin coating, and a heater opposite the face of the inclined support comprising a standard X pivoted and adjustable in inclination, a series of heating devices Y at different elevations upon said standard, and means for regulating separately the individual heating devices.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

CHARLES H. CAMPBELL.

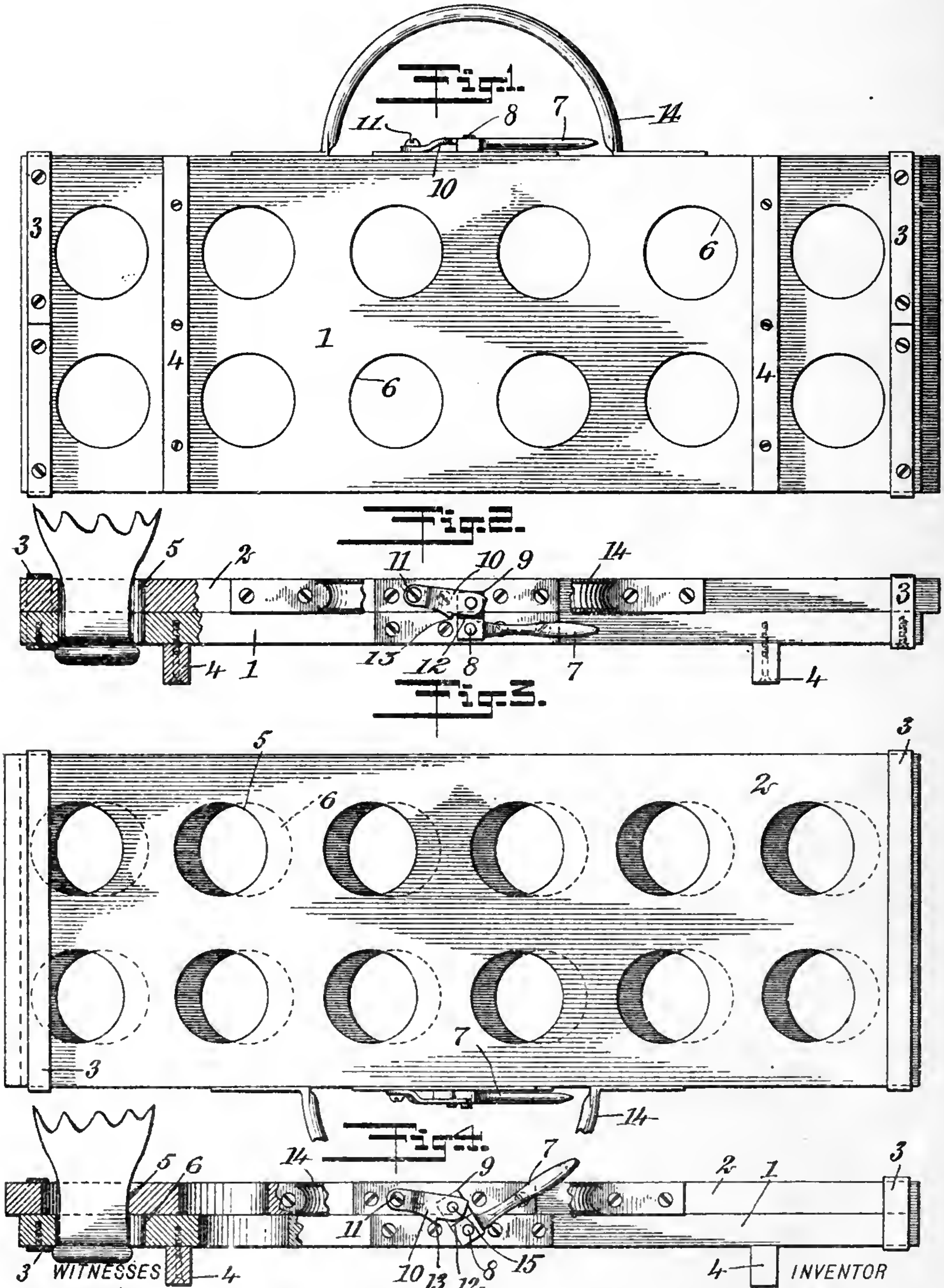
Witnesses:

DOMINGO A. USINA,

FRED WHITE.

B. W. McGINNIS.
DIPPING DEVICE FOR BOTTLES OR JARS.
APPLICATION FILED SEPT. 30, 1908.

929,464. Patented July 27, 1909.



WITNESSES
F. G. Hackenberg.
F. D. Ammen

INVENTOR
Bert W. McGinnis
BY Munn & Co.
ATTORNEYS

UNITED STATES PATENT OFFICE.

BERT W. McGINNIS, WICHITA, KANSAS.

DIPPING DEVICE FOR BOTTLES OR JARS.

No. 929,464. **Specification of Letters Patent.** **Patented July 27, 1909.**

Application filed September 30, 1908. Serial No. 455,434.

To all whom it may concern:

Be it known that I, BERT W. McGINNIS, a citizen of the United States, and a resident of Wichita, in the county of Sedgwick and State of Kansas, have invented a new and Improved Dipping Device for Bottles or Jars, of which the following is a full, clear, and exact description.

This invention relates to dipping devices such as are used for holding bottles or milk jars when they are being dipped to sterilize or scald them.

The object of the invention is to produce a device of very simple construction, which can be operated in a simple manner to hold a number of bottles in a convenient manner to enable them to be dipped in a vessel having a scalding or sterilizing bath.

The invention consists in the construction and combination of parts to be more fully described hereinafter and particularly set forth in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the device; Fig. 2 is a plan or upper edge view, in this view certain parts are broken away and shown in cross section, this view also shows the device in the relation which the parts assume when the bottles or jars are to be inserted; Fig. 3 is a side elevation showing the opposite side from that shown in Fig. 1, and showing the device in an inverted position; and Fig. 4 is a view similar to Fig. 2, but showing the parts of the device in the relation which they assume when the bottles or jars are locked against removal.

Referring more particularly to the parts, the body of the device is formed of two plates or boards 1 and 2, which are of the same size and superposed one above the other, as indicated. The plate 1 is provided at its ends with rigid guide bars or guide straps 3 of metal, which enable the plate 2 to slide freely longitudinally of the face of the plate 1. On its outer side the plate 1 is provided with transverse cleats 4, the purpose of which will appear more fully hereinafter. The plates 1 and 2 are provided with series of openings 6 and 5 respectively, which may register exactly with each other, as indicated in Fig. 1, or which may be drawn slightly out of alinement with each other, as shown in Fig. 3. This is accomplished by sliding one of the plates on the other. For this purpose I provide a lever 7 which is pivotally mounted on a stud 8 on the upper edge of the plate 1. This lever is a bell crank lever, having a short laterally projecting arm 9 which is connected by a link 10 with the edge of the plate 2, said link 10 being pivotally attached by a suitable screw 11. The arm 9 of the bell crank lever is reduced in thickness so that a shoulder 12 is formed on the head of the lever 7, and the edge of this shoulder is adapted to engage with a notch 13 on the side of the link 10, which limits the movement of the lever 7, as will be readily understood.

As shown in Fig. 2, the lever 7 extends longitudinally of the device, and at this time the openings 5 and 6 are in alinement with each other. With the device in this position, it may be set upon a table with the cleats 4 disposed on the under side, and resting upon the surface of the table. The bottles or jars are then inserted in the openings from above, as indicated in Figs. 2 and 4. After the openings have all been filled with bottles, the lever 7 is thrown over to the position in which it is shown in Fig. 4. This slides the plate 2 upon the plate 1, and the plate 1 then engages the necks of the bottles under the lips thereof and holds them securely against withdrawal. The upper edge of the plate 2 is provided with a suitable handle 14 which can be held when the device is being immersed with the bottles which it holds in a sterilizing or scalding bath. After the bottles have been dipped, the device may be set upon a table or shelf so as to enable the bottles to drain.

In the practical construction of the device, the links 10 and arm 9 are arranged in such a way that the pivot connection 15 between them will pass beyond the line joining the pins 8 and 11; in this way the device jams or locks the slides relatively to each other. After bottles are drained, the device with bottles can be inserted over a delivery case and by unlocking the lever the bottles will drop into the case.

Having thus described my invention, I claim as new and desire to secure by Letters Patent,—

1. A dipping device for bottles and jars, comprising a pair of horizontally elongated plates, means for guiding one of said plates upon the other, a handle attached to one of

said plates on the edge thereof whereby said plates may be normally held in a substantially vertical plane when dipping the bottles and jars, said plates having a plurality of openings adapted to register and which may be thrown out of register, and means for locking said plates with respect to each other with said openings slightly out of register to hold the necks of the bottles and jars inserted in said openings.

2. A dipping device for bottles and jars, comprising a horizontally elongated plate having a plurality of openings formed therethrough, a sliding member adapted to reduce the area through said openings and adapted to engage the necks of bottles or jars inserted therethrough, and a handle attached at the edge of said plate and affording means for holding the same normally in a substantially vertical plane.

3. A dipping device for bottles and jars, comprising a horizontally elongated plate having a plurality of openings formed therethrough, a sliding member adapted to reduce the area through said openings and adapted to engage the necks of bottles or jars inserted therethrough, a handle attached at the edge of said plate and affording means for holding the same normally in a substantially vertical plane, and members attached to the side of said plate and adapted to project beyond the mouths of said bottles or jars and affording means for supporting said plate in a substantially horizontal position, said members being attached on the side opposite to which the necks of said bottles or jars are inserted in said openings.

4. A dipping device for bottles and jars, comprising a plate having guides, a second plate mounted on said first plate and movable in said guides, said plates having openings adapted to register and adapted to be thrown out of register when said plates slide one upon the other, means for actuating said plates, and means for holding said plates with said openings in register or out of register.

5. A dipping device for bottles and jars, comprising a plate having guides, a second plate mounted on said first plate and movable in said guides, said plates having openings adapted to register and adapted to be thrown out of register when said plates slide one upon the other, means for actuating said plates, means for holding said plates with said openings in register or out of register, and a handle attached to the edge of one of said plates.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

BERT W. McGINNIS.

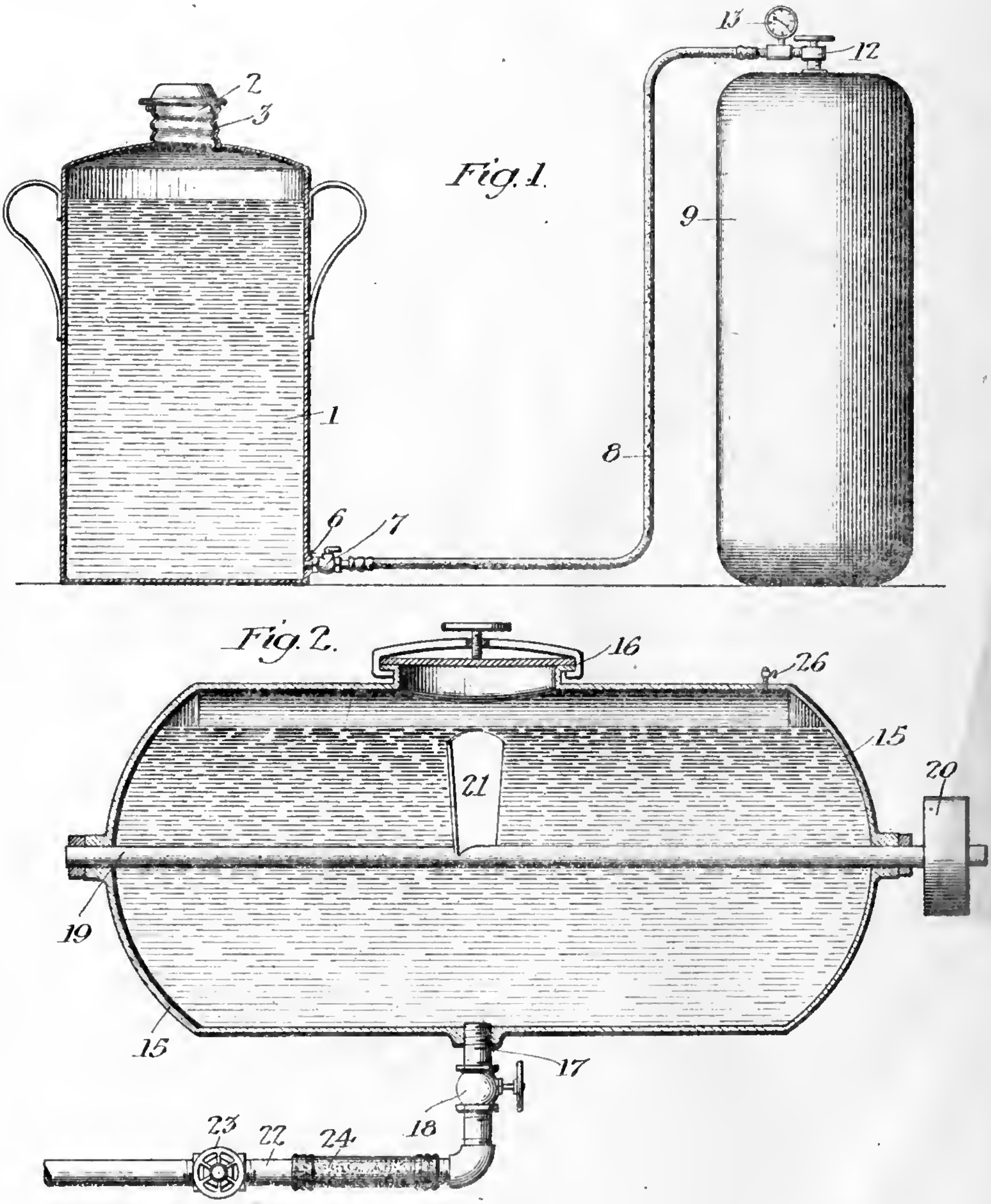
Witnesses:
O. L. JACQUES,
C. E. ARNETT.

H. E. HANSEN.

PROCESS OF RETAINING MILK IN FRESH CONDITION.

APPLICATION FILED SEPT. 7, 1910.

994,641. Patented June 6, 1911.



Witnesses:

Lutie D Alter

J. D. Thornburgh

Inventor:
Harald Emil Hansen
by Townsend Zane & Hackley
Attys

UNITED STATES PATENT OFFICE.

HARALD EMIL HANSEN, OF LOS ANGELES, CALIFORNIA.

PROCESS OF RETAINING MILK IN FRESH CONDITION.

994,641. Specification of Letters Patent. Patented June 6, 1911.

Application filed September 7, 1910. Serial No. 580,936.

To all whom it may concern:

Be it known that I, HARALD EMIL HANSEN, a subject of the King of Denmark, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Process of Retaining Milk in Fresh Condition, of which the following is a specification.

The object of my invention is to provide a cheap and effective process whereby a large percentage of the microbes or bacilli is destroyed and the germination or propagation thereof prevented in cow's milk, thereby maintaining such milk in sweet or fresh state.

I have discovered that milk can be retained in its sweet or fresh condition for a considerable period, sufficient to cover the time required for transportation, and for ordinary storage, by subjecting it to the action of carbonic acid gas in the manner hereinafter set forth, and then reducing the pressure of the gas so as to restore the milk to substantially atmospheric pressure, but retaining an atmosphere of carbonic acid gas in contact with the milk, whereby the milk is delivered free from effervescence and in a condition in which it can be used in the same manner as ordinary milk, the process having no effect on the appearance or quality of the milk and not interfering with the rising of the cream in the usual manner.

The accompanying drawings illustrate apparatus suitable for carrying out the invention.

Figure 1 is a vertical section of a can showing an elevation of the apparatus for supplying carbonic acid gas thereto, said can being adapted for shipping purposes or for treatment of the milk or other fluid on a comparatively small scale. Fig. 2 is a vertical section of a tank for treating milk or other fluid on a large scale.

Referring to Fig. 1 a can 1 which may be of usual shape and dimensions for shipping is provided at the top with a cover 2 screwing into a screw-threaded neck 3 so as to give a gas-tight joint. In the lower part of the can is provided an inlet 6 for carbonic acid gas, said inlet having a valve 7 and being adapted for connection to a hose or flexible pipe 8 leading to any suitable source of carbonic acid gas, for example, a gas holder or tank 9, provided with a valve 12 and with a pressure gage 13.

In carrying out my process by the use of the apparatus shown in Fig. 1, milk is placed in the can 1, the cover 2 having first been removed, after which the cover 2 is screwed down tight and the connection to the carbonic acid gas holder 9 having been made, the valve 7 is opened, allowing the carbonic acid gas to pass into the body of milk in the tank 1, the gas being admitted until the pressure reaches say, 60 pounds per square inch, the carbonic acid gas then present in the milk being sufficient to kill a large proportion of the microbes, and the pressure thereof insufficient to cause separation of the casein from the milk.

The killing of the microbes is substantially instantaneous upon the subjection of the milk to the gas, the valve 7 being then shut and the connection to the carbonic acid supply being removed. At any time thereafter the pressure of the gas may be reduced, for example, by turning the can on its side and opening the valve 7, the carbonic acid gas being thereby allowed to flow out until the pressure within the can approximately equalizes with that of the atmosphere, sufficient pressure being, however, left in the can to exclude the atmospheric air, the residual pressure being slightly in excess of the atmosphere. The removal of pressure from the carbonic acid gas is preferably effected before the milk is shipped so that the milk can be shipped under atmospheric pressure in the same manner as untreated or pasteurized milk without any special provisions for retaining pressure thereon and I have found that subjecting milk to the action of carbonic acid gas will preserve the same even after removal of the pressure of the gas and the milk can be shipped without liability of becoming sour.

The initial treatment with the carbonic acid gas under pressure is found to be sufficient to considerably reduce the number of live microbes in the milk and to reduce the activity of the remaining microbes in such manner that in the absence of air which is insured by the retention of an atmosphere of carbonic acid gas on the milk, there is not only no further development but a gradual decrease in the number of live microbes in the milk.

It will be understood from the above description that the gases originally in the milk will be displaced in part by the carbonic acid gas, such gases accumulating with the excess of carbonic acid gas in the upper part of the can and escaping together with such excess of carbonic acid gas, from the can when the can is turned on its side and the valve 7 is opened. When the valve 7 is opened in this manner, the carbonic acid gas which has been absorbed by the milk by reason of the condition of pressure, escapes from the liquid, leaving only that amount in the liquid which is retainable by the liquid at atmospheric pressure. With a small body of milk such as that in the can, a moderate time of exposure to the atmosphere in this manner is sufficient to release substantially all of the excess of carbonic acid gas due to the original charge under pressure, and the amount left in the milk is not sufficient to affect the taste or render it in any way materially different from sweet or fresh milk, except as regards the reduction of active microbes.

In carrying out the process on a large body of milk as will be necessary in a large plant, it is desirable to provide special means for incorporating the carbonic acid gas into the body of milk and releasing it therefrom. In Fig. 2 the tank 15 which is provided with a man-hole at the top for filling and cleaning and with an outlet 17 at the bottom having a valve 18, is further provided with a shaft 19, driven by pulley 20 and carrying a blade or paddle 21, is adapted to stir or agitate the milk. The supply pipe 22 for carbonic acid gas leads to any suitable source for such gas and is provided with the valve 23 and with a flexible hose 24 for detachable connection to outlet 17. The process is carried out in this apparatus as above described except that the paddle or agitator means is kept in operation during the process so as to facilitate thorough mixture of carbonic acid gas with the milk and to expedite removing the carbonic acid gas from the milk when the gas is released through the valve 26 in the top of the tank, and to prevent separation of the cream from the milk, after the carbonic acid gas is released and it is desired to draw off the milk.

What I claim is:

1. The process of retaining milk in fresh condition, which consists in passing carbonic acid gas into the milk under pressure, and subsequently reducing the pressure and retaining on the milk an atmosphere of carbonic acid gas at substantially atmospheric pressure in contact with the milk.

2. The process of retaining milk in fresh condition, which consists in subjecting the milk to the action of carbonic acid gas and retaining the milk in an atmosphere of carbonic acid gas at substantially atmospheric pressure.

3. The process of retaining milk in fresh condition, which consists in forcing carbonic acid gas under pressure into the body of milk, agitating the body of milk to incorporate the carbonic acid gas therewith, exposing the body of milk to atmospheric pressure and agitating the milk to release approximately all of the carbonic acid gas therefrom.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 31st day of August 1910.

HARALD EMIL HANSEN.

In presence of—
ARTHUR P. KNIGHT,
FRANK L. A. GRAHAM.

F. W. HOWE.

PRESERVING MILK.

APPLICATION FILED SEPT. 23, 1907.

1,000,409. Patented Aug. 15, 1911.

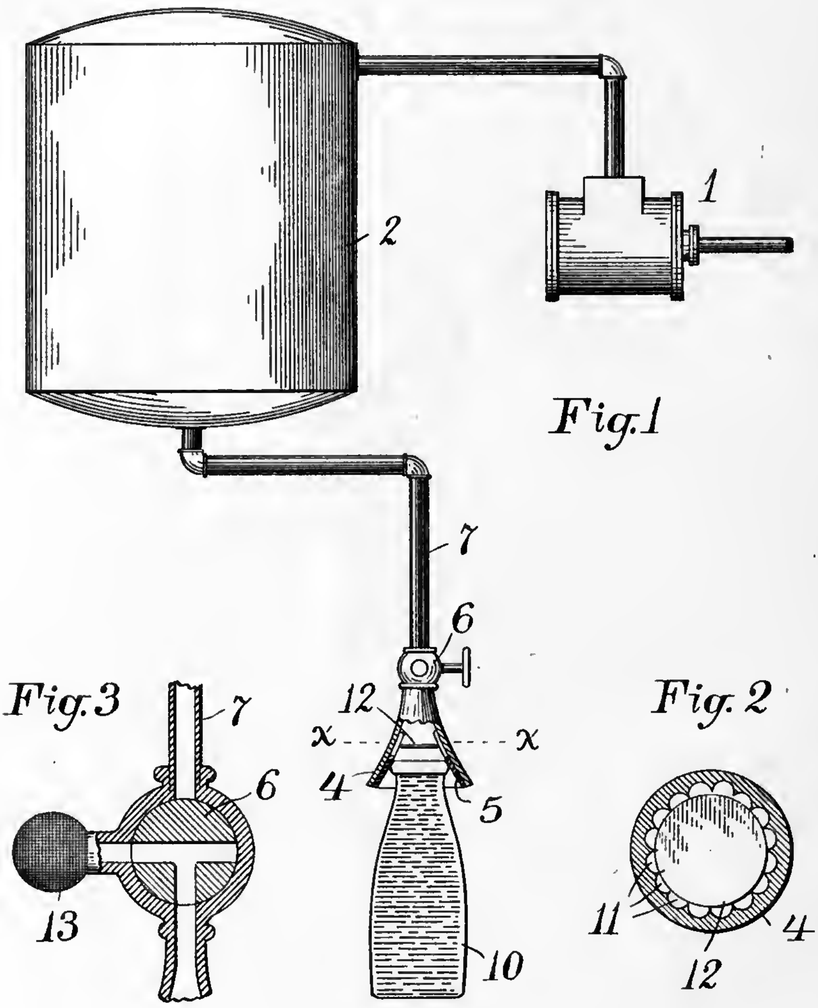


Fig. 1

Fig. 3

Fig. 2

Witnesses;

E. W. Waite

Helen Macomber

Inventor,

Frederic W. Howe;

By A. B. Upham,

Attorney.

UNITED STATES PATENT OFFICE.

FREDERIC W. HOWE, OF FRAMINGHAM, MASSACHUSETTS.

PRESERVING MILK.

1,000,409. Specification of Letters Patent. **Patented Aug. 15, 1911.**

Application filed September 23, 1907. Serial No. 394,039.

To all whom it may concern:

Be it known that I, Frederic W. Howe, a citizen of the United States, residing at Framingham, in the county of Middlesex and Commonwealth of Massachusetts, have invented a certain new and useful Improvement in Preserving Milk, of which the following is a specification.

In the distribution of milk to consumers, it is essential to first thoroughly refrigerate the same in an attempt to remove the animal heat, in order to retard bacteriological alteration therein as long as possible. In my position as chemical expert for a great milk receiving and distributing concern, I have had ample opportunity to observe the inefficiency of the present method of cooling by means of ice. After considerable study and experiment upon this subject, I finally conceived of the possibility of cooling the milk by subjecting the same to a vacuum. In further experiment, I not only found that such subjection to a vacuum proved a success in refrigerating the milk and thoroughly removing all animal heat, but in addition it served to remove all noxious and odoriferous gases present in the milk, and further, killed the larger part of the bacteria therein.

The object of this invention is, therefore, for preserving, purifying and cooling milk.

In carrying this process into effect, I have devised the apparatus shown in the accompanying drawings, in which—

Figure 1 is an elevation, partially in section, illustrating the same. Fig. 2 is an enlarged horizontal section on the line X—X in Fig. 1. Fig. 3 is a cross section of the three-way valve which I prefer to use.

The apparatus shown is arranged for the treatment of milk after being put in the usual milk-jar, but the process is equally applicable to milk in any other styles of containers. It is on many accounts preferable to employ the process upon the milk after it is placed in the can, jar or other container in which it is to be delivered to the consumer, in order that there may be no further opportunity for its contamination.

For the production of the vacuum, any ordinary form of vacuum pump may be employed, as the pump 1 shown in Fig. 1: and an air-tight chamber 2 may be used, from which the pump is constantly withdrawing the air and vapor. Connected with said chamber is a bell-mouthed member 4, having its inner surface covered with a soft rubber lining 5. By pressing the open mouth of the jar or can 10 up within said bell-mouthed member, into intimate contact with the rubber lining 5, and then turning the valve 6 to open the connecting pipe 7, the milk within said can or jar is subjected to the vacuum maintained in said chamber. Thus subjected to the vacuum, the milk rapidly gives off watery vapor to a sufficient extent to soon cool it to the required degree,—preferably about 38 degrees F. At the same time the gases within the milk also escape; the bacteriological germs are largely killed, and the milk is left in a condition of coolness and purity which will insure its keeping sweet and pure for several days. The valve 6 is then shut, to turn off the suction; the jar is removed, and its cover or other sealing device applied. During this part of the work, however, more or less air reaches the surface of the milk, and to a limited degree re-contaminates it. To prevent this, I serrate the throat of the bell-mouthed member at a suitable distance above the section reached by the mouth of the jar 10, as shown in Fig. 2, and insert the paper disk 12 usually used for sealing jars of this kind. As this disk is applied with one hand, the valve 6 is given a partial turn, enough to retain the disk in place by suction, and then the glass jar is applied as shown in Fig. 1. Then the valve is opened wide; the watery vapor and gases pass from the milk through the spaces between the disk and serrations 11, until the milk is sufficiently treated; and finally the valve 6 is turned to another angle to shut off the vacuum-pipe 7, and admit the atmosphere through the valve. By having the same a three-way valve, as shown in Fig. 3, this is easily done. The atmosphere being thus admitted to the space above the paper disk, the latter is instantly forced down into the mouth of the jar in its sealing position. The jar of milk is then ready at once for shipment. It is well to thus use a three-way valve even if no seal is to be applied through its means, in order that the vacuum shall not interfere with the jar's removal. If desired, the intake 13 of said valve may be suitably screened to prevent any access of contaminating germs to the milk when being sealed as above.

By means of this process, the milk,

whether in a jar, can or other receptacle, is simultaneously cooled, purified and made capable of lengthy preservation in but a moment of time and at a merely nominal expense.

What I claim as my invention and for which I desire Letters Patent is as follows, to wit;—

The herein described method of preparing milk for delivery to customers, which consists in filling the container which is to be shipped to the consumer, with milk freshly drawn from the cow, connecting a vacuum producing device with the container until the gases and animal heat have been eradicated from such milk, and then applying a permanent seal to the mouth of the container without the access of atmospheric air.

In testimony that I claim the foregoing invention, I have hereunto set my hand this 19th day of September, 1907.

FREDERIC W. HOWE.

Witnesses:
A. B. Upham,
Burton Payne Gray.

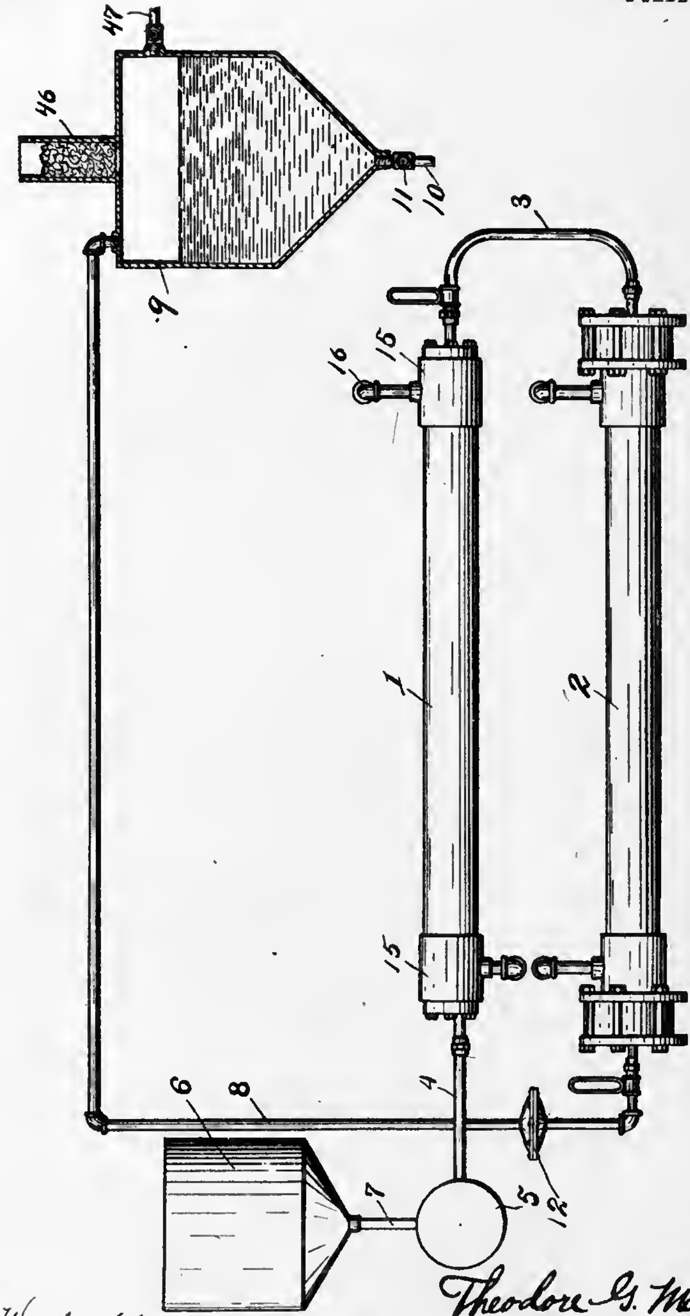
T. G. MOLLINGER.
PROCESS FOR TREATING MILK.
APPLICATION FILED SEPT. 22, 1910.

1,005,275.

Patented Oct. 10, 1911.

2 SHEETS—SHEET 1.

Fig. I.



Witnesses
W. Phina Woodruff.
L. G. Greenfield

Inventor
Theodore G. Mollinger
By Chappell & Earl
Attorneys

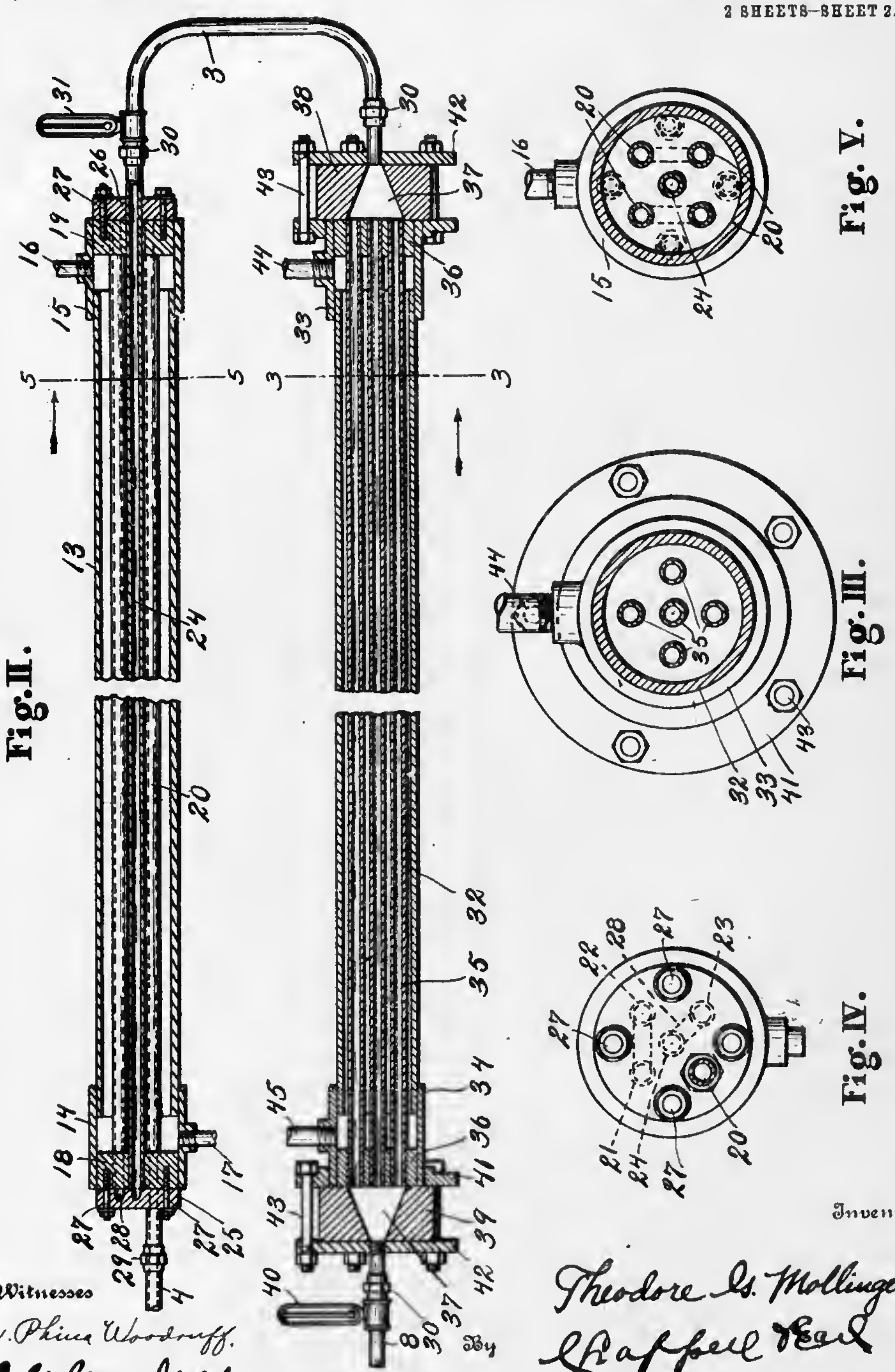
T. G. MOLLINGER.

PROCESS FOR TREATING MILK.

APPLICATION FILED SEPT. 22, 1910.

1,005,275. Patented Oct. 10, 1911.

2 SHEETS—SHEET 2.



Witnesses

W. Phine Woodruff.

L. G. Greenfield

Inventor

Theodore G. Mollinger

By Chappell & Earl

Attorneys

UNITED STATES PATENT OFFICE.

THEODORE G. MOLLINGER, OF KALAMAZOO, MICHIGAN, ASSIGNOR TO STEPHEN B. MONROE, TRUSTEE, OF KALAMAZOO, MICHIGAN.

PROCESS FOR TREATING MILK.

1,005,275. Specification of Letters Patent. **Patented Oct. 10, 1911.**

Application filed September 22, 1910. Serial No. 583,270.

To all whom it may concern:

Be it known that I, Theodore G. Mollinger, a subject of the Queen of the Netherlands, and now residing at Kalamazoo, Michigan, have invented certain new and useful Improvements in Processes for Treating Milk, of which the following is a specification.

In the accompanying drawings, I illustrate an apparatus such as I prefer to use in carrying out my improved process, the various parts thereof being shown mainly in conventional form, and without particular regard to scale or proportions.

Figure 1 is a side elevation of an apparatus for carrying out my improved process, certain of the parts being shown in conventional form, they being illustrated merely for the purpose of illustrating the general arrangement of the apparatus and the connections for the various parts thereof. Fig. 2 is a vertical longitudinal section through the heating and cooling elements, the connections being shown in full lines. Fig. 3 is an enlarged transverse section through the cooling element, taken on a line corresponding to line 3—3 of Fig. 2. Fig. 4 is an end view of the heating element, looking from the left of Fig. 2. Fig. 5 is a transverse section through the heating element, taken on a line corresponding to line 5—5 of Fig. 2.

In the drawings, similar reference characters refer to similar parts throughout the several views, and the sectional views are taken looking in the direction of the little arrows at the ends of the section lines.

The essential principle of my process resides in the exposure of the milk to a relatively high temperature within definite limits and considerably in excess of the boiling point of milk, such exposure being so controlled as to be practically momentary and the milk being under substantial pressure. This step is immediately followed by the very rapid cooling of the milk, down to a point closely approximating, but not higher than, the boiling point. This is again followed by a more protracted, but still definitely limited, period of cooling down to a temperature in excess of normal, after which the milk is allowed to cool throughout the remaining range of temperature, down to normal, without specific control.

Referring to the accompanying drawing, 1 represents the heating element and 2 the cooling element. The heating element is connected to deliver to the cooling element through a pipe 3, the milk being delivered to the heating element through the pipe 4 by means of a pump 5, which is shown herein in conventional form. The tank 6 represents the supply of milk and is connected to the pump through the pipe 7. The treated milk is delivered through the pipe 8 to a delivery receptacle 9, which has a draw-off faucet 10 controlled by a suitable valve, as 11.

The pipe 8 is preferably provided with a pressure regulator 12, so that the desired pressure may be maintained on the milk as it is forced through the heating and cooling elements by means of the pump. A steam pump is preferably used, as it is desirable ordinarily to maintain high pressure, and to force the milk rapidly through the heating and cooling elements.

The heating element 1 preferably consists of a cylindrical jacket 13, a pipe of about four inches diameter being found practical. The pipe is provided with heads or caps 14 and 15. Steam is admitted to the jacket by the pipe 16 connected to the head 15 and is discharged through the pipe 17 connected to the head 14. The supply pipe 4 is connected to the inlet end of the coil arranged within the jacket. Steam is supplied from a suitable source, so that it may be delivered under high pressure to secure the desired temperatures.

The heads 14 and 15 are provided with plug-like end pieces 18 and 19, respectively, which are adapted to receive the ends of a plurality of tubes forming the coil, the structure illustrated having 5 tubes as 20, 21, 22, 23 and 24. See Figs. 2, 4 and 5. These tubes are preferably of copper about $\frac{5}{16}$ of an inch internal diameter and about ten feet long. They are preferably open at each end for convenience in cleaning. These tubes are connected to form a single continuous channel. The connections in the structure illustrated are the headers 25 and 26, which are removably clamped against the outer faces of the pieces 18 and 19, respectively, screw bolts, as 27, being provided in the structure illustrated for the purpose. These headers are provided with channel-like passages 28, the ends of which register with the pipes to be connected. At the left hand end of Fig. 2 the channels are shown in cross section, they are also indicated by dotted lines in Fig. 4. The channels at the right hand end of the heating element are shown by dotted lines in Fig. 5. The pipes are thus connected so that the milk passes from the intake pipe 20, which is connected to the milk supply pipe 4, by a coupling 29, to the outlet pipe 23 of the heating element which is connected by the pipe 3 to the cooling element.

A thermometer 31 is provided for the heating element, it being preferably mounted on the pipe 3.

The cooling element preferably consists of a cylindrical jacket 32, having heads or caps 33 and 34, respectively. Within the jacket is a plurality of conduits or pipes 35. These pipes are supported by and extend through the end pieces 36 of the heads and open into the chambers 37 in the headers 38 and 39, the header 38 being at the inlet end and the header 39 being at the discharge end. The pipe 3 is connected to deliver to the header 38, while the header 39 is connected to the discharge pipe 8. Couplings 30 are preferably provided for the pipe 3 adapted to be readily removed.

A thermometer 40 is preferably arranged at the discharge end of the cooling element.

The headers are preferably removably secured, so that the pipes of the cooling element can be readily cleaned. These pipes are also formed of copper and are of about the same diameter as the pipes forming the coil of the heating element. In the structure illustrated, this is accomplished by providing the heads with flanges 41 and the headers with end plates 42, the parts being clamped together by the bolts 43.

The cooling fluid is delivered to the jacket by means of the pipe 44 and is discharged therefrom through the pipe 45.

The reservoir 9 is provided with a vent 46 which is screened by a mass of cotton or other suitable material. This reservoir is also provided with a steam inlet 47, by which the water and steam may be introduced for cleaning and sterilizing the reservoir.

With the parts thus arranged, the milk to be treated is delivered from the supply 6 by means of the pump, first to the heating element, then to the cooling element and then to the delivery tank.

The pump is, as stated, adapted to deliver the milk under high pressure, so that it is rapidly forced through the heating and cooling elements and also, it is desirable to maintain the pressure while the milk is being treated, in order to secure the most satisfactory product

It will be noted that the heating element exposes the milk to the heat in a relatively small or attenuated body or stream. The cooling element also exposes the milk in a small or attenuated body or stream, the difference being that there is preferably a continuous single passage for the milk in the heating element and a plurality of passages in the cooling element. This causes the milk to flow more rapidly while being heated than while being cooled. This rapid movement of the milk through the heating element keeps it properly agitated so that it is evenly heated and prevents its burning. The presentation of the milk to the heat in the attenuated body or stream makes it possible to accomplish the desired heating rapidly.

In treating milk by my improved process, the heating and cooling elements are brought to the proper temperatures and the milk forced therethrough by means of the pump. Sweet milk, preferably as fresh as possible, is introduced at its normal temperature, for instance, about 20° centigrade, that is, no preliminary heating or cooling is required. The milk is forced through the apparatus, by means of the pump, under considerable pressure, preferably of about 600 pounds per square inch, which however, may be materially varied, and at such a rate that the time of passage through the heating element shall be preferably about two seconds, and that preferably the time of passage through the cooling element shall be similar.

The heating element is maintained at a temperature sufficient to raise the milk, in its passage through the same, to a temperature preferably of about 138° centigrade at the time of its exit therefrom. The temperature, to which the milk is ultimately thus raised, may vary within certain limits, but should not be substantially less than 130° centigrade, nor substantially more than 155° centigrade. The temperature of the steam in the heating element may, of course, be higher than the maximum limit above mentioned for the milk, depending upon the conductivity of the apparatus, the initial temperature of the milk, or other conditions.

Upon passing to the cooling element, the temperature of the milk is reduced to a point not substantially exceeding its boiling point and preferably about 98° centigrade. This cooling action should preferably take place with a rapidity substantially equal to that of the heating. The milk, having been received in the reservoir 9, and the pressure having been reduced, is then inclosed, preferably as soon as possible, in vessels which have been sterilized by heat, and whose temperature should preferably correspond substantially with that of the milk at this stage, the vessels being filled as nearly full as possible and promptly sealed. The subsequent cooling of the milk down to a temperature of about 70° centigrade, is thereupon controlled in any convenient manner, so that a substantial period, preferably about fifteen minutes, shall be required for the drop from its temperature at the moment of exit from the cooling element, (say 98° centigrade) to 70° centigrade. This prolonged secondary cooling insures the destruction of injurious bacteria, including any which may have obtained access after the emergence of the milk from the primary cooling apparatus and during the bottling operation. After the expiration of the time required for the secondary cooling, the milk may be allowed to cool down to a normal temperature without specific control.

Milk when thus treated, is thoroughly sterilized without any substantial impairment of color or breaking of the cream line, and retains the flavor of new untreated milk.

I employ the term "bottling", as a convenient one to describe the inclosure of the milk in any suitable vessel, and it will therefore be understood that said term does not imply any limitation as to the character of the vessel.

I have specified above the preferred temperatures and periods which give the best results in my process, but it is proper to state that some variation therefrom is permissible; thus, the milk may be raised to a temperature between 130° and 155° centigrade, but these limits should not be exceeded in either direction. The period of actual maintenance of the milk at the maximum temperature should be momentary, preferably only the fraction of a second, although the actual passage through the heating and cooling elements, during which the temperature is raised and lowered is of course longer. Under no circumstances should the milk be maintained at a temperature above 130° centigrade, for more than two seconds. The primary cooling to about 98° centigrade should, as before stated, be very rapid, and should preferably correspond in duration with that of the heating, and the secondary cooling from about 98° centigrade to about 70° centigrade, while prolonged during a substantial period, in order to subject any new bacteria to destructive exposure to heat, should not be protracted substantially beyond thirty minutes.

I am aware that the sterilization of milk by the controlled application of heat, is not broadly new, and I am also aware that it has been proposed to sterilize fluids, including milk, by exposing them to a temperature considerably above the boiling point, as set forth in Letters Patent of the United States No. 786,819, dated April 11th, 1905. I, therefore, do not broadly claim the brief exposure of milk to high heat, for I have found by actual experience that such exposure must not only be definite but must be attended by the definite control of the subsequent cooling, in order to produce the desired result of sterilizing the milk without impairment of its qualities. The essence of my invention resides in the organization and successive steps of treatment both in regard to temperature and periods of duration whose limits are above set forth.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

The hereinbefore described process for the sterilization of milk, which consists in the heating of an attenuated body of milk to a temperature not substantially less than 130° centigrade or substantially more than 155° centigrade, during a period not substantially exceeding two seconds; the primary rapid cooling of the milk to a temperature of about 98° centigrade; the bottling and sealing of the milk; and the prolonged secondary cooling of the milk to a temperature of about 70° centigrade.

In witness whereof, I have hereunto set my hand and seal in the presence of two witnesses.

THEODORE G. MOLLINGER. [L. S.]

Witnesses:
M. PHINA WOODRUFF,
CLARA E. BRADEN.

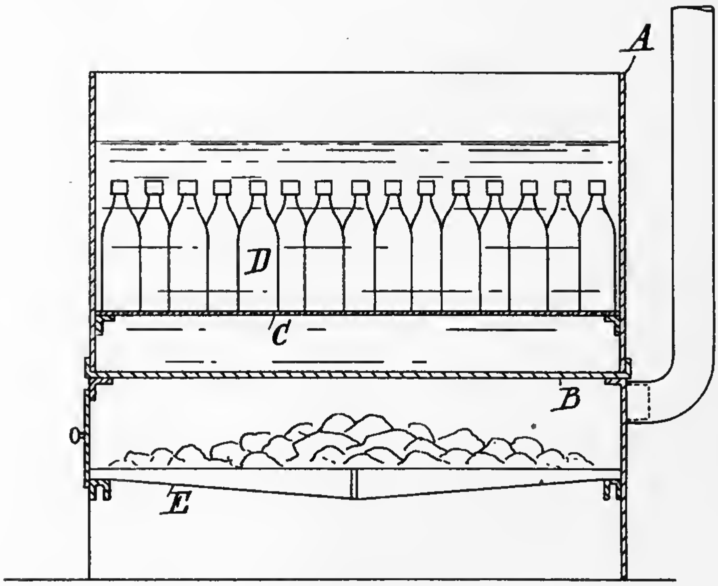
W. D. PUSEY.

PROCESS OF PRESERVING MILK.

APPLICATION FILED JAN. 16, 1911.

1,008,063.

Patented Nov. 7, 1911.



Witnesses.

W. B. Keeler

Robert Everett.

Inventor.

Walter D. Pusey.

By James L. Norris Jr.

Attys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WALTER DOBSON PUSEY, OF WOODLUPINE, NEAR PERTH, WESTERN AUSTRALIA, AUSTRALIA, ASSIGNOR OF ONE-HALF TO ARCHIBALD ROBERTSON FLEMING, OF ALBANY, WESTERN AUSTRALIA, AUSTRALIA.

PROCESS OF PRESERVING MILK.

1,008,063. Specification of Letters Patent. **Patented Nov. 7, 1911.**

Application filed January 16, 1911. Serial No. 602,941.

To all whom it may concern:

Be it known that I, WALTER DOBSON PUSEY, a subject of the King of Great Britain, residing at Mills Street, Woodlupine, near Perth, in the State of Western Australia, Commonwealth of Australia, architect, have invented an Improved Process for the Preservation of Milk, of which the following is a specification.

This invention has been devised with the object of providing a simple and efficient process whereby milk may be preserved for a practically indefinite period under varying conditions of temperature or climate. Accordingly the fresh warm clean milk from the animal is placed in suitable bottles, cans, or other similar receptacles previously thoroughly cleansed of all foreign matter, sterilized and allowed to dry. When almost full, sound corks thoroughly washed in clean water and then boiled in a solution of boracic acid (H_3BO_3) in the approximate proportion of 1 teaspoonful of boracic acid to each quart of water, are then forced (preferably while still warm) into said receptacles, and wired in position. If desired, metal or wooden disks are placed between the corks and the wires in order to prevent the latter cutting into the former. The receptacles with their contained milk are then completely immersed in open boilers, tanks, or the like containing a sufficiency of tepid water to completely cover said receptacles. Heat is then applied to the boiler, etc., and the temperature of the water raised to boiling point (212° F.). At this temperature it is retained for about 15 minutes, when the heating agent is removed and the water allowed to cool down to its original tepid state. The milk containers are then removed and hermetically sealed with wax or the like and are then ready for storage or delivery.

Milk treated by this process will keep practically indefinitely without any perceptible change taking place in its constitution and even after the containers are opened it will keep fresh for several days.

It will be obvious that no special apparatus is necessary for the carrying out of this process, but the following arrangement has been found to fulfil the necessary conditions.

Referring to the accompanying drawing, which is a longitudinal section through the tank, A designates the latter, B the bottom thereof, and C a perforated false bottom upon which the bottles D are conveniently placed side by side, while E is a fire grate, which may be made removable. It will be noted that the tank A is of sufficient depth to contain the amount of water necessary for the complete immersion of the bottles but is not so deep as to interfere with the easy manipulation of same.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

The hereindescribed process for the preservation of milk, which consists in placing the milk in sterilized receptacles, closing such receptacles by sterilized corks, completely immersing the receptacles containing the milk in tepid water, increasing the temperature of such water to the boiling point and retaining it at such temperature for a period of time sufficient to sterilize the milk, allowing said water to cool to approximately normal temperature, removing the receptacles from the water, and finally hermetically sealing the receptacles.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WALTER DOBSON PUSEY.

Witnesses:
EVERETT HENRY BARDWELL,
WILLIAM JAMES PARSONS.

1,069,096

Milk

UNITED STATES PATENT OFFICE.

ADA M. ALBERTY, OF SEATTLE, WASHINGTON.

MILK-MODIFIER.

1,069,096. Specification of Letters Patent. **Patented Aug. 5, 1913.**

No Drawing. Application filed July 22, 1909. Serial No. 508,916.

To all whom it may concern:

Be it known that I, Ada M. Alberty, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Milk-Modifiers, of which the following is a specification.

This invention relates to infants' foods; and has for its object the provision of a food preparation to be used with cow's milk as a modifier of the latter's tendency to coagulation when used as human food.

Under natural conditions cow's milk used as food becomes acidulated by the secretions of the stomach and often, especially in the case of infants, forms into dense and continuous curds which resist the normal processes of digestion and become an element of danger to the child's health. Preparations which are designed to overcome this excessive coagulation have heretofore been deleterious to health owing to their action upon milk being chemical in character and tending to interfere with the natural and necessary changes properly taking place in milk under digestive conditions.

My improved modifier of cow's milk consists of a combination of food substances which are formed during the process of manufacture largely into dextrin and soluble starch. After addition to cow's milk and heated a colloidal starch is formed which is not subject to precipitation by the acids of the digestive tract and which interposes a barrier against the formation of continuous, hard clots through the intense coagulation of the casein present in the milk. The coagulum is evenly distributed throughout the liquid, is somewhat granulated or flaky in texture and affords a product readily assimilated by the digestive organs. This action of the modifier is apparently wholly mechanical in its effect and is due to the interposition of the colloids of soluble starch rendering the milk unable to combine into a coagulum hard enough to be injurious to health.

While the same results may be obtained by varying somewhat the materials and methods of manufacture, the preferred manner in which I proceed to carry out my invention is as follows: I bake finely ground white wheaten flour in a moderately heated oven until of a deep brown color, and until the starch therein has as thoroughly as practicable been changed to soluble starch and dextrin. Finely ground and sifted flour made from the whole wheat is then added to the treated white flour in the proportions of two parts of the browned white flour to one part of the whole wheat flour, and to each six parts of the mixture thereof I add one part of finely powdered sugar of milk. This may be prepared and preserved for use in unlimited quantities as it is not subject to rapid deterioration and is usually put up in metal cans. It is prepared for use by adding one part of the modifier just described to ten parts of milk, or milk and water in the proportions proper to the age and condition of the child. It is heated and kept at a temperature of about two hundred degrees Fahrenheit for several minutes whereupon it is cooled and strained for use.

The partially predigested farinaceous and other ingredients of which the food is comprised lend an added food value to the milk by increasing the relative amount of carbohydrates therein.

Having described my invention, what I claim is—

1. A milk modifier adapted when boiled with milk to interpose a barrier to the formation of continuous clots therein when subjected to coagulation consisting of browned white flour, whole wheat flour, and sugar of milk substantially in the proportions specified.

2. A milk modifier adapted when boiled with milk to interpose a barrier to the formation of continuous clots therein when subjected to coagulation, comprising four parts of browned white flour, two parts of whole wheat flour, and one part of sugar of milk.

3. A milk modifier adapted when boiled with milk to interpose a barrier to the formation of continuous clots therein when subjected to coagulation, comprising browned white flour, two parts, and whole wheat flour, one part.

Signed at Seattle, Wash., this 7th day of July, 1909.

ADA M. ALBERTY.

Witnesses:
Horace Barnes,
M. M. Smith.

heating an acid capable of sterilizing the same and treating the sterilized product with charcoal and bone black to remove the odor and color.

3. The process of manufacturing a durable salutary drink from whey or other milk residue, which comprises adding without heating an acid capable of sterilizing the same and treating the sterilized product with charcoal to remove the odor and color, and then filtering the deodorized product.

4. The process of manufacturing a durable salutary drink from whey or other milk residue, which comprises adding without heating an acid capable of sterilizing the same, treating the sterilized product with charcoal to remove the odor and color, filtering the deodorized product and adding carbonate of soda to the clear filtrate.

5. The process of manufacturing a durable salutary drink from whey, which consists in sterilizing the whey by adding thereto without heating pure hydrochloric acid, treating the sterilized whey with wood charcoal and bone black to remove the odor and color, filtering the treated product and adding to the clear filtrate carbonate of soda.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

ADOLF JOLLES.

Witnesses:
JOSEF RUBASCH,
AUGUST FUGGER.

UNITED STATES PATENT OFFICE.

ANDREW A. DUNHAM, OF BAINBRIDGE, NEW YORK, ASSIGNOR TO CASEIN COMPANY OF AMERICA, A CORPORATION OF NEW JERSEY.

PROCESS FOR PRODUCING CASEIN PREPARATIONS.

1,080,204. Specification of Letters Patent. **Patented Dec. 2, 1913.**

No Drawing. Application filed May 14, 1913. Serial No. 767,560.

To all whom it may concern:

Be it known that I, ANDREW A. DUNHAM, a citizen of the United States, residing at Bainbridge, in the county of Chenango and State of New York, have invented or discovered certain new and useful Improvements in Processes for Producing Casein Preparations, of which the following is a specification.

This invention or discovery has for its object the manufacture, in an inexpensive and simple way, of a chemical compound consisting of casein and a glycerophosphate.

The processes heretofore practised in the manufacture of a casein or albuminous substance, made by treating the albuminous substance with a glycerophosphate, are expensive and complicated, an objection which is avoided by the present invention.

In carrying the present invention into effect freshly precipitated casein, made by any of the well-known methods of adding acid to milk, is washed three or four times in water to remove as much as possible of the acid. The curd is then heated in water to about 180° F., after which the water is strained off and the curd or casein drained for about twenty-four hours. The product is now in a heavy dough-like mass, containing about 60 or 70% water, but dry enough so that it can be readily separated into fine particles, for instance by putting it through an ordinary sausage grinder. The comminuted material is now transferred to a mixer of any suitable design, and to the calculated dry weight of the casein 5% of glycerophosphate, also calculated on a dry weight basis, is added. These two substances are thoroughly mixed together in such a manner as to insure a very complete mingling thereof and the compound is then dried at a temperature of about 120° F., after which the product is ground and sifted to the desired mesh.

If it be desired to prepare a sodium glycerophosphate, the procedure is as follows: With 100 grams of anhydrous glycerin mix 125 grams of 85% phosphoric acid and heat to a temperature of about 122° F. and then nearly neutralize this mixture with sodium carbonate. It requires about 110 grams of anhydrous sodium carbonate to secure the right neutralization. It is preferable, however, to leave the product slightly acid to litmus paper.

The above mixture makes a solution of sodium glycerophosphate, of about 75% strength.

The product which is secured by treating casein with glycerophosphate in the manner above described is an edible compound, very high in protein and combining phosphates in an easily assimilable form, and at the same time a product which may easily and readily be manufactured.

The preparation produced as above described is completely soluble in water, although it reacts acid to litmus paper.

Having thus described my invention or discovery I claim and desire to secure by Letters Patent:—

1. The process of producing a casein glycerophosphate compound, soluble in water, which comprises mixing together casein in a comminuted form, containing water, with a slightly acid solution of a simple glycerophosphate, and thereafter drying the compound thus produced.

2. The process of producing a casein glycerophosphate compound, soluble in water, which comprises thoroughly mixing about 5 parts of a simple glycerophosphate in the form of a slightly acid solution thereof, with casein in amount corresponding to 100 parts of dry casein, and thereafter drying and grinding the compound thereby produced.

In testimony whereof I affix my signature, in presence of two witnesses.

ANDREW A. DUNHAM.

Witnesses:

L. A. STEVENS,

H. V. DUNHAM.

1,080,920 Milk

UNITED STATES PATENT OFFICE.

PHILIPP MÜLLER, OF FRANKFORT-ON-THE-MAIN, GERMANY.

MANUFACTURE OF ALIMENTARY PRODUCTS.

1,080,920. Specification of Letters Patent. **Patented Dec. 9, 1913.**

No Drawing. Application filed March 7, 1910. Serial No. 547,771.

To all whom it may concern:

Be it known that I, PHILIPP MÜLLER, merchant, residing at Wingertstrasse 3, Frankfort-on-the-Main, Germany, have invented new and useful Improvements in the Manufacture of Alimentary Products, of which the following is a specification.

It has been found that in carrying out the process described in Patent No. 863081 of August 13, 1907 for the manufacture of alimentary products, suitable for constant use, from buttermilk, flour and sugar, the time (about six weeks) required for storing the intermediate product can be shortened or dispensed with if a certain quantity of cane sugar be added to the buttermilk before the latter has been soured. The storage described in the patent before named had for effect to bring about the complete conversion of the cane sugar and of the lime still remaining in combination with the casein after the souring of the buttermilk, and thus improved the digestibility and suitability of the food. According to the present invention this complete conversion of the original constituents of the food can also be effected by adding cane sugar to the buttermilk before the latter has been completely soured, for the reason that the lactic fermentation (souring) then proceeds in presence of a larger quantity of sugar (*i. e.* milk sugar and cane sugar).

In consequence of the cane sugar being subjected to the process of fermentation which occurs in the buttermilk, the liability of the food to undergo fermentation during its passage through the alimentary canal is also considerably lessened; this result being the same as that produced by the prolonged storage of the intermediate product, according to the method described in the patent already mentioned. Hence, the intermediate product, obtained by subsequent treatment in the manner described in that patent can now be evaporated to dryness without the necessity for further storage.

The phenomenon described above as resulting from the addition of cane sugar previous to the souring of the buttermilk is also found to ensue when whole milk or skim milk is used in place of buttermilk.

The following example illustrates how the process of this invention is carried out, if the desired alimentary product is to be used as a food for infants: To 1 liter milk approximately 60 grams of cane sugar are added before the milk has been completely soured. This mixture of milk and sugar is then subjected to souring. If the acidification has not advanced further than 5 degrees according to Thoerner's scale (See *Chemikerzeitung*, 1892, No. 80, and *Milchzeitung*, 1893, page 58), 15 grams of flour are added and the mixture obtained in this manner is then heated and boiled under constant stirring, then poured, at a temperature of about 90 degrees centigrade, into previously sterilized vessels and, when the vessels have been closed, heated for a short time (say for 10 minutes) at a temperature of 100 degrees centigrade. This heating (sterilization) has for its object to render the percentage of acid in the milk unalterable and giving a fixed and unchanging composition to the mixture so that it can be desiccated and stored without the risk of any appreciable chemical change taking place in the same manner as is the case in the process of the said U. S. Patent 863081 but without the storage of about 6 weeks. The process described may also be performed in such a way that during the boiling of the mixture of milk, cane sugar and flour, sugar may again be added and the mixture boiled again.

If the desired alimentary food is to be used for feeding young animals (such for example as calves and suckling pigs) the amount of the flour and sugar to be added must be suitably modified so that it may correspond with the natural food of these suckling animals.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is—

1. The herein described process for the manufacture of an alimentary product which consists in adding cane sugar to milk, souring the milk, mixing the resulting product with flour, heating and boiling the mixture, then subjecting the product to sterilization in a closed vessel, substantially as and for the purpose described.

2. The herein described process for the manufacture of an alimentary product which consists in adding cane sugar to milk from which the fat has been removed, souring the milk, mixing the resulting product with flour, heating and boiling the mixture, then subjecting the product to sterilization in a closed vessel, substantially as and for the purpose described.

3. The herein described process for the manufacture of an alimentary product which consists in adding cane sugar to buttermilk, souring the milk, mixing the resulting product with flour, heating and boiling the mixture, then subjecting the product to sterilization in a closed vessel, substantially as and for the purpose described.

4. The herein described process for the manufacture of an alimentary product which consists in adding cane sugar to milk from which the fat has been removed, souring the milk, mixing the resulting product with flour, heating and boiling the mixture, adding sugar during the heating operation and subjecting the product to sterilization in a closed vessel, substantially as and for the purpose described.

5. The herein described process for the manufacture of an alimentary product which consists in adding cane sugar to buttermilk, souring the milk, mixing the resulting product with flour, heating and boiling the mixture, adding sugar during the heating operation and subjecting the product to sterilization in a closed vessel, substantially as and for the purpose described.

6. The herein described process for the manufacture of an alimentary product which consists in adding cane sugar to milk from which the fat has been removed, souring the milk, mixing the resulting product with flour, heating and boiling the mixture, adding sugar during the heating operation, boiling the mixture repeatedly, subjecting the product to sterilization in a closed vessel, storing the sterilized product in a closed vessel and then evaporating to dryness, substantially as and for the purpose described.

7. The herein described process for the manufacture of an alimentary product which consists in adding cane sugar to buttermilk, souring the milk, mixing the resulting product with flour, heating and boiling the mixture, adding sugar during the heating operation, boiling the mixture repeatedly, subjecting the product to sterilization in a closed vessel, storing the sterilized product in a closed vessel and then evaporating to dryness, substantially as and for the purpose described.

In testimony, that I claim the foregoing as my invention I have signed my name in presence of two witnesses, this 12th day of February 1910.

PHILIPP MÜLLER.

Witnesses:
RUDOLPH FRICKE,
ALBERT ROSMANN.

C. H. ATKINS.
PROCESS OF PRESERVING MILK.
APPLICATION FILED MAR. 3, 1911.

1,057,519. Patented Apr. 1, 1913.

Fig.1.

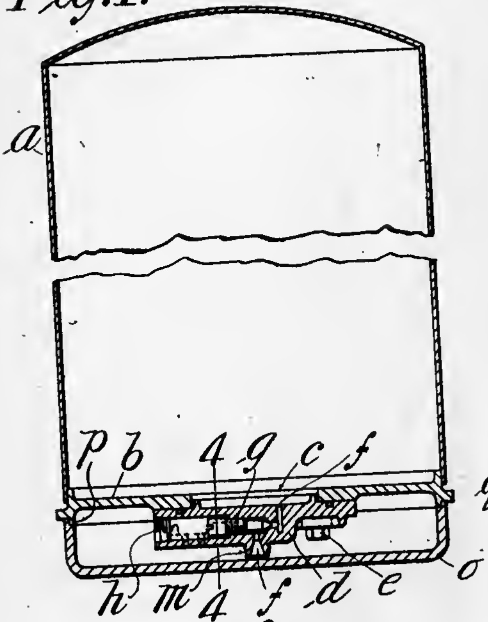


Fig.2.

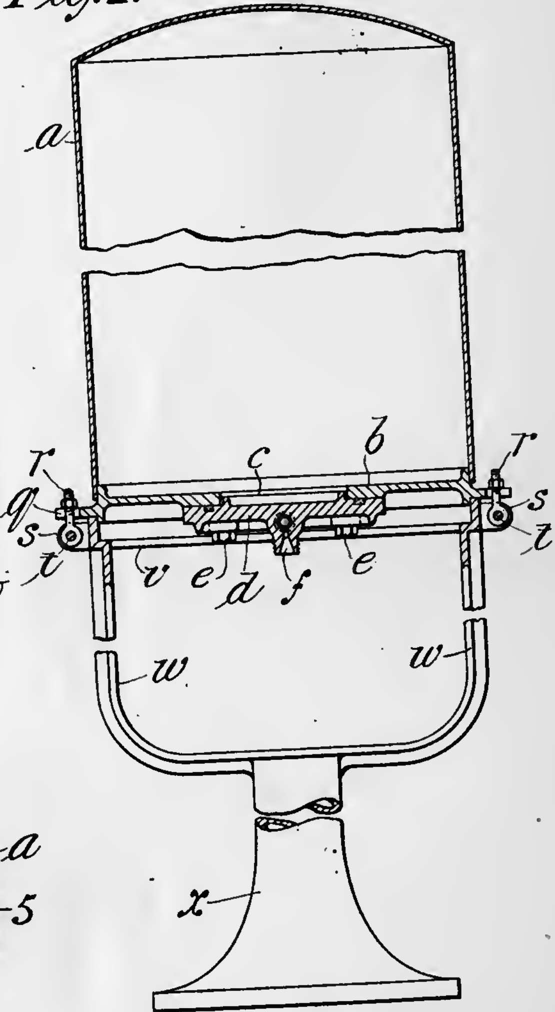


Fig.3.

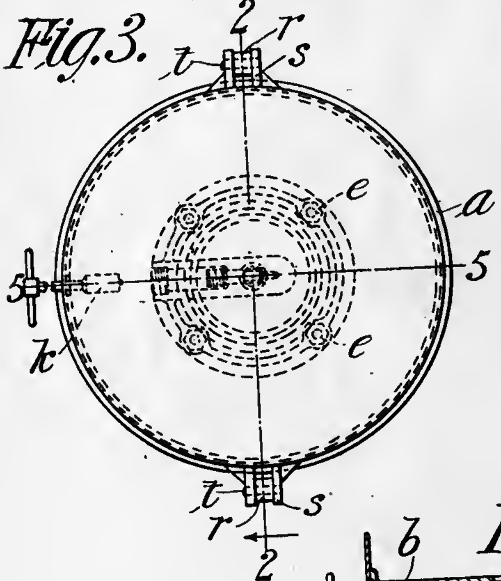
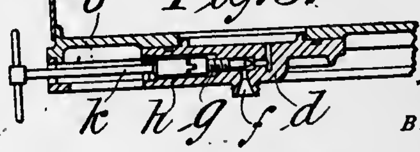


Fig.4.

Fig.5.



WITNESSES:
K. D. Clemons
E. H. Elder

INVENTOR,
Charles H. Atkins
BY Chapin & Co
ATTORNEY.

UNITED STATES PATENT OFFICE.

CHARLES H. ATKINS, OF SPRINGFIELD, MASSACHUSETTS.

PROCESS OF PRESERVING MILK.

1,057,519. Specification of Letters Patent. **Patented Apr. 1, 1913.**

Application filed March 3, 1911. Serial No. 612,147.

To all whom it may concern:

Be it known that I, CHARLES H. ATKINS, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Processes of Preserving Milk, of which the following is a specification.

This invention relates to the preservation of milk, broadly, and specifically to the process for the preservation of milk on a commercial scale, as compared with the purely experimental or laboratory basis.

The prior art discloses, in a number of patents, the fact that milk, when subjected to a certain degree of heat, can be made sterile and in such condition, provided air is excluded from the container, it may be kept in a palatable condition for a long time.

So far as applicant is aware, there is no disclosure in the prior art whereby the public has in any degree been benefited by this knowledge up to the present time. Heretofore, for example, as disclosed in Letters Patent of the United States issued to Walker on May 18, 1899 numbered 625,280, milk has been charged in a close vessel, pressure has then been applied to that vessel, and then it has been subjected to a sufficient degree of heat to properly sterilize the contents,—the vessel being provided with a tube and faucet of the ordinary so-called "siphon bottle" whereby the contents may be drawn off, as required. This method, while it involves the basic idea of sterilization as employed in the process forming the subject of the present application, is only capable of being practised on a relatively small scale, and the distribution of the product can extend only over a relatively small area; and, furthermore, in carrying out this process, it is necessary to employ mechanism for forcing the milk into a closed container against constantly increasing pressure, due to the air contained therein before the beginning of the charging operation. This not only involves considerable expense, which is vital from a commercial point of view, but it also involves passing the milk through a pump or similar device employed in charging the container, and under these conditions of operation cleanliness, as understood at the present time, would be practically impossible, though theoretically it might be possible by frequently dismantling the charging apparatus and thoroughly cleaning and sterilizing the same. Other patents might be cited in which the same fundamental idea of sterilization is disclosed, but so far as applicant is aware, as stated above, they contain no disclosure whereby the daily product of a dairy may be handled and packaged on a commercial scale, without fear of contamination, and so treated as to make it possible to preserve the contents in palatable condition for many months.

The object of the present invention is, therefore, to provide a process whereby milk may be so treated on a commercial scale as to make it possible to keep it in a palatable condition for months without the use of ice or refrigeration, which will permit its transportation and distribution in bulk, as practised at the present time, with the advantage, however, that the element of time in effecting this distribution is a negligible factor permitting the selection of the cheapest mode of transportation.

In the drawings forming part of this application,—Figure 1 is a sectional elevation of a container of the preferred form, the cap for closing it being secured thereon and the cover inclosing the removable cap being secured in its place. Fig. 2 is a view similar to Fig. 1 showing the cover removed and the container mounted on a standard. Fig. 3 is a plan view of the underside of the container shown in Fig. 1. Fig. 4 is a cross sectional view on line 4—4, Fig. 1, showing the construction of the needle valve on a somewhat enlarged scale. Fig. 5 is a sectional view of the cap showing means applied thereto for opening the needle-valve.

The container *a*, as shown in Figs. 1 and 2, is preferably made in the form of a cylinder of steel with a head *b* welded into the open end thereof, there being an opening *c* in said head into which is fitted a closing cap *d* which may be secured to the head in any suitable manner, as by means of the bolts *e*, whereby the container may be hermetically sealed. A passage *f* is made through the cap *d* and is so disposed that the screw-threaded needle-valve g may be operated to open or close said passage at will. This valve is located in a hole h drilled into the cap, preferably in such manner that the needle-valve g is inaccessible except by means of a specially devised tool k, as shown in Figs. 3 and 5, said concealed valve being provided to prevent surreptitious abstraction of the contents of the container. The outer end of the passage f is through a projection m which is screw-threaded to receive a pipe whereby the required volume of air under pressure may be introduced into the container after the cap d has been secured in place. All of the parts of the container should be tinned to provide against corrosion.

To protect the cap d from injury during shipment, a cover o of metal is fitted closely over the rim p of the head b, the latter being provided with the ears q through which bolts r extend which are carried on lugs s on the cover, whereby the latter may be tightly secured to the head by turning up the nuts on the bolts, the latter being preferably hung on pins t between the lugs s, as shown, similar bolts being used to secure the container to the supporting standard, as shown in Fig. 2.

When the container is set up for use, it is mounted upon a circular frame v, as shown in Fig. 2, which frame, by means of the U-shaped arms w extending from a suitable base x, supports the container at a convenient distance from the floor, the whole being so arranged that the valve-operating tool k may be conveniently used to open and close the valve g to draw the contents of the container off.

In carrying out this process, the cap d is removed from the container and through the relatively large opening c in the head b, the milk may be poured into the container from pails, or otherwise, until, in a container of the capacity specified,—viz., 50 quarts,—an amount equal to about 44 quarts of milk has been introduced. The cap is then put into place, and a pipe connection screwed onto the projecting end on the cap, and air, under pressure of 100 lbs., more or less, is then admitted into the vacant space remaining in the container. The desired pressure having been attained, the valve g is closed, the container then being subjected, in a suitable apparatus provided therefor, to the action of about 225 degrees of heat, Fahrenheit, for a sufficient length of time to thoroughly sterilize the contents, say for about one hour and a half. The container is then removed from the sterilizing chamber, and the cover o secured in place over the head, and from this time on no further attention is required. The container, with its contents, may now be left indefinitely in any temperature; it may be handled with impunity and the contents drawn therefrom, as required, the container being set up, as described, whereby a constant pressure of the contents will be maintained against the head thereof. With the amount of space in the container devoted to the air chamber at the pressure indicated, the entire contents of the container may be drawn off without exhausting the pressure, which will permit the complete evacuation of the container without permitting the entrance of any outside air. Therefore, when the receptacle is returned for refilling, decomposition will not take place therein of the particles of milk which might adhere to the walls, and consequently the consumer is not only protected but the cost of re-sterilization, before refilling the container, is avoided.

Preferably, before the milk is placed in the container, it is passed through a separator to remove any foreign substances which will inevitably find a lodgment therein in spite of the utmost care used in collecting it; and the products of the separator, that is the cream and milk, are then poured into the container and thereby again become mixed together: or, the separator may be so located as to deliver its contents directly into the containers. Another fact which greatly simplifies the use of this process is that when the milk has been treated as herein set forth, the cream contained therein will not rise to the surface, no matter how long a container may be left in one position. This fact makes it possible, therefore, to deliver relatively large containers which may be set up in a convenient place and the milk drawn therefrom, as required, and the natural distribution of the fatty substances throughout the fluid body of the milk remaining unchanged, the user is always assured of a supply of milk in practically normal condition.

The process is equally adapted to the preservation and distribution of cream on a large scale, thus making it possible to supply users of large quantities very economically with a product which, as collected and distributed at present, is frequently a menace to the public health.

By means of the herein described process, milk, in times of plentiful supply, can be put up and stored anywhere.

What I claim, is:—

The process for preserving and handling milk which consists in freely pouring into a container open to the atmosphere a quantity of milk of less volume than the capacity of the container, then closing the container and introducing therein air under sufficient pressure to provide and maintain an excess air-pressure within the container, then subjecting the sealed container and contents to a sufficiently high temperature for a sufficient length of time to prevent the subsequent development of living organisms therein, and finally removing the liquid contents of the container while in an inverted position whereby the excess air-pressure will insure the complete expulsion of the entire liquid contents and still leave the container wholly filled with sterile air to maintain the inside walls of the container sterilized for refilling purposes.

CHARLES H. ATKINS.

Witnesses:

HARRY W. BOWEN,

WM. H. CHAPIN.

UNITED STATES PATENT OFFICE.

JOHN BRENSIKE, OF HUSTISFORD, WISCONSIN.

PROCESS FOR CURDLING MILK.

1,083,659. Specification of Letters Patent. Patented Jan. 6, 1914.

No Drawing. Application filed October 12, 1912. Serial No. 725,474.

To all whom it may concern:

Be it known that I, JOHN BRENSIKE, a citizen of the United States, residing at Hustisford, in the county of Dodge and State of Wisconsin, have invented certain new and useful Improvements in Processes for Curdling Milk; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a process for curdling milk.

An object of the invention is to provide a new and comparatively inexpensive process for curdling milk, preparatory to converting the same into cheese, and the invention consists in such improved process as will be hereinafter fully described and afterward specifically claimed.

The rennet which is well known in the art, for curdling milk, is substituted in the present invention by a rennet prepared from the stomach and intestines of fishes of various kinds.

In carrying out my process I take a quantity of the stomachs and intestines of fish and after having removed the contents thereof I thoroughly dry the casing either by exposure to the atmosphere or in suitable drying machines. These dried materials are then placed in a vessel with sufficient water to cover or float them and are allowed to thus remain for several hours, or a sufficient time for them to become saturated and soft. I now surround the vessel containing this material with warm water and keep it in this condition for one or more hours, until the whole mass has become thoroughly warm. I then draw off the liquid and filter the same through any suitable filtering medium, the result being a fish extract or ferment ready for use. I may use this fish extract or ferment either as a substitute for the well known rennet, or I may use it in connection or combination therewith, a small quantity of the fish extract in the latter case being employed for the destruction of harmful bacteria in the liquid being treated. This fish extract or ferment has been found very effective, either alone or mixed with rennet, for all the purposes for which rennet has heretofore been used, my extract having been found to be a great destroyer of injurious or objectionable bacteria contained in the liquid being treated.

To curdle milk I mix a suitable quantity of my fish extract or rennet, either plain or mixed with rennet, as described, with milk whereupon the milk is curdled and freed from harmful bacteria.

What I claim as new is:

A process for curdling milk and destroying harmful bacteria therein consisting of drying a quantity of the stomachs and intestines of fish from which the contents have been removed, adding water sufficient to cover the mass and permitting it to stand until it has become thoroughly saturated and soft, subjecting the mass to a warm temperature for a period of one or more hours, then separating the liquid from the solid matter by filtering, then mixing the liquid with a suitable quantity of rennet, and finally applying the mixture to the milk.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN BRENSIKE.

Witnesses:

O. T. GOETSCH,

F. A. GOETSCH.

1,085,380

Milk

UNITED STATES PATENT OFFICE.

WALTER SEYMOUR DOWNHAM, OF WHEATLEY, ONTARIO, CANADA, ASSIGNOR OF ONE-SIXTH TO ADAM THOMAS BELL AND ONE-SIXTH TO MICHAEL STEELE, BOTH OF TAVISTOCK, ONTARIO, CANADA.

WHEY EMULSION.

1,085,380. Specification of Letters Patent. **Patented Jan. 27, 1914.**

No Drawing. Application filed March 28, 1913. Serial No. 757,307.

To all whom it may concern:

Be it known that I, WALTER SEYMOUR DOWNHAM, of the hamlet of Wheatley, county of Kent, Province of Ontario, Canada, medical doctor, have invented certain new and useful Improvements in Whey Emulsions for Babies, Infants, and Invalids, of which the following is a specification.

This invention relates to the production of a whey emulsion made from sweet cow's milk, to be fed to babies, infants, and invalids, particularly invalids suffering from typhoid fever, stomach and intestinal troubles, kidney disease, heart trouble, and arterio sclerosis, and one of the objects of my invention is to provide a baby-food in the form of a whey emulsion, the prolonged use of which will not be accompanied by infantile scurvy.

Another object of my invention is to provide a whey emulsion for the market in which the spores are all killed, thus insuring a product of this class that will keep for an indefinite period.

A still further object of my invention is the production of a product of this class wherein the casein of cow's milk coagulates in the stomach in the form of a flocculent precipitate in which state it is very easily digested.

As is well known by one skilled in this art, the use of ordinary untreated casein of cow's milk, results in the formation of ropy curds, which are hard to digest, and which cause by their presence irritation producing various forms of stomach and bowel disorders, and cholera-infantum. Now by emulsifying the ingredients of my product, the casein is broken up into very small particles in which state it is very easily digested, and the envelops surrounding the fat globules are broken, thus liberating the fat particles which thoroughly mix with the other ingredients, and cannot be separated therefrom in the ordinary way, except to a small extent such as by means of a cream separator or by allowing the mixture to stand. It is very important that the covering surrounding the fat globules be broken so that the fat cannot again separate from the mixture in the form of cream, and, furthermore, to insure the fat being easily assimilated and digested. When my whey mixture is properly homogenized and emulsified, the fat globules or cream, and the casein, remain evenly distributed throughout the mixture for an indefinite period. By mixing with the ingredients of my product a suitable prophylactic agent, such as sodium citrate, the casein is acted upon in such a way that when taken into the stomach it will be coagulated in a flocculent form, in which state it ceases to be a cause of the disorders above noted.

This emulsion, for example in the case of babies, passes through the stomach and bowels free of all chunks of curd. I have found that it is a soothing nourishment in cases of ulcer of the stomach, and duodenum, and in gastritis.

It is very important to note that since there is no curdy residue deposited in the stomach and bowels as a result of the use of this emulsion, the conditions are absent which irritate and cause perforation of the inflamed and ulcerated Peyer's patches. Consequently it will be found that this emulsion can be well retained by patients suffering from typhoid fever.

By providing my emulsion with a suitable prophylactic agent, the casein, in the cow's sweet milk or cream used, is rendered in characteristics like the casein of human milk, which is flocculent and coagulable only in soft curds.

It is to be noted that this product is not a mechanical mixture of the various ingredients, but is a true emulsion.

In compounding the ingredients of this product, I obtain sweet whey either from cow's milk as it comes from the cow, or, from skimmed milk, and test the same to ascertain that it does not contain over a certain percentage of lactic acid, preferably 18%. To this sweet whey is added a certain amount of butter fat in the form of sweet cream. To this mixture is now added a certain percentage of milk sugar, or, as a substitute therefor, a certain percentage of cane sugar. Then a certain amount of a suitable prophylactic agent, such as sodium citrate, is added. The mixture is of course more or less stirred and then it is pasteurized, and after pasteurization it is passed through what is known as a homogenizing machine which emulsifies the ingredients thoroughly after the manner well known. As a result of such emulsification, the fat contained in the mixture thoroughly mixes with the other ingredients and cannot again be separated therefrom except with great difficulty, thus forming a substantially stable emulsion. The particles of the prophylatic agent are, as a consequence of said treatment, also broken up and emulsified, and are consequently readily digested.

So soon as the mixture has been made into an emulsion, it is cooled off and hermetically sealed in suitable receptacles and then sterilized in a temperature that will kill all spores therein, thus resulting in a product that will keep indefinitely. I find that by subjecting the emulsion to a temperature of from 225 degrees F. to 235 degrees F. and maintaining it in this temperature for approximately a half an hour, the spores will be killed. If desired, the casein may be introduced into the mixture as part of the sweet cream or as part of sweet skimmed milk.

During the compounding of the ingredients, sweet skimmed milk may be added to the whey and cream mixture in varying quantities, so that the mixture may contain from 25% to 75% of skimmed milk, provided it also contains from 1% to 3.5% of butter fat. This will enable me to provide my emulsion possessing varying percentages of casein so that the emulsion may be suitable as food for infants and invalids whose digestion is fairly good.

I shall now give below the relative proportions of the ingredients of my emulsion for babies and infants, as well as for invalids. The following ingredients compose one quart of the emulsion compounded to be fed to delicate infants. This quart contains the following ingredients in approximately the proportions mentioned; 99% sweet whey and 1% of butter fat, to which is added 20 grains of a suitable prophylactic agent, such as sodium citrate.

The following ingredients compose one quart of the emulsion compounded to be fed to babies and infants and invalids whose digestion is fairly good. This quart contains the following ingredients in approximately the proportions mentioned; 73% sweet whey; 2% butter fat; 1% of milk sugar, or, as a substitute therefor, one half of 1% of cane sugar, and skimmed milk to the amount of 25% which is equivalent to one half of 1% of casein. To the foregoing is added 30 grains of a suitable prophylactic agent, such as sodium citrate.

The following ingredients compose one quart of the emulsion compounded to be fed to healthy children. This quart contains the following ingredients in approximately the proportions mentioned; 36.5% sweet whey; 3.5% butter fat; 2% of milk sugar, or, as a substitute therefor, 1% of cane sugar, and skimmed milk to the amount of 60% which is equivalent to 1.2% casein. To the foregoing is added 40 grains of a suitable prophylactic agent, such as sodium citrate.

I may manufacture my emulsion in a concentrated form, and in order to do so it will be necessary to reduce the amount of moisture in the emulsion by boiling or evaporization, until the volume thereof is substantially one quarter to one eighth of its volume before boiling or evaporization.

The concentrated form is prepared for feeding by mixing water therewith according to the directions indicated on the receptacles containing the emulsion, until it is of the desired consistency.

My emulsion prepared according to formulæ 1 and 2 may be fed to adult patients suffering from typhoid fever, gastritis and indigestion.

What I claim as my invention is:

1. As a new article of manufacture a whey emulsion from which the fat particles cannot again be naturally nor mechanically separated except to a small extent, sterilized after being manufactured to form a sterile food.

2. As a new article of manufacture, a whey emulsion containing sweet whey; butter fat, and a suitable prophylactic agent.

3. As a new article of manufacture, a whey emulsion containing sweet whey; butter fat; milk sugar, skimmed milk and a suitable prophylactic agent.

4. As a new article of manufacture, a whey emulsion containing the following ingredients in approximately the proportions mentioned: 73% sweet whey; 2% butter fat; 1% milk sugar; 25% of skimmed milk and 30 grains of sodium citrate.

5. As a new article of manufacture, a whey emulsion composed of sweet whey; butter fat; a sugar; casein, and a prophylactic agent.

6. The process of manufacturing a food for infants and invalids which consists in taking the desired quantity of sweet whey; adding the desired amount of butter fat thereto, to which ingredients is added the required amount of a prophylactic agent; pasteurizing the compound and then emulsifying the same.

7. The process of manufacturing a food for infants and invalids which consists in taking the desired quantity of sweet whey; adding the desired amount of butter fat thereto, to which ingredients is added the required amount of a prophylactic agent;

pasteurizing the compound; emulsifying the same, and sterilizing the compound in hermetically sealed receptacles in a temperature that will kill all spores.

8. As a new article of manufacture, a substantially stable whey emulsion containing a prophylactic agent, made from cow's milk, the casein in which has been rendered in characteristics like the casein of human milk.

In testimony whereof I affix my signature in presence of two witnesses.

WALTER SEYMOUR DOWNHAM.

Witnesses:
G. CLEVELAND WAGNER,
CHAS. DUCHMANN.

1,091,054

UNITED STATES PATENT OFFICE.

JOHAN D. FREDERIKSEN, OF LITTLE FALLS, NEW YORK.

COMPOSITION FOR PRODUCING LACTIC FOOD PRODUCTS.

1,091,054. Specification of Letters Patent. Patented Mar. 24, 1914.
No Drawing. Application filed July 23, 1913. Serial No. 780,662.

To all whom it may concern:

Be it known that I, JOHAN D. FREDERIKSEN, a citizen of the United States, residing at Little Falls, in the county of Herkimer and State of New York, have invented a new and useful Improvement in Compositions for Producing Lactic Food Products, of which the following is a specification.

This invention relates to the production of food products in which milk, curdled by means of rennet ferment, is an ingredient.

In my Letters Patent No. 1,046,766, December 10, 1912, a composition is described which is used for curdling milk by the direct admixture to the milk of the composition in a dry state. That composition is available where milk can be obtained but is not available in the absence of milk.

The object of the present invention is to produce a dry composition which contains milk, skimmilk, or partially skimmed milk in a dry state mixed with rennet ferment also in a dry state, so that the desired food product containing the curdled milk can be produced by simply mixing the composition with water.

In practising this invention milk powder composed of dried full milk, skimmilk or partially skimmed milk is intimately mixed with rennet powder, the latter consisting of dry rennet ferment mixed with a very large proportion of sugar or salt. The dry composition also contains such flavoring and coloring ingredients as may be desirable for producing the desired ultimate product. Preferably it also contains a small admixture of a calcium salt, such as hypophosphite of calcium, the object of which is to restore to the dried milk the property of curdling firmly under the action of the rennet ferment, which property may have been partially destroyed by the evaporating process.

In this composition the rennet ferment is uniformly distributed throughout the mass and unequal coagulation is thereby avoided when the mixture is dissolved in water or a similar liquid. When strong liquid rennet—extract or rennet powder is added to milk, the milk particles in the immediate vicinity of the point at which the rennet ferment is supplied to the milk are apt to be coagulated much more quickly than the more remote parts of the milk and sometimes instantaneous coagulation takes place in part of the milk, thereby producing a coagulum or curd which is of very uneven firmness or texture. To counteract this the milk is usually stirred vigorously immediately when the rennet is added until perfect and intimate blending is secured. By mixing the rennet powder and the milk powder, as is done in practising the present invention, the particles of the two ingredients are brought into intimate and uniform proximity throughout the mass, the rennet ferment ready to act uniformly upon the adjacent milk particles and the latter ready to be so acted upon as soon as the condition for action is supplied by the addition of water or a similar liquid, and perfect uniformity is insured.

The period of time required for coagulating ordinary milk, skimmilk or partially skimmed milk depends mainly upon the strength of the rennet preparation, its proportion to the milk, the temperature of the milk and the condition of the milk as to acidity, bacteria contents, &c. Usually the strength of the rennet preparation and the temperature can be closely regulated but the condition of the milk, its acidity and the number and species of bacteria contained therein cannot be controlled and vary to such an extent that the period required for coagulation varies greatly, so that in the ordinary use of rennet for curdling milk the results are uncertain and lack uniformity. A proportion of rennet which would curdle sweet milk for pudding in five minutes may curdle milk which is perceptibly acid in one minute or sometimes even before the rennet can be thoroughly mixed with the milk, causing the curd to be sloppy and of uneven texture. With milk powder, on the other hand, the quality of the milk is definite and unchangeable, and the manufacturer of the composition described in this application can regulate it to a nicety so that, if a definite quantity of the powder is added to a definite quantity of water at a definite temperature, the time when coagulation will take place can be exactly determined.

In the composition covered by this application, the acidity of the dry milk is definite and unchangeable until it is dissolved and the proportion of rennet can be readily fixed by the manufacturer to a nicety, so that the user has only to mix the composition with a suitable exact amount of water or similar liquid at a certain temperature to make the coagulation take place in a definite time without danger of disturbing the process by stirring to thoroughly dissolve the powder.

The consistency or texture of the resulting food product depends upon the proportion of casein which is present in relation to the amount of water. In ordinary liquid milk this proportion and the consistency of the coagulum cannot be controlled. With milk powder, on the other hand, the consistency of the ultimate food product can be nicely regulated by using more or less of the milk powder or the finished composition for a given amount of water.

This dry composition is available for producing food products where milk cannot be obtained, as, for instance, in camp, on board ship, in the arctic and tropical regions, or in the home when the supply of milk has been consumed.

The flavor can be of any desired character and the flavoring ingredient can be incorporated with the sugar and, if necessary, a gelatinous substance to hold it, such as gum tragacanth, as described in Letters Patent No. 1,046,766. As an illustration the following formula may be given:—In case the flavor is vanilla, about 216 cubic centimeters of a concentrated extract of vanilla, preferably about ten times stronger than the usual flavoring extract of commerce, and a coloring ingredient, if such is desired, are mixed with forty-three grams of gum which has been soaked in water so as to form a smooth paste. This mixture is then added to and thoroughly incorporated in about thirty-two pounds of finely granulated sugar and the whole mixture is dried at a low temperature, say about 120° F. It is then ground into a moderately fine powder and thoroughly mixed with about ten grams of rennet powder and about fifty-seven grams of hypophosphite of calcium. Other flavors, such as orange, lemon, maple, pistachio, raspberry, coffee, chocolate, &c., may be incorporated in a similar way, with or without a gelatinous substance as a conveyer.

By adding one part, by weight, of the above dry mixture to one part of milk powder consisting of dried skimmilk, and adding $3\frac{1}{2}$ ounces of this composition to one pint of water at 100° F., stirring for one or two minutes and then letting the solution stand at rest, a firm pudding will be produced in seven minutes.

For producing soft cheese, such as Neuchâtel or cream cheese, an exceedingly small quantity of rennet ferment is mixed with the milk powder, sufficient to curdle the watery solution in from 18 to 24 hours.

I claim as my invention:

1. A dry composition for producing lactic food products, comprising milk powder and rennet powder intimately mixed, which composition dissolves and curdles upon the addition of water.

2. A dry composition for producing lactic food products, comprising milk powder, rennet powder and a calcium salt intimately mixed, which composition dissolves and curdles upon the addition of water.

3. A dry composition for producing lactic food products comprising milk powder and a pulverized mixture of rennet ferment, a calcium salt and sugar.

4. A dry composition for producing lactic food products comprising milk powder, rennet powder, a calcium salt, sugar and a flavoring ingredient.

Witness my hand in the presence of two subscribing witnesses.

JOHAN D. FREDERIKSEN.

Witnesses:
S. J. Seckner,
E. Toborg.

1,092,616

UNITED STATES PATENT OFFICE.

ERNST F. W. WIEDA, OF PATERSON, NEW JERSEY.

PROCESS OF TREATING MILK AND MILK PRODUCTS.

1,092,616. Specification of Letters Patent. **Patented Apr. 7, 1914.**

No Drawing. Application filed August 2, 1912. Serial No. 712,898.

To all whom it may concern:

Be it known that I, Ernst F. W. Wieda, a citizen of the United States, residing at Paterson, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in the Process of Treating Milk and Milk Products, of which the following is a specification.

According to a well-known method of treating dried milk or milk powder with a view to rehabilitate the milk as liquid milk a mixture of the powder, butter and water in a certain proportion is first thoroughly agitated at a suitable temperature (say, 120° F.) for a sutiable time (say, 30 to 40 minutes); secondly, the temperature being appreciably reduced (to say 100° F., or not less than 95° F.), the mixture is again agitated for a suitable length of time; thirdly, the mixture is forced through a restricted orifice or otherwise subjected to pressure at from 150 to 250 on a kilogram gage, which again raises its temperature, to approximately 110° F.; and, finally, the mixture is cooled to and retained until used at 35° F. The first step, including agitation and sufficient heat for the purpose, produces the melting and breaking up of the butter into fat particles and their diffusion throughout the liquid; the second or "tempering" step continues the diffusion phase of the first step under a temperature condition (lowered) where the specific gravity of the butter is such as to advance the diffusion to as perfectly uniform state as possible; the third, known as the "emulsifying" or "homogenizing", step gives the emulgent character to the mixture not possible by agitation alone; and the fourth step is a matter merely of preservation of the mixture. The first two steps, including heating and then reducing the temperature appreciably, accomplish what is known as "pasteurizing", destroying any active organisms present. The product of this method, though hygienically superior to natural or raw milk, possesses a taste and smell quite distinct from those of the raw or natural product—a condition which it has heretofore been attempted to correct, but so far as I am aware without success.

My object is to improve this process and, more generally, to provide a process for the treatment of milk and certain milk products, such as dried milk and skimmed milk, whose product shall in every material respect be superior to the raw product and yet possess a taste and smell not different from those of the raw product.

Proceeding, now, to describe my invention in detail, and particularly, first, in respect to the rehabilitation of dried milk as liquid milk: A mixture of 31 lbs. of butter, 80 lbs. of dried milk and 700 lbs. of water is first placed in a suitable vessel, and, maintained at a temperature of approximately 120° F., is melted and thoroughly agitated by some suitable expedient with a view to break up the butter into as fine particles or globules of fat as possible and secure the highest possible degree of uniformity of their diffusion throughout the mixture, for a reason already explained. Next, the temperature having been appreciably reduced and the mixture agitated at that temperature the mixture is emulsified or homogenized, say in the way already explained, this having the effect of raising the temperature of the mixture to approximately 110° F. So far, the improved process is substantially identical to that already known and above outlined. I now introduce the following novel steps responsible for the improved product accomplished by my invention. The mixture (which leaves the homogenizing or emulsifying apparatus at approximately 110° F.) is placed next in a suitable vessel and is reduced to the materially lower temperature of approximately 90° F., being further agitated, if desired. Either while the mixture is cooling or after it has reached the temperature last named I find it helpful to aerate the mixture, though this is not essential. Thereupon, the mixture is subjected again to the emulsifying or homogenizing operation at substantially the same pressure as before. The mixture is then cooled to a temperature of approximately 35° F., corresponding to the last step in the old process already described. Finally, it is preferable to aerate the mixture again and then store it for twenty-four hours or longer at 35° F. The product of this process will be found to have a taste and smell undistinguishable from those of the raw or natural product, being otherwise, of course, in every respect equal to the produce of the old process, first described.

I may proceed in the same way and, instead of using water and dried milk, use skimmed milk; thus: a mixture of 31 lbs. of butter and 780 lbs. of skimmed milk. The result will be the same as that of the improved process as first described, to wit, whole milk of 3% butter-fat standard.

Proceeding in the same way I may also produce cream, (1) either by using a mixture of 166 lbs. of butter, 55 lbs. of dried milk and 660 lbs. of water; or (2) 166 lbs. of butter and 715 lbs. of skimmed milk; or (3) 124 lbs. of butter and 700 lbs. of whole (raw) milk, the product in each case being cream of 16% butter-fat standard.

The essential feature of my invention, whereby the improved taste and smell result, is the emulsifying or homogenizing in a process otherwise of substantially the nature of that first described herein, at a temperature of approximately 90° F.

The temperatures and quantities and other details herein mentioned are chosen with reference to producing the several products in conditions found by me to be the best, but they may be varied without departure from the invention.

Having thus fully described my invention, what I claim and desire to secure by Letters Patent is:

1. The herein-described process consisting in agitating a liquid mixture containing butter-fat and milk at a suitable temperature and meanwhile reducing the temperature appreciably; then subjecting the mixture to the emulsifying operation substantially as herein described; then cooling the mixture appreciably; then, while the mixture is substantially at the temperature at which it was when last cooled, again subjecting the mixture to the emulsifying operation substantially as herein described; and then cooling the mixture to a temperature suitable for the preservation thereof, substantially as described.

2. The herein-described process consisting in agitating a liquid mixture containing butter-fat and milk at a suitable temperature and meanwhile reducing the temperature appreciably; then subjecting the mixture to the emulsifying operation substantially as herein described; then cooling the mixture appreciably and aerating the same; then, while the mixture is substantially at the temperature at which it was when last cooled, again subjecting the mixture to the emulsifying operation substantially as herein described; and then cooling the mixture to a temperature suitable for the preservation thereof, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ERNST F. W. WIEDA.

Witnesses:

JOHN W. STEWARD,

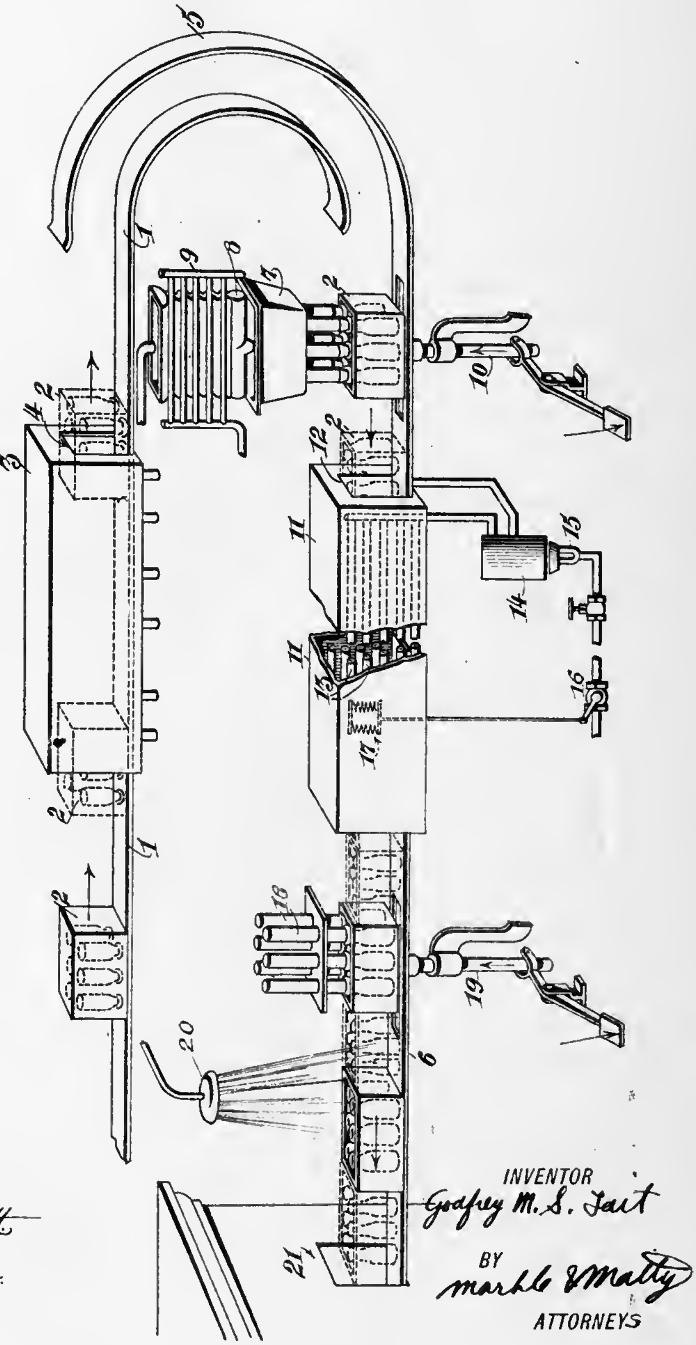
WM. D. BELL.

G. M. S. TAIT.

PROCESS OF TREATING MILK AND OTHER LIQUIDS.

APPLICATION FILED JULY 28, 1913.

1,094,380. Patented Apr. 21, 1914.



WITNESSES:

John G. Schrott

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INVENTOR

Godfrey M. S. Tait

BY

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UNITED STATES PATENT OFFICE.

GODFREY M. S. TAIT, OF WASHINGTON, DISTRICT OF COLUMBIA.

PROCESS OF TREATING MILK AND OTHER LIQUIDS.

1,094,380. Specification of Letters Patent. **Patented Apr. 21, 1914.**

Application filed July 28, 1913. Serial No. 781,633.

To all whom it may concern:

Be it known that I, GODFREY M. S. TAIT, a subject of Great Britain, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Processes of Treating Milk and other Liquids, of which the following is a specification.

This invention relates to the sterilization or pasteurization of liquids; and it comprises, as a process, a process of sterilizing milk or other liquids in bottles or other containers, according to which the containers are first washed and scalded or otherwise sterilized, and while in a still highly heated condition from the washing are filled with preheated milk or other liquid, and without being allowed to cool the bottled milk or containers containing other liquid are subsequently maintained in a heated condition until the sterilization or pasteurization is completed, the sealing of the bottles or other containers being effected either before or after the completion of the pasteurization or sterilization.

More specifically, the invention comprises, as a process, a process of pasteurizing milk in bottles according to which the bottles are first washed and scalded and thereby sterilized, and without being allowed to cool appreciably, but while still in a highly heated condition and at or above the pasteurizing temperature are filled with milk preheated to or above the pasteurizing temperature, after which the bottled milk is prevented from cooling and maintained at the pasteurizing temperature until the pasteurization is completed, the heat of the preheated milk and of the heated bottles being retained and utilized to effect the pasteurization, a small amount of heat being supplied if necessary to prevent the bottled milk from cooling below this temperature, all as more fully hereinafter set forth and as claimed.

The present invention relates to the sterilizing or pasteurizing of milk or other liquids in the bottles or containers as distinguished from the pasteurization or sterilization in bulk.

The invention will be more particularly described in connection with the pasteurization of milk in bottles, but it will be understood that such description is by way of illustration and that the invention is applicable also to the treatment of other liquids such as beer, etc. In the pasteurization of milk it is necessary to heat the milk to a temperature of about 130 to 140° F. and to maintain such temperature for a considerable period of time to effect the pasteurization.

The present invention comprises such a process of pasteurization according to which the milk is first preheated and is filled into bottles themselves also in a highly heated condition, after which the milk in the bottles is kept at the pasteurization temperature to complete the pasteurization, the milk bottles being capped either before or after the completion of the pasteurization and the bottles being subsequently cooled and conveyed to a suitable refrigerating or storing apparatus.

More particularly, the invention comprises a combined process of washing and sterilizing the milk bottles and of filling and pasteurizing the same according to which the milk bottles are washed and scalded and are subsequently filled with preheated milk while still heated to a temperature above 130° F., the bottles being subsequently kept at such temperature to complete the pasteurization. According to this process the heat necessary for the pasteurization or sterilization is furnished partly by the heat contained in the heated bottles and partly by the preheating of the milk or other liquid, the bottled milk or other liquid being already at a temperature at or above that of pasteurization and it being necessary only to retain this heat and the temperature necessary for pasteurization until the pasteurization is completed. For retaining such heat it is necessary only that the bottled milk be kept in a sterilizer or pasteurizer similar in nature to the fireless cooker in which the cooling of the bottled milk is prevented and the temperature maintained at that of pasteurization, a small amount of heat being applied to the sterilizer if necessary to insure that the required temperature is maintained and to prevent cooling of the bottled milk.

On the accompanying drawing is shown an apparatus illustrative of the present invention, the various parts of this apparatus being for the most part shown diagrammatically.

The process of the present invention will be described in detail in connection with this drawing which is illustrative of one embodiment of the invention and of one form of apparatus in which the process of the present invention can be carried out. In this drawing a suitable conveyer is shown at 1 which may be of the roller or rail type and which may be provided with means (not shown) for insuring a regular and continuous travel or an intermittent travel of the crates of bottles thereon.

A washing apparatus is shown at 3 through which the crates 2 are adapted to pass on the conveyer 1 and in which the bottles in the crates 2, which crates and bottles are upside down, are subjected to washing with alkali or soap or other cleansing agent and are subsequently rinsed and scalded, the scalding water usually being near the boiling point and the bottles leaving the washing apparatus still heated to a temperature more or less close to the boiling point. The washer 3 is provided with doors 4 at its ends which, in the normal operation of the device, are filled and closed by the crates of bottles which pass through the washer in a continuous stream, these doors being of such a size that the crates practically fill the same. It will be understood that the washer 3 is provided with suitable pipes or other means for insuring the necessary washing and scalding of the bottles, but it is not deemed necessary to illustrate or describe such washing device in detail. From the washing device the crates 2 are conveyed to the end of the conveyer 1 onto the conveyer 5 which turns the crates upside down and conveys them to the filling device 7 which is operated by a foot lever 10, the crate being raised and the bottles themselves operating automatically the valves controlling the milk supply. The filler 7 is fed with milk preheated in the heater 8 by means of the steam coil 9 to about or above the pasteurization temperature, *e. g* 130 to 150° or 160° F. This preheater is shown as a heater of the "flash" variety but it will be understood that other suitable heating means can be used for preheating the milk. Since the milk bottles are conveyed from the washing and scalding apparatus directly to the filling device they reach the filling device still in a highly heated condition and a temperature usually above that of pasteurization. By preheating the milk and filling the heated bottles with the preheated milk the pasteurization is started before the milk reaches the bottles and is continued immediately after reaching the bottles so that the pasteurization is begun before the bottles reach the pasteurizing apparatus, a very material saving in heat being thus effected and the process being very materially shortened and simplified. It is not necessary to heat cold bottles after filling them with cold milk or to first pasteurize the milk and cool it and bottle it in cold bottles, but the bottles are filled while still hot from the washing and scalding apparatus and the heat still contained in the bottles is made use of in effecting the pasteurization. The disadvantages incident to the filling of cold bottles with hot milk or of hot bottles with cold milk are also avoided and the milk immediately upon filling the bottles is already at or above the pasteurization temperature and requires merely a small amount of heat to maintain it at this temperature until the pasteurizing is completed. The preheating of the milk and of the bottles and the starting of the pasteurizing process is thus begun before the crates of bottles reach the main sterilizing apparatus and it is necessary only for such apparatus to maintain the bottles in a heated condition. Since only a small amount of heat is necessary for this purpose, as compared with the amount of heat necessary for first heating the milk and bottles, the sterilizer requires only a small amount of heat to be supplied to it.

In the apparatus illustrated, the sterilizer 11 which usually extends for a considerable distance, is shown as provided with doors 12 for the entrance and escape of the crates, the doors being practically closed by the crates which pass in a continuous stream on the conveyer 6 through the apparatus. The sterilizer 11 is shown as heated by steam coils or hot water coils 13 which in turn are heated by the gas heater 14, the gas burner 15 being controlled by the thermostat 17 in the sterilizer and by the controlling valve 16 so that the temperature can be maintained practically constant at about 130 to 140° F. The length of the sterilizing chamber can be made sufficient to insure the sterilization of the milk bottles while passing through it, the conveyer 6 being provided with suitable means (not shown) for insuring the progressive feed of the crates of bottles to and from the filling and capping device and through the sterilizer. The caps can be applied to the bottles in the crates either before or after the passage of the crates through the sterilizer.

In the embodiment of the invention illustrated, the capping device is shown at 18 and is arranged to cap the bottles after they come from the pasteurizer, the capping of the bottle being effected by the lever 19 which raises the crate against the capping devices. The bottles of milk which are now pasteurized and capped are cooled by the water spray 20 and are conveyed to the refrigerating or storing chamber 21.

It will be seen that in the embodiment of the invention illustrated the bottles are kept in crates into which they are suitably secured so that the crates may be conveyed into the washing device upside down and the bottles thoroughly washed, rinsed and scalded and allowed to drain, after which the crates are reversed by the conveyer 5 and reach the filling device right side up. Other suitable forms of washing apparatus can be used and other means for reversing the crates and bringing the bottles into an upright position. Also other means for heating the sterilizer can be employed, it being necessary only that the temperature of the sterilizer be maintained at the pasteurization temperature and that means be provided for maintaining the sterilizer or pasteurizer at this temperature. It will be seen that the process and apparatus of the present invention enables the pasteurization of milk or the sterilization of other liquids to be effected in a simple and efficient manner and that the heat contained in the bottles from the scalding and washing operation, together with the preheating of the milk, are made use of in effecting the pasteurization. It is advantageous to heat the milk to a temperature somewhat greater than that of pasteurization, for example, up to 150° F. or even higher, and it is also advantageous to fill the bottles while still heated above the pasteurization temperature, the bottles frequently reaching the filling apparatus from the washer at a temperature above 150° F. By using milk heated to such a temperature and bottling it in bottles also heated above the pasteurizing temperature the bottled milk is prevented from cooling below the pasteurizing temperature before it reaches the sterilizer and it is necessary for the sterilizer merely to prevent the cooling of the milk below the temperature necessary for pasteurization. The so-called sterilizer is in fact merely a heat retainer upon the principle of the fireless cooker. It is provided with insulated walls to retain the heat in the bottled milk and it is heated only sufficiently to prevent the milk from cooling below the required temperature. This sterilizer or pasteurizer is accordingly merely an apparatus for retaining in the bottled milk the heat already contained in it so that practically the pasteurization is effected by the heat applied to the preheated milk and the heat contained in the heated bottles. Since the preheating of the milk is carried out in a flash or instantaneous heater it is possible to heat the milk considerably above the pasteurizing temperature for the necessary short interval of time without injuring it in its taste and properties, heat thus applied to the milk being made use of in the manner indicated to effect or assist in the pasteurization.

While the process of the present invention and the apparatus illustrative of the present invention have been described in connection with the pasteurization of milk, yet it will be understood that other liquids can be treated in a similar manner, the heat necessary for the pasteurization being applied principally to the liquid before bottling and to the bottles during the washing and scalding step. It will be understood also that variations can be made in carrying out the process and in the apparatus described without departing from the spirit and scope of the invention, as set forth in the accompanying claims.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is—

1. The process of pasteurizing milk in bottles which comprises filling the bottles while in a highly heated condition with preheated unpasteurized milk and continuing the heating of the milk in said bottle to complete the pasteurization.

2. The process of pasteurizing milk in bottles which comprises washing and scalding the bottles, filling the bottles after scalding and while in a highly heated condition with preheated unpasteurized milk, and continuing the heating of the milk in said bottles to complete the pasteurization.

3. The process of pasteurizing milk in bottles which comprises filling the bottles while in a highly heated condition with unpasteurized milk preheated to about 130 to 150° F., and continuing the heating of the milk in said bottles at about 130 to 140° F. to complete the pasteurization.

4. The process of pasteurizing milk in bottles which comprises washing and scalding the bottles, filling the bottles while still heated to a temperature above that of pasteurization with unpasteurized milk preheated to about the pasteurization temperature, and continuing the heating of the milk in said bottles to complete the pasteurization.

5. The process of pasteurizing milk in bottles which comprises washing and scalding the bottles, filling the bottles after scalding and while still at a temperature above 130° F. with unpasteurized milk preheated to a temperature of about 130 to 150° F. and continuing the heating of the milk in said bottles at a temperature of about 130 to 140° F. to complete the pasteurization.

6. The process of pasteurizing liquids in containers which comprises filling heated bottles or other containers heated above the pasteurization temperature with the unpasteurized liquid preheated to about the pasteurization temperature and maintaining the heated liquid in the containers at the pasteurization temperature to effect pasteurization, whereby the heat of the containers and the preheating of the liquid are utilized for effecting the pasteurization.

7. The process of pasteurizing milk in bottles which comprises filling milk bottles heated above the pasteurization temperature with unpasteurized milk preheated to about the pasteurization temperature and preventing the cooling of the bottled milk below the

pasteurization temperature until pasteurization has been effected.

8. The process of pasteurizing milk in bottles which comprises filling milk bottles heated to above 130° F. with unpasteurized milk heated to above 130° F. and preventing the cooling of the bottled milk below 130° F. until pasteurization has been effected.

9. The process of pasteurizing milk in bottles which comprises washing and scalding the milk bottles, filling said bottles while still heated above the pasteurization temperature with unpasteurized milk preheated to above the temperature necessary for pasteurization, and preventing the cooling of the bottled milk below the pasteurization temperature until pasteurization is effected, whereby the heat necessary to effect the pasteurization is supplied principally or entirely by the preheating of the milk and the heat contained in the heated bottles.

10. The process of pasteurizing milk and other liquids in bottles which comprises filling heated bottles heated above the pasteurization temperature with preheated unpasteurized milk or other liquid and maintaining the bottled liquid at the pasteurization temperature by means of dry heat until pasteurization is effected.

11. The process of pasteurizing milk in bottles which comprises filling milk bottles heated above the pasteurization temperature with unpasteurized milk preheated to about the pasteurization temperature and maintaining the bottled milk at the pasteurization temperature by means of dry heat until pasteurization has been effected.

In testimony whereof I affix my signature in the presence of two witnesses.

GODFREY M. S. TAIT.

Witnesses:
F. E. Barrows,
A. F. Caffrey.

Milk

1,101,044.

UNITED STATES PATENT OFFICE.

ARMEN H. THOUMAIAN, OF BALTIMORE, MARYLAND.

FERMENTED-MILK FOOD PRODUCT AND PROCESS OF MAKING THE SAME.

1,101,044. Specification of Letters Patent. **Patented June 23, 1914.**

No Drawing. Application filed May 17, 1913. Serial No. 768,279.

To all whom it may concern:

Be it known that I, ARMEN H. THOUMAIAN, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Fermented-Milk Food Products and Processes of Making the Same, of which the following is a specification.

My invention relates to a new and improved fermented milk food product, and process of making the same.

The object of the invention is to provide a fermented milk food product which is highly palatable and nutritious, possesses good keeping qualities, is acceptable to the most delicate stomach and easily digestible, and is, therefore, a valuable article of diet for infants and invalids and others having impaired digestive organs, and which is, further, free from the objections incident to other fermented milk foods and, besides constituting a pleasant, agreeable and nourishing article of food and beverage, for general use, is of especial benefit and advantage in the alleviation and cure in general of all disorders of the digestive and intestinal tracts.

A further object of the invention is to provide a process of manufacture whereby a fermented milk food product of the character set forth may be reliably and efficiently prepared.

My improved fermented milk food product is prepared from pure, fresh, wholesome milk and cream, a special ferment combining the lactic acid bacillus and the Bulgaricus bacillus, and egg albumen. The milk and cream, after being cooled, tested and found thoroughly clean and free from disease germs, are placed in a suitable vessel and intimately combined, and either before or after admixture, but preferably after, are sterilized at a temperature below boiling, namely, at about 210° F. The sterilized mixture of milk and cream is then cooled to a suitably lower temperature, and at a temperature of from 170° to 180° F. a desired quantity of pure egg albumen is added thereto and thoroughly combined therewith, after which the special ferment is introduced and the mixture allowed to actively ferment under the action thereof for a period of from two to three hours, usually about two and one-half hours. The product is then chilled, strained and bottled or stored in other suitable receptacles for use.

In practice, cream in the proportion of from six to ten parts, or from six per cent. to ten per cent., and albumen in the proportion of from three to six parts, or from three per cent. to six per cent., to each one hundred parts of milk, are used, according to the degree of richness and nutritive qualities desired. It will, of course, be understood that, irrespective of other factors, the albumen renders the product more wholesome and nutritious than would otherwise be the case but, in addition, I have found that the albumen in this product employing lactic acid and Bulgaricus bacilli, exceptionally valuable properties, in that it acts as a vehicle and diffusing agent for the ferment and, hence, promotes and hastens the process of fermentation to a material degree. Moreover, after a certain period, namely, at the end of the most active stage of fermentation, it retards further fermentation, and, hence, serves as a preservative, enhancing the keeping properties of the product. Finally, the albumen performs the highly valuable and important function of reducing the acidity to a practically negligible point, an objection present in all other fermented milk food products with which I am familiar, and renders the product bland and soothing, acceptable to the most delicate stomach and non-irritating even in serious inflammatory conditions of the alimentary canal.

The product prepared in the manner described, and under the action of the special ferment set forth, is of a yellowish-white color, of thick cream-like consistency, smooth and without clots of separation, of a pleasant, faintly-acid odor and entirely free from cheese-like odor, totally devoid of acridity, and neither sweet nor sour, but of a most agreeable cream-like taste and delicious flavor. Unlike ordinary milk or cream, it is not constipating and does not leave a fatty taste in the mouth, but, on the contrary, is slightly laxative and leaves the mouth sweet and pure, and does not coagulate into curds in the stomach under the action of the gastric juices, remaining liquid, so that it is easily attacked by the gastric juices and may be digested in the most delicate stomach. It is for this, and the other reasons stated of the utmost value in malnutrition, diseases of the digestive and intestinal tracts, fevers and other wasting diseases, as it may be retained and digested when all other food substances are rejected. It is also bland and healing in all inflammatory conditions.

Chemical analysis of this food product shows that it retains all the ingredients and food values of the original milk and cream, while being readily digestible, and having the other desirable qualities noted, the product containing protein (combined) five per cent., fat five and two tenths per cent. and carbohydrate, four per cent. Its calorific value per quart, is from eight hundred and fifty to one thousand calories, whereas the average good quality milk gives only from six hundred to six hundred and fifty calories. Bacteriological and microscopical examination shows the presence of a prolific growth of a short bacillus—the lactic acid bacillus, and a long bacillus known as the Bulgaricus bacillus, also a lactic acid-forming organism, one of the most vigorous known, and exceptionally few yeast cells and no colon bacillus pus or disease producing organisms. It is, therefore, antagonistic to the pathogenic and other disease producing germs which infest the intestinal tract, as well as those germs which produce fermentation in the refuse remaining from undigested food, and by prohibiting the growth of such germs acts as an intestinal antiseptic and preventive of many diseases.

The product may be weakened by the addition of water, if desired, to suit the taste or fancy, used as a beverage as well as a food, and served hot or cold. By evaporation it may be reduced to a powder, to which a required amount of water may be added when used.

I claim:—

1. A fermented milk food product having the following characteristics and properties, to wit: of a yellowish-white color, thick cream-like consistency, smooth and without clots of separation, a pleasant faintly-acid odor and freedom from cheese-like odor or acridity, neither sweet nor sour but of a cream-like taste and agreeable flavor, and non-curdling and freely digestible under the action of the gastric juices, the said product containing protein (combined) approximately five per cent., fat, approximately five and two tenths per cent., carbohydrate, approximately four per cent., a prolific growth of lactic acid bacillus and Bulgaricus bacillus, and having a caloric value per quart of approximately from eight hundred and fifty to one thousand calories, substantially as described.

2. A fermented lacteal food product of the character described containing milk, lactic acid bacillus and Bulgaricus bacillus.

3. A fermented lacteal food product of the character described containing milk, cream, egg albumen, lactic-acid bacillus and Bulgaricus bacillus.

4. A fermented milk food containing lactic acid and Bulgaricus bacilli and egg albumen.

5. The herein-described method of making a fermented lact-albumen food product, which consists in combining egg albumen with a lactael fluid, and fermenting the mixture by the action of a ferment containing lactic-acid and Bulgaricus bacilli.

6. The herein-described method of making a fermented food product, which consists in mixing a small proportion of cream with milk, sterilizing the mixture at a temperature close to but below the boiling point, and then fermenting the mixture by the action of a ferment containing lactic-acid and Bulgaricus bacilli.

7. The herein-described method of making a fermented lact-albumen food product, which consists in mixing a small proportion of cream with milk, sterilizing the mixture at a temperature close to but below the boiling point, cooling the mixture to a degree below the sterilizing temperature, adding thereto egg albumen, and then fermenting the mixture by the action of a ferment containing lactic-acid and Bulgaricus bacilli.

8. The herein-described method of making a fermented lact-albumen food product, which consists in mixing a small proportion of cream with milk, sterilizing the mixture at a temperature of about two hundred and ten degrees, cooling the mixture to a temperature between one hundred and seventy degrees and one hundred and eighty degrees, adding thereto egg albumen, and then fermenting the mixture by the action of a ferment containing lactic-acid and Bulgaricus bacilli.

9. The herein described method of making a fermented milk food product, which consists in subjecting a lacteal fluid to a process of sterilization at a temperature close to but below the boiling point, and then fermenting the sterilized fluid by the action of a ferment containing lactic acid and Bulgaricus bacilli.

In testimony whereof I affix my signature in presence of two witnesses.

ARMEN H. THOUMAIAN.

Witnesses:

AGNES I. STEWART,
BENNETT S. JONES.

1,120,330

Mill

UNITED STATES PATENT OFFICE.

IRA D. ODLE, OF GAINESVILLE, FLORIDA.

MEDICATED FOOD PRODUCT.

1,120,330. Specification of Letters Patent. **Patented Dec. 8, 1914.**

No Drawing. Application filed June 18, 1914. Serial No. 845,793.

To all whom it may concern:

Be it known that I, IRA D. ODLE, citizen of the United States, residing at Gainesville, in the county of Alachua and State of Florida, have invented certain new and useful Improvements in Medicated Food Products; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to medicated food products or palatable therapeutical preparations, its prime object being to provide a palatable and readily stored medium for introducing bacteria into the human system.

It has long been known that certain bacilli when introduced through the stomach will propagate within the digestive organs of the body and will act as germicides for destroying the toxins tending to produce digestive disorders. Such a therapeutic action has been particularly noted in connection with lactic acid bacilli, such as the *Bacillus Bulgaricus* studied by Professor Metchnikoff, which readily propagates in the alimentary tracts and acts as an effective germicide for preventing auto-intoxication and the like. Such bacilli have heretofore been introduced into the system as constituents of liquids of the order of butter-milk, the preparation of which liquids required conditions not always available, and which liquids could be kept only for very limited periods of time. Moreover, the liquids thus prepared are not palatable to those who have no fondness for the taste of butter-milk and will not permit of being flavored to suit various tastes.

The prime objects of my invention are to provide a food product which will act as a carrier for introducing such bacilli into the digestive tracts of the body, which may easily be stored and kept for a considerable length of time, and which may be varied in flavoring so as to make it palatable to persons of widely varying tastes. I accomplish these objects primarily by mixing a suitably concentrated culture of the desired bacilli with cream and freezing the mixture after the customary manner to make ice cream, which ice cream may be suitably flavored either before or after the freezing process.

In carrying out my invention, I preferably start with a pure culture which may be obtained on the market in liquid form, or with bacillary tablets as also obtainable on the market. This initial culture is grown in one quart of sterile skimmed (or practically fat free) milk at a temperature of approximately 37° C., the incubating being continued until an acid value of 3.8 to 4 per cent. is reached. The liquid is then mixed with at least as large a quantity of sterile, fat free milk, after which it is incubated again until it shows an acid value between 2.8 and 3, the acidity being readily determined by titrating a sample of the liquid with sodium hydroxid, preferably using a $\frac{1}{10}$ normal solution. When the culture liquid has reached this desired degree of acidity, it is cooled to a temperature of from 5 to 0 degrees C., at which temperature the liquid may be kept as a stock culture. However, if this stock solution is kept for some time, it should be tested frequently as a check on the gradual decrease of its bacterial content, which latter can be restored to its proper value by adding sterile and substantially fat free milk and again incubating. I preferably use five gallon tanks for the storage for the stock solution, as I have found them more satisfactory than tanks of larger size. The tank used should preferably be equipped with means for stirring the liquid to effect a uniform distribution of the bacteria and it should have a faucet at the bottom for enabling the liquid to be drawn off as needed. The stirring may be effected by supporting the entire tank in such a manner that it may be swung or churned back and forth. As the final step in preparing my medicated food product, I add the stock culture (prepared as above) to pasteurized cream and thereupon freeze the cream after the usual manner to produce ice cream. The proportions of the pasteurized cream and the standard stock culture may be varied according to the bacterial content desired in the resulting product; that is to say, one volume of the stock culture may be added to from 1 to 20 volumes of the cream. If the proportion of stock culture to the cream is relatively large, some of the flavors commonly used with ice cream (any of which flavors may be added before the cream admixed with the stock culture is frozen) may not eliminate the acid taste. In this case, I preferably add a small amount of lime to neutralize the acid, although I have found that this usually will not be necessary when the acidity of the mixture of cream and stock culture does not exceed 2.

When the culture-laden ice cream has been prepared as above, the bacteria in the same are practically dormant and will decrease in number very slowly. Consequently, the medicated food product of my invention may be stored for a considerable period of time without appreciably losing its therapeutic value. However, as soon as the ice cream is eaten and melted by the warmth of the body, the bacilli contained therein will propagate rapidly and particularly so as the cream forms an excellent medium for their growth. It will be evident that by varying the flavor used in the manufacture of the ice cream, or by adding suitable flavoring matter to the ice cream when it is being served, the taste can be varied so as to make my food product palatable to practically everyone. It will also be evident that other bacteria besides the Bulgarian lactic acid bacilli above mentioned may be used and that the preparation may be varied in numerous details without departing from the spirit of my invention. For example, the incubating of the original culture may be done at a somewhat higher temperature, although I prefer not to have this temperature exceed 40° C. It will also be evident that if any putrefactive bacteria should be present in the cream to which the stock culture is added, the lactic acid formed during the incubation of the stock culture will act as a germicide to prevent their development. Consequently, there will be no danger of the propagation of such bacteria as streptococci, which grow better at low temperatures than at a high temperature and which must, therefore, be checked by a germicide, the effect of which latter will not be detrimental when taken into the body. Consequently, my invention simultaneously provides a check for impurities in the cream (although the latter is preferably pasteurized before being mixed with the stock culture) and also provides a germicide which will readily become active within the digestive tracts of a person eating this palatable food product.

While I have described my food product as comprising a culture-laden ice cream, it will be evident that other frozen confections (such as sherbets or water-ices) may be similarly medicated by mixing a culture of bacteria with the ingredients thereof before freezing the latter. However, I preferably use my invention in connection with ice-cream as the cream after being eaten affords a better medium for the propagation of the bacteria within the digestive system.

I claim as my invention:

1. The medicated food product comprising a frozen confection containing a culture of lactic acid bacilli, the said culture being mixed with the ingredients of the confection before the freezing of the latter.

2. The medicated food product comprising a frozen confection containing a culture of bacteria and a sufficient quantity of lime for approximately neutralizing the acidity of said culture, the said culture and lime being mixed with the ingredients of the confection before the freezing of the latter.

3. The medicated food product comprising ice cream made by freezing cream admixed with a culture of lactic acid bacilli.

4. The medicated food product comprising ice cream made by freezing cream admixed with a culture of lactic acid bacilli, and with a sufficient quantity of lime for neutralizing the acidity of the said culture.

5. The medicated food product comprising ice cream containing a dormant culture of lactic acid bacilli capable of being propagated in the cream to which the said ice cream is molten by the body warmth of the eater of the ice cream.

6. The medicated food product made by incubating bacteria in substantially fat free milk to an acidity not exceeding about four per cent., mixing the resulting culture with additional fat free milk, incubating the mixture, stirring the said mixture into at least as large a volume of cream, and thereafter freezing the resulting mixture.

7. The medicated food product made by incubating lactic acid bacilli in a gradually increased quantity of substantially fat free milk, mixing the resulting culture with cream, and thereafter freezing the said mixture.

In testimony whereof I have signed my name in presence of two subscribing witnesses.

IRA D. ODLE.

Witnesses:
R. R. SELLERS,
C. A. MARTINI.

1,125,692 Milk

UNITED STATES PATENT OFFICE.

JOSEPH MOSES WARD KITCHEN, OF EAST ORANGE, NEW JERSEY.

METHOD FOR THE UTILIZING OF SKIM-MILK AND IN MILK COMPOSITION.

1,125,692. Specification of Letters Patent. **Patented Jan. 19, 1915.**

No Drawing. Application filed January 9, 1913. Serial No. 740,963.

To all whom it may concern:

Be it known that I, JOSEPH MOSES WARD KITCHEN, a citizen of the United States, residing in the city of East Orange, county of Essex, State of New Jersey, have invented a new and Improved Method for the Utilizing of Skim-Milk and in Milk Composition.

The object of this invention is to so treat skim milk as to make of it a part of a nutritively well balanced form of healthful food for human beings in convenient practical form to use in commerce.

It is common practice to admix fluid skim milk and corn meal or other cereals in such balanced proportions as to render the composition nutritively desirable for feeding domestic animals; but the large water content in skim milk and its tendency to quickly deteriorate from fermentations, deprives large human populations of the advantages of using such food compositions. Furthermore, the fact of having had the butter fat removed from skim milk renders it not only unpalatable, but also ineffective from a nutritive point of view. Nevertheless, if skim milk is properly dehydrated and used in admixtures containing fatty constituents, and perhaps other constituents, it makes a very valuable food for human beings.

In view of the now recognized fact that certain of the protein constituents of maize are more or less lacking in nutritive availability, the desirability of adding to maize an available nutritive protein like skim milk that has not undergone marked chemical change from high heat, will be obvious. It should be noted that there are physiological virtues in milk that are not calculable as equivalents in the ordinary terms for energy or nutrition that are applicable to other foods. The skimming of fat from the milk in no way damages it for food so far as its protein, sugar, mineral salts and other nutritive constituents are concerned.

In carrying out my inventive idea, I do not confine myself to any special method of dehydrating skim milk and of making compositions therefrom. The general idea is to remove a sufficient amount of water from it and to secure through other food additions, a sufficient content of constituents that in the aggregate comprises sufficient fat to replace so far as is dietically desirable as much of the fat that has been skimmed from the milk as may be nutritively desirable. I also, in my idea of utilizing skim milk, may introduce constituents other than fats, such as starchy and flavoring matters.

It is obvious that the general idea of the invention may be carried out by mixing various constituents with a fluid skim milk, and then drying and pulverizing the mixture, or, by drying and pulverizing the ingredients separately and admixing such constituents in desired proportions.

The manner in which I carry out the purpose of the invention may be an important feature of the invention. Some methods are better than others. It is old to make compositions of whole milk and cereals; and to dry and pulverize such compositions, as through for example; the complicated method of making a dough of milk and meal, baking it, drying it and pulverizing the baked product. This method is too costly and unsatisfactory as to economic and dietary results. Another way is to mix a cereal with milk and then dehydrate the mixture to dryness and finally pulverize the dried product. This process is not very satisfactory inasmuch as the cereal becomes more or less dissolved in the milk, and a very hard horny mass is produced which is difficult to grind and which is difficult to digest. To overcome these defects, I may adopt several other methods. For example: I dry and pulverize skim milk separately and apart from any other food principle, by any known method, or by a special method that I have devised. I then add a definite proportion of the dried pulverized milk to a selected proportion of maize meal or other comminuted suitable food material such as ground chocolate or dextrinized barley, and then thoroughly admix the food constituents, which are afterward packaged. Such packages are preferably of an air and moisture proof character, and preferably, are subjected to a sterilizing heat after their sealing. Sometimes I double-seal the packages against external decomposing influences. Sometimes I use a paper package, and sometimes a hermetically sealed metal package, as in case of a condensed composition of skim milk and chocolate. In the latter instance, I merely condense the skim milk and add chocolate to it either before, during or after the condensing process; and then can the composition in the usual way; the closed can being sterilized after the can is sealed. I may use admixtures of dried skim milk and dried chocolate powder, with or without additions of sugar or other materials. In this instance, I prefer to use a paper package prepared from stiff cardboard in packing the composition, of a square, or of a rounded form. It should be noted here, that dried whole milk does not keep as well as dried skim milk, because of decompositions of the fat which occur in the whole milk. If, however, the fat is closely associated with the vegetable substance in which the fat originates, the objection as to poor keeping quality in the composition is overcome, the contained fat not becoming disassociated until after the composition is moistened and heated during its preparation for consumption. The original state of association protects the fat from oxidizing processes, and perhaps other decomposing activities.

I usually aim to secure the elimination of most of the water from skim milk by some process which leaves the dried milk and admixed other constituents in the form of dry powder or fine granules; the admixed constitutents being added either during the process of drying the milk or after its drying, and being of nutritive matters such as corn meal, barley, other cereals or chocolate, in sufficient quantities to secure a desirable nutritive balance to the admixture. This especially applies in connection with adding fat containing food constitutents. In carrying out any method of performing this process, it may be accomplished in any one of various ways. I may gradually add to corn meal skim milk, and heat and dry the same during the process. This method I have specifically described and claimed in my copending application, Sr. No. 814,188 filed, January 24th 1914. I may add some desirably flavored materials to the skim milk, such as chocolate, and then concentrate the several materials. If the admixed materials are reduced to a substantially dry condition, I preferably pack the same in some form of paper package that more or less prevents atmospheric infections of, and moisture from entering the package. I preferably subject any package of such compositions to sterilizing temperatures after its sealing. Inasmuch as I usually add more or less in some form of cereal to the skim milk, if the preparation is to be marketed in dry form, I preferably use a cereal that is rich in vegetable fats; but not having fat in such large proportions as to incite non-organic decomposition in the package. If I add fats that would be subject to such decompositions, I hermetically seal such packages, using preferably a metal container for th admixed ingredients. This is particular the case, if I add chocolate as an ingredie to incompletely dehydrated skim milk.

The present invention differs from th prior art inasmuch that I recognize the d sirability of preparing such compositions will have a satisfactory, nutritively well ba anced content of the several ingredient To secure my aim I perform a combined s ries of steps or processes that must be c actively carried out in full to secure m aimed for result, some of which individu steps may have been individually and sing performed in other instances but witho securing the advantage of my particul combination of steps or processes.

Subject matter is herein disclosed whic is not herein claimed; but which is claime in one or more of the following of my c pending applications, viz; that which pa ticularly relates to special methods of deh drating milk and other fluids, in Sr. N 814,188, filed Jan. 24, 1914; and that whic particularly relates to compositions of coc and skim milk, in Sr. No. 872,707, filed N vember 18, 1914.

What I claim as new is:

1. The method herein described, whic consists in, admixing pulverized cerea with dehydrated skim milk, said pulverize cereal having a fat content at least rel tively equal to the butter fat removed fro the milk in its skimming.

2. The method herein described, whic consists in, drying and pulverizing ski milk and a food material rich in vegetab fat, said material having its fat naturall associated with the other constitutents the material and being present in suitab proportion to gove the admixed materials fat content approximately equivalent to th butter fat removed from the milk.

3. As a new food product, a dry com minuted composition of skim milk an maize or Indian corn, said compound hav ing sufficient proportions of skim milk an maize therein to give the dried compositio a definite well balanced economic nutriti ratio of proteids and fats between its sever constitutents.

4. The food product herein describe which consists of an admixture of dried pu verized skim milk and ground maize, th admixture having a desired nutritive ba ance.

JOSEPH MOSES WARD KITCHEN.

Witnesses:
GEO. L. WHEELOCK,
BEATRICE MIRVIS.

Casein

1,126,429

UNITED STATES PATENT OFFICE.

RICHARD EILERSEN, OF COPENHAGEN, DENMARK.

PROCESS FOR MAKING CASEIN FROM BUTTERMILK.

,126,429. Specification of Letters Patent. Patented Jan. 26, 1915.

To Drawing. Application filed March 19, 1914. Serial No. 825,838.

o all whom it may concern:

Be it known that I, RICHARD EILERSEN, ierchant, a citizen of the Kingdom of Denıark, residing at No. 24 Kronprinsessegade, openhagen, Denmark, have invented ceriin new and useful Improvements in Procsses for Making Casein from Buttermilk, id of which the following is a specification.

Hitherto all casein has been made from kimmed milk only, and it has up to now een considered impracticable to make casein om buttermilk. Now, however, it has been ccessfully done to make casein from butrmilk by the following process: The butrmilk is heated to 40–65 C., and is left a w hours until the curd has separated from ie whey; then the whey is drawn off and ie curd is washed with cold water, and cold ater is added (while stirring) to such an tent, that the original quantity is again btained. To this liquid is added enough carbonate of soda to dissolve the casein, id this solution is now run through a separator; thus the liquid is divided into three irts; the butterfat of the buttermilk is mply skimmed off through the cream pipe the separator; the dissolved casein flows it through the other pipe of the separator id the albumen is thrown against the des of the separator and clings there, and taken out in thick cakes or layers. The ssolved casein is then precipitated by muriatic acid and washed with cold water; then it is pressed and dried.

I claim as my invention:

1. The process of producing casein from buttermilk consisting in separating the whey and curd by the application of heat, washing the curd with cold water, adding sufficient cold water to replace the separated whey, dissolving the casein by an alkali bicarbonate, separating the casein solution, precipitating the casein by a mineral acid, and washing the precipitate with cold water.

2. The process of making casein from buttermilk consisting in heating the buttermilk to 40–65 C., separating thereby the whey from the curd, drawing off the whey, washing the curd with cold water, adding a quantity of cold water equivalent to the separated whey, dissolving the casein by the addition of a sufficient quantity of bicarbonate of sodium, eliminating the butter fat and separating the albumen, adding muriatic acid to the remaining solution to precipitate the casein, and washing the precipitate with cold water.

In testimony whereof, I affix my signature, in presence of two witnesses.

RICHARD EILERSEN.

Witnesses:
MARCUS MOÉLLER,
VRYGO C. EBERTT.

1,126,734

UNITED STATES PATENT OFFICE.

ANDREW A. DUNHAM, OF BAINBRIDGE, NEW YORK, ASSIGNOR TO CASEIN COMPANY OF AMERICA, A CORPORATION OF NEW JERSEY.

DESICCATED MILK PRODUCT AND PROCESS FOR PRODUCING SAME.

1,126,734. Specification of Letters Patent. **Patented Feb. 2, 1915.**

No Drawing. Application filed April 16, 1914. Serial No. 832,172.

To all whom it may concern:

Be it known that I, ANDREW A. DUNHAM, a citizen of the United States, residing at Bainbridge, in the county of Chenango and State of New York, have invented or discovered certain new and useful Improvements in Desiccated Milk Products and Processes for Producing Same, of which the following is a specification.

This invention has for its object the production of a food or medicinal composition consisting of sodium glycerophosphate, or other suitable glycerophosphate, admixed with or in combination with the solid constituents of whole or skim milk; that is to say, admixed with or in combination with casein, lactose, albumen, butter fats (where whole milk is used) and the salts which constitute the so-called solid constituents of milk, the composition to be used for food or medicinal purposes. In speaking of milk in the paragraphs following I refer either to whole milk, skim milk or to a combination of both.

Numerous processes and products have heretofore been known in which albuminous substances, like the proteids of corn, wheat, etc., have been treated in various ways with sodium glycerophosphate to produce a product in an easily assimilable form. So far, however, as is known to me no one has produced a dry food composition consisting of sodium glycerophosphate, or any other suitable glycerophosphate, admixed with or in combination with the solid constituents of milk.

In carrying out my invention I prefer first to evaporate the milk to a heavy condensed form, that is to about 15 degrees Baumé. This can be done in a vacuum pan or any other suitable receptacle for evaporation, and the resulting condensed milk is then treated with sodium glycerophosphate or any other suitable glycerophosphate. Now to about 95 parts of the condensed milk I add preferably about five parts of sodium glycerophosphate, figured on a dry weight basis of the milk. The sodium glycerophosphate is thoroughly incorporated with the milk and the mixture is then dried by any suitable means. The resulting product is quite palatable and is perfectly soluble in cold water. The sodium glycerophosphate does not coagulate the casein in the milk, even though the sodium glycerophosphate used reacts acid to litmus.

This novel product has a very distinct advantage over other compositions containing a glycerophosphate and albuminous substance, because the product is palatable, easily soluble and may be easily assimilated.

Instead of adding the sodium glycerophosphate to condensed milk a small percentage thereof may be thoroughly mixed with dried milk, or milk powder, if desired, to produce the novel food product. Instead of sodium glycerophosphate, any other suitable glycerophosphate may be employed, meaning by "suitable" a glycerophosphate which when thoroughly incorporated with milk and the mixture dried, or when admixed or combined with the solid constituents of milk, will produce a product that will be palatable, easily soluble and easily assimilated, and which possesses food and medicinal values.

While it is preferred to combine about five per cent. of the glycerophosphate with the dry constituents of the milk, in producing the novel food or medicinal product, it will be understood that this percentage of the glycerophosphate may be varied to suit different conditions.

Having thus described my invention or discovery I claim and desire to secure by Letters Patent:

1. The herein described process for producing glycerophosphate milk powder, consisting in thoroughly mixing a glycerophosphate with milk on a basis of about five parts of the glycerophosphate to about ninety-five parts of the solid constituents of the milk, and then drying the mixture to solid form.

2. The herein described process for producing sodium glycerophosphate milk powder, consisting in thoroughly mixing sodium glycerophosphate with milk on a basis of about five parts of the sodium glycerophosphate to about ninety-five parts of the solid constituents of the milk, and then drying the milk to solid form.

3. The herein described process for producing a glycerophosphate milk powder, consisting in first condensing the milk to about 15 degrees Baumé, then thoroughly

incorporating a glycerophosphate with the condensed milk in a proportion of about five parts of the glycerophosphate to about ninety-five parts of the solid constituents of the milk, and then drying the mixture to solid form.

4. The herein described process for producing sodium glycerophosphate milk powder, consisting in first condensing the milk to about 15 degrees Baumé, then thoroughly incorporating sodium glycerophosphate with the condensed milk in a proportion of about five parts of the sodium glycerophosphate to about ninety-five parts of the solid constituents of the milk, and then drying the mixture to solid form.

5. A food or medicinal product consisting of desiccated milk containing a small percentage of a glycerophosphate.

6. A food or medicinal product consisting of desiccated milk containing a small percentage of sodium glycerophosphate.

In testimony whereof I affix my signature, in presence of two witnesses.

ANDREW A. DUNHAM.

Witnesses:

CARLTON CRUMB,

L. A. STEVENS.

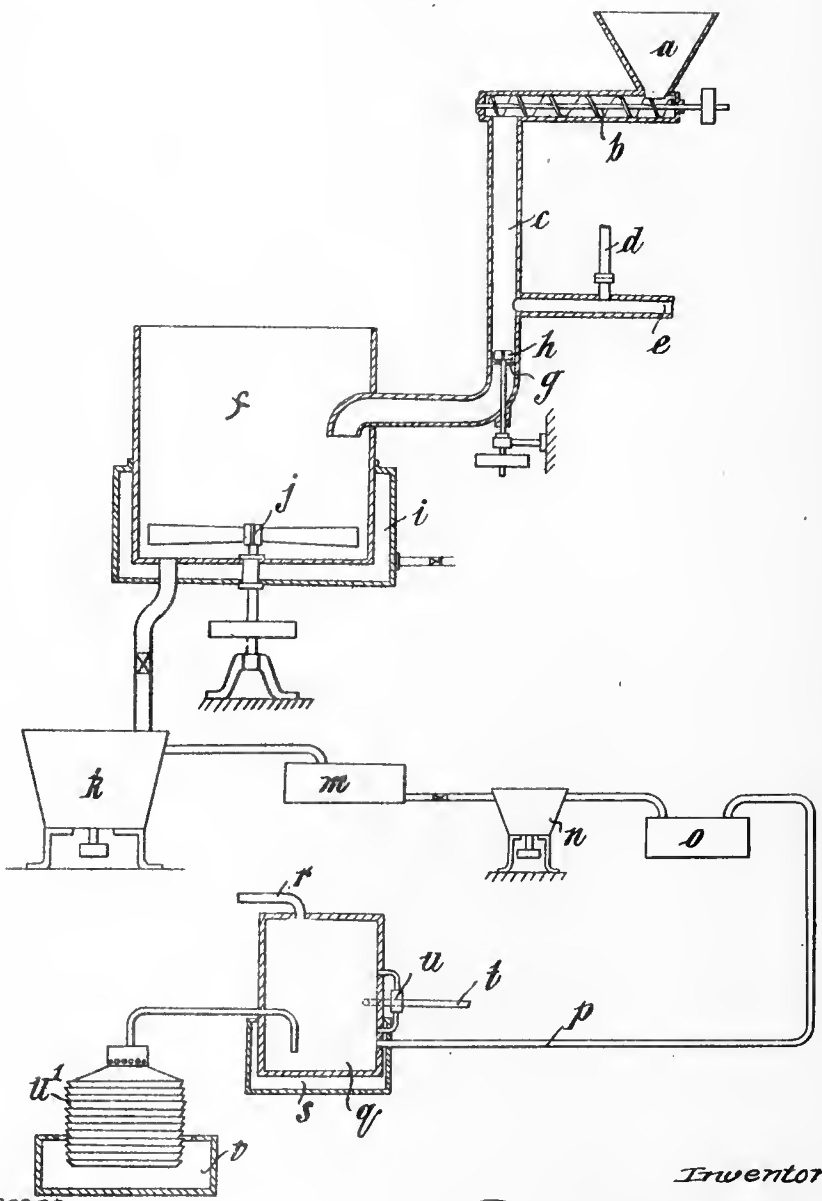
May, 1915

F. GÖSSEL.

MANUFACTURE OF ARTIFICIAL MILK.

APPLICATION FILED MAY 5, 1914. RENEWED MAR. 25, 1915.

1,139,031. Patented May 11, 1915.



Witnesses:
S. V. Caffrey
George McDaniel

Inventor
Fritz Gössel
by
K. P. McElroy
Atty.

UNITED STATES PATENT OFFICE.

FRITZ GÖSSEL, OF FRANKFORT-ON-THE-MAIN, GERMANY.

MANUFACTURE OF ARTIFICIAL MILK.

1,139,031. Specification of Letters Patent. **Patented May 11, 1915.**

Application filed May 5, 1914, Serial No. 836,426. Renewed March 25, 1915. Serial No. 17,051.

To all whom it may concern:

Be it known that I, Fritz Gössel, citizen of the German Empire, residing at Frankfort-on-the-Main, Germany, have invented certain new and useful Improvements in the Manufacture of Artificial Milk, of which the following is a specification.

This invention relates to the manufacture of artificial milk from vegetable seeds or beans in a manner similar to that described in my prior Patent 1082118 patented December 23rd, 1913. The present invention is directed to a process of manufacturing such an artificial milk in a cheap and effective manner.

In manufacturing artificial milk from the soy bean, it is sought first of all to obtain an extract containing the ingredients of the bean which resemble the components of milk. In the manufacture of any particular kind of milk the next step is to add to and emulsify with this extract any other ingredients as may be lacking therein. By the present method it is possible to obtain a highly nutritious and pleasant tasted milk in which the albumins and fats are very finely divided and perfectly emulsified; and the milky product may at pleasure be varied to simulate various natural milks.

In the following description while I shall refer more specifically to the use of soy beans, it will be understood that the other seeds, and mixtures of seeds, referred to in said patent may be used in the same way. The beans are washed, decorticated and then ground into a fine flour. In practice the flour should be fine enough to pass through a 100 mesh sieve, as the fineness of the flour improves the efficiency of the extraction. If a coarser flour is used then a relatively greater quantity must be employed to get the same strength or concentration in the extract.

In the accompanying illustration I have shown more or less diagrammatically, partly in vertical section and partly in elevation, an organization of apparatus elements which may be usefully employed in the hereindescribed process.

In this showing, element a is a hopper or receptacle for fine flour. Communicating with it is a screw conveyer b leading to chute c. Communicating with this chute are a water pipe d and steam pipe e. Within the chute is a rubbing and mixing device composed of a sieve g provided with rotating brush h. The chute feeds to mixer f heated by a steam jacket i. The mixer is provided with a stirrer j run by any suitable power. Communicating with this mixer is a centrifugal separator k. This centrifugal separator discharges liquid into cooling tank m. Liquid may be taken from this tank to a centrifugal device of the general type of a cream separator n. Liquid treated in this separator passes to tank o. From this tank it passes through pipe p to emulsifier q. Vacuum may be produced in this vessel by a pipe r communicating with any suitable vacuum producing means. The emulsifier is provided with a steam jacket s, an inlet t for oil or fat and a sight gage u. A glass window may also be used. From the emulsifier the material may pass via cooler u' into a storage tank v whence it may be withdrawn by any suitable means and packaged in any suitable manner.

The soy bean, as well as other analogous seeds, varies in composition and in the solubility or ease of extraction of the albumin and fats. There is a variation also with the age of the bean or meal. For the purpose of facilitating extraction, it is best to add phosphate of soda or a similar substance in small quantities.

In a specific embodiment of my process using the apparatus described, I first feed the fine flour from a by means of b to element c. In c the flour is mixed with water and brought into the form of a thin paste. The water entering by pipe d may be tempered by steam from pipe e so that it contacts with the flour at a temperature of about 90 to 95° C. The water used should be as pure as possible and is preferably boiled and cooled before entering through pipe d. Presuming that about 100 liters of milk are to be made in an operation, the quantity of flour fed in may be 10 kilograms. If the flour is sufficiently fine the quantity of water may be 100 liters. With this quantity about 5 grams of phosphate of sodium will be sufficient where the bean flour is of the ordinary freshness. The "aging" or deteriorating action proceeds more quickly on flour than on the bean and for this reason the flour should always be used as soon after grinding as may be. The thin paste in c is best well rubbed down before going to the mixer f. For this purpose sieve g and rotating brush h are convenient. The pasty material passing to f is kept therein until the extraction is sufficiently complete. As a rule the temperature should be about 95° C. and ordinarily extraction will be complete in about an hour. While the soy bean flour of course varies, it may be assumed to have a composition about as follows:

Albumin	43	per cent.
Fats and fatty acids	22	" "
Carbohydrate	21	" "
Salts	5.5	" "
Cellulose and fiber	8.5	" "
	100.0	

Using a kilo of flour with 10 liters of water, with the usual degree of extraction (which is of course never absolutely perfect) it may be assumed that with material of this analysis the liquid in the mixer will contain on an average about—

Albumin	3.7	per cent.
Fats, fatty acids	2.0	" "
Carbohydrate	1.8	" "
Salts	0.5	" "

The liquid in the mixing device of course contains a solid residue in addition to the materials which have gone into solution. This must be separated, which may be conveniently effected in the centrifugal separator *k* shown. Care should be taken that no solid matter emerges with the liquid. The liquid leaving the centrifugal and passing into tank *m* should be cooled down; best approximately to room temperature. It is often advisable to reduce the quantity of oil or fat in the liquid, thereby reducing the particular flavor of the soy bean. This separation or partial separation of fat may be effected in the separator *n* shown. The liquid leaving this separator and having its content of fat and oil reduced to the desired degree is the raw material for the manufacture of milk. This milk in the present process now has its composition adjusted to simulate more nearly a natural animal milk. For this purpose it is ordinarily necessary to add additional materials. The amounts to be added will in all cases depend on the degree of concentration of the extract and on the amount of fats or fatty acids removed in the separator *n*. If we assume that 1 per cent. of fats still remain in the liquid and it is desired to produce a milk containing say 3.5 per cent. of fats, then in the case under consideration 2.5 kilos of any suitable fat or oil or mixture of fats or oils may be added. The other ingredients to be added may be calculated the same way. The ingredients usually added are soluble carbohydrates (sugars), sodium chlorid, and carbonate of sodium or the like. With material such as just described about 2.4 kilograms of carbohydrate may be added, with 6 grams of sodium chlorid and 60 grams of carbonate of sodium.

The choice of the fat to be used and also of the carbohydrate is determined by the nature of the product desired. If a thick creamy liquid is desired, a thick or heavy oil is used, such as cocoanut oil. If a thinner product is required a thinner oil or mixture of oils is used, such as sesame oil. The carbohydrate, or carbohydrate material, used depends on the flavor and other properties desired. Cane or beet sugar, milk sugar, malt extract, etc., may be used. If it is desired to produce a milk which will not discolor on heating, malt extract is avoided and milk sugar or beet or cane sugar is used or any mixture of these. Choice as regards flavor, etc., of oil or carbohydrate must of course in every case be made according to the results required and this also applies to the addition of any flavoring or bacterial culture which may be added. The added ingredients are thoroughly admixed and emulsified with the liquid in *q*. Emulsification may be under either pressure or vacuum; and is advantageously under vacuum. While ordinary types of emulsifying apparatus in which liquids are passed at a high pressure through narrow tortuous passages, etc., may be used, I regard as advantageous a simple type of apparatus using vacuum, such as is illustrated. In the emulsification it is advantageous to provide some degree of vacuum prior to introducing the liquid from tank *o*. During emulsification, the temperature may be maintained at from 35 to 40 C. At this temperature under vacuum the liquid may be boiled with a production of some vapors. It is best to add the oils and other ingredients during the emulsification rather than prior thereto (in vessel *o*), using for this purpose introductory means *t*. The added material should enter the emulsifier at about the same temperature as prevails therein or at a little higher temperature. Ebullition may be continued until complete emulsification is reached. Conditions in the emulsifier should be carefully watched and kept constant. A temperature of about the degree indicated gives very good results. When the liquid circulating within the emulsifier shows no visible indications of fatty globules or particles and is of a uniform nature, emulsification may be regarded as completed. The conditions should be carefully watched and kept constant and the temperature according to my experience hitherto, should be also kept about the degree indicated above. A glass window or glass tube *u* should be provided in the tank *q* to facilitate observation. When the liquid passing the glass shows no signs of fatty globules or particles and is of a uniform nature, emulsification is completed. After the emulsification the liquid should be quickly cooled, as by the device *u'* shown. The liquid finally collected in storage tank *v* will of course be less than 100 liters, (operating in the described manner) since more or less vapor will be drawn off in producing the vacuum. Sufficient pure water may therefore be added to the milk to bring the volume back to 100 liters. The milk is now ready for consumption or use in cooking, baking, or the manufacture of the usual milk products.

If desired pure cultures of suitable bacteria such as the organism known as *B. lactis acidi* or *B. massal*, may be added to the milky material.

What I claim is:—

1. The method of manufacturing artificial milk from vegetable beans which comprises making an extract of such beans with hot water at a temperature below 100° C. of those ingredients suitable for making milk, removing undissolved substances from said extract and adding to and emulsifying with the extract fats, sugars and the like while maintaining the extract under as constant condition of temperature and pressure as possible.

2. The method of manufacturing artificial milk from vegetable beans which comprises making a water extract from beans in a finely divided form, of the albumins, fats, carbo-hydrates and salts contained therein, separating said extract completely from the residue of the beans and adding to the extract and emulsifying therewith fats, sugars and the like, said emulsification being effected under constant conditions of temperature and pressure.

3. The method of manufacturing artificial milk from vegetable beans which comprises making a water extract from such beans in a finely divided form, of the albumins, fats and carbohydrates and salts, separating said extract completely from the residue of the beans, removing a portion of the fats, and adding to the extract and emulsifying therewith additional fats, sugars and the like, said emulsification being effected under constant conditions of temperature and pressure.

4. The method of manufacturing synthetic milk from vegetable beans consisting in making an extract in water of the nutritive constituents of said beans, eliminating fatty matter from said extract and adding to and embodying with the resulting product such materials as are required to make its composition approximate that of milk.

5. The method of manufacturing artificial milk from vegetable beans which comprises treating fine flour of the bean with pure hot water and intimately mixing said flour and water at a temperature below the boiling point, retaining said flour and water in paste form and hot for a time, completely separating the liquid extract from the residue, removing a portion of the fats in said extract, and emulsifying fats with said extract at a temperature of about 40° C.

6. In the manufacture of artificial milk from vegetable beans, the process which comprises making an extract of the bean containing the fats, albumins and other constituents in finely divided form, introducing additional fats and other constituents of milk to said extract at approximately the same temperature as the extract itself and emulsifying said extract and fat under constant conditions of heat and pressure.

7. In the manufacture of artificial milk from vegetable beans, the process which comprises making an extract of the bean containing the fats, albumins and other constituents in finely divided form, passing said extract into an evacuated vessel and maintaining the same at a temperature of about 40° C., adding fat at about the same temperature and maintaining the vacuum and temperature so that the liquid is in a constant state of ebullition until emulsification is complete.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRITZ GÖSSEL.

Witnesses:
LYON HARRIS,
JEAN GRUND.

Milk

1,143,516

UNITED STATES PATENT OFFICE.

BURT E. DUNN, OF MUNCIE, INDIANA, ASSIGNOR TO DUNN'S WHOLE MILK BUTTERMILK COMPANY, INC., OF MUNCIE, INDIANA, A CORPORATION OF INDIANA.

METHOD OF MAKING A WHOLE-MILK PRODUCT.

1,143,516. Specification of Letters Patent. **Patented June 15, 1915.**

No Drawing. Application filed August 11, 1914. Serial No. 856,238.

To all whom it may concern:

Be it known that I, BURT E. DUNN, a citizen of the United States, residing at Muncie, in the county of Delaware and State of Indiana, have invented new and useful Improvements in Methods of Making a Whole-Milk Product, of which the following is a specification.

The present invention relates to a milk product particularly suitable for use by invalids, or other persons having weak digestion, which also will be suitable for use as a general beverage, which shall have a flavor similar to buttermilk but which production will be materially more nourishing than buttermilk since it contains all the ingredients of the whole milk. This material also will be as easy to digest as buttermilk, and on account of the fact that it contains all the fat of the original milk will be more nourishing than ordinary buttermilk.

In producing this beverage I may start with sour milk, containing up to about .6 % of lactic acid or if sour milk is not available, I may use sweet milk. In operating upon sweet milk I heat the same to a temperature of 90° F., and allow the same to stand at this temperature for ten to twelve hours, or until an acidity equal to about .6 % of lactic acid is developed.

After reaching the desired state of acidity, the milk must be at once cooled to a temperature of 45° F., since if allowed to stand at a temperature of 90° F., for a longer time, the fat would separate, in the form of butter, which would injure the product, since it would remove the fat content. The milk is then placed in a cylindrical agitator and is rapidly and vigorously agitated the agitating member being rotated at a speed of one hundred and fifty revolutions per minute for about twenty minutes, in order to produce a thorough and complete mixture of the ingredients.

Thereupon the product is ready to be placed into bottles, and iced ready for shipment and use. In this condition it will keep for several weeks, being maintained at a temperature below 45° F., during said time.

I call attention to the fact that no harmful ingredients are added to the milk at any stage, and nothing is removed from the milk, except the sugar which has been converted more or less into lactic acid.

I claim:—

1. A process of producing a nutritive milk beverage, said process comprising, maintaining untreated whole milk at a temperature of about 90° F., for ten to twelve hours, cooling said milk before separation of the butter fat occurs, to a temperature of about 45° F., and thoroughly agitating the same, while at said temperature.

2. A process of producing a milk beverage, which comprises maintaining untreated whole milk at a temperature of about 90° F., until an acidity equal to about .6 % of lactic acid has been secured, at once cooling the product to about 45° F., and thoroughly agitating, while at said temperature, in order to produce a homogeneous mixture containing all the fat of the whole milk.

In testimony whereof I affix my signature in presence of two witnesses.

BURT E. DUNN.

Witnesses:

NOAH D. BERRY,
WILL B. KOONS.

UNITED STATES PATENT OFFICE.

BURT E. DUNN, OF MUNCIE, INDIANA, ASSIGNOR TO DUNN'S WHOLE [illegible] MILK COMPANY, INC., OF MUNCIE, INDIANA, A CORPORATION OF [illegible]

METHOD OF MAKING A WHOLE-MILK PRODUCT.

1,143,516. Specification of Letters Patent. Patented June 15, 1915.

No Drawing. Application filed [illegible] Serial No. [illegible]

To all whom it may concern:

Be it known that I, BURT E. DUNN, a citizen of the United States, residing at Muncie, in the county of Delaware and State of Indiana, have invented new and useful Improvements in Methods of Making a Whole-Milk Product, of which the following is a specification.

The present invention relates to a milk product particularly suitable for use by invalids, or other persons having weak digestion, which also will be suitable for use as a general beverage, which shall have a flavor similar to buttermilk but which preparation will be materially more nourishing than buttermilk since it contains all the ingredients of the whole milk. This material also will be as easy to digest as buttermilk, and on account of the fact that it contains all the fat of the original milk will be more nourishing than ordinary buttermilk.

In producing this beverage I may start with sour milk containing up to about .6 % of lactic acid or if sour milk is not available, I may use sweet milk. In operating upon sweet milk I heat the same to a temperature of 90° F., and allow the same to stand at this temperature for ten to twelve hours, or until an acidity equal to about .6 % of lactic acid is developed.

After reaching the desired state of acidity the milk must be at once cooled to a temperature of 45° F., since if allowed to stand at a temperature of 90° F., for a longer time, the fat would separate, in the form of butter, which would injure the product, since it would remove the fat content. The milk is then placed in a cylindrical agitator and is rapidly and vigorously agitated, the agitator [illegible]

[illegible]

A. J. DAVIS.

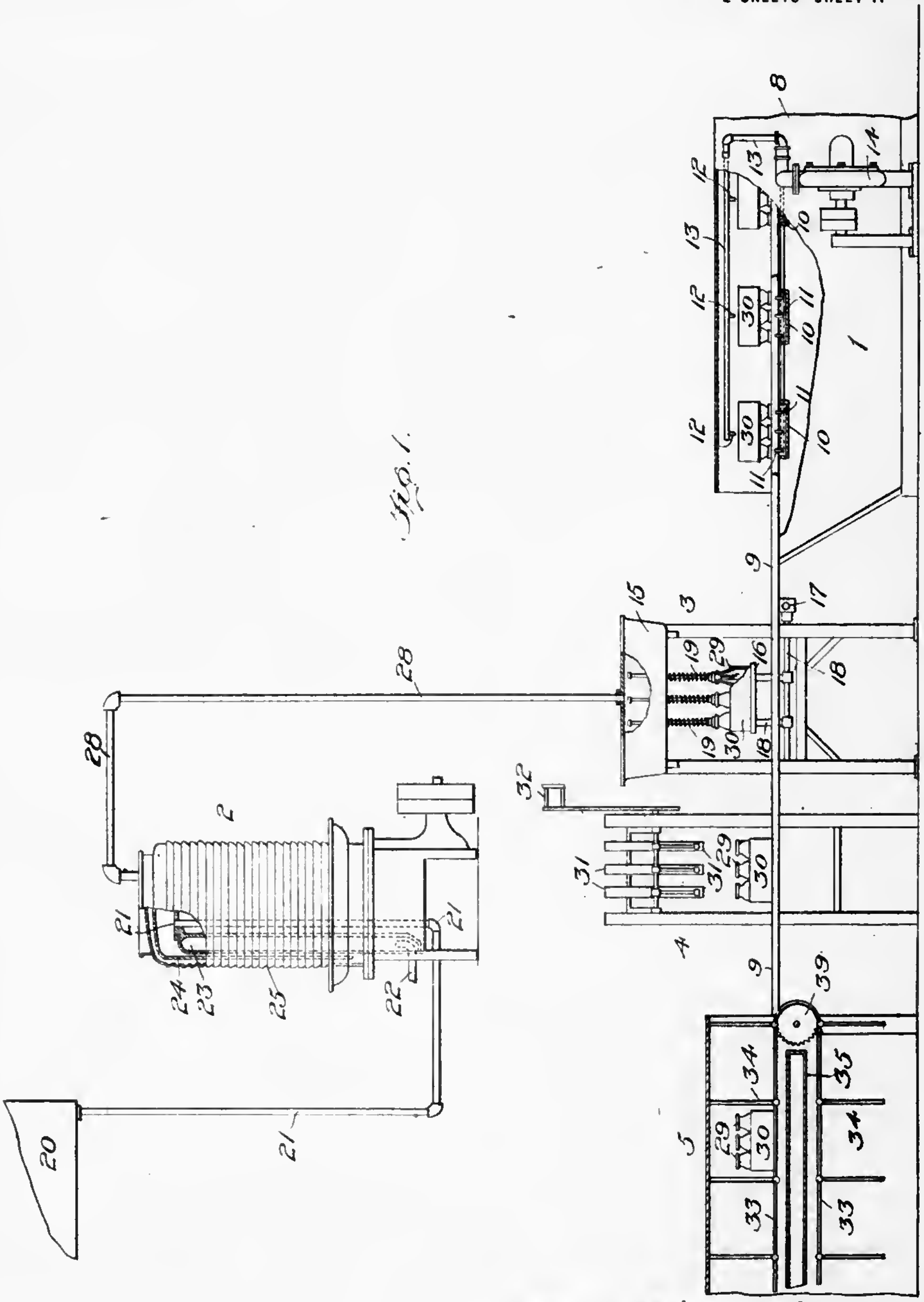
METHOD OF PRESERVING MILK AND MILK PRODUCTS.

APPLICATION FILED DEC. 18, 1911.

1,157,976.

Patented Oct. 26, 1915.

2 SHEETS—SHEET 1.



Witnesses.

John O. Gempler

A. Daly

Albert J. Davis Inventor

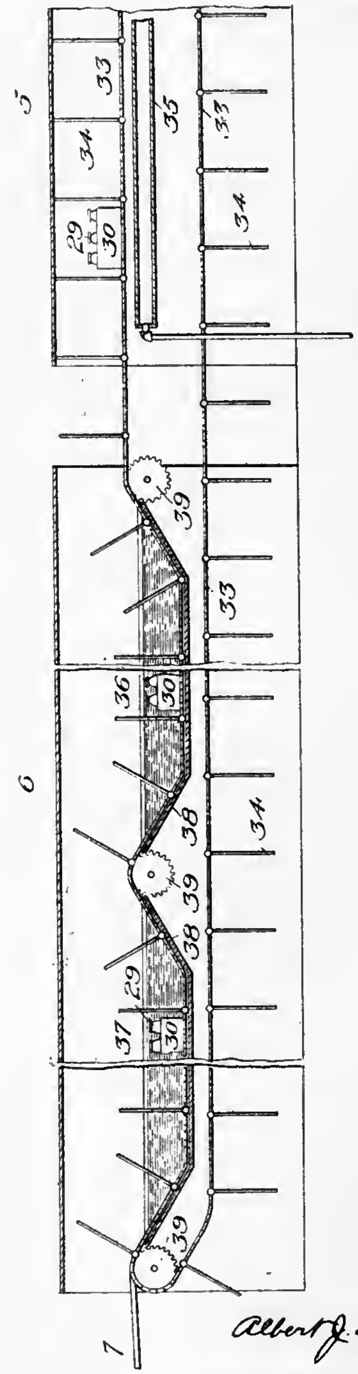
By his Attorneys

Kenyon & Kenyon

A. J. DAVIS.
METHOD OF PRESERVING MILK AND MILK PRODUCTS.
APPLICATION FILED DEC. 18, 1911.

1,157,976. Patented Oct. 26, 1915.
2 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
John O. Gempler
A. Daly

Albert J. Davis Inventor

By his Attorneys
Kenyon & Kenyon

UNITED STATES PATENT OFFICE.

ALBERT J. DAVIS, OF NEW YORK, N. Y.

METHOD OF PRESERVING MILK AND MILK PRODUCTS.

1,157,976. Specification of Letters Patent. Patented Oct. 26, 1915.

Application filed December 18, 1911. Serial No. 666,535.

To all whom it may concern:

Be it known that I, ALBERT J. DAVIS, a citizen of the United States, and a resident of the city, county, and State of New York, have invented a Method of Preserving Milk and Milk Products, of which the following is a specification.

The principal objects of my invention are to preserve milk and milk products for as long a time as possible, and without materially changing their character except by the removal of the injurious bacteria from the products.

Another object of my invention is to remove all bacteria and other elements that are injurious to health from the milk or milk products, and to prevent the admission of said elements to the products for as long a time as possible, but without materially changing their character.

My invention consists in subjecting the milk or milk products to a pasteurizing temperature of from about one hundred and thirty five to one hundred and sixty five degrees Fahrenheit (135° to 165° F.), introducing said products at said pasteurizing temperature into clean and preferably hot bottles, jars, or other receptacles, the temperature of said receptacles at such time when hot being about or near that of said pasteurizing, then closing the receptacles while they and the inclosed products are at said temperatures. After this the closed receptacles containing the pasteurized products, may be held at said temperature for any desired time in order to insure complete pasteurization, and then allowed to cool at the ordinary temperature, or cooled in any convenient manner, as desired.

The accompanying drawing is a diagrammatic illustration of apparatus such as could be used for carrying out my invention in the treatment of milk or milk products.

Figure 1 represents a bottle washing apparatus, a milk pasteurizer, a bottle filling and stoppering machine, and one end of a device for holding the bottled milk or milk products at an even temperature, and Fig. 2 represents the other end of said device and a cooling apparatus.

The following characters represent like parts in both figures: 1 is an ordinary milk bottle washing apparatus, 2 is a milk pasteurizer, 3 is a milk bottle filling machine, 4 is a bottle stoppering machine. 5 is an apparatus for keeping milk or similar products at an even temperature, 6 is a cooling apparatus, and 7 is a table beyond said apparatus.

All of the above devices are preferably used in my improved method of preserving milk and similar milk products, and all of said devices except the pasteurizer being arranged in continuous order from the bottle washing apparatus to the final cooling apparatus and delivery table.

The bottle washing apparatus is provided with a receptacle 8 which is nearly closed, leaving room, however, for the admission to and outlet from the same of boxes or cases containing milk bottles. Extending longitudinally within and beyond said receptacle 8 is a horizontal support 9 preferably in the form of rails for supporting the boxes containing the milk bottles and guiding them thereon. This support or table 9 continues beyond the washing apparatus 1 through the bottle filling and stoppering machines and to the apparatus for keeping the even temperature, 5. Supported under the rails of the support 9 are shallow jackets 10, into which are led small outlet pipes 11. Other outlet pipes 12 are situated within the casing 8 above the support 9, and both pipes 11 and 12 are connected with supply pipes 13 from a source of hot water or other liquid supply under pressure, as, for example, from a pump 14.

15 is a receiving tank for the pasteurized milk which enters said tank from the pasteurizer hereinafter to be described.

16 is a vertically movable platform, which is adapted to be raised and lowered at will by means of bell crank lever 17, 18, the handle being shown at 17.

19 represents the ordinary spring valves that are connected with the tank 15 for the purpose of filling the milk bottles, when they are raised by the platform 16 so that the necks of said bottles will press upon the lower ends of said valves and open the same.

20 is a tank for holding the supply of milk to be treated. Extending downward from said tank is an inlet pipe 21 for the passage of the milk from the tank 20 into the pasteurizer 2.

22 is a steam inlet pipe for the introduction of steam into a steam jacket 23 surrounding the inlet pipe 21. Surrounding the outer wall of said jacket 23 is a casing 24 there being a space between said casing

and wall and a passageway at the bottom of said casing from said space outward. Outside of the casing 24 is the exterior casing 25 which is preferably corrugated, there also being a space between said two casings 24 and 25. The top of casing 24 is closed, as is also the top of the casing 25 except for the introduction of the outlet pipe 28. Both ends of the steam jacket 23 are closed, and said upper ends are also connected by a closed dome or ceiling, except for the passage therethrough of the outlet end of the pipe 21. The outlet pipe 28, as above stated passes through the closed top of the outer casing 25 and extends down into the tank 15 of the bottle filling machine 3.

29 represents milk bottles inclosed in an ordinary box or casing 30.

31 represents the vertical tubes for containing the ordinary paper or similar disk stoppers for the milk bottles, and 32 is the handle lever for forcing the same down to the bottles and inserting the disks or other stoppers.

33 is an endless carrier provided with wings or partitions 34 extending outward from the same, and for the purpose of dividing the device 5 into compartments, since said wings 34 extend to, or almost to, the top of said device 5.

35 is a jacket for hot water or steam for the purpose of keeping the device 5 and whatever is in said device of practically the same temperature as said jacket.

The cooling apparatus 6 is supplied with tanks 36, 37 for water or other liquid, said tanks being divided by a partition 38. There may be as many of these tanks as desired, but the last tank should be for cold liquid, preferably iced. The preceding tank or tanks may be of warmer water, those of each succeeding tank being for liquid colder than the preceding one. The carrier 34 is adapted to pass not only through the device 5 but through the cooling apparatus 6, and the tank or tanks of said apparatus. For this purpose I have shown the partition 38 in the form of a double incline and with the carrier 33, 34 passing through said tanks and over said incline, to the delivery table 7. There is also a decline for the carrier 33, 34 from the device 5 into the first tank 36 of the cooler 6, and there is an incline from the last tank 37 to delivery table 7. The carrier 33, 34 can be operated in any manner, as, for example, by providing it with sprocket chains passing over ordinary sprocket wheels 39.

My improved method when used with the above described apparatus is as follows: The boxes or empty bottles 29, 30 are first inserted in the receptacle 8 of the washing apparatus 1 on the rails of the support 9, over the jackets 10. The hot water is caused by the pump 14 to be forced through the pipes 11 and 12 so that the interior of the bottles and the boxes and the exterior of the same shall be completely washed and preferably heated, the hot water or steam that is injected through the pipes 11 and 12 thoroughly cleansing and heating the bottles. While this is taking place, the milk from the tank 20 passes down to pipe 21 into the pasteurizer, which heats the milk to a temperature about 135° to 165° F., preferably somewhat over 135°, to prevent too much cooling of the milk before it enters the bottles. The milk in the pasteurizer 2 is heated by the surrounding steam jacket 23, the milk passing up through the pipe 21, into the dome above the steam jacket and outside of said jacket, and then around the inner casing 24 and out of the pipe 28 into the tank 15. The boxes of bottles 29, 30 are then drawn out of the washing apparatus 1, and turned right side up upon the platform 16 of the filler 3. Said platform is then raised by the lever 17, 18 so that the outlet ends of the valves 19 enter the mouths of said bottles, and the pasteurized milk from the tank 15 enters the bottles 29. The temperature of the bottle washing machine 1 in order to produce the best results should keep the bottles up to as near as possible the temperature of the pasteurized milk that is to enter said bottles. After the bottles have been filled, the platform 16 is lowered, and the boxes of bottles 29, 30 are drawn along the rails of the platform 9 under the tubes 31 of the stoppering machine, when the disk stoppers are inserted in the necks of the bottles in the usual manner by means of the handle 32 forcing the disks or stoppers into the bottle necks. Up to this point the milk at a pasteurizing temperature has been introduced into the clean bottles when they were at practically the same temperature, and sealed. If desired, the filled bottles will then be allowed to cool naturally, or in any desired manner. The best results for insuring complete pasteurization, however, are attained by retaining the filled bottles at the pasteurizing temperature for some little time, and this can be done by passing the filled bottles 29 in the boxes 30 onto the carrier 33 between two adjacent wings 34, and then drawing the same through the device 5 over the heating jacket 35. The carrier can be operated at will as fast or as slowly as desired, or it may remain quiet for a while with the filled bottles inside the receptacle 5. In the apparatus above described and illustrated in the drawings, after the filled bottles in the boxes have been passed by the carrier out of the device 5, they are carried down into the tank of cooling liquid 36, and then pass into a tank of a still colder liquid 37 and then from said tank out upon the delivery table 7, when the bottles containing the milk are ready for sale or shipment. As above stated, the last tank 37 should be very cold and for containing iced water or some other rapidly cooling medium.

I am aware that it is old to preserve milk by sterilizing it, but this treatment entirely changes the character of the milk, in fact, it boils it. The main object to be attained in preserving milk is to still retain its original character. I have found that cold bottles or receptacles accumulate a large amount of injurious bacteria, which soon causes everything that is placed therein to spoil and renders it unfit for use. The cleaning of the bottles at a temperature of 135° to 165° F., and retaining them at this temperature while the milk at practically the same temperature is inserted therein, and then the sealing of the bottles will accomplish the purpose of preventing the admission and growth of injurious bacteria in the bottles and in the milk. When the bottles treated in the manner above described are kept at a temperature of the pasteurized milk at say from 135° to 165°, for a short time and then afterward cooled, the milk may be kept pure and fresh for a considerable length of time without any extra refrigeration or additional cooling.

I do not limit myself to the precise method above set forth, nor to the apparatus above described and shown in the drawings, as it will be evident that many changes may be made therein without departing from the spirit of my invention, or sacrificing its principal advantages.

What I claim as new and desire to secure by Letters Patent is:

1. The improved method of preserving milk and similar products consisting in pasteurizing the same, then while at its pasteurizing temperature and without intermediate treatment, introducing it into a clean heated receptacle and closing said receptacle while hot, and with the product at the pasteurizing temperature.

2. The improved method of preserving milk and similar products consisting in pasteurizing the same, then while at its pasteurizing temperature and without intermediate treatment, introducing it into a clean receptacle heated to pasteurizing temperature and closing said receptacle while hot.

3. The improved method of preserving milk and similar products consisting in pasteurizing the same, then while at its pasteurizing temperature and without intermediate treatment, introducing it into a clean heated receptacle, closing said receptacle while hot, and with the product at the pasteurizing temperature, and rapidly cooling the receptacle and inclosed product.

4. The improved method of preserving milk and similar products consisting in pasteurizing the same, then while at its pasteurizing temperature and without intermediate treatment, introducing it into a clean receptacle heated to pasteurizing temperature, then closing said receptacle, and cooling the receptacle and inclosed product.

5. The improved method of preserving milk and similar products consisting in pasteurizing the same, then while at its pasteurizing temperature and without intermediate treatment, introducing it into a clean receptacle heated to pasteurizing temperature, then closing said receptacle, then retaining the receptacle and inclosed product at substantially the same temperature for an appreciable time and then cooling the same.

6. The improved method of preserving milk and similar products consisting in pasteurizing the same, then while at its pasteurizing temperature and without intermediate treatment introducing it into a clean heated receptacle, closing said receptacle while hot, and with the product at the pasteurizing temperature and retaining for an appreciable time the receptacle and inclosed product at substantially the same temperature, and then cooling the same, for the purpose set forth.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ALBERT J. DAVIS.

Witnesses:
EDWIN SEGER,
ADAM SCHMIDT.

UNITED STATES PATENT OFFICE.

ERNST F. W. WIEDA, OF PATERSON, NEW JERSEY.

LACTEAL MIXTURE AND METHOD OF MAKING THE SAME.

1,159,455. Specification of Letters Patent. Patented Nov. 9, 1915.

No Drawing. Application filed January 25, 1915. Serial No. 4,352.

To all whom it may concern:

Be it known that I, Ernst F. W. Wieda, a citizen of the United States, residing at Paterson, in the county of Passaic and State of New Jersey, have invented a certain new and useful Improved Lacteal Mixture and Method of Making the Same, of which the following is a specification.

This invention relates to the manufacture of lacteal food products and it consists, first, in a novel method of preparing a lacteal food product in which, among other advantages, the fat globules or fat-including solid constituents shall be retained in a state of separation from each other; second, in the product of this method; third, in the method first stated, when supplemented by desiccation, thereby to produce a dried lacteal food product which will resist deterioration for a materially longer period than ordinary so-called dried milk or milk powder and the like; and, fourth, in the product of the latter method.

According to this invention, the lacteal content and some viscious innocuous substance that is soluble in water, for instance, gelatin, sugar, starch, certain gums, albumen and the like, are subjected to some operation, as emulsifying or homogenizing, whereby the lacteal content and the viscous substance are broken up each into a highly divided state and thoroughly mixed together.

This treatment has certain well defined advantages. In the first place, the product of the treatment if retained in the liquid state will have the fat globules or fat-including solid particles not only highly divided but homogeneously distributed in or thoroughly disseminated throughout the mixture and separated from each other, such particles being retained in this condition by the liquid constituent of the mixture, on account of the viscosity imparted thereto by the viscous substances, long after the time when the fat particles would otherwise agglomerate as cream. If the product of this treatment is desiccated, there is the further advantage that the resulting powder may be kept for a considerably longer period of time than ordinary milk powders; for, upon drying, each fat-globule or fat-including particle will be found to have an enveloping deposit of the substance (gelatin, sugar, starch, gum, albumen, etc.) which imparted viscosity to the liquid constituent of the mixture dried thereon and forming a protection to such particle from the deteriorating influences of the atmosphere.

If desired, a mixture of the two ingredients may first be formed and in this case the viscous substance may be introduced into the mixture either in the solid state, to be allowed to dissolve in the liquid constituent of the lacteal content, or in liquid form.

The drying of milk or other lacteal products is known to deprive the milk of certain qualities, notably its natural viscosity, so that when restored to the liquid condition its taste is flat, insipid and unnatural. My treatment has the still further advantage that when the dried product is dissolved in a suitable quantity of water to restore it to the liquid state the viscosity, and consequently the flavor, remains substantially the same as the viscosity and flavor of natural milk.

My invention will be found to possess certain other advantages, according to the nature of the product, whether liquid or dry, according to the kind of substance used to impart viscidity to the liquid with which the lacteal content is associated, and according to the specific purpose for which it is to be used. For instance, in the making of a mixture suitable for conversion by freezing into ice cream (as disclosed in my allowed application Serial No. 817,460), using, for example, sugar 8 lbs., gelatin ¼ lb., cream (20%) 6.4 qts., skimmilk 16 qts., mixing these ingredients together, and then passing the mixture through an emulsifying or homogenizing apparatus, the product is one which, when it has been converted into ice cream, is very much more free of either the gritty or granular condition, or any tendency to assume such condition on standing, than ordinary ice cream mixtures, has an unusually smooth texture and pleasing taste, and affords a considerable economy in that the "swell" or increase in bulk resulting from the freezing is greater than when ordinary ice cream mixtures are used, these qualities being attributable to the fact that, with what is known in the ice-cream maker's art as a "binder" (gelatin, in the present instance) present, the emulsification leaves the lacteal content and the binder so thoroughly broken up and uniformly distributed throughout the mixture that when the mixture is frozen and then left to stand crystallization is prevented from ensuing, and that in the freezing process the incidental agitation causes air to be incorporated in the frozen product in superior quantity due to the highly divided state of the solid constituents composed principally of butter fat.

I have desiccated a mixture such as that specifically indicated above as suitable for use in making ice cream after homogenizing or emulsifying the same, producing an ice cream powder that has great self-preserving properties, on account of the enveloping of each fat-globule or fat-including particle thereof with a coating of the substance that imparts viscosity to the mixture (sugar and gelatin) and that may be readily converted into use in a freezer by dissolving it in a suitable quantity of water.

Mixing the lacteal content and the viscous substance before emulsification is not indispensable, but it is apparent that the desired homogeneity of disposition of the fat-including particles in the product will perhaps best and certainly most simply be accomplished if this is done.

I claim:

1. The hereindescribed method of preparing a lacteal food-product which consists in breaking up a lacteal liquid and a viscous substance soluble in water each into a highly divided state and thoroughly mixing them together.

2. The hereindescribed food product containing, with a lacteal content, a viscous substance soluble in water, the lacteal content being broken up into a highly divided state and homogeneously distributed in the mixture.

3. The hereindescribed method of forming a lacteal food product consisting in preparing a mixture containing, with the lacteal content, a viscous substance soluble in water, and then breaking up the lacteal content and the viscous substance each into a highly divided state and mixing them together.

4. The hereindescribed method of preparing a lacteal food product which consists in breaking up a lacteal liquid and a viscous substance each into a highly divided state and thoroughly mixing them together, and finally desiccating the mixture.

5. The hereindescribed lacteal powder having a deposit of dried viscous substance enveloping each fat-including particle thereof.

In testimony whereof I affix my signature in presence of two witnesses.

ERNST F. W. WIEDA.

Witnesses:

JOHN W. STEWARD,

WM. D. BELL.

[illegible]

Mills

[illegible] 1915

C. F. C. KNUDSEN.

MOLDABLE MILK PRODUCT AND METHOD OF MAKING THE SAME.

APPLICATION FILED APR. 3, 1915.

1,160,086. Patented Nov. 9, 1915.

Fig. 1.

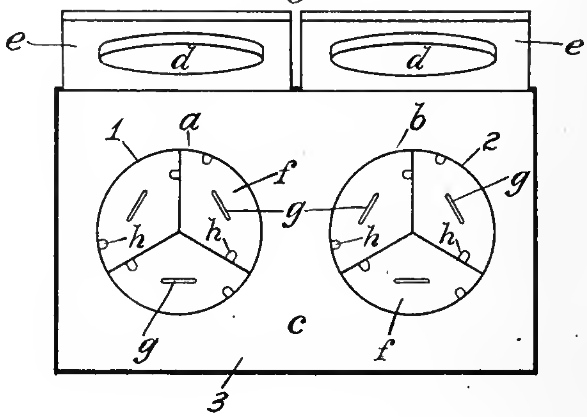
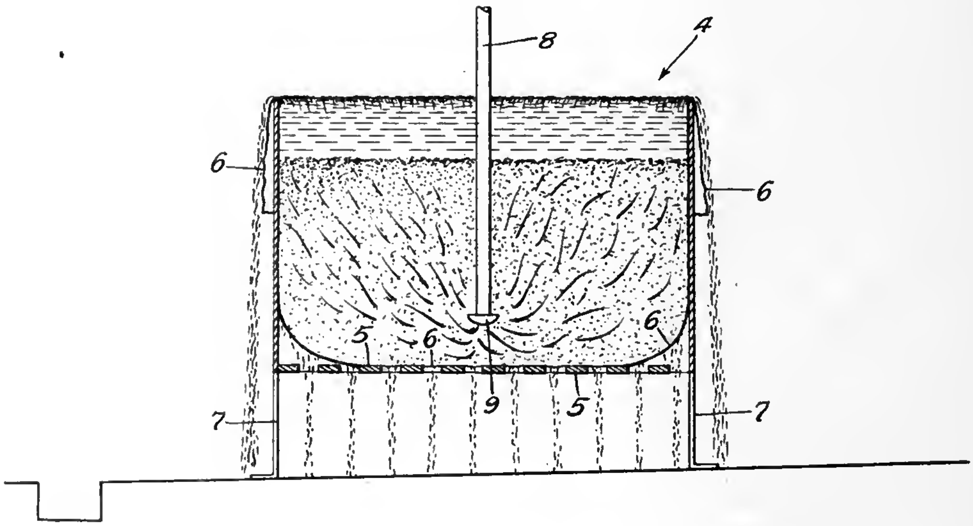


Fig. 2.



Witnesses
H. N. Kirkby
Estella Hill.

Inventor
Carl F. C. Knudsen
by James R. Townsend
his atty.

UNITED STATES PATENT OFFICE.

CARL F. C. KNUDSEN, OF LOS ANGELES, CALIFORNIA.

MOLDABLE MILK PRODUCT AND METHOD OF MAKING THE SAME.

1,160,086. Specification of Letters Patent. Patented Nov. 9, 1915.

Application filed April 3, 1915. Serial No. 19,059.

To all whom it may concern:

Be it known that I, CARL F. C. KNUDSEN, a subject of the King of Denmark, having declared my intention to become a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Improvement in Moldable Milk Products and Methods of Making the Same, of which the following is a specification.

This invention relates to that class of milk products known as and resembling cottage cheese.

It is well recognized that milk products such as cottage cheese and the like are subject to rapid changes at ordinary temperatures; such changes resulting in increase of lactic acid and a consequent sour taste, also other changes of flavor occur and a change in texture to a hard and grainy body.

An object of this invention is to produce a uniform moldable milk product rich in proteid and containing milk sugar and having a pleasing palatability and also having keeping qualities superior to cottage cheese and the like made from skim-milk.

An object is to insure the production of a product of this character that will be and remain of a uniform pleasing quality for at least a week so as to allow the dealer to carry a considerable stock without danger of loss.

A further object of the invention is to produce a superior skim-milk food product.

In this invention I utilize skim-milk; as for instance, the separator by-product commonly produced in dairies where the butter fats are taken out by centrifugal separators.

An object of this invention is the production from said by-product of a soft, creamy mild food product to take the place of cottage cheese and distinguished from cottage cheese in that it is free from the grainy, elastic character and acid taste of cottage cheese, and will remain so for a considerable time under slight refrigeration.

An object is to utilize said skim-milk by-product that is at present mainly un-utilized as a food for mankind.

An object is to eliminate an item of great waste in creameries and dairies and as a result of this invention and discovery as distinguished from previous processes and products known in the art I will here state that prior to the introduction of my new process and product one creamery in Los Angeles was turning into the sewer as waste material a quantity of said skim-milk by-product to the amount of more than one thousand gallons per day, and since the introduction of my new process said creamery has by said process not only utilized all of said one thousand gallons or more per day previously turned into the sewer as waste, but has also bought up the like by-products produced by adjacent creameries and is continuing now to do so to its own profit and to the profit of said other creameries; the by-product thus saved and bought up being utilized by said creamery in the manufacture of this new product, which has become a popular article of common commerce; and the creameries in eight principal cities of California have had a like experience, thus making within a period of less than one year a saving of great value.

The new method and process which I employ in producing this novel food product is as follows, reference being had to the accompanying drawing in which—

Figure 1 is a plan view of an incubator and Fig. 2 is a vertical section of a curd and whey separator, capable of use in conducting parts of the process.

A quantity of pure milk is taken and sterilized by steam heat, by quickly bringing the milk under treatment to a temperature of 220° Fahrenheit in twenty minutes with the well-known steam sterilizer in common use in laboratories. The resulting sterilized milk product is then cooled down to a temperature of 90° Fahrenheit. This is done by putting the vessel containing the sterilized milk product into running water until the desired temperature of 90° Fahrenheit is reached by the sterilized milk product. Then half of the cooled sterilized milk is removed and the cooling continued with the other half until it is cooled to a temperature of 80° Fahrenheit. To the first portion having a temperature of 90° Fahrenheit is added in the manner hereinafter stated a pure culture of *Bacillus Bulgaricus*. To the remaining portion cooled to 80° Fahrenheit is then introduced a pure culture of *Bacillus lactic-acidi*. The proportions found most desirable are one ounce of the pure culture to one quart of milk.

The commercial cultures of *Bacillus Bulgaricus* and of *Bacillus lactic-acidi* are for the purpose of this process regarded as pure.

Each of the two portions of milk with its added bacillus culture is separately stirred and the separate bacillary mixtures thus made are separately placed in a common incubator which will maintain each at the temperature stated, respectively, and both are there kept for a period of eighteen hours; one at the temperature of 90° Fahrenheit and the other at the temperature of 80° Fahrenheit. For convenience and accuracy the two separate cultures are preferably produced in separate three-cornered pressed aluminum vessels, preferably the usual trisector vessels 1, 2 of a common incubator 3; said vessels preferably having a depth of seven inches and having a radius of five inches and capable of containing about twice the quantity of milk required to form a culture; that is to say, where the quantity of pure milk to receive the commercial bacillary fluid is one quart the incubator vessel will be capable of containing two quarts. The incubator wells *a*, *b* are surrounded by heat insulation *c* and are closed by insulating plugs *d* of lids *e*. Each vessel is provided with a cover *f* having a handle *g* and held down on the vessel by hooks *h* so that the closed vessels can be conveniently placed in and removed from the incubator wells. Prior to the expiration of such period of eighteen hours a required quantity of skim-milk or separator by-product above referred to is prepared for reception of the cultures in the following manner: Said skim-milk is pasteurized in the usual pasteurizer; being brought to a temperature of 140° Fahrenheit and being held to that temperature for a period of twenty minutes and then quickly cooled to a temperature of 96° Fahrenheit.

To insure against failure a plurality of cultures are produced simultaneously, the two wells *a* and *b* of the incubator being utilized respectively for the separate cultures, so that with the apparatus shown, three charges of each of the cultures are produced at the same time.

A scum rises to the surface of the mixture and at the end of eighteen hours the vessels are removed from the incubator and the upper surface or scum of the charges in the incubating vessels is skimmed off to a depth of about one-fourth of an inch. The scum is thrown away and the remaining content of each vessel is thoroughly stirred in its respective vessel until each of such contents becomes of a smooth creamy consistency. This is done with each of the two cultures. A quantity of the pasteurized skim-milk by-product is previously cooled in a separate container to 96° Fahrenheit and the contents of two vessels containing the two cultures, being about one quart of each culture, and then added to the cooled pasteurized skim-milk, thus practically, or nearly making a two per cent. mixture; the proportions being about two volumes of the combined cultures to one hundred volumes of the pasteurized skim-milk by-product; that is to say, the amount of pasteurized by-product to which the approximately two quarts of culture may be added with perfect success will be one hundred quarts or twenty-five gallons. The twenty five gallons of cultured mixture is then subjected to a temperature of 96° Fahrenheit for a period of from fourteen to eighteen hours, thus allowing such mixture to coagulate and ripen, with the result that the mixture reaches a gelatinous consistency which determines the completion of the ripening process. Water is then separately heated to a temperature of 180° Fahrenheit, and while thus heated is added to the twenty five gallons of coagulated or gelatinous mixture and slowly stirred until water to the amount of twenty per cent. by volume of the mixture has been added, thus forming a dilute mixture having a temperature of about 100° F. Then the dilute mixture is allowed to stand at such temperature of about 100° Fahrenheit for a period of from ten to twenty minutes. During this period the contents of the container separate into curds and whey, the curd rising to the surface of or being suspended in the whey which tends to sink to the bottom of the container. The curds are then removed from the liquid contents beneath them and are placed in a washing and draining box 4 which is constructed of convenient size with slats 5 in the bottom and in which a closely-woven sheet of cheese-cloth 6 has been spread, the edges of the cheese-cloth being drooped over the edges of the box. As many boxes may be used as the operator deems most convenient and the boxes may be mounted on legs 7. When a mass of curds has thus been placed in a washing and draining box, water is introduced into such mass through a hose 8 extending centrally of the box and having its outlet 9 opening downward near the bottom of the box. The water thus introduced is at a temperature of about 60° Fahrenheit and the washing is continued for a period of about one hour after allowing the water to rise through the curds until the box is filled and water over-flows around the edges. Sufficient water is allowed to flow through the hose to cause the liquid to overflow at the surface in a thin sheet all around the edges of the box. At the same time some portion of the water is drained out through the apertures between the slats 5, said slats being about one inch across and separated by one inch of open space. After the washing has thus been effected, thereby removing the whey and lactic acid from the curd, the water is shut off and the edges of the cheese-cloth are lifted and the contents of the sheet are shaken, thus to loosen the curds from the sheet and allow the liquid to drain through the sheet. Though this washing removes the whey it is found that a quantity of milk sugar remains in the curd. Such shaking and draining may be continued for a period of about ten minutes and then the sheet and its contents are suspended in a refrigerator and brought to a temperature of about 40° Fahrenheit, thus checking the growth of any bacteria that may remain in the curd. The whole mass is allowed to remain in the refrigerator having such temperature of 40° Fahrenheit for a period of twelve hours. Then the mass is removed from the refrigerator and is thoroughly stirred and beaten by suitable mechanism corresponding to that of an ice-cream freezer mechanism, the mass being meanwhile kept at an ordinary atmospheric temperature say, 68° Fahrenheit, more or less, until the mass becomes of a smooth and creamy consistency and is readily moldable; whereupon the finished product thus produced is put in paraffined air tight boxes for distribution and sale.

By keeping the product at a low temperature, say about 40° to 50° Fahrenheit it will remain practically without change for a period of one week more or less.

The final product is characterized as an amorphous milk product composition containing proteid and milk sugar having about two-tenths per cent. of butter fat and somewhat resembling cottage cheese but different therefrom; being practically free from acid, being of low cohesion, being of a smooth creamy consistency and of a creamy color and having a mild nut flavor and taste, and having better keeping qualities than cottage cheese.

I claim:—

1. The amorphous milk product composition set forth containing proteid and milk sugar having about two-tenths per cent. of butter fat and somewhat resembling cottage cheese but differing therefrom being practically free from acid being of low cohesion and being of a smooth creamy consistency and of a cream color and having a mild nut flavor and taste, and having better keeping qualities than cottage cheese.

2. A milk product of an amorphous composition containing proteid and milk sugar and being of a smooth creamy consistency and having a mild nut flavor and taste.

3. In the method of producing a milk food product the step set forth which consists in coagulating sweet skim-milk by means of combined cultures of *Bacillus lactic-acidi* and *Bacillus Bulgaricus* substantially as set forth.

4. In the method of producing a skim-milk food product, the steps set forth which consist in coagulating sweet skim-milk by means of combined cultures of *Bacillus lactic-acidi* and *Bacillus Bulgaricus* in the proportions of about two parts of the bacillary mixture to about one hundred parts of the skim-milk.

5. In the method of producing a skim-milk food product, the steps set forth, which consist in coagulating sweet skim-milk by means of combined cultures of *Bacillus lactic-acidi* and *Bacillus Bulgaricus* in the proportions of about two parts of the bacillary mixture to about one hundred parts of skim-milk, and heating the same and separating and thoroughly washing out the whey.

6. The method set forth of making a skim-milk food product which consists in;—sterilizing pure milk by quickly raising the temperature thereof to 220° Fahrenheit, cooling a portion of said milk to a temperature of 90° Fahrenheit and adding thereto a pure culture of *Bacillus Bulgaricus;* cooling a portion of said milk to 80° Fahrenheit and adding thereto a pure culture of *Bacillus lactic acidi;* separately stirring each portion of the milk with the added bacillus culture therein; incubating bacteria in said milk culture by maintaining each milk culture at the temperature stated, viz., 90° and 80° Fahrenheit, respectively, for a period of eighteen hours and allowing scum to rise to the top; preparing skim-milk by pasteurizing the same to a temperature of 140° Fahrenheit and holding the same at that temperature for a period of twenty minutes and then quickly cooling said skim-milk to a temperature of 96° Fahrenheit; stirring the cultures respectively until they become of a smooth creamy consistency and adding said cultures to the cooled pasteurized skim-milk in the proportions of about two volumes of combined cultures to one hundred volumes of the pasteurized skim-milk; subjecting the cultured mixture thus produced to a temperature of 96° Fahrenheit for a period of from fourteen to eighteen hours, thus allowing the cultured mixture to coagulate and ripen, said ripening being determined by the mixture reaching a gelatinous consistency; adding water at a temperature of about 180° Fahrenheit until water to the amount of twenty per cent. by volume of the cultured mixture has been added, thus forming a dilute mixture having a temperature of 100° Fahrenheit; allowing said dilute mixture to stand for a period of from ten to twenty minutes and allowing the same to separate into curds and whey; removing the curds from the liquid contents; washing out the whey and acids by washing the curds with water for a period of about one hour, thereby removing whey and lactic acid from the curd; draining the liquid from the curd and refrigerating at a temperature of about 40° Fahren-

heit, thus checking the growth of bacteria; and stirring and beating the mass at an ordinary temperature until the mass becomes of a smooth and creamy consistency and is readily moldable.

7. The method set forth of making a skim-milk food product which consists in;—adding to a portion of sterilized pure milk at a temperature of 90° Fahrenheit a pure culture of *Bacillus Bulgaricus;* adding to another portion of said milk at 80° Fahrenheit a pure culture of *Bacillus lactic acidi;* separately stirring each portion of the milk with the added bacillus culture therein; incubating bacteria in said milk culture by maintaining each milk culture at the temperatures stated, viz., 90° and 80° Fahrenheit, respectively, for a sufficient period of time, allowing scum to rise to the top; stirring the cultures respectively until they become of a smooth creamy consistency and adding said cultures to cooled pasteurized skim-milk in the proportions of about two volumes of combined cultures to one hundred volumes of the pasteurized skim-milk; subjecting the cultured mixture thus produced to a temperature of about 96° Fahrenheit for a period of from fourteen to eighteen hours, thus allowing the cultured mixture to coagulate and ripen until the mixture reaches a gelatinous consistency; adding water at a temperature of about 180° Fahrenheit until water to the amount of twenty per cent. by volume of the cultured mixture has been added, thus forming a dilute mixture having a temperature of 100° Fahrenheit; allowing said dilute mixture to stand for a period of from ten to twenty minutes and allowing the same to separate into curds and whey; removing the curds from the liquid contents; washing out the whey and acids by washing the curds with water for a period of about one hour, thereby removing whey and lactic acid from the curd; draining the liquid from the curd and refrigerating, thereby checking the growth of bacteria, and stirring and beating the mass until the mass becomes of a smooth and creamy consistency and is readily moldable.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 27th day of March 1915.

CARL F. C. KNUDSEN.

In presence of—
JAMES R. TOWNSEND,
ESTELLA TOWNSEND.

1,175,876

Mills

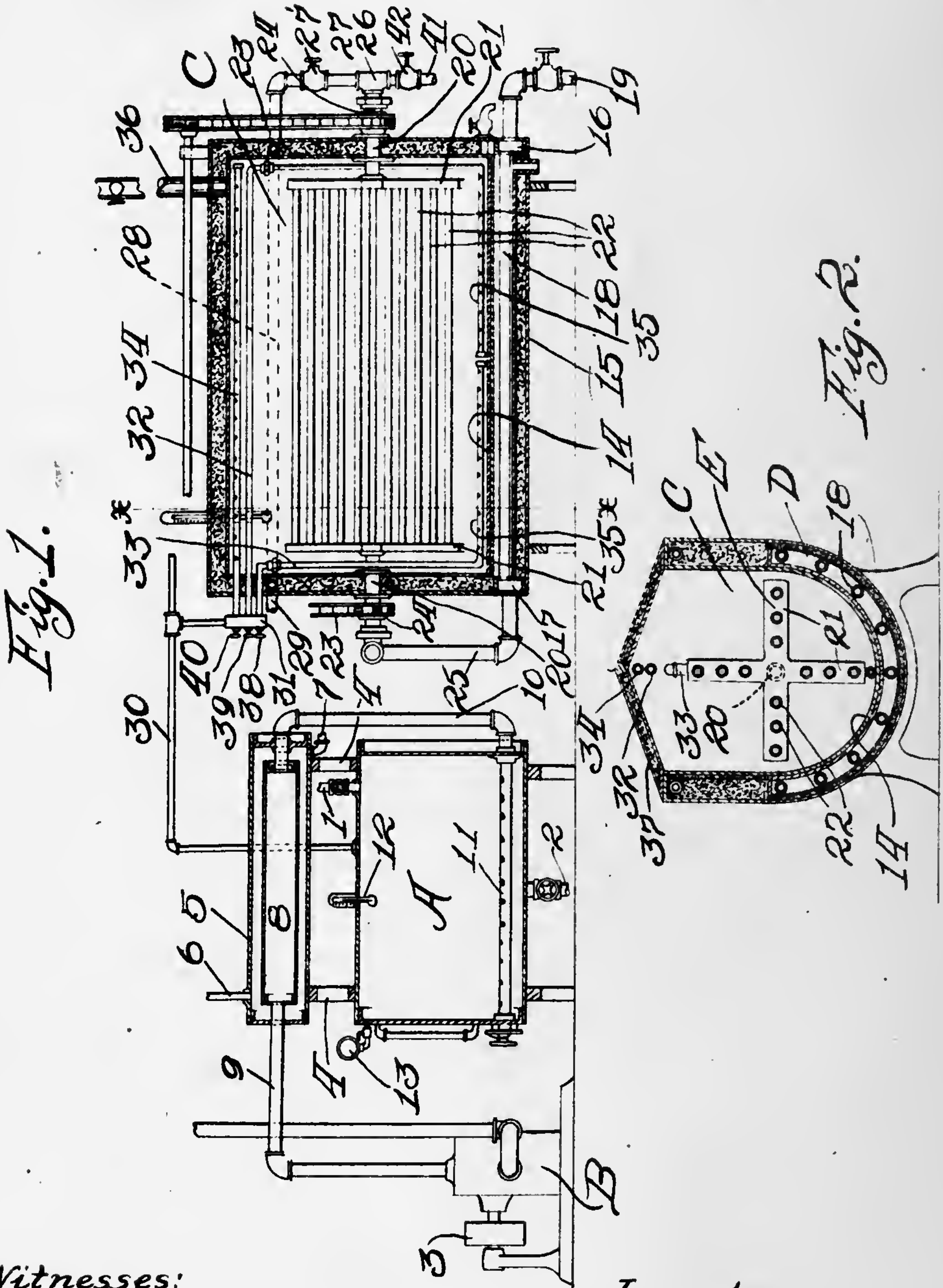
Mar, 1916

G. SINCLAIR.

METHOD OF TREATING MILK.

APPLICATION FILED AUG. 13, 1914.

1,175,876. Patented Mar. 14, 1916.



Witnesses:
L. W. Holmes.
H. P. Alden

Inventor:
George Sinclair,
by: H. G. Bradbury
Attorney.

UNITED STATES PATENT OFFICE.

GEORGE SINCLAIR, OF ST. PAUL, MINNESOTA, ASSIGNOR TO CLIFFORD L. NILES, OF ANAMOSA, IOWA.

METHOD OF TREATING MILK.

1,175,876. Specification of Letters Patent. Patented Mar. 14, 1916.

Application filed August 13, 1914. Serial No. 856,584.

To all whom it may concern:

Be it known that I, George Sinclair, a citizen of the United States, residing at St. Paul in the county of Ramsey and State of Minnesota, have invented a new and useful Improvement in Methods of Treating Milk, of which the following is a specification.

This invention relates to a new process of treating liquids and is especially adapted for use in connection with the pasteurization of milk and cream, the particular object of the method employed being the application of heat for the destruction and elimination of the undesirable germs, as those of decomposition and disease present in milk fresh from a dairy, and the cultivation of the "pure milk" germs, or those giving the milk its agreeable aroma and natural taste, and to do this in such a way that the milk has not the cooked and deadened taste commonly attendant to some other like processes.

In former processes it has been common to "flash," or suddenly elevate the temperature, and then quickly cool the milk. This results in destruction of nearly all germ life, beneficial as well as harmful, and gives an inferior product. The gradual raise of temperature increases the resistance of the desirable germs by "acclimatization," and a higher temperature may be endured. A sterile milk has no lactic acid bacteria, and the beneficent results of the action of this organism on the digestive canal are naturally lacking, hence the milk is an inferior product. This has led to the refertilization of such milk by implantation of cultures of flavoring bacteria, as "Butter flavor," "Flavorine" etc., of pure lactic acid bacteria and pure lactic acid in an attempt to rehabilitate the milk in which the germs have been destroyed. These germs, after an incubation in which they are not retarded by harmful bacteria and impurities, and thus obliged to fight for existence, develop a most excellent flavor in the milk, and remain sufficiently resistant to withstand the final or pasteurizing heat; and remain as active agents in the milk when consumed.

It is a well known fact that all milk is affected by the sanitary condition of the dairy where drawn, and by its later care and treatment, and it is an object of this present process to remove the impurities in the milk tending to taint the same; and to act deleteriously on the beneficial and valuable part of its germ life, as soon as possible, using due caution toward the cultivation and preservation of this "pure" germ life. Naturally the sooner treated after being drawn the better, as the harmful germs have not had a chance to develop and compete with the beneficent germs. The presence of a suitable degree of heat and lactic acid greatly increase the activity of the beneficent germs (such as *B. acidi lacti*) and it is the opinion of some that these germs overcome the harmful germ life and eliminate it.

With this end in view, the invention consists, broadly, in first raising the temperature of the milk to about 145 to 155 degrees F., the application of such heat being regulated according to the amount of contamination in the milk, as determined by bacteriological test or otherwise and subjecting the milk during this heating operation to a variable flow of sterile, washed air over, about and up through the same; rapidly raising the temperature to approximately 180 degrees F., and then immediately and rapidly cooling; finally, incubating at about 50 degrees F. in sterile air.

The invention consists in certain other novel steps which will be hereinafter described and claimed.

In the accompanying drawing is shown one, and the preferred, form of apparatus by means of which the process may be carried into effect, and in which—

Figure 1 is a side elevation, partly in section and parts broken away, of the device; and Fig. 2 is a section taken on line X—X of Fig. 1.

In the accompanying drawing, A indicates a tank into which water is fed through an inlet 1 and from which the water may be withdrawn through an outlet 2.

B indicates a blower having a fan (not shown), adapted to be driven by a suitable motor 3. and C indicates a closed jacketed vat in which is placed the body of milk to be treated.

Arranged above the tank A, as by spacing arms 4, is a horizontally disposed hot-water or steam jacket 5 having an inlet 6 and an outlet 7, while within the jacket is located an elongated heating chamber 8, one end of which is connected with the blower B by means of a pipe 9, as shown, extending through the jacket 5. At its opposite end, the heating chamber delivers through a pipe connection 10 into a perforated pipe 11 located within the tank A and extending entirely across the bottom of the same. A thermometer 12 and a pressure gage 13 may be used if desired.

The vat C is in the form of a jacket having an inner wall 14 and an outer wall 15, the space within containing a radiator D composed of two heads 16 and 17 communicating with one another through the medium of a plurality of longitudinal pipes designated by the numeral 18 which are distributed around the lower portion of the vat so as to effect an equal distribution of heat passed into the radiator, through the inlet 19 and head 16, to the contents of the vat.

A revolving radiator E is carried upon a hollow shaft 20 extending through suitable bearings in opposite ends of the vat and comprises two sets, as shown, of spaced cylindrical arms 21 communicating with the interior of the shaft and extending at right angles thereto, the arms of one set being connected with the corresponding arms of the other set by means of the longitudinal piping 22, as shown. The shaft 20 may be rotated by means of chains 23 meshing with gear wheels 24 carried by the shaft outside of the vat, said chains being driven from any suitable source of power. The head 17 of the radiator D is connected with the shaft 20 of the radiator E by means of a pipe 25.

When it is desired to raise the temperature of the contents of the vat C, a heating medium is passed from a suitable heater, not shown, through the inlet 19 into the radiator D, thence through the connecting pipe 25 to the revolving radiator E, and from which it is directed via the T 26 either back to the heater through the connection 41, having a valve 42, and which forms a complete circuit as will be understood, or through the connection 27, having a valve 27′, to a coil 28 placed in the upper portion of the vat above the radiator E and from which it passes through a pipe 29 leading to the heater, or otherwise. The valves 42 and 27′ serve as a means for regulating the amount of heating medium passing through the radiating coils and consequently the temperature of the contents of the vat.

In carrying out my invention, I place a body of water ranging in temperature from 47 to 70 degrees Fahrenheit in the tank A and fill the vat C with the milk or other liquid to be treated. After carefully determining the amount of impurities in the liquid—the presence of which affects the odor thereof—heat is introduced into and through the several radiators and coil as above suggested so that there is an equal distribution of heat throughout the contents treated. The temperature is thus increased until 145 to 155 degrees Fahrenheit is reached; resulting in the elimination or destruction of the weaker and harmful germs, and the conversion of the beneficial organisms (for example, *Bacillus acidi lacti*) into their spores. The germs in development are eliminated. The foul and animal odors are discharged from the liquid, which is thus rendered quite sweet and pure. By extensive experiment, it has been found that the best results are obtained by regulating the application of this heat according to the condition of the milk, *i. e.*, the temperature is raised slowly if the odor of the milk is excessive or bad, and if good, the temperature is raised rapidly, care being taken not to raise the temperature above 155 degrees F. until the odors emanating therefrom have become clean and agreeable. In order to effectually remove all gases generated by this step, air is continuously forced by means of the motor driven fan or blower B through the chamber 8 wherein it may be heated, if desired, by means of the jacket 5 and from which it is delivered into the tank A, washed and cleansed of impurities during its passage through the body of water in the tank and permitted to escape therefrom through a pipe 30 connecting with a chamber 31 from which extend, through a wall of the vat C, a series of pipes 32, 33 and 34, the first two of which are arranged to deliver down either side within the vat and terminate in horizontal perforated pipes 35 disposed in the bottom of the vat. The pipe 34 terminates above the surface of the liquid within the vat for delivering a forced draft of air thereover to remove from the liquid any and all gases resulting from the aeration of the liquid, said gases passing out through an outlet 36 formed in the cover member 37 with which the vat C is provided. The temperature of 145 to 155 degrees F. and the passage of the washed air over, about and up through the milk are continued until the odor of the milk becomes cleanly and agreeable.

As the primary application of heat is advanced in degree, the evolution of the gases is correspondingly increased and it will be appreciated that a greater force or flow of washed air through the pipes 32, 33 and 34 will be required to properly cope with such gases to drive them off from the liquid through the exhaust pipe 36. In order that the flow of air may be properly adjusted, the chamber 31 is provided with valves 38, 39 and 40 coöperating with the pipes 32, 33 and 34, respectively.

When it is desired to use the milk or cream within a comparatively short time, it is first raised to 145 or 155 degrees F., as aforesaid, and after the odor has become clean and agreeable, the temperature is immediately increased to 170 to 185 degrees

F., and then cooled to a "ripening" temperature, or that best adapted for the development of the germs giving the milk its agreeable flavor and aroma, and permitted to stand in sterile air for a short period of time.

During the second or rapid heating of the liquid, a flow of sterile air may be directed to advantage thereover in order to remove any possible foul odors remaining after the primary treatment or which might generate during the "flash". If, however, it is not necessary to hasten the operation, the temperature of the liquid treated is first raised to 145 or 155 degrees F., then cooled to 58 degrees F. and held at this temperature for about twenty-four hours surrounded by clean sterile air; after which the liquid is rapidly reheated to a temperature of 170 to 185 degrees F., and then at once cooled and held in sterile air for seventy-two hours, or longer, at a constant temperature of 58 degrees F. so as to cause a full development of the beneficent germ life.

From the foregoing description, taken in connection with the accompanying drawing, it is believed that the process will be fully understood without requiring an extended explanation. It may be well, however, to lay stress on the fact that the essence of my invention resides in the partial sterilization of the milk by heating to a temperature sufficient to kill harmful germs and convert the beneficial ones to spores, while at the same time all disagreeable odors are disengaged; and allowing this milk to cool and stand at an incubating temperature until the beneficial germs are well developed again. These germs have been "acclimated" to an increased temperature, and are now rapidly "flashed" to kill all the harmful bacteria which may have survived the first operation, the "flash" temperature and time, however, not being sufficient to kill the beneficial germs.

Having thus fully described my invention, what is claimed and desired to be secured by Letters Patent is—

1. The preparation of a milk containing *B. acidi lacti* by a gradual heating to inure the germs and their spores to a high temperature, meanwhile introducing air to scavenge away all foul gases, cooling and incubating the milk containing *B. acidi lacti* remaining, momentarily flashing the temperature to above that of the first heating, and rapidly cooling the milk.

2. The process of pasteurizing milk consisting in gradually heating to approximately 150 degrees F., passing sterile air over, about, and up through the milk during said heating operation, cooling and incubating such milk, and finally flashing to near the death point of the *B. acidi lacti* contained therein.

3. The pasteurization of milk by gradually heating to approximately 150 degrees F., passing sterile air therethrough during said heating operation, cooling and incubating at 58 degrees F., flashing to approximately 180 degrees F. and immediately rapidly cooling said milk, and finally again incubating at 58 degrees F.

4. The preparation of a milk containing germs valuable to the digestive system by a gradual heating to approximately 150 degrees F. to inure said germs to an increased temperature and to destroy deleterious organisms, sterile air being used to scavenge all foul gases, liberated during said heating, cooling to 58 degrees F. and incubating at this temperature, until the germ life is again well developed, flashing the temperature to 180 degrees F. for a short time to destroy all deleterious organisms remaining, again cooling to 58 degrees F. and incubating until the digestively valuable germs are well developed.

5. The process of pasteurizing milk consisting in gradually heating to approximately 150 degrees F., passing sterile air over, about and up through the milk during said heating operation, then flashing to approximately 180 degrees F., and finally incubating at 58 degrees F.

6. The process of pasteurizing milk consisting in gradually heating to approximately 150 degrees F., then "flashing" to approximately 180 degrees F., passing sterile air over and about the milk during said heating operations, and finally incubating at 58 degrees F.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE SINCLAIR.

Witnesses:
L. W. Holmes,
Henry P. Alden.

Mich.

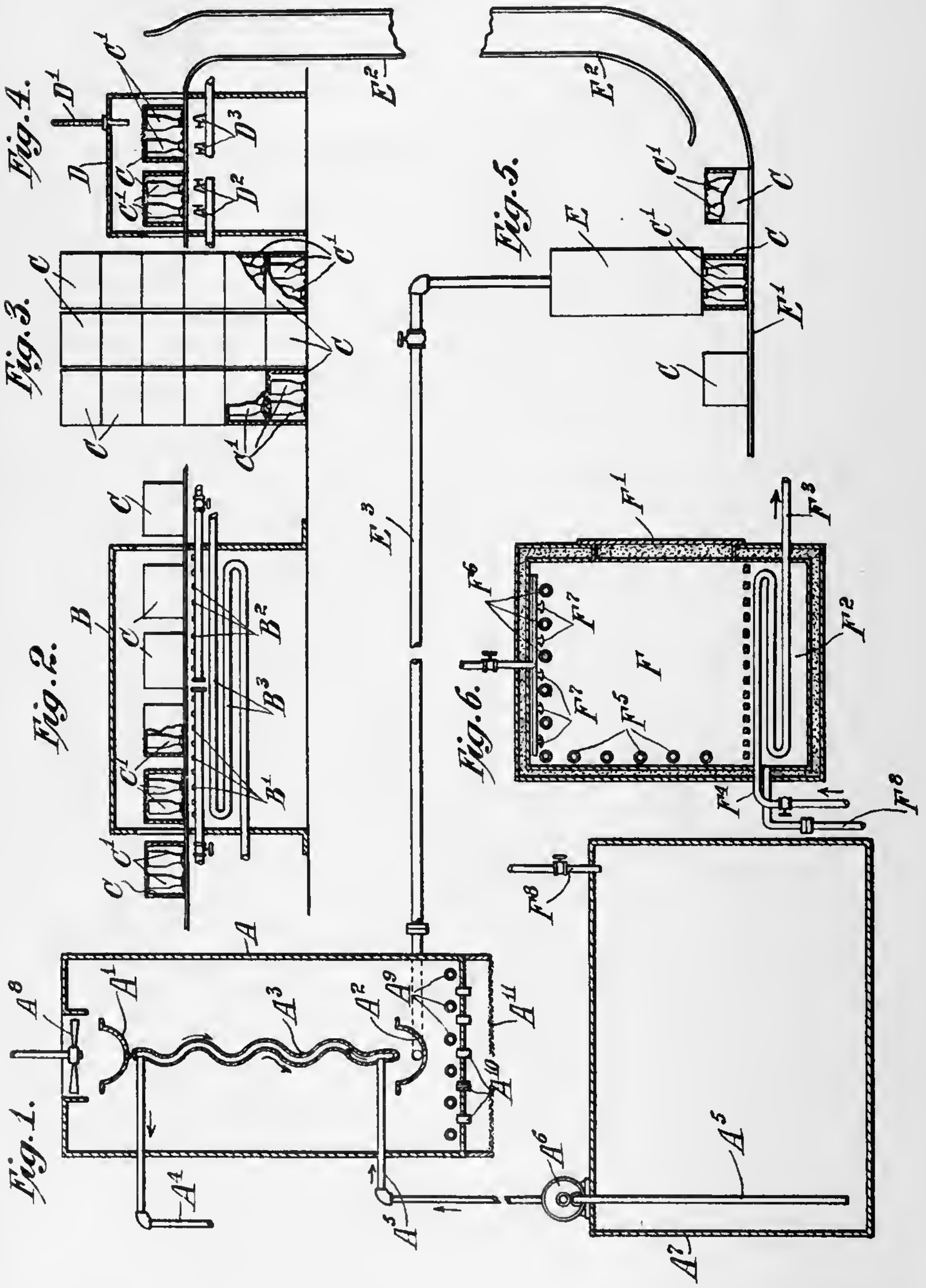
Apr 1916

J. M. W. KITCHEN.

METHOD OF TREATING MILK.

APPLICATION FILED OCT. 25, 1915.

1,178,808. Patented Apr. 11, 1916.



Attest:

C. B. Mitchell

Inventor:

J. M. W. Kitchen

by Geo. L. Wheelock

his Atty

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOSEPH M. W. KITCHEN, OF EAST ORANGE, NEW JERSEY.

METHOD OF TREATING MILK.

1,178,808. Specification of Letters Patent. **Patented Apr. 11, 1916.**

Application filed October 25, 1915. Serial No. 57,733.

To all whom it may concern:

Be it known that I, JOSEPH MOSES WARD KITCHEN, a citizen of the United States, residing in the city of East Orange, county of Essex, State of New Jersey, have invented an Improved Method of Treating Milk, of which the following is a specification.

The object of this invention is to secure increased efficiency in connection with the pasteurization of milk, especially when that performance is conducted in the final container or bottle; to secure economies in carrying out the process; and to overcome other defects that have been inherent to methods previously practised.

The main structural features that may be used in practising my method of treating milk, are schematically represented in the accompanying drawings: in which,

Figure 1 is a combined milk preheater, aerater, hot water receiving tank, and hot water pump; Fig. 2 is a bottle washer and sterilizer; Fig. 3 is a piled stack of inverted bottles in their cases; Fig. 4 is a bottle preheater; Fig. 5 is a bottle filler; and Fig. 6 is a pasteurizing and refrigerating apartment.

The reference characters indicate as follows: A is the preheating and aerating apparatus: A^1 is a milk conveying trough; A^2 is a milk conducting trough: A^3 is a preheating device on which milk flows downwardly over its external surfaces, and hot water is forced internally upward through it: A^4 is an exhaust water outlet: A^5 is a hot water inlet: A^6 is a hot water forcing pump: A^7 is a hot water receiving tank: A^8 is an exhaust fan that draws air upwardly over the milk as the milk descends. The air is exhausted into the outer atmosphere.

A^9 are heating pipes: A^{10} are air inlets; and A^{11} is an air filtering screen.

B is a bottle washing and sterilizing apparatus; B^1 are hot water jets; B^2 are steam jets; B^3 is a steam coil.

C are bottle cases filled with inverted, washed, and sterilized bottles C^1. The washing and sterilization are performed at convenient times, and the cases of bottles are stacked in a convenient place, the bottles remaining inverted to prevent dust from falling into them. Inasmuch as these bottles remain stacked until immediately prior to their filling, they become reduced in temperature to the temperature of the room in which they are stacked.

D is a device for preheating the cooled bottles immediately prior to their filling. The temperature in this device is indicated by the thermometer D^1 and the bottles are progressively heated by upwardly projected sprays of hot water in progressively larger amounts from the jets D^2, and are further heated by the steam jets D^3; the ultimate degree of heat attained by the bottles being below 130° F.

E is a bottle filling device of any known character, located on and attached to a bottling and capping table E^1. The preheating device is preferably located at a higher level than the device E. The cases of inverted bottles are vertically reversed in traversing the track E^2, and are immediately filled with the milk that has been preheated in the apparatus A, and which is conveyed to the bottle filling device by the disconnectible conduit E^3.

F is one of the number of pasteurizing and refrigerating apartments of any convenient size. It is entered by the door F^1. The apartment has moisture impervious walls which are more or less insulated. There is a water pool F^2 below the slatted floor of the apartment. This pool has a steam coil in it into which the steam enters at the high level inlet F^4, and finds a return to the steam generator of the plant, through the outlet F^3.

F^5 and F^6 are refrigerating pipes, and F^7 are water spraying jets.

F^8 is an outlet for the cooling water, which becomes heated from the hot bottles in their cooling. The water is conveyed to the tank A^7, through the disconnectible conduit F^8. It will be observed that through the operation of this apparatus, there is a circulatory heat transferring action that effects a considerable economy in carrying out the performance of pasteurization in the final container. Various subsidiary features of a plant of this character are not represented in the drawings because they have no direct relation to the invention here claimed.

The defects remedied by my invention are: (1) that of ordinary methods of pasteurizing, in which some part of the milk is brought in contact with too highly heated surfaces, whereby a part of the milk has its taste and physical character changed; and in which the upper parts of milk being heated in a bottle may receive the undesirable heating influence of a high degree of temperature for too long a time; (2) the infections of milk that under old methods are likely to occur during bottling the milk; (3) the infections which are conveyed through the ordinary cardboard and some other closures of bottles that are commonly used; (4) the common method of washing and high heat sterilization of bottles only immediately prior to their filling and while the bottles are very hot, which practice does not allow of sufficient time to secure a complete sterilization of the bottles with certainty before their filling, and that it takes too long a time to cool the bottles from a sterilizing to a pasteurizing temperature; (5) the filling of very hot bottles with very hot milk at substantially a pasteurizing temperature, which practice makes the handling of the very hot milk and bottles unnecessarily uncomfortable for the working attendants of the milk plant; (6) having the milk so hot at the time of filling the bottles which results in over heating a part of the milk during the placing of the bottled milk in the apartment, tank, or whatever receptacle is used for containing and holding the bottled milk, because the time occupied in filling and placing enough bottles to fill the apartment, requires considerable time from the beginning of the filling of that apartment or other receptacle, up to the end of its filling with the very hot filled bottles. Under such conditions some of the bottled milk placed in the bottle holding apartment or receptacle is over heated by too long holding at a high heat.

It should be noted that if milk is placed into the final container while the milk is cold, and is heated entirely in the container, the milk at the lower levels of the container is only heated to the pasteurizing temperature in from seven to ten minutes after the top layers are heated. Hence, those top layers in the container are over heated, and this results in a change in the taste of the top layers of the milk, and this measurably prevents the appearance of the so-called cream line in the container; a point which is of considerable practical importance in connection with the commercial handling of milk; consumers feeling that they are defrauded unless they can see the cream line.

When milk or cream is heated, there is more or less of a fusion of the butter fat globules, with a consequent lesser showing of the so-called cream line, which line is easily to be observed in bottled raw milk. On this account it will be obvious that it is desirable that all the milk in all the bottles, while being treated, should only be brought to as high a temperature as is necessary to secure the pasteurizing effect, which temperature is usually not above 145° F.; and that the milk should be held at that temperature only as long as is necessary to secure the destruction of pathogenic germs, which time is about 30 minutes. Therefore it will be seen that everything which will interfere with this special uniformity of degree of temperature in applying the heat, and of the time of holding the milk at that temperature in all parts of the milk being treated, is an important matter from the commercial point of view.

The present invention is largely for the overcoming of this particular defect in older practices.

Another object of the invention is to secure economy in the pasteurizing treatment of milk through the coincident performance of several processes, namely; that of aeration, pre-heating, and the introduction of the heat economizing principle of the vertical counter-current transfer of heat.

In applying this invention, my procedure is preferably as follows: Milk that has been transported to and preferably held at the milk plant, at the unusually low temperature of about 30° F., is passed through an aerating apparatus from a high level to a low level, running in a very thin film over sheet metal surfaces which are internally traversed and warmed by an upwardly ascending current of warm water, preferably not heated to above 150° F. The warm water which is preferably only heated to a degree necessary for the preheating of the milk, is pumped up through the aerating and heating apparatus. The milk or cream gravitating downward over the heating surfaces of the apparatus, at first meets moderately warm water and is able to absorb heat from the water. As the milk gradually descends, it meets zones of water of gradually increasing heat, and at a desired temperature, is finally received in a tank at the bottom of the apparatus. Air for aerating the thin film of milk or cream is mechanically forced or drawn through the apparatus, and if desired, this air is first passed over either steam or water heating pipes, or surfaces that may be heated by hot gases passing through them. This warmed and somewhat dry air passing upwardly over the descending film of milk, besides assisting the internally pumped warm water in preheating the milk, is impregnated with any of the obnoxious fumes from the milk, which are usually more or less present in all milk, and then escapes through an opening at the top of the apparatus. Preferably, the air is carried upwardly through the apparatus in an induced draft. Such an induced draft has slightly less than atmospheric pressure, and on this account its power of inducing quick elimination of the fumes from the milk is enhanced. The flow of the milk and the flow of the hot water is so arranged as to individual quantity, that the milk is not raised to the pasteurizing temperature. A temperature between 100° and 130° F. is held to be as high as is desirable for the preheating of the milk. The heating may be even less than 100° F.

Inverted new bottles for the milk, or the returned old bottles, are first washed and scalded in the ordinary way, and are then subjected for a sufficient length of time to a high sterilizing heat, and in cases with the bottles still inverted, are then stacked in a convenient place for reuse, where they become reduced to a room temperature. These bottles before feeding them to the bottle filling apparatus, are passed through a secondary heater in which they are gradually given a considerable heating, and preferably, by sprays of steam and hot water, but are not heated to a pasteurizing or sterilizing temperature. The bottles are heated preferably to the same temperature that is given to the milk in its pre-heating. The temperature of the bottles is gradually raised, and preferably, to the same temperature as that of the milk that is placed in the bottles. There may be a variation of a very considerable number of degrees between the temperature of the bottles and that of the milk so long as a variation in temperature does not exist of sufficient extent to induce a too great strain from unequal expansion on the glass bottles, which would otherwise be likely to be followed by breakage.

In the older art, the sterilizing process given to the bottles prior to the bottling, has usually been maintained for about two minutes; but this time I do not consider to be sufficient to certainly effect sterilization. But if the bottles are sterilized immediately before the bottling of the milk, and as the very high heat of the sterilizing process must be reduced in the bottles, to or close to the pasteurizing temperature, before filling the bottles in order to prevent breakage of the bottles and overheating parts of the milk, the general process goes on too slowly unless a very much increased floor area of the milk plant is available, and unusually expensive and cumbersome machinery used. My process has for one of its purposes an economical utilization of labor and invested capital. Such a short time as is usually given to sterilization is not sufficient to be absolutely safe. In my method I give a sufficiently long sterilizing of the bottle to secure absolute safety. This is done as a separate preliminary operation, and is followed by a considerable cooling of the bottles. I then perform a secondary heating immediately before placing the milk in the bottles, which is for the purpose of preventing overheating of some of the layers of milk in the bottles, and some overheating of all of some of the bottles in the final heating of the milk; as well as for preventing fracture of the bottles due to putting hot milk in cold bottles; and for washing out dust and bacteria that may have gained access to the interior of the bottles after their washing and sterilization. Inasmuch as a complete sterilizing temperature is much higher than a pasteurizing temperature, it will be obvious that if the bottles are sterilized immediately before filling, it takes too much time, or appropriates too much floor space, in reducing the temperature to a pasteurizing temperature, and also leaves great uncertainty as to the temperature of the bottles when partly cooled. It is particularly desirable to avoid contact of milk with any surface heated higher than is necessary, either in its preheating or in its pasteurization.

I do not confine myself to the method of preheating milk in connection with the aerating process, though that is a convenient and economically desirable method. Any method of preheating in which a definite temperature can be secured, though preferably a method through contact with heating surfaces of moderate temperatures, may be carried out. Any known method of filling the bottles with the preheated milk may be used.

After their filling the bottles are capped, and preferably, with a metal cap in the use of which is carried out the principles which I explain in my co-pending application for Patent, Sr. No. 874,385. The basic principle applied in that bottle closure is in having a combined pressure and protection cap that shields the bottle lip and mouth from all gravitating fluids or solid matters that might be of an infective nature, and which cap is of sufficient size to retain pneumatically a volume of sterile air under the cap sufficient in amount to draw upon in the in drawing of air into the bottle during the cooling of the bottle.

The filled, capped bottles in their cases, are conveyed into pasteurizing and cooling-holding apartments, which are practically hermetically closed by proper doors, and which are constructed with non-conducting impervious walls. In the interior of these apartments, a sufficient number of which are provided, I provide apparatus for the higher heating and pasteurizing of the preheated milk, and in that case, the higher heating of all the milk that has been placed in any single apartment, is done at one time. This avoids having some part of the milk which may be first placed in the apartment, retained for too long a time at a pasteurizing temperature while other parts of the milk are not heated so long a time. This process avoids the positive defect of differences in the taste of the several parts of the milk, which would otherwise be possible and which might be recognized by consumers from day to day. Apparatus is also provided in these apartments for the cooling of the milk, either by spraying with water of various temperatures, or by refrigerative piping or by blowing cold air. If the cooling is done by water, the waste water from the first stage of cooling is used to preheat the milk, either alone or by reinforcement with heat received by passing the waste water through a water-heater. The moderately heated waste water used in the second stage of the cooling of the bottles is advantageously used for the first cooling of the bottles.

In the regenerative use of the heat of the cooling of the bottles, considerable economy is effected. So far as the heating of the bottles of milk is concerned, I prefer to heat them in the referred to apartments by means of evolving warm vapor from pools of water at the bottom of the apartments, through which heating coils are run and from which the warm vapor rises through the bottle cases, which have permeable wire tops and bottoms. Proper provision is made for observing the interior temperature with accuracy in these apartments, and also for determining the temperature of the milk at the bottoms of the bottles through the use of test bottles connected with an outside located temperature indicating apparatus. In these apartments the milk is not only cooled to the ordinary holding temperature of 45° F. It is cooled much below such ordinarily practised cooling temperatures, and preferably, close to the freezing point of milk; at which temperature there is substantially no fermentation occurring during the several days in which the milk is usually held prior to its conveyance and distribution to consumers. It will be noted that pasteurizing temperatures do not destroy some of the putrefactive types of bacteria and various spores in milk, which proliferate at the temperatures at which milk is usually held after its pasteurization and up to the time of its delivery to the consumer. Putrefactive bacterial growths in milk tend to induce decomposition accumulations of undesirable character in milk. The low temperatures I apply in this connection, I regard as highly important in connection with the providing of safe milk. The milk being held in the apartment in which it is refrigerated, undergoes practically no decomposition changes during the usual short time of its holding, and being deeply refrigerated at the time of its removal, retains that frigidity sufficiently during the time in which the milk is being distributed.

In heating and cooling milk, I do not confine myself to any special means or method. Any known means or method may be used.

Sterilizing and filling the bottles with milk of a pasteurizing heat in one continuous operation is not only objectionable in connection with a lack of certainty as to securing effective pasteurization. It is economically lacking in that the working force at the milk plant has its time of work too much concentrated into too few hours. It is economically better to perform the washing and sterilization of the bottles at a separate time each day from the time of heating and filling the milk into the bottles. This spreading of the working efforts in the milk plant results in a financial saving. Heating the bottles and milk at or prior to the time of bottling, at a lower temperature than is common, although theoretically that practice may not be economically equal to the higher heating, still, an advantage is gained in that the preheating process can be effected with moderately hot water instead of steam, and the heat in the water can be more economically applied through the use of heat economizing heat transferring apparatus.

The substitution of an interrupted succession of steps, which, however, are coöperative, as practised in this invention, in place of the uninterrupted method, while it results in a slight loss of heat in the cooling and heating of the bottles, gives aggregate results that are in advance of the results from higher heating, by securing a better edible quality, as well as a better sanitary quality; and also over-head general working economies that can be secured in a milk handling plant. In particular, the present advance of applicant, pertains to milk plants handling very large quantities of milk, where floor space is limited and where the element of time is an important matter, especially in connection with utilizing the working force to the best advantage over the entire working day.

As a further part of my invention, and to secure a greater uniformity in the heating of all of the milk in the bottles, and of all the bottles of milk under treatment at one time, I, using the species of bottle closure for which I was granted Patent No. 1,141,553, issued June 1st, 1915, may reverse vertically the bottles one or more times and may change the position of the bottles from one level to another zone at a different level of the apartment while I subject the bottles to a pasteurizing heat. The bottle closure referred to allows of that procedure.

What I claim as new is:

1. The method of treating milk herein described, which consists in performing the following combination of coöperating steps, namely: (1) aerating cold milk and preheating the milk during the step of aeration to a temperature not to exceed 130° F., (2) washing a milk bottle and sterilizing the bottle during a time that is required for its complete sterilization, (3) cooling the milk bottle to a temperature lower than 130° F., (4) spraying the cooled bottle with steam and hot water until the temperature of the bottle is approximately that of the preheated milk, (5) placing the pre-heated milk in and filling the heated milk bottle, (6) capping the filled milk bottle with a metal impervious bell cap retaining warm air under its convexity when placed on the bottle, (7) placing the capped bottle in a substantially closed-to-air apartment, (8) subjecting the bottle while in the apartment to a pasteurizing heat, (9) holding the milk in the apartment for a sufficient length of time to secure the pasteurization of the milk, and (10) cooling the heated milk to a temperature sufficiently low to substantially prevent fermentation in the milk while holding the milk in said apartment.

2. The method of treating milk herein described, which consists in, heating the bottles in which the milk is to be placed, from a room temperature to a temperature approaching to, but not to exceed 130° F.; heating milk approximately to a temperature of, but not to exceed the temperature of the bottles in which the milk is placed; filling the bottles with the heated milk capping the bottles; heating the capped bottles and the milk therein contained at a pasteurizing temperature; holding the heated bottles and contained milk at a pasteurizing temperature until pathogenic germs are destroyed in the milk; and cooling the bottles and contents thereof.

3. The method of treating milk herein described, which consists in, aerating cooled milk and preheating the milk during the aeration of the milk; placing the aerated and preheated milk in clean sterilized bottles of a temperature sufficiently near the temperature of the preheated milk to avoid a breaking strain on the bottles; closing the bottles; heating the closed bottles and preheated milk to a pasteurizing temperature; holding the heated milk until the pasteurizing performance is effected; and cooling the pasteurized milk without removal of the milk from the position in which it has been pasteurized, said preheating being effected by heat taken from the milk in said cooling.

4. The method of treating milk herein described, which consists in, pre-heating milk to a temperature approximately to but below a pasteurizing temperature; placing the pre-heated milk in a container having a temperature below 130° F., capping the container; pasteurizing the pre-heated milk while in the container; and cooling the pasteurized milk.

5. The method of treating milk herein described, which consists in, preheating milk and aerating the milk during its heating; bottling the milk; pasteurizing the milk in the bottle; and cooling the pasteurized milk by transfer of heat in the milk to water, the preheating of the milk being effected by heat transferred to the water from the pasteurized milk cooled by the water.

6. The method of treating milk herein described, which consists in, (1) pasteurizing milk, (2) cooling the milk with water, said water being heated in the cooling of the milk, (3) preheating milk with the preheated water run in countercurrent to the milk and aerating the milk in its preheating; and (4) bottling the preheated milk.

7. The method of treating milk herein described, which consists in, (1) bottling a preheated milk, (2) pasteurizing the preheated milk, (3) cooling the bottled milk with water, and (4) preheating the milk by currents of water heated in cooling the milk, and by warm air.

8. The method of treating milk herein described, which consists in, (1) sterilizing a bottle at a sterilizing heat, (2) cooling the bottle to a room temperature, (3) reheating the bottle at a temperature above a room temperature but not to exceed 130° F., (4) preheating milk to a temperature approximating the temperature of the bottle, (5) placing the preheated milk in the preheated bottles, (6) subjecting the preheated milk and the bottle containing the milk to a secondary heating of a temperature sufficient to pasteurize the milk, and (7) cooling the milk and bottle.

9. The method of treating milk herein described, which consists in, (1) preheating the milk from a cold, non-fermentative holding temperature to a temperature higher than the holding temperature and higher than atmospheric temperatures but lower than a pasteurizing temperature by bringing said milk into contact with a heating surface of a temperature lower than a pasteurizing temperature, (2) bottling said preheated milk, and (3) further heating the milk to a pasteurizing temperature.

10. The method of treating milk herein described, which consists in preheating the milk to a temperature approximating to but lower than a pasteurizing temperature, and placing the preheated milk in a container that has been subjected to a sterilizing heat, cooled and reheated to a temperature approximately that of the preheated milk, but

lower than a pasteurizing temperature, preventing the milk during its pasteurization and after its pasteurization from germinal contamination in the bottle, giving a secondary heating to the milk in the bottle at a pasteurizing temperature, holding the milk at a pasteurizing temperature until pasteurization has been effected, and cooling the milk at a temperature below 40° F.

JOSEPH M. W. KITCHEN.

Witnesses:
BEATRICE MIRVIS,
GEO. L. WHEELOCK.

J. L. GOUCHER.
MILK PRODUCT.
APPLICATION FILED APR. 1, 1909.

1,181,219. Patented May 2, 1916.

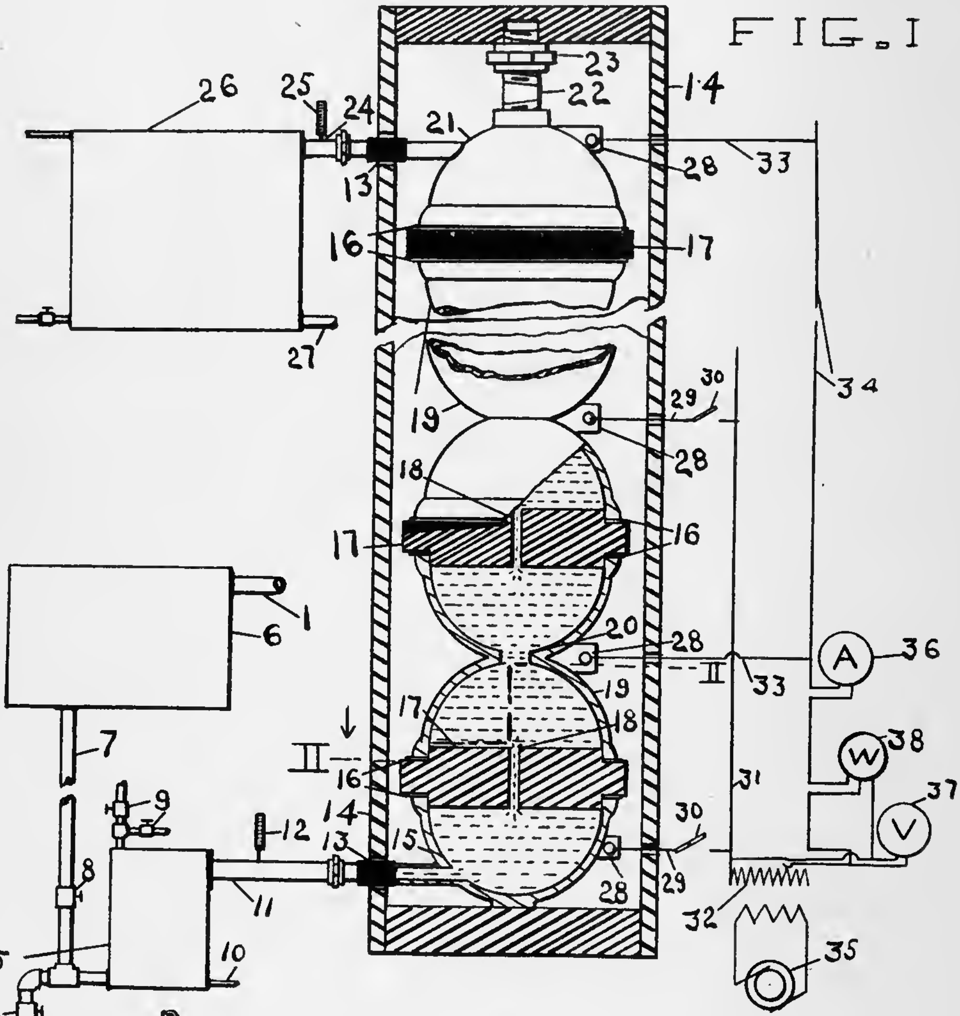


FIG. 1

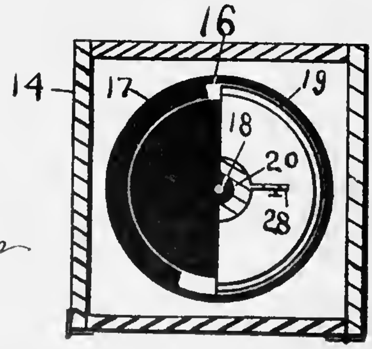


FIG. 2

WITNESSES
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INVENTOR

BY Geo E. Kirk.
ATTORNEY

UNITED STATES PATENT OFFICE.

JAMES L. GOUCHER, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE NEW YORK CONVEYANCERS COMPANY, A CORPORATION OF NEW YORK.

MILK PRODUCT.

1,181,219. Specification of Letters Patent. Patented May 2, 1916.

Application filed April 1, 1909. Serial No. 487,176.

To all whom it may concern:

Be it known that I, James L. Goucher, a citizen of the United States, residing at New York, New York county, New York, have invented a new and useful Milk Product, of which the following is a specification.

This invention relates to a milk product and to the manner of treating fluids to render them bacteria free and to improve the digestibility.

This invention has utility as a purified fresh milk product of exceptional value for invalids and children. The fluid treatment herein disclosed is especially valuable for milk to prepare the purified milk product.

The physical and chemical characteristics of milk vary to quite a wide extent from different animals, and as to feed and climate; and likewise the product herein will not only vary to the same extent, but also further due to the modifications of the treatment. In the course of an extended series of comparative tests during quite a considerable time, in each of which instances the treated milk hereof has shown marked superiority over the natural, untreated or raw milk, in being sterile and of improved digestibility, it has developed that to a quite remarkable extent many of the normal or original natural characteristics have remained unchanged, in fact to a much greater extent than in "sterilization" and "pasteurization" processes. Apart from its purity, sterility and improved or of more than normal digestibility, it is practically unaltered natural milk, as to general characteristics for consumption when fresh. The milk is maintained normal as to viscosity, specific gravity, water content, acidity, ash; most nearly approximates normal as to milk sugar and fat. The total proteids approximate normal, and in certain treatments from which tests show a reduction of casein with increase in globulin or albumin, the totals still approximate normal for the proteids, seemingly confirming that some transposition has occurred in the proteid group. In view of these normal or standard conditions prevailing, there remains the question as to changed features. It is a normal product and sterile—sterilization or rendering free from bacteria has not wrought any change in the general characteristics, as observed in the fresh product. This treated product has, when kept on ice, retained sweetness, in summer season for fourteen and one-half days. There are changes produced in the product, for carefully conducted culture tests, show, when treated, no growth, while there was considerable bacteria content before treatment. "Sterilized" and "pasteurized" milk have digestibility thereof made more difficult than when raw or natural, while comparative and confirmative tests using artificial gastric juice with and without rennet bring out the fact that the product herein not only does not have its digestibility made more difficult than the normal or raw milk, but in reality is more easily digestible.

This product of molecularly agitated milk is apparently without any marked deviation from many normal chemical conditions of the milk. Considerable microscopic research develops the fact of dissemination or apparent breaking up and more uniform scattering of the cell groupings or globules in the milk solids, not only of the proteids, but also of the fat. These discoveries are confirmed by noting conditions in the milk after standing. When the cream rises, which seems to occur more readily than in normal raw milk, the volume of cream as shown by the cream line indicates an increase varying from as much as 25% to as high as 40% above that of the raw milk from which the sample is taken. This should establish breaking up of the fat globules, or a more general diffusion or scattering thereof, thus leaving more susceptible to attack by digestive agents. A to-some-extent similar condition as to breaking up or dissemination seems to occur in the proteids. The after confirmation of this fact is found in the uniformity in texture of the portion of the original treated milk below the cream, for there is not a separation of the curd and whey even when first souring stage is reached. It is accordingly seen applicant has a bacteria-free product; that such product not only has no detrimental features as to digestibility over normal milk, but is improved; and that there has been a dissemination of the solids of the normal milk. The bringing about of this condition, or the production of this milk, is made possible by the fluid treatment, apparatus adapted for the performance of which in handling milk is shown in the drawings to add to clearness of steps of operation.

Figure 1 is a general view of the apparatus, partially in outline and partially in vertical section, with parts broken away, showing an embodiment for carrying on the steps of the process of invention hereof; and Fig. 2 is a section on the line II—II, Fig. 1.

The fluid, herein considered as milk, may be received through the supply pipe 1 and forced by circulation pump 2 through line 3, having valve 4 therein. By controlling the speed of the pump 2, the rate of delivery of milk into the regulator 5 may be varied. In connection with this force feed system by the pump, which permits of increased rate of working, there may be a gravity feed system, the milk supply being delivered by line 1 to the elevated tank 6, from which leads the line 7 having a valve 8 therein. This line 7 through line 3 enters the regulator 5. With the gravity system working, valve 8 may be adjusted to regulate rate of flow, while valve 4 cuts out the pump 2. With the force system working, valve 8 may be closed to cut out the overhead tank 6. The regulator 5 has supply lines 9 for fluid to bring the temperature of the entering milk to a predetermined point. The fluid entering the regulator 5 at lines 9 is discharged therefrom by line 10. The milk brought to a uniform temperature in the regulator 5, passes through line 11, having thermometer 12 therein, to permit checking up of the operation of the regulator and adjusting as the circumstances warrant. From line 11, the milk passes through insulating fitting 13 in the housing 14, to the semicircular, or rather hemispherical electrode 15, spaced by gasket 16 from circular insulator block 17, provided with central opening 18 which serves to materially reduce cross-sectional area of the milk stream, and accordingly increase the flow rate or velocity. The milk passing through opening 18 from electrode 15, enters the next of the series of electrodes 19 which are of an hour-glass form, having at the restricted portion a communicating passage 20. The two sections or reservoir portions of the electrode 19 are hemispherical and similar to electrode 15. After passing through the series of electrodes 19 and insulators 17, the milk reaches the terminal electrode 21, which by means of the threaded bar 22 and nut 23, is not only itself held in position, but serves at this one locking point to firmly bind together, or release the whole series of electrodes and insulators of the treating apparatus in the housing 14. The milk from electrode 21 leaves the housing through insulating fitting 13 connected up with the pipe 24, which has a thermometer 25 therein, permitting a checking of milk temperature as read on the thermometer 12 when entering the treating apparatus proper. The line 24 enters the cooler 26, from which the milk is conducted by line 27 to the bottling machine, if to be bottled, or to such vessels as are to be used for storage. Each of the electrodes 15, 19, 21, is provided with an electric terminal 28, alternate ones of which terminals are connected by lines 29, and switches 30 with main 31 to one side of the transformer 32. The remaining electrodes are connected by lines 33 with the electric main 34 to the opposite terminal of the adjustable transformer 32. The transformer 32 is in communication with a source of electric power, as the alternating current generator 35. For the purpose of controlling the steps of the process, in addition to the checking up of operation by the thermometers 12 and 25, there are provided in the electric circuit the ammeter 36, voltmeter 37 and wattmeter 38.

The resistance of milk varies with its temperature, so by bringing the milk in the regulator 5 to a certain temperature before starting the treating, and causing a uniform rate of flow so that the thermometer 25 shall show milk leaving the treatment is of constant temperature, then there will be no variation in the resistance in the milk portions of the electric circuits between opposing bowl-shaped electrodes and the perforate intervening insulator. This means that the demand for electricity during the treatment will not vary, and in consequence the volts and amperes, as well as watts may be uniform for a given rate of flow of milk with a certain temperature for the milk on entering. This electric current is of a wave action so readily controlled and of such range of vibration as to effect the dissemination, purification and improvement in the milk as outlined.

While "sterilizing" milk contemplates heating to 212° F., and "pasteurizing" is defined as heating to at least 150° F. for a period of twenty minutes, or 160° F. for ten minutes, the heating herein is kept below the minima of time and temperature thus recited, and is effectual. The heating of milk to 150° F. or above brings about undesirable changes in the physical characteristics of the milk, which are avoided herein, as the treatment may be successfully pursued with the milk leaving the apparatus at 146° F. and lower. In the treating, the flow may be governed absolutely, and due to the particular structure of the machine, the flow is positive and at any given point therein of always uniform cross-section regardless of flow rate. Furthermore, the completely inclosed features thereof, also make operation possible independent of the placing of the treater proper as to whether the milk is caused to flow up, down or more or less in a horizontal direction. As to the uniform temperature for entering the treater, it may be varied to suit conditions, but a convenient temperature for use is 120° F. The rate of flow through the treater, while adjustable or controllable as are all the other features hereof, in regular operation may be such as to expose the milk to treatment of less than one minute duration and still produce the sterile product as outlined. For instance, in practice some milk can be satisfactorily treated while flowing at the rate of six hundred quarts per hour through the machine and subjected to 2200 volt, 6 ampere current of electricity. Due to condition of the milk, it may offer a resistance below the average, and for ready adjustment to take care of such emergencies, flow rate may be increased or one or more switches 30 thrown out to apply such uniform wattage or amperage as is desired to effect the result. The complete inclosing of substance treated during the performance of the steps, not only adds to the safety in operation, but also insures against contamination or departure from certain normal conditions.

The disposal of the bowl-shaped electrodes with contact surface of large area uniformly distant from maximum flow and current passages 18, permits a radiating diffusion of current to avoid effective intensity except in the congested passages 18. The pre-heating economizes electricity, but the additional incidental heating in treating by the current is not a cooking.

What is claimed and it is desired to secure by Letters Patent is:

A sterilized milk of improved digestibility having approximately normal viscosity, normal specific gravity, normal acidity, normal content of water and ash, decreased casein content, and increased globulin and albumin content over normal milk.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

JAMES L. GOUCHER.

Witnesses:

FRANK W. GOUCHER,
CHARLES H. KITCHEN.

Cream

1190369

UNITED STATES PATENT OFFICE.

HERMAN C. BECKMAN AND GEORGE E. DYCK, OF CHICAGO, ILLINOIS, ASSIGNORS TO NATIONAL SYNTHETIC PRODUCTS CO., OF CHICAGO, ILLINOIS, A CORPORATION OF NEW JERSEY.

PROCESS OF MAKING ARTIFICIAL CREAM.

1,190,369. Specification of Letters Patent. Patented July 11, 1916.

No Drawing. Application filed September 19, 1912. Serial No. 721,142.

To all whom it may concern:

Be it known that we, HERMAN C. BECKMAN and GEORGE E. DYCK, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Processes of Making Artificial Cream, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

Our invention relates to a method or process of making cream artificially, and its object is to provide a simple, practical and effective method of making cream or the like, so that the product shall be a very close resemblance to, if not in fact substantially identical with natural cream, and shall be pure, healthful and wholesome in every respect, and capable of being utilized for all the purposes for which natural cream can be used, and at the same time the process is very cheap and expeditious.

In accordance with our invention we provide certain ingredients, pretty largely the natural ingredients of cream, and we mix and manipulate these in such a way as to form the cream. We may take, for example, beef fat, or in lieu thereof, butter fat, animal or vegetable oils, such as oleo, olive, cotton-seed or peanut oil, or a mixture of the two, together with either full milk, condensed milk, milk prepared with milk powder, or skim milk, and milk sugar or any other sugar or glucose, and lecithin if desired, and these we will combine in suitable manner, one satisfactory method of which we find to be as follows: We heat the oil, beef or butter fat, and then dissolve the lecithin in the oil (if lecithin be used), the lecithin being soluble in such fat. The milk sugar or other sugar is dissolved in the milk, in full milk or skim milk, whichever may be used. These two mixtures are then united, as for example by pouring both of them into a container provided with some suitable agitator and surrounded by a steam or hot water jacket, or having some other suitable agitating and heating arrangement. We find it desirable, although not essential to put the milk with the sugar dissolved in it into the container first and then heat that mixture to start the agitator, and then pour in the fat or oil solution with the lecithin dissolved in it, the same having been previously heated to bring it to a liquid state. Then the entire mixture is pasteurized and then emulsified. It is then taken out and cooled, preferably by running it through some suitable cooler or cooling apparatus. To this mixture after cooling we preferably, though not necessarily, add a certain amount of starch. However, the use of this particular agent is not an essential feature of our process, as we may use any one of various agents to produce the result desired in this respect, which is that of binding the ingredients together to prevent separation, or of stabilizing the product. For instance, we have used besides starch, rennet and other active ferments, gelatin, calcium sucrate, gum tragacanth, gum arabic, Iceland moss, Irish moss, and carragheen moss. The above agents also have a thickening effect.

We have obtained good results also by merely oxidizing the product after pasteurization, by blowing through it air or air containing ozone. In the step of oxidizing the product we find that ozone possesses a remarkable efficiency and produces a superior article due to its stabilizing effect. This agent also has a thickening effect.

The product made as above is palatable, and can be used in place of natural cream in all ways in which the latter is used. The product made as above is also quite stable, the oil being so thoroughly incorporated into the milk base that it does not separate out under ordinary circumstances. We attribute this result largely to the use of starch or similar agent, as described above, since the oil quickly separates on standing if it is attempted to make the cream without using such an agent, which has the effect of binding the various ingredients together and so stabilizing the product. We find, however, that under certain severe circumstances the agents or ingredients mentioned above do not make the product sufficiently stable. For instance, if the product is shipped a long distance by rail, as from Chicago to St. Louis, the oil is apt to separate from the milk base, due perhaps to the jarring in transit, rendering the product valueless as cream. To further bind the oil to the base, therefore, and to render the product sufficiently stable to withstand rail transportation, we add casein, preferably in solution, although it may be added undissolved. Casein is soluble in practically any alkaline solution. Consequently we may dissolve the casein in any harmless alkaline solution. Bicarbonate of soda, ammonia water, caustic soda, sal soda, or caustic potash may be used in either hot or cold water to provide a solvent for the casein. We prefer to use bicarbonate of soda on account of its absolute harmlessness. Consequently, if casein is used in our process, it is dissolved in a solution of bicarbonate of soda and added to the mixture at any time during the process, but preferably prior to emulsification. The finished product is then ready for delivery.

If desired we can add some ingredient which will serve as coloring matter, such ingredient being well known on the market. We can then, if desired, add other ingredients which are at times desirable to add. For instance we can add any one or more, or all of the following: cholesterol, phytosterol, or lipochrome. These are all natural ingredients of cream and will serve to give the product more of the properties of the natural article. These elements may be added either in addition to or in place of lecithin. They are desirably added prior to pasteurization. If desired we will also add, and these would also desirably be added prior to pasteurization, any one or more or all of the glycerids of the following acids, to-wit: acetic, butyric, caproic, caprylic, lauric, myristic, palmitic, stearic, arachidic and oleic, the same being ingredients of natural cream.

The cream made by this process will be clean and pure, the whole having been pasteurized and the various elements having been inspected and purified as required by pure food laws, before they are used. It will be seen that all of the ingredients used, with the exception of starch, are natural ingredients of cream, the starch being simply used as a binder or thickener. The glycerid of butyric acid will serve to flavor the product, it being one of the natural flavoring elements. The cream is thoroughly wholesome and palatable and resembles natural cream very closely, and can be used in all the ways that natural cream can be, either as such, or by being manufactured into other products such as butter, ice cream and pastry and the like.

It will be understood that changes and modifications can be made without departing from the spirit of the invention.

What we claim as our invention is:

1. The process of making artificial cream which consists in preparing a mixture of an oleaginous substance, a milk base, adding casein, pasteurizing and emulsifying the whole, and subjecting the resulting product to the action of a binding agent.

2. The process of making artificial cream which consists in preparing a mixture of an oleaginous base, a milk base, adding casein, pasteurizing and emulsifying the whole, and adding starch.

3. The process of making artificial cream which consists in preparing a mixture of an oleaginous base, a milk base, adding casein in solution, pasteurizing and emulsifying the whole, and adding starch.

4. The process of making artificial cream which consists in preparing a mixture of an oleaginous substance and a milk base, pasteurizing and emulsifying the same, and subjecting the resulting product to the action of oxygen.

5. The process of making artificial cream which consists in preparing a mixture of an oleaginous substance and a milk base, pasteurizing and emulsifying the same, and subjecting the resulting product to the action of ozone.

In witness whereof, we hereunto subscribe our names this 5th day of July, A. D., 1912.

HERMAN C. BECKMAN.
GEORGE E. DYCK.

Witnesses:
A. Miller Belfield,
A. L. Jones.

UNITED STATES PATENT OFFICE.

RALPH W. CRARY, OF WAUKESHA, AND STEWART R. BARNETT, OF ALBANY, WISCONSIN, ASSIGNORS TO CRARY BROKERAGE COMPANY, OF WAUKESHA, WISCONSIN, A CORPORATION OF WISCONSIN.

FOOD PRODUCT AND METHOD OF PRODUCING THE SAME.

1,193,477. Specification of Letters Patent. **Patented Aug. 1, 1916.**

No Drawing. Application filed April 14, 1916. Serial No. 91,070.

To all whom it may concern:

Be it known that we, Ralph W. Crary, a resident of Waukesha, Waukesha county, State of Wisconsin, and Stewart R. Barnett, a citizen of the United States, residing at Albany, in the county of Green and State of Wisconsin, have invented a new and useful Food Product and Method of Producing the Same, of which the following is a specification.

The object of our invention is to produce a new food product composed of non-fatty portions of animal milk and the fixed fatty acids of alimentary vegetable oils, whereby the high value animal fats of animal milks may be utilized separate from milk and the low priced vegetable oils may be made palatable and available as foods.

It has heretofore been proposed to combine skimmed milk with vegetable oils, but heretofore proper care has not been exercised in the preliminary extraction of the free fatty acids of the vegetable oils and the vegetable oils have been combined with the skimmed milk prior to concentration. As a consequence, the free fatty acids of the vegetable oils have resulted in rancid tastes in the final product and the product has been non-uniform, owing to the difference in the specific gravity between the skimmed milk and the oils during the process of concentration.

In producing our improved product, we proceed in the following manner: An animal milk, such as cow's milk, is subjected to any well known process for the removal of butter fat as far as possible. Preferably this process includes a heating of the whole milk to about 98° F. and a mechanical separation of the butter fat therefrom, this separation being carried to a high degree in order that as much of the high-value butter fat be made available for separate sales as possible. Thereupon the skimmed milk is concentrated by the removal of a portion of the water in the usual manner of producing evaporated or condensed milk. Any well known process for accomplishing this result may be followed, but it is desirable to carry the process somewhat beyond the usual standards in order that the resultant product may be somewhat heavier in consistency than the desired final product, owing to the thinning effect of the oil which is to be added. After the concentration has been accomplished to the desired extent, an alimentary vegetable oil, from which the free fatty acids have been principally eliminated, is introduced into the concentrate and the mixture homogenized.

It is highly important that a thorough mixture and homogenization be accomplished in order that the ultimate product be uniform. It is also important that the free fatty acids of the oil be eliminated to a high degree before the oil is added to the concentrate.

The oil is, of course, of less specific gravity than the concentrate and ordinary methods of mechanical mixture, especially if the mixture is permitted to stand for any considerable period prior to homogenization, are not satisfactory.

Where ordinary mechanical mixing of the concentrate and oil is accomplished and the mixture then drawn off from the bottom of the mixing vessel, the lower strata of the mixture will be much less rich in oil than the upper strata, and a considerable portion of the oil, which inevitably rises to the top of the mixture, will stick to the walls of the mixing chamber. As a consequence, the product would be non-uniform and also inaccurate as to the proper porportioning of oil and milk solids.

In order to avoid the difficulties set forth above, we have found it extremely desirable to introduce the oil into the concentrate just prior to delivery to the homogenizer and in such manner that the oil is provided with an envelop of concentrate so that the oil does not come into direct contact with the supply piping of the homogenizer. In order to accomplish this, the oil is delivered to the concentrate through an aspirator, *i. e.*, through a small diameter tube which is projected into a larger diameter tube through which the concentrate is delivered to the homogenizer.

Any desired form of homogenizer may be

used, several such devices being at present upon the market and their operations being well understood, the material delivered thereto being broken up and intimately associated by reason of the pressure under which the material is driven through the homogenizer. By the method described, the mixture, in the form of an infinite number of infinitely thin disks, composed of a center of oil and a surrounding ring of concentrate, is delivered to the homogenizer, and, as a consequence, an exceedingly uniform product having definitely proportioned amounts of oil and milk solids not fats, is produced. After the product leaves the homogenizer, it is packaged in any usual manner.

The precise proportion of oil to milk solids not fats may of course, be readily determined and varied by a control of the amount of oil delivered through the aspirator.

If the oil is introduced into the milk before concentration, the heating of the mixture necessary for purposes of concentration, results in a thinning of the oil so that it is practically impossible to maintain a uniform mixture during concentration, and, as a consequence, the upper strata are richer in oil than the lower strata, and a considerable proportion of the oil would be lost both by volatilization and by adherence to the walls of the concentrating chamber.

In practice, we have found that, while many of the alimentary vegetable oils are satisfactory, cocoanut oil, from which the free fatty acids have been carefully removed, produces a product of exceptionally high character and pleasing taste.

We claim as our invention:

1. That improvement in the art of producing a food product from animal milk, which comprises the addition to a concentrate of skimmed milk, of an alimentary vegetable oil and the homogenization of said mixture.

2. That improvement in the art of producing a food product, which comprises the addition to a concentrate of skimmed cow's milk of an alimentary vegetable oil from which the free fatty acids have been removed, and the homogenization of said mixture.

3. That improvement in the art of producing a food product, which comprises the addition to a concentrate of skimmed cow's milk of an alimentary vegetable oil, and the homogenization of said mixture.

4. That improvement in the art of producing a food product, which comprises the addition to a concentrate of skimmed cow's milk of cocoanut oil from which the free fatty acids have been removed, and the homogenization of said mixture.

5. As an article of manufacture, a food product composed of a homogenized mixture of a concentrate of skimmed animal milk to which has been added, after concentration, an alimentary vegetable oil from which the free fatty acids have been removed.

6. As an article of manufacture, a food product composed of a concentrate of skimmed animal milk homogenized in successive small quantities with proportioned quantities of an alimentary vegetable oil associated with the concentrate immediately prior to homogenization.

7. As an article of manufacture, a food product consisting of a concentrate of skimmed cow's milk and cocoanut oil from which the free fatty acids have been removed, the mixture being homogenized.

8. As an article of manufacture, a homogenized compound resulting from the homogenization of an envelop of concentrated skimmed cow's milk, and a core of alimentary vegetable oil from which the free fatty acids have been removed.

9. As an article of manufacture, a homogenized compound resulting from the homogenization of an envelop of concentrated skimmed cow's milk and a core of cocoanut oil from which the free fatty acids have been removed.

10. That improvement in the art of producing a food product from animal milk, which comprises the injection of a core of an alimentary vegetable oil into an envelop of a concentrate of skimmed milk, and the prompt treatment of said envelop and core in successive portions by a homogenizer.

11. That improvement in the art of producing a food product from animal milk, which comprises the injection of a core of an alimentary vegetable fat, from which the free fatty acids have been removed, into an envelop of a concentrate of skimmed milk, and the prompt treatment of said envelop and core in successive portions by a homogenizer.

12. That improvement in the art of producing a food product from cow's milk, which comprises the injection of a core of an alimentary vegetable oil into an envelop of a concentrate of cow's milk, and the prompt treatment of said envelop and core in successive portions by a homogenizer.

13. That improvement in the art of producing a food product, which comprises the injection of a core of an alimentary vegetable oil, from which the free fatty acids have been removed, into an envelop of a concentrate of cow's milk, and the prompt treatment of said envelop and core in successive portions by a homogenizer.

14. That improvement in the art of producing a food product, which comprises the injection of a core of cocoanut oil into an envelop of cow's milk, and the prompt treat-

ment of said envelop and core in successive portions of a homogenizer.

15. That improvement in the art of producing a food product, which comprises the injection of a core of cocoanut oil, from which the free fatty acids have been removed, into an envelop of cow's milk, and the prompt treatment of said envelop and core in successive portions by a homogenizer.

In witness whereof, we have hereunto set our hands at Waukesha, Wisconsin, this tenth day of April, A. D. one thousand nine hundred and sixteen.

RALPH W. CRARY.
STEWART R. BARNETT.

Witnesses for Crary:
FRED J. STRONG,
JOHN J. STAUB.
Witnesses for Barnett:
CHAS. E. HUGHES,
FRED WINSHELL.

1,197,270 Milk

UNITED STATES PATENT OFFICE.

JOHN W. DAVIES, OF BOSTON, MASSACHUSETTS.

METHOD OF PRESERVING MILK.

1,197,270. Specification of Letters Patent. **Patented Sept. 5, 1916.**

No Drawing. Application filed January 24, 1916. Serial No. 73,784.

To all whom it may concern:

Be it known that I, JOHN W. DAVIES, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Methods of Preserving Milk, of which the following is a specification.

The invention to be hereinafter described relates to the process or method of preserving milk and cream and its purpose is to keep such liquids in a sweet and palatable condition for an indefinite length of time, ready for use.

Heretofore, attempts have been made to preserve milk by subjecting it to a treatment, the preservative basis of which has been refrigeration. In these prior attempts, the milk has been first pasteurized by subjecting it to a temperature sufficiently high to destroy most of the bacteria and then immediately cooled to a temperature sufficiently low to prevent the development of bacteria life. Where the milk is to be preserved for any length of time, the temperature must be still further lowered, which causes the milk to solidify or freeze, and in practice the refrigerating temperature has been approximately 10° F. So long as the refrigerating temperature has been maintained, the milk has remained in the solid state and been well preserved for indefinite periods. Before such milk can be used, however, its temperature must be raised and the solid mass liquefied. This has caused a separation of the milk constituents.

In some attempts, the milk has been pasteurized and then or within a very short time after pasteurization, it has been placed in bottles and cooled to a temperature of substantially 40° F. At this temperature, however, bacteria development takes place, although more slowly than at temperatures somewhat higher, so that the length of time the milk can be preserved by this method is limited to a few days, during which the bacteria multiply and finally, at the end of three or four days, render the milk unfit for use.

Applicant has discovered that if milk be subjected to a temperature sufficiently high to destroy bacteria or germ life and be permanently maintained at substantially such temperature or a temperature sufficiently high to prevent bacteria development, it may be preserved for months in a stable, pure, and wholesome condition, ready for use.

The first step in the present process consists in pasteurizing the milk. This is best accomplished at a temperature of between 140° and 152° F. which serves to slowly destroy bacteria or germ life without "cooking" the milk, or coagulating the albumin, and may be continued until most of the bacteria have been rendered harmless. This step in the process may be carried out by any of the usual pasteurizing apparatus or it may be performed by hand. After it has been pasteurized, it is subjected to the permanent preservative temperature treatment which should be sufficiently high to prevent the development of bacteria. The preservative temperature treatment is conveniently carried into effect by transferring the pasteurized milk to a hot room, either directly in bulk or by placing the pasteurized milk in suitable containers for transfer to the hot room. Experiments have shown that the best results are secured by a minimum preservative temperature of not lower than about 140° F. and a maximum of not over approximately 152° F.

Contrary to the generally-accepted theory that milk preservation for any material length of time must depend upon maintenance of a low or refrigerating temperature, such as hereinbefore noted, I have discovered, and my experiments have demonstrated, that if fresh milk be pasteurized and its temperature thereafter be permanently maintained sufficiently high to prevent bacteria development, the milk may be indefinitely preserved in stable condition, and without disintegration of the constituents as happens when milk is frozen and then liquefied.

A temperature of about 145° F. is suggested as a good pasteurizing and mean preservative temperature, but it is to be understood that such temperature may vary within a range of temperatures that will insure proper pasteurization and permanent preservation thereafter, as I believe I am the first in the art to preserve milk in stable condition for long periods of time by permanently and continuously subjecting it to a high temperature, as contradistinguished from a low or refrigerating temperature.

The term "milk" is hereby employed in

its general sense and of course includes milk constituents, such as cream; and likewise the term "pasteurizing" is used in its general sense, to indicate a temperature treatment sufficiently high to destroy bacteria life.

What is claimed is:—

1. The process of preserving milk in stable condition for long periods of time, which consists in pasteurizing the milk and then subjecting the pasteurized milk to a permanent preserving temperature sufficiently high to prevent bacteria development.

2. The process of preserving milk, which consists in pasteurizing the milk, transferring the milk to containers while still maintaining the pasteurizing temperature, and subjecting the milk to a permanent preservative temperature sufficiently high to prevent bacteria development and hold the milk in stable condition for long periods of time.

3. The process of preserving milk, which consists in pasteurizing the milk, then transferring the milk to a hot room in which the temperature is maintained sufficiently high to prevent bacteria development, whereby the milk may be permanently preserved in stable condition.

4. The process of preserving milk, which consists in pasteurizing the milk at a temperature sufficiently high to destroy bacteria or germ life without changing the condition of the milk constituents, placing the milk in containers while at substantially the same temperature, and transferring the milk to a hot room in which the temperature is maintained between substantially 140° F. and 152° F., whereby the milk may be maintained in stable condition for use for long periods of time.

5. The process of preserving milk, which consists in subjecting the milk to a pasteurizing treatment at a temperature of between 140° F. and 152° F., and then transferring the pasteurized milk to a hot room having a temperature of between 140° F and 152° F. to permanently preserve the milk in stable condition.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

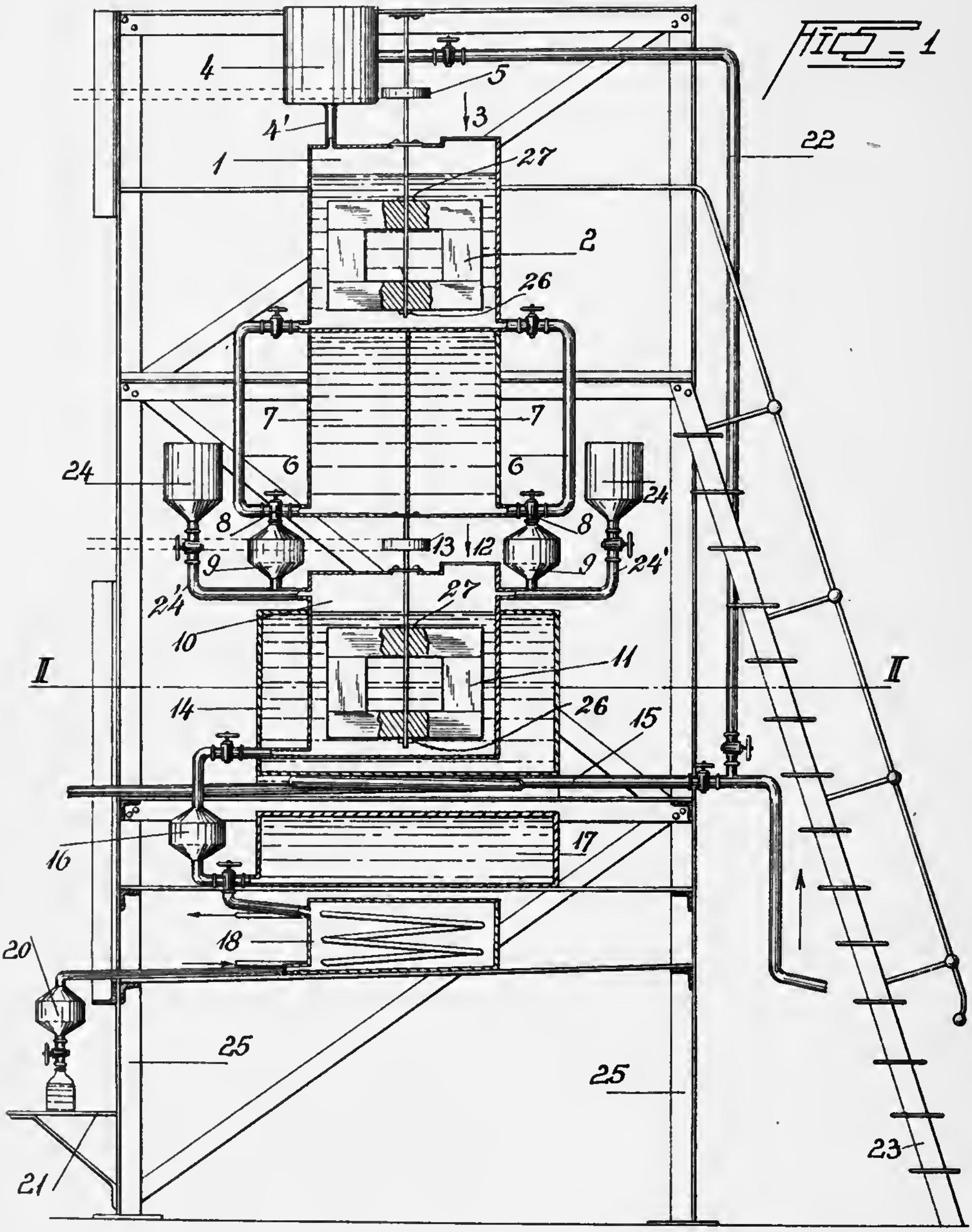
JOHN W. DAVIES.

Witnesses:
BEATRICE I. SMITH,
PETER C. HAINS, Jr.

G. VON RIGLER.
APPARATUS FOR MANUFACTURING MILK.
APPLICATION FILED MAR. 6, 1914.

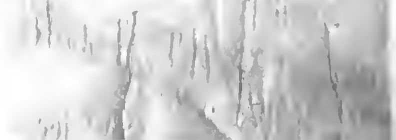
1,200,782. Patented Oct. 10, 1916.
2 SHEETS—SHEET 1.

FIG. 1



Witnesses:
J. J. Wallace
René Bruine

Inventor:
Gustav von Rigler
By Attorneys,
Fraser, Turk & Myers

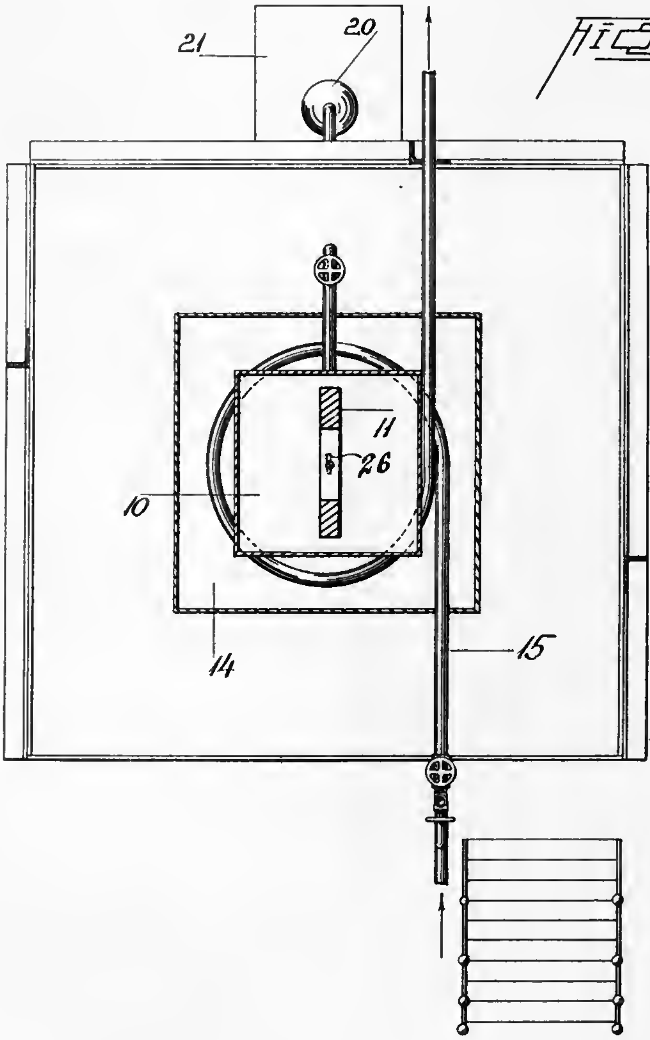


G. VON RIGLER.
APPARATUS FOR MANUFACTURING MILK.
APPLICATION FILED MAR. 6, 1914.

1,200,782.

Patented Oct. 10, 1916.
2 SHEETS—SHEET 2.

FIG. 2



Witnesses:
J. Wallace
René Bruine

Inventor:
Gustav von Rigler
By Attorneys,
Fraser, Turk & Myers

UNITED STATES PATENT OFFICE.

GUSTAV von RIGLER, OF KLAUSENBURG, AUSTRIA-HUNGARY.

APPARATUS FOR MANUFACTURING MILK.

1,200,782. Specification of Letters Patent. **Patented Oct. 10, 1916.**

Original application filed May 22, 1913, Serial No. 769,178. Divided and this application filed March 6, 1914. Serial No. 822,843.

To all whom it may concern:

Be it known that I, Gustav von Rigler, a subject of the King of Hungary, residing in Klausenburg, Austria-Hungary, professor in the University of Kolozsvar, Hungary, have invented certain new and useful Improvements in Apparatus for Manufacturing Milk, of which the following is a specification.

The invention relates to apparatus for the production of artificial milk, similar not only to the composition and appearance of the natural milk, but also in behavior when subjected to the ordinary methods of treating milk, such as cooking, cooling, coagulating, etc.

The attaining of the latter quality is the object of the present invention. For it is not difficult, from constituents such as are contained in natural milk, to produce a fluid whose composition is similar to that of the natural milk, possessing the external qualities of the same. I have, however, so selected materials to be employed in the production and to so treat them that the artificial milk thus formed will undergo cooking, cooling and other operations which are carried on with milk in the household and in the food industry like the natural milk and without their milky qualities suffering a change. The present invention answers these demands, gluten being employed as the albuminous matter for the production of the artificial milk, which material can be dissolved or suspended in the solvent in such a way that the same remains in uniform distribution both under heat and under cold at rest or in motion, and also holds the other materials combined in solution, for instance, the fat in perfect emulsion and in consequence thereof can easily be sterilized, preserved and transported.

The use of gluten as albuminous basic material for the artificial milk offers the still further advantage that the same is available in large quantities and at relatively low prices and in consequence of its vegetable origin excludes those dangers which in the use of animal albuminous material, in consequence of the disease causing bacteria and spores contained in certain cases in them, can occur, an advantage which in a food, like milk, which forms the specific food of nursing children, sick people, convalescent and weak people, needs no extensive discussion. It must be consequently considered an extremely fortunate circumstance that it has been possible to discover right in a vegetable albuminous material, in gluten, that albuminous material which perfectly answers all the requirements for the production of artificial milk.

For the purpose of transferring the gluten into the partly dissolved, partly suspended form, similar to the albuminous materials of the natural milk the gluten in accordance with the process of the present invention is used in the fresh raw condition. In such treatment of the gluten there are employed very diluted solvents or suspending means and very energetic mechanical agitation.

As solvent or suspending means there is used a very dilute aqueous alkali solution, preferably a potassium hydrate solution, to which a little alcohol is added. The dissolving or suspending of the fresh gluten in this solution is carried out at ordinary temperature and the mechanical treatment is continued until a liquid of slightly yellowish color, thick, opaque and strongly foaming appears. From which on standing only the starch kernels contained in the gluten separate, and these are run off by filtration, standing or removed in any other way. The appearance of the liquid thereby suffers no change, and the filtered liquid shows no perceptible change if it is allowed to stand for a considerable time, is heated or cooled or treated mechanically, for example, shaken or stirred. The reaction of the liquid should be very weakly alkaline. Therefore the amount of alkali employed for the solvent or suspending liquid must be proportioned in accordance with the amount of gluten to be added. As an example, if 150 grams of raw gluten is to be employed per liter of the finished product then there is employed a potassium lye of 0.10 to 0.15 per cent. strength, which contains 0.5% alcohol.

The product above described forms the basic material upon which this apparatus is peculiarly designed to operate in the manufacture of the artificial milk. Into this basic material there are now brought the necessary mineral constituents, taking into consideration the composition of the water to be employed and the circumstance that the basic material already contains the necessary amount of potassium—if potassium lye was employed in the production of the same. As a general rule then, the use of pure faultless drinking water being assumed, to which of course the greatest care is to be given, it becomes a question of the addition of the lime, soda, chlorin and phosphorus. These materials are preferably added in the form of cooking salt, lime water, and phosphoric acid to the basic material, and in the form of previously prepared dilute solutions. In adding these materials care is to be taken that the basic material does not lose its alkaline reaction.

To the basic fluid there is added the requisite sweetening material—sugar of any kind or, if prepared for those suffering from sugar in the blood, in the place of the sugar, saccharin. These materials are preferably put in the solid condition into the liquid and dissolved in this itself.

The alkalinity of the basic fluid containing the mineral materials and sweetening material should preferably for ten c. c. of liquid correspond to 0.5 c. c. of 10% normal acid (indicator phenolphtalein).

The fat is emulsified in the basic liquid, which is preferably performed under very energetic mechanical treatment at a somewhat high temperature—about 70–100° C. As fat substances there are employed preferably vegetable fats or vegetable oils, from the same hygienic standpoint as was mentioned above with reference to the vegetable albumin, the gluten. Of course, however, in case of necessity animal fats or oils can also be employed. With regard to the fact that at times cocoanut fat can be most easily and cheaply obtained there will be set forth at length hereinafter the treatment of the cocoanut fat as the representative of the fats employed.

An amount of cocoanut fat amounting to about 3.5% by weight of the basic fluid is melted in hot water and then mixed with the basic fluid heated to at least 70° C. The mixing is carried on slowly at the beginning, then gradually more rapidly and energetically and at the same time the temperature of the basic fluid is gradually increased, preferably by means of the water or steam bath, for example, in such manner that the same rises about 10° C. every quarter of an hour up to 100° C., at which temperature the stirring is continued still for about half an hour longer. If care is taken for a corresponding energetic mixing then in this manner within four to five quarter hours the finished, hot and consequently sterile milk is let off and in case care is taken for suitable settling, filtering, cooling and bottle-filling devices, can be filled in bottles in a sterile condition.

The finished artificial or vegetable milk possesses in many respects the characteristics of natural milk. It curdles in the open air in open vessels. The curd is of a looser structure and consists of finer flocks than that of cow's milk. The taste of the same is an agreeable sweetish sour. After three days the curd rises to the surface in consequence of the bubbles (Co_2) developed in the same. When the curdled artificial milk is cooked the coagulate thickens and forms a mass similar to the curd yet somewhat looser. This possesses a very agreeable taste similar to that of the curd of sheep's milk. This curd can be employed for all purposes of cooking in the same manner as animal curd. By inoculating with kephir of joghurt fungus there is obtained from the artificial milk a food similar to the product obtained from cow's milk of loose curd and agreable taste.

In the accompanying drawings is illustrated one praticable embodiment of a form of my improved apparatus, in which drawing—

Figure 1 is a vertical section of the apparatus, and Fig. 2 a cross-section taken on a plane at about the line II—II of Fig. 1.

The apparatus comprises such a grouping of the mixing, clarifying, emulsifying and cooling devices that the same are arranged in the succession of their application as regards each other in such a manner that the liquid flows immediately out of one device into the next succeeding it. This, with a proper arrangement and adjustment of valves enables the purifying and sterilizing of the entire apparatus with hot washing or sterilizing liquid or water.

In the drawing the mixing vessel serving for the production of the basic fluid is designated by the reference character 1, the stirring device 2, the feeding inlet 3, the expansion vessel 4, for receiving the foam. The stirring device rotates preferably at 150–200 revolutions per minute, and the mixing receptacle has preferably a quadratic cross-section. It has been demonstrated that the illustrated construction of mixer effects the solution or suspending of the gluten in a relatively short time with perfectly satisfactory results, the rotary stirrer in the quadratic mixing chamber producing eddy currents which are desirable in making an emulsion. The foam receiver 4 communicates with the upper part of the mixing chamber through a narrow passage, a conduit 4′ of small cross-sectional area being illustrated.

It has further been proved as advantageous to so arrange the stirring device that the same does not touch the bottom of the receptacle. The frame constituting the stirring device is shown located below the normal surface level of the liquid in the mixing chamber, and is suspended therein in such manner that an entirely free space is present between the bottom of the said frame and the bottom of the said chamber. This free and open space materially contributes to the accomplishment of the desired results.

5 is the belt pulley of the stirring device.

The finished basic fluid flows through the pipes 6—6 provided with valves alternately into the one or the other of the settling receptacles 7 7, so that for further working settled basic fluid can always be available out of which the starch content of the gluten is already separated. By proper adjustment of the three-way valve 8 8, the settled basic fluid is now let off through one of the filters 9 9, into the fat emulsifying receptacle 10 provided with a stirring device 11 driven by the pulley 13, into which fat emulsifying receptacle the fatty material is introduced by the feeding inlet 12. The construction of the stirring device illustrated is identical with that of the one previously mentioned; the emulsifying vessel also possesses advantageously a quadratic horizontal cross-section, and is also furnished with receptacles 24—24 for the reception of the foam. Conduits 24′ 24′, preferably of small cross-section, are illustrated for establishing communication between the upper part of the emulsifying vessel 10 and the expansion vessels or foam receivers 24—24. A foam receiver is preferably provided for each side of the vessel 10. Valves are shown in the conduits 24′—24′ which are useful when cleansing or sterilizing the apparatus. The stirring device should be able preferably to rotate at the rate of 400 rotations per minute. The emulsifying vessel stands in the water bath 14, which by means of the heating worm 15 can be heated with hot water to about 100° C. Finished milk flows through the filter 16 into the pre-cooling receptacle 17, where it will remain for about an hour subjected to the slow, cooling action of the same, then it is subjected to the rapid action of the cooler 18, and finally passed to the filter 20. It will be perfectly cooled and filtered and can be filled at 21 in bottles.

By means of the branch pipe 22 the entire apparatus can be placed under hot water or any other sterilizing and purifying fluid, which flowing over the ordinary course of the milk rinses and sterilizes the same. There are provided for the purpose of mechanical purification of the receptacles suitably disposed holes. The whole apparatus is arranged on the frame 25 and the ladder 23 makes the higher lying portions easily accessible.

As is seen the fluid traverses the apparatus up to the point of the complete finishing of the milk in a closed stream without the same coming into contact with the outer air or the human hand, so that the possibility of infection is avoided.

The stirrers 2 are illustrated formed of a number of pieces of wood dovetailed together, and held to their shafts by some suitable means, such as pins 26 and 27.

It will be understood that the foregoing is illustrative of my invention, and that changes may be made within the scope of the claims without departing from the spirit of the invention.

This application is a division of my application Serial No. 769,178, filed May 22, 1913, for artificial milk and the process of and apparatus for the production of the same.

I claim as my invention:—

1. A milk manufacturing plant comprising mixing chambers, settling and cooling chambers, filters, etc., so constructed, connected together and relatively disposed that the material under treatment passes by gravity from one part of the apparatus to the next in order in a closed stream shielded from the outer air, thereby facilitating the carrying out of the process and also affording means wherein the entire apparatus may be placed under the influence of sterilizing and purifying fluid flowing through the apparatus over the ordinary course of the milk.

2. In a device for the production of artificial milk the combination with a mixing chamber, a plurality of settling chambers, pipes extending from the mixing chamber to the settling chambers, a second mixing chamber and a conduit extending from each of the settling chambers to said mixing chamber.

3. In a device for the production of artificial milk the combination with a mixing chamber, of a foam receiver disposed above said mixing chamber and a conduit of small cross-sectional area extending from the upper part of the mixing chamber to said receiver.

4. In a device for the production of artificial milk the combination with a mixing chamber, of a stirrer therein, a foam receiver disposed above said mixing chamber, and a conduit of small cross-sectional area extending from the upper part of the mixing chamber to said receiver.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

GUSTAV von RIGLER.

Witnesses:
Dr. Friedrichstein,
Arthur Voltank.

UNITED STATES PATENT OFFICE.

JOSEPH MOSES WARD KITCHEN, OF EAST ORANGE, NEW JERSEY.

FOOD COMPOSITION.

1,230,091. Specification of Letters Patent. **Patented June 12, 1917.**

No Drawing. Application filed November 20, 1916. Serial No. 132,288.

To all whom it may concern:

Be it known that I, JOSEPH MOSES WARD KITCHEN, a citizen of the United States, residing in the city of East Orange, county of Essex, and State of New Jersey, have invented Improvements in Food Compositions, of which the following is a specification.

The object of the present invention, which is a continuation of my copending application, Sr. No. 872,707, is to provide for a commercial and economical utilization of skim milk as human food, as well as to produce an excellent table beverage of improved hygienic character, of low cost, agreeable gustatory quality and well balanced as to its nutritive constituents.

In my application for patent, Sr. No. 740,963, which was filed January 9, 1913, and has developed into Patent No. 1,125,692, I refer to chocolate as a desirable addition to skim milk in making food compositions, the addition of which confers improved hygienic and gustatory quality to skim milk through replacement of the butter fat that has been removed from the milk in its skimming, by an equivalent amount of fat—that of the vegetable fat in the chocolate, which addition also confers a chocolate flavor to the milk. In that patent I lay stress on the idea of nutritively re-balancing skim milk with fat, by the addition of food materials rich in fat other than milk, in which the fat is not disassociated from the fibrous tissue of the material used, which condition of retained fat association prevents the occurrence of rancidity in the composition. In my Patent No. 1,127,778, I describe a preferred method of dehydrating fluid food compositions through which successive layers of fluid are dried upon a nucleus, at moderate temperatures, which moderate application of heat largely prevents changes in the digestibility of the food that ordinarily occurs when exposed to higher temperatures in the drying process.

The present application has for purpose, specifically claiming several novel inventive ideas that were more or less disclosed in the referred to patents; as well as other related ideas. It specifically claims a method, and a product containing a cocoa preparation made by the method, which in constitution is much as described in the cited patents.

The general idea of utilizing admixed skim milk and a cocoa constituent is old; but the advance I have evolved, I believe, is new. In this case, when reference is made to a cocoa preparation, a preparation of the entire cocoa seed, such as forms of pulverized chocolate, is meant.

The making of food compositions of chocolate or other preparations of cocoa and whole milk, is commonly practised; but such compositions besides being more costly than my composition, have too large a fat content to be hygienically desirable. I overcome that objection by using skim milk instead of whole milk, and thus secure a lessened cost, as well as an increased hygienic-dietetic value. To secure a commercially desirable product, I partly dehydrate the skim milk, either before or after admixing it and the chocolate or other cocoa preparation and other admixed constituent, which may be sugar, starchy cereals or flavoring matter; and from such admixed materials, I make partly fluid, solid, or dry powdered compositions, packaged in various known incasements. The partly fluid, condensed form, is preferably incased in hermetically sealed tins, the solid form in soft paper, and the powdered form in stiff cardboard incasements or non-hermetically sealed sheet metal packages. All of these forms should be sterilized against fermentative action, after being packaged.

In preparing any composition of this character, I prefer that the skim milk and cocoa preparation should be partly dehydrated under a reduced atmospheric pressure, as I do not pre-digest my milk. The composition thus produced has only been subjected to a limited extent to a degree of heat that reduces digestibility in the product. My method secures better results as compared with compositions entirely dried under high heat. My next preferred method is to dry such compositions as are herein claimed, under the method described in my Patent No. 1,127,778. However, I do not confine myself to any special method of dehydrating the skim milk or in pulverizing or in otherwise preparing the cocoa constituent of the composition. The cocoa constituent may be partly deprived of its naturally contained fat if desired, in order to secure a maximum gustatory flavoring effect from the cocoa constituent, and yet avoid an undesirable presence of fat in the composition. In cow's milk of average composition the various food constituents are present in desirable proportions; hence I prefer, in making my compositions, to imitate the nutritive proportions of the solids found in cow's milk of average character as to its food constituents.

I do not confine myself to any degree of dehydration of the skim milk, or definite proportions of cocoa or chocolate that I add to the skim milk; other than enough is added to make good the butter fat that has been removed from the milk.

I may admix dry powdered skim milk with powdered chocolate or cocoa in my compositions, the base of which is normal undigested skim milk as a rule. I use any preparation made from cocoa seeds that is designated as cocoa, chocolate, broma, or that may be otherwise named; except so-called cocoa-butter that has been disassociated from the fibrous tissue of the cocoa seed; for I prefer to use, especially in dry compositions, a preparation of cocoa that retains its fatty constituents in natural association with the vegetable fiber and flavoring matter of the cocoa seed; and thus avoid decomposition in and a greasy texture of the mixture, and also secure a better digestive quality, as well as a good gustatory effect in such compositions.

In further carrying out the aim of the invention, I preferably add some powdered starchy constituent to it, such as barley or wheat flours, with the aim of reducing the cost of the totally contained nutrients, and also to secure a thicker character in the composition when prepared for consumption. This addition also promotes the digestion of the milk proteids by preventing clotting in the stomach of the milk, in such large hard masses as would otherwise occur.

Although I prefer to make my product in the form of a partially dehydrated composition, I may admix in suitable proportions, dry powdered forms of cocoa with pulverized skim milk prepared by the known method of drying the milk on a highly heated roll, or otherwise produced. This form of product is of a lesser cost; but the high heat of the process coagulates the proteids of the milk and renders them more difficult of digestion, and it takes a longer time to prepare the completely dried product for table consumption.

My method of drying as indicated in Patent No. 1,127,778, is preferable, but is more costly. My method of incorporating the ingredients in the fluid form, partially dehydrating them under reduced atmospheric pressure, and then hermetically sealing the same in sheet metal incasements, is the most costly of the several methods; but it is the best, as in its preparation for immediate use, it merely requires the addition of warm water to be prepared for consumption; and the process of dehydrating the milk under reduced atmospheric pressure preserves the wholesome quality of the milk to an extent that otherwise would not obtain. In making my food compositions, I may, and usually do add other constituents; but for hygienic reasons, I prefer not to add sugar before the product is marketed, leaving the matter of adding a sweetening ingredient, to individual consumers. It will be particularly noted that a special aim of this invention is to produce a nutritive beverage of a very low cost, as well as a composition that is edibly attractive, and of an improved hygienic quality.

In the ordinary forms in which cocoa compositions are prepared for consumption at the table, not only is whole milk generally used, containing a large butter fat content; but also, butter fat in the form of whipped cream, is generally added, which total addition of fat to an already fatty material, is dietetically objectionable. I aim to produce a composition that is designedly well balanced in its constituents of proteids, fat, and sugar to secure the best dietetic results, and in proportions that are harmoniously equivalent to those of whole milk of ordinary composition, and yet, that shall have the generally relished chocolate flavor.

I claim:

1. The method of producing the food composition herein described, which consists in, (1) skimming milk, (2) adding to the skim milk pulverized cocoa seed and a pulverized cereal, and (3) partly eliminating water from the admixed materials under a decreased atmospheric pressure.

2. The method of producing the food composition herein described, which consists in, (1) adding to skim milk a cocoa product in quantity sufficient to replace the fat skimmed from the milk by an equivalent amount of the fat contained in the cocoa preparation, (2) adding a thickening cereal to the skim milk and cocoa preparation, and (3) condensing the skim milk, cocoa preparation and thickening cereal under a lessened atmospheric pressure.

3. The method of producing the food composition herein described, which consists in, admixing skim milk, pulverized cocoa seeds and a thickening material, and eliminating water from the admixed material under a lessened atmospheric pressure.

4. As a new food composition, skim milk, pulverized cocoa seed and a pulverized cereal.

5. As a new food composition, partly dehydrated skim milk, pulverized cocoa seed and a cereal.

6. The method of producing the food composition herein described, which consists in, mixing skim milk and powdered cocoa seeds and dehydrating the admixture under de-

creased atmospheric pressure, whereby a thorough emulsion is secured.

7. As a new food composition skim milk, powdered cocoa seeds and a cereal.

8. As a new food composition, an emulsion of powdered cocoa seeds and skim milk, produced in a vacuum pan.

9. As a new food composition, powdered cocoa seeds and skim milk, the proportion of cocoa seeds used, comprising a fat content equal to the butter fat that was in the milk before it was skimmed.

10. As a new food composition, powdered cocoa seeds and skim milk, the fat in the powdered cocoa being retained in association with the vegetable tissue of the cocoa and in proportionate amounts substantially equaling the amount of fat removed from the milk in its skimming.

JOSEPH MOSES WARD KITCHEN.

Witnesses:
BEATRICE MIRVIS,
GEO. L. WHEELOCK.

UNITED STATES PATENT OFFICE.

STEWART R. BARNETT, OF ALBANY, WISCONSIN, ASSIGNOR TO CRARY BROKERAGE COMPANY, OF WAUKESHA, WISCONSIN, A CORPORATION OF WISCONSIN.

FOOD.

1,230,817. Specification of Letters Patent. **Patented June 19, 1917.**

No Drawing. Application filed June 26, 1916. Serial No. 106,015.

To all whom it may concern:

Be it known that I, STEWART R. BARNETT, a citizen of the United States, residing at Albany, in the county of Green and State of Wisconsin, have invented a new and useful Food, of which the following is a specification.

The object of my invention is to produce, in commercial form, a stable concentrated food product which, when diluted with water, will prove satisfactory as a food for babies and invalids, especially those who are in a condition of "fat intolerance", and, in some cases, those who require an assimilated hematinic food.

This concentrated food product comprises concentrated cow's milk (either whole or skim); malt soup extract, preferably alkaline; an alimentary vegetable oil, such as olive oil, and preferably one from which the free fatty acids have been removed; and finally, if desired, peptonized iron.

In preparing this food product I preferably use (1) approximately 79.63%, more or less, of cow's milk (whole or skim) concentrated by any well known process. This concentrate should be warmed or taken directly from the concentrating apparatus and to it is added, by mechanical agitation (2) 16.66%, more or less, of a malt soup extract, preferably alkaline.

"Malt soup extract", in its present usual commercial form, is a combination of dextro-maltose and potassium carbonate, and gives an acid reaction, although it is not readily fermentable in its concentrated form. When diluted with water or milk or concentrated milk, however, it becomes more readily affected by micro-organisms and yeasts. In order, therefore, to make this material available for my stable product, it is necessary to render the dextro-maltose compound clearly non-acid and preferably alkaline, in order to neutralize, at least in part, the acidity of the milk concentrate. This non-acid or alkaline product may be produced by any desirable neutralizing agent, such, for instance, as suitable carbonates or oxids of alkalis or alkaline earths.

To the mixture comprising the elements (1) and (2) as above described, is added (3) approximately 3.7% (more or less in order to make the combined fat ingredients preferably from 9.5% to 10.5% of the whole) of an alimentary vegetable oil from which have been removed the free fatty acids. The addition of the oil is accomplished preferably by introduction through a small pipe lying within a larger pipe, after the manner of an inspirator. These two pipes are so arranged that simultaneous flow therethrough may be accurately graduated and the mixture composed of the two elements (1) and (2) is delivered to the larger pipe. The two pipes deliver to any standard homogenizer and, by the arrangement described, the oil reaches the homogenizer in the form of a core to an envelop of milk and is thus at all times accurately proportioned so that the homogenized product is thoroughly uniform. Ordinary bulk mixing of the oil with the milk before concentration, or with the concentrated milk, will not give the most satisfactory results. Care should be exercised in the full removal of the free fatty acids from the oil, as otherwise the product is apt to have a disagreeable taste, especially if kept for any considerable time.

The homogenized compound, above described, should be cooled to approximately 42 degrees Fahrenheit, or lower, and thereupon (4) peptonized iron is added by mechanical agitation. There are at the present time two well known brands of peptonized iron on the market, one containing 25% of ferric oxid and the other containing 5% of ferric oxid. If the first brand is used, about $\frac{1}{50}$ of 1% is added to compound (1), (2), (3), while if the second brand is used, the quantity is about $\frac{1}{10}$ of 1%. These quantities may be varied within reasonable limits.

It is highly important that the introduction of the peptonized iron be carefully performed and the most satisfactory results are obtained if it is first mixed to a small quantity of the homogenized compound and then mixed with the total bulk. If the addition is made while the homogenized compound is warmer than 42 degrees Fahrenheit a digesting action begins which tends to alter the proteins and produce coagulation, whereas, if the compound is first cooled, this danger, either at the time of mixture, or during the later sterilization, is avoided.

The proportion of the oil may be varied, depending largely upon the quantity of fat in the concentrated milk, but for ordinary purposes the intention is that the total fat content (both animal and vegetable) shall be sufficient to produce, when diluted with water in the ordinary manner, a milk which, in its proportions, shall closely approach mother's milk.

While any one of the alimentary vegetable fats may be used, I consider, at the present time, that olive oil is preferable because of its generally-recognized laxative and nutritive value.

The peptonized iron is used because of the character of its iron content rather than for the peptones.

The homogenization should be carried out at as high a pressure as the milk will stand.

It will be readily understood that, both because cow's milk naturally varies to a considerable extent in its cream content, and also because at times a greater or less residue of natural cream may be desired in the product, the compound which has heretofore been described may contain a greater or lesser percentage of cream and that, therefore, the cow's milk may be used either whole or skimmed to a greater or lesser extent. The term "milk" used in the claims, therefore, is intended to mean either whole milk or milk from which some of the natural cream content, or even practically all of the natural cream content, has been removed.

I claim as my invention:—

1. A food product comprising an homogenized compound of concentrated cow's milk; alkaline malt soup extract; olive oil; and peptonized iron.

2. A food product comprising an homogenized compound of concentrated cow's milk; malt soup extract; olive oil; and peptonized iron.

3. A food product comprising an homogenized compound of concentrated cow's milk; alkaline malt soup extract; and olive oil.

4. A food product comprising an homogenized compound of concentrated cow's milk; non-acid malt soup extract; olive oil; and peptonized iron.

5. A food product comprising an homogenized compound of concentrated cow's milk; non-acid malt soup extract; and olive oil.

6. A food product comprising an homogenized compound of concentrated cow's milk; alkaline malt soup extract; olive oil from which the free fatty acids have been removed; and peptonized iron.

7. A food product comprising an homogenized compound of concentrated cow's milk; alkaline malt soup extract; and olive oil from which the free fatty acids have been removed.

8. A food product comprising an homogenized compound of concentrated cow's milk; malt soup extract; olive oil from which the free fatty acids have been removed; and peptonized iron.

9. A food product comprising an homogenized compound of concentrated cow's milk; non-acid malt soup extract; olive oil from which the free fatty acids have been removed; and peptonized iron.

10. A food product comprising an homogenized compound of concentrated cow's milk; non-acid malt soup extract; and olive oil from which the free fatty acids have been removed.

11. A food product comprising concentrated cow's milk; alkaline malt soup extract; an alimentary vegetable oil from which the free fatty acids have been removed; and peptonized iron.

12. A food product comprising concentrated cow's milk; alkaline malt soup extract; and an alimentary vegetable oil from which the free fatty acids have been removed.

13. A food product comprising concentrated cow's milk; malt soup extract; an alimentary vegetable oil from which the free fatty acids have been removed; and peptonized iron.

14. A food product comprising concentrated cow's milk; non-acid malt soup extract; an alimentary vegetable oil from which the free fatty acids have been removed; and peptonized iron.

15. A food product comprising concentrated cow's milk; non-acid malt soup extract; and an alimentary vegetable oil from which the free fatty acids have been removed.

16. A food product comprising concentrated cow's milk; alkaline malt soup extract; an alimentary vegetable oil; and peptonized iron.

17. A food product comprising concentrated cow's milk; alkaline malt soup extract; and an alimentary vegetable oil.

18. A food product comprising concentrated cow's milk; malt soup extract; and alimentary vegetable oil; and peptonized iron.

19. A food product comprising concentrated cow's milk; non-acid malt soup extract; an alimentary vegetable oil; and peptonized iron.

20. A food product comprising concentrated cow's milk; non-acid malt soup extract; and an alimentary vegetable oil.

21. A food product comprising an homogenized compound of concentrated cow's milk; alkaline malt soup extract; olive oil; and peptonized iron added to the other ingredients after said ingredients have been reduced to a temperature as low as approximately 42 degrees Fahrenheit.

22. A food product comprising an homogenized compound of concentrated cow's

milk; non-acid malt soup extract; olive oil; and peptonized iron added to the other ingredients after the said ingredients have been reduced to a temperature as low as approximately 42 degrees Fahrenheit.

23. A food product comprising an homogenized compound of concentrated cow's milk; malt soup extract; olive oil; and peptonized iron added to the other ingredients after said ingredients have been reduced in temperature as low as approximately 42 degrees Fahrenheit.

24. A food product comprising an homogenized compound of concentrated cow's milk; alkaline malt soup extract; olive oil from which the free fatty acids have been removed; and peptonized iron added to the other ingredients after said ingredients have been reduced to a temperature as low as approximately 42 degrees Fahrenheit.

25. A food product comprising an homogenized compound of concentrated cow's milk; non-acid malt soup extract; olive oil from which the free fatty acids have been removed; and peptonized iron added to the other ingredients after the said ingredients have been reduced to a temperature as low as approximately 42 degrees Fahrenheit.

26. A food product comprising an homogenized compound of concentrated cow's milk; malt soup extract; olive oil from which the free fatty acids have been removed; and peptonized iron added to the other ingredients after the said ingredients have been reduced to a temperature as low as approximately 42 degrees Fahrenheit.

27. A food product comprising an homogenized compound of concentrated cow's milk; alkaline malt soup extract; an alimentary vegetable oil; and peptonized iron added to the other ingredients after the said ingredients have been reduced to a temperature as low as approximately 42 degrees Fahrenheit.

28. A food product comprising an homogenized compound of concentrated cow's milk; non-acid malt soup extract; an alimentary vegetable oil; and peptonized iron added to the other ingredients after the said ingredients have been reduced to a temperature as low as approximately 42 degrees Fahrenheit.

29. A food product comprising an homogenized compound of concentrated cow's milk; malt soup extract; an alimentary vegetable oil; and peptonized iron added to the other ingredients after the said ingredients have been reduced to a temperature as low as approximately 42 degrees Fahrenheit.

30. A food product comprising an homogenized compound of concentrated cow's milk; alkaline malt soup extract; an alimentary vegetable oil from which the free fatty acids have been removed; and peptonized iron added to the other ingredients after said ingredients have been reduced in temperature as low as approximately 42 degrees Fahrenheit.

31. A food product comprising an homogenized compound of concentrated cow's milk; non-acid malt soup extract; an alimentary vegetable oil from which the free fatty acids have been removed; and peptonized iron added to the other ingredients after said ingredients have been reduced to a temperature of approximately 42 degrees Fahrenheit.

32. A food product comprising an homogenized compound of concentrated cow's milk; malt soup extract; an alimentary vegetable oil from which the free fatty acids have been removed; and peptonized iron added to the other ingredients after said ingredients have been reduced to a temperature of approximately 42 degrees Fahrenheit.

In witness whereof, I have hereunto set my hand at Indianapolis, Indiana, this second day of June, A. D. one thousand nine hundred and sixteen.

STEWART R. BARNETT.

1,230,479

UNITED STATES PATENT OFFICE.

WILLIAM P. M. GRELCK, OF EVANSTON, ILLINOIS, ASSIGNOR TO BERTHA H. GRELCK, OF LINCOLN, NEBRASKA.

SELF-PRESERVING ACID MILK PRODUCT AND PROCESS OF MAKING THE SAME.

1,230,479. Specification of Letters Patent. **Patented June 19, 1917.**

No Drawing. Application filed May 10, 1915. Serial No. 27,022.

To all whom it may concern:

Be it known that I, WILLIAM P. M. GRELCK, a citizen of the United States, residing at the city of Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Self-Preserving Acid Milk Products and Processes of Making the Same, of which the following is a specification.

My invention relates to the production of food products from milk which has been soured, and especially from buttermilk from which the fats have been taken, and which therefore is practically a waste product of the butter manufacturer. Many attempts have been made in the past to utilize in portable and convenient form this great source of food material, but until now no practical means of producing a wholesome, edible product has been discovered.

In order that the difficulties to be met may be understood as well as the means by which I have succeeded in overcoming them, I will say briefly: Normal milk, even when called "sweet" has an acid reaction. The acidity thereof increases with keeping, as the result of the formation of lactic acid following the development therein of lactic acid bacilli—a change which is facilitated by moderate heat. When the lactic acid amounts to about $\frac{3}{10}$ of one per cent. in volume, the casein begins to be precipitated, an action which proceeds more rapidly as the temperature is raised to moderate but not sterilizing heat. In the first steps of separation the casein appears as a slight flocculent precipitate. As the precipitation continues a soft gelatinous mass or curd is formed, the consistency of which gradually increases while it retains the same general characteristics, until a temperature of about 120 degrees Fahr., is reached, when the character of the mass undergoes a radical change. The physical change is marked, and this is probably due to an extensive chemical change as well. It is not to be understood that the changes stated occur in a fixed, definite and unvarying manner. They vary according to the amount of acidity in the milk, the temperature at which and the length of time during which heat is applied; and perhaps with local atmospheric conditions. But, and subject to special variations, the foregoing sets out the general changes which take place while milk is passing from a sweet condition to that at which is formed a homogeneous insoluble curd of coagulated casein precipitate.

Owing to the conditions stated, the sour milk products made or attempted have heretofore fallen into two classes: In one class a high enough degree of heat is directly applied to precipitate, coagulate, cook and dry the casein. The milk albumen, sugar and mineral salts may thus be retained if desired, but the product is left in solid, homogeneous masses, which, from their character and size, resist the action of the gastric juices thereon. Moreover, the product is insoluble, except in the presence of weak alkalis or strong acids, neither of which conditions obtains in the normal processes of animal digestion. This material therefore is not fit for food, but is only adapted for use in certain of the mechanical industries. On the other hand, the attempts which have been made to prepare acceptable food products have taken account of the refractory character of casein when coagulated in masses according to the nature thereof, and, have sought to use the precipitated casein, stopping short of the heat necessary to coagulate or to cook it. And the heat actually used therefore was not sufficient to sterilize or pasteurize the material. The result has been a raw unstable product, in which the action of lactic and other bacilli is continuous and which is comparatively unfit for food consumption. And when the whey is withdrawn from the mass before drying, as is usually done when these methods are followed, the milk albumin, milk sugar and mineral salts are in large part lost. The attempt has been made to overcome the coagulation of the casein in large masses by introducing foreign matter, such as wheat flour, only with the result of adding an incongruous element without attaining the practical end of a nutritious and wholesome food. Moreover, these low temperature methods are slow, thereby unduly developing the acidity of the product and the expense of manufacture.

It is the object of my invention to produce a food product of definite acidity, to so treat the soured milk or buttermilk as to cause the casein to precipitate and finally be fixed in very finely separated non-adherent particles, to also coagulate the albumin and preserve it, together with the milk sugar and other mineral salts of the resulting product; in fact, to preserve all the constituents of the milk operated upon, except the water of solution, and moreover, to leave such product in a sterilized condition and containing the elements of self preservation. It is thoroughly cooked and will be found a wholesome and readily digested food. It can moreover be made so economically and in such quantities as to be available for feeding to poultry and the lower animals.

In the practice of my invention, I prefer to have about $\frac{6}{10}$ of one per cent. of lactic acid in the buttermilk developed at the normal temperature thereof. I then apply heat to produce rapid precipitation followed by fixation of the casein before any appreciably greater production of lactic acid takes place. Such heat is preferably applied in a steam or water jacketed kettle, in which the temperature may be accurately gaged, bringing the milk gradually to a temperature of about 140 degrees Fahr. This temperature with the named percentage of lactic acid causes the casein in the presence thereof to be precipitated. The kettle should also be provided with paddles or any other means for rapidly and thoroughly stirring the fluid.

In my process, therefore, as soon as the temperature begins to rise I violently agitate the mixture by the paddles or other means provided. As a result of the developing flocculent particles of precipitating casein have no opportunity to coalesce. Each particle follows its normal law of development and becomes separated from the other particles in a completely fixed or hardened condition, in which it will not adhere to other like particles. Instead, therefore, of a homogeneous curd I have an infinite number of separately formed non-adherent particles in suspension in the whey.

The process should be so timed that a pasteurizing or sterilizing temperature shall be maintained long enough to destroy all germs and particularly the lactic acid bacilli, thereby limiting the further production of lactic acid.

One object of my invention is attained at this point. The material is sterilized so that it no longer contains the germs which will produce further changes, and particularly those germs which will form lactic acid. But the heat sufficient to produce this condition and which ordinarily would have left the casein in the form of a continuous indigestible mass has only cooked the casein and left it in the form of an infinite number of minute particles. The resulting produce may be used and will be found an agreeable and wholesome potable food.

In forming a condensed product further steps may be taken as follows: The temperature of the milk in the condition described should now be raised to 172 degrees or more Fahr., at which the milk albumin will be coagulated, and remain in suspension in the whey. The object of coagulating the albumin is not only to conserve this valuable constituent of the milk, but to put the same in condition that it will not adhere to the utensils used in the further steps of the process.

After coagulation of the albumin, I conduct the fluid into evaporating pans, in which the water of solution is expelled *in vacuo* until the resulting product is reduced to about $\frac{1}{6}$ in volume of the original milk. It then consists of extremely small non-adherent particles of precipitated casein with which are mingled the other solid constituents of the treated milk, and the lactic acid formed prior to that point in the process at which sterilization took place. It should be of a smooth and uniform consistency, and the constituent particles are in such condition that, upon the addition of water, they will be separated and remain in complete suspension and practically reproduce the milk originally treated. The said product, being sterilized, is further made self-preserving against fermentation by the lactic acid which it contains, amounting to from 3 to $3\frac{1}{2}$ per cent. By reason of the acidity of the product, as well as the finely divided character of the particles, it is readily attacked by the digestive ferments in the ordinary course of digestion.

The material as described my be further treated to remove the remaining moisture and then mechanically reduced to small particles. It may be used as a food material either in the moist or dry condition or by the further addition of water to either form. But whether the product is left in the moist state or whether it is evaporated to dryness, the product and the process of preparing it are equally within the scope of my invention.

I claim:

1. The process of producing a food product from soured milk which consists in precipitating the casein by the agency of heat and simultaneously agitating the precipitate whereby the casein is mixed in the form of finely divided non-adherent particles.

2. The process of producing a food product from soured milk which consists in precipitating the casein by the agency of heat, simultaneously agitating the precipitate to keep the particles thereof out of continuous contact, and then increasing the heat to fix the said particles in finely divided non-adherent form.

3. The process of producing a food product from soured milk which consists in precipitating the casein by the agency of heat, agitating the precipitate while forming to keep the particles thereof out of continuous

contact, and then increasing the heat fix the said particles in finely divided non-adherent form and sterilize the mass.

4. The process of producing a food product from soured milk which consists in precipitating the casein, agitating the precipitate to keep the particles thereof out of continuous contact and fix the said particles in finely divided non-adherent form and then evaporating the surplus fluid.

5. The process of producing a food product from soured milk which consists in precipitating the casein by the agency of heat, agitating the precipitate, heating the precipitated particles during agitation until they become non-adherent and then evaporating the surplus fluid.

6. The process of producing a food product from soured milk which consists in precipitating the casein by the aid of heat, agitating the precipitate while forming whereby the particles of casein are kept out of continuous contact and fixed so as to become non-adherent, and then evaporating the surplus fluid.

7. The process of producing a food product from soured milk which consists in precipitating the casein by the aid of heat, agitating the precipitate whereby the particles thereof are kept out of continuous contact and fixed so as to become non-adherent, coagulating the milk albumin, and then evaporating the surplus fluid.

8. The process of producing a food product from soured milk which consists in heating the milk to precipitate the casein, simultaneously agitating the milk to cause the precipitating casein to retain the form of minute discontinuous particles, increasing the heat to fix the said particles in discontinuous non-adherent form and to sterilize the mass, increasing the heat to coagulate the milk albumin, and then evaporating the surplus fluid.

9. The process of making an acid milk product which consists in developing in milk sufficient acidity to cause the casein to be precipitated, raising the same to sufficient temperature to sterilize it and fix the casein, agitating the milk while being so heated, coagulating the albumin thereof, and evaporating the surplus fluid.

10. An acid milk food product having a casein content in the form of minute precipitated, fixed, discontinuous, non-adherent particles.

11. An acid milk food product having a casein content in the form of minute precipitated, fixed, discontinuous, non-adherent particles, and containing a preservative quantity of lactic acid.

12. A sterilized acid milk food product having the casein thereof in minute precipitated, fixed, discontinuous, non-adherent particles.

13. An acid milk food product having a casein content in the form of minute, precipitated, fixed, discontinuous particles which are non-adherent in the presence of a substantially normal quantity of water.

14. The process of making an acid milk product which consists in developing in milk sufficient acidity to cause the casein to be precipitated, raising the same to sufficient temperature to sterilize it and fix the casein, and agitating the milk while being so heated.

In witness whereof, I have hereunto subscribed my name in the presence of two subscribing witnesses, this 22nd day of April, 1915.

WILLIAM P. M. GRELCK.

Witnesses:
C. K. CHAMBERLAIN,
A. S. PHILLIPS.

Corrections in Letters Patent No. 1,230,479.

It is hereby certified that in Letters Patent No. 1,230,479, granted June 19, 1917, upon the application of William P. M. Grelck, of Evanston, Illinois, for an improvement in "Self-Preserving Acid Milk Products and Processes of Making the Same," errors appear in the printed specification requiring correction as follows: Page 2, line 33, strike out the word "of"; same page, line 60, for the word "produce" read *product;* same page, line 116, claim 1, for the word "mixed" read *fixed;* and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of September, A. D., 1917.

[SEAL.]

R. F. WHITEHEAD,
Acting Commissioner of Patents.

Cl. 99—11

H. J. STARTZENBACH.
PROCESS OF CANNING MILK.
APPLICATION FILED JUNE 23, 1916.

1,255,483. Patented Feb. 5, 1918.

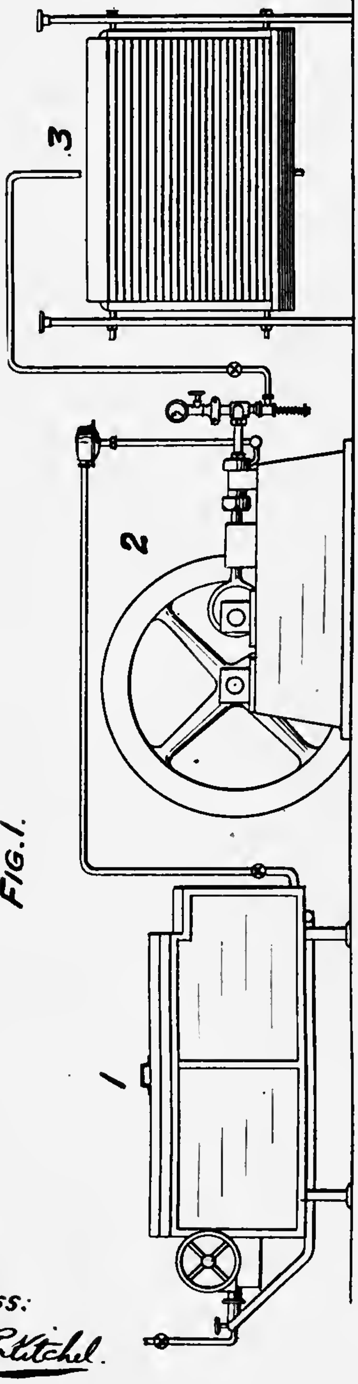


FIG. 1.

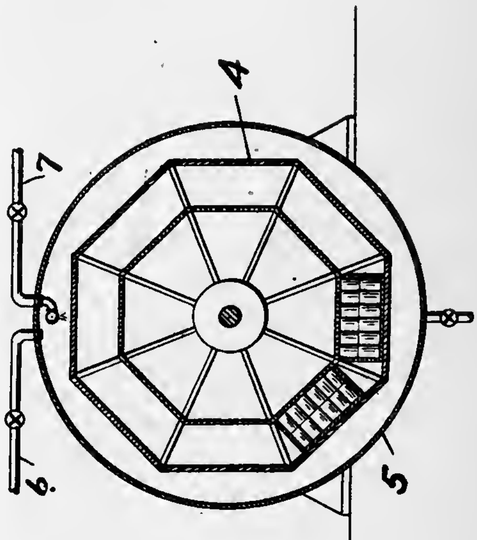


FIG. 2.

WITNESS:
Rob R. Kitchel.

INVENTOR
Hermann J. Startzenbach
BY
Augustus B. Stoughton.
ATTORNEY.

UNITED STATES PATENT OFFICE.

HERMAN J. STARTZENBACH, OF ATLANTIC CITY, NEW JERSEY.

PROCESS OF CANNING MILK.

1,255,483. Specification of Letters Patent. Patented Feb. 5, 1918.

Application filed June 23, 1916. Serial No. 105,348.

To all whom it may concern:

Be it known that I, HERMAN J. STARTZENBACH, a citizen of the United States, residing at Atlantic City, in the county of Atlantic and State of New Jersey, have invented a certain new and useful Process of Canning Milk, of which the following is a specification.

The principal object of the present invention is to provide an expeditious and reliable process for canning milk and cream in such a way that the canned product will be uniform, will keep almost indefinitely in any climate, will contain no preservative, will not cream up, will not have objectionable cooked characteristics, and will keep for days in a cool place after the cans have been opened. The canned cream is in taste practically indistinguishable from fresh cream although the milk may taste slightly differently from fresh milk and both the canned cream and canned milk are not distinguishable in chemical composition from fresh milk, but they are physically and bacteriologically different. In referring to cans and canning the intention is to include the use of other vessels which, like cans, can be sealed.

My invention involves a process in which use is made of steps, old in themselves, but the process as a whole and in many of its parts or details I believe to be both new and useful and it is adapted to produce a commercially new and unique product.

According to my process of canning, filtered or strained milk or cream is pasteurized and homogenized and cooled. The pasteurized and homogenized and cooled milk or cream is sealed in cans and sterilized at relatively low temperature and at relatively high temperature for certain intervals of time, which are critical, while confined in the cans, and then rapidly cooled. Lime water helps milk or cream to withstand this treatment without undue alteration and therefore I may add from 3 to 6% by weight of that substance or material to the raw milk or cream. The addition of lime water according to medical authorities improves the product for use in feeding children. The temperature to which the canned product is raised in the sterilizer varies with the percentage of butter fat, being higher for milk than for cream. The object is to treat the product in the sterilizer at such temperatures and for such periods of time that it will keep but without imparting to it objectionable cooked characteristics of taste and constituency. For milk containing 8% of butter fat, the temperature in the sterilizer should be substantially 106° C. for 15 minutes, then raised as suddenly as possible to 128° C. for 10 minutes and then suddenly reduced to about 65° C.

The drawings diagrammatically illustrate apparatus useful in the practice of my process of canning milk and cream, and in them Figure 1, is in elevation and Fig. 2, is in transverse section.

Referring to the drawings and to the practice of the invention for canning 8% butter fat milk; strained or filtered milk containing from 3 to 6% by weight of lime water is run through the pasteurizer 1, homogenizer 2, and cooler 3. The cool product is therefore pasteurized and homogenized and it will not cream up and is in a certain sense sterile. This product is canned and the cans are sealed. The canned product at this stage of the process would not keep in all climates or for any considerable length of time. To make the product keep in all climates and practically indefinitely the cans are put into the rotary carrier 4, of the sterilizer 5, and subjected to the heat and pressure of steam at 106° C. for 15 minutes and then the temperature is suddenly raised to 128° C. for 10 minutes, and thereupon the product is suddenly cooled as by means of a cold water spray applied to the cans. 6, are steam and 7, are water connections. The motion imparted to the rotary carrier 4, in respect to the heating and cooling mediums and to the contents of the cans insures uniformity of the product.

For cream the temperature is 102° C. for 15 minutes and then suddenly to 123° C. for (8) eight minutes followed by sudden cooling. Of course some departure is permissible in respect to both temperature and time but I regard those matters as of importance for they seem to be necessary to impart the property of keeping to the product without unduly cooking it or adding preservatives to it. The result of this sterilizing step in the process is to produce products which will keep for very long periods of time, measurable by years, and in all climates in the cans, and which, when the cans are opened, do not possess objectionable cooked characteristics and which will keep, if kept cool, for several days after the cans are opened. Moreover, the product by reason of being homogenized and treated substantially as described does not cream up and responds to all the requirements of pure milk or cream.

I claim:

1. The process of canning milk and cream which consists in pasteurizing and homogenizing and cooling the same, canning the cooled product, sterilizing the product in the cans by the application of heating and cooling mediums, and subjecting the canned product and the heating and cooling mediums to relative movement during sterilization, substantially as described.

2. The process of canning milk and cream which consists in adding lime water to the raw fluid, pasteurizing and homogenizing and cooling the mixture, canning the cooled product, and sterilizing and cooling the canned product, substantially as described.

3. The process of canning a milk product containing 8% butter fat which consists in pasteurizing and homogenizing and cooling the same, canning the cooled product, and sterilizing the cooled product by subjecting it in the cans to steam at 106° C. for 15 minutes and suddenly raising the temperature to 128° C. for 10 minutes, and suddenly cooling it, substantially as described.

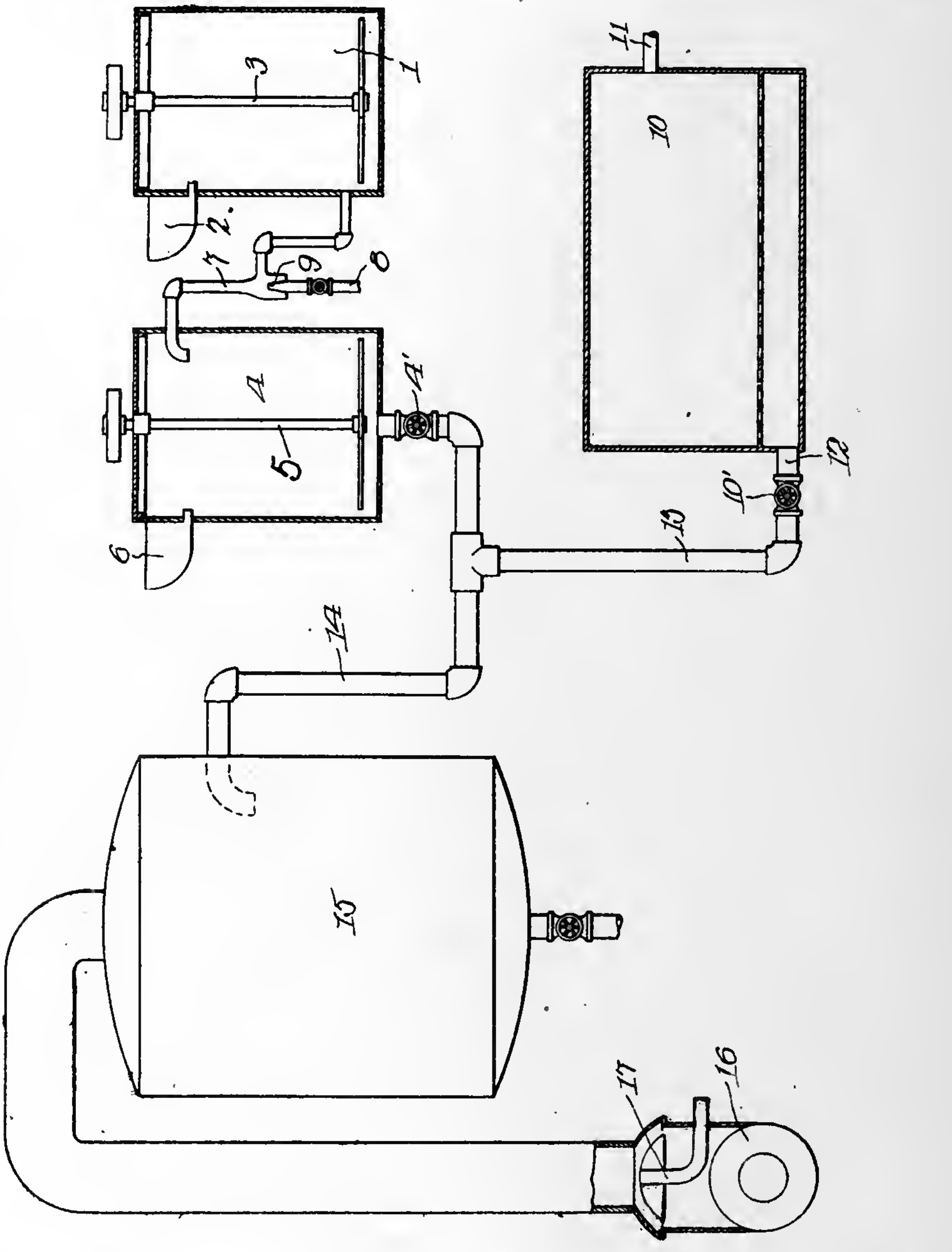
HERMAN J. STARTZENBACH.

W. P. M. GRELCK.

MILK FOOD PRODUCT AND METHOD OF MAKING THE SAME.

APPLICATION FILED DEC. 26, 1916.

1,272,035. Patented July 9, 1918.



WITNESSES:

Geo. J. DuMais.

W. K. Olson.

INVENTOR.

William P M Grelck

BY Warwick Chamberlain

ATTORNEYS.

UNITED STATES PATENT OFFICE.

WILLIAM P. M. GRELCK, OF LINCOLN, NEBRASKA.

MILK-FOOD PRODUCT AND METHOD OF MAKING THE SAME.

1,272,035. Specification of Letters Patent. Patented July 9, 1918.

Application filed December 26, 1916. Serial No. 138,724.

To all whom it may concern:

Be it known that I, WILLIAM P. M. GRELCK, a citizen of the United States, residing at the city of Lincoln, in the county of Lancaster and State of Nebraska, have invented certain new and useful Improvements in Milk-Food Products and Methods of Making the Same, of which the following is a specification.

My invention relates to food products and particularly to those which are primarily founded upon the solid constituents of milk, especially that from which the butterfat has been removed, and thereby has become a creamery by-product. It may, however, be used in connection with the milk solids in which the butterfats have been retained in whole or part. My process involves the use of the milk solids of buttermilk or separated or whole milk so prepared as to become a more easily digestible product, the individual elements thereof being non-adherent and readily divisible. And to make the best possible use of such solids in the art of bread making, for which my product is primarily designed, I mingle with the same, preferably in the process of manufacture, a considerable quantity of malt extract, thus producing what may be described as a malted acid milk product.

It is a matter of general knowledge that the gradually increasing production of lactic acid in milk resulting from the action of the lactic acid bacteria tends to precipitate the casein thereof, and that such precipitation is aided by the application of heat. The casein so precipitated normally forms a solid coherent mass separated from the milk serum or whey which, unless further treated, retains the greater portion of the milk albumin, sugar and salts. The curd thus formed is non-soluble in water, except upon the addition of alkalis or strong acids which make it unavailable for food purposes.

But by permitting a certain amount of lactic acid to form, up to from 0.3 to 0.6 per cent. of the bulk, applying heat thereto sufficient to raise the product to about 140 degrees Fahr., and violently agitating the milk meanwhile, the precipitation or separation of the casein from its natural solution or suspension in the milk serum is effected. But the molecular elements which at the instant of precipitation are mutually coherent are prevented from coming into such contact with each other as to permit the individual cohesion thereof. The tendency or capacity for such adhesion speedily passes. And the resultant precipitated casein instead of being in the form of a strongly adherent undissolvable curd is in the form of an extremely large number of non-adherent particles in suspension in the milk fluids. The resulting product may be condensed to semi-solid consistency and then dried, preferably *in vacuo*, and affords a valuable food product which may be put into solution by mingling it with water, and thus or in other ways used with flour or other ingredients in the manufacture of bread.

The value of this product may be greatly enhanced and a considerable convenience afforded by the mixture therewith of a certain proportion, preferably about 25%, of the extract of malt. This also is largely used by bakers in the production of bread, thereby making a more digestible product as the diastase acts on the soluble starch to transform it into dextrin during the process of fermentation, while the resulting maltose is acted upon by the yeast in the well-known manner to give off the leavening carbonic dioxid gas and alcohol.

While the constituents severally derived from the malt and milk used may be separately prepared and then mixed together, I prefer to produce the elements concurrently and mingle them as a part of the process, so that when it is conducted to the point where the desired amount of water is removed the resulting product will be a uniform and homogeneous one. In either case I consider the desirable proportion of the elements mingled to be approximately one of malt solids to four of the milk solids.

A diagrammatic representation of apparatus which may be used in carrying out the principles of my invention is shown in the drawings, in which 1 represents a tank adapted for the reception of soured milk through the inlet opening 2. It is provided with suitable stirring apparatus 3. 4 is a second receptacle having stirring apparatus 5, and inlet opening 6. A tubular connection 7 is provided by which the soured milk in fluid condition is drawn from tank 1 to receptacle 4; and 8 is a connection through which high pressure steam may be forced through the nozzle 9 into the pipe 7. It thus acts to draw the milk from tank 1, meeting the same at the point of steam discharge and heating it so as to cause a precipitation of casein from the soured milk. The pressure of the steam should be so controlled as to heat the milk to about 160 defrees Fahr., at which temperature pasteurization will take place and the further production of lactic acid bacteria prevented. The forcible impact of the steam upon the soured milk will prevent the adhesion of the particles of casein as precipitated. As the milk fluids with the precipitated particles of the casein are carried into the receptacle 4 the action of the stirrer upon the heated fluid will prevent the formation of agglutinated masses by adhesion of the particles of casein. In the vat 10 provided with the inlet 11 and outlet 12 may be placed ground barley malt mixed with from four to five times its bulk of water, sufficient to make a suitable mash, and this being heated to about 135 to 150 degrees Fahr., a wort rich in malt diastase will be formed, although the details of such preparation of malt extract form no part of my invention. Connection is made by means of the pipes 13 and 14 with the vacuum pan 15. The latter is provided with a vacuum pump 16 and suitable condenser 17. When a vacuum is produced in the vacuum pan a flow of fluids from the receptacle 4 and the vat 10 may be produced in proper proportion by means of the valves 4′ and 10′. After a sufficient quantity of the fluids from receptacle 4 and tank 10 in proper proportion to each other is contained in the vacuum pan, the operation thereof will remove the surplus water, leaving the finished product in semi-solid condition and ready to be removed and placed for use. It will be noted that in order that the diastase may be preserved the heat in the vacuum pan should not exceed about 150 degrees Fahr., although at the same time this heat is sufficient to finish any sterilization of the milk which before had been begun and which may not have been fully completed up to the time that it was carried into the vacuum pan.

The product which is a part of my invention is not to be considered limited to the particular manner in which the particles or molecules of casein are precipitated and made mutually non-adherent. It is equally a part of my invention if such condition of the casein is produced by other means than that herein set out as, for instance, that shown and described in my Patent No. 1,230,479, issued June 19, 1917.

I claim:—

1. The method of preparing a food product from soured milk which consists in subjecting the milk to the action of a steam jet, whereby the casein is precipitated and fixed in the form of minute mutually non-adherent particles.

2. The method of preparing a food product from soured milk which consists in subjecting the milk to the action of a steam jet, whereby the casein is precipitated, and agitating the milk whereby the casein is fixed in the form of minute mutually non-adherent particles.

3. The method of preparing a food product from soured milk which consists in subjecting the milk to the action of a steam jet, whereby the casein is precipitated and fixed in the form of minute mutually non-adherent particles, and then evaporating the excess fluids *in vacuo* at a pasteurizing temperature.

4. The method of preparing a food product from soured milk which consists in precipitating the casein, agitating the precipitated particles so that they become mutually non-adherent, and intermingling extract of malt with the said particles and removing the excess fluid therefrom.

5. The method of preparing a food product from soured milk which consists in precipitating the casein, agitating the precipitated particles so that they become mutually non-adherent, adding extract of malt thereto, and evaporating the excess fluids at a temperature lower than that destructive of malt diastase.

6. As a new article of manufacture; a food product comprising malt extract and the solids of soured milk in which the casein is present in the form of fixed discontinuous particles.

7. As a new article of manufacture; a food product comprising malt extract and the casein of sour milk in the form of fixed discontinuous particles.

8. As a new article of manufacture; a food product including malt extract and the casein and butterfats of sour milk.

9. An acid milk food product having a casein content in the form of minute precipitated fixed discontinuous non-adherent particles with which extract of malt is intermingled.

10. An acid milk food product having a

casein content in the form of minute precipitated fixed discontinuous non-adherent particles with which extract of malt is intermingled, and containing a preservative quantity of lactic acid.

11. A pasteurized acid milk food product having the casein thereof in minute precipitated fixed discontinuous non-adherent particles intermingled with extract of malt.

In witness whereof, I have hereunto subscribed my name, this 20th day of December, 1916, at Lincoln, in the county of Lancaster and State of Nebraska.

WILLIAM P. M. GRELCK.

UNITED STATES PATENT OFFICE.

PAUL W. TURNEY, OF PORTLAND, OREGON.

PROCESS OF MAKING AND NEW FOOD PRODUCT OF MILK.

1,274,218. Specification of Letters Patent. **Patented July 30, 1918.**

No Drawing. Application filed March 22, 1917. Serial No. 156,783.

To all whom it may concern:

Be it known that I, PAUL W. TURNEY, a citizen of the United States, and a resident of Portland, county of Multnomah, State of Oregon, have invented a certain new and useful Process of Making and New Food Product of Milk, of which the following is a specification.

I have discovered that in the process of making curd from the casein of milk there is a stage when the curd particles are in the form of fine flakes which will precipitate in a jelly-like mass, resembling cream. And if maintained in this state by low temperature it constitutes an easily digested, wholesome article, suitable for preparing many palatable foods and drinks. For example, the article so produced is adapted for being used as a substitute, in many instances, for the cream of milk in preparing articles of food; also in making a product resembling ice cream; and at soda fountains in the preparation of various drinks.

The articles so prepared, furthermore, have a special advantage from the standpoint of digestibility, and of economy. With some persons the fat of cream does not agree. For such my article is specially suited, for my product may be made from skimmed milk if desired. And since skimmed milk is frequently a mere left-over product, having only a limited use, by my discovery this skimmed milk is given a commercial value.

I produce my product by proceeding, in the first instance, as in the case of artificially producing curd from the casein of milk. But the process is permitted to develop only to a certain stage, and is then arrested by refrigeration, that is, by the rapid reduction of the temperature to the point where the enzym used for the product is rendered inactive. A flocculent curd is so produced which is permitted to settle, and then the whey is poured off. The low temperature must be maintained until the product is consumed.

In detail, the process which I pursue for producing my product is as follows:

I first heat the milk to from 80° to 100° Fahrenheit in order to ripen it, that is, place it in that state best suited for curdling by the addition of an enzym. I then add the enzym, such as rennet or pepsin; said temperature being maintained during the curdling process so as to facilitate the coagulation of the casein of the milk. The proper stage in the curdling process is ascertained by taking some of the curd between two fingers and noticing whether the curd particles have attained a tendency to stick together when the fingers are separated. When this stage has been reached the temperature of the milk must be rapidly lowered to approximately 45° Fahrenheit so as to render the enzym inactive. The proper consistency to be attained in the coagulated particles before the curdling is stopped, as mentioned, is a matter to be learned by experience, and must be left to the judgment of the operator, because by it the quality of the product obtained is determined.

During the rapid cooling of the milk it is necessary that the same be gently agitated for the purpose of breaking up the adhesion of the coagulated curd particles and thus releasing the whey. The article is then allowed to stand for a sufficient length of time to permit the curd particles to settle; said low temperature being maintained. This settling usually takes from 2 to 12 hours according to the degree of separation to be effected between the particles and the whey. The latter is then poured off, and the residue will be found to be a mass of creamy consistency, and such residue may be greatly beaten or whipped to obtain a more even texture. Coloring, flavoring, sweetening and other materials, for example, cream, may be added as desired. If the beating is done in an ice cream freezer a product simulating ice cream is produced.

The product must be kept at said low temperature until consumed, for if the temperature be permitted to rise to the degree rendering the enzym active again, the curdling will be renewed and rapidly carried to such degree as to render the product wholly unfit for the use mentioned.

By the term low temperature I intend any temperature of approximately 45° Fahrenheit or lower.

I claim:

1. The process for making the described food product of milk consisting in taking fresh milk, inducing curdling therein by the agency of an enzym, permitting the curdling to develop until the curd particles attain a tendency to adhere, then arresting further coagulation by a rapid reduction of the milk

to that temperature rendering the enzym inactive, and maintaining the mass at said low temperature until used.

2. The process for making the described food product of milk consisting in taking fresh milk, inducing curdling therein by the agency of an enzym, permitting the curdling to develop until the curd particles attain a tendency to adhere, then arresting further coagulation by a rapid reduction of the milk to that temperature rendering the enzym inactive, then pouring off the whey and maintaining the precipitate at said low temperature until used.

3. The process of making a milk food product, consisting of taking fresh milk, inducing curdling thereof by an enzym, permitting the curdling to develop until the precipitate obtained will have a flocculent, slightly adherent consistency, then arresting further curdling by low temperature rapidly induced, gently agitating the mass, then permitting the precipitate to settle, pouring off the whey, and maintaining the stability of the precipitate by low temperature.

4. A milk food product comprising a flocculent slightly adherent fresh-milk casein precipitate induced by an enzym, the action of which was arrested, upon the precipitate becoming flocculent, by an immediate reduction in temperature, said precipitate being partially separated from the milk stock and inhibited from further change by being maintained at a low temperature.

PAUL W. TURNEY.

N. D. NIELSEN.
PROCESS OF TREATING MILK.
APPLICATION FILED FEB. 11, 1918.

1,274,748. Patented Aug. 6, 1918.

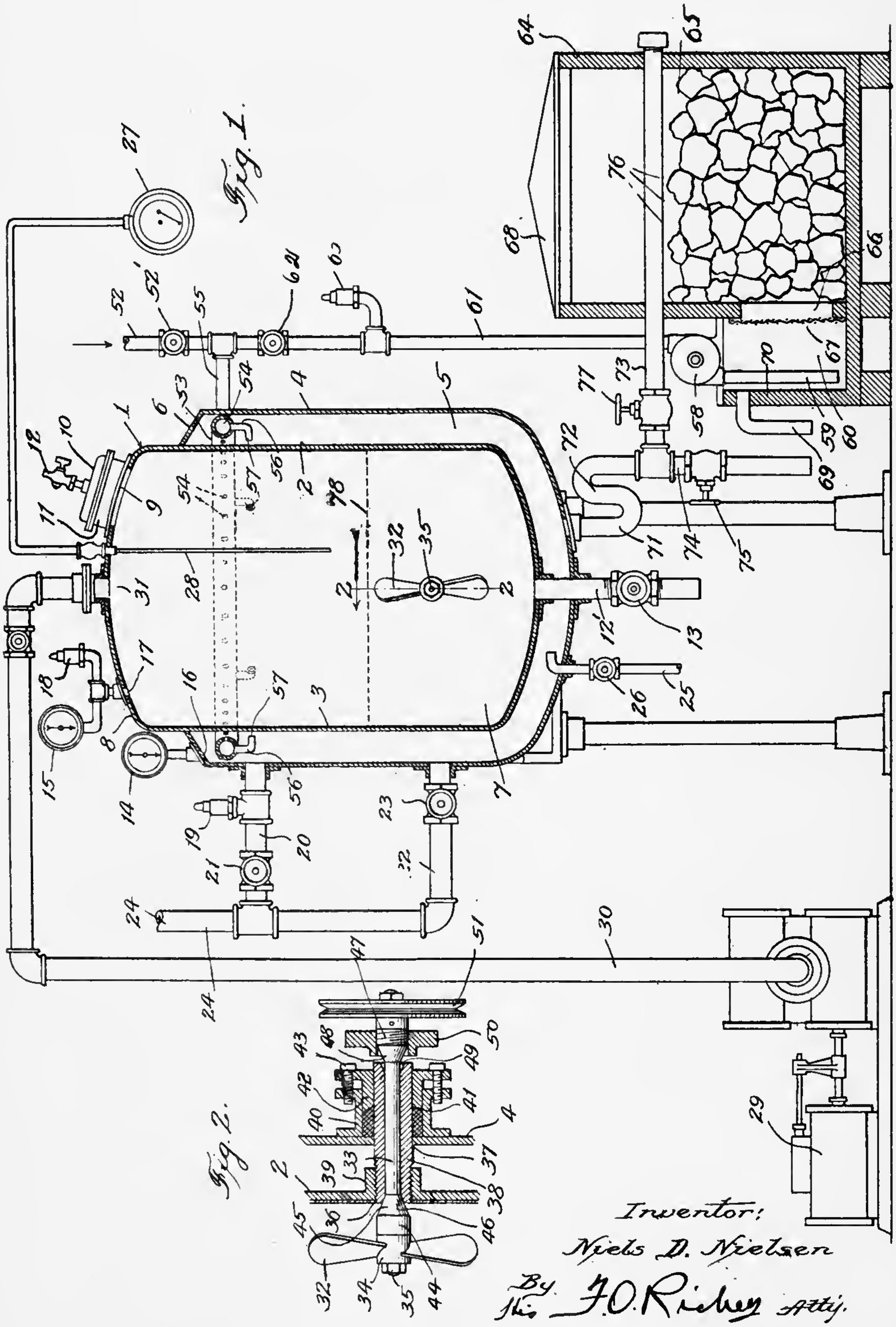


Fig. 1.

Fig. 2.

Inventor:
Niels D. Nielsen
By his F. O. Richey Atty.

UNITED STATES PATENT OFFICE.

NIELS D. NIELSEN, OF ELYRIA, OHIO.

PROCESS OF TREATING MILK.

1,274,748. Specification of Letters Patent. Patented Aug. 6, 1918.

Application filed February 11, 1918. Serial No. 216,622.

To all whom it may concern:

Be it known that I, NIELS D. NIELSEN, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Processes of Treating Milk, of which the following is a specification.

One of the objects of the invention is to provide a simple, economical and efficient process for treating milk, which is adapted to be used for pasteurizing, holding, cooling and condensing or evaporating milk, or for any of said purposes, so as to exterminate or reduce to a minimum the bacteria contained in the material treated, without detriment to such material, and as quickly as possible consistent with the accomplishment of the desired results. I also aim to enable the milk or material treated to be cooled and placed in containers without being exposed to contamination by being passed through or transferred to cooling apparatus or other devices before being placed in bottles or containers, and adapted to enable a separate cooler or cooling mechanism such as cooling coils or similar cooling devices to be dispensed with.

Other and further objects of the invention will appear from an examination of the following description of an embodiment of my invention and of the appended claims, and from an inspection of the accompanying drawings which are made a part of this specification.

In the accompanying drawings, Figure 1 is a diagrammatic view of an embodiment of my invention showing apparatus for treating milk, comprising a tank and stirring mechanism, and means for heating and cooling the contents or material to be operated upon, and shows my improved tank in central vertical section, and with an ice chest also shown in vertical section and provided with means for conducting brine or cooling liquid from the space or chamber formed between the inner and outer walls of the tank to the ice chest, means for pumping cooling liquid into the space formed between said inner and outer walls of the tank, and means for supplying and regulating the admission of steam for heating the tank and its contents. The figure also shows a vacuum pump provided with a conduit which communicates with the interior of the tank.

Fig. 2 is an enlarged detail view in central vertical section taken on line 2 of Fig. 1, looking in the direction of the arrow, and showing my improved stirring mechanism in side elevation.

In constructing a tank, stirring mechanism, and means for heating and cooling the tank and its contents, and for treating, holding and cooling milk in accordance with my invention and improvements, I provide a tank or receptacle 1, which is, by preference, in the form of a reservoir having vertical cylindrical walls, including inner walls 2 of metal, and provided with a lining 3 of glass or enamel, and an outer metallic wall 4, provided with a space 5 between such inner and outer walls. An annular flange or apron 6, encircles, and has its inner edge welded to, the inner wall 2, its outer edge being connected or integral with the outer wall 4, so as to cover and inclose the space 5 and form an air tight or hermetically sealed chamber, which entirely surrounds the inner casing on all sides, and also incloses the bottom.

A cover 8 is preferably used for said casing and chamber. This cover is, by preference, integral with the casing and is provided with an opening or manhole 9, having a cover 10 adapted to be secured in air-tight engagement with the flange or rim 11 which surrounds the manhole. The cover is removably secured in position to form a closure for the manhole by means of screws or other suitable, ordinary and well known securing means and a vent cock 12 having a valve-controlled passage communicating with the chamber 7 is provided and mounted by preference upon the removable cover 10.

A discharge pipe 12′ leads from the bottom of the liquid containing chamber or reservoir 7, and is provided with a cock or valve 13 for opening and closing the discharge passage formed by said pipe and communicating with the chamber. Vacuum and pressure gages 14 and 15 are mounted in position to communicate with the chambers or spaces 5 and 7, respectively, the gage 14 being provided with a passage 16, which communicates with the chamber 5 and the gage 15 having a passage 17 communicating with the chamber 7. A safety valve 18, which may be of any ordinary and well known suitable construction, is mounted in position to communicate with the chamber 7, and a similar safety valve 19 is mounted in position to communicate with the chamber 5, said valve being mounted, by preference, upon an exhaust pipe 20 which forms the upper or high level exhaust passage leading from the annular chamber 5 formed between the inner and outer walls 2 and 4. This exhaust passage is provided with a controlling valve or cock 21 for opening and closing the passage when desired, and a lower exhaust passage or conduit 22 leads from the chamber 5 at a point below the level of the exhaust passage or conduit 20 and near the bottom of the chamber 5. The lower exhaust passage or conduit 22 is provided with a cock or valve 23 for opening and closing said passage, and communicates with a main exhaust pipe 24 into which the upper exhaust passage 20 leads when the cock 21 is in passage opening position.

A steam supply pipe 25, which communicates with a suitable source of steam supply (not shown), which may be in the form of a boiler of any suitable, ordinary or well known type, communicates with the interior of the chamber 5, and is provided with a cock or valve 26 for opening and closing said passage, and regulating the admission of steam to the interior of the chamber 5 for heating the casing 2 and its contents. A recording thermometer 27, having a stem 28, is mounted in position to record the temperature in the chamber 7, and a vacuum pump 29, which may be of any desired or well known form adapted to provide a suitable vacuum, or partial vacuum, in the chamber 7, is operatively connected with the tank by means of a pipe 30, the receiving end of which communicates with the upper extremity of the chamber 7, and forms an outlet passage 31 leading to the suction chamber of the pump 29.

The tank is provided with an agitator, here shown as a propeller 32, comprising agitator blades secured to a propeller shaft 33 by means of a central head or hub portion 34. The hub is secured to the shaft by means of a nut 35 in threaded engagement with the inner end of the shaft or by similar suitable securing means. The shaft extends into the chamber 7 through an opening 36 in the casing 2, and through an opening 37 in the outer wall 4, and is rotatively supported by a bearing sleeve or bushing 38, the inner extremity of which is in threaded engagement with a threaded annular flange 39, which may be integral with the casing 2 and surrounds the opening 36. The outer extremity of the bushing or journal bearing member 38 is mounted in a packing box 40 fixed to the outer wall 4 and provided with suitable packing material 41 which is held in snugly fitting engagement with the bushing by means of a packing gland 42, which is secured in position by means of screws or bolts 43, or similar securing means. The propeller shaft has an enlarged inner end or head 44, having a conical bearing surface 45, adapted to engage a tapered or concave seat 46 in or formed by the inner end of the journal bearing bushing 38. This shaft is provided at its outer extremity with a similar head or annular shoulder 47, having a conical or tapered surface portion 48 which extends into a similarly tapered concave seat 49 formed in the outer end of the journal bearing member or sleeve 38, and a nut 50 is mounted in threaded engagement with the head 47, and engagement with a stationary part of the structure so as to enable the conical surface portion 46 of the inner head 44 on the shaft to be held in air-tight engagement with its seat when the shaft is stationary and the propeller not in active operation. The escape of fluid from the chamber 7 is thus effectively prevented when the propeller is stationary.

When the agitating means, here shown as the propeller 32, is operated, the milk or liquid contained in the chamber 7 will be circulated rapidly in such a manner as to thoroughly agitate the liquid contents of the chamber throughout the entire mass of the material operated upon. The contents will thus be so evenly and rapidly exposed to the surfaces of the chamber that the walls 2 may be heated to a very high degree of temperature considerably above the boiling point of the liquid or milk without scorching or burning, or detrimentally affecting the milk appreciably, either with respect to its flavor or with respect to the condition of the particles of cream or butter fat, or what is commonly referred to as the cream line of the treated milk.

The rotation of the agitator in the operation of stirring the liquid also causes the conical bearing surface 45 of the propeller shaft to engage the conical seat 46, so as to prevent the escape of any liquid from the chamber 37, except an exceedingly small quantity, barely sufficient to properly lubricate the journal bearing of the propeller shaft. The propeller shaft is provided with a driving wheel 51, which may be of any desired ordinary and well known form adapted to connect the shaft with a motor or source of power for driving the same.

In order to provide means for cooling the tank and its contents, a main water supply pipe 52 is provided which is adapted to be connected with a water main or other suitable source of water supply for furnishing cooling water under pressure, and a coil or annular conduit, which may be in the form of a pipe 53, having a series of perforations 54 therein, is mounted in the upper part of the chamber 5 formed between the inner and outer walls of the tank, the annular passage 54, formed by the annular spray coil or pipe 53, is connected with the main water supply pipe 52 by means of a connecting pipe 55 which extends through the wall 4 and communicates with the passage 54. A series of drain passages 56 is provided for draining the coil 53. These drain passages are, by preference, in the form of angular depending tubes, the lower extremities 57 of which open toward the inner casing wall 2, and lead from the bottom of the passage 54, so as to force cooling water in the form of a spray or small jets against the inner casing wall, and also thoroughly drain the pipe 53. The perforations 54 also serve to discharge cooling water or spray, in small jets, against the casing wall 2.

There is provided a brine pump 58 having an inlet or suction passage 59 which communicates with a brine containing receptacle or chamber 60, and having a brine supply or discharge passage 61 which communicates with the conduit 55 leading to the passage 54 formed by the perforated pipe 53. The pipe 61 has a controlling cock or valve 62 for opening and closing the passage formed by said pipe and is provided with a safety valve 63, which may be in the form of an ordinary spring-pressed safety valve, such as is well known in the art. A refrigerator or ice chest 64, having a refrigerator or cooling compartment 65 adapted to contain ice or an equivalent cooling medium, and having a passage 66 communicating and adapted to conduct cool brine through a screen 67 and into the brine containing chamber 60, is provided, and arranged in position to supply cool brine to the brine pump 58, for cooling the tank 1 and its contents. The ice chest has a cover 68, and the brine chamber 61 has an overflow passage or outlet 69 which may be in the wall 70 of the brine chamber.

An outlet passage or conduit 71 leads from the bottom of the chamber 5 formed between the inner and outer walls of the tank 1 and is provided with a goose-neck or liquid sealed trap 72. The passage formed by the pipe 71 communicates with a pipe 73 through the medium of the trap 72, and also communicates with a discharge or waste pipe 74. The waste pipe 74 has a controlling cock 75 for opening and closing the discharge passage formed by said pipe; and the pipe 73, which leads into the cooling chamber 65, has an opening or openings 76 adapted to discharge cooling liquid received from the chamber 5 into the cooling chamber 65, and is provided with a controlling cock 77 for controlling the passage formed by the pipe 73 and leading from the trap 72 into the cooling chamber 65 or ice chest.

The main water supply pipe 52 has a controlling cock 52′ for regulating the supply of water from the original source of water supply.

The apparatus above described is adapted to be used to advantage in the practice of my improved method or process of treating milk.

In practising my improved method or process of treating milk, and particularly the method of pasteurizing, holding and cooling milk, a supply of milk to be operated upon is placed in the treating chamber 7, and the agitating mechanism is set in operation by starting the driving mechanism for operating the same. The agitating mechanism, constructed and arranged as above described, is adapted to set the entire liquid contents of the tank in motion and cause the liquid to circulate with such evenness and rapidity, where it comes in contact with the inner surface of the wall 2, and throughout the entire mass of liquid, that the wall of the chamber 7 may be heated at once to a high degree of temperature considerably above the boiling point of the milk or liquid operated upon, and the milk or liquid may be, and in practice is, subjected to such a temperature, for instance, 220 degrees Fahrenheit, for a prolonged period of time, sufficient to bring the entire mass of milk or liquid to a temperature of 160° F., while exposed to a surface temperature at the inner surface of the glass or enamel lined wall of the treating chamber, such as would be produced by heating the outer surface of the wall 2 to approximately 220° F. The wall 2 being of metal, and the lining or covering of glass or enamel, the temperature of the glass or enamel lining, which would be in actual contact with the milk, would be somewhat below the temperature of the metallic portion of the wall 2 actually in contact with the steam or heating medium. The temperature at the surface of the glass lining, which is in actual contact with the milk during the operation of stirring and treating the milk, in accordance with my invention, and improved process, is, by preference, above 110° F., and I find in practice that the best results are accomplished by maintaining such a temperature that the glass lining will have a temperature of approximately 200° F., or in other words, a temperature produced by heating the metallic wall 2 of the receptacle by subjecting it to the action of steam at a temperature of 220° F. The heating of the walls of the receptacle or treating chamber by means of the introduction of steam at a temperature of approximately 220° F. into the chamber 5 and in contact with the wall 2 is in practice continued until the milk or liquid contained in the treating chamber has thus been heated to a temperature of between 140° F. and 160° F. throughout the entire mass of the liquid treated, and the entire mass is simultaneously stirred or agitated in such a manner as to cause the fluid to be kept in such rapid motion during such heating operation and while subjected to a temperature of preferably between 210° F. and 220° F., as to prevent scorching or injury of the milk or fluid treated.

In practising my improved process of pasteurizing milk. the milk to be treated is. by preference. introduced into the treating chamber or receptacle at a temperature below 40° F., or below a bacilli forming temperature. or temperature which is conducive or favorable to the growth and development of bacilli. It is well known by those skilled in the art to which this invention relates that bacilli or bacteria will develop in milk at temperatures between 40° F. and 110° F. with great rapidity as said temperatures are favorable to the growth of bacteria. It is also well known that temperatures above 110° F. are less favorable to the growth and development of bacteria, and that temperatures above 110° F., and particularly temperatures between 140° F. and 160° F. or even as low as 130° F., are not only unfavorable to the growth of bacteria but are actually destructive to the life of bacteria.

I have found in practice that milk can be heated to a temperature of 160° F. without scorching or injury to the milk, and that it can be introduced into a treating chamber at a temperature of 38° F. and subjected to the action of heat sufficient to raise the temperature of the entire mass of milk or fluid to a temperature of 140° F. within a period of eight minutes without scorching or injury to the milk.

Having introduced a quantity of milk to be treated into a treating chamber or receptacle at a temperature below 40° F., steam is introduced into the chamber 5 in contact with the outer surface of the wall of the treating chamber, the steam being at a temperature of approximately 220° F., as already suggested, thus subjecting the mass of milk to a temperature of between 200° F. and 220° F., which is the temperature of the steam heated wall of the treating chamber or receptacle. This temperature is maintained for and during a sufficient period of time to raise the temperature of the liquid from 38° F. to a temperature of between 140° F. and 160° F. The entire mass of milk or fluid is at the same time stirred or agitated in such a manner as to keep the entire mass in such rapid motion during the entire period during which it is being heated. as to prevent scorching or injury to the milk during such heating and stirring of the mass. The entire batch or mass of milk, having thus been rapidly heated from a temperature of 40° F. or lower, to a temperature of approximately 160° F., and above 110° F., the time for the growth and development of bacteria, with the fluid at temperatures between 40° F. and 110° F., is reduced to a minimum and to all intents and purposes entirely prevented, and the bacteria originally contained in the milk or fluid before the beginning of the operation are thus destroyed or reduced to a minimum in the shortest possible time consistent with the treatment or pasteurizing of the milk without scorching or other detrimental effect.

During the admission of the steam into the chamber 5, for heating the material, which is accomplished by means of the steam supply conduit 25, the high level steam outlet conduit 20 is kept open.

The operation or process of pasteurizing the milk or fluid in the manner above described, having been completed. the supply of steam is then shut off. and the upper exhaust steam conduit 20 is closed. The milk or material treated is thus in condition to be cooled or allowed to cool. and to be transferred directly from the treating chamber into bottles or receptacles or containers of any desired suitable form. It is also in condition to be condensed or evaporated while in the treating chamber, if desired. In case the treated material is to be held in the receptacle, or placed in bottles or receptacles without further treatment, such, for instance, as condensation or evaporization. it is usually desirable to cool the material to a temperature suitable for holding or for handling, for instance. a temperature of 40° F.

In order to cool the material contained in the chamber 7 cooling liquid may be admitted to the chamber 5 by first opening the cock 52′ which controls the water supply conduit 52. The cock 75 may then be opened, so as to allow the cooling water to flow into and through the chamber 5 from the water supply conduit 52 and pipe 55, and out through the discharge pipes 71 and 74, until the temperature of the fluid treated has been reduced to a considerable extent. In case the available cooling water is sufficient in quantity and cool enough for the purpose, it may be found that no other cooling medium will be required.

Whenever the supply of cooling water is limited, or not sufficiently cool to lower the temperature of the milk or fluid to the desired extent, the outlet conduit 74 may be closed before shutting off the cooling water from pipe 52, and cock 77 may be opened and a sufficient quantity of water permitted to flow into the refrigerating or cooling chamber 65 of the ice box (unless the refrigerator chamber 65 has been previously supplied with sufficient water) for making brine. The main water supply conduit 52 is then closed, and the brine pump 58 is set in operation, after opening the cock 62, which controls the brine conduit 61. Cooled liquid, which is by preference in the form of brine, is thus caused to flow through the chamber 5, and from said chamber back to the cooling chamber 65 to be cooled and again caused to flow into and through the chamber 5 until the milk or liquid in the treating chamber has been reduced to the desired temperature.

The milk thus treated or pasteurized and cooled, is in condition for bottling, or for being placed in any desired receptacle or receptacles, by passing directly from the treating chamber, or treating and holding chamber 7 into the bottles or receptacles. The transferring of the milk or treated fluid to a cooler and the exposure of the milk to contamination or pollution is thus avoided.

In case it becomes desirable to hold the treated milk or fluid for a period of time before placing it in a container or containers, it is plain that the tank is adapted to serve for holding the fluid and to keep it at the desired uniform and unvarying temperature for any desired length of time. In order to enable this to be accomplished in a highly efficient manner it is only necessary to stop the brine pump when the treated fluid has been cooled to the desired temperature, and to close the cock 62, and allow the cooling liquid to run out of the chamber 5 of the tank until said chamber is empty. In case the liquid thus emptied from the chamber is brine, it should of course be allowed to flow into the cooling chamber 65 of the refrigerator. When not required to be used again, the liquid from the chamber 5 may be discharged through the waste pipe or conduit 74, and the cock 75 should then be closed.

In order to render the treating and holding tank even more efficient as a means for holding the treated milk or fluid for any desired length of time and at a desired uniform temperature, a practical and very effective and desirable vacuum or partial vacuum is provided in the chamber 5 between the outer and inner walls of the tank, and the walls of the tank are rendered heat-resisting or heat-insulated to the greatest possible extent, by admitting steam to the interior of the chamber 5 by opening the steam supply cock 26 for a short time, and allowing the products of condensation to escape by opening the cock 75, and then closing the cocks 26 and 75 while live steam is in the chamber 5, and when all other cocks and conduits communicating with the chamber 5 are closed, thus providing a vacuum or partial vacuum in the chamber 5 and providing a holding tank, the walls of which are heat-insulated. The tank is thus adapted to serve as a vacuum holding tank or thermos tank or receptacle, and is like a thermos bottle in its heat-resisting qualities.

During the operation of heating and stirring the milk or fluid in the process of pasteurizing milk, the upper opening 9, or the top of the treating chamber 7 may be open.

In order to carry out the process of condensing or evaporating the milk to be treated, it is only necessary to keep the top opening 9 and all openings to the chamber 7, except the upper opening or passage 31, closed, during the operation of stirring or agitating and heating the milk, and to have the passage 31, which leads from the chamber 7 to the vacuum pump opening and the pump 29 in operation, with the high-level steam exhaust conduit 20 closed and the low-level or lower steam exhaust conduit 22 and cock 23 open, and to continue the stirring and heating until the desired evaporation and condensation has been accomplished.

The supply of steam may then be shut off, and the process of cooling may be carried out and completed in the manner already described in connection with the process of pasteurizing.

When the high-level steam exhaust conduit is closed and the lower steam exhaust conduit is open, the hot steam is prevented from ascending to the top of the chamber 5 by reason of the fact that circulation is prevented from occurring in the upper part of the chamber above the level of the lower steam exhaust conduit. The undesirable heating of the walls of the treating chamber above the level of the milk operated upon in the operation of condensing or vaporizing the milk, is thus prevented, and only so much of the chamber as contains milk or fluid to be treated is exposed or subjected to the action of the steam in actual contact with the receptacle wall to be heated. The top of the milk or fluid, during the latter part or at the completion of the operation of condensing or evaporating a batch of milk or fluid, is indicated by the broken line 78, in Fig. 1.

I claim—

1. The process of treating milk, which consists in introducing into a receptacle a batch of milk to be treated, increasing the temperature of the entire mass of fluid at the rate of at least 12° F. per minute to a temperature of 140° F. by applying a heating medium to the walls of the receptacle, and keeping the mass of fluid in such rapid motion as to prevent scorching of the fluid during such heating of the mass.

2. The process of treating milk, which consists in introducing into a receptacle a quantity of milk at a temperature below 40° F., subjecting the walls of the receptacle which are in contact with the milk to a temperature between approximately 212° F. and 220° F., until the mass is heated to a temperature of at least 140° F., and simultaneously stirring the fluid and maintaining the entire mass in such rapid motion during the heating operation as to prevent the heat thus produced from scorching or injuring the milk.

3. The process of heating milk or other liquid food, which consists in placing the milk or other liquid food in a vessel, agitating the same, heating the same rapidly while in agitation to a temperature of about 140° F. and then cooling such milk or other food to about 40° F. without removing the same from such vessel.

4. The process of treating milk or other liquid food, which consists in placing the milk or other food in a vessel, agitating the same, heating the same while in agitation to a temperature of about 140° F. and then cooling such milk or other food to about 40° F. without removing the same from such vessel.

5. The process of treating milk or other liquid food, which consists in placing the milk or other food in a vessel, agitating the same so as to evenly and quickly expose all parts of the milk or other liquid food to the walls of the vessel, rapidly heating such food while being so agitated to a temperature of about 140° F., and then cooling such food to a temperature of about 40° F. without removing the same from about such vessel.

6. The process of treating milk or other liquid food, which consists in placing the milk or other food in a vessel, agitating the same so as to evenly and quickly expose all parts of the milk or other liquid food to the walls of the vessel, rapidly heating such food while being so agitated to a temperature of about 140° F. and then cooling such food to a temperature of about 40° F. while so agitated, without removing the same from such vessel.

7. The process of treating milk or other liquid food, which consists in placing such food in a vessel, agitating such food while in such vessel so as to evenly and quickly expose all parts of the food to the walls of the vessel, rapidly heating such food through a heating agency applied to the walls of said vessel until the temperature of such food is about 140° F., and then cooling such food while thus in agitation, to a temperature of about 40° F. by applying a cooling agency to the walls of said vessel and without removing said food from said vessel.

8. The process of treating milk or similar liquid food, which consists in bringing such food to a temperature of about 40° F. and running the same at such temperature into a vessel, applying to the walls of such vessel a heating medium preheated to a temperature of about 212° F. to 220° F., and thereby at a rate of 12° F. or 15° F. per minute heating such food to about 160° F. and above 110° F., thereby limiting the time for development of bacteria, and meanwhile agitating the food to evenly and quickly expose all parts thereof to the walls of the vessel and therethrough to the heating medium, and thereby preventing scorching of such food.

9. The process of treating milk or similar liquid food, which consists in bringing such food to a temperature of about 40° F. and running the same at such temperature into a vessel, applying to the walls of such vessel a heating medium preheated to a temperature of about 212° F. to 220° F., and thereby at a rate of 12° F. or 15° F. per minute heating such food to about 160° F. and above 110° F., thereby limiting the time for development of bacteria, and meanwhile agitating the food to evenly and quickly expose all parts thereof to the walls of the vessel and therethrough to the heating medium and thereby preventing scorching of such food, and then cooling such food while thus in agitation to a temperature of about 40° F. by applying a cooling agency in place of such heating agency to the walls of said vessel and without removing such food from said vessel.

In witness whereof, I have hereunto set my hand this 9th day of Feb., 1918.

NIELS D. NIELSEN.

N. D. NIELSEN.

PROCESS OF TREATING MILK AND THE LIKE.

APPLICATION FILED MAR. 22, 1918.

1,274,750. Patented Aug. 6, 1918.

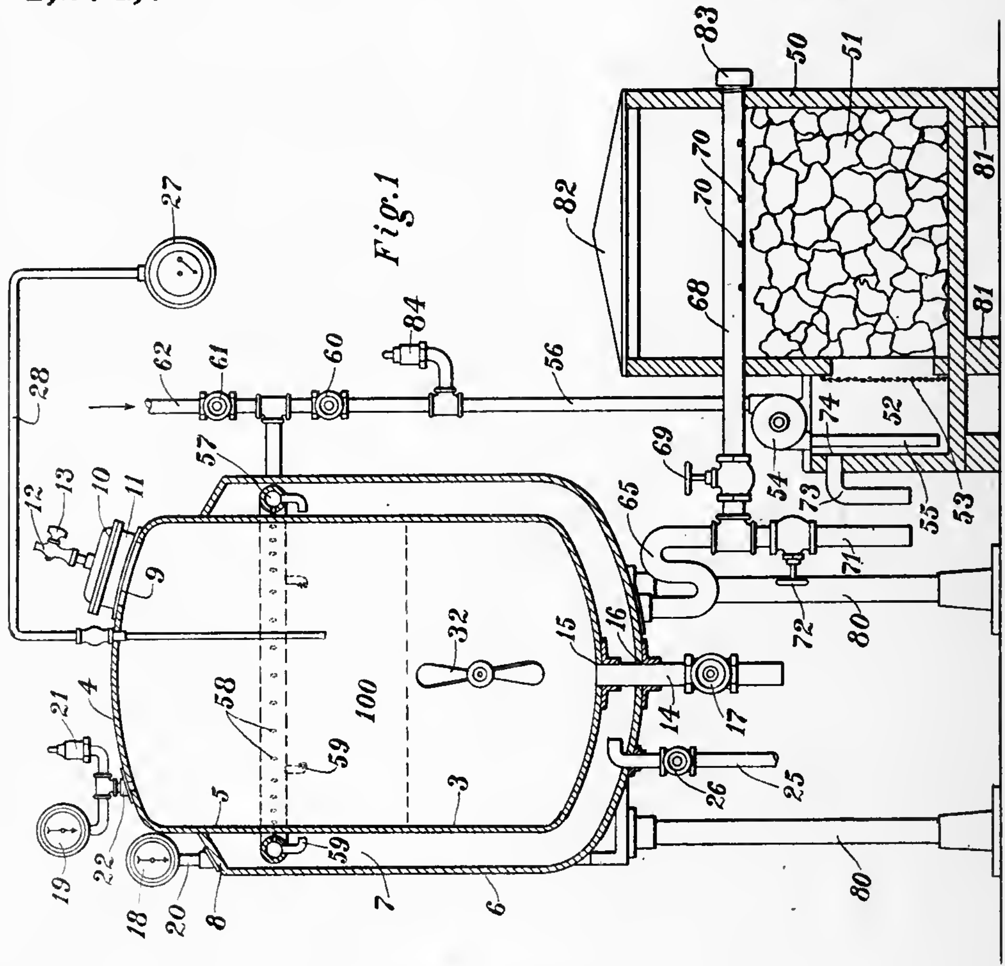


Fig. 1

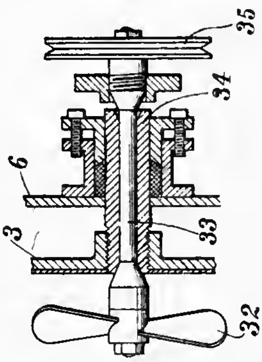


Fig. 2

NIELS D. NIELSEN
INVENTOR

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UNITED STATES PATENT OFFICE.

NIELS D. NIELSEN, OF ELYRIA, OHIO.

PROCESS OF TREATING MILK AND THE LIKE.

1,274,750. Specification of Letters Patent. **Patented Aug. 6, 1918.**

Original application filed February 9, 1918, Serial No. 216,622. Divided and this application filed March 22, 1918. Serial No. 223,909.

To all whom it may concern:

Be it known that I, Niels D. Nielsen, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Processes of Treating Milk and the like; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This application is a division of my application No. 216,622, filed Feb. 9, 1918.

This invention relates to processes for treating and handling milk or the like, and has for its principal object the provision of an improved process for eliminating any possibility of infection of the milk, its certain and proper preservation and for a simplification of such processes.

One of the objects of the invention is to provide a simple, economical and efficient process for treating milk or the like, and of providing means for cooling the milk in the container in which it has been sterilized, and of preserving it at a low temperature in such condition until it is to be drawn for use, for example, into bottles, small containers or the like.

Other and further objects of the invention will appear from an examination of the following description of an embodiment of my invention and of the appended claims, and from an inspection of the accompanying drawings which are made a part of this specification.

Figure 1 shows one embodiment of my invention, illustrating the container and the cooling apparatus in section, and the ducts, pipes, etc., in elevation.

Fig. 2 is a section showing one form of agitating means suitable for employment with my invention.

Referring now to the drawing, at 3 are shown the walls and at 100 the interior of a receptacle, here shown as a closed tank for heating, cooling, holding and otherwise treating milk or like liquid in accordance with my invention. In the embodiment shown, the tank is closed by a top 4 and preferably provided with a lining 5 of glass or enamel. The major portion of the tank is surrounded by a jacket 6, providing a jacket space 7 between the tank proper 3 and the jacket 6. At 8 is shown an apron, which closes the top of the space 7, making the same gas-proof. The apron 8 may be connected to the tank in any suitable manner, such as by welding. The top 4 is provided with a manhole 9 having a cover 10 therefor adapted to suitably close the manhole in the top of the tank. This cover may be removably connected to a sleeve 11 on the top of the tank. A vent tube 12 may be mounted upon the manhole cover 10 and controlled by a valve 13.

A discharge pipe 14 leads from an opening 15 through the space 7 and an opening 16 in the jacket 6 to any suitable destination. A valve 17 is provided for controlling this discharge pipe 14. Vacuum and pressure gages are shown at 18 and 19 mounted in position to communicate with the interior of the tank and with the space 7, respectively. A passage 20 connects the gage 18 to the space 7 and a passage 22 connects the interior of the tank to the pressure gage 19 and to a safety valve 21. The gages and safety valve, of course, may be of any well known construction.

A steam supply pipe is shown at 25, leading from a suitable source of steam (not shown) to the space 7 and is controlled by a valve 26. A recording theremometer 27 is employed to indicate and record the temperature of the interior of the tank to which it is connected by a tube 28.

The tank is provided with agitating means, here shown as a propeller 32 mounted upon a shaft 33, which passes through a sleeve 34 mounted in the walls 3 and 6. Means through which the propeller is driven is provided and here consists of a pulley 35. The details of this construction are not described here, since they constitute no part of this invention.

When rotated, the propeller coöperating with the walls of the tank, distributes the contents thereof about in such a manner as to cause the heating or cooling effect of the medium in the space 7 to act uniformly or substantially uniformly upon the contents of the tank, and thereby more quickly and evenly bring it to the desired temperature.

Apparatus is provided for producing and introducing a cooling medium to the space 7, here shown as an ice chest for cooling brine, and means for introducing it to said space and withdrawing it therefrom. At 50 is shown the ice chest proper filled with ice

51. A brine chamber is shown at 52, separated from the ice chest proper by a screen 53. A brine pump is shown at 54, which, when operated, causes the brine to flow through the intake 55 and the discharge pipe 56 to a delivery pipe 57, whence it is delivered to the walls of the tank and the space 7. The delivery pipe 57 is best formed to completely surround the tank and is provided with a plurality of perforations 58 and jets 59 from which the cooling fluid is sprayed upon the various portions of the wall of the tank in such a manner as to run down the walls in a sheet. A valve 60 controls the pipe 56. A second valve 61 controls a pipe 62 leading from any source of water at ordinary temperature, such as a city main, to the delivery pipe 57.

It will be apparent that the valve 60 may be closed and the valve 61 opened, when water of ordinary temperature is to be supplied to the tank.

The brine is returned through a pipe 65 to a feed pipe 68, which is controlled by a valve 69. The brine flowing through 65, 69 and 68 is returned to the ice chest through openings 70 in the feed pipe 68. A discharge pipe is shown at 71 controlled by a valve 72. When it is desired to discharge the brine rather than return it to the ice chest, the valve 69 may be closed and 72 opened. At 73 is shown an overflow pipe for the brine chamber 52, and which leads from an overflow opening 74 therein to waste. Suitable means are provided for supporting the tank and associate structure, such as columns 80. The ice chest is supported by blocks 81 and is covered with a suitable cover 82. The pipe 68 is dead-ended by a cap 83. A safety valve 84 is employed in connection with the pipe 56.

The valves, both ordinary and safety, may be of any suitable form, many of which are upon the market. I may also use any suitable form of pump at 54 for conveying the brine to the jacket chamber 7, or it will be apparent that any other suitable means may be employed for causing the brine to flow into such chamber.

In practising my improved method or process of treating milk or the like, a supply of milk to be operated upon is placed in the treating chamber 100 inclosed by the walls 5, and the same is pasteurized, by introducing the heating medium, such, for example, as steam, which may be introduced to the space 7 through the pipe 25. During the exposure of the contents of the chamber 100 to such heating medium, the agitator 32 is operated to quickly and uniformly expose all particles of the contents of such chamber to such heating medium.

The contents of the chamber having thus been pasteurized, the valve 26 is closed, leaving the space 7 filled with steam, which is condensed by introducing cool water, cold brine or other steam condensing medium. In the embodiment shown this is introduced through the feed pipe 57 from the source connected with pipe 62, or through the pipe 56 from the cooling apparatus. The condensation of the steam in space 7 leaves a vacuum or partial vacuum therein, which acts as a heat insulating medium and preserves the contents of the chamber 100 at a constant or substantially constant temperature for as long a period of time as is desirable in this work; for example, the contents of the tank may be brought to a temperature of 142° F. or 145° F. and maintained at such temperature for thirty minutes.

It is very important to cool the milk or the like, without removing it from the chamber in which it was pasteurized, to avoid exposing it to contamination during such moving. Accordingly, the means for introducing the cooling brine to the space 7 is operated in the manner already described and the contents of the chamber 100 brought to the desired temperature without removing it from the tank. During the cooling, the agitating means should be operated to uniformly and evenly distribute the contents of the tank to the cooling medium, so as to quickly bring it to a uniform temperature, preferably about 36° F. When such temperature is reached, the pump 54 is stopped and the valve 60 is closed so as to prevent further introduction of cooling brine to the space 7. The brine, however, is permitted to drain from the chamber 7 so as to empty the chamber thereof. It is important to maintain the contents of the tank at the temperature to which it has thus been brought, often for some hours. It is also important to accomplish this purpose without removing the contents of the tank from such tank, in order not to expose it to contamination. This step of my invention is accomplished in the following way:

The valves 69 and 72 are closed and valve 26 is opened, permitting enough steam to flow through the pipe 25 to fill the space 7 between the walls 3 and 6. The valve 26 is then closed. Enough of cooling water is then introduced through the distributing pipe 57 to condense the steam in 7, and thereby produce a vacuum or substantially a vacuum in such space, which, acting as a heat insulating medium, prevents the access of heat to the contents of the tank, whereby the temperature of such contents is maintained constant, or substantially constant for the desired period of time. The condensing fluid may be introduced to the space 7 either through the pipe 62 controlled by the valve 61, or the pipe 56 controlled by the valve 60.

It will be apparent that the supply of milk or the like in the tank may thus be preserved at substantially the temperature to which it has been reduced, for considerable periods of time, and that it may be withdrawn from the tank, for use, into bottles or the like, without any opportunity of its having been infected, and with certainty of its purity.

I have illustrated and described this embodiment of my invention for the purpose of better explaining the same. I do not wish to be limited to such embodiment, or the details thereof, as I contemplate many departures therefrom without departing from the spirit of my invention, which is set forth in the appended claims.

I claim:—

1. The method of treating milk or like liquid, which consists in sterilizing the same, then cooling said liquid to about 36° F. and then filling a space surrounding or substantially surrounding a vessel containing said liquid with a condensable gas and then condensing said gas and thereby creating a heat insulating vacuum about said liquid and then thus maintaining the temperature of such liquid at about 36° F. for a desired length of time.

2. The method of treating milk or like liquid, which consists in sterilizing the same by heat applied to the vessel containing the liquid through a heating medium confined in a space between the walls of such vessel and a jacket thereabout, then cooling said liquid to about 36° F. by applying to such vessel a cooling medium in said space, then withdrawing such cooling medium and filling said space with steam and then condensing the steam in such space by introducing cold water into such space.

3. The method of treating milk or like liquid, which consists in sterilizing the same by filling a space surrounding or substantially surrounding such liquid with a heating medium, then introducing to such space a cooling medium to cool said liquid, then when said liquid is cooled to a desired temperature, introducing to such space a condensable gas and condensing said gas, thereby surrounding or substantially surrounding said liquid with a heat insulating vacuum and thereby maintaining such liquid at a low temperature for a desired length of time.

4. The method of treating milk or like liquid, which consists in sterilizing the same by heat applied to the vessel containing the same through a heating medium confined in a space between the walls of such vessel and a jacket thereabout, then cooling such liquid to about 36° F. and creating a heat insulating vacuum about such liquid by filling such space with a condensable gas and condensing such gas and then maintaining such liquid at such temperature for a desired period of time.

5. The method of treating milk or like liquid, which consists in sterilizing the same by heat applied to the vessel containing the same through a heating medium confined in a space about said liquid, then cooling such liquid to a desired low temperature and maintaining such liquid at substantially such temperature by creating a heat insulating vacuum in such space.

6. The method of treating milk or the like, which consists in sterilizing the same by heat applied to the vessel containing the liquid through a heating medium confined in a space between the walls of said vessel and a jacket thereabout, withdrawing such heating medium and then cooling said liquid to about 36° F. by introducing into such space a cooling medium, then withdrawing such cooling medium and filling said space with steam and then introducing to said space jets of cool water injected near the top thereof and permitted to flow down the walls of said vessel and thereby condensing said steam and creating a heat insulating vacuum in such space.

7. The method of treating milk or like liquid, which consists in sterilizing the same, cooling said liquid to about 36° F. by applying a cooling medium in a space surrounding or substantially surrounding a vessel containing such liquid, withdrawing such cooling medium and filling said space with a condensable gas and then condensing said gas by introducing cool water to such space and thereby creating a heat insulating vacuum.

8. The method of treating milk or like liquid, which consists in sterilizing the same by heating the same to a temperature of about 142° to 145° F. by filling a space surrounding said liquid with steam, then condensing said steam by introducing to said space sufficient cooling medium to condense said steam and thereby creating a vacuum or partial vacuum in said space to insulate said liquid from exterior heat, then thereby maintaining such liquid at a constant temperature of 142° to 145° F. for about thirty minutes, cooling said liquid to about 36° F. by applying a cooling medium in such space, then withdrawing said cooling medium and again filling said space with steam and then condensing said steam by again introducing sufficient cooling medium to said space to condense said steam and thereby creating a heat insulating vacuum about said liquid, whereby it may be maintained at the temperature to which it has been reduced.

9. The method of treating milk or the like, which consists in sterilizing the same by heating the same to a temperature of about 145° F. by filling a space surrounding said liquid with a heated condensable gas, then introducing to said space sufficient cooling medium to condense said gas and there-

by creating a vacuum or partial vacuum in said space to insulate such liquid from heat, then thereby maintaining such liquid at a constant temperature for about thirty minutes, then introducing to said space a cooling medium sufficient to reduce the temperature of the liquid to about 36° F., then withdrawing such cooling medium and again filling said space with a condensable gas then condensing said gas by introducing cooling water to such space and thereby creating a heat insulating vacuum about said space, whereby the temperature of the liquid may be maintained constant for a suitable period of time.

In witness whereof, I have hereunto signed my name this 11th day of March, 1918.

NIELS D. NIELSEN.

M. MUSSINO.

PROCESS OF TREATING MILK.

APPLICATION FILED MAY 31, 1917.

1,284,751. Patented Nov. 12, 1918.

Fig. 1.

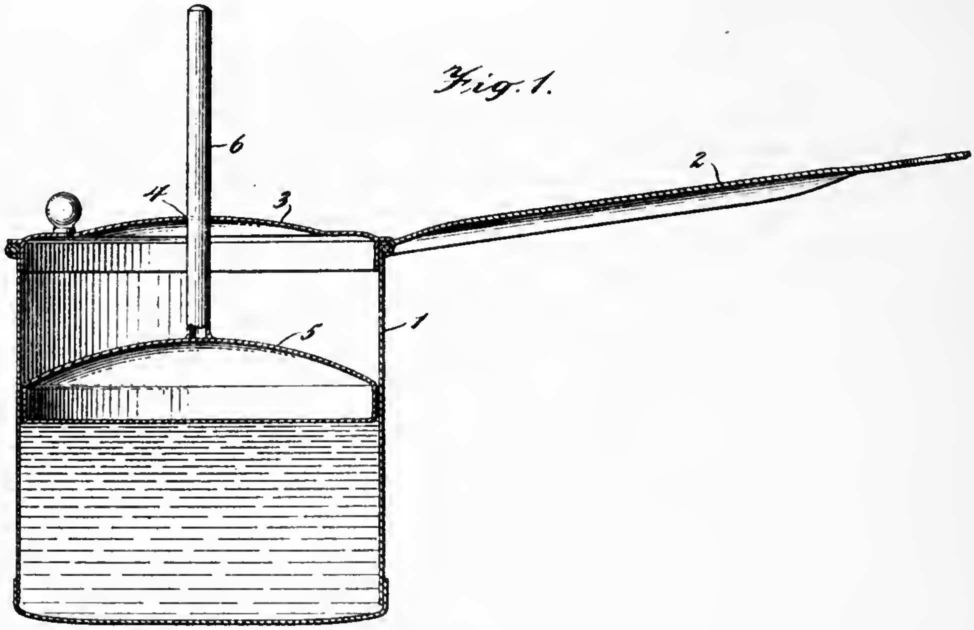
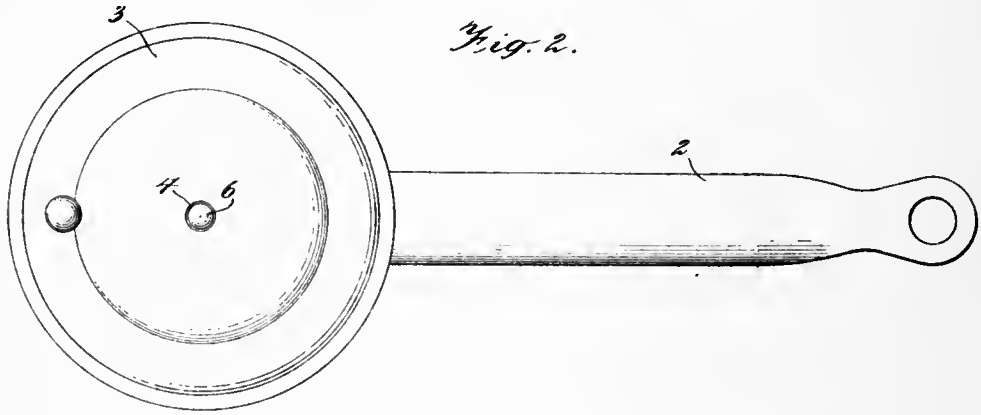


Fig. 2.



INVENTOR

Michel Mussino.

BY

Rosenbaum, Stockbridge & Borst

ATTORNEYS

UNITED STATES PATENT OFFICE.

MICHEL MUSSINO, OF NICE, FRANCE, ASSIGNOR TO FRANK D. REILLY, OF MONTCLAIR, NEW JERSEY.

PROCESS OF TREATING MILK.

1,284,751. Specification of Letters Patent. Patented Nov. 12, 1918.

Application filed May 31, 1917. Serial No. 171,930.

To all whom it may concern:

Be it known that I, MICHEL MUSSINO, a subject of Italy, residing at Nice, France, have invented certain new and useful Improvements in Processes of Treating Milk, of which the following is a full, clear, and exact description.

This invention relates to a process of treating milk while it is at a temperature above that at which a skin forms upon its exposed surface.

As is well known, milk is frequently boiled or raised to a temperature somewhat below its boiling point for the purpose of destroying the bacteria and also for cooking purposes. Invariably after the milk is heated to this high temperature, a skin forms upon its exposed surface, which is objectionable and is usually removed from the surface of the milk before use. This skin contains an appreciable quantity of the nutritive content of the milk, so that the milk remaining after the skin is removed is in markedly impoverished condition.

This invention has for its object a process whereby milk may be heated or retained hot without the formation of this skin.

It is also well known that milk which is placed in a receptacle and is not completely filled and sealed, is frequently infected with the bacteria which are present in the air. It is also the object of the invention to provide against the infection of the milk in this manner.

The formation of the skin upon the exposed surface of milk which is brought to the boiling point or to a temperature approximating the boiling point, has been attributed to various organic changes occurring in milk when heated. According to some authorities the formation of the skin is the result of the desiccation of a portion of the proteid content of the milk, due to surface evaporation. In some instances it has been attributed to the coagulation of the casein and albumen when exposed to contact with the air. According to the present invention, the upper surface of the milk in a receptacle in which it is heated or in which it is kept hot, is completely covered, in such a manner as to prevent surface evaporation and to exclude the surrounding air. One embodiment of an apparatus in which the process may be carried out, is shown in the accompanying drawings in connection with which the process will be described in detail, and in which—

Figure 1 shows a vertical section through the apparatus; and

Fig. 2 is a top plan view thereof.

The apparatus comprises a receptacle 1 which may be of any desirable shape, but is preferably cylindrical and may be provided with a handle 2. This part of the apparatus is in no wise different from the usual pan or boiler, which is utilized at the present time for heating or boiling milk.

The receptacle 1 may be provided with the usual cover 3, which, in the present construction, is provided with a centrally-disposed opening 4. The novel portion of the boiler comprises a float 5 which may be of a hollow metal construction, or of any other suitable material whose specific gravity is less than that of milk, whereby it will float upon the surface of the milk contained within the receptacle. This float is of slightly less diameter than the diameter of the receptacle so that practically none of the surface of the milk within the receptacle is exposed when the float is in place thereon. The float may be provided with a stem 6, which passes through the central opening 4 within the cover 3 which serves to prevent the float from tipping. The cover 3, however, is not essential to the apparatus.

The manner in which this boiler is used is as follows: The cold milk is poured into the receptacle 1 and the float 5 is placed upon the same, whereby the entire upper surface of the milk is completely covered by the float which is in contact therewith. The boiler is then placed over a suitable heating medium, and the milk heated until it reaches its boiling point, which will be indicated by a rise of the float within the receptacle. The boiler is then removed from the fire and when the milk cools to a temperature below the temperature at which the skin forms upon its exposed surface, it may be poured from the receptacle and used as desired. To pour a portion of the milk from the receptacle, it is not necessary to remove the float, for if the top cover 3 is removed, the milk may be poured from the receptacle by tilting the same, the float resting upon the surface of the liquid.

Before pouring the milk from the receptacle, it is preferable to push the float down into the milk and twirl it gently for a few turns. The reason for this is that even where the float is used, it has been found that when milk is heated, the cream gradually rises toward the surface of the milk without coagulating and adheres to the bottom of the float. When a slight twirling movement is given to the float, the cream adhering to the bottom of the float is removed and is again incorporated into the milk.

The skin will form upon hot milk which is not quite to a boiling temperature, as well as upon milk while at or above the boiling temperature, and for this reason care should be exercised to keep the float upon the milk until the milk cools down to a temperature below the point at which the skin forms.

It has been found that when milk is heated, or is retained hot in this manner, the objectionable skin, which has heretofore invariably formed upon the milk, is entirely eliminated.

Another advantage of the apparatus and process described, is that the float prevents the air from coming into contact with the exposed surface of the milk. If the usual milk receptacle is partially emptied, the exposed surface of the milk absorbs the bacteria from the air which will then breed within milk. With the present construction, however, if a portion of the milk is utilized, the float still remains in contact with the exposed surface of the remainder of the milk within the receptacle, and will thus prevent contact between the exposed surface and the air until the entire quantity of milk has been used.

The process described may be carried out with other types of apparatus than the one described, the scope of the invention being apparent from the appended claims.

I claim:

1. The process of treating milk, which consists in heating the milk in an open vessel to a temperature above that at which a skin normally forms thereon, and continuously maintaining a rigid seal in contact with the upper surface of the milk.

2. The process of treating milk in an open vessel, which consists in boiling the milk, and maintaining a floating seal on the upper surface of the milk while the latter is being heated to the boiling point.

3. The process of treating milk in an open vessel, which consists in boiling the milk, and continuously maintaining a floating rigid seal in contact with the upper surface of the milk.

In witness whereof, I subscribe my signature in the presence of two witnesses.

MICHEL MUSSINO.

Witnesses:
R. ROBINSON RILEY,
S. HENDERSON.

MILK- STERILIZATION

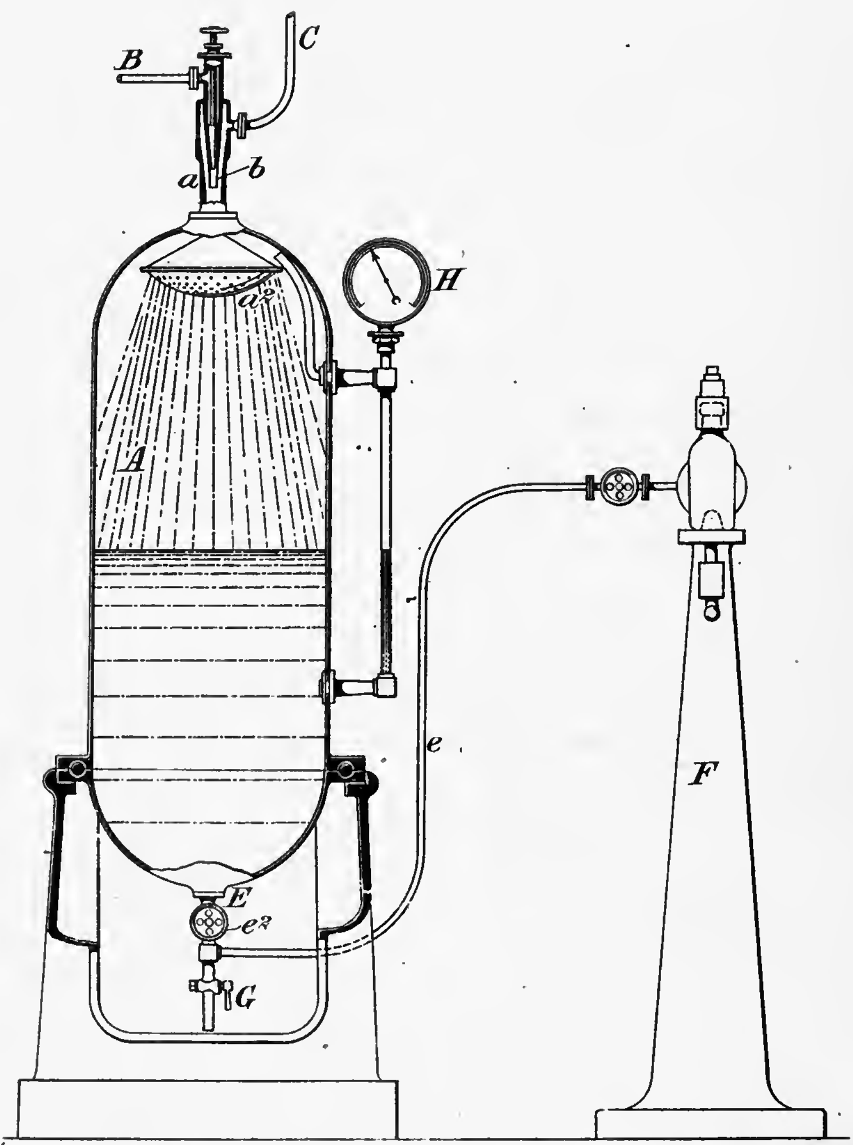
Patent	Subject	Author	Date
361,045	Preserving milk.	Brin	Apr. 12, 1887.
524,649	Process of sterilizing milk.	Popp	Aug. 14, 1894.
597,082	Process of and apparatus for sterilizing liquids.	Kuhn	Jan. 11, 1898.
615,050	Apparatus for continuously sterilizing milk.	Salenius	Nov. 29, 1898.
615,108	Apparatus for sterilizing milk.	De Segundo.	Nov. 29, 1898.
669,702	Process for sterilizing milk.	Nash	Mar. 12, 1901.
678,891	Process of sterilizing liquids.	Miller	Jl. 23, 1901.
786,819	Process of sterilizing milk and other fluids.	De Jong	Apr. 11, 1905.
963,244	Process of sterilizing milk,	Palmer	Jl. 5, 1910.
1,006,992	Process for sterilizing milk and milk products.	Wiener	Oct. 24, 1911.
1,036,806	Process and apparatus for sterilizing milk and other organic liquids.	Desmaroux	Aug. 27, 1912.
1,050,707	Process of sterilization of liquids.	Volney	Jan. 14, 1913.
1,081,483	Process of sterilizing milk.	Bonine	Dec. 16, 1913.
1,140,717	Process of sterilizing milk, cream, beverages, and other alimentary substances.	Rutter	May 25, 1915.
1,190,769	Apparatus for treating liquids.	Jurist	Jl. 11, 1916.
1,199,642	Apparatus for the sterilization of fluids.	Walkey	Sept. 26, 1916.
1,230,751	Process of sterilizing liquids.	Mérie	Je. 19, 1917.
1,235,698	Sterilizing apparatus.	Keyes	Aug. 7, 1917.
1,325,094	Process for treating fruit-juices.	Hieber	Dec. 16, 1919.

(No Model.)

A. BRIN.

PRESERVING MILK.

No. 361,045. Patented Apr. 12, 1887.



Witnesses:
Philip Mauro
G. H. Howard

Inventor:
Arthur Brin
By A. Pollok
his attorney.

UNITED STATES PATENT OFFICE.

ARTHUR BRIN, OF PARIS, FRANCE.

PRESERVING MILK.

SPECIFICATION forming part of Letters Patent No. 361,045, dated April 12, 1887.

Application filed February 21, 1887. Serial No. 228,397. (No model.) Patented in England July 28, 1886, No. 9,738.

To all whom it may concern:

Be it known that I, ARTHUR BRIN, engineer and chemist, a citizen of the Republic of France, and residing at 7 Rue Gavarni, Paris, in the said Republic, have invented certain new and useful Improvements in Treating Milk for Preserving it, (for which I have applied for a patent in Great Britain on the 28th of July, 1886, No. 9,738,) of which the following is a specification.

This invention relates to preserving milk; and it consists in impregnating the milk with pure oxygen by placing the milk in a closed vessel and introducing thereinto, under pressure, the oxygen with which the milk is to be impregnated. I prefer to employ for the purpose the oxygen produced according to the process described in the specification of British Letters Patent No. 157, granted to Leon Quentin Brin and myself, as of the 5th of January, 1885.

In order that the way in which my invention may be carried into effect may be well understood, I have illustrated in the accompanying drawing an apparatus suited to the purpose.

A is a closed vessel with a pipe at a, with an inner nozzle, b. The pipe C leads from a reservoir of the milk to be treated into the pipe a, and the pipe B leads from a reservoir of oxygen gas under pressure into the nozzle b. Both these pipes are controlled by valves. The pipe a terminates in a perforated rose, a^2. When the milk and oxygen gas are turned on, they pass together from the rose a^2, and the milk is thoroughly submitted to the action of the oxygen and collects in the lower part of the vessel A.

E is an outlet leading by a pipe, e, to the bottling-machine F, which may be of the ordinary kind used for bottling aerated waters, the said outlet being controlled by a valve, e^1.

G is a blow-off cock for blowing out the contents of the apparatus for cleaning or other purpose.

H is a pressure-gage for ascertaining the pressure in the vessel A.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. The treatment of milk by impregnating it with oxygen, substantially as hereinbefore described.

2. The treatment of milk by impregnating it with oxygen, by injecting the oxygen gas under pressure into the milk while the said milk is contained in a closed vessel, substantially as hereinbefore explained with reference to the accompanying drawing.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR BRIN.

Witnesses:

DOUGLAS J. NEWTON,
9 Birchin Lane, London.

CHAS. MILLS,
47 Lincoln's Inn Fields, London.

[illegible]

[illegible]

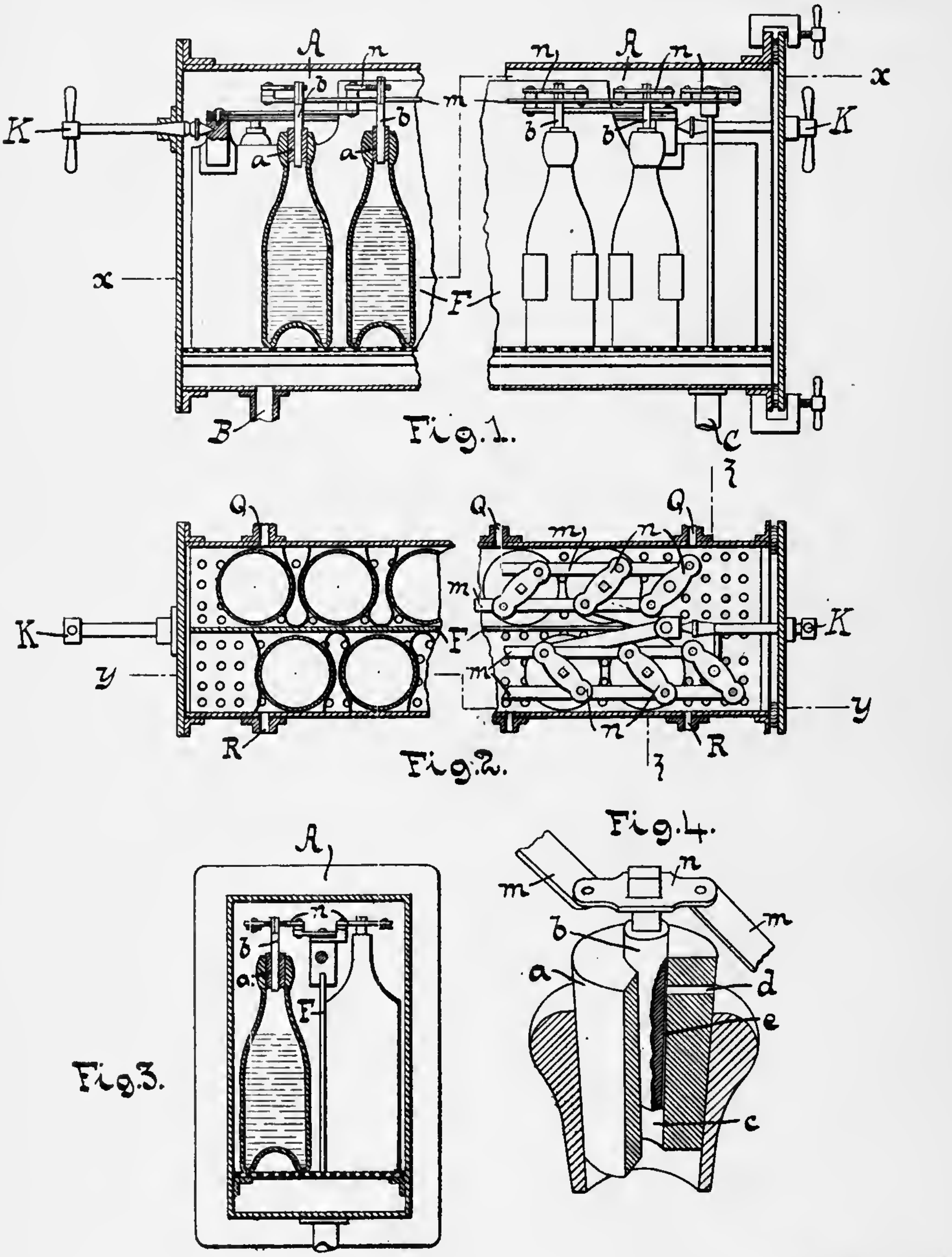
[illegible]

(No Model.)

G. POPP & J. H. BECKER.

PROCESS OF STERILIZING MILK, &c.

No. 524,649. Patented Aug. 14, 1894.



WITNESSES:

Klas H. Pinnstedt

J. J. Malle

INVENTORS:

Georg Popp

Johann Heinrich Becker,

BY

A. Faber du Faur Jr.

ATTORNEY

UNITED STATES PATENT OFFICE.

GEORG POPP AND JOHANN HEINRICH BECKER, OF FRANKFORT-ON-THE-MAIN, GERMANY.

PROCESS OF STERILIZING MILK, &c.

SPECIFICATION forming part of Letters Patent No. 524,649, dated August 14, 1894.

Application filed April 11, 1893. Serial No. 469,990. (No specimens.)

To all whom it may concern:

Be it known that we, GEORG POPP and JOHANN HEINRICH BECKER, both subjects of the Emperor of Germany, residents at Frankfort-on-the-Main, Prussia, Germany, have invented new and useful Improvements in Processes for the Sterilization of Milk, &c., of which the following is a specification.

Our invention has reference to a method of sterilizing milk and other liquids;—it having for its primary objects to obtain a complete sterilization of the liquid and to facilitate the operations.

It is well known that to obtain a complete and thorough sterilization of milk and other liquids, it is not sufficient merely to raise and maintain the liquid for a definite time at a temperature slightly in excess of 100° centigrade; but, that it is essential to cool the liquid after this heating,—preferably rapidly, and then again subject the same to the heat. This intermediate cooling of the liquid serves to so develop such bacteria and spores which may be in the so-called latent condition, that they are destroyed in the subsequent reheating of the liquid. Heretofore this fractional sterilizing has been carried out with bottles, or other receptacles provided with stoppers made of wadding, by placing the receptacles repeatedly in the sterilizing chamber. The air which may enter the receptacles upon the condensation of the steam is purified by the wadding. While this manner of carrying out the fractional sterilization answers for scientific and experimental purposes, it is not well adapted for sterilization on a large scale for the market, since the wadding closures do not permit transportation of the receptacles to greater distances witout special treatment or appliances, and because the closures in time breed and become filled with micro-organisms. It was therefore necessary heretofore for commercial purposes, either to heat the liquid but once, or, to enable a repeated heating with free exchange of gases, it was necessary to open the several receptacles, which had been heated in the apparatus, separately and externally to the same, and then place them again into the apparatus and reheat and close them in the usual manner. The cooling of the receptacles and contents external to the sterilizing apparatus has heretofore been usually accomplished by ordinary air cooling or by placing the same in warm water, which is gradually cooled. The opening of the receptacles external to the sterilizing apparatus after they have been already heated and closed inside of the apparatus has the disadvantage that in view of the vacuum formed in the receptacles, air is drawn into the same and with it germs;—and besides this the process is very costly in view of the fact that each receptacle must be separately manipulated.

Our process consists essentially in placing the receptacles while open into the heating chamber where they are subjected to the action of steam or other heating agent at the usual temperature and for the proper period of time;—then they are closed air-tight while in the steam chamber and after closure they are cooled; in practice preferably by removing the same while closed from the chamber and cooling in any well known manner. After proper cooling, and after the proper period of rest, the receptacles are again placed into the heating chamber, and opened after the steam or other heating agent has been turned on and all the air expelled from the chamber. After this second sterilization the receptacles are closed while in the chamber, and, after the steam or other heating agent has been turned off, they are removed.

In the accompanying drawings where we have illustrated an apparatus especially adapted for carrying out our process, Figure 1 represents a vertical section in the plane y y Fig. 2. Fig. 2 is a horizontal section in the plane x x Fig. 1. Fig. 3 is a transverse section in the plane z z, Fig. 2, and Fig. 4 is a sectional perspective view illustrating a construction for the bottle closure.

Similar letters of reference indicate corresponding parts throughout the several views of the drawings.

In the drawings the letter A designates the heating chamber, to which in this instance steam is conducted through pipe B, while the water of condensation is led away through pipe C.

F is a suitable removable rack constructed to rigidly hold the bottles or other receptacles.

m n are two sets of parallel movements connected with the closures and adapted to turn the same, when either of the push bars K is forced inwardly, the whole being constructed to be operated from the exterior of the heating chamber to open or close the bottles.

The closure shown in Fig. 4, consists of a rubber stopper *a* fitted tightly to the neck of the bottle, and in the longitudinal bore *c* of which is fitted to turn a glass plug *b* made slightly taper while its upper end is squared to fit sockets in the links *n* of the parallel movement *m n*. In the stopper *a* is formed a radial channel *d*, and on the periphery of plug *b* is formed a groove *e*, so that when the plug is turned to connect the channel and groove the closure is open and vice versa.

In practice the method is carried out as follows:—The bottles filled with milk or other liquid to be sterilized and provided with the closures such as described are secured in the rack F, care being taken that the horizontal channels *d* in the plugs *b* all point in the same definite direction. The rack with the open bottles is now slid into the heating chamber and the chamber closed air tight. Steam is now admitted and the bottles exposed for the proper time. The bottles are then simultaneously closed air tight, and then removed from the chamber and permitted to cool. After cooling, the rack containing the bottles is again placed into the heating chamber and the chamber closed and steam admitted. As soon as all the air has been driven out of the steam chamber, so that the bottles are surrounded only by air or vapor free from germs, the bottles are simultaneously opened by pushing in one of the push bars K and the contents of the bottles are again exposed to the steam as before described. The bottles are then closed from the exterior by pushing in the second bar, and are removed after the steam has been shut off and then allowed to cool, when they are ready for shipment.

We have found it to be of great advantage to reduce the steam pressure somewhat after each heating period, then to increase the pressure to the normal one and then to close the bottles. This has the advantage that in view of the reduction of pressure the liquid boils up and is agitated so that all parts are well sterilized and any air and foul gases contained in the liquid escape.

Instead of removing the bottles and cooling the same in the open air, they may be cooled directly in the apparatus by surrounding the same while in the heating chamber with running water entering at Q Q, Fig. 2, and escaping at R, said water being caused to gradually grow colder,—a precaution which must be taken to prevent the bottles from cracking. It is evident that in place of water, hot air or other fluid may be used for sterilizing the liquids, and also that in place of water, air or other fluids may be used for cooling the liquid, and when sterilized air is used for this purpose the bottles need not be closed during the cooling process.

We do not herein claim the apparatus shown as we have claimed the same in an application bearing even date herewith, Serial No. 469,991.

What we claim as new, and desire to secure by Letters Patent, is—

1. The herein described process for the fractional sterilization of liquids in separate receptacles, consisting in placing the receptacles and contents into a heating chamber, heating with the receptacles open, closing the receptacles, then cooling while closed, then re-opening the receptacles while in the heating chamber in the presence of the sterilizing fluid and re-heating, then closing the receptacles while in the chamber and removing the same.

2. The herein described process for the fractional sterilization of liquids in separate receptacles, consisting in placing the receptacles into a suitable chamber and heating while open, then simultaneously closing the receptacles while in the chamber, removing the same when closed and cooling, then replacing in the chamber, then introducing the sterilizing fluid into the chamber, simultaneously opening the receptacles while in the chamber; reheating, and finally simultaneously closing the receptacles again while in the chamber and removing the same, substantially as described.

3. The herein described process for the fractional sterilization of liquids in separate receptacles, consisting in placing the receptacles and contents into a steam chamber, heating with the receptacles open, closing and then cooling, then opening the receptacles while in the chamber in the presence of steam, and reheating with the receptacles open, then reducing the steam pressure in the chamber for the purpose of agitating the liquid, then raising the pressure to the normal, and then closing the receptacles and removing the same.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

GEORG POPP.
JOHANN HEINRICH BECKER.

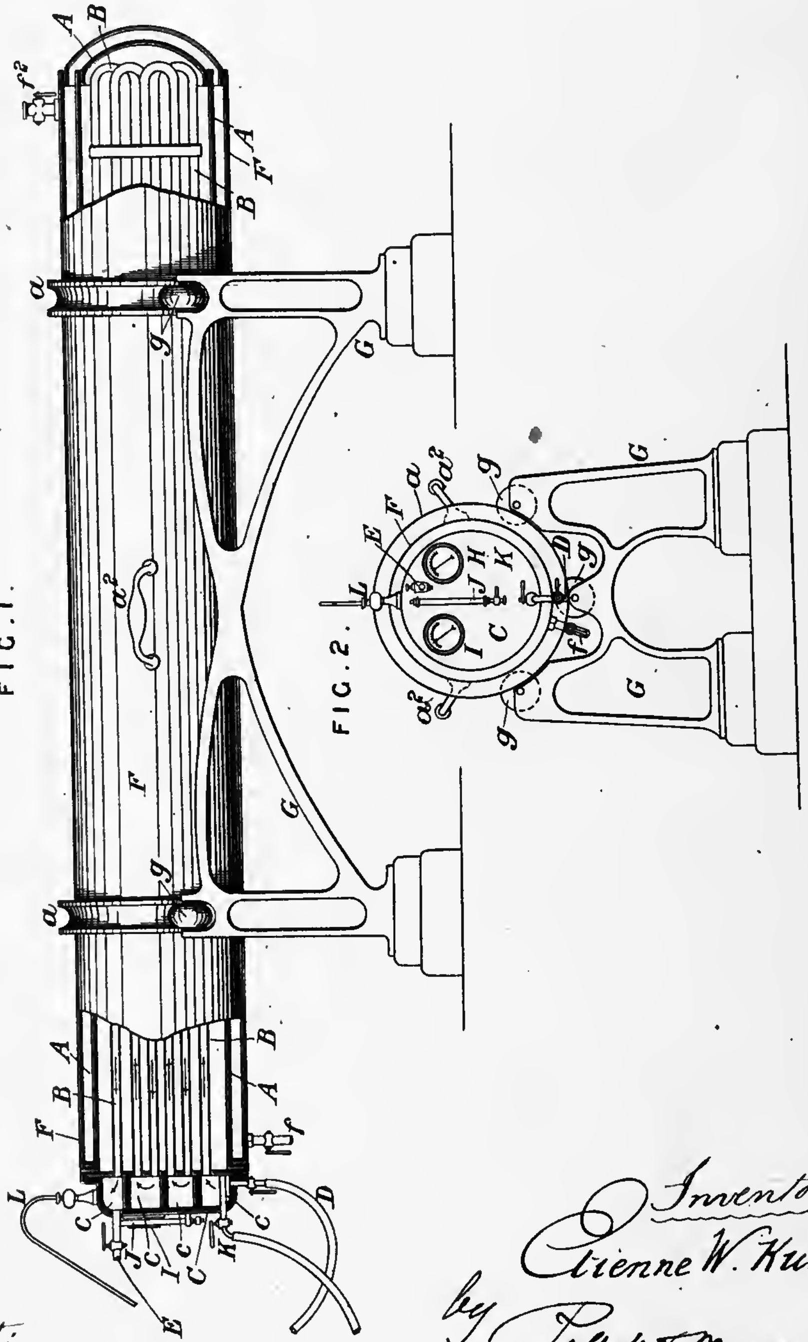
Witnesses:
ALVESTO S. HOGUE,
JEAN GRUND.

(No Model.)

E. W. KUHN.

PROCESS OF AND APPARATUS FOR STERILIZING LIQUIDS.

No. 597,082. Patented Jan. 11, 1898.



Attest:
Geo. Lewis
J. M. Copenhaver.

Inventor:
Etienne W. Kuhn
by Pollok & Mauro
his attorneys

UNITED STATES PATENT OFFICE.

ETIENNE W. KUHN, OF PARIS, FRANCE.

PROCESS OF AND APPARATUS FOR STERILIZING LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 597,082, dated January 11, 1898.

Application filed May 14, 1895. Serial No. 549,283. (No model.) Patented in Belgium October 15, 1894, No. 112,247.

To all whom it may concern:

Be it known that I, ETIENNE WILLIAMS KUHN, engineer, a citizen of the French Republic, residing at 42 Rue du Louvre, Paris, in the Republic of France, have invented certain Improvements in Processes of and Apparatus for Sterilizing Liquids, (for which I have obtained a patent in Belgium, dated October 15, 1894, No. 112,247,) of which the following is a specification.

This invention has reference to the sterilization of liquids; and its object is to sterilize liquids—such as beer, milk, and the like—in bulk without physical, chemical, or organic change taking place therein.

Prior to my invention the successful commercial sterilization in bulk of liquids, such as beer and milk, had never been accomplished, and where such liquids had been sterilized at all they were treated in small quantities—such as in bottles, cans, &c.—with results far from satisfactory.

The various applications of heat which have hitherto been tried for the sterilization of fermented liquids have not given satisfactory results for commercial purposes, partly because the processes employed did not permit the treatment of sufficiently large masses at one operation and partly because the changes brought about in the nature or condition of the liquid by the treatment to which it was subjected in apparatus such as have been used hitherto impaired the commercial value of the product.

I observed that the heat applied in prior processes of sterilization, while effective for the purpose of destroying micro-organisms in the liquid, also had injurious effects, such as causing alterations in the taste, smell, color, or limpidity of the liquid treated. The failures hitherto met with were therefore due in large part to the fact that up to the present time means have never been provided which fulfilled the necessary conditions for homogeneous and composite sterilization while retaining the liquid in an unaltered condition physically, chemically, and organically.

The absence of homogeneity or uniformity in the effect produced and of completeness in sterilization is owing to the fact that the temperature is not regular throughout the mass of liquid, because the liquids being bad heat-conductors heat is not evenly diffused, and consequently the temperature is not the same throughout the different portions of the liquid unless the liquid be submitted to agitation. The agitation or stirring devices hitherto employed for this purpose have been attended by serious drawbacks, as they interfered with the lightness of the chambers or receivers used or gave rise to the danger of considerable loss of gas, especially of carbonic-acid gas, in the case of treating fermented liquid, which gas in escaping carries away with it the aromatic principles which impart the peculiar qualities to beer and like liquids.

The abandonment of previous sterilizing methods has also been due to certain peculiar and hitherto inexplicable disturbances which take place in the liquids treated and which may manifest themselves some considerable time after the operation. These disturbances have hitherto been attributed to the action of heat; but I have found by analysis that they are due to the partial decomposition produced by contact with the metals hitherto employed for the apparatus, and that the only metals which will not cause such disturbances are silver, gold, or platinum and certain other metals of the same class, such as palladium and iridium; but for practical purposes silver will of course be generally used, and I will refer to the lining as being of silver. When metals other than these come in contact with a heated and fermented liquid, metal hydroxids form, and these react upon the nitrogenous and albuminoid matters contained in the liquid and cause them to be precipitated. Other reactions of a very complicated nature also take place between the organic acids and the metals, which reactions it is particularly important to avoid, especially where beer, for instance, is the liquid treated.

The principal object of my invention is therefore to retain the useful effects resulting from heating the liquid—viz., the destruction of the micro-organisms existing in the liquid—while avoiding the injurious and undesirable effects resulting therefrom—viz., physical, chemical, or organic changes in the liquid.

To this end the improved process constituting part of my invention consists in producing a rapid and uniform distribution of the heat throughout the mass of liquid, so that the latter is quickly and homogeneously heated to a temperature sufficient to effect the destruction of micro-organisms or bacteria in the liquid, and in then quickly and homogeneously cooling the mass of liquid before the high temperature produces a chemical or physical effect, such as boiling, this operation being conducted under conditions, as herein specified, such that the causes of alteration of taste, appearance, &c., explained above are wholly removed.

In furtherance of the object of my invention apparatus is provided whereby the various inconveniences and objections hereinbefore referred to are entirely avoided and whereby the process above indicated can be carried out, resulting in homogeneous, regular, and perfect sterilization without any physical, chemical, or organic change taking place in the liquid treated or its utility for human consumption being detrimentally affected.

To this end my apparatus consists of a vessel or chamber capable of being tightly closed and of resisting such pressures as are employed in the operation and having such internal arrangements as to dispose the mass of liquid contained therein in strata of but slight depth or thickness in contact with surfaces capable of being quickly heated and cooled by a circulating medium, as hereinafter more fully explained.

In order to prevent chemical reaction taking place between the metal of the vessel and the liquid being sterilized, a lining or coating of silver is applied to the surfaces of the vessel and the internal arrangements thereof with which the liquid makes contact.

It is advisable that the length of the cylinder or vessel should be at least six times greater than its diameter, so that the liquid layer shall have but little height or depth, and by this means differences of temperature between the top and bottom portions of the liquids are avoided.

To this cylinder or vessel a gyratory or oscillatory or equivalent movement can be imparted by mounting it upon spindles, pivots, rolls, or other similar devices, enabling it to be partially rotated through an angle varying, say, between one hundred and eighty degrees in each direction—that is, permitting it to perform a semirevolution in each direction, so that what was before the top of the apparatus becomes its bottom, and vice versa, whereby an intermixture of the liquid divided into layers or zones differing in temperature and density is effected. The said cylinder or vessel is provided with an outer casing or jacket and with tubes or equivalent passages running through its interior for the passage of the heating and cooling medium, and the motion imparted to it, while enabling it to remain tightly closed, has the effect of causing the said internal tubes or passages to act as an agitating device of great efficiency, which in the most satisfactory manner effects the complete mixture of the liquid and insures homogeneousness of the treatment throughout.

As already explained, to prevent the treatment causing changes in the taste, flavor, or odor of the liquid treated the time of heating is made as short as possible, too intense a heat being avoided; but the heating surfaces being as numerous or extended as possible physiological effects are more rapidly obtained than physical or chemical effects, and they bear a more direct relation to the factor temperature than to the factor time, so that by rapid and brief application of high temperature a zymotechnical sterilizing effect is obtained, and on this taking place the application of heat should cease before it has time to bring about a chemical or physical effect, such as boiling or other cause of undesirable change due to the continual action of heat. The inner tubes or passages and the outer casing and the passage therethrough of a heating agent and then of an intensely cold agent, as ice-water or incongealable cold liquid or brine, enables the liquid treated to be raised to the sterilizing temperature in a short time, and to be maintained at that temperature just as long as and not longer than the time strictly necessary for the attainment of the desired sterilizing effect. When this is attained, the liquid treated is immediately cooled down to its original temperature, the maintenance of any high or intermediate temperature liable to prove harmful being carefully avoided. This method enables sterilization to be attained in a satisfactory manner, while avoiding the least modification in the taste, odor, or nature of the liquid treated, and it gives a result totally different from that obtained by the slow heating and cooling processes performed in bottles or like receptacles, in which the conditions hereinbefore defined have not been provided for.

By plating with silver the injurious metal surfaces with which the liquids to be sterilized (more particularly fermented liquors) would otherwise come into contact decomposition is entirely avoided and the injurious disturbances which hitherto have been solely ascribed to heat, but are due to contact with such injurious metal surfaces, are prevented.

In the accompanying drawings I have shown an apparatus constructed according to my invention.

Figure 1 is an elevation of the apparatus, partly in section; and Fig. 2 is an end view of the same from the entrance or admission end, being the left-hand end, Fig. 1.

The apparatus consists of a tightly-closed cylinder A—say of copper. Its interior is silver-plated and it has a length, say, at least about six times greater than its diameter. It is arranged horizontally or practically horizontally and is traversed longitudinally by a series of tubes B, set very closely together and, say, of copper, and they are silvered on their exteriors. These tubes are arranged in horizontal tiers and their ends are secured in front to the end plate, over which is fixed a box or chamber C, forming the end of the apparatus, the said box or chamber C being divided into a number of superposed compartments c, into which the ends of the tubes B open, so as to constitute with the said tubes a continuous passage. This chamber C is connected with the cylinder by very closely set bolts, so that a hermetically-tight joint is formed. The bottom and top compartments c have respectively connected with them the pipes D and E, constituting the inlet and exit for the heating and cooling agent. The said cylinder A is covered by a jacket F, with an inlet at one end and an outlet at the other end ($f\,f^2$) for the entrance and exit of the heating and cooling fluid to and from the space between the jacket F and cylinder A. The said cylinder A is supported by the rings a, which rest on rollers g, supported by the framing or support G.

The apparatus is provided at one end with a pressure-gage H, a thermometer or temperature-indicator I, a liquid-gage J, a filling and discharge cock K, and an air-exhaust cock L.

To the cylinder A handles a^2 are secured, which enable the operator to impart oscillation in both directions to the said cylinder with the greatest ease and with the requisite amplitude of movement, (no matter what the dimensions or the weight of the apparatus may be,) owing to its being supported by rollers. In the case of a very large sized apparatus one of the rings a may be replaced by a toothed wheel, with which engages a pinion, by means of which semi or partial rotary motion can be given to the cylinder A, or any other suitable means for giving the necessary motion to the cylinder can be used.

The liquid to be sterilized having been filtered or strained, (if necessary, under pressure,) is conveyed through the pipe and cock K into the cylinder A, while the air contained in the latter escapes through the outlet or discharge cock L. A line marked upon the liquid-gage J indicates the point which should not be exceeded in the level of liquid in the cylinder, so as to allow of the necessary pressure being attained and of the necessary space above for permitting the gases and volatile principles of the liquid under treatment to remain in such a way that chemical disassociation is prevented and retention of the said gases and volatile principles is insured when the pressure is relieved on cooling. When the apparatus is filled sufficiently, the cocks K and L are closed. Hot water or other heating agent from any suitable source of supply is then admitted through the pipes D and f, which are fully opened for the purpose. The temperature of such water or heating agent should not exceed by more than ten degrees the final temperature for sterilization, as any contact between the liquid treated and a surface heated to a higher temperature would cause changes to occur in those portions of the liquid so brought into contact with the superheated surfaces, and it is an object in carrying out my invention to avoid this by insuring absolute uniformity of heating effect throughout the liquid under treatment. The hot water or other heating agent flows through the rows of tubes B in succession, and through the compartments c, as indicated by the arrows, so that it traverses the said tubes in two directions, passing from one end of the apparatus to the other and then back again alternately, thus exerting its maximum heating effect in a thoroughly equalized way upon the liquid under treatment, and on arriving at the inner compartment c the liquid escapes through the outlets. Hot water or other heating agent also passes through the jacket F, entering by the inlet f and leaving by the outlet f^2. The liquid to be treated, being thus in contact on all sides with the heating medium, is in a short time raised to sterilizing heat, and when this has been attained the supply of hot water or other heating agent employed is discontinued after the zymotechnical and physiological effects of the destruction of micro-organisms or bacteria have been produced, care being taken to impart to the cylinder A alternating rotary or oscillatory movements, preferably not less than one hundred and eighty degrees in amplitude, the effect of such movements being to render the temperature of the whole liquid mass perfectly uniform or homogeneous. The pipes connected with the apparatus may be made of india-rubber or other flexible material to enable them to follow the movements of the cylinder. When the desired result is attained, there is admitted through the same passages as those by which the hot water or other heating agent was previously admitted and caused to circulate in the same manner the cooling agent—say ice-water—at about zero temperature, or, better still, uncongealable liquid at 10° centigrade, supplied from cold-producing machines, which cooling medium causes instantaneous cooling of the liquid under treatment to take place, and in a very short time the whole of the liquid will in consequence fall to its initial low temperature. During this cooling process all the gaseous volatile principles are retained by the cooled liquid, which thus does not lose its original properties. The operation is then completed, and the sterilized liquid, the other properties of which have undergone no substantial alteration whatever, may be decanted or drawn off for use or be introduced into sterilized casks or other vessels for shipment or storage, if necessary, the precautions being taken of previously washing the vessel with an antiseptic and subsequent introduction of the fluid by isobarometric pressures into such vessel, so as to avoid any infection from noxious germs and any subsequent loss of gas.

To recapitulate, the characteristic features of the invention explained in the foregoing description and which are for the most part necessary to practical success (said invention having as its primary object the sterilization for the market on a large scale—that is to say, in large quantities and in a practical manner—those liquids—such as beer, milk, wine, cider, vegetable-sugar juices, &c.—which are known to be most liable to changes for converting them into aseptic and unchangeable liquids which retain all their other qualities intact, such qualities being retained by the avoidance of producing any permanent chemical, physical, or organic changes in the liquid during the treatment) may be summarized as follows: The liquid in large quantities is placed in a hermetically-sealed vessel capable of withstanding heavy internal pressure and wherein it (the liquid) is disposed in thin strata or layers, so as to be quickly and homogeneously heated and chilled, as desired, throughout its entire mass, thereby facilitating and permitting instantaneous changes in temperature necessary to the sterilization of the liquid. The changes in temperature referred to here are, first, quick heating of the liquid to a temperature at which the zymotechnical effect of destruction of micro-organisms or bacteria is attained. As soon as this heating is commenced the expansion or dilation of the liquid in the vessel reduces the gaseous vacuum and creates a high pressure (higher than six kilos, for example) before the liquid has had time to become heated to a temperature capable of changing it in the absence of pressure, and this pressure prevents the gases from being lost or wasted by keeping them soluble. As before stated, the expansion of the liquid due to the heating thereof generates extreme internal pressure, which the vessel must be capable of withstanding. The next change of temperature is, second, the quick cooling of the liquid before the high temperature produces a chemical or physical effect, such as boiling. The sudden cooling causes the liquid to again take up or absorb the gases expanded by the heating, such gases often being a constituent necessary to the marketable value of the liquid.

In an apparatus for carrying out the process of this invention it is essential, first, that it should distribute the liquid in thin layers or strata, giving a large contact-surface for imparting the heating and cooling effects; second, that the liquid be agitated (not violently) to homogeneously distribute such effects; third, it is absolutely indispensable that the surface with which the liquid makes contact be coated with silver (or its equivalent mentioned in the foregoing explanation) for the preventing of the formation of metallic hydroxids at a high temperature and under pressure; fourth, it is necessary to the proper agitation of the liquid that the vessel be oscillated upon suitable bearings; fifth, means must be provided for circulating heating and cooling agents over the contact-surfaces. All these requirements are best fulfilled by the apparatus shown in the drawings, wherein the tubes through which the heating and cooling medium circulates also serve the function of agitators.

The temperatures to which it is necessary to heat the liquid and the time required to carry out the process of course vary somewhat with different liquids. The following indications of temperature and durations with the principal liquids to which this process is applicable may be followed with good results: beer—temperature, 80° centigrade—duration of process, thirty minutes; milk—temperature, 110° centigrade—duration of process, five minutes; water—temperature, 110° centigrade—duration of process, twenty minutes; wine—temperature, 70° centigrade—duration of process, fifteen minutes; grape-must—temperature, 90° centigrade—duration of process, twenty minutes.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The process of sterilizing liquids in bulk, consisting in quickly and homogeneously heating them in a closed vessel to a sterilizing temperature, and then quickly and homogeneously cooling the whole mass of liquid after the desired physiological changes have taken place, but before the high temperature causes injurious chemical or physical changes, said operations being performed out of contact with metals which are chemically acted upon by corrosive agents generated in the liquid during the sterilization, as set forth.

2. The process of sterilizing liquids in bulk, consisting in placing the liquid in a closed vessel in contact with incorrodible surfaces, leaving a space for liquid expansion such that the pressure developed by heating the liquid will prevent chemical disassociation of the volatile aromatic principles, quickly and uniformly raising the liquid to the sterilizing temperature, and cooling the same before the high temperature causes injurious chemical or physical changes, substantially as described.

3. In apparatus for sterilizing liquids, a practically horizontal cylinder or vessel for containing the liquid to be treated, adapted to be tightly closed, of a diameter or width small in comparison to its length, a series of longitudinal tubes or passages extending substantially the length of and disposed substantially uniformly throughout the interior of the cylinder, a casing or jacket about the cylinder, means for supplying a heating agent and a cooling agent to said jacket and tubes or passages and means for imparting an oscillatory movement to the cylinder about its longitudinal axis, as set forth.

4. In apparatus for sterilizing liquids, a practically horizontal cylinder or vessel for containing the liquid to be treated adapted to be tightly closed, of a diameter or width

small in comparison to its length, a series of longitudinal tubes or passages extending substantially the length of and disposed substantially uniformly throughout the interior of the cylinder, a casing or jacket about the cylinder, means for supplying a heating and a cooling agent to said jacket and tubes or passages, and means for imparting an oscillatory movement to the cylinder about its longitudinal axis, the surfaces in and of the cylinder and other parts of the apparatus with which the liquid being treated makes contact being provided with a coating of silver, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

E. W. KUHN.

Witnesses:
A. GURTZ,
MICHEL BRIAND.

No. 615,050. Patented Nov. 29, 1898.

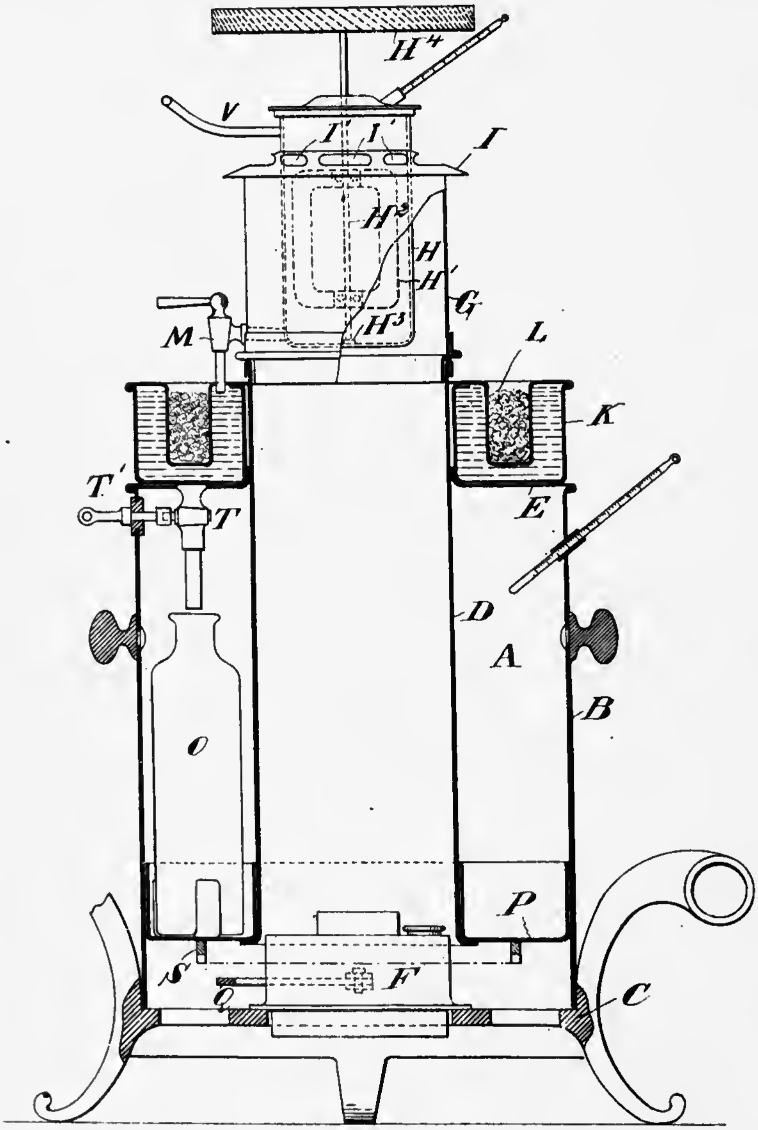
E. G. N. SALENIUS.

APPARATUS FOR CONTINUOUSLY STERILIZING MILK, &c.

(Application filed Sept. 14, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig: 1.



WITNESSES:

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INVENTOR

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BY

Henry Connett

ATTORNEY

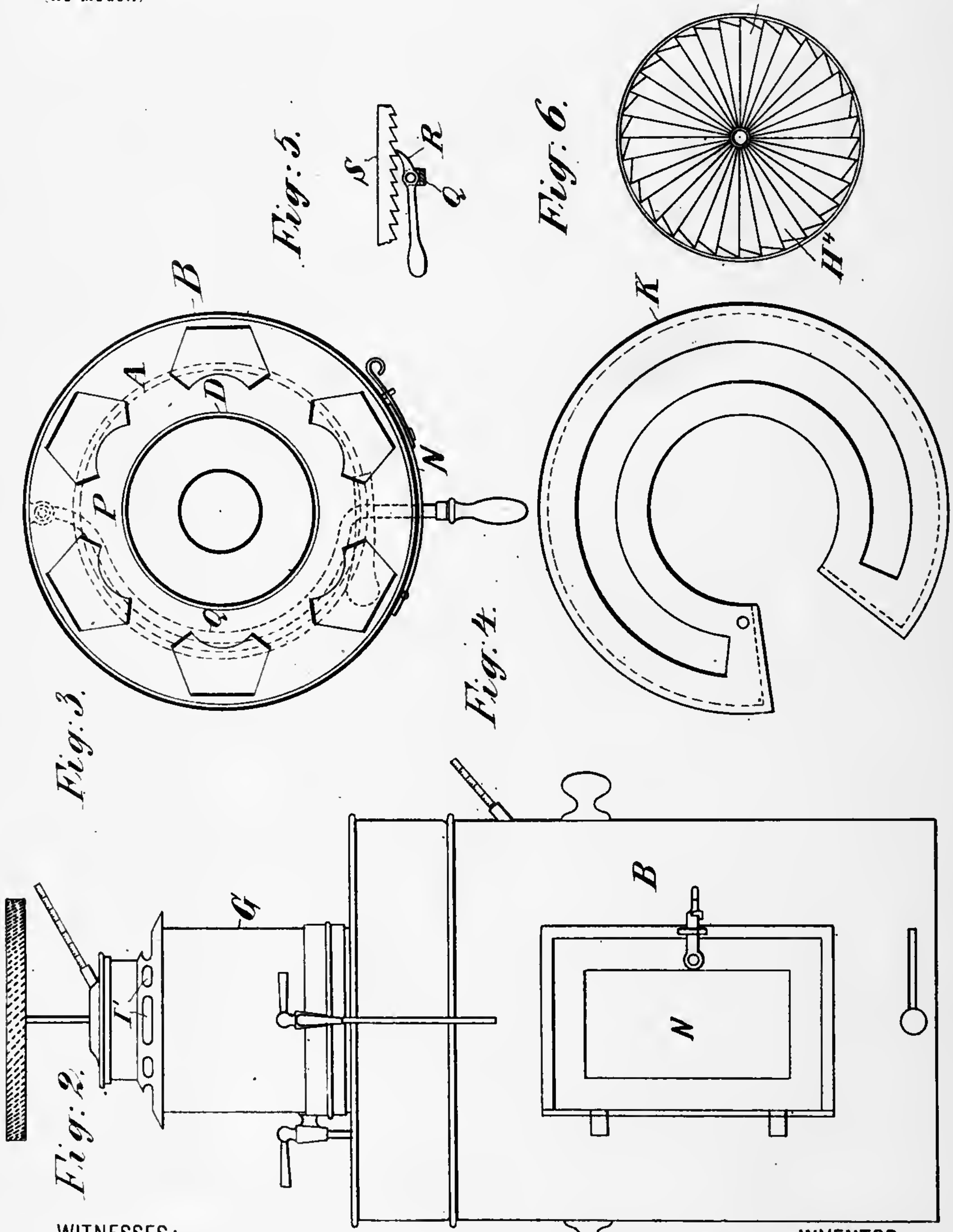
No. 615,050. Patented Nov. 29, 1898.

E. G. N. SALENIUS.

APPARATUS FOR CONTINUOUSLY STERILIZING MILK, &c.

(Application filed Sept. 14, 1897.)

(No Model.) 2 Sheets—Sheet 2.



WITNESSES:

F. W. Wiman

Peter A. Ross

INVENTOR

Erik G. N. Salenius

BY

Henry Connett

ATTORNEY

UNITED STATES PATENT OFFICE.

ERIK GUSTAF NICOLAUS SALENIUS, OF ALBANO, SWEDEN.

APPARATUS FOR CONTINUOUSLY STERILIZING MILK, &c.

SPECIFICATION forming part of Letters Patent No. 615,050, dated November 29, 1898.

Application filed September 14, 1897. Serial No. 651,591. (No model.)

To all whom it may concern:

Be it known that I, ERIK GUSTAF NICOLAUS SALENIUS, engineer, a subject of the King of Sweden and Norway, and a resident of Albano, in the Kingdom of Sweden, have invented certain new and useful Improvements in Apparatus for Continuously Sterilizing Milk and other Liquids, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to apparatus for sterilizing any liquid; but the apparatus is especially adapted for milk serving as nourishment for infants. It is therefore provided with heating and cooling arrangements, as well as with an arrangement for heating the bottles before the sterilized milk is tapped into them.

The apparatus consists of a great compartment for the bottles, through which compartment ascends a heat-passage. Above this passage is located the vessel wherein the milk is heated. Above the first-mentioned compartment, which is annular in consequence of the heat-passage, is a cooling vessel from which the milk is tapped into the bottles, which are placed under the cooling vessel and which may successively be carried under a cock in the bottom of said vessel by turning the bottom on which the bottles rest.

Figure 1 shows a vertical section of this apparatus; Fig. 2, an elevation, and Fig. 3 a cross-section, of the same. Fig. 4 shows the cooling vessel in plan, and Figs. 5 and 6 show details.

The annular compartment A for the bottles is formed between an outer cylinder B, resting on a foot C, and an inner cylinder D, which is connected to a flange E, fixed to the cylinder B. Under the cylinder D there is a lamp F or the like, the cylinder thus forming the heat-passage. At the top the cylinder D has a loose extension G, on which rests the narrower vessel H by the aid of a ring I, provided with openings I′. The flange E, forming the top of the annular compartment A, supports the cooling vessel K, which also is annular, this vessel having an inner compartment L for the cooling agent. The cooling vessel K, which is hermetically closed, communicates with the vessel H through a cock M. The bottles O, introduced into the compartment A through a door N, rest on a revoluble bottom P, which may be put in motion by means of a lever Q, the pawl R of which engages in a toothed rack S on the lower side of the bottom P. By this arrangement the bottles may successively be carried under the cock T in the bottom of the vessel K, the key T′ of this cock protruding through the cylinder B. Through a pane on this cylinder the placing of the bottles straight below the nozzle of the cock T may be controlled. The vessel H contains an agitator H′, which is mounted on a shaft H^2, resting in a small step-bearing H^3 and ascending through the cover of the vessel H. Above this cover the shaft H^2 carries a wing-wheel or shovel-wheel H^4. (See Fig. 6.) This wheel is acted upon and rotated by the hot air ascending through the openings I′, the agitator thus being rotated continuously. The milk being sufficiently heated for being sterilized is tapped from the vessel H, which is either filled for once or continuously fed with milk through a suitable pipe V into the vessel K, where it is cooled without coming into contact with the atmosphere. Also in the compartment A the temperature is sufficiently high for killing all bacteria and the like which may be in the air, on the bottles, on plugs, &c., introduced into the compartment A. A bottle being filled, a plug is introduced in the same.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An apparatus for sterilizing liquids, especially milk, intended to be tapped into bottles, having a compartment A, containing the bottles through which ascends a comparatively wide heat-passage D, the vessel H, in which the liquid is heated, situated above the compartment A, and a closed cooling vessel K, situated above the compartment A, into which the liquid is drawn from the vessel H, situated at a higher level, said vessel K having in its bottom a cock T, for tapping the milk into the bottles O, in the compartment A and under the vessel K.

2. In an apparatus for sterilizing liquids, especially milk, intended to be tapped into bottles, the combination with the compartment A, for the bottles, and the heating and cooling vessels situated above the compart-

ment A, of the revoluble bottom P in the compartment A, on which the bottles rest, a toothed rack S, on the lower side of said bottom, an operating lever or arm Q, and a pawl R, carried by said arm and engaging the rack, whereby the said bottom is shifted in order to bring the bottles successively in position to be filled.

3. In an apparatus for sterilizing liquids, the combination with the compartment A, having in it the cylinder D, forming a flue or heat-passage, of the said cylinder, the loose extension G, on the top of said cylinder, the heating vessel H within said extension and of less diameter than the latter, the said vessel H having an apertured ring flange I which rests on the top of the extension G, an agitator H′, in the vessel H, the shaft of said agitator projecting out through the cover of the vessel H and being provided with a wing-wheel H⁴, and the said wing-wheel, whereby the hot gases ascending through the cylinder D and extension G act upon the said wheel H⁴ to rotate the agitator.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ERIK GUSTAF NICOLAUS SALENIUS.

Witnesses:

H. B. OHLSSON,

E. HERMANSSON.

No. 615,108. Patented Nov. 29, 1898.

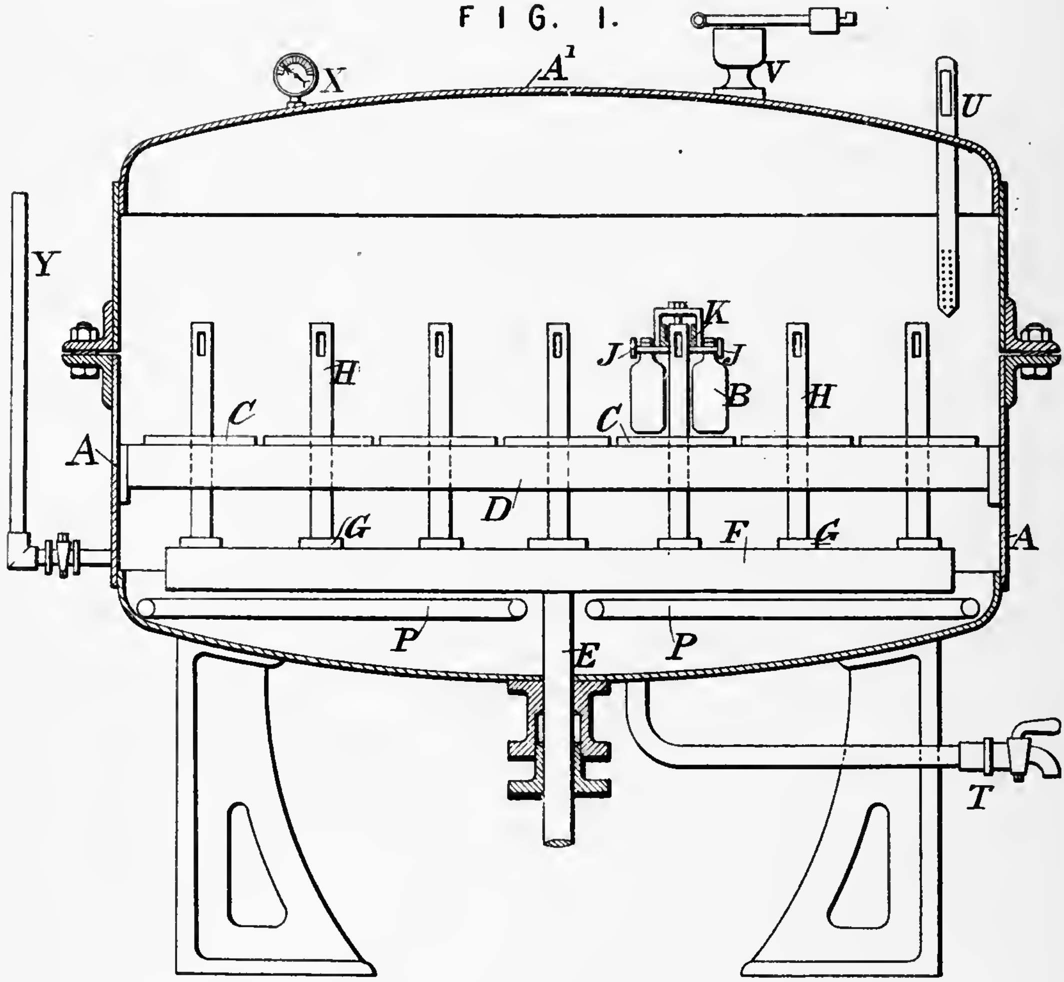
E. C. DE SEGUNDO.

APPARATUS FOR STERILIZING MILK, &c.

(Application filed Aug. 20, 1898.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.



Witnesses
H. P. Keefer
Bruce S. Elliott.

Inventor
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By James L. Norris
Atty.

No. 615,108. Patented Nov. 29, 1898.

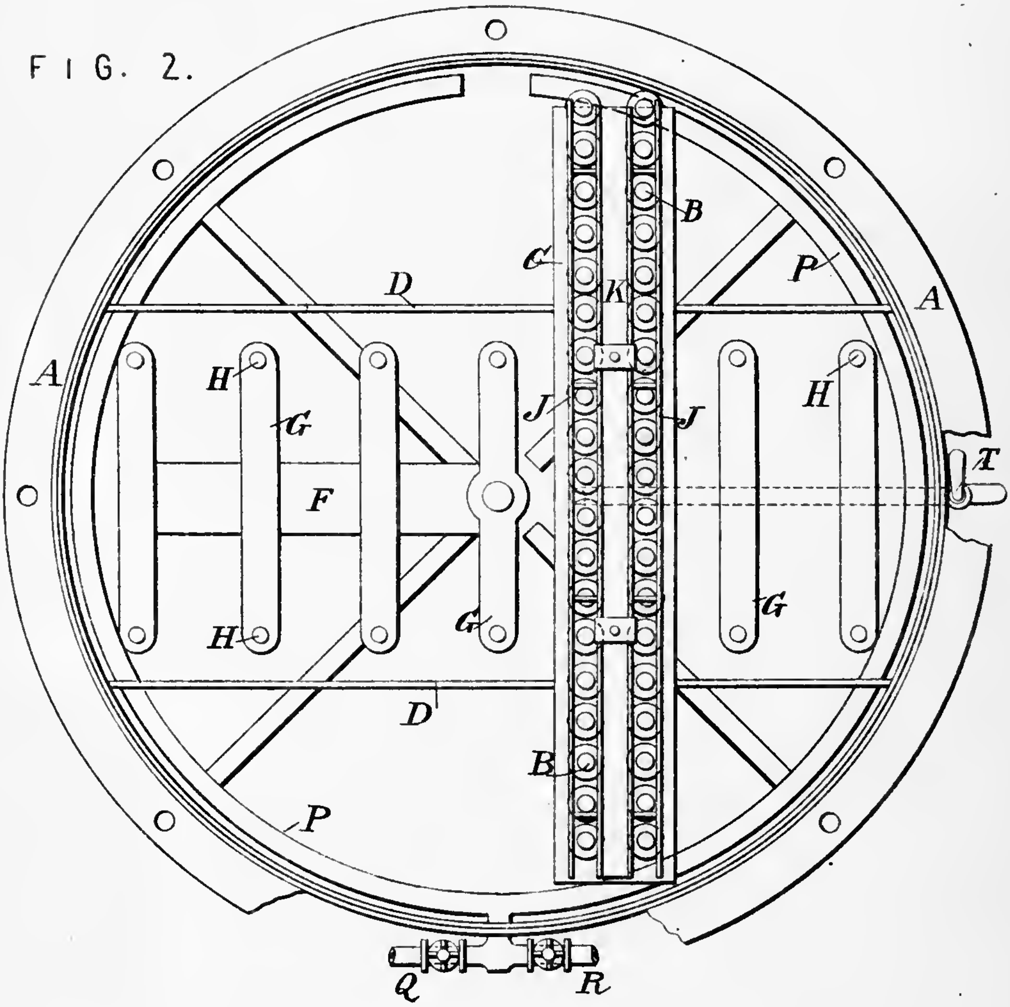
E. C. DE SEGUNDO.

APPARATUS FOR STERILIZING MILK, &c.

(Application filed Aug. 20, 1898.)

(No Model.) 3 Sheets—Sheet 2.

FIG. 2.



Witnesses
F. B. Keefer
Bruce S. Elliott.

Inventor
Edward C. de Segundo
By James L. Norris
Atty.

No. 615,108. Patented Nov. 29, 1898.

E. C. DE SEGUNDO.

APPARATUS FOR STERILIZING MILK, &c.

(Application filed Aug. 20, 1898.)

(No Model.) 3 Sheets—Sheet 3.

FIG. 3.

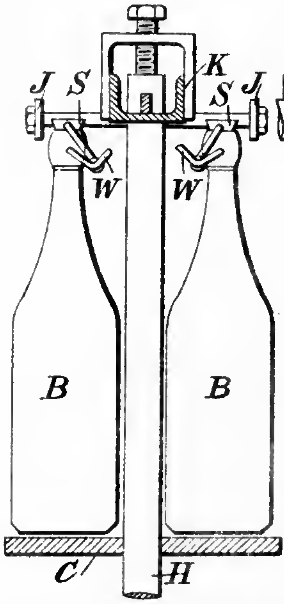
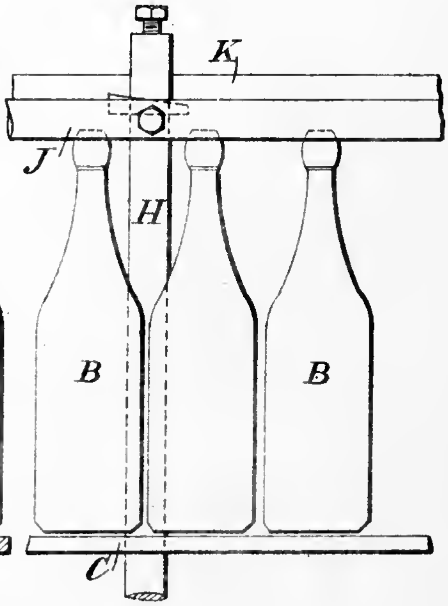


FIG. 4.



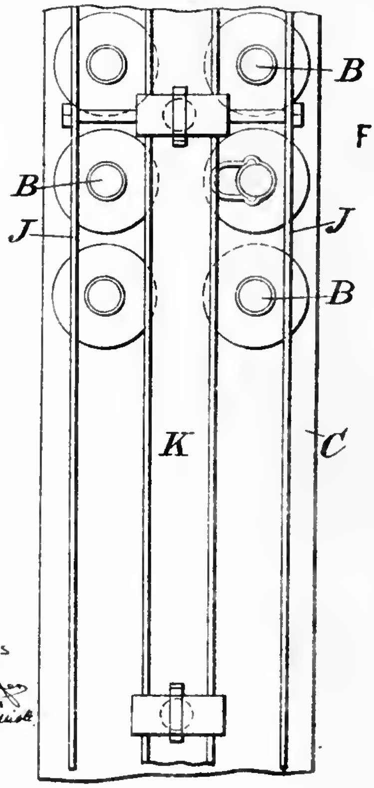


FIG. 5.

Witnesses

Inventor

Edward C. de Segundo

By James L. Norris

Atty

UNITED STATES PATENT OFFICE.

EDWARD C. DE SEGUNDO, OF LONDON, ENGLAND.

APPARATUS FOR STERILIZING MILK, &c.

SPECIFICATION forming part of Letters Patent No. 615,108, dated November 29, 1898.

Application filed August 20, 1898. Serial No. 689,112. (No model.)

To all whom it may concern:

Be it known that I, EDWARD CARSTENSEN DE SEGUNDO, a citizen of England, residing at 28 Victoria street, Westminster, London, England, have invented certain new and useful Improvements in Apparatus for Sterilizing Milk and other Nutritious Substances, (for which I have made applications for patent in Canada, Serial No. 81,090, and in Great Britain, No. 3,926, dated February 16, 1898,) of which the following is a specification.

Milk and other nutritious substances are sterilized by heating and cooling while the vessels containing them are inclosed in chambers to which no air has access.

My invention relates to apparatus for conveniently and effectively carrying on this process, as I shall describe, referring to the accompanying drawings.

Figure 1 is a vertical section, and Fig. 2 is a plan, with cover removed, of a sterilizing-chamber according to my invention arranged for sterilizing the contents of bottles provided with wire-fastened stoppers of a known kind. Fig. 3 is a transverse section. Fig. 4 is a part longitudinal section; and Fig. 5 is a part plan showing, to an enlarged scale, the arrangement for fastening the stoppers.

A is the lower part, and A′ the removable cover, of the sterilizing-chamber, in which a number of bottles B containing the milk or other substance to be sterilized are placed in parallel rows on plates C, carried on girders D, the stoppers S being placed in the mouths of the bottles, but not fixed.

Through a stuffing-box in the bottom of A passes a rod E, carrying a cross-head F with arms G, from which project upward pairs of rods H, these rods passing through holes in the plates C and each pair carrying two guide-bars J and a bar K of trough-section, which can be adjusted in height by a wedge and screw. In the lower part of A a circular perforated pipe P is carried nearly all around, its ends being closed, and its middle communicates with two branches having stop-cocks or valves Q and R, the one leading from a steam-boiler and the other from a water reservoir or service. From the middle of A leads a discharge-pipe with stop-cock or valve T.

V is a safety-valve.

U is a thermometer.

X is a pressure-gage, and Y is a glass water-gage which can be shut off by a stop-cock.

The charged bottles B being placed in parallel double rows on the plates C, their mouths being within the guide-bars J and the projecting parts W of the wires for fastening their stoppers being immediately under the sides of the bar K, the cover A′ is put on and fixed, the joint being made air-tight by suitable packing between the flanges of A and A′. Steam is then admitted, by which the air is expelled, and the contents of the bottles are heated to about 100° centigrade. After a certain time the supply of steam is cut off and water is admitted until it attains a level a little below the bottle-mouths. To prevent the breakage of the bottles due to sudden admission of cold water, the temperature of the water can at first be regulated by the simultaneous admission of steam. When the contents of the bottles are thus cooled, the water is run off, and steam is again admitted, raising the temperature to about 106° centigrade. After a certain time the rod E is pulled down by any convenient mechanism, such as a rack and pinion or lever, and thus the projecting wires W are all simultaneously pushed down, securely fastening the stoppers. The supply of steam being now cut off, the bottles are allowed to cool a little and then more rapidly cooled by admitting water, and, after running it off, the cover A′ is raised, and the bottles, having their contents sterilized, are removed.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

1. In sterilizing apparatus the combination with a chamber adapted to receive the vessels which contain the substance to be treated, of a removable cover, valve-controlled inlets and outlet for steam and water and for discharge, supports arranged within said chamber for the vessels containing the substance to be treated, a movable cross-head arranged transversely to said supports and carried by a rod packed through a stuffing-box said cross-head having transverse arms provided with vertical rods at their ends, a presser-bar mounted on each pair of said rods, and guide-bars mounted upon supports carried by the presser-bar and arranged one on each side

of the latter to push down the projecting wires which fasten the stoppers in said vessels, substantially as described.

2. In sterilizing apparatus the combination with a chamber of a removable air-tight cover, valve-controlled inlets and outlet for steam and water and for discharging the same, horizontal supports arranged in said chamber for the vessels containing the substance to be treated, a movable cross-head arranged transversely to said supports, and provided with transverse arms having vertical rods at their ends, a presser-bar mounted on each pair of said rods, guide-bars one on each side of and parallel with the presser-bar, said guide-bars being supported by arms transverse to said presser-bar, means for adjusting the latter vertically and a rod packed through the bottom of the chamber to operate the cross-head, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EDWARD C. DE SEGUNDO.

Witnesses:
FRED C. HARRIS,
W. M. HARRIS.

No. 669,702. Patented Mar. 12, 1901.

R. G. NASH.

PROCESS OF STERILIZING MILK, &c.

(Application filed Nov. 15, 1897.)

(No Model.)

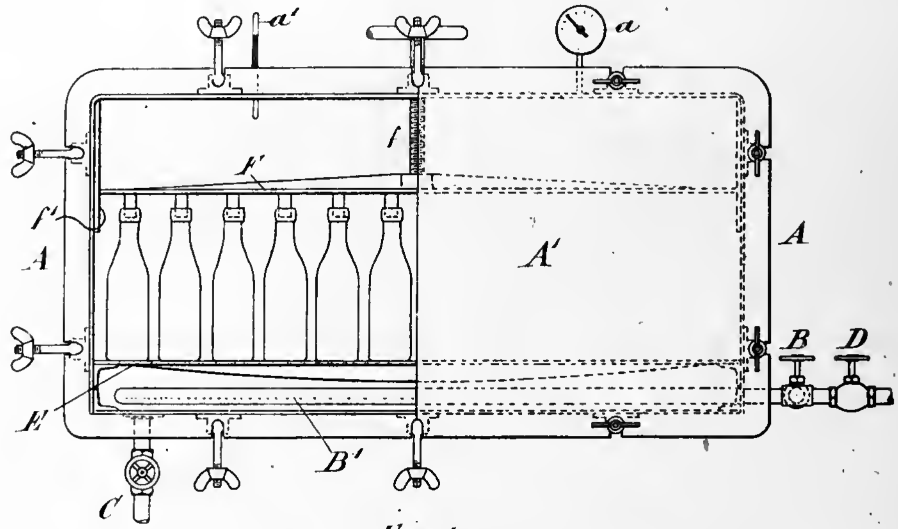


Fig. 1.

Fig. 2.

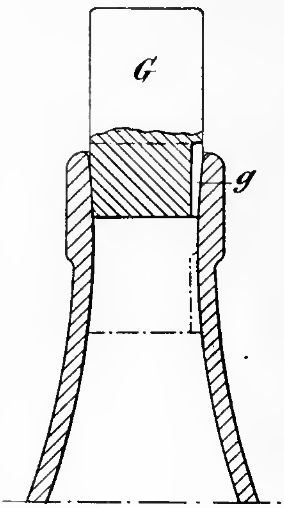
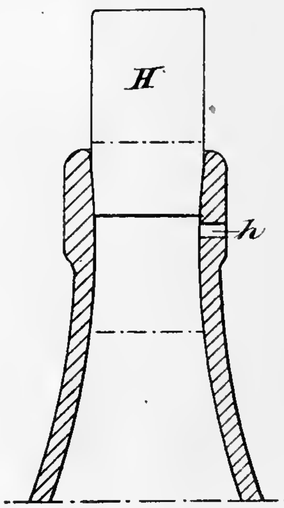


Fig. 3.



Witnesses.

Thos. P. Clam.

Ernest. G. Taylor.

Inventor.

Richard Grainger Nash

UNITED STATES PATENT OFFICE.

RICHARD GRAINGER NASH, OF LUCAN, NEAR DUBLIN, IRELAND.

PROCESS OF STERILIZING MILK, &c.

SPECIFICATION forming part of Letters Patent No. 669,702, dated March 12, 1901.

Application filed November 15, 1897. Serial No. 658,596. (No specimens.)

To all whom it may concern:

Be it known that I, RICHARD GRAINGER NASH, a subject of the Queen of Great Britain and Ireland, residing at Finnstown House, Lucan, near Dublin, Ireland, have invented a new and useful Improved Process for Use in Sterilizing Milk and other Liquids or Substances, (in respect whereof I have obtained a patent in Great Britain, dated April 8, 1897, No. 8,977,) of which the following is a specification.

This invention relates to an improved process of treating milk, cream, fruit, and other comestibles for the purpose of effecting their sterilization, the said process being effected in apparatus adapted for the reception of the bottles or other vessels containing such commodities.

Apparatus adapted for carrying out my improved process is illustrated in Figure 1 of the accompanying drawings, Figs. 2 and 3 being vertical sections showing means for closing the vessels whereof the contents are being treated, the former consisting of a cork having a notch at one end applicable for use with an ordinary bottle, while the latter comprises a cork of the ordinary construction and a bottle-neck formed with a vent-hole in its side.

A is a steam-tight vessel provided with suitable pipes and valves B C, serving, respectively, for the admission of steam and the escape of the water of condensation and furnished with a steam-gage a and thermometer a', the latter extending by preference into one of the bottles. A pipe and stop-cock D for the admission of cold water when required may also be provided, a door A', which may be rendered steam-tight in any suitable manner, being applied at a convenient part of the vessel. A short distance above the floor of the vessel is situated a perforated false bottom E whereon the bottles or other vessels containing the liquid or substance to be treated are placed. If preferred, the bottles may be placed in a trolley or basket and then deposited on the false bottom. Above this false bottom and above the bottles is a plate F, which may be of perforated iron, suitable means, such as a screw f or lever, being provided for effecting the vertical adjustment of the said plate, which may be provided with guides or rollers working over rails f' in the interior of the vessel for facilitating the up-and-down movement thereof.

When the liquids or substances to be sterilized are contained in receptacles of the ordinary construction, such as bottles, a cork G, having a V or other shaped notch g at one end, is forced into the neck of the bottle until the bottom of the V-notch arrives just above the lip of the bottle, as shown in Fig. 2. Thus a vent is provided for the escape of any gases or odors which may arise during the heating or reheating, and upon the forcing home of the corks in the bottle-neck and the contents becoming cool a vacuum is created in the vessels above the contents. It will be obvious that the notch or groove g may be formed in the internal surface of the neck instead of the external surface of the cork, or the neck of the bottle may be provided with a small hole h, (see Fig. 3,) in which case an ordinary cork H is employed, the hole being closed by the side of the cork when the latter is forced into the neck. A small channeled or tubular vent may, moreover, be introduced with the cork when first inserted in the neck of the bottle and subsequently withdrawn upon the cork being driven home.

In applying my improved process to the sterilization of milk, for example, the bottles containing the same are deposited on the perforated false bottom E in the steam-tight vessel A, it having been observed that all the corks G (or H) are in a vertical attitude and the vent g (or h) free. The door A' having been closed steam-tight, the movable plate F is brought to within a short distance—say one-eighth of an inch—of the tops of the corks. Steam is now admitted to the vessel A by means of the cock B and perforated pipe or coil B', and when the temperature has risen to the desired height and the necessary time has been allowed for effecting sterilization the movable plate F is forced onto the corks, so as to press them into their respective bottle-necks, the plate being allowed to remain in this position until the milk is sterilized and cooled. If reheating is to be resorted to, the movable plate F is raised to the first position, so that on heat being again applied in the vessel A the corks are free to rise in the bottle-necks and any gas or bad odor that may have risen since the first heating is permitted to escape. The movable plate is lowered, as before explained, when the desired temperature has been reached and the required time for effecting sterilization has been allowed.

If the milk is well filtered and the temperature raised in bulk to 160° Fahrenheit for about twenty minutes, then cooled to 90° Fahrenheit, and bottled at the latter temperature, the appearance and keeping quality of the milk will be improved.

To obtain the best results, the milk is heated in bulk to a temperature of about 160° Fahrenheit, cooled to about 90° Fahrenheit, and then bottled at about the latter temperature, the bottles themselves having previously been heated to about 90° Fahrenheit. Any bad odors or gases which may arise from the milk during this heating and cooling are allowed to escape. The bottles containing the milk, their corks being arranged as hereinbefore described, are placed in the sterilizing vessel A, and water heated to about 90° Fahrenheit is run into the said vessel in sufficient quantity to leave the apertures of the bottle-necks uncovered, the movable plate F being then brought into position over the corks and the temperature of the water raised to about 160° or 212° Fahrenheit. Steam may now be blown or otherwise admitted above the water with a view to removing any bad odors or gases arising from the milk. By this method of treatment the process of sterilization is expedited, the flavor and appearance of the milk being at the same time improved. If desired, economy in the method of treatment may be effected by dispensing with the use of steam and employing direct fire heat, which may be applied beneath the apparatus.

Before effecting the corking of the bottles sterilized atmospheric air may be admitted into the vessel A with a view to impregnating the milk with such air.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In the sterilization of milk and other liquids or substances the herein-described process consisting in filtering the liquid, raising it to a temperature of 160° Fahrenheit, cooling it to about 90° Fahrenheit, bottling at the latter temperature and then subjecting the bottled liquid to a high temperature in a closed vessel, the escape from the bottles of any gases or bad odors evolved during the heating being permitted.

2. The herein-described process for the sterilization of milk and other liquids or substances consisting in filtering the liquid, raising its temperature in bulk to 160° Fahrenheit, cooling it to about 90° Fahrenheit, bottling at the latter temperature and then subjecting the bottled liquid to a high temperature in a closed vessel, the receptacles containing the liquid being in a partially-sealed condition whereby the escape from the bottles of any gases or bad odors evolved during the heating is permitted and regulated; a vacuum being created in the bottles upon the completion of the sealing and the cooling of the liquid.

3. The herein-described process for the sterilization of milk, consisting in filtering the liquid, subjecting it in bulk to a temperature of 160° Fahrenheit for about twenty minutes, and then to a temperature of 90° Fahrenheit, heating the bottles to this latter temperature, bottling the milk at the same temperature 90° Fahrenheit, partially sealing the charged bottles and then placing them in a steam-tight vessel, raising the temperature to about 212° Fahrenheit, injecting steam into the vessel for removing any bad odors or gases evolved during the heating, completely sealing the bottles and then cooling them and their contents.

RICHARD GRAINGER NASH.

Witnesses:
THOS. P. ELAM,
ERNEST G. TAYLOR.

No. 678,891. Patented July 23, 1901.

J. C. MILLER.

PROCESS OF STERILIZING LIQUIDS.

(Application filed May 10, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

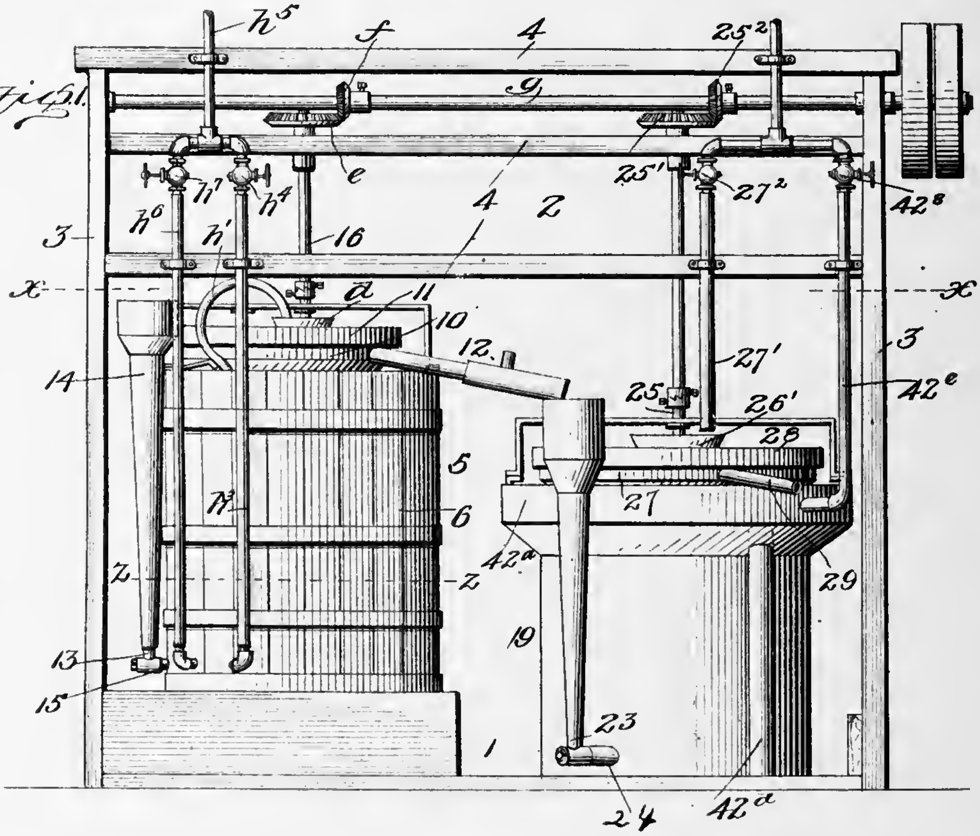
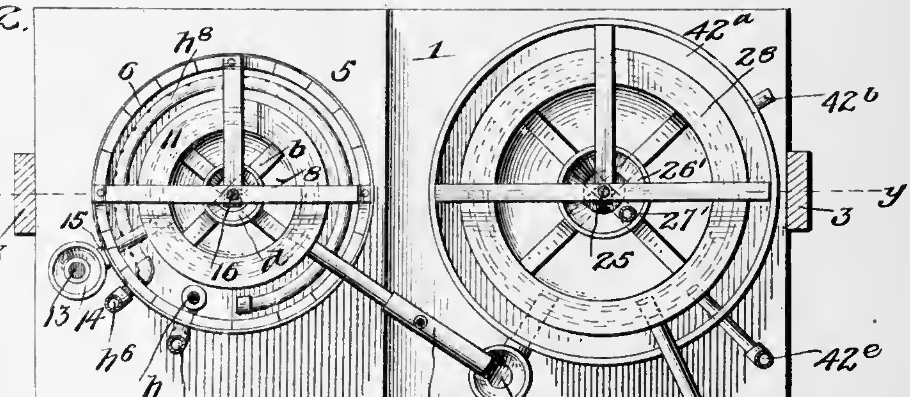


Fig. 2.



Witnesses
C. E. Hunt.
Benj. G. Cowl

Inventor
J. C. Miller.
by Chas. R. Miller
Attorney

No. 678,891. Patented July 23, 1901.

J. C. MILLER.

PROCESS OF STERILIZING LIQUIDS.

(Application filed May 10, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

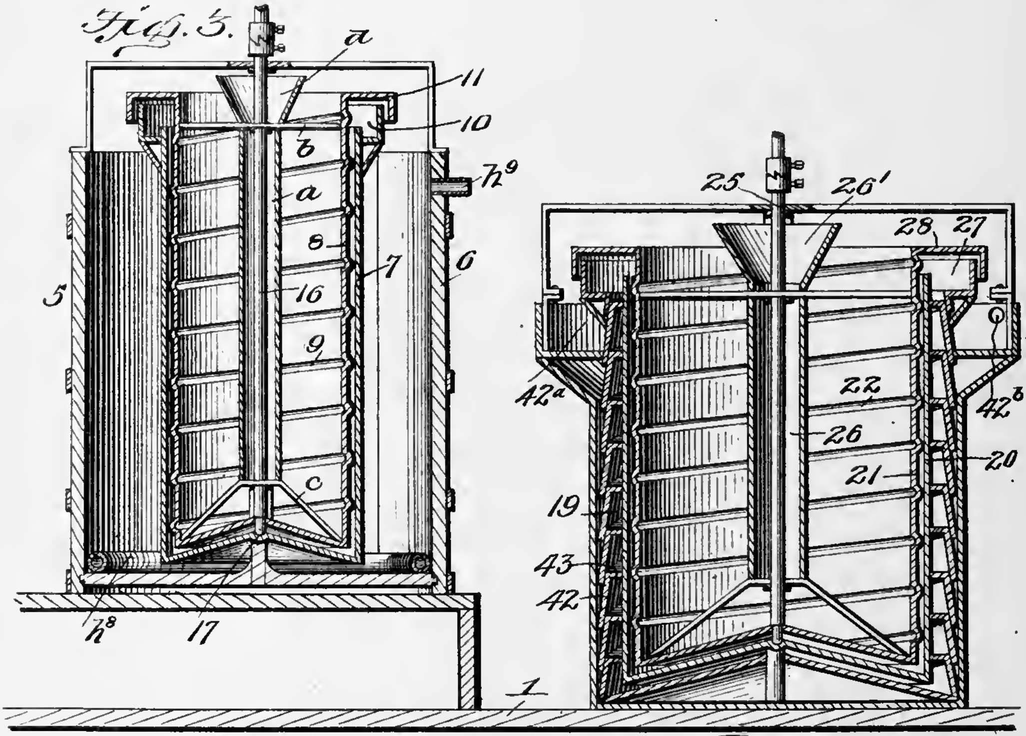


Fig. 4.

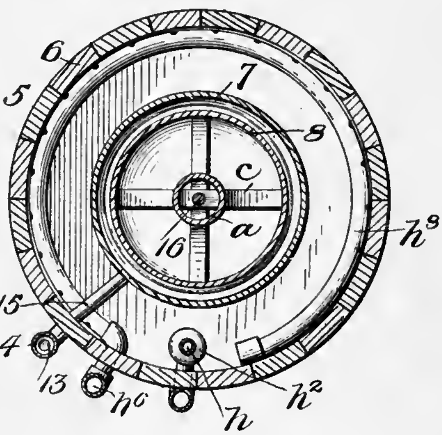
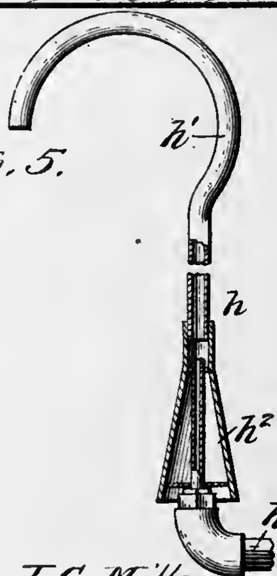


Fig. 5.



Witnesses

C. E. Hunt.

J. C. Miller Inventor

by Chas. R. Miller

Attorney

UNITED STATES PATENT OFFICE.

JOHN C. MILLER, OF CANTON, OHIO, ASSIGNOR TO JACOB H. MILLER, OF SAME PLACE.

PROCESS OF STERILIZING LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 678,891, dated July 23, 1901.

Application filed May 10, 1900. Serial No. 16,218. (No specimens.)

To all whom it may concern:

Be it known that I, JOHN C. MILLER, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented new and useful Improvements in Processes of Sterilizing Liquids, of which the following is a specification.

The invention relates to a new process for sterilizing and cooling liquids, and more particularly to a process for treating milk to destroy bacteria and germs and to remove therefrom obnoxious odors and tastes, all of which may be accomplished without imparting to the milk a cooked taste, which is generally noticeable in milk sterilized by other processes and means, and, furthermore, without destroying the cream-giving properties of the milk, whereby the cream may be skimmed from the milk sterilized by my process the same as if the sterilization had not taken place.

The invention consists, broadly, in raising the temperature of the milk to a point below the boiling-point—say, for instance, to 168° or 170° Fahrenheit—keeping the milk in constant motion and in an attenuated stream while being subjected to a high temperature on both sides of the stream, then feeding the milk from the sterilizer to a cooler, before entering which it is subjected to the air to liberate from it all obnoxious and disagreeable fumes and gases.

The invention also consists in certain other steps, which will be hereinafter described and claimed.

This process may be carried out by the apparatus shown in the accompanying drawings and which is made the subject-matter of a separate application filed May 16, 1900, Serial No. 16,854, or may be carried out by the apparatus shown and described in my application for patent for improvements in apparatus for sterilizing and cooling liquids, filed December 7, 1899, Serial No. 739,469, or entirely-different apparatus may be employed from those just mentioned.

In the accompanying drawings, Figure 1 is a side elevation of an apparatus for carrying out my improved process. Fig. 2 is a transverse horizontal section on the line x x of Fig. 1. Fig. 3 is a longitudinal vertical sectional view on line y y of Fig. 2. Fig. 4 is a horizontal sectional view on the line z z of Fig. 1; and Fig. 5 is a side elevation, partly in section, of the steam or hot-water injector.

Referring to said drawings, 1 denotes the supporting-bed, and 2 the gear-frame, the latter consisting of vertical standards 3, connected by cross-bars 4.

5 denotes the sterilizer, which consists of the tub 6, which incloses two cylinders 7 and 8, the latter being inclosed within the former and formed with a helical corrugation 9, which throughout its entire length engages the inner wall of the cylinder 7 and forms a feed-screw. The upper end of the cylinder 7 is provided with an annular trough 10, while the upper end of the cylinder 8 is provided with an overhanging annular shield or flange 11, which prevents the liquid fed upward by the corrugation 9 being thrown out of the trough and also prevents the steam or hot water becoming mixed with said liquid. 12 denotes a pipe or conveyer which leads from said trough and communicates with the cooler hereinafter described.

13 denotes a supply-pipe, the upper end of which is provided with a funnel 14, into which the liquid is adapted to be fed, and the lower end of which communicates with a transverse pipe 15, which communicates with the bottom of the cylinder 7 and is adapted to supply the liquid to said cylinder below the bottom of the cylinder 8.

a denotes a vertical tube arranged centrally within the cylinder 8 and secured thereto by braces b and c. Each end of this tube is open, and the upper end is provided with a funnel d.

16 denotes a shaft fixed in the bottom of the cylinder 8 and having its lower end stepped in a bearing 17, formed in the bottom of the cylinder 7. This shaft is adapted to be rotated in any suitable manner, preferably by providing it with a gear e, which meshes with a gear f, fixed to the drive-shaft g, and will impart a rotary movement to the cylinder 8 to feed the liquid in the bottom of the cylinder 7 upward into the trough 10. Steam or hot water is adapted to be injected into the cylinder 8 to raise the temperature of the liquid as it is being fed upward in an atten-

uated stream from the bottom of the cylinder 7 and between the cylinders 7 and 8 by the helical rib or feed-screw, whereby the liquid under treatment will be thoroughly sterilized.

To maintain an equal temperature around the outside of the cylinder 7 and the inside of the cylinder 8, and thereby subject all particles of the liquid to a uniform temperature, I provide an injector h, which I locate between the tub 6 and the outer cylinder 7. This injector consists of a tube h', the upper end of which is bent over the funnel d to direct the steam and hot water into said funnel. The lower end of the tube is flared, as shown at h^2, and projecting within this flared end is a steam or hot-water pipe h^3, controlled by a cock h^4 and connected at its upper end to the main steam-pipe h^5. A second steam-pipe h^6, provided with a controlling-cock h^7, projects through the tub 6 and is connected with a perforated coil h^8, which is arranged within the tub at the bottom thereof.

When the machine is in operation, the hot water is fed into the tub and entirely surrounds the cylinder 7. The cock h^4 is now opened and the injector put into action. The hot water is now drawn from the tub by the injector and fed into the funnel d and passing down the centrally-disposed vertical pipe is discharged into the cylinder 8 at the bottom thereof. It will thus be seen that the cylinders 7 and 8 will be kept at the same temperature, so that the milk being fed between said cylinders will have a uniform temperature. If desired, the tub may be provided with an overflow-pipe h^9.

After the liquid has been thoroughly sterilized it is desirable to cool the same or reduce it to a low temperature, by doing which it is found that the cooked taste so objectionable in sterilized liquids is entirely removed, and the sudden subjection of the liquid to a lower temperature entirely destroys any germs or bacteria which may be in the liquid. It is essential in transferring the liquid from the sterilizer to the heater to pass it through the air or vent it, so as to permit of the escape of the obnoxious fumes and gases. The manner of accomplishing this will soon appear from the following description:

The cooler hereinbefore referred to consists of a tub or casing 19 and the cylinders 20 and 21. Within the tub 19 and within the cylinder 21 is adapted to be placed a cooling agent, such as cold water, or, ~~if~~ desired, I may use cold water in the tub and cold water and ice in the cylinder 21. The inner cylinder 21 is provided with a helical corrugated feed-screw 22, which coacts with the interior wall of the cylinder 20 to feed the liquid under treatment upwardly in a like manner as in the description of the sterilizer.

The conductor-pipe 12 extends from the trough of the sterilizer to a feed-pipe 23, which communicates with a pipe 24, which leads to the space between the cylinders 20 and 21 and conveys the liquid from the sterilizer to said space. As the liquid is discharged from the pipe 12 into the pipe 23 it is subjected to the atmosphere, and the gases and fumes separated from said liquid by the action of the sterilizer are liberated, so that the liquid when admitted to the cooler is freed from such fumes and gases and is in condition to have any bacteria or germs therein destroyed by the shock incident to the sudden changing of the temperature of the liquid. The cylinder 21 is provided with a shaft 25 for rotating it, and this shaft is provided with a gear-wheel 25', meshing with a gear 25^2, fixed to the drive-shaft. The cylinder is also provided with a centrally-disposed tube 26, open at each end and having at its upper end a funnel 26'. Through this funnel is adapted to be passed cold water from a pipe 27', provided with a stop-cock 27^2. The upper end of the cylinder 20 is provided with a trough 27, while the upper end of the cylinder 21 is provided with an overhanging flange or shield 28.

29 denotes a discharge-pipe leading from the trough 27 to a point where the liquid is to be bottled or stored.

The cylinder 20 of the cooler is preferably provided with a spiral strip 42, having a continuous flange 43 to form a spiral chamber, and is provided at its upper end with a trough 42^a, having an outlet-pipe 42^b near its upper edge and may be inclosed within the casing 19. The tub at the lower end communicates with a vertically-disposed external pipe 42^d, which leads upwardly and communicates with the trough 42^a.

A cold-water pipe 42^e, provided with a stop-cock 42^f, extends through the trough 42^a and communicates with the upper end of the tub. The ice, if used as a cooling agent, is placed within the cylinder 21 and the water turned on and discharged from its respective pipes 27' and 42^e. The water discharging from the former pipe enters the funnel of the vertically-disposed tube and is discharged at the bottom of the inner cylinder and flows upward over the flange or shield 28 and empties into the trough 42^a and escapes through the escape-pipe 42^b. The water entering the outer cylinder passes in a tortuous stream around the same until it reaches the lower end of the cylinder, from whence it escapes into the vertical pipe 42^d, and is led to the trough 42^a and discharged therefrom through the escape-pipe 42^b.

From the foregoing description, taken in connection with the accompanying drawings, it is believed that the process will be fully understood without requiring an extended explanation. It may be well to lay stress upon the fact that the process is a continuous one and that there are no periods of rest, thereby enabling me to carry out the process without waste of time, which is common to processes used for similar purposes, wherein after the liquid under treatment has been raised to a certain temperature it is held to that temperature for a certain period before it is passed to the cooler, thus necessitating a halt in the process, and consequently reducing the capacity of the machine with which the process is carried out. By my process the liquid under treatment is fed to the sterilizer in a continuous stream and flows from the cooler in a like manner thoroughly sterilized.

Having thus fully described my invention, what is claimed, and desired to be secured by Letters Patent, is—

The process of sterilizing liquids which consists of the following steps: suddenly raising the temperature of the liquid uniformly to the required degree, subjecting it to the atmospheric air to liberate therefrom all gases and fumes, and suddenly, and continuously, without pause, reducing its temperature.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN C. MILLER.

Witnesses:

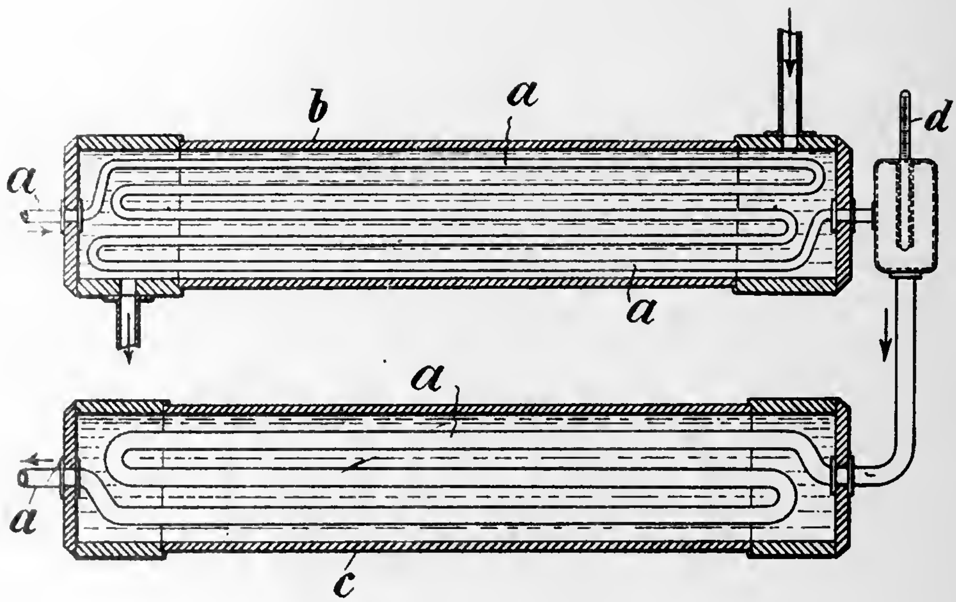
BENJ. G. COWL,
SAML. A. DRURY.

No. 786,819. PATENTED APR. 11, 1905.

C. DE JONG.

PROCESS OF STERILIZING MILK OR OTHER FLUIDS.

APPLICATION FILED JAN. 3, 1903.



WITNESSES:

Fred White

Thomas F. Wallace

INVENTOR:

Corstiaan de Jong,

By his Attorneys:

Arthur C. Fraser & Co

UNITED STATES PATENT OFFICE

CORSTIAAN DE JONG, OF HUIZE SNIPPESCHRIK AMSTELVEENSCHE WEG, NEAR AMSTERDAM, NETHERLANDS.

PROCESS OF STERILIZING MILK OR OTHER FLUIDS.

SPECIFICATION forming part of Letters Patent No. 786,819, dated April 11, 1905.

Application filed January 3, 1903. Serial No. 137,678.

To all whom it may concern:

Be it known that I, CORSTIAAN DE JONG, a subject of the Queen of the Netherlands, residing in Huize Snippeschrik Amstelveensche Weg, near Amsterdam, Netherlands, have invented certain new and useful Improvements in Processes of Sterilizing Milk or other Fluids, of which the following is a specification.

My invention aims to provide a new sterilizing process which is very effective and which is easily carried out and requires only the simplest apparatus, which is cheap in first cost and practically never requires repair.

The process employs heat and finds its most common application in the sterilizing of milk, but may be applied to other fluids.

Processes employing heat are already well known. Such known processes, however, are very detailed, especially in view of the apparatus employed in carrying them out, and possess other disadvantages and other inconveniences which are avoided by my improved process.

As is known, sterilization by means of a single heating depends only on the period of time during which the nitro-organisms are subjected to a determined temperature. The higher this temperature is carried the shorter can the period of time be. This circumstance is of especial weight where fluids are to be treated which readily undergo chemical changes during heating.

One of the known processes employed is the so-called "pasteurizing," which is characterized by a repeated warming to a temperature below 100° centigrade (70° to 90° centigrade) in order to permit in the intervals the development of the spores into bacteria in vegetable form, which then upon the successive warmings are gradually killed. In this process, therefore, the spores are not directly killed.

My improved process aims at a direct absolute sterilizing of the fluid, especially of milk, by means of the employment of a high temperature (that is to say, a temperature materially above 100° centigrade) during a very short time. My process aims not only at the killing of the bacteria themselves, but also simultaneously the killing of the spores. In order to attain this end, I propose to heat the fluid to a temperature sufficiently high to completely sterilize it for such a short time as to avoid modifying its proper constitution. The process is preferably carried out in detail by passing the fluid at a high velocity through a tube, heating it above its boiling-point in the fore part of said tube—as, for example, by means of a steam-jacket surrounding the tube—and cooling it in the rear part of said tube—as, for example, by means of a water-jacket.

The accompanying drawing shows an apparatus suitable for the carrying out of the process. The apparatus shown consists, essentially, of a tubular coil *a*, the fore part of which is preferably of smaller diameter than the rear part and is surrounded by a chamber *b* in order to heat the fluid passing through this part of the tube materially above its boiling-point and for a sufficient length of time by means of steam under very high pressure or by means of any other suitable heating medium at a high temperature. The rear part of the tube, which, preferably, as above explained, is of greater diameter than the fore part, is likewise provided with a chamber or jacket *c* in order to quickly and immediately cool the hot fluid by means of water or some other cooling medium. Between the heating and cooling parts of the tube there is preferably arranged a thermometer *d* in order to be able to observe the temperature. The length and diameter of the tube, as well as the temperature of the heating medium and the velocity of the fluid through the tube, are such and are so arranged relatively to each other that the length of time during which the fluid is subjected to the maximum temperature is, on the one hand, sufficient for complete sterilization, and, on the other hand, is too short for any change whatever in the proper constitution of the fluid. When these precautions are observed, milk, which is in the greatest degree sensitive to all kinds of influences, comes out of the apparatus not only perfectly and completely sterilized, but also unchanged in color, smell, and taste. The exact length of time the fluid is subjected to the heating action varies, of course, with different fluids and dimensions of the apparatus. In practicing my process—for example, in sterilizing milk—I have obtained good results when using a heating-tube of about twenty-seven meters in length and about eight millimeters in diameter and working at a temperature of from about 145° to 150° centigrade (293° to 302° Fahrenheit) by regulating the velocity of the fluid in such a manner that ten liters of sterile milk are produced in one minute, in which case the velocity of the fluid amounts to about three meters in one second. In thus practicing my process the fluid is rapidly heated throughout highly above its boiling-point for a short period, passing with great velocity through the long tube, which is preferably of the small diameter stated, whereby in a sure and perfect manner all parts of the fluid come in contact with the hot walls of the heating-pipe, and the bulk of the liquid possesses the highest temperature only for a very short time.

The simple apparatus which may be used for the carrying out of my process has the great advantage over other apparatus operating with high temperatures that it avoids the necessity for stirring mechanism to prevent burning of the fluid and that on account of its simplicity it can be very cheaply made and is substantially incapable of getting out of order.

Though I have described with great particularity of detail a process embodying my invention and an apparatus suitable for the carrying out of the process, yet it will be understood that the process described may be modified by those skilled in the art without departure from the invention and that a great variety of apparatus may be employed in the carrying out of the process.

The tube *a* can of course be bent or wound in various ways and may be made of any desired material which may seem suitable.

I claim as my invention—

1. The process of sterilizing fluids which are very sensitive to heat, which consists in heating the fluid to a temperature sufficiently high to completely sterilize it, but for such a short time as to avoid modifying its original constitution and properties, substantially as and for the purpose set forth.

2. The process of sterilizing fluids which are very sensitive to heat, which consists in imparting to the fluid a very high velocity, heating it highly above its boiling-point, and immediately cooling it, substantially as and for the purpose set forth.

3. The process of sterilizing fluids which are sensitive to heat, which consists in passing the fluid in a comparatively small stream into contact with a highly-heated medium, and thereby heating it above its boiling-point so that its complete sterilization takes place, and then cooling it by bringing it into contact with a cooling medium before its original constitution and properties are changed.

4. The process of sterilizing fluids which are sensitive to heat, which consists in causing the fluid to pass at a high velocity along a conduit, and at one point in its passage subjecting it while in motion to the action of a high degree of heat, so that the fluid is raised well above its boiling-point, and then subjecting it to a cooling action before the action of the heat has been continued long enough to change the original properties of the fluid.

5. The process of sterilizing milk which consists in heating the same to a temperature above its boiling-point to completely sterilize it, and then cooling it before its proper constitution is modified.

6. The process of sterilizing milk which consists in heating the same to a temperature considerably above its boiling-point for a brief period, and then immediately cooling the same.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CORSTIAAN DE JONG.

Witnesses:
W. F. TROOST.
PAUL STAAL.

[illegible] [illegible]ston

3[illegible] [illegible]

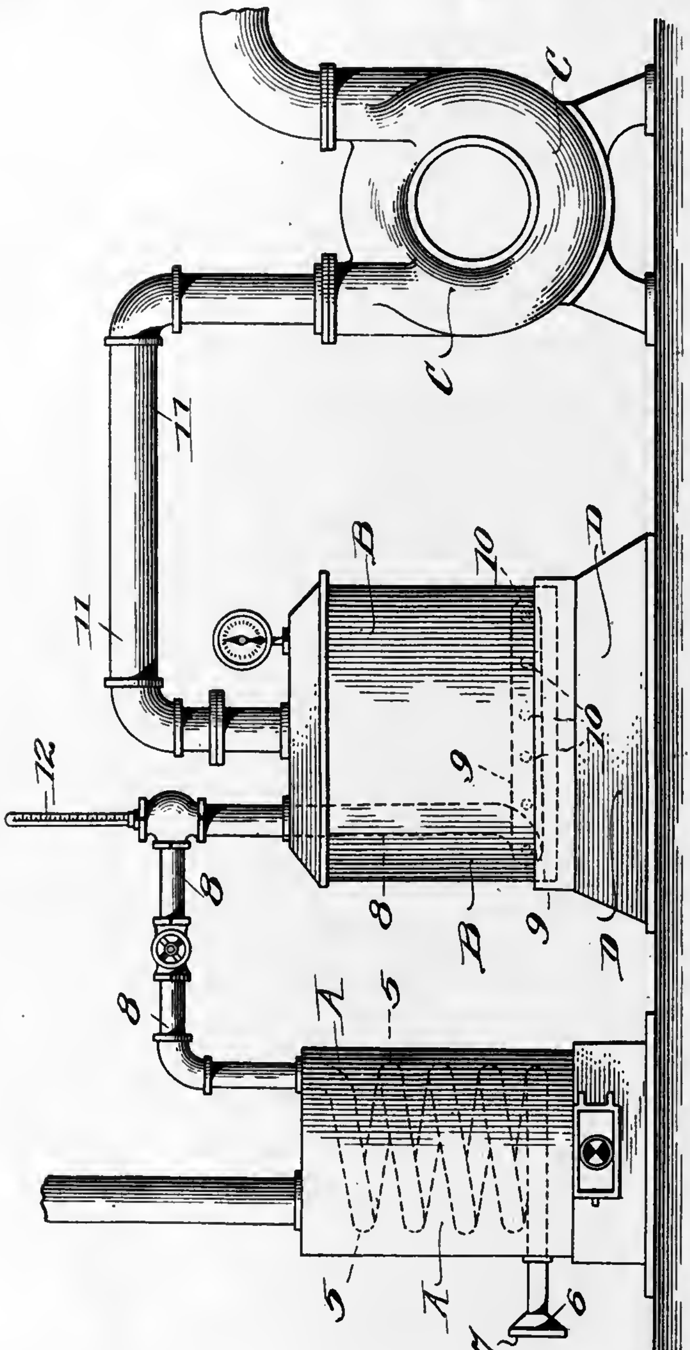
[illegible]

C. C. PALMER.

PROCESS OF STERILIZING MILK.

APPLICATION FILED FEB. 16, 1907.

963,244. Patented July 5, 1910.



Witnesses:
Robert W. Ashley
R. B. Cavanagh

Inventor
Cassius Clay Palmer
By his Attorneys Gifford & Bull

UNITED STATES PATENT OFFICE.

CASSIUS CLAY PALMER, OF CRANFORD, NEW JERSEY, ASSIGNOR TO MARTHA ELLA PALMER, OF CRANFORD TOWNSHIP, UNION COUNTY, NEW JERSEY.

PROCESS OF STERILIZING MILK.

963,244. Specification of Letters Patent. **Patented July 5, 1910.**

Application filed February 16, 1907. Serial No. 357,670.

To all whom it may concern:

Be it known that I, Cassius Clay Palmer, a citizen of the United States, and a resident of Cranford, in the county of Union and State of New Jersey have invented certain new and useful Improvements in Processes of Sterilizing Milk, of which the following is a specification.

This invention relates to an improvement in the process of sterilizing milk, the object being to destroy the germs of decomposition or disease commonly present in unsterilized milk.

The invention consists in the improved process set forth in and falling within the scope of the appended claims.

In order to destroy the germs such as above recited, I have found that it is desirable to heat the milk to a temperature upward of 167° F., and furthermore, that it is desirable that the entire body of milk be subjected to heat at the same time; that is to say, no portion or particle of the milk should be left unheated, while it is further desirable that the milk should not reach the boiling point.

In carrying out my invention I pass a current of heated air to the body of milk and preferably force such air through the milk by pressure or suction, so that the body is agitated and the heated air well distributed therethrough, thus resulting in the complete and uniform heating of the entire bulk.

In the accompanying drawing I have shown one form of apparatus by means of which my invention may be carried into effect, but it will of course be understood that other forms of apparatus may be employed in the performance of the process.

In the accompanying drawings A indicates a heater, B a receptacle containing the body or bulk of milk, and C indicates a compressor. The heater A, which may be of any suitable construction of stove, furnace or the like, has therein an air pipe, preferably in the form of a coil indicated at 5, and provided with an open end portion 6, enlarged or flared and which, if desired, may be covered with a screen 7 of fabric or other suitable material for the purpose of preventing the entrance of dust and the like. This coil is connected with the receptacle B by means of suitable pipe connections 8, leading into the receptacle and terminating preferably in a coil 9 provided with air outlets or perforations 10. The receptacle B and the compressor C are also connected by the air pipe 11 and such compressor is preferably in the nature of a suction device exerting a drawing or suction effect upon the body of milk sufficient to draw the heated air which passes through the heating coil and the connection 8, to the coil 9, and thence through the openings 10 into the body of milk. This action of the compressor in drawing the heated air through the orifices or perforations 10 in the coil tends to draw such air upward through the body of milk and thus cause the agitation or bubbling of the milk. As the compressor is started the air from over the milk will be exhausted and a vacuum produced. At the same time the heater is in operation and the coils of the interior of such heater raised to the desired temperature necessary to sterilize the air as it passes through the pipes. The vacuum in the milk receptacle or tank draws the air through the pipes between the heater and the tank, thus causing the agitation before described and at the same time the heat of the air assists in raising the temperature of the milk to the desired degree to insure sterilization. It is obvious that by this process it will be impossible for any portion of the milk to escape contact with the temperature necessary to cause the sterilization.

If desired, the receptacle B may be placed in an auxiliary heating device such as a sand bath D, and the pipe connection between the heater and the receptacle provided with a thermometer 12.

In the present invention I do not limit myself to drawing air through the milk by suction, for any other arrangement may be employed for passing the air through the body of milk.

After sterilizing the milk should be cooled as rapidly as possible and any suitable means may be employed for this purpose.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The process of sterilizing milk, which consists in passing fine streams or globules of air heated to a sterilizing temperature through a body of milk for a period of time sufficient to render the milk sterile.

2. The process of sterilizing milk, which

consists in placing a body of milk in a closed container, forcing a body of air heated to approximately 150° F. through the body of milk, the air being broken up into fine streams or globules in passing through the milk so as to come in intimate contact with the milk particles, and creating a circulation of the air through the container.

In testimony whereof I have hereunto signed my name to this specification in the presence of two subscribing witnesses.

CASSIUS CLAY PALMER.

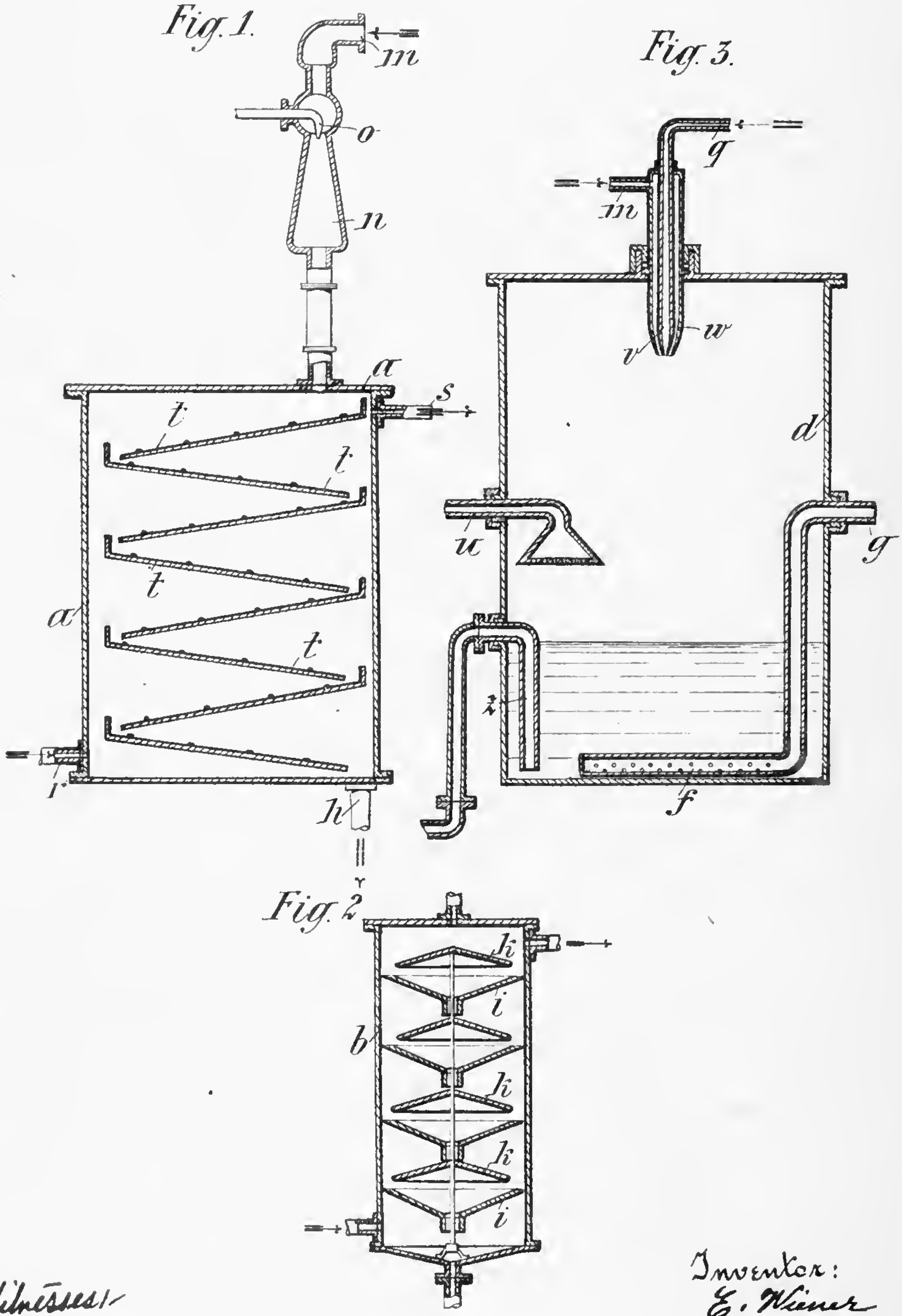
Witnesses:
R. B. CAVANAGH,
JOS. J. PIERANDO.

E. WIENER.

PROCESS FOR STERILIZING MILK AND MILK PRODUCTS.

APPLICATION FILED SEPT. 12, 1910.

1,006,992. Patented Oct. 24, 1911.



Witnesses:-
E. H. Bond
Anton W. Selander.

Inventor:
E. Wiener
by F. Dittmar.
Attorney.

UNITED STATES PATENT OFFICE.

EMIL WIENER, OF VIENNA, AUSTRIA-HUNGARY.

PROCESS FOR STERILIZING MILK AND MILK PRODUCTS.

1,006,992. Specification of Letters Patent. Patented Oct. 24, 1911.

Application filed September 12, 1910. Serial No. 581,615.

To all whom it may concern:

Be it known that I, EMIL WIENER, doctor of medicine, subject of the Emperor of Austria-Hungary, residing at Vienna, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in the Process for Sterilizing Milk and Milk Products, of which the following is a specification, reference being had therein to the accompanying drawing.

The sterilization of liquids and in particular of milk by the employment of ozone or ozonized air is already known; in accordance with the methods heretofore known the milk or other liquids to be sterilized are treated either by conducting them into a sieve and filling the chamber into which the drops or jets fall with ozonized air, or, ozonized oxygen is emulsified with the liquid to be atomized and conducted with an excess of ozone into bottles. These hitherto known processes do not give the desired results more particularly as regards the special purposes of sterilizing milk because, as experiments have demonstrated, an effective sterilization of the milk by ozone, while simultaneously avoiding any destruction of the organic constituents, can only be effected when the milk is exposed to the ozone in a very finely divided state and provided also that this action is restricted to a short period, and further no ozone must remain in the liquid.

The process forming the object of the present invention is based upon the knowledge referred to above that the milk subjected to the action of the ozonizing air in an extremely finely divided or atomized condition must, if the good properties of the milk are not to be endangered, be only subjected to this action for a short time and this reaction must also be followed by an aerating process by means of which the particles of ozonized air remaining in the milk are eliminated and any alterations in the taste and smell experienced by the milk during the ozonizing removed.

As regards the aerating process it may be mentioned that it is already known to free milk sterilized by the boiling process from the taste of boiling which it acquires by aerating it with sterilized air; it is, however, novel to combine this aerating process with the ozonizing process and thereby eliminate the ozonizing taste from the milk and simultaneously to prevent ozonized air particles from remaining in the milk.

Figures 1 and 3 of the accompanying drawing illustrate two forms of apparatus suitable for effecting the sterilizing and deodorizing processes in accordance with the invention. Fig. 2 shows a modified form of a part of the apparatus.

In the form of apparatus illustrated in Fig. 1 the milk is sprayed under pressure through the spraying nozzle *o* into a conically flaring chamber *n* thereby drawing in with it the ozonized air supplied through the socket *m*. By the action of the ozone on the finely divided milk the latter is sterilized and then flows over the trickling surfaces *t* arranged in a second vessel *a*; upon these surfaces it comes into intimate contact with the sterilized fresh air blown-in in counter current through the conduit *r* or drawn in through the conduits *s* thus causing it to lose the foreign flavor acquired through the ozonizing whereupon it flows off in a deodorized condition through the socket *h*.

The flow of the ozonized air to the sterilizing chamber *n* can be produced by any suitable mechanical means, such for example as by a special suction or forcing apparatus, instead of by the suction effect of the spraying nozzle *o*. The contact of the milk with the sterilized air can also be effected by running the milk through the vessel *b* shown in Fig. 2, in which a large number of collecting and overflow plates *i k* are arranged, the sterilized milk flowing over them in thin layers while the sterilized air is drawn or forced through the vessel *b* in the same or the opposite direction.

Instead of drawing the ozonized air through the milk under pressure as in the method of operating described above, the arrangement may be inverted by drawing the milk through the ozonized air supplied under pressure by means of the atomizing nozzle. Or again both the ozonized air and the milk to be sterilized can be supplied to the mixing and pulverizing nozzle under pressure. This arrangement, in which the suction and atomizing of the milk are effected by the suction effect of the jet of compressed air surrounding the mixing nozzle, presents the advantage that the mixing of the jet of milk with the ozonized air is rendered extremely intimate and efficacious. The aeration following the ozonizing can also be effected in the sterilizing vessel in the following manner: The sterilized air is blown through the liquid accumulating on the bottom of the vessel and continually passing off through an overflow or siphon, after which it leaves the ozonizing vessel together with the ozonized air through a flue arranged above the level of the liquid.

In Fig. 3 an apparatus enabling this modification of the process to be carried out is illustrated diagrammatically in section. The whole of the operation here takes place in the vessel d which is normally closed and through the walls of which a number of tubular conduits pass; the ozonized air under pressure is conducted through the conduit m, to the nozzle w and draws in with it the milk which is supplied through the conduit q to the interior of the nozzle v and this milk either in the nozzle itself or by means of suitable atomizing appliances of a known kind arranged in front of the nozzle is atomized so as to form a mist the fine bubbles of which are subjected to the action of the ozonized air. The liquid which reforms by the assemblage of the mist bubbles collects in the lower part of the vessel d and is conducted away through a suitably arranged siphon z in such a manner that it is maintained at an approximately constant level in the reservoir d. A perforated tube f is arranged at the bottom of the vessel d and connects with a conduit g supplying sterilized air; through its perforations sterilized air is forced in a number of small jets through the milk which is maintained at a certain level. By this means the milk is deodorized and any ozonized particles of air remaining in it are carried off so that their continued action upon the milk is avoided. The sterilized air then passes out of the vessel d together with the ozonized air through an outlet pipe u arranged above the level of the liquid.

The milk thus treated presents only a fraction of the number of bacteria originally contained in it and is characterized in particular by the absence of all pathogenic bacteria (in particular tubercular bacilli) and also by its almost completely natural taste.

The process can of course also be utilized for creams of greater or less density and also for milk by-products.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. The process for sterilizing milk and cream by ozone, which consists in exposing the liquid to the ozonized air in an atomized form and then subjecting the same to an aerating process and removing the ozonizing taste and simultaneously preventing any particles of the ozonized air from remaining in the liquid.

2. The process for sterilizing milk or cream by ozone, which consists in exposing the liquid to the ozonized air in an atomized form and then subjecting the same to an aerating process and removing the ozonizing taste and simultaneously preventing any particles of the ozonized air from remaining in the liquid, the sterilizing and deodorizing of the liquid taking place in the same vessel.

3. The process for sterilizing milk and cream by ozone, which consists in exposing the liquid to the ozonized air in an atomized form and then subjecting the same to an aerating process and removing the ozonizing taste and simultaneously preventing any particles of the ozonized air from remaining in the liquid, the sterilizing and deodorizing of the liquid taking place in the same vessel, conducting the sterilized air in jets through the liquid collecting in the lower part of the ozonizing vessel and conducting away the ozonized and sterilized air from a point above the level of the liquid in said vessel.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

EMIL WIENER.

Witnesses:
FRIEDRICH BINDEI,
AUGUST FUGGER.

J. DESMAROUX.

PROCESS AND APPARATUS FOR STERILIZING MILK AND OTHER ORGANIC LIQUIDS.

APPLICATION FILED MAR. 26, 1908.

1,036,806. Patented Aug. 27, 1912.

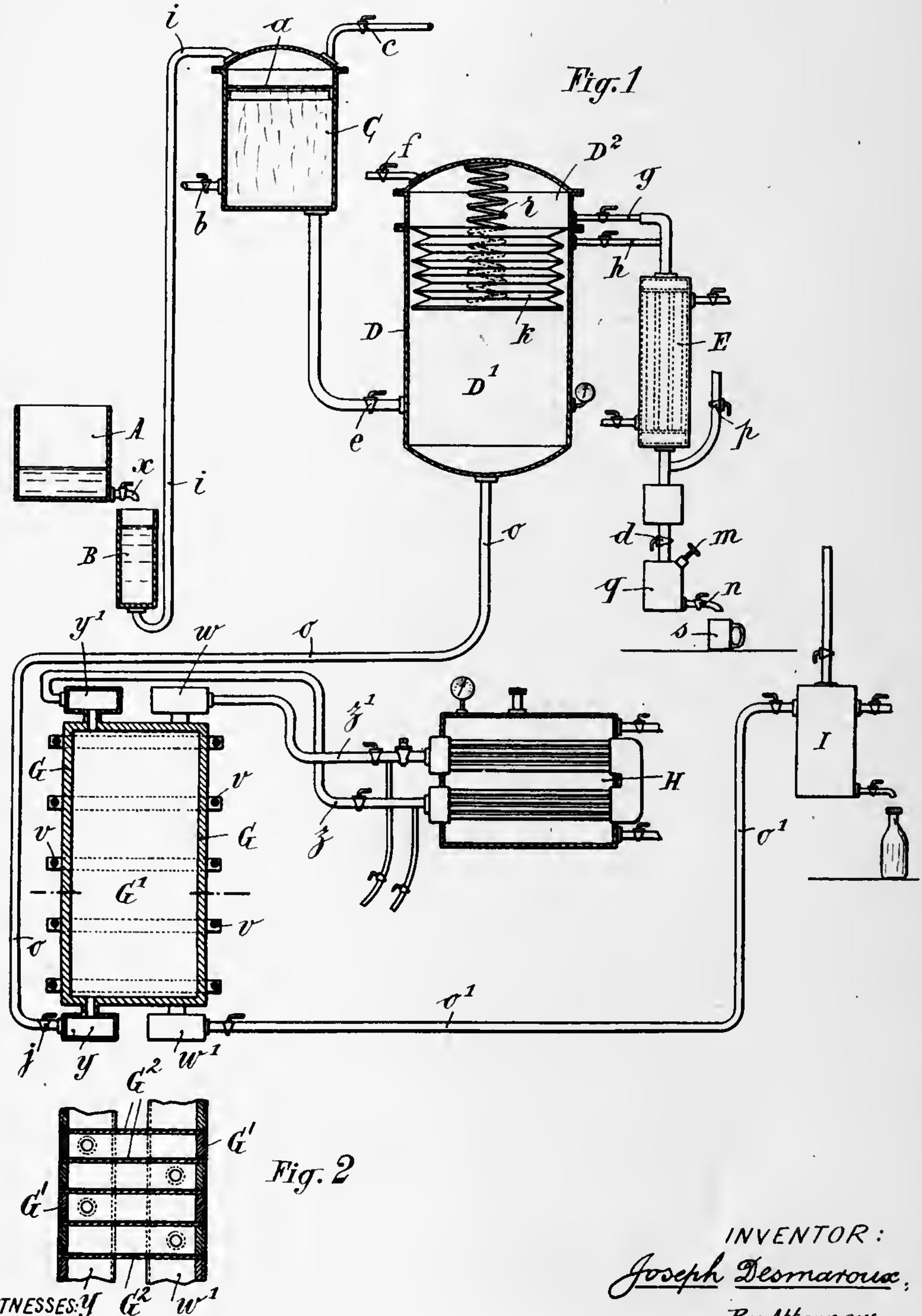


Fig. 1

Fig. 2

WITNESSES: Fred White, René Bruine

INVENTOR: Joseph Desmaroux, By Attorneys, Arthur G. Fraser & Ussina

UNITED STATES PATENT OFFICE.

JOSEPH DESMAROUX, OF PARIS, FRANCE.

PROCESS AND APPARATUS FOR STERILIZING MILK AND OTHER ORGANIC LIQUIDS.

1,036,806. Specification of Letters Patent. Patented Aug. 27, 1912.

Application filed March 26, 1908. Serial No. 423,470.

To all whom it may concern:

Be it known that I, Joseph Desmaroux, a citizen of the Republic of France, residing in Paris, France, have invented a certain new and useful Process and Apparatus for Sterilizing Milk and other Organic Liquids, of which the following is a specification.

The present invention aims to sterilize milk and other organic liquids in such a way as to completely free them from pathogenic or other germs, without altering the taste, color, appearance and properties of the liquid.

The process in its most specific form includes the following three successive operations:—

1. The milk is finely subdivided and brought into the presence of an active gas, such as oxygen or ozonized air, which comes in contact with all the particles of the subdivided milk, thus preparing for the final sterilization of the milk and rendering it much easier. By this operation the milk becomes very sensitive and very permeable by the heat, which is the final agent employed in the sterilization.

2. The milk thus prepared is then freed from the gas remaining in it, not only from the active gas employed in the first operation, but also of any other gas which may have been previously in solution in the milk. This withdrawal of the gases takes place at a temperature about 15° to 30° C., under the action of a vacuum, the pressure being reduced to about 10 millimeters of mercury. This operation is continued to the point where a small quantity of the liquid is removed by distillation or evaporation so as to show that the milk has been freed of all gases and volatile products which were in it. It is also important that the milk to be sterilized by heat in the third step of the operation explained below, shall contain no trace of gas which might under the action of heat seriously modify the taste and chemical constitution of the milk.

3. The milk prepared as above explained is then sterilized by heating. The heating takes place while the milk is maintained out of contact with any air or gas whatever. Nevertheless the circulation of the milk in the heating apparatus is effected by exerting upon one side of the body of milk a pressure of at least one kilogram per square centimeter, and by producing on the other side of the body such a vacuum as to effect the flow of the milk by reason of the difference of pressure. But the fluid pressure transmitted to the milk in the direction of its movement, is exerted through the intermediation of a membrane which follows the surface of the milk introduced into a suitable reservoir; so that the compressed fluid, gaseous or otherwise, cannot mix with the milk and become dissolved therein. Under these conditions the temperature may be raised to 110° to 120° C., which is necessary to obtain a complete sterilization.

This process of sterilization of milk (or of other organic liquids) is specifically distinguished therefore from known processes, in that the milk is heated to a temperature of 110° to 120° C., under the action of a pressure of about one kilogram per square centimeter produced by a fluid which is not in contact with the milk under treatment, the milk having been, before heating brought to as fine a state of division as practicable, and submitted to the action of an active gas to prepare it for the sterilization, and the operation of sterilization being effected however on milk absolutely free from any gas whatever, because such gases have been removed to the point where distillation commences in a vacuum, but distillation being stopped only when a little of the liquid is vaporized and condensed.

The following description, with reference to the annexed drawing, will explain the means of realizing the process above described.

Figure 1 is a schematic view of the complete apparatus; Fig. 2 is a section of the vessel G at right angles to the section thereof shown in Fig. 1.

The milk is subjected to the first operation, the treatment in a fine state of division, by an active gas in the elevated receptacle C, which carries near its upper end a perforated disk *a* upon which the milk to be treated is admitted by a tube *i* under the action of a vacuum which is produced through a tube with a valve *e*. The tube *i* connects at its lower end with a measuring receptacle B, which is filled with milk from a receptacle A having a cock *x*. The milk drawn through the tube *i* spreads over the surface of the disk *a* and falls in fine drops through the perforations of this disk into the space below. While the milk is falling thus in a state of perfect division through the receptacle C, it is subjected to the action of an active gas, oxygen or ozonized air, which is admitted through a tube having a cock *b*. The milk then runs by way of a tube provided with a cock *e* to the receptacle D.

It is in the receptacle D that the milk is freed from gas. It is also in this receptacle that a pressure is exerted on the surface of the liquid to effect its circulation in the apparatus for sterilizing by heat. The receptacle D has within it a flexible extensible membrane *k* of accordion type; the edge of the upper rim being fixed to the inner wall of the receptacle D. A coiled spring *r* is fixed at one end at the center of the said membrane, and at the other end to the upper end of the receptacle D. A tube having a cock *f* serves for the admission of a fluid under pressure. Two conduits *g h* which communicate with each other, and which communicate respectively with the two chambers D^2 and D′, which are separated by the flexible membrane, serve to equilibrate the pressure of these two chambers. These two conduits *g h* communicate with a condensation apparatus E.

From the bottom of the receptacle D a tube *o* runs out, through which the milk is passed to conduct it successively to the sterilization apparatus and to the withdrawal apparatus I.

The removal of the gas carried in the milk contained in the receptacle D, is effected by means of a vacuum produced in the bottom of the condensation apparatus E through a tube having a valve *p* therein, at a low temperature (15° to 30° C.), and the operation is pushed so far that there is condensed in the apparatus E a little of the liquid, showing the vaporization of the milk contained in D. The condenser is of the ordinary tubular type, the gas being condensed in the tubes by a cooling liquid circulating about the tubes. This assures certainly that there shall no longer remain in the milk any gas or volatile particles. The products of distillation which condenses in the apparatus E are collected in the following way:—The condenser E communicates at its lower end through a conduit provided with a valve *d* with a small reservoir *q* provided with a needle valve *m* and with a draw-off cock *n*. The liquid being collected in *q* after the opening of the valve *d*, the valve *d* is then closed and *m* and *n* are then opened and the condensed liquid runs out into a vessel *s*. When this takes place the valve *j* in the lower end of the tube *o* is opened and fluid pressure is exerted by opening the valve *f* leading into the receptacle D. Thus the milk is made to circulate in the apparatus for sterilizing by heat. The membrane *k*, of rubber or other suitable material, is pressed downward in the receptacle D, remaining in contact with the liquid, so that the latter finds itself submitted on one side to the pressure necessary to produce the circulation of the liquid during heating, without being able to produce any phenomenon of ebullition. This renders the operation absolutely harmless, so that there is no alteration of the milk or modification of its chemical composition. When the membrane *k*, which serves to isolate the milk from the compressed fluid by which it is circulated, reaches the bottom of the receptacle D and expels practically all of the milk under constant pressure, the compressing fluid is stopped and withdrawn, the spring *r* again lifts the membrane *k*, and the receptacle D can receive a new charge of liquid.

The sterilization apparatus may be of any known or suitable type. In the drawing it is supposed to be composed of a heater H and a temperature interchanging apparatus G. The latter is composed substantially of vertical boxes formed of frames G′ separated by plates G^2, the whole held together by ties *v*. The boxes G′ G^2 formed by the frames of the plates, communicate in pairs through small tubes with the outer boxes *y y′* at top and bottom, so that there is a circulation of the colder milk in one direction and the warmer milk in the opposite direction, with only thin walls between the two streams, so as to permit an interchange of heat between the two streams. The lower one of the outer boxes, *y*, is connected to the receptacle D, and the upper one, *y′*, communicates through the tube *z* with the heater H. The milk is thus circulated through the boxes *y* and *y′* going to the heater. The milk passing out of the heater passes through a tube *z′*, a box *w*, and the alternative passages in the interchanger G′ to the box *w′*, and thence through the tube *o′* to the bottling apparatus. The two streams passing through the interchanger G′ with only the plates G^2 between them, partly exchange their temperatures, so that the incoming milk is warmed and the outgoing milk cooled.

The heater H is composed of tubes in two groups connected respectively to the tubes *z* and *z′*, and each group communicating with the other at the opposite end of the heater, so as to provide for circulating the milk and heating the same, the heating tubes being in a closed receptacle for hot water or other heating medium. After sterilization and cooling in the interchanger G, the milk passes to the bottling apparatus I.

What I claim is:—

1. The sub-process in the sterilizing of an organic liquid, which consists in first treating it with an active gas and then removing all volatile matter held in solution in such liquid by means of a vacuum and at a low

temperature, carrying the operation to the point of vaporization of a small quantity of the liquid.

2. An apparatus for use in sterilizing an organic liquid, comprising means for finely dividing the liquid and subjecting it to an active gas, means for subjecting the liquid to a vacuum at a low temperature to remove all volatile matter held in solution, and means for finally heating it to between 110 and 120 degrees centigrade.

3. An apparatus for sterilizing an organic liquid comprising means for finely dividing the same, and means for subjecting it in such finely divided state to an active gas, in combination with means for subjecting the liquid to a vacuum at a low temperature to volatilize all matter held in solution therein.

4. An apparatus for sterilizing an organic liquid comprising means for finely dividing the same, and means for subjecting it in such finely divided state to an active gas, in combination with means for subjecting the liquid to a vacuum at a low temperature to volatilize all matter held in solution therein, and means for subjecting it to fluid pressure without contact with the pressure medium and heating it to between 110 and 120 degrees centigrade.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

JOSEPH DESMAROUX.

Witnesses:
H. C. Coxe,
Gabriel Belliard.

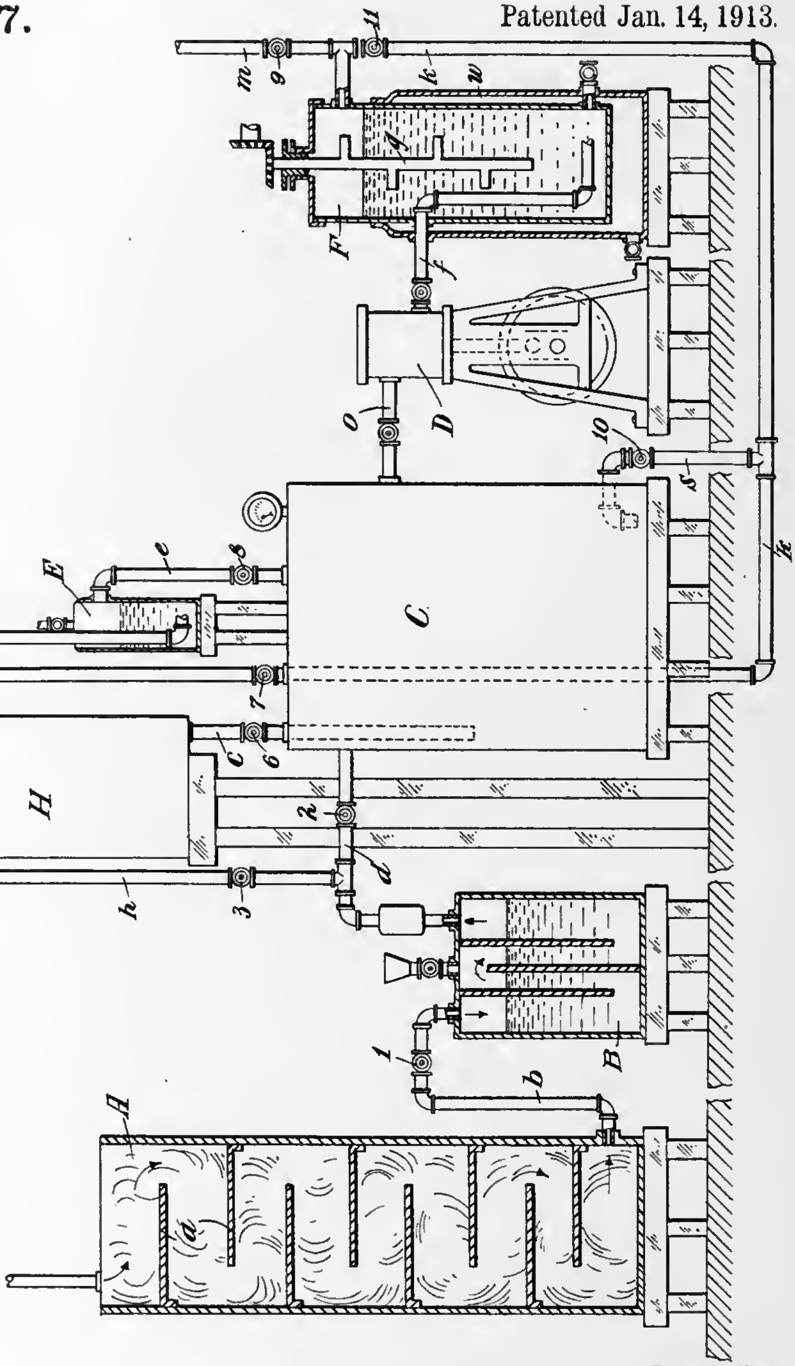
C. W. VOLNEY, DEC'D.

S. L. G. VOLNEY, EXECUTRIX.

PROCESS OF STERILIZATION OF LIQUIDS.

APPLICATION FILED NOV. 14, 1908.

1,050,707. Patented Jan. 14, 1913.



Witnesses:
S. Newman.
H. D. Penney.

Inventor:
Carl W. Volney,
By his Attorney,
F. H. Richards.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CARL WALTER VOLNEY, OF KEYPORT, NEW JERSEY; SARAH L. G. VOLNEY EXECUTRIX OF CARL WALTER VOLNEY, DECEASED.

PROCESS OF STERILIZATION OF LIQUIDS.

1,050,707. Specification of Letters Patent. **Patented Jan. 14, 1913.**

Application filed November 14, 1908. Serial No. 462,612.

To all whom it may concern:

Be it known that I, Carl W. Volney, a citizen of the United States, residing in Keyport, in the county of Monmouth and State of New Jersey, have invented certain new and useful Improvements in Processes of Sterilization of Liquids, of which the following is a specification.

The object of the present invention is to provide a process for the effective and complete sterilization of liquids by the treatment of the liquid with a gas and subsequently washing out the gas from the treated liquid with another gas.

This invention is particularly applicable to the sterilization of milk by the use of a relatively small quantity of a germicide substance, and which process will also effectively and completely destroy not only all of the infusorial and bacterious or germ-like matters of the treated milk but will also completely remove from the substance the germicide employed and at the same time will not injure or affect in any manner the treated milk.

Although this invention may be used in the sterilization and treatment of various liquids yet its application to the sterilization of milk will be described in detail.

It is well known that infusorial organisms in milk are destroyed by heating and boiling, but it has also been found that effective sterilization requires a high degree of heat sustained for a considerable length of time and under such treatment denaturation and coagulation of protein matter, evaporation of volatile constituents and other undesirable changes are produced in the milk so that sterilization and disinfection at lower temperatures has always been held desirable. And it is also well known that by the application of antiseptic germ destroying matter to the milk sterilization may be effected at lower and at ordinary temperatures but that the use of such matters is limited and prohibited in a great measure by custom and law whenever any trace of the sterilizing or disinfecting matter remains in the milk imparting to the latter injurious or disagreeable qualities. From these considerations it follows that the application of germicide material to milk depends upon the non-injurious character of the germicides if there is any trace of these left in the milk after sterilizing, and on the condition of being completely removed from the same after sterilization. It is consequently indicated by these considerations, that the germicide or disinfecting matter for the milk should be of a gaseous or sufficiently volatile character, so that it can be removed readily after sterilization, and that it should not have any deleterious effect on the milk during its reaction on the infusorial organisms.

Although the hereinbefore mentioned infusorial matter consists usually of an infinite number of individuals, it would form, if all these individuals were collected, but an infinitely small portion of the mass; and it follows that a correspondingly small quantity of germicide necessary for its destruction would be likewise required. It is, however, known that the quantities of germ destroying matter with which organic material is usually treated, is greatly in excess of the quantity actually needed for the destruction of the comparatively small quantity of infecting or decomposing matter; and it will thereon be found, that this excess of germicide is used because, by the methods at present in use, the destroying medium could not be brought in thorough contact therewith throughout the proportionately large volume of matter to be sterilized.

It is the purpose of my invention to overcome these difficulties; to reduce the quantity of the germ-destroying matter on a rational basis, and to render it effective at the same time; and finally, after having effected the desired sterilization, to remove all traces of the disinfecting matter from the milk. To that end, I first diffuse a comparatively very small mass of carbon monoxid in a proportionally very large quantity or volume of a suitable indifferent gas, preferably atmospheric air, and then treat the milk with this volume of prepared air, causing it to pass through the liquid as many times as appears necessary to affect and destroy all the noxious infusorial matter. By these means, the intended contact filtered and sterilized air containing a very small quantity of carbon monoxid relative to the quantity of the milk to be treated, repeatedly forcing such germicide laden air through and into intimate contact with the entire mass of the milk, and thereupon removing said gases from the milk by passing filtered and sterilized air through the same.

CARL WALTER VOLNEY.

Witnesses:
GEORGE W. BROWN,
HATTIE P. SIMMONS.

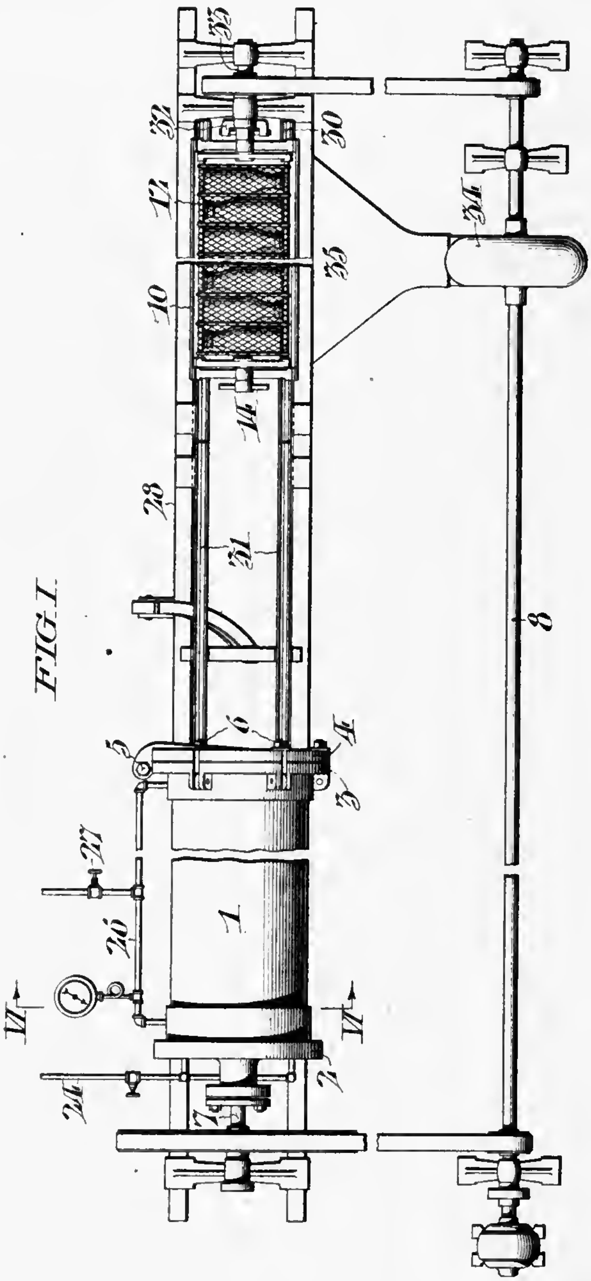
C. E. BONINE.

PROCESS OF STERILIZING MILK.

APPLICATION FILED DEC. 17, 1912.

1,081,483. Patented Dec. 16, 1913.

4 SHEETS—SHEET 1.



Witnesses
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James C. Bell

Inventor
Charles E. Bonine,
By Ralph Paul
Attorneys

C. E. BONINE.

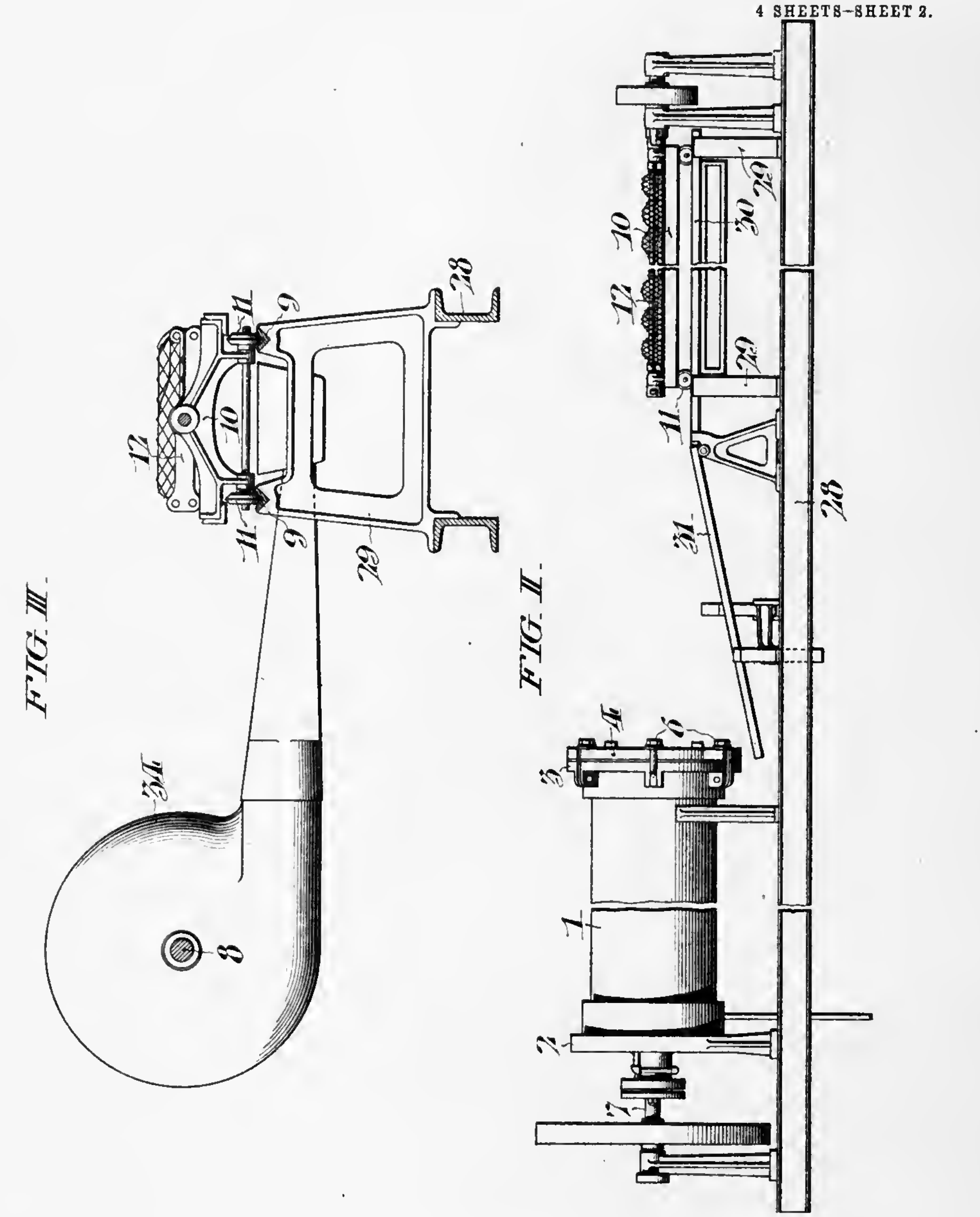
PROCESS OF STERILIZING MILK.

APPLICATION FILED DEC. 17, 1912.

1,081,483.

Patented Dec. 16, 1913.

4 SHEETS-SHEET 2.



Witnesses

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James H. Bell

Inventor

Charles E. Bonine,

By Bailey & Paul

Attorneys.

C. E. BONINE.
PROCESS OF STERILIZING MILK.
APPLICATION FILED DEC. 17, 1912.

1,081,483. Patented Dec. 16, 1913.

4 SHEETS—SHEET 3.

FIG. IV.

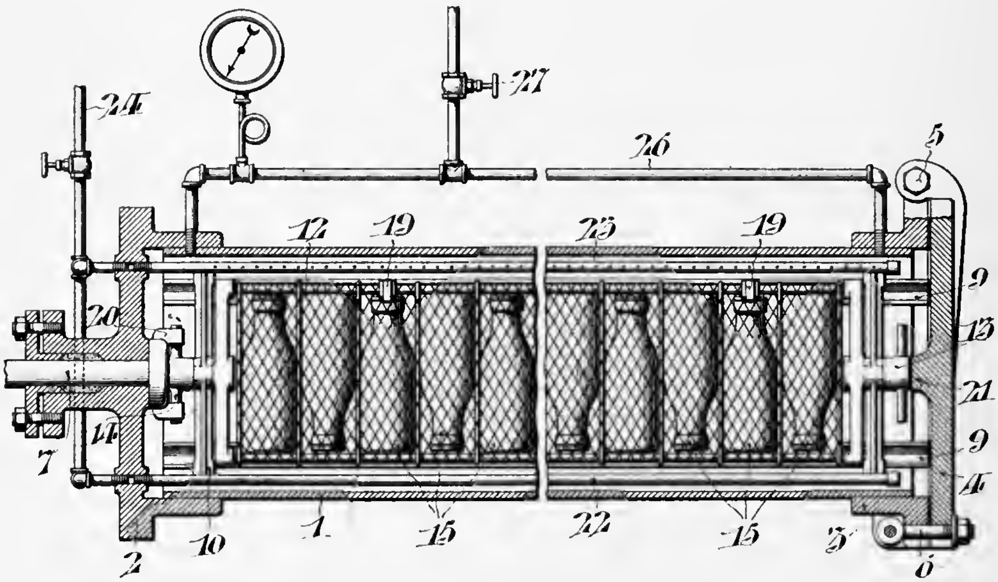
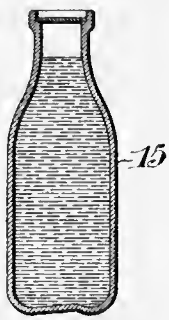


FIG. VIII.



Witnesses
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James H. Bell

Inventor
Charles E. Bonine,
By Raley & Paul
Attorneys

C. E. BONINE.

PROCESS OF STERILIZING MILK.

APPLICATION FILED DEC. 17, 1912.

1,081,483. Patented Dec. 16, 1913.

4 SHEETS—SHEET 4.

FIG. V.

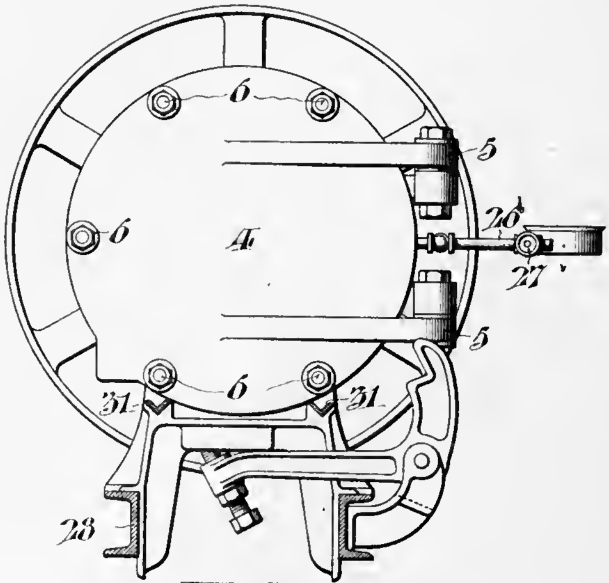


FIG. VI.

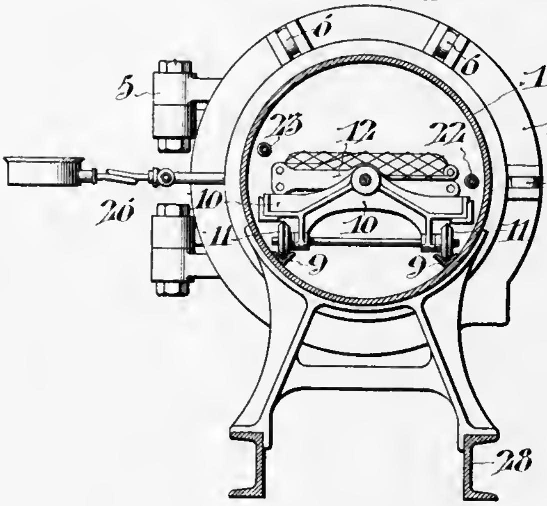
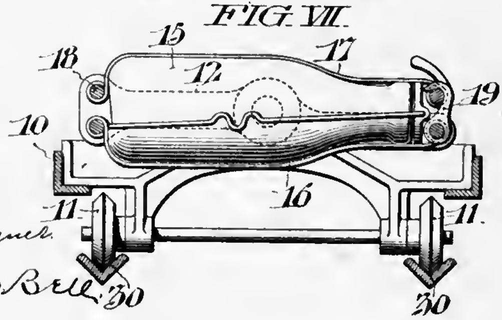


FIG. VII.



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES E. BONINE, OF PHILADELPHIA, PENNSYLVANIA.

PROCESS OF STERILIZING MILK.

1,081,483. Specification of Letters Patent. Patented Dec. 16, 1913.

Application filed December 17, 1912. Serial No. 737,195.

To all whom it may concern:

Be it known that I, CHARLES E. BONINE, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Processes of Sterilizing Milk, whereof the following is a specification, reference being had to the accompanying drawings.

It is well known that the taste and odor of milk are due, in a large measure, to the dissolved gases contained therein. Processes, as now practised, for sterilizing milk result in the separation of these gases from the milk which imparts thereto a boiled taste and a peculiar odor, both of which are objectionable to the consumer.

An object of the present invention is to provide a process whereby milk may be thoroughly sterilized without this resulting separation of the gases contained therein from the milk, and whereby the desired taste and odor of the milk are maintained.

A further object of the invention is to provide a process wherein the milk may be sterilized in the containers in which it is to be handled, or stored, which process prevents a separation of the gases from the milk, either during sterilizing or during the subsequent cooling of the milk.

These and other objects will in part be obvious, and will in part be hereinafter more fully disclosed.

In the drawings, which show one form of apparatus for carrying out my improved process, Figure I, is a plan view showing an apparatus wherein the milk may be placed in separate containers and sterilized by my improved process and subsequently cooled. Fig. II, is a side view of the same, the operating shaft and the blower being omitted. Fig. III, is a transverse sectional view showing the apparatus for cooling the containers in end view. Fig. IV, is a longitudinal horizontal sectional view through the sterilizing chamber. Fig. V, is an end view of the sterilizing chamber. Fig. VI, is a sectional view on the line VI, VI, of Fig. I. Fig. VII, is an enlarged sectional view showing one of the containers and the supporting frame therefor. Fig. VIII, is a view showing one of the containers filled with milk, in accordance with my invention.

The process consists generally of heating the milk to a temperature somewhat in excess of 100° C., long enough to destroy the bacteria, or to a higher temperature, approximately 130° C., until the spores are destroyed, and the maintaining of a surface pressure on the milk during the entire sterilizing of the same, which exceeds the vapor pressure of the milk, whereby the gases contained in the milk are prevented from separating therefrom. According to my process this surface pressure on the milk is secured by placing the milk in closed containers in which the milk is heated to sterilizing temperature and subsequently cooled. During the heating of the container and the contents, there occurs an expansion of the milk and the dissolved gases, an expansion of the air in the container over the milk, and also an expansion of the material forming the container, that is the volume of the container. If the volume of air in the container be rightly proportioned, the resulting pressure of the air on the surface of the milk will exceed the vapor pressure of the milk. I have found in practice that when the container is filled at about 20° C. and at atmospheric pressure, it should be filled to from 85% to 92% of its full capacity. The amount of milk placed in the container varies with the material of the container.

Referring to the apparatus shown in the drawings, the process will be described in further detail, it being understood, however, that the present apparatus is described purely for the purpose of a better understanding of the process set forth in the appended claims, and in no wise restricts or limits the scope of my invention.

In Fig. I, of the drawings, I have shown a sterilizing apparatus consisting of a sterilizing chamber 1, which is preferably cylindrical in shape. This sterilizing chamber is formed with a head 2, which is fixed thereon, and a head 3, similarly secured to the sterilizing chamber, and having a door 4, hinged at 5, to the head, so that the sterilizing chamber may be readily opened or closed. This door 4, is sealed when it is closed and is held closed by locking bolts 6, of the usual construction. A shaft 7, extends through the head 2, into the sterilizing chamber. This shaft is rotated from the main driving shaft 8, which may be operated from any suitable source of power.

Inside of the sterilizing chamber are two V-shaped tracks 9, 9, on which is adapted to roll a carriage 10, mounted on suitable wheels 11. This carriage consists of a suitable frame on which the wheels 11, 11, are mounted, and carried on the frame is a tray 12, which is pivoted to the supporting frame of the carriage. These pivotal supports are in the form of trunnions, which extend through their bearings and each is provided with a cross-arm 14. This tray for the containers is so proportioned that it may rotate in the carriage in the supporting bearings therefor. The containers 15, as herein shown, are of glass, and of the usual form. The containers are adapted to be placed on their sides in suitable wire pockets 16, formed therefor, and are held in place by a similar wire cover 17, which is hinged at one side, as at 18, and is held closed on the containers by suitable latches 19. (See Fig. VII.) When the containers are placed in the tray formed therefor, as above noted, and the wire cover closed on the same, they may be rotated with the tray.

The shaft 7, which extends into the sterilizing chamber, is formed with a forked clutch 20. When the carriage is rolled into the sterilizing chamber, the cross-arms 14, are caused to engage the clutch 20. The door 4, is formed with an abutment 21, which lies adjacent the opposite trunnion 13, of the carriage, and holds the cross-arms 14, in the clutch 20. By the rotating of the shaft 7, the tray holding the containers will be rotated in the carriage.

The sterilizing chamber, as herein shown, is heated by steam pipes 22, and 23, which extend lengthwise of the chamber. The pipe 23, is formed with openings on its upper face, which are directed so that when steam is admitted to the pipe, the jets are directed slightly outwardly toward the inner wall of the sterilizing chamber and away from the container held on the tray. The steam pipe 22, is formed with openings in the lower face thereof, which are directed so that the jets of steam issuing therefrom will be directed against the inner wall of the sterilizing chamber and away from the containers. Steam is admitted to the pipes 22, and 23, from a pipe 24, having a controlling valve 25, therein. The steam may be exhausted from the chamber through a pipe 26, connecting with each end thereof, and the pressure in the chamber may be controlled by a hand valve 27.

The container is closed by the usual form of cap, which may be held thereon in any desired way. As herein shown a retaining bail is used which clamps the cap to the container. Other devices may, however, be used for this purpose, and it is with this understanding that I refer to the container hereafter as sealed.

The sterilizing apparatus is mounted adjacent one end of a main supporting bed 28, and the cooling apparatus is mounted adjacent the other end thereof. This cooling apparatus consists of a frame 29, carrying V-shaped tracks 30, on which the carriage for the containers may roll. A track 31, may be also utilized for conveying the carriage from the sterilizing chamber to the cooling frame. When the carriage is placed on the cooling frame, the cross-arms 14, engage the clutch 32, carried by the shaft 33, mounted in suitable bearings on the main supporting frame 28. This shaft 33, is driven through suitable connections with the main shaft 8. In this position, the tray may be rotated in the carriage, while the containers are being cooled. The present apparatus is especially adapted for cooling containers made of glass, and I have, therefore, utilized in connection with the cooling apparatus, a blower 34, which is mounted on the main shaft 8, and is of the usual type. A blast of cool air may be delivered through a suitable connecting casing to a delivering nozzle 35, and from the delivering nozzle 35, against the containers in the rotating tray. It will be noted that the containers are so placed in the tray that they are rotated in planes extending longitudinally of the containers, and, therefore, the milk contained therein will be thoroughly agitated.

In carrying out my improved process, the milk to be sterilized is given a preliminary cooling to remove the animal heat, and is then placed in the containers in which it is to be stored or handled. These containers are filled within a certain percentage of the container volume. If the container is of glass, it is filled between 90% and 92% of its volume. The bottles or containers are then secured on the frame or tray 12, and the carriage is run into the sterilizing chamber. The door is closed and sealed and the main shaft operated at a slow speed of preferably 100 revolutions per minute. This rotating of the shaft will cause the bottles or containers carried on the tray or frame to rotate end over end. Steam is admitted to the sterilizing chamber through the pipe 24, the steam preferably being at about 50 pounds gage pressure. The agitation of the milk during the heating secures a uniform heating thereof. This treatment is continued at this pressure for a period of approximately five minutes, the period of time depending upon the thickness of the bottle walls, size of bottle, and character of treatment desired. Immediately at the end of this time, the steam valve is closed, shutting off the steam supply, and the exhaust valve is opened, discharging steam to the atmosphere. The door of the chamber is then quickly opened and the carriage carrying the bottles or containers is run out along the track to the cooling apparatus, where the tray or frame is again rotated. During this rotation of the tray, the fan or blower subjects the bottles or containers to a blast of air. The bottles are rotated in the blast of air for about ten minutes, after which they are cool enough to be handled and packed for shipment.

It has been found in practice that the steam pressure in the sterilizing chamber can be raised from atmospheric pressure to that indicated above very quickly when the bottles are rotated and the steam enters through a set of jets so that steam cannot impinge on any part of the bottle.

When the milk in the containers is subjected to the temperature of steam around the container, the heat at first is absorbed by the milk at a very rapid rate, which rate of heat flow is reduced as the temperature of the milk rises. The temperature of the milk would continue to rise at a decreasing rate until it finally reaches the temperature of the surrounding steam, if the containers are allowed to remain in the sterilizer a sufficient length of time. It is well known that steam at fifty pounds pressure has a temperature of approximately 147° C. As above noted, the temperature desired in sterilizing milk is approximately 130° C. In carrying out my process, the time of treatment is so gaged that the milk is allowed to reach about 130° C., at which time there is still a considerable difference between the temperature of the milk and the temperature of the steam, yet not such a great difference that the rate of temperature increase in the milk is so rapid, but that the operator is given a sufficient time margin within which to remove the milk from the sterilizer to the cooler without danger of too great variation in the temperature maximum in the milk from that desired. At a lower pressure than fifty pounds per square inch, the time of treatment required in order to reach the desired temperature in the milk would be so great that the constitution of the milk would be altered. At a greater pressure the rate of temperature change is so rapid that the operator cannot easily stop the treatment at the proper temperature. The length of the time of treatment therefore and the temperature of the steam are important items in securing the best results by my improved process, without causing the albumin in the milk to turn in color and to give a sufficient work period for the withdrawing of the container from the sterilizer. If metal bottles or cans are used, the time of treatment will be shorter, or the steam pressure varied, because of the better heat conductivity of the walls of the container, also if metal bottles are used, the same may be cooled after treatment by subjecting them to a spray of cool water in place of the air blast, as shown, in order to lower the temperature of the milk as quickly as possible.

It will be noted that by this process of treatment, the dissolved gases contained in the milk, when the same is first introduced into the bottle, cannot escape or be separated from the milk, as the pressure in the bottle during heating is substantially higher than the normal vapor pressure of the liquid, and the tendency for such gases to go out of solution is suppressed. If any such gases should be liberated, even to a slight extent, they will be again dissolved in the cooling cycle, owing to the thorough agitation.

The temperature to which the milk is to be heated, is such that the bacteria and spores are destroyed, if the milk is to be kept for any considerable period. If, however, it is intended to partially sterilize the milk—that is, where the milk is to be kept only a short time—then the maximum temperature of treatment may be such as to destroy only the bacteria. It is preferred, however, to effect complete sterilization of the milk, and the temperature to accomplish such treatment must approximate a maximum of 130° C. It has been found in practice that the milk being treated, if in glass containers, must fill such container over 85% of the full volume, in order to prevent its boiling—that is, in order to maintain a surface pressure on the milk in excess of the vapor pressure of the milk. It has been also found in practice that if the container be filled above 92%, the internal pressure is likely to burst the container. Therefore, I prefer to fill the bottle between 90% and 92% of its volume with the milk to be treated. The sealing of the bottle, after it is filled, and the sterilizing of the milk result, as above noted, in the destroying of the bacteria and the spores without causing the separation of the gases contained in the milk from the milk, with the undesirable result of changing the taste and odor.

From the above description it will be noted that by my improved process practically all possibility of the milk becoming contaminated during handling is removed. Furthermore, during the sterilizing of the milk, the container is also thoroughly sterilized.

While I prefer the above process, wherein the pressure on the surface of the milk is obtained through the relative unequal expansion of the milk, the air over the milk, and the material of the container, it is obvious that from certain aspects of the invention, the surface pressure on the milk may be otherwise obtained. The essential features of the invention broadly consist in the heating of the milk to sterilizing temperature, and the maintaining of a surface pressure on the milk during the heating or cooling, which is in excess of the normal vapor pressure of the milk.

Having thus described my invention, I claim:

1. The process of sterilizing milk, consisting in heating the milk to sterilizing temperature, agitating the milk during heating and maintaining, during heating, a surface pressure on the milk in excess of the normal vapor pressure of the milk.

2. The process of sterilizing milk, consisting in heating the milk to approximately 130° C., agitating the milk during heating and maintaining, during heating, a surface pressure on the milk in excess of the normal vapor pressure of the milk.

3. The process of sterilizing milk, consisting in filling a container with milk to 85% to 92% of the container volume, sealing the same, heating to sterilizing temperature and agitating the milk continually during heating.

4. The process of sterilizing milk, consisting in filling a container with milk to 85% to 92% of the container volume, sealing the same, heating to approximately 130° C., agitating the milk continually during heating and subsequently cooling the same in the container.

5. The process of sterilizing milk, consisting in filling a container with milk to approximately 90% of the container volume, sealing the same, heating to approximately 130° C., and agitating the milk continually during heating.

6. The process of sterilizing milk, consisting in filling a container with milk to approximately 90% of the container volume, sealing the same, heating to approximately 130° C., and agitating the milk continually during heating, and subsequently cooling the same in the container.

7. The process of sterilizing milk, consisting in placing the same in glass containers, each of which is filled to approximately 90% of its capacity, sealing the containers, heating the containers in a sterilizing chamber under pressure to about 130° C., and quickly withdrawing from the chamber and cooling with a blast of air, said containers being rotated during heating and during cooling.

8. The process of sterilizing milk, consisting in filling a container with milk to approximately 90% of the container volume, sealing the same, introducing into a sterilizing chamber holding the container steam at approximately fifty pounds pressure, agitating the milk during heating, permitting the container to remain in the sterilizing chamber until the temperature of the milk is approximately 130° C., then quickly withdrawing the container and cooling the same.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this sixteenth day of December, 1912.

CHARLES E. BONINE.

Witnesses:
JAMES H. BELL,
E. L. FULLERTON.

Milk - S

UNITED STATES PATENT OFFICE.

ALFRED RUTTER, OF MENTONE, VICTORIA, AUSTRALIA.

PROCESS OF STERILIZING MILK, CREAM, BEVERAGES, AND OTHER ALIMENTARY SUBSTANCES.

1,140,717. Specification of Letters Patent. **Patented May 25, 1915.**

No Drawing. Application filed December 19, 1913. Serial No. 807,692.

To all whom it may concern:

Be it known that I, ALFRED RUTTER, A. R. C. Sc., a subject of the King of Great Britain, residing at "Marlton," Florence street, Mentone, in the State of Victoria, Australia, analytical chemist, have invented a Process of Sterilizing Milk, Cream, Beverages, and other Alimentary Substances, of which the following is a specification.

This invention has for its object the destruction of the micro-organisms in milk, cream and other alimentary substances and beverages in such a manner as to economize the cost, increase the utility and widen the scope of the process and enable the substance treated to be received by the consumer in a sterilized condition and free from contamination and less susceptible to deterioration but without having its taste or nutritive or digestive qualities impaired.

It is well known that nascent oxygen and ozone have a very destructive effect on micro-organisms and attempts have been made to industrially apply nascent oxygen for such purposes by the employment of peroxid of hydrogen either directly or by chemical action. Peroxid of hydrogen however is of an unstable character and liable to quickly deteriorate besides which its presence in any quantity other than a trace is undesirable, and moreover it does not effectively sterilize except in undesirable quantities. The substances employed in this invention are stable at ordinary temperatures when kept in tubes away from moisture and air and by the use of this invention the object mentioned above can be attained in respect of many alimentary substances, and the excess of hydrogen peroxid, if any, is a minimized amount, and is so controlled that it is a secondary consideration to the production of oxygen to the maximum amount. For instance, alkalis, heat, ferments, catalysts, reducing agents and a low pressure are agencies which promote the decomposition of hydrogen peroxid and act against its formation, whereas in prior proposed processes the conditions which obtained both as regards method and material were such as to favor the production of hydrogen peroxid to the maximum degree, the use of hermetically sealed vessels with slow action materials tending not only to produce a maximum of hydrogen peroxid, but also preventing the decomposition of the hydrogen peroxid molecule. This is responsible for a considerable excess of hydrogen peroxid in the resultant product, which is exceedingly difficult of removal. Moreover, the production of solid precipitates in milk, beverages, and alimentary substances generally is disadvantageous on commercial and physiological grounds and the production of soluble matters is eminently necessary.

It is desirable that the process be carried out in vessels wherein the substance under treatment is protected from contamination during and after the operation and that the process be conducted under atmospheric pressure, a condition which favors the breaking down of the hydrogen peroxid molecule into water and oxygen.

I have found that by the introduction into the substances to be treated of a small proportion of the peroxid of such an alkali metal or alkaline earth metal as may without injurious or detrimental effect be introduced into the substances to be treated so that reaction will ensue with acids in the substances to be treated and (or) with one of the acids allowable to be introduced under the process hereinafter set forth and by the adoption of the process as hereinafter directed the destruction can be achieved of the micro-organisms in milk and cream and in some other alimentary substances in such a manner as to enable the substance treated to be received by the consumer in a sterilized condition free from contamination and less susceptible to deterioration and without impairing the taste or nutritive or digestive qualities of such substances.

Described in general terms my process is as follows: A very small proportion of sodium peroxid as previously mentioned but preferably sodium peroxid is gradually added to the substance for treatment and is thoroughly mingled therewith by constant stirring or agitation for the purpose of rapidly producing nascent oxygen and (or) ozone when heated in a vessel under ordinary atmospheric pressure. Unless the substance under treatment contains sufficient acid to neutralize or almost neutralize the alkali in the peroxid, an amount of some suitable acid (that is to say, an acid which when combined with the base of the peroxid will yield a salt which in the amount produced will have no injurious or detrimental effect upon the substance under treatment) such as citric phosphoric carbonic or sulfuric should be added. The substance under treatment should then be gradually warmed to and maintained at a temperature exceeding 30° C. and which may require to be varied in accordance with the nature and quality of such substance and for a period of time which may also require to be varied in like manner. The temperature should not be allowed to rise to a degree which would prejudicially affect the taste or impair the nutritive or digestive qualities of the substance under treatment, but subject to this condition should be as high as practicable. The amount of peroxid used must be as nearly as possible just sufficient to generate the requisite quantity of nascent oxygen and (or) ozone to destroy the micro-organisms in the substance under treatment. Should the acid naturally present in the substance to be treated be sufficient to fully neutralize or more than neutralize the alkali in the peroxid introduced carbonate of soda or the like may sometimes be used with good effect to reduce the acidity.

The process may be varied by first warming the substance to be treated before adding any of the materials and applying the process as described above.

Having in general terms described the process I will now more particularly describe its application in certain particular cases: In the case of milk gradually add from about 0.05 per cent. to about 0.15 per cent. by weight (in proportion to the degree of deterioration of the milk) of sodium peroxid with constant stirring. If the milk after such addition and stirring is alkaline, immediately add an amount of citric or other suitable acid as mentioned above, in quantity just sufficient to almost neutralize the alkalinity. The degree of alkalinity of the milk may be determined by titration and the quantity of acid required calculated from the chemical reaction. If the milk to be treated is free from acid and citric acid is employed in the process, 1.6 parts of citric acid to every part of sodium peroxid should be added as the sodium peroxid will thus be very slightly in excess. The milk should be placed in suitable vessels open to atmospheric pressure but as far as practicable protected from contamination in such a manner that air or gases can freely enter or leave the vessel, but all microbes are precluded from contaminating the liquid both during and subsequent to the process. The substance is accordingly treated at atmospheric pressure and the use of hermetically sealed vessels is thereby obviated. The milk is then gradually warmed by any suitable means to a temperature approximating to but preferably not exceeding 52° C., and maintained at that temperature for thirty minutes or more according to the degree of deterioration in the milk. The prolongation of the time for which the temperature is maintained for even four or five hours would not prejudicially affect the working of the process. The warming of the milk to the temperature mentioned above may, if preferred, immediately precede the application of the process. The presence of lactic or other acid if any in the milk to be treated will dispense with the necessity for the artificial addition of acid to an extent equivalent to the amount of lactic or other acid present.

In the case of cream the treatment is the same as above described for milk. If the cream has been ripened prior to the treatment the addition of acid will be rendered unnecessary by reason of the presence of lactic acid in the ripened cream.

In the case of grape juices, fruit juices, fruit pulp, beer, aerated waters and other beverages the treatment is also substantially the same as for milk, the amount of sodium peroxid used being approximately .05 per cent., and again the use of acid is unnecessary if present in sufficient quantity in the product treated.

It will be well understood that in lieu of sodium peroxid, potassium peroxid, or such other equivalent alkaline peroxid may be used as well in the presence of an acid when heated rapidly produce nascent oxygen and (or) ozone, and have no injurious or detrimental effect on the substance under treatment.

Having now fully described and ascertained my said invention and the manner in which it is to be performed, I declare that what I claim is:—

1. In the sterilization of alimentary liquids, treating such liquids at atmospheric pressure by gradually adding thereto and thoroughly mingling therewith a small proportion of sodium peroxid, and heating the said substance substantially as herein set forth.

2. In the sterilization of alimentary liquids, treating such liquids at atmospheric pressure by gradually adding thereto and thoroughly mingling therewith small proportions of sodium peroxid and an acid, and heating the said substance, substantially as herein set forth.

3. The improvements in and relating to

the sterilization of alimentary liquids by the production therein of nascent oxygen and ozone without the production of hydrogen peroxid to a prejudicial or undesirable extent in the manner herein specified.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ALFRED RUTTER.

Witnesses:
EDWARD N. WATERS,
WILLIAM G. HOLDEN.

B. JURIST.
APPARATUS FOR TREATING LIQUIDS.
APPLICATION FILED NOV. 27, 1911.

1,190,769.

Patented July 11, 1916.
2 SHEETS—SHEET 1.

Fig. 1.

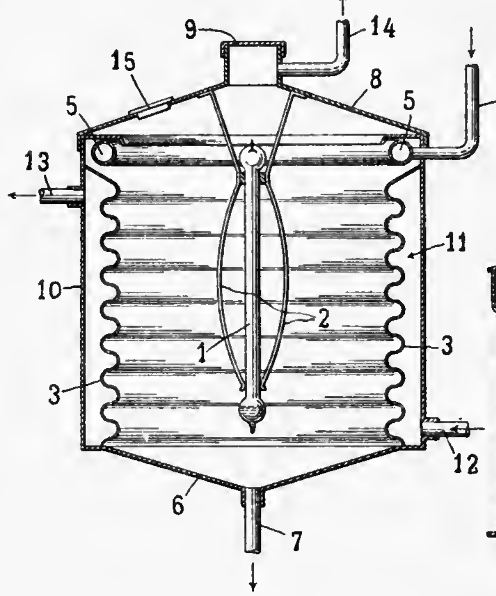


Fig. 2.

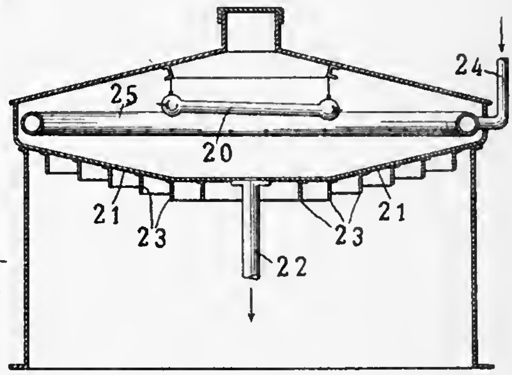
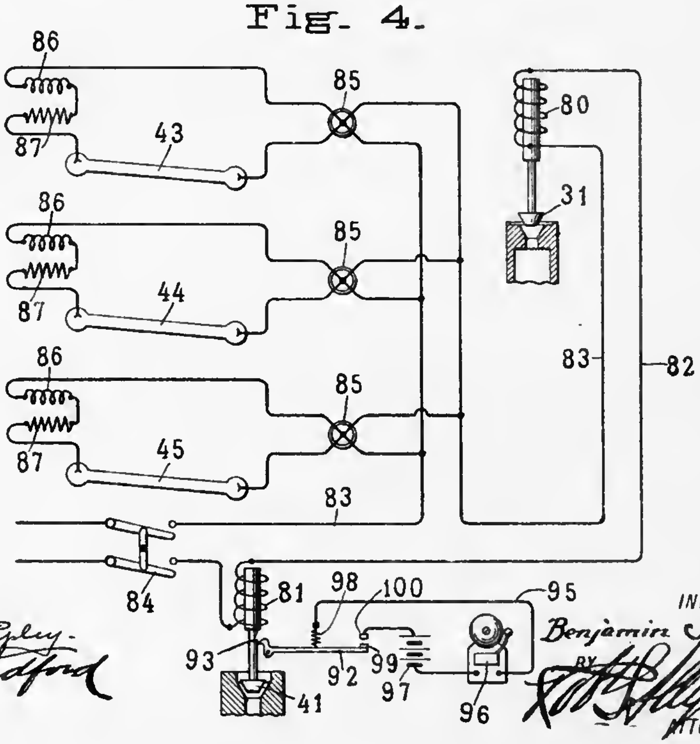


Fig. 4.



WITNESSES
J. Clyde Kipley
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INVENTOR
Benjamin Jurist.
BY
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ATTORNEY

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APPARATUS FOR TREATING LIQUIDS.
APPLICATION FILED NOV. 27, 1911.

1,190,769.

Patented July 11, 1916

2 SHEETS—SHEET 2.

Fig. 3.

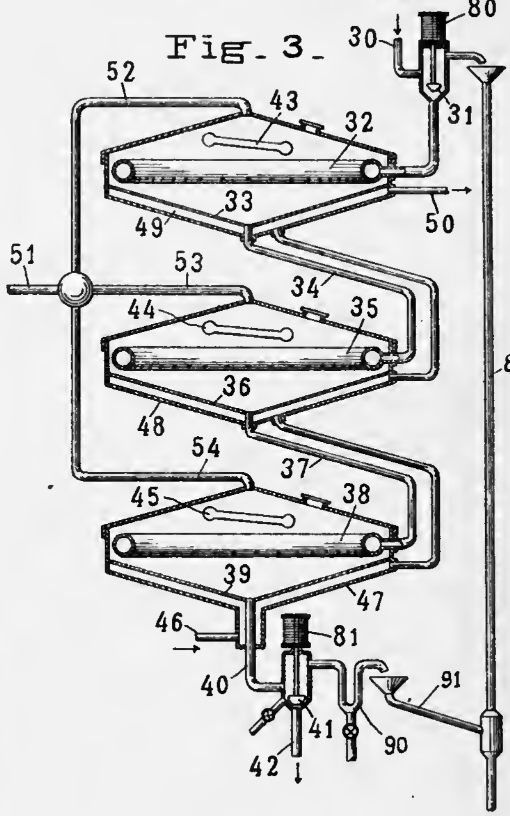
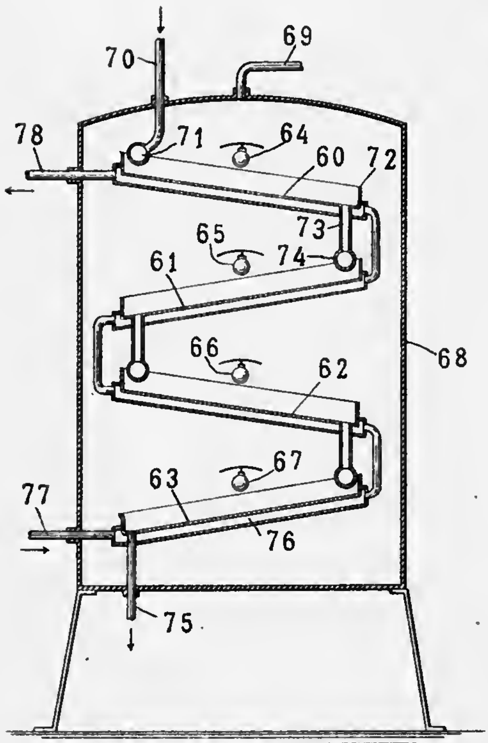


Fig. 5.



WITNESSES

J. Clyde Kipley
E. Bradford

INVENTOR

Benjamin Jurist.

ATTORNEY

UNITED STATES PATENT OFFICE.

BENJAMIN JURIST, OF NEW YORK, N. Y., ASSIGNOR TO BRYER H. PENDRY, TRUSTEE.

APPARATUS FOR TREATING LIQUIDS.

1,190,769. Specification of Letters Patent. Patented July 11, 1916.

Application filed November 27, 1911. Serial No. 662,555.

To all whom it may concern:

Be it known that I, BENJAMIN JURIST, a citizen of the United States, and resident of New York, in the county of Kings and State of New York, have invented certain new and useful Improvements in Apparatus for Treating Liquids, of which the following is a specification.

This invention relates particularly to the treatment of liquids with ultra violet rays.

Ultra violet rays have as is well known, remarkable bactericidal and chemical actinic powers. By reason of the power of destroying and inhibiting the growth of germs it has been proposed to use the ultra violet rays for the sterilization of liquids and by reason of their power to effect chemical changes it has been proposed to use them for certain industries for instance, the treatment and bleaching of oils and in the acceleration of various chemical processes.

The most effective lamps for emitting ultra violet rays at present on the market are vacuum lamps and usually operate most efficiently at a comparatively high temperature and for this reason it is well to avoid having the liquids which are to be treated come in contact with the lamp owing to the cooling effect of the liquid. It has also been found that when the liquid comes in contact with the lamp deposits are likely to be formed on the outer portion of lamp which are more or less opaque and thus interfere with the passage of the rays. Some liquids are themselves more or less opaque to ultra violet rays and in such cases the effects of the rays either bactericidal or merely chemical are limited to the depth of penetration which is determined by the degree of opacity. If an opaque liquid is treated in any considerable mass the effect is unsatisfactory owing to the fact that the penetration is so slight. The liquid is therefore not uniformly treated.

In any continuous process for the treatment of liquids if the lamp at any moment fails to operate it is obvious that a certain quantity of liquid will receive less treatment than it should. If this uncompletely treated liquid is permitted to mingle with the completely treated liquid or any part of it the product will of course be contaminated. In cases of sterilizing processes the effect might be very dangerous since some germs would be certain to pass into the product. It has also been found desirable in many cases to keep the liquid at a fairly low temperature during its treatment. As the lamps give off more or less heat it is therefore desirable to provide some suitable form of cooling device to prevent an undue rise in the temperature of the liquid. In some cases the ultra violet rays from a lamp produce certain changes in the surrounding air such as the formation of ozone. While this may be valuable in some processes for instance, in treating and bleaching oils, it is objectionable in other processes as for instance, in sterilizing liquid foods such as milk. It is therefore well to provide means if desired for carrying off the gaseous products.

It is the object of this invention to provide a process for the treatment of liquids and also to provide apparatus for carrying out such a process in which the foregoing principles will be properly developed so that liquids may be treated efficiently and completely in a continuous manner uniformly at proper temperatures. It should be understood that any suitable type of lamp for emitting ultra violet rays may be employed but as a mercury vapor lamp having a transparent quartz container is thus far the most efficient source of ultra violet light at present on the market, the invention will be described with particular reference to such a lamp.

Briefly considered the invention contemplates treatment of a thin layer of liquid by the rays from a lamp spaced apart from the liquid. The liquid is allowed to flow over a surface a short distance from the lamp at a uniform speed. The shape and design of the liquid guiding surfaces will depend upon the type, design and power of the lamp employed. The guiding surfaces should be such as to allow the liquid the greatest possible exposure with the greatest permissible velocity. For small installation a single lamp may be used but for commercial processes of magnitude a number of lamps may be employed, the liquid supporting or guiding surfaces being designed so as to cause the liquid to pass through the influence of the rays from the different lamps successively. The lamps not being in contact with the liquid operate at their most efficient temperature. The guiding surfaces may be cooled in a suitable manner. To avoid the accumulation of any deleterious gaseous products in the apparatus a suitable form of ventilation may also be provided. In case the current supplying the lamps fails at any time the supply of liquid to the apparatus can be instantly and automatically checked. In case of failure of a lamp or lamps to operate the product from the apparatus can be instantly and automatically prevented from flowing out into the receptacle for treating the liquid. When a number of lamps are used in one apparatus the flow of liquid can be automatically regulated according to the varying power of the lamps to emit ultra violet rays, be it in the case of a fluctuating electric current in the lamp or should one or more of the lamps fail to operate.

In the accompanying two sheets of drawings the principles of the invention are illustrated.

Figure 1, is a vertical cross sectional view of a simple form of apparatus embodying the invention with a vertical type or mercury vapor lamp. Fig. 2, is a vertical sectional view of another form of apparatus with a horizontal type of vacuum lamp. Fig. 3, is a vertical sectional view of a form of the invention made up of a plurality of independent sections so that the liquid is treated in successive stages. Fig. 4, is a diagrammatic view showing the electric circuit for operating the lamps and the valves. Fig. 5, is a vertical sectional view of another form of apparatus embodying the invention, the liquid guiding surfaces being arranged in the form of cascades one below the other.

In the form of apparatus illustrated in Fig. 1 the lamp 1 is supported by holders 2. Surrounding the lamp is the fluted or corrugated cylindrical wall 3 forming the guiding surfaces for the liquid to be treated. 4 is the supply pipe for the liquid which discharges into the annular distributing member 5 above the wall 3. The distributer 5 is provided with perforations so that the liquid is allowed to trickle in fine streams on to the corrugated wall 3. The bottom 6 of the treating chamber is funnel-shaped so that the liquid may collect and run out through the outlet or discharge pipe 7. The upper end of the treating chamber is closed by a cover 8. A cap, window or observation opening 9 may be provided at the upper end. In some cases the corrugated wall 3 may serve to provide all the cooling surfaces necessary or a jacket 10 may be provided outside of it forming a cooling chamber 11 through which air or other cooling fluid may be forced, entering through the pipe 12 and flowing out through the pipe 13. In case it is desired to remove the gases from the treating chamber a ventilating or suction pipe 14 may be provided. In case it is desired to admit fresh air to the treating chamber, a filtering inlet 15 may be provided if desired. The inside of the treating chamber may have its inner surface formed of white enamel so as to reflect such of the rays as are not completely absorbed in direct passage through the liquid. The observation opening 9 may be provided with colored glass if desired to protect the eyes of the operator. In this form of apparatus the liquid passes with considerable speed over the corrugated wall 3. Owing to the surfaces being corrugated, the liquid is subjected to the rays from the lamp through a suitable period of time, greater of course than would be the case if the wall 3 were smooth or uncorrugated. In some cases the corrugated wall 3 will provide sufficient cooling surfaces, in other cases the cooling jacket 11 may be provided. Ventilation by suction through the pipe 14 will also tend to keep down the temperature of the apparatus.

In the form of apparatus shown in Fig. 2 the lamp 20 is substantially horizontal and the guiding walls 21, 21 are inclined toward each other so as to form a flattened funnel leading to the discharge pipe 22. Cooling vanes 23 may be provided if desired. The liquid to be treated is supplied through the pipe 24 and the distributer 25 so that the liquid is distributed around the upper edges of the guiding walls 21, 21. This construction is particularly adapted to short horizontal lamps with high intrinsic power.

While the apparatus thus far described is suitable for small out-puts and while of course the capacity will be proportional to the size of the apparatus it has not been found practical to increase the capacity by a simple increase of size beyond certain limits. It is believed that the most practical method of increasing the capacity without shortening the time of exposure or excessively increasing the velocity of flow of the liquid is to build the apparatus in several independent sections through which the liquid passes successively as for instance in Figs. 3 and 5. The apparatus of Fig. 3 consists of the combination of three sections such as are shown in Fig. 2. The liquid to be treated is introduced from a suitable reservoir through the pipe 30, past the valve 31 and through the distributing member 32 into the upper chamber. The liquid then flows over the guide surfaces 33 out through the pipe 34 and through the distributing member 35 into the second chamber. It then flows over the surface 36, is collected and flows through the pipe 37 and is distributed by the member 38 into the lower treating chamber. When the liquid has flowed down the incline of the guide surfaces 39, it is collected and passes out through pipe 40 past the valve 41 and through discharge pipe 42 into a suitable collector or receptacle. The lamps 43, 44 and 45 supply the rays for treating the liquid in successive steps in the three chambers. Obviously any number of these chambers with suitable lamps may be employed. Cooling fluid may be supplied through the pipe 46 and pass upward through the jackets 47, 48 and 49 and out through the outlet 50. When desired, the chambers may be ventilated through the pipe 51 having branches 52, 53 and 54 leading to the three chambers respectively.

In the form of apparatus shown in Fig. 5 the liquid guiding members are in the form of inclined planes such as 60, 61, 62 and 63 arranged as cascades and with suitable lamps such as 64, 65, 66 and 67. These are all inclosed in a casing 68 from which the air may be withdrawn through a pipe 69. The liquid to be treated is supplied through pipe 70 and the distributer 71 which discharges fine sprays upon the upper edge of the incline 60. A ledge 72 forms the trough to collect the liquid into the pipe 73 and discharge it through the distributer 74 on to the incline 61. In a similar manner the liquid passes successively over the successive inclines beneath the successive lamps and discharges from the pipe 75 at the bottom. Cooling jackets such as 76 may be provided for the liquid surfaces through which a cooling fluid may be forced through the pipe 77 and out through the outlet pipe 78 at the top.

Multiple chamber treating apparatus in addition to the advantage of great capacity is particularly valuable on account of the uniform results obtained. As the liquid is treated in each chamber of the apparatus it is collected and redistributed into the next chamber and in this manner the liquid is thoroughly mixed so that in the final result there has been practically a perfectly uniform exposure of the entire mass of liquid. When the apparatus has once been installed it is easy to increase the capacity by simply adding one or more treating chambers and increasing the rate of flow of the liquid correspondingly. It is possible to operate one of these multiple unit systems at a fraction of its total capacity by simply shutting off one or more of the lamps. The liquid is then only treated in the other chambers where the lamps are running and the chambers where the lamps are turned off serve simply as mixing chambers.

Other important improvements of this invention reside in the automatic regulation of the supply of liquid to the apparatus and the automatic regulation of the discharge. The principles of this part of the invention are illustrated and described in conjunction with the type of apparatus shown in Fig. 3 but it will be obvious that the automatic regulation can be applied to any form of apparatus as heretofore described.

Valves 31 and 41 have previously been referred to as located in the supply and discharge pipes respectively. These valves are raised by the action of solenoids 80 and 81 respectively which solenoids are connected in series in the power supply circuit of the system. One branch 82 (Fig. 4) of the circuit connects the two solenoids 80 and 81 and the other branch 83 includes the lamps 43, 44 and 45. A switch 84 is provided for controlling the system. Each individual lamp may be controlled by a switch such as 85 and each lamp has in series with it, as is customary with such lamps, an induction coil 86 and a series resistance 87 for steadying and regulating the lamp current. As long as the current is on and the lamps are operating the solenoids hold up the valves so that the liquid is supplied to the apparatus and discharge into a suitable receptacle. As the current in the lamp circuit fluctuates the valve 31 is raised and lowered so that with an increase of current a greater supply of liquid to the apparatus is permitted and with a decrease of current there is a corresponding decrease in the supply of liquid. The result is that the supply of liquid is proportioned to the available current and the available effective power of the lamp or lamps. In case the supply of current fails or the lamps are all shut off, the valve 31 drops and stops the supply of liquid to the apparatus which then overflows into some suitable receptacle through the overflow pipe 88. In case the current is shut off or the lamps fail to operate while the liquid is being treated, the solenoid 81 releases the valve 41 and closes the outlet to the pipe 42 as previously mentioned. The liquid which at this time is in the apparatus is thus prevented from mingling with the properly treated liquid and flows out through the trap 90 into the overflow pipe 91. The trap 90 prevents air from flowing back into the outlet and contaminating the product. This is particularly valuable in sterilization processes.

On account of the danger which would result from mingling incompletely treated liquid with the completed product it is desirable to prevent the outlet valve 41 from being automatically raised after it has once been closed by failure of the lamps. The lamp or lamps may go out for only a few seconds so that while the supply would be shut off the liquid in the apparatus would not have time to entirely drain out before the valve 41 was again opened. This is particularly dangerous in sterilization processes. Similar difficulties may be encountered with quartz lamps operating under high pressure. The mercury vapor arc does not reach its highest actinic power until several minutes after starting and the result will be an imperfectly treated liquid if the flow of liquid was permitted before the lamp reached its proper running condition. A self-locking mechanism is therefore provided as indicated in Fig. 4. A pivoted lever 92 has one end adapted to engage in a notch 93 in the stem of the valve 41. When the valve is once closed, the lever engages in the notch 93 and prevents the valve from being opened until the operator manually resets the lever 92.

In order to warn the attendant of interruptions in the operation of the apparatus a signal system may be employed as illustrated in Fig. 4. A local circuit 95 contains a bell 96 or any other suitable form of signal device and a source of current 97. Any suitable form of contacts may be employed and may be conveniently actuated by the lever 92. In this case the lever 92 is pulled upwardly by a spring 98 and one end of the lever has a contact 99 adjacent to the stationary contact 100. When the end of the lever 92 falls into the notch 93 in the stem of the valve 41, the local signal circuit is closed and the signal given calling attention to the condition of the apparatus. Obviously where several treating apparatuses are used in one installation an electric annunciator may be used as a signal device. It is obvious that the supply valve 31 may also be equipped with a self-locking mechanism and signal device as just described. Thus in small apparatus such as those shown in Figs. 1 and 2 the safety valve 41 may be omitted and only a regulating valve 31 provided in the supply pipe.

It is obvious that many changes may be made in details of construction and method of operation herein shown and described and it should be understood that the claims are not limited to the specific disclosure herein except so far as required by the prior art.

In the claims where terms such as "lamp", "wall", "surface" etc., are used it should be understood that they are used in a broad sense to cover the use of one or more.

What I claim is:—

1. Apparatus for treating liquids comprising a treating chamber, a lamp, and electro-magnetically controlled means for regulating the supply and discharge of the liquid in accordance with the operation of the lamp.

2. Apparatus for treating liquids comprising a lamp for emitting ultra violet rays, a chamber for treating the liquid and means for automatically checking the discharge of liquid in case the lamp is extinguished.

3. Apparatus for treating liquids comprising a lamp for emitting ultra violet rays, a chamber for treating the liquid, means for automatically checking the discharge of liquid in case the lamp is extinguished and means for preventing the resumption of discharge in case the lamp is again started.

4. Apparatus for treating liquids comprising a lamp, a liquid treating chamber having a discharge outlet and an electro-magnetic device in series with the lamp for controlling the discharge.

5. Apparatus for treating liquids comprising a lamp, a liquid treating chamber having a discharge outlet, an electro-magnetic device in the lamp circuit operating a controlling valve in the discharge and a latch for automatically locking said valve when said valve has been closed and so preventing a resumption of the operation of said valve after the lamp has been once extinguished and before said automatic locking device is released.

6. Apparatus for treating liquids comprising a plurality of lamps for successively affecting the liquid and means variable with the operation of the lamps for regulating the discharge of liquid.

7. Apparatus for treating liquids comprising a plurality of independently operable sections, each section equipped with a distributer and a collector for the liquid connected so that the liquid flows successively through the series of said sections, in each section an electric lamp emitting ultra violet rays, a source of supply for the liquid to be treated connected to the distributer of the first section, an automatic valve for electro-magnetically regulating the supply of liquid to be treated according to the electric current in all lamps, means for directing the untreated liquid past the distributer of the first section when said valve in said supply is closed, a discharge pipe connected to the last section, an outlet for the perfectly treated liquid, an automatic valve for electro-magnetically controlling the connection between said discharge and said outlet so as to interrupt the connection upon interruption of the electric current in all lamps, means for directing the partly treated liquid in the discharge pipe past the outlet for the perfectly treated liquid when said valve has closed the connection between said discharge and said outlet, means for automatically locking said valve in the discharge pipe after it has been closed and means for signaling the interruption of the electric current.

8. Apparatus for treating liquids comprising a plurality of inclined liquid guiding members arranged in the form of a cascade, a source of ultra violet rays arranged adjacent each of said guiding members, a distributing member at the top of each inclined member, means for collecting the liquid at the bottom of each inclined member and delivering the liquid into the next lower

distributing member, means for supplying liquids to be treated and means for collecting the treated liquid, an electro-magnetically operable valve for controlling the outlet of liquid to be collected and a by-pass for the liquid operable when the said valve has closed the normal outlet, a latch for said valve and a means for signaling the interruption of the current.

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APPARATUS FOR THE STERILIZATION OF FLUIDS.

APPLICATION FILED APR. 8, 1915.

1,199,642.

Patented Sept. 26, 1916.

2 SHEETS—SHEET 1.

Fig. 1

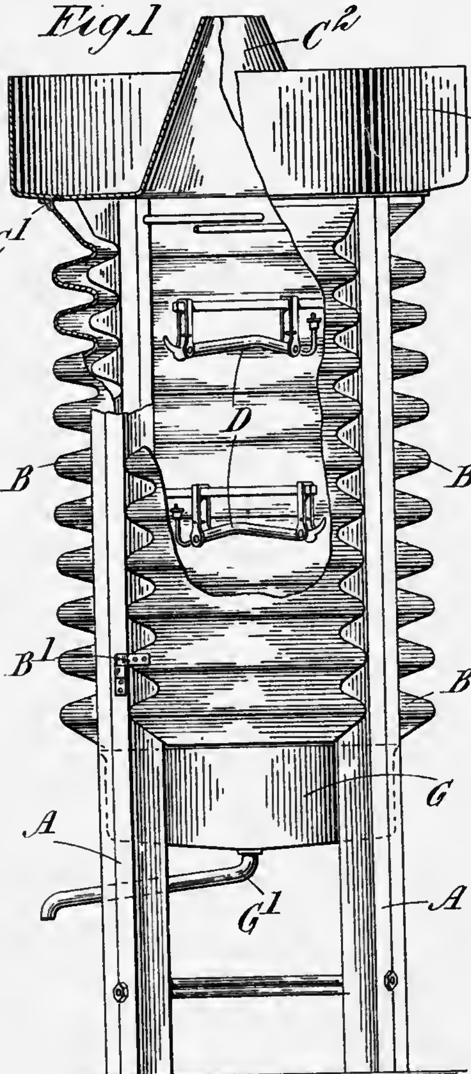


Fig. 2.

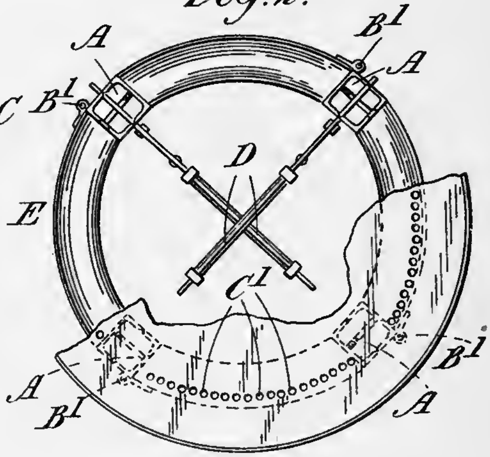


Fig. 4.

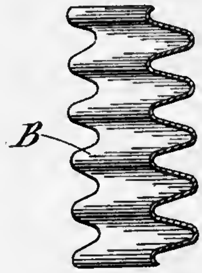
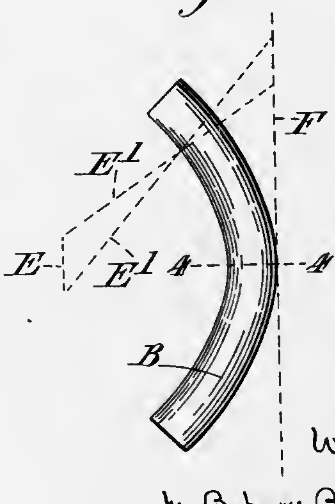


Fig. 3.



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Inventor
Wm R. Walkey
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Attys

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W. R. WALKEY.
APPARATUS FOR THE STERILIZATION OF FLUIDS.
APPLICATION FILED APR. 8, 1915.

1,199,642. Patented Sept. 26, 1916.

2 SHEETS—SHEET 2.

Fig. 5.

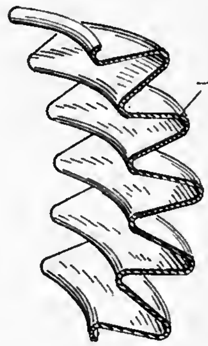
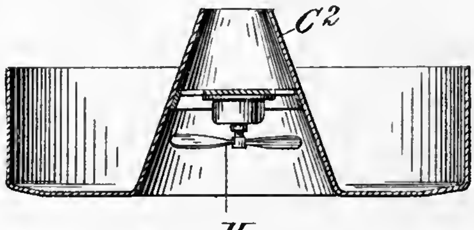


Fig. 6.



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Inventor
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by Bakewell, Byrnes & Parmelee
Attys.

UNITED STATES PATENT OFFICE.

WILLIAM RICHARD WALKEY, OF WESTMINSTER, LONDON, ENGLAND.

APPARATUS FOR THE STERILIZATION OF FLUIDS.

1,199,642. Specification of Letters Patent. Patented Sept. 26, 1916.

Application filed April 8, 1915. Serial No. 19,896.

To all whom it may concern:

Be it known that I, William Richard Walkey, a subject of the King of England, residing in Westminster, London, England, have invented certain new and useful Improvements in Apparatus for the Sterilization of Fluids, of which the following is a specification.

This invention relates to apparatus wherein is employed ultra-violet light for the sterilization of milk, beer and other liquids, more particularly opaque liquids, such as milk.

The object of the present invention is to provide a sterilizing apparatus, the efficiency of which shall be considerably greater than apparatus hitherto employed and to effect this the surface over which flows the fluid to be sterilized, is arranged in a particular manner and is of a particular character, such as will afford the best possible concentration of the light-rays upon the fluid.

Thus, according to this invention, a sterilizing apparatus comprises in combination a source of ultra-violet light and a stationary member providing a surface over which the fluid to be sterilized may flow in contact by adhesion or surface tension under the action of gravity, (sometimes referred to as capillary attraction) in a thin film to be acted upon by the said ultra-violet light-rays, characterized by the said surface being corrugated in a vertical plane and also curved as a whole so that the rays of light from the source strike the fluid in a normal or substantially normal direction or at least are inclined away from the normal to a substantially less degree than would be the case if an uncurved surface were employed in place of the curved surface. Preferably means are also provided for maintaining a circulation of air over the said surface.

According to one particular embodiment of the invention there is a plurality of surfaces curved as above described and arranged symmetrically around the source of light. More particularly the said surfaces are curved apart from their corrugations only in one plane, generally in a horizontal plane.

The invention will be more clearly understood by reference to the following description taken in connection with the accompanying drawings which illustrate a preferred embodiment thereof, and in which—

Figure 1 is an elevation, partly in section, of the apparatus; Fig. 2 is a plan of Fig. 1, parts being removed for clearness; Fig. 3 is a plan of one of the surfaces having a convenient curvature; Fig. 4 is a section on line 4—4 of Fig. 3. Figs. 5 and 6 diagrammatically illustrate modified forms of portions of the apparatus.

Like letters indicate like parts throughout the drawings.

The main frame of the apparatus consists of vertical supports A tied at A^1 at the top and bottom. Between each adjacent pair of supports A is a swinging side B, each of which is identical so that a description of one will suffice for all. The important feature of the sides is that they shall be curved as shown in plan in Figs. 2 and 3. They may constitute swinging sides by being hinged at B^1 to the supports A and, if desired, any convenient form of clip may be employed to hold them in place. Supported above the sides B is a tank C having holes C^1 disposed close to the upper edge of the sides B so that fluid may fall by gravity from the tank C on to the sides. The holes C^1 are so dimensioned that the fluid passes on to the side B in a thin film and by adhesion under the action of gravity flows over the surface on the corrugations.

Arranged centrally in the tank C is a funnel C^2 which opens the interior of the apparatus to the outer surrounding atmosphere and serves as an uptake for the exit of any ozone which may be formed and also for the air as it becomes slightly heated during the operation of the apparatus. Thus a circulation of air is maintained which keeps the air in the apparatus cool and pure.

Within the apparatus is a source of ultraviolet light which may conveniently consist of two mercury vapor lamps D suspended from the support A. The curvature of the sides may be such as to, as closely as possible, approximate that of a circle struck from a center approximately coinciding with the position of the source of light. Thus, referring to the dotted lines in Fig. 3, assuming E to be the lamp, it will be seen that while a ray, diagrammatically shown at E^1, strikes the curved surface B substantially in a normal manner, it strikes the plane surface F in an oblique direction, while similarly a ray, such as E^2, far more nearly approximates to a normal ray in relation to the curved surface B than it does to the plane surface diagrammatically shown at F.

It has been found convenient in practice to curve the surface B on either the lines of a parabolic curve or of a circle having a somewhat larger diameter than the diameter of the apparatus, which latter may conveniently be 12–18 inches internally. The fluid drains from the sides B into a receptacle G from which it is removed by a drain-pipe G^1.

Although the invention has been described in detail it is not limited to the particular construction illustrated as that is shown merely as one convenient arrangement of the various parts. Thus, the surfaces B may be curved in their length from top to bottom as diagrammatically shown in Fig. 5 to increase the benefit obtained from the invention. Further, a fan H may be employed in conjunction with the funnel or uptake (see Fig. 6) to cause a continuous flow of air through the apparatus and to remove positively the ozone and warm air and at the same time more effectively to keep the apparatus cool.

What I claim as my invention and desire to secure by Letters Patent is:—

A sterilizing apparatus comprising in combination, a source of ultra-violet light, a plurality of hinged members arranged around the source of light each of said members having a surface which is curved so that it presents a concavity to the source of light and has on it corrugations which are transverse to its vertical axis, an annular container surmounting the said members and having a central chimney-like extension and peripheral orifices communicating with the inner faces of the said members for the purpose described, and means to remove the fluid after it has been sterilized from the lower edges of the said members.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM RICHARD WALKEY.

Witnesses:
H. D. Jameson,
O. J. Worth.

J. MERIE.

PROCESS OF STERILIZING LIQUIDS.

APPLICATION FILED APR. 17, 1914.

1,230,751. Patented June 19, 1917.

2 SHEETS—SHEET 1.

Fig. 1.

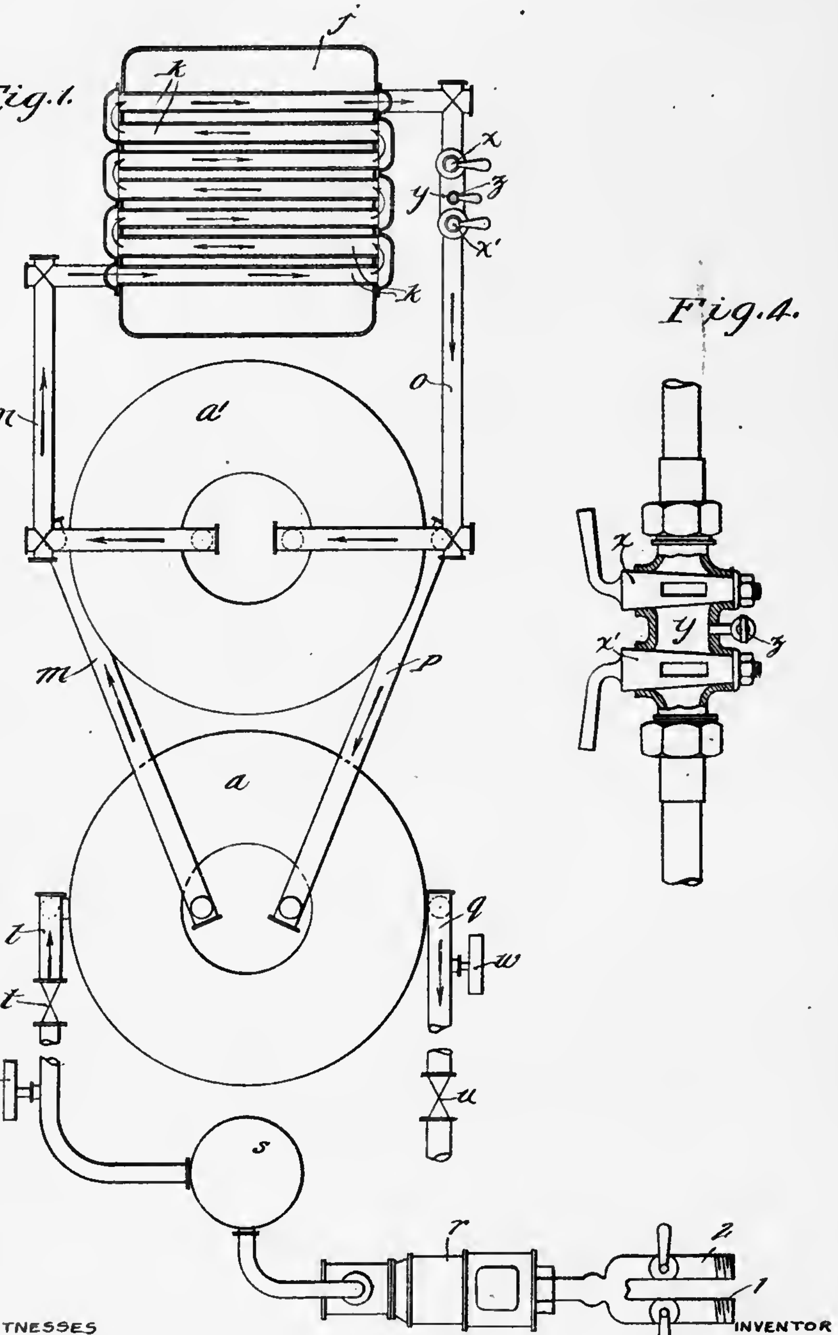

Fig. 4.

WITNESSES

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PROCESS OF STERILIZING LIQUIDS.
APPLICATION FILED APR. 17, 1914.

1,230,751. Patented June 19, 1917.

2 SHEETS—SHEET 2.

Fig. 2.

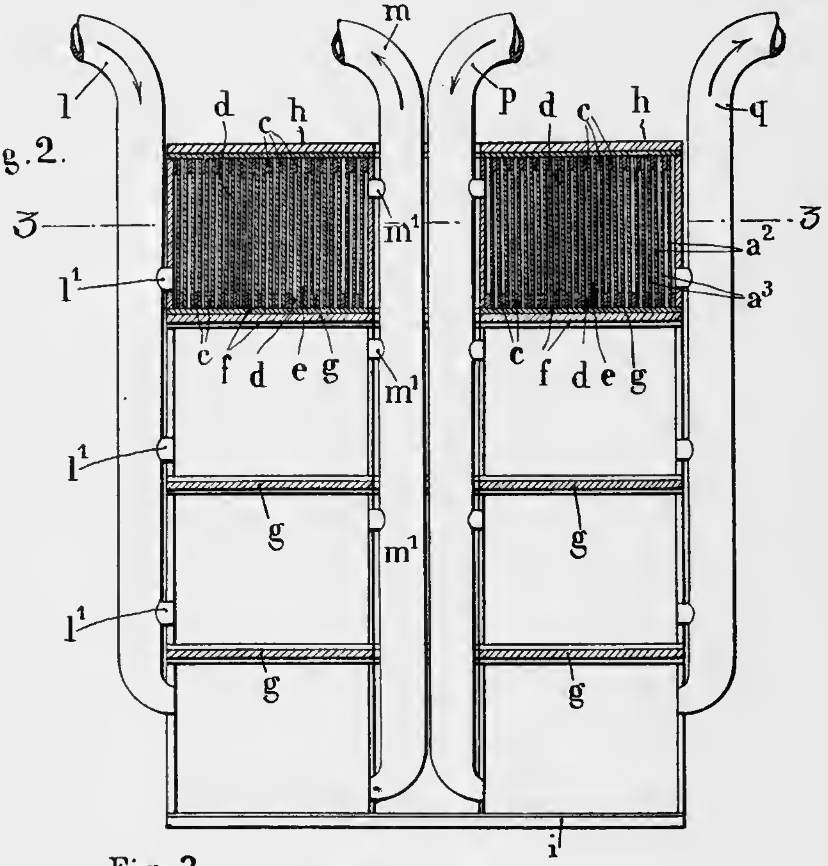
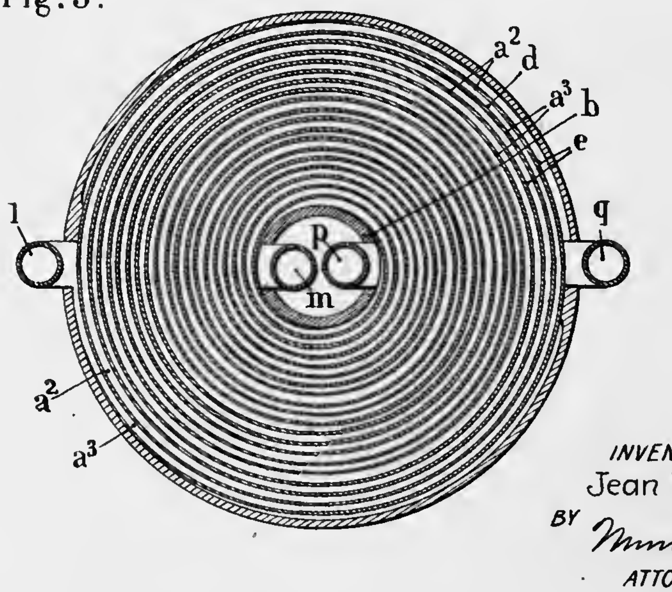


Fig. 3.



INVENTOR
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UNITED STATES PATENT OFFICE.

JEAN MÉRIE, OF PARIS, FRANCE.

PROCESS OF STERILIZING LIQUIDS.

1,230,751. Specification of Letters Patent. Patented June 19, 1917.

Application filed April 17, 1914. Serial No. 832,660.

To all whom it may concern:

Be it known that I, JEAN MÉRIE, of 135 Rue d'Alésia, in the city of Paris, Republic of France, have invented Improvements in the Process of Sterilizing Liquids, of which the following is a full, clear, and exact description.

In the specification of my pending patent application filed December 18th, 1912, Serial No. 737,412, I have described a process of sterilizing milk in which the milk, protected from the air, is continuously circulated under constant pressure through conduits which are of constant area in order to avoid, in the course of the operation, any prolonged contact of the milk with the walls of the apparatus and any expansion of the liquid likely to lead to the liberation of the gases dissolved in the milk.

The apparatus by means of which this process is carried into effect, comprises a sterilizing apparatus proper and a heat-recuperator or economizer connected therewith, in which the milk to be sterilized is brought gradually to a temperature very near to the sterilizing temperature before it is admitted to the sterilizing apparatus, by the heat given off by the sterilized milk flowing out of the latter.

The present invention relates to improvements in this process of sterilization and has for an object to permit of the initial sterilization of the apparatus before the liquid to be treated is admitted thereto and to bring about the sterilization of the liquid at the very commencement of the operation so that at no time shall there be any prolonged contact of the liquid with the walls of the apparatus or any stoppage of its circulation, from which it follows that at no time during the operation is there produced either "scorching" of the casein or caramelization of the lactose.

The accompanying drawing schematically illustrates the sterilizing apparatus wherein the present process is carried out:

Figure 1 shows in a plan view the whole of the sterilizing apparatus.

Fig. 2 is a detail view showing an elevation of a heat-recuperating device partially in vertical section.

Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 2.

Fig. 4 is a detail view illustrating the valves and chamber in the outlet of the coil of the sterilizer proper.

As shown in the drawing, such sterilizing apparatus comprises:

1. Two heat-recuperating or economizing devices a, a', consisting of several superposed elements, each of which, as shown by Figs. 2 and 3, is constituted by two sheets of tinned copper a^2, a^3, spirally coiled, about a core b; the said sheets are joined together by bands c which alternately close the said elements on the upper side and on the lower side, as shown in Fig. 2. The bands c serve to connect the sheets a^2, a^3, and maintain between the latter the space for the circulation of the liquid. Thus each element comprises two channels d, e, the one being open at the bottom and the other at the top. Two successive elements are separated by two sheets of rubber f or other elastic material, between which is placed a copper plate g. Above and underneath the apparatus are two strong plates h, i, which may be connected with each other by bolts, whereby the whole is united.

2. A heater or sterilizer constituted by a vessel j, heated in any suitable manner and crossed by parallel tubes k, connected on the outside of the vessel by removable intercommunications. The said tubes constitute a coil immersed in water in the vessel, the water forming a water bath, the temperature of which may be easily regulated, so that the same remains constant.

The liquid to be treated comes by a pipe l and enters the channel d of each element of the first heat-recuperating device a by nozzles l', and flows through the said channel; and then flows out through the nozzles m' and is introduced from the conduit m into channel d of each element of the second heat-recuperating device a'. On leaving the latter, the liquid passes through the pipe n to the coil k of the sterilizer proper. The sterilized liquid on flowing out of the latter is introduced from the conduit o into the channels e of the heat-recuperator a', then on leaving the latter flows through the pipe p into the channels e of the heat-recuperating device a, and finally flows out of the apparatus through the pipe q.

In order to provide for a supply and circulation of the liquid under a constant pressure, the plant, as shown in Fig. 1, in front of the first heat-recuperating device a, has a pump r, and a closed tank s which acts to regulate the pressure. In Fig. 1, an inlet for water to the apparatus is indicated at 1, and an inlet for milk or other liquid to be sterilized, is indicated at 2, cocks controlling said inlets.

On the inlet and outlet of the first heat-recuperator a are mounted two valves or cocks t, u, and two pressure gages v, w, which permit of regulating the discharge of the liquid at the desired pressure.

The inlet valve t being quite open, it may be ascertained on the pressure gage v whether the pressure, under which the liquid is forced, corresponds to the pressure or tension of the vapor at the sterilizing temperature; by adjusting the outlet valve or cock u, the flow of liquid may be regulated for the delivery desired.

The pressure being held constant at the inlet, the pressure at the outlet is also constant, for a constant delivery.

In the present improved process, at the commencement of the operation, the apparatus is filled with an inert liquid, for instance water, which enters the apparatus at the water inlet 1. The operation begins by filling with water the whole of the apparatus, that is to say, the heat-recuperators a, a', the coil k of the sterilizer proper and the whole of the piping; then the sterilizer is heated to the sterilizing temperature. The outlet cock u is then slightly opened, the water contained in the sterilizer coil k is evaporated and the steam so formed forces the water in front of it; when the steam appears at the cock u, the operator is thus warned that the apparatus is sterilized.

When this sterilization is completed the cock u is closed and water is forced by the pump r into the apparatus for filling it again. When the apparatus is filled with water and the cocks of the circulation closed, the sterilizer is heated, preferably by admiting in the water bath of the sterilizer, until the whole of the apparatus is brought into the normal condition of service. When the temperature has reached 80° c., for instance, the circulation valves t, u are slightly opened, the temperature of the liquid entering the apparatus increases rapidly and in a few minutes reaches very nearly the sterilizing temperature (about 110°) its passage into the heated sterilizer at last giving it the temperature required for the sterilization, (115°).

When equilibrium of temperature or the normal condition of service has been established the water inlet is closed and milk is introduced into the apparatus through the milk inlet 2, from a reservoir maintained at the pressure necessary to equilibrake the tension of the vapors produced at the sterilizing temperature. Thus the milk is introduced so that the operation may proceed without change, stoppage, or expansion, the milk forcing the water in front of it to and out of the outlet.

The sterilization of the milk is thus effected according to the conditions set out in the above mentioned patent application, that is to say without any risk either of caramelizing the lactose or of scorching the casein.

At the end of each operation it is necessary to expel the milk to the last drop in order not to leave any of it in prolonged contact with the hot walls of the passages; to this end the inlet for the milk is closed and the apparatus is filled with water immediately after the exit of the milk, while continuing to heat the sterilizer, so that the said cleaning water is itself sterilized. The water so introduced forces in front of it the milk which is still in the apparatus. Water is so forced through the apparatus until such water is delivered quite clear.

The apparatus thus cleans itself by the passage of the hot water and may remain in operation for several weeks without being taken to pieces if the precaution be observed of passing through it an alkaline solution from time to time in order to get rid of the greasy residues which adhere to the walls.

At the end of each operation the sterilizer remains full of water under pressure.

In order to avoid, when the heating of the sterilizer is stopped, the water which has not yet passed through the sterilizer (and which has not been sterilized) from contaminating the sterilized water which has passed through the sterilizer, the exit pipe of the sterilizer is provided with a set of valves by means of which this contamination is avoided.

On the outlet pipe of the coil k of the sterilizing apparatus are arranged two valves x, x' mounted at each end of a chamber y which is provided with a purge cock z. When the two valves x, x' are closed the purge cock z is opened in order to empty the chamber y which is then dried by heating it by a flame so as to create between the two valves x, x' a dry and sterilized chamber.

It will be understood that when the apparatus is filled with water at the close of an operation and the heating of the sterilizer is stopped, the above described arrangement is used to separate the sterilized water which has passed through the sterilizer from the unsterilized water and prevent contamination of the sterilized water.

With this arrangement it is not necessary, when the operation ceases and the heating of the sterilizer is stopped, to begin the whole process anew.

When the apparatus is to be put again into operation the valves x, x', are opened to allow passage therethrough only at the moment when the water which the coil k of the heating device or sterilizer contains has reached the sterilizing temperature.

Beer, wine, cider, and in fact all kinds of alimentary liquids as well as water, may be treated by this improved process.

Claims:

1. A process for sterilizing alimentary liquids in a sterilizing apparatus, consisting in sending water into the whole of the apparatus, at the beginning of the operation, in bringing this water to the sterilizing temperature, in causing said water to be displaced by the liquid to be treated and, at the end of the operation, in displacing by water the liquid which has been treated.

2. In a process for sterilizing alimentary liquids in a sterilizing apparatus, displacing by water the liquid which has been treated leaving the apparatus full of water when the operation ceases, and separating the sterilized water which has passed through the sterilizer from the unsterilized water in the apparatus.

3. A process for sterilizing alimentary liquids in a sterilizing apparatus, consisting in sending water into the whole of the apparatus at the beginning of the operation, in bringing the water to the sterilizing temperature, in displacing said water by the liquid to be treated, then, a little before stopping the operation, in displacing by water the liquid which has been treated, and finally in separating the sterilized water in the apparatus from the unsterilized water, to prevent, while the apparatus is at rest, the contamination of the sterilized water.

The foregoing specification of my improvements in the process of and in apparatus for sterilizing liquids signed by me this second day of April, 1914.

JEAN MÉRIE.

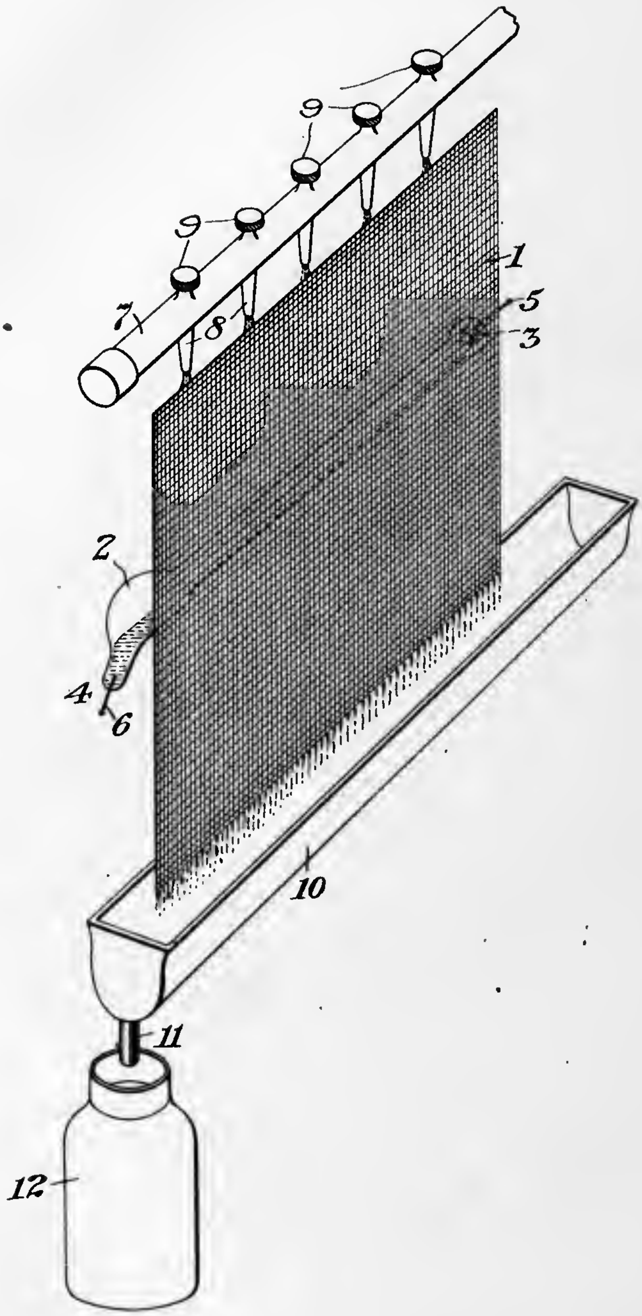
Witnesses:
CHAS. P. PRESSLY,
RENÉ THIRIOT.

F. G. KEYES.

STERILIZING APPARATUS.

APPLICATION FILED JULY 1, 1913.

1,235,698. Patented Aug. 7, 1917.



Witnesses:
Chas. J. Clagett
Thos. H. Brown

Frederick G. Keyes Inventor

By his Attorney
George H. Stockbridge

UNITED STATES PATENT OFFICE.

FREDERICK G. KEYES, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO COOPER HEWITT ELECTRIC COMPANY, OF HOBOKEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

STERILIZING APPARATUS.

1,235,698. Specification of Letters Patent. **Patented Aug. 7, 1917.**

Application filed July 1, 1913. Serial No. 776,757.

To all whom it may concern:

Be it known that I, Frederick G. Keyes, a citizen of the United States, and resident of Boston, county of Suffolk, State of Massachusetts, have invented certain new and useful Improvements in Sterilizing Apparatus, of which the following is a specification.

In a companion application executed on the same date herewith, I have shown and described an invention relating to the treating of liquid by exposure to a suitable active influence for sterilization or other purposes. As a source of the active influence, I have therein shown a mercury vapor apparatus comprising a quartz container hermetically sealed and electrodes therein joined to suitable leading in wires, whereby, in operation, ultra-violet radiation is produced.

The special object sought to be obtained by the apparatus of the companion application is that of securing a thin uniform layer of suitable material which is to be exposed to the action of ultra-violet radiation supplied through walls of the source. In the present instance I attain the desired uniformity and thinness of liquid material by utilizing as a surface along which the liquid, such as milk, is allowed to pass while exposed to the rays from the source, a sheet or screen of gauze or fabric, usually of fibrous material, the same being either suspended from or supported upon a metallic or other surface. The liquid to be sterilized or otherwise affected drops down over this screen and is separated into uniform layers as it passes downward, said layers being sufficiently thin to admit the complete sterilization of the liquid or, in the case of certain other materials, say the bleaching or partial oxidation of oil, as the case may be. From this it appears that sterilization is not the sole object to which my apparatus may be applied but other results aimed at may be attained according as they are appropriate to the properties of the liquid to be treated.

I show such a screen as I have described in the accompanying drawing.

Referring to the accompanying drawing, the part 1 is a screen suspended by means not shown in such a position as to be exposed to the radiation from a source of ultra-violet light. The screen may be of material such as iron or copper, in which case it is preferably tinned before being woven into the mesh. When material such as metallic gauze is employed it can readily be washed off after use so that the same gauze or fabric may be employed repeatedly. Should the gauze be made of fibrous material, it might, in case milk, for example, was the liquid allowed to pass over it, have to be removed after every use and replaced by a fresh piece.

The liquid to be treated is admitted through a tube 7, through which pass at intervals drips, 8, 8, subject to regulation by mill-heads 9, 9. By the proper manipulation of the mill-heads, the amount of liquid passing through each drip is regulated until all become adapted to furnish a practically uniform supply which then falls upon the upper edge of the gauze 1, whence it passes downward by gravity into a trough 10 and passes out through an outlet 11 into a jar or other receptacle 12. During this passage the liquid is subject to the effects of radiation from the quartz lamp or tube 2, and when it passes into the jar 12 it is in a sterilized or otherwise altered condition.

When the gauze fabric is made of fibrous material, it is evident that the mesh of said material may be so chosen as to act in coöperation with gravity in the nature of a sponge, attracting the liquid uniformly through the region occupied by the fabric.

I claim as my invention:

1. A sterilizing apparatus comprising a gauze screen supported to hang in a vertical plane, means for distributing the liquid to be sterilized to the top of the gauze, a trough for cooling the sterilized liquid at the bottom, and a source of ultra-violet radiation in proximity to the gauze.

2. A sterilizing apparatus for liquids comprising a gauze fabric supported to hang in a vertical plane, means for distributing the liquid to be sterilized to the top of the fabric, and a source of ultra-violet radiation in proximity to the fabric.

3. In a sterilizing apparatus for liquids, a source of ultra-violet radiation, a gauze fabric of fibrous material supported to hang in a vertical plane, means for distributing the liquid to be sterilized to the top of the said fabric, the meshes of the gauze fabric being close together.

Signed at New York in the county of New York and State of New York this 27th day of June A. D. 1913.

FREDERICK G. KEYES.

Witnesses:

WM. H. CAPEL,

THOS. H. BROWN.

J. G. F. HIEBER.
PROCESS FOR TREATING FRUIT JUICES.
APPLICATION FILED OCT. 21, 1918.

1,325,094. Patented Dec. 16, 1919.

2 SHEETS—SHEET 1.

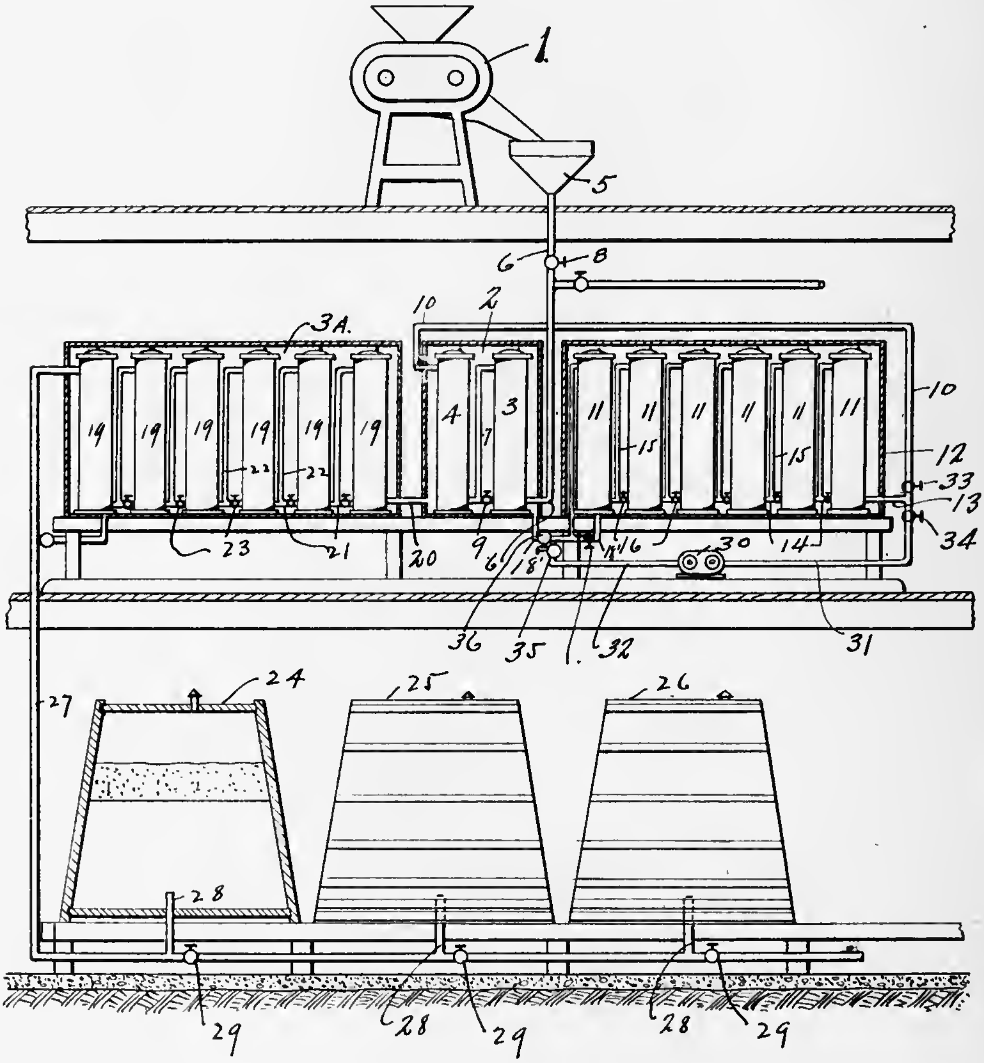


Fig. 1

Inventor
John G.F. Hieber

By Herbert E. Smith

Attorney

J. G. F. HIEBER.

PROCESS FOR TREATING FRUIT JUICES.

APPLICATION FILED OCT. 21, 1918.

1,325,094. Patented Dec. 16, 1919.

2 SHEETS—SHEET 2.

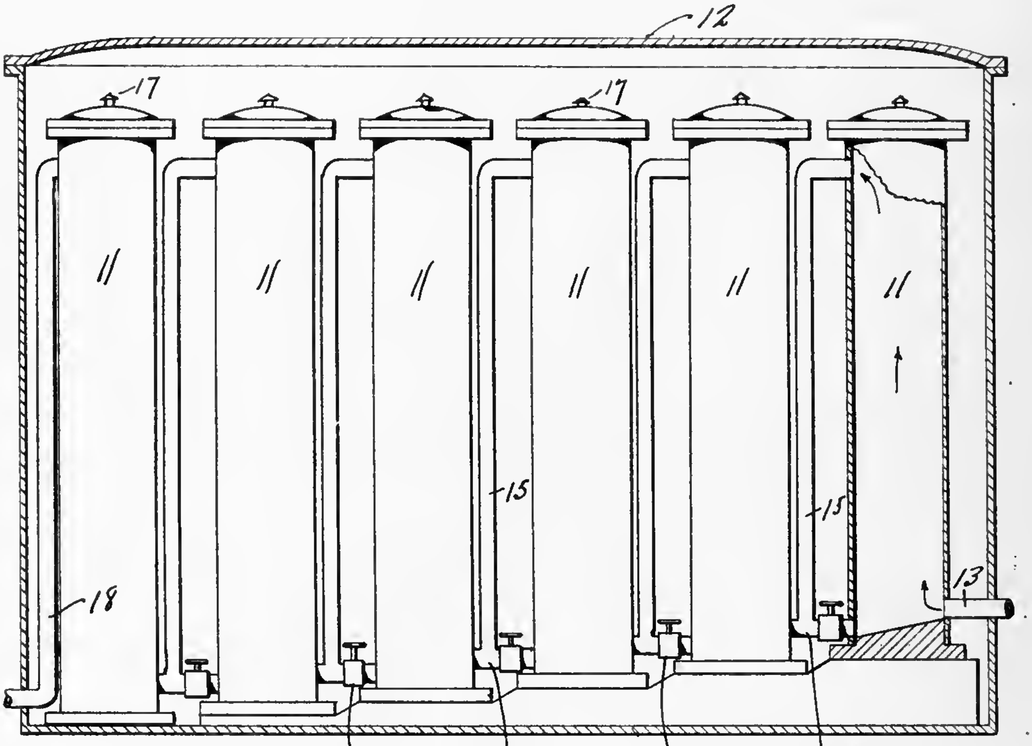


Fig. 2

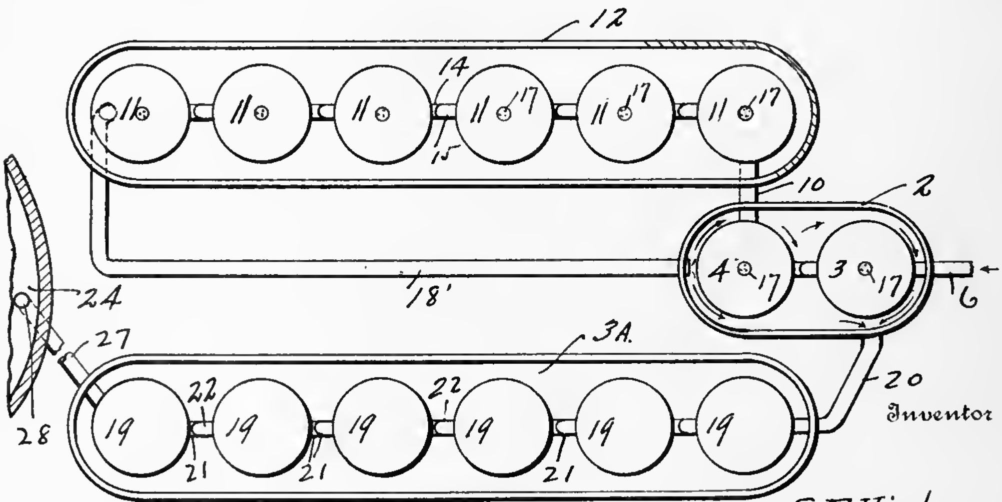


Fig. 3

Inventor

John G. F. Hieber

By Herbert E. Smith

Attorney

UNITED STATES PATENT OFFICE.

JOHN G. F. HIEBER, OF SPOKANE, WASHINGTON.

PROCESS FOR TREATING FRUIT-JUICES.

1,325,094. Specification of Letters Patent. **Patented Dec. 16, 1919.**

Application filed October 21, 1918. Serial No. 259,162.

To all whom it may concern:

Be it known that I, John G. F. Hieber, a citizen of the United States, residing at Spokane, Spokane county, and State of Washington, have invented certain new and useful Improvements in Processes for Treating Fruit-Juices, of which the following is a specification.

The present invention relates to improvements in the process of treating fruit juices, involving the sterilization, cooling, and storing the juice from apples, grapes, berries, etc., which juices are obtained directly from the press, and the treatment accomplished in hermetically sealed vessels.

The primary object of the invention is the utilization of a process for the production of unfermented fruit juices by means of which infection is prevented, contact with the air is eliminated, and a pure fruit juice is attained in the storage tanks or casks.

In the production of fruit juices according to the present process, the juice is free from all possible contact from the atmosphere, from the time the juice leaves the press until it is stored in the storing vessels, and in order to illustrate the steps in the treatment of the juices I have shown an apparatus which embodies the principles of the invention, arranged according to the best mode so far devised for the practical application of these principles.

Figure 1 is a view, partly in section, showing in diagrammatic form, the physical embodiment of the invention.

Fig. 2 is an enlarged view of the sterilizer.

Fig. 3 is a top plan view of the parts of the apparatus including the pre-heater, sterilizer, cooler, and one of the vats or storage tanks.

In the treatment of the juices, the fruit or berries are first placed in the press indicated by the numeral 1, and from there the juices flow to the pre-heater 2, which is a vessel, closed, and inclosing the pair of tanks 3 and 4. The juice is not conveyed to the interior of the pre-heater, but to the interior of a pair of cylinders 3 and 4 within the pre-heater, through the inlet hopper 5 and pipe 6, these cylinders being joined by a connecting pipe 7 leading from the top of the first cylinder 3 to the bottom of the second cylinder 4, and the passage of juice through these pipes is controlled by the respective valves 8 and 9.

Following the course of the fruit juice from the cylinders within the pre-heater to the sterilizer, the juice leaves the upper end of the cylinder 4 by way of pipe 10 and enters the first cylinder 11 within the sterilizer casing 12 by way of the short pipe 13. Preferably there are a series of these cylinders 11 and they are joined by a succession of lower connecting pipes 14 and the stand pipes 15, the latter connected to the top of a cylinder and at its lower end connected to a lower connecting pipe 14 in which are placed the valves 16 for controlling and regulating direct communication of all the cylinders 11 at their lower ends. At their upper ends each cylinder has a vent 17, and in Fig. 2 it will be noted that the bottoms of the sterilizer cylinders are on gradually lowering planes, so that the series of cylinders may be drained when it is necessary to cleanse them.

Following the course of the fruit juice, after being heated in the sterilizer, the juice passes to the pre-heater 2 by way of the pipe 18 from the bottom of the last sterilizing cylinder to the interior of the pre-heater. And the juice passes around the two cylinders 3 and 4 of the pre-heater, heating the incoming juices as they flow from the press, and passing around the interior of the pre-heater casing as indicated, incidentally losing some of the heat units which are withdrawn by the comparatively cool juice coming from the press.

From the pre-heater, the juice flows to the cooler 3, or rather to the series of cylinders 19 within the cooler, by way of the connecting pipe 20. These cooling cylinders are arranged substantially in the same manner as the cylinders in the sterilizer, with a connecting short pipe 21 at their bottoms, and a longer stand pipe 22 from the top of each cylinder to its short pipe, there being a controlling valve 23 for each short pipe 21.

After being cooled, the juice is passed to the storage vats or tanks indicated as 24, 25, 26, by way of the pipe 27 from the top of the last cooling cylinder 19, from which short branch pipes 28 pass up into the storage tanks, and valves 29 are provided to regulate the flow of juice or liquid. Thus it will be observed that the fruit juice passes from the press through the cylinders 3 and 4, thence through the sterilizing cylinders

11, thence through the pre-heating vessel 2, and thence through the cooling cylinders and to the storage tanks.

The sterilizing or heating medium used in the sterilizing casing or tank 12, may be hot water or steam, as desired, the medium of course being brought to the proper and suitable temperature, and in the pre-heater the medium utilized to raise the temperature of the incoming juice, is the sterilized juice, the heat exchange between the sterilized juice and the fresh juice serving to increase the temperature of the fresh juice and decrease the temperature of the sterilized juice. Thus the juice passing to the sterilizer is partly prepared, and the juice passing to the cooler is also partly prepared, each for further treatment. In the cooling tank or receptacle 3, a brine solution or cold water is utilized for cooling the sterilized juice.

During the treatment of the juice just described, it is necessary, at intervals to agitate and stir the juice to prevent the accumulation of slimes, or to break up such a condition, should it exist. For this purpose a circulating pump 30 is provided, preferably of the rotary type, and this pump has a pipe 31 connecting with the pipe 13 to the sterilizing cylinders, and another pipe 32 connected with pipe 18 which connects the last sterilizing cylinder with the pre-heater. Thus by closing the valve 33 in pipe 10 and opening valve 34 in pipe 31, and opening valve 35 in pipe 32 and closing valve 36 in pipe 18′, and opening the valves 16 in connecting pipes 15, the pump will cause a circulation of the juice through the bottoms of the sterilizing cylinders, the pump and its branch pipes, to effectively break up any tendency of the juice to coagulate, and to maintain the juice in a liquid condition. When the pump is not in use, of course the proper valves are manipulated to provide for cutting out the pump and for establishing the necessary communication for the sequential movement of the juice as it is treated.

From the time the juice passes from the press until it is finally treated and stored in the vats or tanks, air is excluded therefrom, and in order that air may not come in contact with the juice while being stored, carbonic gas is furnished to the interior of the tanks above the inflowing juice, as indicated in tank 24 in Fig. 1 of the drawings. At frequent intervals the apparatus is cleansed, and for this purpose the covers of the cylinders may be removed, and the interior walls of the cylinders swabbed with suitable cleansers, and preferably live steam is injected into the receptacles and pipes to thoroughly cleanse them. By means of the circulation pump the juice is caused to move regularly and evenly through the different apparatus and is subjected uniformly to the sterilizing step of the process, the slimy substances of the fruit are prevented from coagulating until they reach the storage vats, and then all sediment and solid matters are congregated at the bottom of the storage tank below the inlet end of the pipe 28, thus insuring a rapid settlement and clarifying of the juice. Suitable thermometers are provided for ascertaining the heat conditions, and the vents 17, it will be understood are for escape of air, as the cylinders are filled with liquids or juices.

What I claim is:—

1. The process of treating fruit juices which consists of flowing the fresh juice to a preheater, thence to a sterilizing apparatus and subjecting the juice to a heating medium, passing the sterilized juice to a container positioned about the pre-heater, whereby the sterilized juice constitutes a heating medium for juice in the pre-heater and then storing the sterilized juice.

2. The process of treating fruit juice consisting of passing the juice through a preheater, thence into and through a heater, thence into a container positioned about the pre-heater whereby the heated juice constitutes a heating medium for the juice in the pre-heater, then passing the juice through a cooler and from the cooler into the lower portion of a closed storage receptacle having gas heavier than air positioned therein.

3. The process of treating fruit juices by furnishing the fresh juice to a pre-heater, conveying the juice from the pre-heater to a sterilizer and applying heat to the juice in the sterilizer, conveying the sterilized, heated, juice to a jacket positioned about the preheater whereby the sterilized juice constitutes a heating medium for juice in the preheater, agitating the juice while circulating it through the sterilizer, and then cooling the partly cooled juice and storing it.

4. The process of treating fruit juices consisting of passing juices through a preheater, thence to a heater and from the heater to a jacket about the pre-heater, then passing the juices through a cooler and into the lower end of a storage receptacle having a medium placed therein for sealing the juices against contact with the air in the upper portion of the receptacle.

In testimony whereof I affix my signature.

JOHN G. F. HIEBER.

MILK, CONDENSED

Patent	Subject	Author	Date
376,496	Apparatus for condensing and carbonating milk.	Von Roden	Jan. 17, 1888.
957,686	Condensing fluid substances.	Kalb	May 10, 1910.
992,705	Manufacture of condensed milk.	Campbell	May 16, 1911.
1,067,336	Milk-condenser	Hay	Jl. 15, 1913.

(No Model.)

O. VON RODEN.

APPARATUS FOR CONDENSING AND CARBONATING MILK.

No. 376,496. Patented Jan. 17, 1888.

Fig.1.

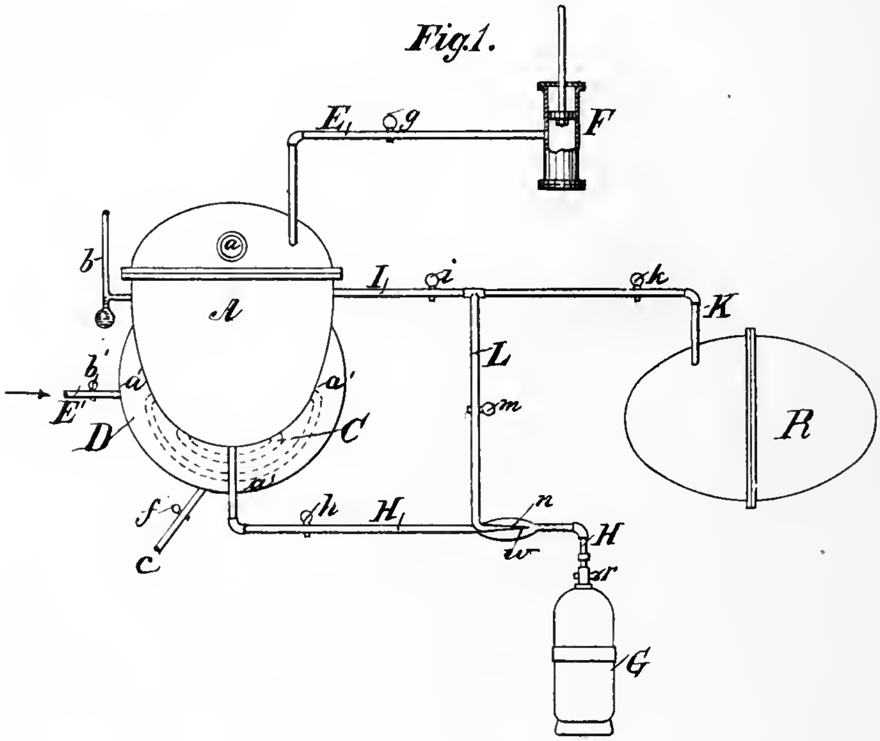
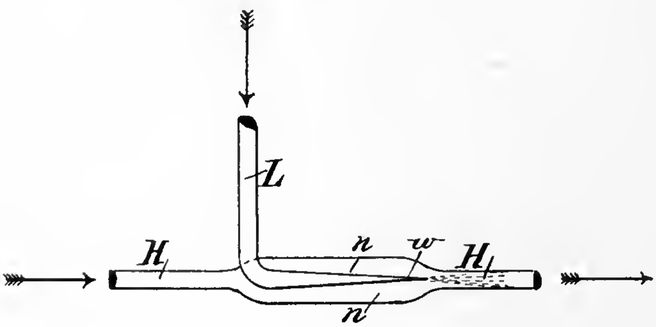


Fig.2.



Witnesses:
Edw. H. Tonteltotte.
Charles MacInnes.

Inventor
Otto von Roden
By
James A. Whitney
Attorney.

UNITED STATES PATENT OFFICE.

OTTO VON RODEN, OF NEW YORK, N. Y., ASSIGNOR TO THE VON RODEN MANUFACTURING COMPANY, OF NEW YORK.

APPARATUS FOR CONDENSING AND CARBONATING MILK.

SPECIFICATION forming part of Letters Patent No. 376,496, dated January 17, 1888.

Application filed December 12, 1885. Serial No. 185,527. (No model.)

To all whom it may concern:

Be it known that I, OTTO VON RODEN, formerly of Hamburg, Germany, but now of the city, county, and State of New York, have invented certain Improvements in Apparatus for Preparing Milk, &c., with Carbonic Acid, of which the following is a specification.

The object of this invention is to provide a new and useful apparatus intended for the preparation of milk charged with carbonic-acid gas; and it comprises certain novel combinations of parts whereby provision is made for heating the milk for partially concentrating the same by removal of aqueous vapor and for charging the same with carbonic-acid gas.

Figure 1 is a side view and a partial vertical sectional view showing the construction and illustrating the operation of my said invention. Fig. 2 is a detail view, on a larger scale, of one part of the apparatus.

A is a vacuum-pan of suitable construction, and which may be provided with a glass window, *a*, through which the contents thereof can be inspected, and also with a thermometer or thermostat, *b*, of any suitable construction, by which the temperature within the vacuum can be readily ascertained. The vacuum-pan is heated by any ordinary or suitable means—as, for example, by the coil of steam-pipes C.

D is an outer shell or jacket attached to the vacuum-pan A, with a space, *a'*, between, within which space is placed the coil of heating-pipes C aforesaid. An inlet-pipe, E', having a suitable cock, *b'*, is arranged to introduce cold water or other refrigerant into the space *a'* when required, as hereinafter explained.

At *c* is an outlet, which is provided with a suitable cock, whereby, when desired, the cold water or refrigerant is permitted to flow or circulate through the space *a'*. A cock, *f*, is so applied as to enable the water or refrigerant to be entirely withdrawn from the space *a'* when required. A pipe, E, is provided, if desired, with a cock, *g*, which connects the vacuum-pan A with the air-pump F, by means of which the vacuum or partial vacuum is maintained in the vacuum-pan.

G is a strong vessel or receiver of any ordinary or suitable construction, and which has a suitable cock, *r*. The receiver G connects by means of the pipe H, having a suitable cock, *h*, with the bottom of the vacuum-pan A.

I is a pipe which extends from the vacuum pan and is continuous with an outlet-pipe, K, which is provided with a suitable cock, *k*, the pipe I being also provided with a suitable cock, as at *i*. The pipe K connects with any suitable source for the supply of carbonic-acid gas—as, for example, with a generator, R, which may be substantially the same as the generators which are in common use for the manufacture of carbonic-acid gas for various purposes in the arts.

The pipes I and K connect with the pipe H by a pipe, L, which has a cock, *m*, and which is connected with the pipe H, as follows: In the pipe H is a hollow bulb or chamber, *n*. The end of the pipe L is passed through the side of this bulb *n*, and is turned to a position which should be parallel or coincident with the axis of said bulb or with that of the pipe H. This extremity of the pipe L is constructed to form an ejector-nozzle having a fine or narrow orifice through which on occasion the carbonic-acid gas issues at a high velocity and with great force, so as to carry with it the milk or other liquid simultaneously admitted to the bulb from the pan A to the receiver G. The carbonic-acid gas is thus brought into contact under pressure with the milk when the same is in a sprayed or minutely-divided condition, thereby effectually charging the milk with the gas. The receiver G is provided with a suitable cock, *r*, by means of which carbonic acid is admitted to or shut off from the pipe H.

The operation of the apparatus is as follows: The milk to be treated and incidentally partially concentrated and to be charged with carbonic-acid gas is introduced into the vacuum-pan A through any suitable inlet, which is afterward closed in any ordinary or suitable manner. It is preferred that the vacuum-pan be filled to about two-thirds of its capacity. The cocks *i* and *h* being closed, the vacuum-pan, by means of the steam-pipes C or other suitable means, is heated so as to raise the milk to a temperature, say, of 180° Fahrenheit and the air-pump F being meanwhile kept in operation to remove the vapors as fast as generated within the vacuum-pan, the contents of the latter are gradually and to some extent concentrated, this being continued for, say, a period of fifteen minutes, the object being to expel the air from the milk, so that its presence may not create fermentation or change. The concentration (to some extent) of the milk, although tending to give a stronger and richer product, is a mere incident to the heating and results just described. When this heating has been accomplished and the elimination of the air has been secured, the cocks i and k are opened, while the cocks m and h are closed, to insure the passage of the carbonic-acid gas through the pipe I into the upper part of the vacuum-pan above the contents thereof to exclude air from contact with the contents of the vacuum-pan. This done, the cock g is closed and the heat is increased until the contents of the vacuum-pan are heated to a temperature of, say, 220° Fahrenheit, which temperature may be maintained for, say, about one hour, the object of this heating being to heat the milk to a temperature sufficient to destroy the germs contained in the milk, and which otherwise would tend to produce putrefactive fermentation. Steam is then turned off from the steam-pipes C in order to cease heating the vacuum-pan; or if other means of heating the latter are used the same are temporarily rendered inoperative in any suitable manner. The vacuum-pan is then cooled either by the admission of water or other refrigerant from the pipe E′, as hereinbefore explained, or by any other appropriate means, this cooling being continued until the temperature of the contents of the vacuum-pan is reduced to 100° Fahrenheit, or thereabout. This done, the cocks k and h and m are opened, and the cock r being opened the contents of the vacuum-pan A are ejected through the pipe H to the hollow bulb or chamber n toward the receiver G, simultaneous with which the carbonic acid, under pressure from the generator R, passes through and from the nozzle w, and dividing the milk into spray charges the same and conveys it so charged into the receiver G, as hereinbefore explained.

Referring to the separate operations of expelling the air from the milk and of destroying the germs of fermentation therein, I find that the first operation must be effected immediately after the air has been expelled from the milk and from its containing-chamber. I find that the second or highest temperature must be effected after the gas has been admitted into the milk-containing chamber. I find that a heat high enough to destroy the fermenting-germ in the milk, if used under the condition of a vacuum in the chamber, would change the color of the milk by acting upon the milk-sugar so as to discolor the milk. I find that to charge the milk into the receiver under this highest degree of heat would act to prevent that intimate relation of the gas and milk which is necessary to cause the gas to be retained in the milk, and hence it is of the highest importance that the milk be cooled before it passes the ejector to fix the gas in the milk.

In the charging operation the pressure is equal in the preparing-vessel at the point of ejectment and mixing and in the receiver to the pressure in the generator, so that the pressure in the generator serves to displace the prepared milk from its containing-vessel, and as the means of ejecting and mixing the milk and gas after it has been discharged from the preparing-vessel. It is important, therefore, that the pipes E and I connect with the vessel A above the level of the milk therein, that the pipe H connect with the bottom of said vessel, and that the pipe I be connected to the pipe H by an ejector-pipe at a point between the receiver and the milk-containing vessel, so as to utilize the two pressures from the same source.

When desired, sugar or other sweetening substance may be added to the milk, together with any desired flavoring material.

For the purposes of this application for Letters Patent I do not claim the process or processes of treating milk, &c., hereinbefore described, for the reason that I claim the said process in a separate and distinct application for Letters Patent filed November 23, 1885, under Serial No. 185,526.

What I claim as my invention is—

1. The combination of a vacuum-pan, A, a receiver, G, a generator or source of supply for carbonic acid gas under pressure, a pipe, H, having a bulb or chamber, n, and connecting the receiver with the pan, and an ejector-nozzle, w, arranged within the bulb or chamber n and connected by a pipe with the generator or source of carbonic-acid supply, all substantially as and for the purpose herein set forth.

2. In apparatus for preserving and charging milk with carbonic acid gas, the vessel A, provided with a bottom shell or jacket having inlet and outlet pipes for heating the milk-containing chamber, a coil of pipe within said shell entering and leaving it for cooling said chamber, a pipe connecting the top of said chamber, a pipe connecting the bottom of said chamber, and an intermediate pipe connecting with said bottom pipe, in combination with the air-pump, the receiver, and the generator, each separately connected with said pipes, and the ejector w, constituting a part of and arranged at the junction of the pipes which connect the vacuum-vessel with the generator and with the receiver, substantially as described.

3. The herein-described combination of parts, constituting an improved apparatus for preserving and charging milk with carbonic-acid gas, said parts consisting of the vacuum-vessel A, having the jacket D, the coil of pipe C, placed within said jacket for heating said vessel, the generator R, the pipes I K, connecting the chambers of said vacuum-vessel and generator, the air-pump F, connecting the upper part of the chamber of said vessel, the re-

ceiver G, its pipe H, having the bulb n, and the pipe L, connecting the pipes I and H, and terminating in the latter in an ejector, w, the said pipes having the cocks shown and described.

4. In apparatus for preserving and charging milk with carbonic-acid gas, the combination, with the milk-containing vessel provided with coils and jacket for both heating and cooling the same, of a thermometer, the air-pump and its pipe E, the generator and its pipes I K, the receiver and its pipe H, and the pipe L, branching from the pipe I and terminating in the pipe H in an ejector at a point between the treating-vessel and the receiver, the several parts having the precise relation shown and described.

5. The combination of a vacuum-pan, a generator, R, for supplying carbonic acid gas under pressure, a receiver, G, pipe H, having bulb or chamber n, and an ejector-nozzle, w, connected with the generator, all substantially as and for the purpose herein set forth.

OTTO VON RODEN.

Witnesses:

CHARLES MACINNES,

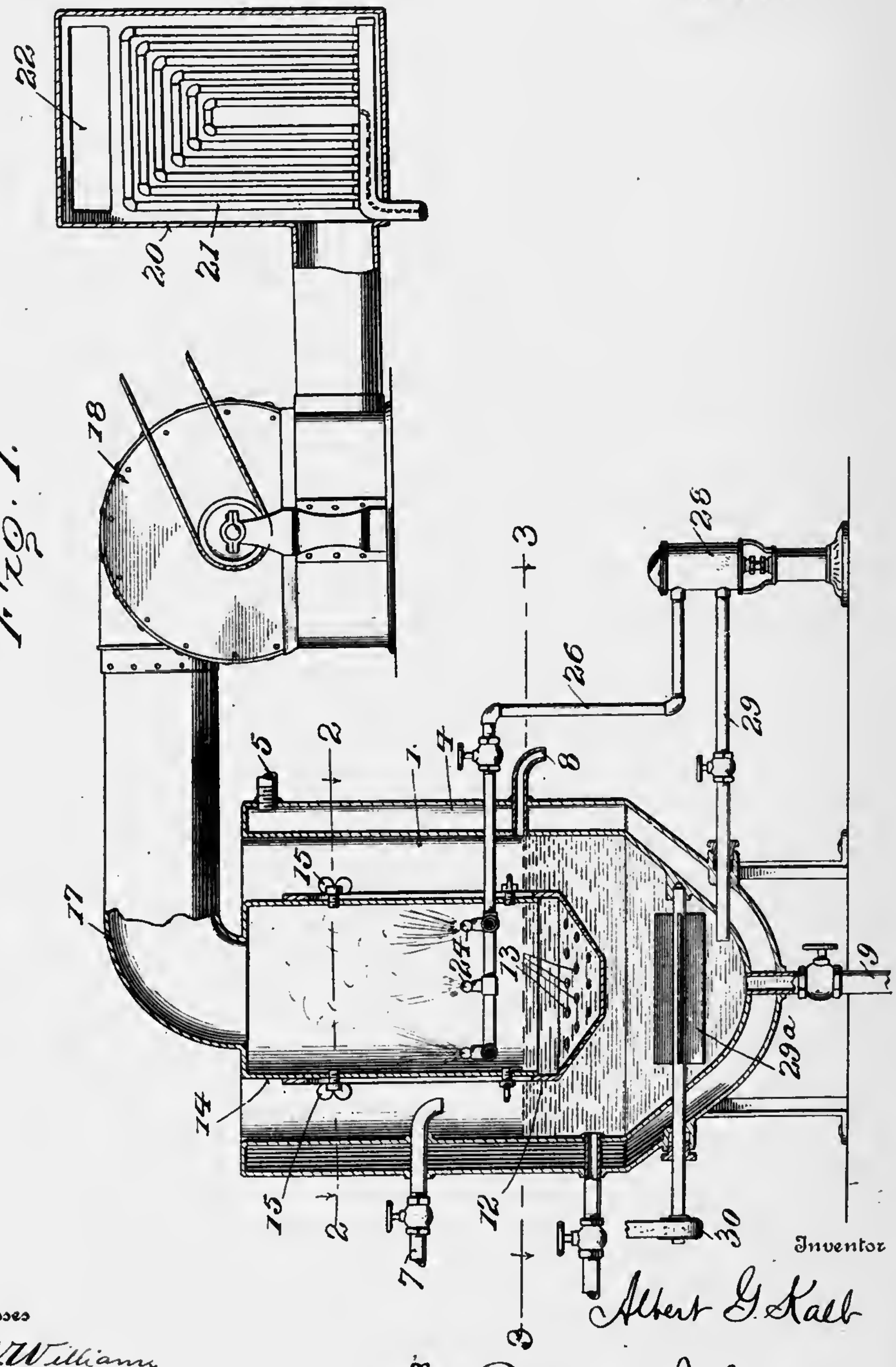
CLARENCE R. CONGER.

Milk Condensed

A. G. KALB.
CONDENSING FLUID SUBSTANCES.
APPLICATION FILED FEB. 4, 1909.

957,686. Patented May 10, 1910.

2 SHEETS—SHEET 1.



Witnesses
W. A. Williams
H. S. Imirie

Inventor
Albert G. Kalb

By Robertson & Johnson
Attorneys

A. G. KALB.
CONDENSING FLUID SUBSTANCES.
APPLICATION FILED FEB. 4, 1909.

957,686.

Patented May 10, 1910

2 SHEETS—SHEET 2.

Fig. 2.

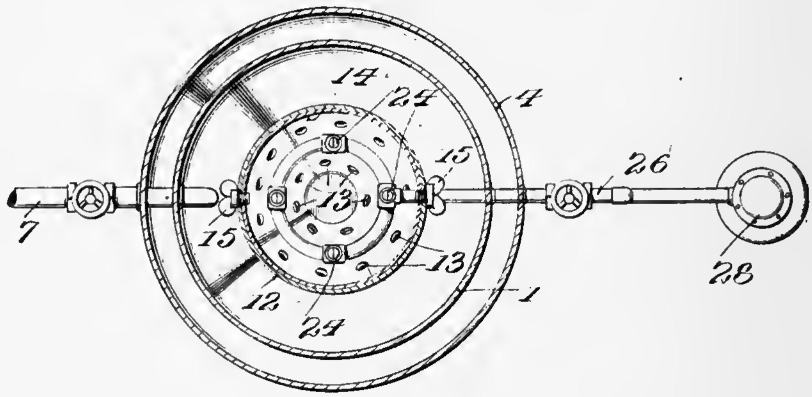
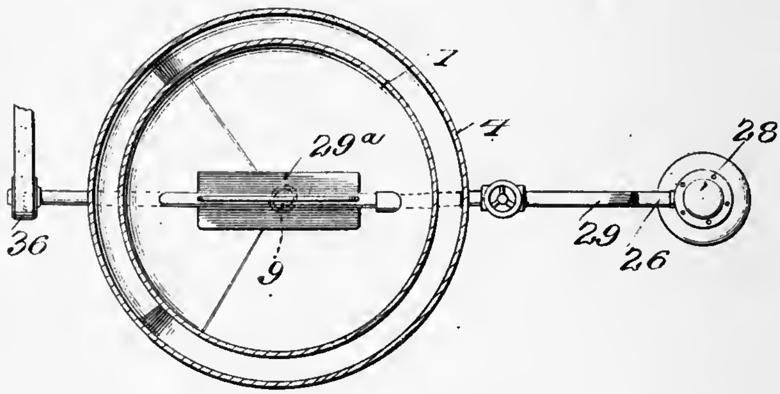


Fig. 3.



Witnesses
W. A. Williams
H. S. Imrie

Albert G. Kalb Inventor

By Robertson & Johnson Attorneys

UNITED STATES PATENT OFFICE.

ALBERT G. KALB, OF CHICAGO, ILLINOIS, ASSIGNOR TO NATURAL DRY PRODUCTS COMPANY, OF AUGUSTA, MAINE, A CORPORATION OF MAINE.

CONDENSING FLUID SUBSTANCES.

957,686. Specification of Letters Patent. Patented May 10, 1910.

Application filed February 4, 1909. Serial No. 476,049.

To all whom it may concern:

Be it known that I, Albert G. Kalb, a citizen of the United States of America, and resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Condensing Fluid Substances, of which the following is a specification.

This invention relates to improvements in method of condensing fluid substances and the invention is adapted more particularly for condensing milk.

The object of my invention is to invent a simple method which will make it possible to condense milk by an economical process and without the use of undue heat.

In the preferred form of apparatus for carrying out my method, the material to be condensed is contained in a suitable tank which may be heated as by a water or steam jacket and with this tank I employ a spraying chamber in which the material to be condensed is introduced in the form of a fine spray and at the same time subjected to a constantly maintained current of dry warm air, the said air being replenished in great volume and acts upon the sprayed milk to take up the liquid particles of the same and the air is then forced through the body of the milk and out of the tank in any desirable way.

My invention consists of a method, broadly speaking, as just described and as hereinafter claimed.

In the drawings accompanying and forming part hereof Figure 1 is a view, part in side elevation but mostly in vertical section, of apparatus constructed to carry out my method. Fig. 2 is a horizontal section through the line 2, 2 of Fig. 1. Fig. 3 is a horizontal section through the line 3, 3 of Fig. 1.

Referring now to the details of the drawings by numerals: 1 designates a tank which may be open at the top as illustrated and which is provided with a heating jacket 4 to which a heating medium may be supplied through the pipe 5 shown in Fig. 1. The tank also is provided with a supply pipe 7, an overflow 8, and a discharge pipe 9.

Within the tank is a spraying chamber formed of two telescopic members 12 and 14, the member 12 being adjustably supported by the member 14 by means of wing nuts 15 so that the member 12 may be lowered within the tank 1 as may be necessary in order to insure that the lower end of said tank shall always be submerged in the material to be condensed and to make it possible to lower said member 12 as the fluid substance lowers in the operation of condensing the same. The member 14 is provided with an inlet pipe 17 of large area which is connected with a blower 18 which exhausts air from a heating jacket 20 provided with a heater 21 and an inlet 22, the whole being so arranged that all the air which is fed by the blower 18 to the spraying chamber 14 must enter through the inlet 22 and be subjected to the drying and warming action of the heating coils of the heater 21.

The lower adjustable member 12 of the spraying chamber is provided with perforations 13 through which the material to be condensed passes and finds the same level within the spraying tank as it does in the condensing tank 1. The spraying chamber is also provided with a series of spraying devices or atomizers 24 supplied by a pipe 26 connected with a pump 28 and this pump connects with the bottom of the tank 1 by means of the pipe 29 and by the action of the pump 28 the material being condensed is drawn from the tank 1, forced through the pipe 26 through the spraying devices 24, where it is subjected to the action of large volumes of constantly supplied heated and dried air introduced into the spraying chamber by means of the aforesaid blower 18. Within the bottom of the tank 1 is also provided an agitator 29[a] operated from a pulley 30 and this agitator 29[a] is adapted to create a slight current in the liquid to be condensed by drawing said material down one side of the chamber and permitting it to flow up the other side, thus keeping the material of uniform consistency, and preventing the formation of foam.

The operation of my invention is as follows: By means of the blower 18, air in large volumes is drawn through the inlet 22 and heated and dried by heater 21 and forced through the inlet 17 into the spraying chamber. In order to find exit from this spraying chamber the air must pass down through the perforations 13 in the lower member 12 of said tank and pass through the material to be condensed where it may escape freely through the open top of the tank 1 but in doing this the large volume of air introduced into the spraying chamber comes in contact with the sprayed or atomized particles from the spraying devices 24 and of course tends to absorb to a large extent the liquid from said particles, thereby carrying off the moisture from these atomized particles and gradually condensing the material to any extent desired. As the material is condensed, the adjustable member 12 may be lowered to keep its perforated end surrounded by the material being condensed and when said material is condensed to the desired consistency it may be delivered through the discharge pipe 9, and a new supply of liquid subjected to the condensation process.

From the foregoing and the accompanying drawings, it will be seen that I have invented a method of condensing fluid substances which is carried out by an apparatus of extremely simple and effective form, by atomizing or spraying the liquid into a spraying chamber in which is constantly maintained a current of dry warm air which is renewed in sufficient quantities to thoroughly absorb the moisture from the sprayed particles.

It will be seen that by my method I obtain the desired result rapidly and economically.

It is obvious that changes may be made in the apparatus for carrying out my method without departing from the spirit thereof, the scope of the invention being set forth by the appended claims.

The apparatus illustrated and described is not herein claimed, but forms the subject matter of a separate application, filed July 30, 1908, Serial Number 446,169.

What I claim as my invention is:

1. The method of condensing fluid substances which consists in introducing the material in atomized condition to a current of air, maintaining the air in motion, and forcing the air through the body of material being treated, substantially as described.

2. The method of condensing fluid substances which consists in subjecting air to a spray of liquid material and in forcing the air so sprayed through the material being treated, substantially as described.

3. The method of condensing fluid substances which consists in subjecting air to a spray of liquid material, in forcing the air so sprayed through the material, and in keeping the liquid in motion, substantially as described.

Signed by me at Chicago, Illinois, this 25th day of January 1909.

ALBERT G. KALB.

Witnesses:
GEO. F. YATES,
W. F. HAYDEN.

UNITED STATES PATENT OFFICE.

CHARLES H. CAMPBELL, OF NEW YORK, N. Y.

MANUFACTURE OF CONDENSED MILK.

992,705. Specification of Letters Patent. Patented May 16, 1911.

No Drawing. Application filed December 9, 1909. Serial No. 532,182.

To all whom it may concern:

Be it known that I, CHARLES H. CAMPBELL, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in the Manufacture of Condensed Milk, of which the following is a specification.

According to this invention I purpose to make the condensed milk not from ordinary fresh milk but from a milk of which a part of the water has previously been extracted. Or in other words I purpose to divide the process into at least two stages. In the first stage the volume is reduced by the extraction of water and preferably without high heat, and in the second stage this concentrated milk is increased in volume by the coagulation of the albuminoids or by the addition of water, or in both ways.

This process has great commercial and technical advantages. The milk can be collected in a grazing country far from the center of manufacturing industries, and can be there treated to remove a large part of the water before being shipped to the place where it is condensed and marketed, thus saving the cost of shipping a large quantity of the water. This concentrated milk because of the small quantity of water in it, will keep fresh much longer than ordinary milk, and will thus bear shipment to a greater distance and at less expense. It can be perfectly controlled as to its contents of butter fat and water, so as to supply at the point where the last stage of the process is to be carried out, a milk which needs only to be heated to the coagulating point to give the desired final product. Or it may be reduced to such an extent that in the second stage it will require the addition of some water as well as the application of heat. There is for example such a concentrated milk now on the market known as White Cross Milk, of such a composition that by mixing one part of water with three parts of this milk and heating to the coagulating point, a condensed milk of the right thickness and of about twelve per cent. butter fat is obtained.

A specific example of the complete process is as follows:—A concentrated milk is first made in accordance with the processes described in the patent of Joseph H. Campbell, No. 668,161, and in my reissued patent No. 12,649. This concentrated milk is then shipped (or if the two stages of the process are to be carried out at the same place is kept for a convenient time) and subjected to the second stage of the process. In the first stage the milk was heated to a temperature maintained below the coagulating point of albumin, and concentrated by exposure to a blast of air in considerable volume, which removes the water so rapidly as to prevent souring. This process preserves the proteids or albuminoids in soluble and peptogenic condition. Preferably this process is continued until the milk is reduced to about one-fourth to one-sixth of its original volume. In that case the second stage of the process is performed by adding about one part of water to three parts of the concentrated milk, and heating to the coagulating temperature by injecting live steam into the mass, or by heating with a water jacket. The temperature must be at least high enough to coagulate the albuminoids, and in practice I have used temperatures of 185° to 190° F. This temperature is maintained for only a few minutes, sufficient to effect the desired extent of coagulation. The milk is then cooled, preferably by circulating a cooling medium through a jacket surrounding the vessel. During the heating and cooling it is kept in constant agitation. The water may be added either before or after the application of the coagulating heat or simultaneously therewith.

The process may be carried out from beginning to end with the same quantity of cream in the mass. Preferably, however, the quantity of cream in the final product is determined separately; the milk being first skimmed and then concentrated in the manner described, and the desired quantity of cream being mixed with the concentrated skim milk until the mass is reduced to a suitable emulsion, and without breaking up the fat globules. This is the process described in my reissue patent above referred to, and secures a product which is directly marketable, and which also is valuable for the manufacture of condensed milk.

While it is preferable for most uses that the final product contain a substantial quantity of butter fat, this is not essential. The material from which the condensed milk is made may be entirely or substantially lacking in cream, being a concentrated skim milk; and the subsequent concentration may be effected with or without the addition of cream at some suitable stage.

What I claim is:—

1. In the making of condensed milk, the heating of the milk to a temperature below the coagulating point of albumin, the simultaneous concentrating of it by exposure to air in such volume that it is concentrated so rapidly as to prevent souring and its proteids are preserved in soluble and peptogenic condition, the heating of the mass to a coagulating temperature, and the cooling of the mass while keeping it in agitation.

2. In the making of condensed milk, the concentrating of it to a thick fluid with application of heat at a temperature below the coagulating point of albumin, and the heating of the concentrated milk to a coagulating temperature.

3. In the making of condensed milk, the concentrating of skim milk to a thick fluid with application of heat at a temperature below the coagulating point of albumin, the mixing of cream with the concentrated skim milk, and the heating of the mass to a coagulating temperature.

4. In the making of condensed milk the performing of the process in two stages in the first of which the volume is reduced by extracting water, and in the second of which it is increased by coagulation of the albuminoids and the addition of water, in quantity at least equal to about one third of the reduced volume resulting from the first stage.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

CHARLES H. CAMPBELL.

Witnesses:

D. Anthony Usina,

Fred White.

S. P. HAY.

MILK CONDENSER.

APPLICATION FILED JAN. 2, 1913.

1,067,336. Patented July 15, 1913.

Fig. 1.

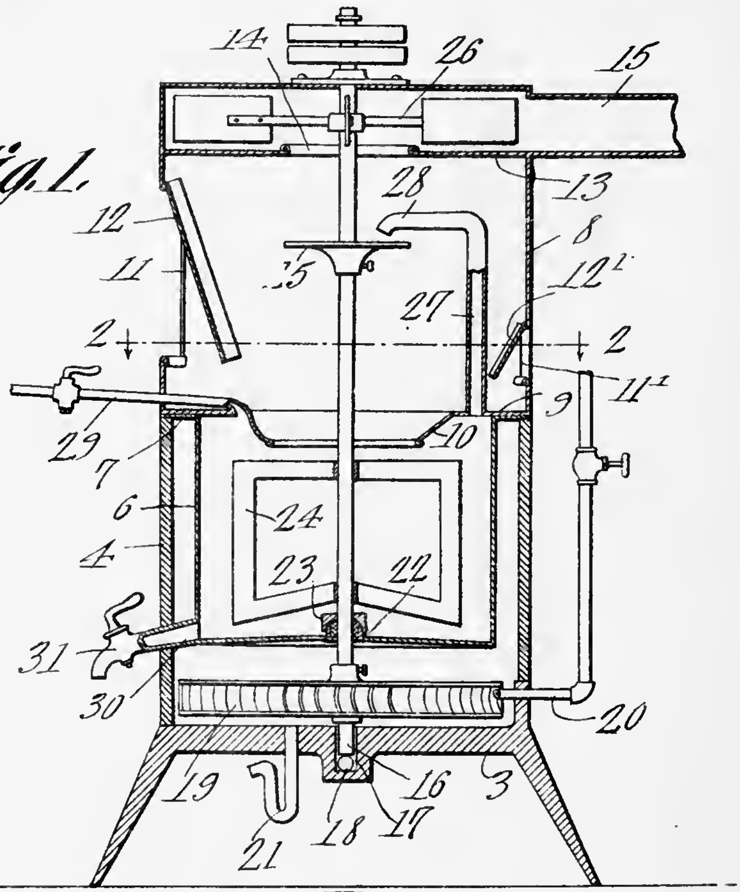
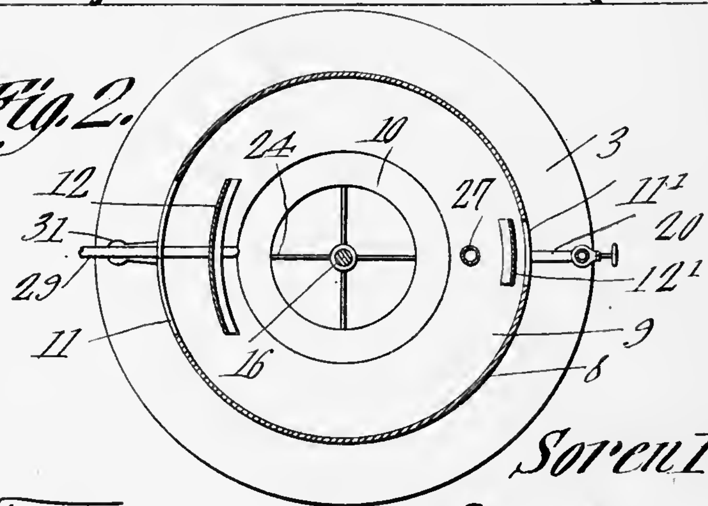


Fig. 2.



Witnesses

Soren P. Hay, Inventor

by C. A. Snow & Co. Attorney

UNITED STATES PATENT OFFICE.

SOREN P. HAY, OF SPOKANE, WASHINGTON.

MILK-CONDENSER.

1,067,336. Specification of Letters Patent. Patented July 15, 1913.

Application filed January 2, 1913. Serial No. 739,864.

To all whom it may concern:

Be it known that I, Soren P. Hay, a citizen of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented a new and useful Milk-Condenser, of which the following is a specification.

The present invention relates to milk condensers, and is particularly an improvement over the milk condenser disclosed in my former Patent No. 1,042,912 issued October 29, 1912.

The present invention contemplates the production of a milk condenser of the general character of the apparatus disclosed in the above mentioned patent but which shall be more simple, compact and inexpensive in construction, as well as of higher efficiency, and serviceability.

The present invention incorporates the prominent features of the apparatus disclosed in the aforesaid patent, and in addition thereto incorporates certain additional advantages, the cardinal of which is the provision whereby the apparatus may be connected to a tank or other suitable supply of milk and in order that the milk may be automatically supplied to the apparatus as the milk within the apparatus condenses due to the desiccating action.

A further feature, as provided by the present improved apparatus, is the provision of a turbine rotor adapted to be actuated by the steam for heating the milk, in order that the steam or other heated fluid may be employed for actuating the agitator, sprayer and exhaust fan.

With the above and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangements of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

The invention has been illustrated in the accompanying drawing, wherein:—

Figure 1 is a vertical central section of the improved apparatus. Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1.

Referring specifically to the drawing, the present apparatus is mounted on a suitable base 3, upon which is mounted an insulating jacket 4, the jacket being constructed of any suitable material, such as a composition containing abestos or other heat resisting element.

Hung within and enveloped by the jacket 4 is the milk receptacle 6 having the upper or exterior flange 7 seating on the upper end of the jacket, the bottom of the receptacle being spaced from the base 3 and the sides thereof being spaced from and concentric with the jacket.

A superimposed casing 8 has an inwardly projecting flange 9 at its lower end resting on the flange 7 of the milk receptacle, it being understood that the jacket, milk receptacle and casing may be secured together in any desirable manner. The flange 9 overhangs the receptacle 6 and the inner or free edge of the flange is bent downwardly in the form of a funnel as designated by the numeral 10, so that any milk precipitating or gathering on the flange 9 will be directed centrally or axially into the milk receptacle. The casing 8 is provided at one side with a relatively large inlet opening 11, and at its opposite side with a relatively small inlet opening 11′, the respective openings being provided with the inwardly disposed aprons or deflectors 12 and 12′ secured at the upper ends of the openings. A partition 13 is also provided within the casing 8 adjacent its upper end, the said partition being provided with a central opening 14, and an exhaust conduit 15 being attached to the casing 8 above the said partition.

Arranged axially within the apparatus is the upright or vertical shaft 16, the lower end of which enters the socket 17 provided in the base and rests on an anti-frictional ball 18 within the socket. A turbine rotor 19 is mounted on the shaft 16 between the bottom of the milk receptacle and the base, and a supply pipe or nozzle 20 projects inwardly through the jacket so as to coöperate with the rotor 19. Thus, steam or any other heated fluid may be admitted into the jacket so as to actuate the rotor and then ascend within the jacket to surround the milk receptacle for heating the same. The steam condenses within the jacket. Thus, the steam or other agent serves the dual function of actuating the apparatus and heating the milk receptacle, it being desirable however, that the temperature of the milk receptacle will be retained below the point of coagulation so as not to destroy the peptogenic properties of the casein or other proteids. Upon the other hand, it is desirable to retain the milk receptacle at a sufficiently high temperature to prevent the milk from buttering as it is agitated.

In order to permit the condensation to pass off, the base 3 is preferably provided with a trap 21, which will permit the condensation to pass off.

The shaft 16 passes through the bottom of the milk receptacle, the bottom being provided with an upstanding packing receiving collar 22 on which is screw-threaded a gland 23. A horizontally rotating agitator 24 is secured to the shaft within the milk receptacle, while a disk or sprayer 25 is secured to the shaft within the casing 8 or above the milk receptacle.

A fan 26 of any suitable character is secured to the shaft above the partition 13 or within the chamber provided by the partition, said fan being rotated by the shaft so as to create an upward current of air through the opening 14 in the partition and outwardly through the exhaust conduit 15. Thus, the rotary fan or centrifugal blower will tend to rarefy the air within the casing 8 and above the milk receptacle, thereby causing air to be drawn in through the openings 11 and 11′, which will be drawn upwardly through the casing 8 and around the sprayer or breaker 25 to the rotary fan.

An upstanding eduction pipe 27 is secured to the flange 9 adjoining the wall of the milk receptacle and has its upper end bent to form an angular arm 28 overhanging the sprayer 25. The eduction pipe 27 is preferably arranged adjacent the inlet 11′, although its particular locality does not alter its environments.

The milk supply pipe is denoted by the numeral 29, the same entering the casing 8 adjacent its lower end and being attached to the flange 9, preferably below the opening 11 and at a point diametrically opposite the eduction pipe 27.

The milk receptacle 6 is also provided with an outlet spout 30 adjacent its lower end and passing through the jacket 4 and having a discharge or outlet faucet 31.

The apparatus as above described and as illustrated in the drawing will therefore possess the advantages and features pointed out in the introduction, and so combines and revises the apparatus disclosed in the aforesaid patent as to increase the efficiency and utility of the apparatus.

In operation, the supply or feed pipe 29 is connected to a suitable tank or other receptacle containing the milk to be condensed the flow of milk being regulated or governed by means of any suitable valve, as usual. After the flow of milk has been established, in order to properly fill the milk receptacle, the steam line may be opened so as to admit the steam into the jacket for actuating the rotor and for heating the milk contained in the receptacle to the proper degree to prevent coagulation. Or, if desired, the shaft may be driven by any other suitable power, it not being necessary to employ the rotor, the same running free with the shaft when the latter is driven by a belt or otherwise, and the steam merely being admitted for heating the milk receptacle. When the agitator 24 is rotated with the shaft, the milk within the receptacle will be whirled to form an eddy or a wall of milk around the sides of the milk receptacle, this centrifugal action forcing the milk upwardly under the flange 9. The superincumbent milk will therefore choke or cut off the passage through the supply pipe 29, and the flow of fresh milk into the apparatus will be retarded or arrested, until the desiccating action reduces the quantity of the milk and thereby admits sufficient fresh milk to make up for the loss. The upward thrust of the milk against the flange 9 also forces the milk up the eduction pipe 27 so as to be discharged on the sprayer 25, the milk being broken and thrown from the sprayer thereby to form a foggy or mist like cloud in the casing 8. The steam or water vapor given off by the milk will therefore be drawn off by the centrifugal fan and will be discharged through the exhaust conduit 15, the curd or heavier constituents descending and being directed back into the milk receptacle by means of the flange 9. The air in being drawn through the casing 8 will also aerate the milk as it is undergoing the evaporating or desiccating action. Thus, as the operation progresses, the milk will be condensed, or the water will be evaporated and drawn off, and the quantity of milk within the apparatus being reduced by the desiccating action, will permit fresh milk to flow gradually into the milk receptacle through the feed pipe 29. The milk being thrown against the walls of the milk receptacle by the centrifugal action caused by the rotary agitator 24 will thus prevent the interior exposure of the walls of the milk receptacle so that the incrustation or scorching of the milk is eliminated or eradicated. After the operation or desiccating action has ensued for the proper time so as to sufficiently reduce the milk, which in practice is one third, the rotation of the shaft is stopped, and the condensed milk may be drawn off through the faucet 31. The milk, thus condensed, will be of undiminished solubility and the casein and other proteids will retain their original peptogenic properties.

From the foregoing, taken in connection with the drawing, the advantages and capabilities of the present apparatus will be apparent, it being noted that this apparatus may be employed for condensing or desiccating various other liquids.

Having thus described the invention what is claimed as new is:—

1. In a condenser, a liquid receptacle, a horizontally rotating centrifugal agitator therein, and a liquid supply pipe so attached to the upper end of the receptacle that the influx of liquid will be choked by the centrifugal action of the liquid when the rotating wall of the liquid rises to a predetermined height.

2. In a condenser, a liquid receptacle, a centrifugal agitator therein, a flange overhanging the receptacle, and a liquid supply pipe attached to the said flange in order that the centrifugal action of the liquid within the receptacle will choke the influx of liquid through the supply pipe.

3. In a condenser, a liquid receptacle, a centrifugal agitator therein, a flange overhanging the receptacle and having its inner edge bent downwardly, and a liquid supply pipe attached to the flange.

4. In a condenser, a receptacle, a rotary agitator therein, a flange overhanging the receptacle, a rotary sprayer above the receptacle, and an eduction pipe upstanding from the flange and overhanging the sprayer.

5. In a condenser, a receptacle, a rotary agitator therein, an annular flange overhanging the receptacle, a casing mounted above the receptacle, a rotary sprayer mounted within the casing, an eduction pipe upstanding from the flange and overhanging the sprayer, and means for creating a current of air upwardly through the casing.

6. In a condenser, a receptacle, a rotary agitator therein, a casing mounted on the receptacle and having an inwardly projecting flange at its lower end overhanging the receptacle, the casing having an air inlet, a rotary sprayer within the casing, an eduction pipe upstanding from the flange and overhanging the sprayer, and a rotary fan mounted in the upper end of the casing for rarefying the air within the casing.

7. In a condenser, a liquid receptacle, a centrifugal agitator therein, an annular flange overhanging the receptacle, a rotary sprayer above the receptacle, an eduction pipe upstanding from the flange and overhanging the sprayer, and a liquid supply pipe attached to the flange.

8. In a condenser, a base, a jacket mounted thereon, a receptacle suspended within the jacket, a shaft passing through the bottom of the receptacle, an agitator secured to the shaft within the receptacle, a rotor secured to the shaft between the base and receptacle, and means for supplying a heated fluid to the rotor for actuating the agitator and for heating the receptacle.

9. In a condenser, a base, a jacket supported thereon, a receptacle suspended within the jacket, a casing mounted on the jacket, an upright shaft journaled through the bottom of the receptacle and supported by the base, an agitator secured to the shaft within the receptacle, the casing having an inwardly projecting flange overhanging the receptacle, a sprayer mounted on the shaft within the casing, an eduction pipe upstanding from the flange and overhanging the sprayer, and means for creating a current of air upwardly through the casing.

10. In a condenser, a base, a jacket supported thereon, a receptacle suspended within the jacket, a casing mounted on the jacket, an upright shaft journaled through the bottom of the receptacle and supported by the base, an agitator secured to the shaft within the receptacle, the casing having an inwardly projecting flange overhanging the receptacle, a sprayer mounted on the shaft within the casing, an eduction pipe upstanding from the flange and overhanging the sprayer, means for creating a current of air upwardly through the casing, the casing having air inlets therein, a fan secured to the shaft at the upper end of the casing for rarefying the air within the casing, and a supply pipe attached to the said flange.

11. In a condenser, a base, a jacket supported thereon, a receptacle disposed within the jacket having an upper exterior flange seated on the jacket, a casing having a lower inwardly projecting flange seated on the said flange and overhanging the receptacle, the inner edge of the latter flange being downturned, the casing having air inlets, inwardly opening flap valves for the said inlets, an upright shaft journaled through the bottom of the receptacle and supported by the base, a rotor mounted on the shaft between the base and receptacle, means for supplying a heated fluid to the rotor, a supply pipe connected to the latter flange, a sprayer carried by the shaft within the casing, an eduction pipe upstanding from the latter flange and overhanging the sprayer, a rotary fan secured to the shaft at the upper end of the casing for expelling the air from the casing, and an agitator carried by the shaft within the receptacle.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

SOREN P. HAY.

Witnesses:

LEONA MERK,

WM. E. RICHARDSON.

MILK, DESICATED

Patent	Subject	Author	Date
1,127,778	Method of dehydrating milk and milk compositions.	Kitchen	Feb. 9, 1915.
1,292,577	Apparatus for producing dried milk.	Campbell	Jan. 28, 1919.

Dessicated

UNITED STATES PATENT OFFICE.

JOSEPH MOSES WARD KITCHEN, OF EAST ORANGE, NEW JERSEY.

METHOD OF DEHYDRATING MILK AND MILK COMPOSITIONS.

1,127,778. Specification of Letters Patent. **Patented Feb. 9, 1915.**

No Drawing. Application filed January 24, 1914. Serial No. 814,188.

To all whom it may concern:

Be it known that I, JOSEPH MOSES WARD KITCHEN, a citizen of the United States, residing in the city of East Orange, county of Essex, State of New Jersey, have invented Improvements in Methods of Dehydrating Milk and Milk Compositions, of which the following is a specification.

The object of the present invention is to secure the dehydration of milk in a uniform manner, and with the least injury to its digestibility; and especially, to secure the dehydration of skim milk when used in compositions including other food materials, such as maize or other cereal meals, to which proteid constituents are desirable additions.

There is a very large amount of skim milk ineffectively utilized for human food, because of the large proportion of water in the skim milk, because of lack of stability in milk due to bacterial fermentations in it, and because of a lack of fatty constituents in it.

I aim to prepare a dry, easily handled food product for general use from skim milk; and particularly, from skim milk and cereals such as maize, producing a well balanced food nutritively that will be a very low cost food, and yet be hygenically, as well as in physical character, a desirable food composition.

If corn meal and a considerable amount of skim milk are admixed, and then dehydrated through the application of high heat, a hard horn-like mass is produced that is difficult to thoroughly dry, pulverize after drying, and which is somewhat difficult of digestion. To compound a ration of corn meal and skim milk that is nutritively well balanced, approximately three parts by weight of skim milk and one pound of corn meal should be used; and to completely dehydrate this mixture, and secure a desirable physical character in the composition, the skim milk should only be added gradually to the meal and dehydrated at a moderate heat, so that the meal granules are not dissolved and diffused in the milk. I find that a desirable method to adopt in carrying out this principle, is to continually but slightly moisten the meal with the milk, and to dry at low temperatures most of the milk on the external surfaces of the meal by the aid of a substantially immediate, continuous and extended contact with the milk of fresh volumes of drying air in such manner that a dried layer of milk of greater or less thickness is formed on the outside of the meal granules. This is preferable to allowing the milk to become much absorbed into the meal granules. Such a composition is of desirable physical character and digestibility: in use, it producing a more light and porous food-mass capable of more immediate and quick penetration by the digestive juices. This procedure can be successfully performed in various ways; and dried food compositions having various proportions of milk may be produced. Milk by itself can be dried into granular form in this manner.

As an example of carrying out the process, may be cited the method of repeatedly sifting granules of repeatedly moistened meal through a heated atmosphere, using an elevating device for continually raising to a high level, the meal being treated; and employing other devices for separating and spacing the moistened granules as they are precipitated through the heated atmosphere. The drying heated air rising in vertical counter-current to the falling granules, imparts its highest heat to the granules at the lowest level, and gradually and progressively looses its heat to the falling granules at progressively higher levels. Another plan is to have a steam jacketed trough for holding the meal. The trough is provided with a revolving set of lifting paddles peripherally attached to a shaft, the revolution of which continually lifts the moistened meal in such manner as to secure its precipitation back into the steam heated trough; the precipitated granules passing through and losing moisture to the air heated by the heated contents of the trough. The milk is gradually but continually being added to the meal in moderate amounts; and by mechanical admixture, is distributed throughout the meal-mass, slightly moistening the surfaces of the meal granules in a substantially continuous manner, while the drying process is continually being carried on through diffusion into the atmosphere of the warmed watery constituents of the milk. I especially avoid very high temperatures in this performance by avoiding the heating of the material being treated, to over 150° F. A drying of the material is easily secured by moderate heat, in a somewhat slow manner, but with a desirable result as to the character of the product. It will be observed that this performance is substantially a continual one of moistening, aerating and drying the milk.

I do not confine myself to any special method of dehydration of milk. It will be obvious that a granular product of dried milk may be produced in this manner by starting the process with fine sized nuclei of meal, dry sugar, or other substance.

It is obvious that the method herein described can be applied to the drying of other nutrient fluids besides milk; and that nuclear material on which the milk or other nutrient fluids can be dried by my process, may include a variety of such materials; and that the dehydration of such fluids or compositions, can be effected without the resulting damage to digestive character that may follow the high heating of a food substance. The same objection of applying high heat in dehydrating milk, also more or less applies to the dehydration of other animal, and vegetable fluids containing protein and other constituents. But the process pertains in particular to skim milk, because of the immense amounts of that material that are either wasted, or inadequately utilized for human food.

Subject matter is herein disclosed which is not herein claimed, but which is claimed in both of two copending applications of applicant, viz: that which especially relates to compositions of skim milk and maize, and other cereals rich in vegetable fats. in Sr. No. 740,963, filed January 9, 1914; and that which particularly relates to milk and cocoa compositions, in Sr. No. 872,877, filed Nov. 18, 1914.

What I claim as new is:

1. The method herein described, which consists in, slowly moistening a cereal granule with milk while mechanically stirring the milk and cereal granules and continually drying the milk on the granules by exposure to dry volumes of air until a desired amount of milk is dried on the granules.

2. The method herein described, which consists in, gradually, slowly but continually moistening with milk a granular-nutrient, continually admixing by stirring, aerating and drying the moistened granules at a moderate temperature, of about 150° F., and finally withholding the milk and completely drying the granular nutrient.

3. The method herein described, which consists in, coating granules with milk without saturating the granules, continually drying the milk on the granules and forming thereon a coat of dried milk in progressively increasing thickness, continually adding more milk to the dried coating and drying it on the dried coating of milk, said granules and their coatings being finally completely dried.

4. The method herein described, which consists in, adding to a cereal rich in vegetable fat, skim milk in desired definite proportions suited to the composing of a desirably balanced ration, such addition being gradually performed, and such admixed material being dried by continual aeration with drying air.

5. The method herein described, which consists in, gradually admixing skim milk with and continually drying the skim milk on the granules of a comminuted cereal in an atmosphere of a temperature, below 200° F., the milk being admixed with, the granules and being continually dried upon the surface of the granules of the comminuted cereals progressively as the milk is added to and admixed with the granules.

6. As a new food product, a dry, combined composition of dehydrated skim milk and pulverized cereal granules, said skim milk having been dehydrated by continually applying the milk to and drying the milk in a progressively thickening coat to said granules during the process of evaporation of the moisture of the milk from the surfaces of the granules at a temperature sufficiently low to prevent the dissolving of the granules, little or none of the milk having been absorbed into the substance of the interior of the granules.

7. As a new food product, maize granules coated with dried skim milk, said granules having a form substantially such as they had before the milk coating was applied.

8. As a new food product, a granule of comminuted cereal having a coating composed of successively applied films of fluid milk dried onto said granule.

9. As a new food product, a composition of cereal granules coated with dried skim milk, said coating being composed of successively applied and dried coats of skim milk.

10. As a new food product, a granule of nutrient material having a coating comprised of successively applied films of milk dried thereon.

11. As a new food product, a dried nutrient granule, said granule being composed of a nutrient nucleus and successively applied and dried coats of a nutrient fluid composed of at least a considerable amount of protein constituent, said drying having been effected at a temperature below the boiling point of water and the digestive character of said dried coats having been conserved by said temperature in said drying.

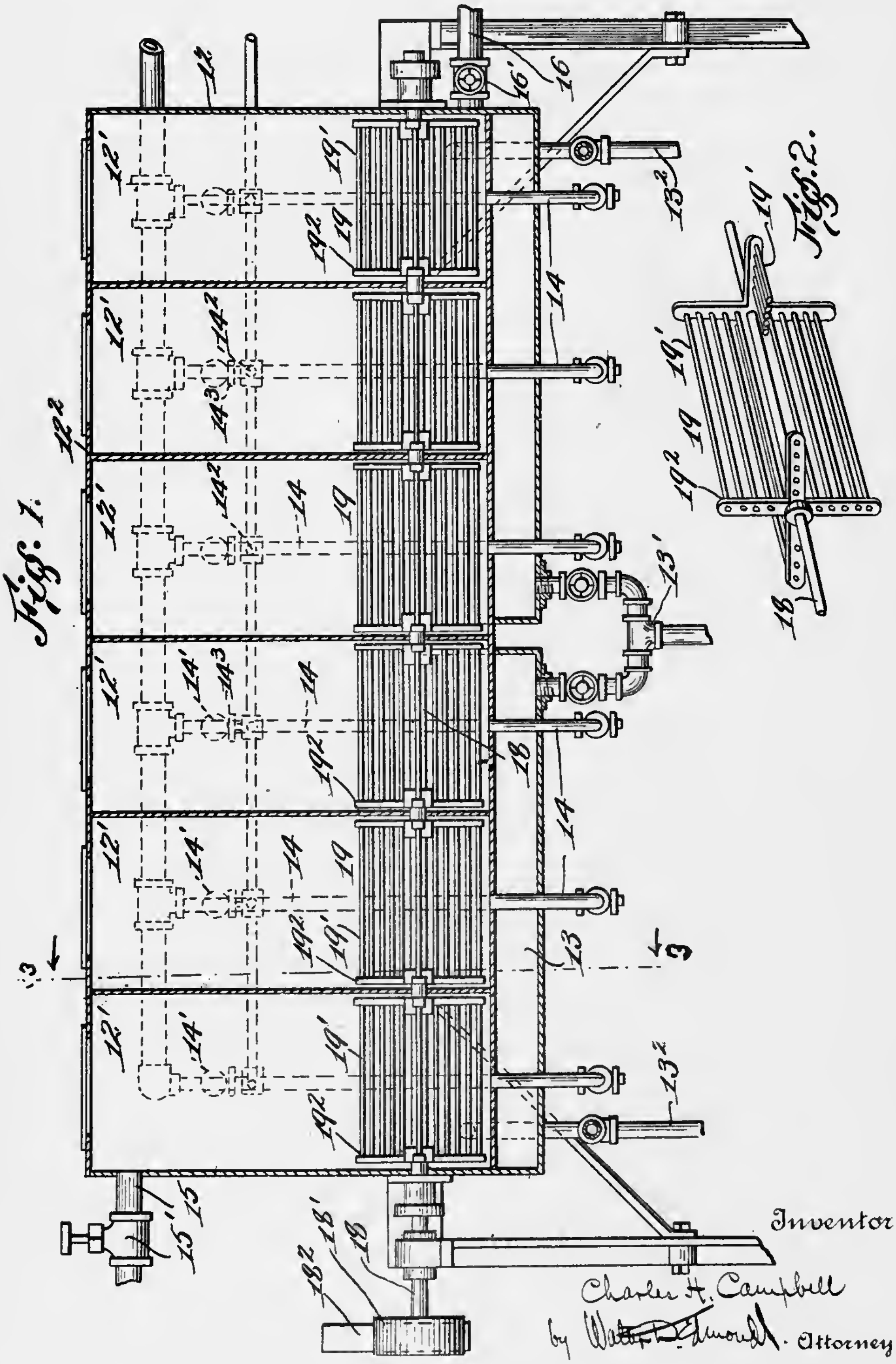
JOSEPH MOSES WARD KITCHEN.

Witnesses:
GEO. L. WHEELOCK,
FLORENCE JACKSON.

C. H. CAMPBELL.
APPARATUS FOR PRODUCING DRIED MILK.
APPLICATION FILED APR. 11, 1917.

1,292,577. Patented Jan. 28, 1919.

4 SHEETS—SHEET 1.



Inventor

Charles H. Campbell

by Walter D. Edmonds. Attorney

C. H. CAMPBELL.

APPARATUS FOR PRODUCING DRIED MILK.

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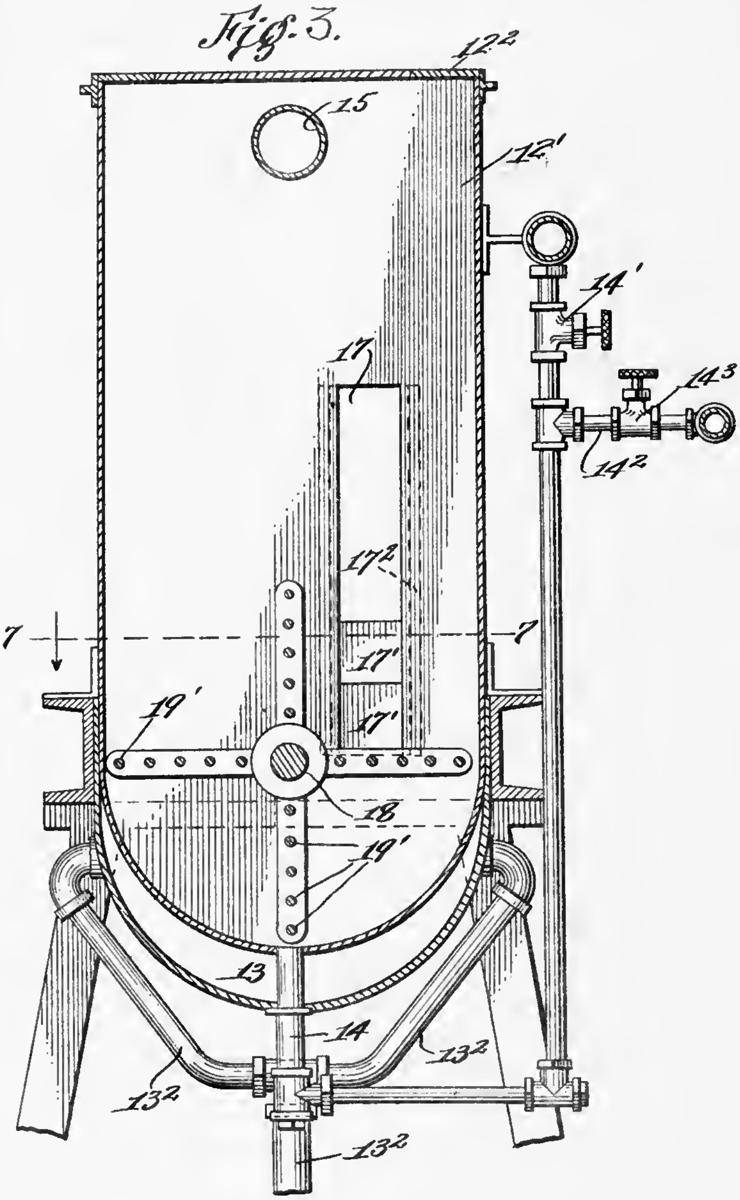
4 SHEETS—SHEET 2.

Fig. 3.



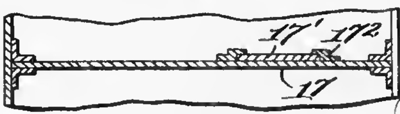


Fig. 4.

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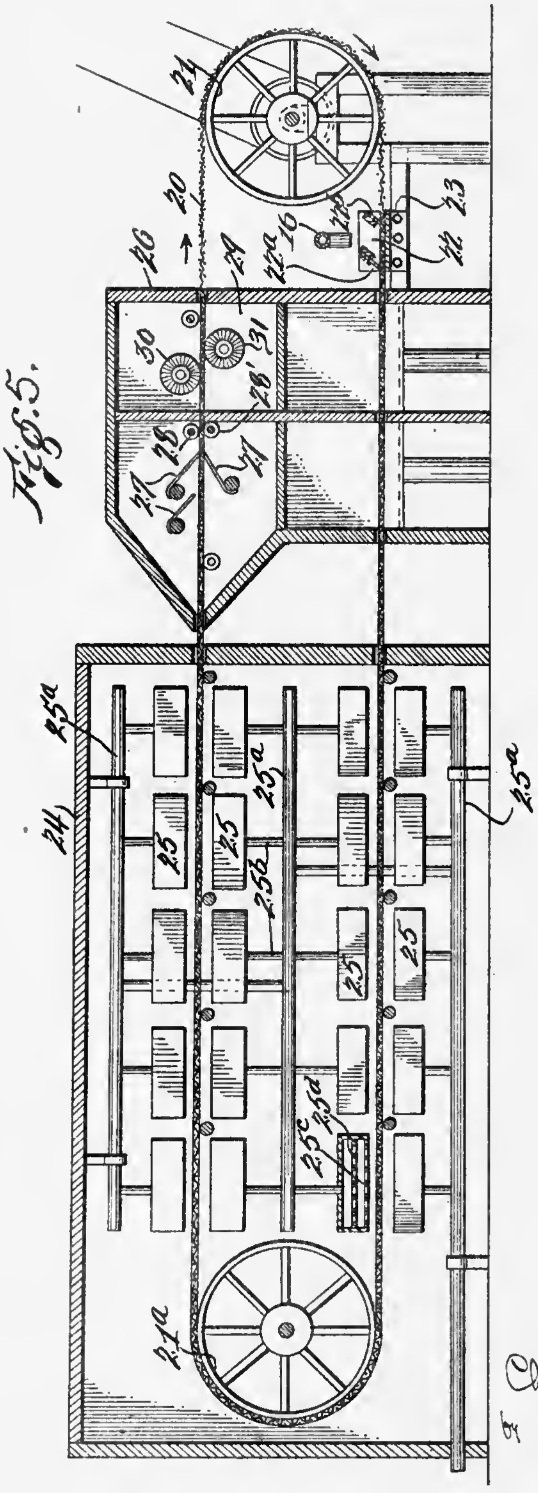
1,292,577.

Patented Jan. 28, 1919.

4 SHEETS—SHEET 3.



Inventor
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APPARATUS FOR PRODUCING DRIED MILK.
APPLICATION FILED APR. 11, 1917.

1,292,577. Patented Jan. 28, 1919.

4 SHEETS—SHEET 4.

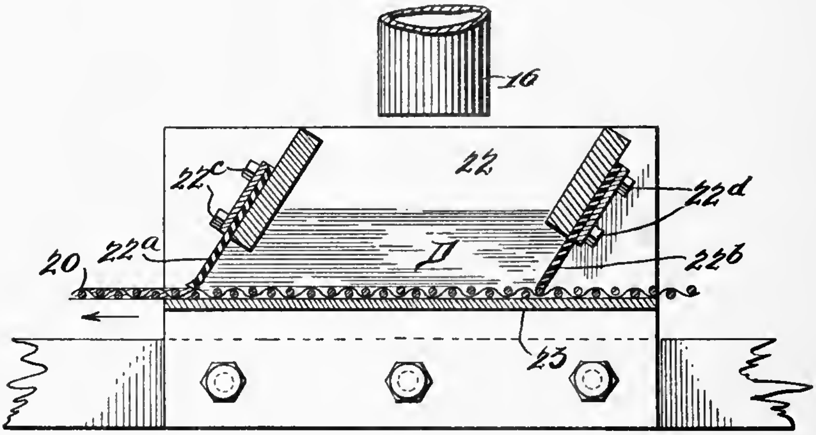


Fig. 6.

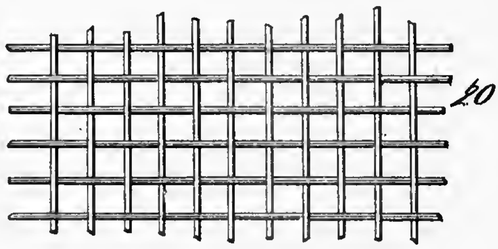


Fig. 7.

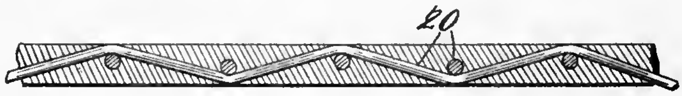


Fig. 8.

Charles H. Campbell Inventor

By Walter B. Edmonds Attorney

UNITED STATES PATENT OFFICE.

CHARLES H. CAMPBELL, OF NEW YORK, N. Y., ASSIGNOR TO BORDEN'S CONDENSED MILK COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

APPARATUS FOR PRODUCING DRIED MILK.

1,292,577. Specification of Letters Patent. Patented Jan. 28, 1919.

Original application filed December 21, 1915, Serial No. 67,996. Patent No. 1,233,446, dated July 17, 1917. Divided and this application filed April 11, 1917. Serial No. 161,147.

To all whom it may concern:

Be it known that I, CHARLES H. CAMPBELL, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented new and useful Improvements in Apparatus for Producing Dried Milk, of which the following is a specification, this application being a division of my application Serial No. 67,996, filed December 21, 1915, on which was granted Patent No. 1,233,446, July 17, 1917.

My invention relates to apparatus for producing dried or desiccated milks, and its objects comprise provision of means in aid of an industrially practicable procedure, the final product of which is composed solely of constituents of the natural milk, whence it is derived, and which, as compared with any other dried milks known to me, is more rapidly and perfectly soluble in water, which, as thus "reconstituted," possesses more nearly and perfectly all the desirable characteristics and behaviors of natural milk, and the peptogenic properties of which are even more effective than those of the natural milk.

Figure 1 is a side view, largely in section, of my aerating and stirring devices.

Fig. 2 is a detail perspective view of one of the stirrers isolated.

Fig. 3 is, on enlarged scale, a cross sectional view on line 3—3 of Fig. 1 viewed in the direction of the arrow.

Fig. 4 is a sectional view on line 7—7 of Fig. 3 viewed in the direction of the arrow, and showing the means for holding the removable bars.

Fig. 5 is a side view largely in section of my drying apparatus.

Fig. 6 is, on enlarged scale, a detail view partly in section of my appliances for feeding the aerated batter onto the conveyer, and regulating its thickness thereon.

Fig. 7 is a fragmentary plan, on enlarged scale, of part of my air-permeable conveyer belt.

Fig. 8 is a detail side view of the belt showing the disposition thereon of the aerated batter.

Like reference numerals and letters refer to like parts in the respective figures.

My method of producing my dried milk product is as follows: I first procure, or produce, in any convenient way, a concentrate of normal, fluid, skimmed, milk. I have discovered that it is essential for requisite viscosity that the albumin of such concentrate be uncoagulated, and it is preferable that all of its other constituents retain likewise their normal characteristics and qualities as in the natural milk.

Such concentrate is producible by such method and means as are disclosed in Letters Patent No. 668,161, dated February 19, 1901, to Joseph H. Campbell, or in my pending application for Letters Patent Serial Nos. 781,081, filed July 25th, 1913, and 865,647, filed October 8th, 1914, in which, by aid of blowing air through the milk, it is concentrated so rapidly as to avoid undesired changes of its constituents.

I have also discovered that in order to produce the most desirable form of my dried product, it is preferable that the milk be thus concentrated down to not less than one-third, and preferably down to about one-sixth, of its original volume.

This concentrated milk thus obtained, I next aerate, in such manner, as to pervasively and homogeneously occlude, throughout the mass, the greatest possible number of separated, relatively minute, bodies of air, thereby pervading the semi-liquid viscous concentrate of milk solids by a great number of mutually, closely approximated relatively minute and persistent spherical cells, whereby a substantially infinite number of curved interior surfaces are imparted to the mass.

Such aeration I accomplish by injecting into the concentrate, air, or other suitable gas, under pressure, and meanwhile stirring the commingled air and concentrate, the pressure, volume, and direction of the gas, and the rapidity and extent of the stirring, being so regulated, as is readily ascertained in each particular case, to insure presence of the greatest possible number of the said cells in the concentrate.

It will be understood that the object and result of such cotemporaneous aeration and stirring is not to expand and lift portions of the concentrate in the form of bubbles or foam, but to uniformly expand all parts of the mass simultaneously and evenly by the multitude of small gas-containing cells thus created therein.

The instrumentalities employed to thus stir, should be of such form and operation as to continuously displace, distort, and break up therewith contacting portions of the viscid concentrate, and of thereagainst bearing bodies of compressed gas, whereby is secured the desired multiplication and minuteness of the subdivisions of the latter in the concentrate.

I have invented in aid of thus aerating the thus concentrated milk, the combination of devices shown in Figs. 1, 2 and 3 of the drawings, in which 12 represents a suitably stationarily supported, longitudinally extended, tank or container, for the concentrated milk, divided by partitions 12′ into a series of alike intercommunicating chambers, and preferably provided with any suitable cover 12^2 and with an ordinary jacket, or jackets, 13, connected in the usual manner, or by suitably valved conduits 13′ with the usual sources (not shown) of temperature influencing mediums, and provided as of course with the usual outlets 13^2.

Into each compartment, adjacent the bottom thereof, means are provided for injecting thereinto compressed air, or other suitable gas, these being, in this instance, the conduit pipes 14 leading to a suitable source of supply (not shown) and each provided with a valve 14′ whereby the volume admitted may be regulated as required.

Incidentally, I prefer to also connect the said pipes with a steam supply, as per the branch pipe 14^2 (Fig. 3) provided with a valve 14^3 whereby the temperature of the compressed air may be raised if desired.

A pipe 15 (Fig. 1) connecting the interior of one end of the tank with any suitable source of supply of the concentrated milk, and provided with a valve 15′, affords means for charging the tank as and when required. Another pipe 16 provided with a valve 16′ affords an outlet for the concentrate after its treatment in the tank.

Intercommunication between the chambers, such as to enable the milk to flow sequentially through the series, is provided, in this instance, by means of openings 17 (Fig. 3) in each of the partitions, the aperture of which is variable as required, by means of removable bars 17′ slidably held by aid of guide flanges 17^2 (Fig. 4) carried by the partition adjacent the vertical sides of the opening, the height of the opening being proportional to the number of said bars at any time so held across it.

A rotatory shaft 18 is mounted in the sides of the tank and its partitions, and provided with the usual pulley 18′, belt 18^2, and other connections with a source of power (not shown).

The shaft 18 carries within each of the chambers a stirring or mixing device 19 (Fig. 2), in this instance, composed of a plurality of mutually-parallel attenuated rods 19′, preferably about one-quarter inch diameter, carried by frames 19^2 secured to the shaft.

The construction is such that, as follows from the foregoing, means are provided whereby the temperature in some of said chambers relatively to the temperature in others is variable by the operator as may be indicated; likewise the volume of gas injected into any chamber as compared to another; also means are provided whereby the feed of milk into the first in series, and the discharge of aerated milk from the last in sequence, of said chambers is likewise variable.

These features are of great importance because during the latter stages of aeration a lower temperature and injection of gas in greater volume than during the earlier are, in connection with other features described, conducive, if not indispensable, to attainment of my aforesaid peculiarly aerated product in its best form.

The operation is as follows: The aforesaid concentrated milk is admitted through pipe 15 in quantity sufficient to fill the first compartment. The valve 14′ being now opened, compressed air is then injected thereinto and the shaft 18 simultaneously rotated. The rods are thus caused to constantly, momentarily, divide therewith contacting portions of the viscous concentrate, and of the air bodies therein in motion. This results in an intimacy and completeness of mixture of the air and concentrate otherwise unattainable, and the concentrate being sufficiently viscous, the very minute subdivisions of air, or bubbles, are thereby persistently retained, as compared with otherwise larger occlusions of air. As the operation proceeds the feed of concentrate is continued, and the overflow passes through the openings in the partitions sequentially through each of the chambers, and during its transit is progressively more and more completely and homogeneously aerated, the product as it emerges through the outlet 16 being filled as full as it can hold of the minutest possible air bodies, or bubbles, which are so crowded in the concentrate matrix, and so minute, and many, as to remain substantially stationary and inertly imprisoned and intact, notwithstanding gravity, atmospheric pressures, or the moderate disturbing influences to which exposed by the next step of my method. During the operation there is circulated through the jacket 13 and its connections, the usual flow of a temperature-influencing medium, such as heated water, but in order to preserve the milk constituents unchanged, and, particularly at this stage, the viscosity of the concentrate, the temperature should not be raised above that of the coagulating point of albumin. My next step consists in dehydrating or extracting from, my, at this stage, aerated batter substantially all of its remaining moisture, or sufficiently to produce my final dried product.

From the outlet pipe 16 the batter is conveyed in any convenient manner and spread in a layer of uniform thickness upon a forwarding instrumentality, adapted to expose the greatest surface thereof with least disturbance to the therein occluded bubbles.

I have discovered that these requirements are best subserved by using as such instrumentality, an endless carrier in the form of an air-permeable yielding belt 20 (Figs. 5–8), composed, in this instance, of nineteen gage wire two and one half mesh.

This belt is carried and endlessly forwarded in the direction of the arrow, in the usual manner, as by aid of pulleys 21, 21ª, (Fig. 5) and other instrumentalities not shown. Adjacent one of these pulleys, I support, stationarily, over the belt, a rectangular storage hopper 22 (Figs. 5 and 6) beneath the open bottom of which I stationarily support a floor or bottom 23 with which the lateral sides of the hopper contact. The sides of the hopper, transverse the belt, are preferably inclosed, as shown in Fig. 6, and provided with inclined plates 22ª and 22ᵇ adjustable in any convenient manner, as by set-screws 22c and 22ᵈ, so that their edges may be approximated and held, in required relation to the top of the belt, which passes between them and said floor as shown. These plates, or at least their belt-approximating edges, should be composed of flexible or, to an extent, yielding material. The outlet pipe 16 vents into the hopper, as shown in Fig. 6. The construction is such that some of the aerated batter concentrate, D, is constantly accumulated upon the belt within the confines of the hopper. By adjusting the proximity of the lower edge of the plate 22ª to the top of the belt, a uniform desired thickness is imparted to the layer of batter which is being entrained and carried forward by its entanglement with the belt. This substantial uniformity of thickness in the layer is of essential importance, inasmuch as without it, it is impossible to uniformly dry with desired rapidity all portions of the belt-carried batter. The plate 22ᵇ should be adjusted to as close contact with the belt and floor as is permissible without undue frictional retardation of movement. The function of this plate is not only to close that side of the hopper against undue leakage of the batter, but also to wipe off of the thereunder-advancing belt any particles of thereto still adherent dried milk.

The relative dispositions of the belt and its thereto adherent layer of aerated batter, are indicated in Fig. 8, in which the layer and the warp wires are shown in section, and the woof wires in perspective.

The belt, as it advances, carries the layer into a drying chamber 24, where it passes, as shown, between an extended series of oppositely-disposed, stationarily supported, alike, driers 25, consisting of a reservoir connected by pipes 25ª, and 25ᵇ, with a source of heated, or dried and heated, air, (not shown) under pressure sufficient to propel the air. Each reservoir is open toward the belt, but in order to insure uniformity of distribution and to avoid any disturbing air pressures against the batter, I prefer to interpose over the opening a screen 25ᶜ of moderately open mesh, and, to the same end, to interpose medially in the reservoir another like screen 25ᵈ of somewhat larger mesh. By these means a constant outbreath of heated air is simultaneously applied to both sides of the layer of batter, but so diffusedly and gently that the integrity of the air bubbles in the batter is not destroyed, or jeopardized, as might be if the ordinary hot air blasts of the art were employed.

I prefer that the drying should be accomplished without raising the temperature so high as to coagulate the albumin, nor so high as to change the natural physical and chemical characteristics of the other milk solids and constituents other than water.

The thus rapidly and uniformly drying batter is, by the belt, conveyed, within the drying chamber, around the pulley 21ª and thus out of the chamber. Thence it passes into a removal chamber 26 (Fig. 5), wherein any convenient instrumentalities can be operated to remove the now dried product from the belt. I have in the present instance diagrammatically indicated such instrumentalities as scrapers 27, supported and disposed to yieldingly scrape the product off of the belt, also as coacting rolls 28, 28′. These instrumentalities break off of the belt in flake-like forms, or groups, most of the thereto adherent, now dried, milk solids. These fall by gravity to the bottom of the chamber, whence they may be removed, for use, by any well known means. I provide adjacent the main removal chamber an auxiliary chamber 29 for collection, therein, of minute particles of the dried solids which may still adhere, to the belt, and which are of value as a secondary, though less desirable commercial product, these minute particles, though more rapidly and perfectly soluble than any dried milk known to me, being in mass not quite so rapidly soluble as the larger flakes. In the chamber 29 I brush the belt thoroughly, using, in this instance, cylindrical revolving brushes 30, 30′, of type too familiar to require further description here. The belt emerges from the chamber 29 substantially cleansed of all thereto-adhering particles, passes over the pulley 21 and returns to its original position beneath the hopper 22, and the cycle is indefinitely repeated.

It will be noted that throughout the operations described, care is taken to exempt the aerated batter, until dried, from any shocks or pressures capable of seriously disrupting its integrity and continuity, or of causing the therein occluded air globules to disrupt or escape from the still plastic magma constituting their matrix. But the constitution imparted to that magma by the preceding procedures and treatment is such that it is sufficiently viscous and tenacious to endure all the ordinary strains incident to the operation, without releasing its occluded air. In this, it differs notably from anything producible by merely beating or otherwise converting raw milk, or even concentrated milk, into mere froth or foam. I am aware that it has been suggested that milk be so frothed or foamed by beaters, and the resulting foam or froth dried, but this I have found impracticable because of the instability of the large bubbles thus produced, and the impossibility of thus homogeneously and persistently aerating the milk treated.

The rods 19′ are preferably cylindrical, *i. e.* of circular cross section, their function being to continuously slice or cut smoothly and evenly, in a multitude of planes, the viscid concentrate through which the air is being upwardly and relatively gently forced, and thus produce the desired impregnation with the least possible ebullition from the surface. To this end, the mixing device 19 is preferably maintained at all times completely immersed in the concentrate, thus avoiding any spasmodic heating into the latter of uncontrollably irregular volumes of surface air.

The dimensions of each of the intercommunicating chambers of the tank 12 may, in the specimens shown in the drawings, be taken to be 12 inches square by 30 inches deep. The tops of the openings 17 are about 18 inches above the floor of the chambers. These dimensions will, of course, be varied according to circumstances, and I mention them only as a guide to approximately proper proportions.

Having thus described my invention, what I claim and desire to secure by Letters Patent is the following:

1. In an apparatus for treating milk, a plurality of chambers interconnected by a pathway for the milk, means to inject gas into, and stirring means in, each of a plurality of said chambers.

2. In an apparatus for treating milk, a plurality of chambers interconnected by a pathway for the milk, means to inject gas into, and stirring means in, each of a plurality of said chambers, and means to vary the temperature in one of said chambers relatively to the temperature in another.

3. In an apparatus for treating milk, a plurality of chambers, a partition between each mutually adjacent pair thereof provided with an opening located between the top and bottom of said chambers, means to inject gas into, and stirring means in, each of a plurality of said chambers.

4. In an apparatus for treating milk, a series of like chambers interconnected by a pathway for the milk; a rotatory shaft mounted in said chambers; a plurality of agitating members carried by said shaft in each of said chambers, and means to inject gas into said milk in each of said chambers.

5. In an apparatus for treating milk, a plurality of chambers interconnected by a pathway for the milk, means to inject gas into, and stirring means in, each of said chambers, and means to vary the volume of gas so injected into one of said chambers relatively to the volume so injected into another.

6. In an apparatus for treating milk, a plurality of chambers interconnected by a pathway for the milk, means to inject gas into, and stirring means in, each of a plurality of said chambers; means to vary the temperature in one of said chambers relatively to the temperature in another; and means to vary the volume of gas so injected into one of said chambers relatively to the volume so injected into another.

7. In an apparatus for treating milk, a plurality of chambers interconnected by a pathway for the milk, means to inject gas into, and stirring means in, each of a plurality of said chambers; means to vary the temperature in one of said chambers relatively to the temperature in another; means to vary the volume of gas so injected into one of said chambers relatively to the volume so injected into another; means to feed the milk into the first in series of said chambers; means to regulate said feed; means to discharge the aerated milk from the last in sequence of said chambers; and means to regulate said discharge.

8. In an apparatus for treating milk, a plurality of chambers, a partition between each mutually adjacent pair thereof provided with a variable opening located between the top and bottom of said chambers, means to inject gas into, and stirring means in, each of a plurality of said chambers.

9. In an apparatus for treating milk, a series of horizontally side-by-side intercommunicating chambers for the milk; a rotatory shaft mounted in said chambers, a plurality of pairs of parallel arms carried by said shaft in each of said chambers and projecting radially from said shaft at right angles

thereto; a plurality of rods carried by each said pair of arms in parallelism with said shaft and with each other, and means to inject gas into each of said chambers below the path of said rods.

10. In an apparatus for treating concentrated milk, a covered chamber having an opening in one side, between the top and bottom, thereof; a rotatory horizontally disposed shaft mounted in said chamber; a plurality of pairs of parallel arms, carried by said shaft and projecting radially from said shaft at right angles thereto; a plurality of rods not exceeding one-quarter inch in diameter carried by each said pair of arms in parallelism with said shaft and with each other; and means to inject gas into said chamber below the path of said rods.

11. In an apparatus for treating concentrated milk, a covered chamber having an opening in one side, between the bottom and top, thereof; an agitator movable within said chamber; and means to inject gas into the path of said agitator in said chamber.

12. In an apparatus for aerating concentrates, a consecutive series of chambers interconnected by a pathway, for the concentrate, extending above the bottom of said chambers; means for aerating the concentrate in each of a plurality of said chambers independently of the others; means to continuously supply the concentrate to the first of said series of chambers; and means to withdraw the aerated concentrate from the last in series of said chambers, whereby the more aerated and rising portions of the concentrate in each chamber are progressively withdrawn therefrom and further aerated in another of said chambers apart from less aerated portions of the concentrate.

CHARLES H. CAMPBELL.

Witnesses:

TIMOTHY J. MAHONEY,
D. HAROLD BUSH.

PASTEURIZATION

Patent	Subject	Author	Date
14,567	Spark-arrester.	Lutz	Apr. 1, 1856.
562,038	Pasteruizing apparatus.	Schier	Je. 16, 1896.
562,460	Bottled-beer steamer.	Freiwald	Je. 23, 1896.
566,268	Process of pasteurizing milk.	Fagersten	Aug. 18, 1896.
593,140	Pasteurizing bottled liquids.	Westelaken	Nov. 2, 1897.
607,304	Beer-pasteurizing apparatus.	Wagner	Jl. 12, 1898.
607,770	Apparatus for pasteurizing beer.	Ruff	Jl. 19, 1898.
654,369	Apparatus for pasteurizing beer.	Wagner	Jl. 24, 1900.
672,788	Device for hoisting and transferring bottled beer in bottling establishments.	Lieber	Apr. 23, 1901.
675,996	Electric meter.	Gutmann	Je. 11, 1901.
678,724	Apparatus for pasteurizing liquids in bottles.	Gangloff	Jl. 16, 1901.
701,622	Pasteurizer.	Ruff	Je. 3, 1902.
708,738	Pasteurizing apparatus.	Schirmer	Sept. 9, 1902.
713,952	Pasteurizer.	Busch	Nov. 18, 1902.
725,489	Pasteurizer.	Schirmer	Apr. 14, 1903.
727,575	Process of treating bottled goods.	Birkholz	May 12, 1903.
731,131	Pasteurizer.	Ruff	Je. 16, 1903.
740,837	Apparatus for pasteruizing beer.	Fesenmeier	Oct. 6, 1903.
749,547	Method of pasteurizing.	Fesenmeier	Jan. 12, 1904.
755,108	Pasteurizer.	Busch	Mar. 22, 1904.
764,657	Pasteurizing apparatus.	Clasmann	Jl. 12, 1904.

PASTEURIZATION (Continued)

Patent	Subject	Author	Date
767,960	Pasteurizer.	Ruff	Aug. 16, 1904.
767,961	Pasteurizer.	Ruff	Aug. 16, 1904.
767,962	Pasteurizer.	Ruff	Aug. 16, 1904.
768,550	Process of pasteurizing beer.	Wagner	Aug. 23, 1904.
775,144	Pasteurizing bottled liquids.	Mathie	Nov, 15, 1904.
781,860	Pasteurizing apparatus.	Wright	Feb. 7, 1905.
782,878	Pasteurizer.	Ruff	Feb. 21, 1905.
798,833	Intermittent movement in pasteurizers.	Ruff	Sept. 5, 1905.
801,693	Pasteurizer.	Ruff	Oct. 10, 1905.
805,025	Pasteurizing apparatus.	Nissen	Nov. 21, 1905.
806,266	Machine for pasteurizing beer.	King	Dec. 5, 1905.
806,354	Pasteurizer.	Loew	Dec. 5, 1905.
808,668	Process of pasteurizing beer.	Loew	Jan. 2, 1906.
817,495	Pasteurizer.	Loew	Apr. 10, 1906.
832,581	Apparatus for sterilizing bottled carbonated liquids.	Kowarsch	Oct. 2, 1906.
839,926	Method of effecting the destruction of pathogenic organisms in water or other liquids.	Griffith	Jan. 1, 1907.
862,623	Sterilizing apparatus.	Emerick	Aug. 6, 1907.
866,870	Pasteurizer.	Loew	Sept. 24, 1907.
886,012	Pasteurizing apparatus.	Paul	Apr. 28, 1908.
886,013	Pasteurizing apparatus.	Paul	Apr. 28, 1908.
902,826	Pasteurizing apparatus.	Loew	Nov. 3, 1908.
904,986	Pasteurizing apparatus.	Pindstofte	Nov. 24, 1908.
907,639	Pasteurizing apparatus.	Paul	Dec. 22, 1908.

PASTEURIZATION (Continued)

Patent	Subject	Author	Date
909,542	Process of treating fruit.	Campbell	Jan. 12, 1909.
913,559	Pasteurizing apparatus.	Pindstofte	Feb. 23, 1909.
913,600	Process of pasteurizing milk.	Willmann	Feb. 23, 1909.
913,910	Pasteurizing apparatus.	Paul	Mar. 2, 1909.
915,765	Pasteurizing apparatus.	Harders	Mar. 23, 1909.
934,377	Apparatus for pasteurizing and cooling beer.	Wenzer	Sept. 14, 1909.
939,162	Pasteurizing apparatus.	Pindstofte	Nov. 2, 1909.
946,397	Pasteruizing apparatus.	Pindstofte	Jan. 11, 1910.
948,443	Pasteurizing apparatus.	Cauffman	Feb. 8, 1910.
964,777	Pasteurizing apparatus.	Heizer	Jl. 19, 1910.
966,872	Pasteurizing apparatus.	Tiesse	Aug. 9, 1910.
979,796	Pasteurizer.	Pinkney	Dec. 27, 1910.
981,303	Pasteurizer equipment.	Paul	Jan. 10, 1911.
981,961	Mechanism for closing covers of pasteurizer-baskets.	Wehmiller	Jan. 17, 1911.
989,141	Pasteurizing apparatus.	Gettelman	Apr. 11, 1911.
991,808	Pasteurizing apparatus.	Tiesse	May 9, 1911.
994,192	Pasteurizer.	Pinkney	Je. 6, 1911.
996,209	Method of pasteurizing liquid food and drink products in glass containers.	Cabanne	Je. 27, 1911.
999,553	Apparatus for handling bottles or like containers.	Eick	Aug. 1, 1911.
1,001,517	Pasteurizing apparatus.	Eick	Aug. 22, 1911.
1,002,499	Pasteurizing apparatus.	Cauffman	Sept. 5, 1911.
1,004,885	Process of pasteurization.	Loew	Oct. 3, 1911.
1,005,854	Process of pasteurizing bottle beverages.	Lindemann	Oct. 17, 1911.

PASTEURIZATION (Continued)

Patent	Subject	Author	Date
1,009,686	Pasteurizing process.	Park	Nov. 21, 1911.
1,017,777	Pasteurizer.	Loew	Feb. 20, 1912.
1,027,894	Pasteurizing apparatus.	Pindstofte	May 28, 1912.
1,037,247	Sterilizing apparatus.	Hauk	Sept. 3, 1912.
1,076,852	Combined rack and seal for submerged milk-containers.	Wescott	Oct. 28, 1913.
1,077,270	Pasteurizing.	Gettelman	Nov. 4, 1913.
1,082,743	Pasteurizing.	Gettleman	Dec. 30, 1913.
1,085,901	Pasteurizing apparatus.	Gettleman	Feb. 3, 1914.
1,088,921	Pasteurizing-machine.	Nissen	Mar. 3, 1914.
1,098,551	Pasteurizing apparatus.	Beckman	Je. 2, 1914.
1,102,486	Pasteurizing-machine.	Felt	Jl. 7, 1914.
1,104,716	Pasteurizing apparatus.	Tait	Jl. 21, 1914.
1,106,033	Apparatus for handling bottles or other containers.	Eick	Aug. 4, 1914.
1,115,173	Pasteurizing apparatus.	Cauffman	Oct. 27, 1914.
1,115,248	Pasteurizing apparatus for liquids in bottles.	Schier	Oct. 27, 1914.
1,119,520	Process for pasteurizing liquids.	Krug	Dec. 1, 1914.
1,127,634	Pasteurizer.	Kerber	Feb. 9, 1915.
1,141,566	Process of pasteurizing milk.	Lester	Je. 1, 1915.
1,144,883	Apparatus for pasteurizing substances.	White	Je. 29, 1915.
1,150,269	Process of pasteurizing milk or other fluids.	Heulings	Aug. 17, 1915.
1,162,808	Pasteurizer and cooler.	Robinson	Dec. 7, 1915.
1,168,789	Art of pasteurizing liquids.	Crecelius	Jan. 18, 1916.
1,168,823	Method and means for the treatment of fluids containing fat globules, casein, and sugar.	Nielsen	Jan. 18, 1916.

PASTEURIZATION (Continued)

Patent	Subject	Author	Date
1,191,386	Apparatus for use in and in connection with electrolytic processes.	Battle	Jl. 18, 1916.
1,214,376	Combined pasteurizing, holding, and cooling means.	Rudd	Jan. 30, 1917.
1,260,127	Milk-pasteurizer.	Barnum	Mar. 19, 1918.
1,307,689	Pasteurization apparatus.	Murray	Je. 24, 1919.

Pa

UNITED STATES PATENT OFFICE.

STIMMEL LUTZ, OF PHILADELPHIA, PENNSYLVANIA.

SPARK-ARRESTER.

Specification of Letters Patent No. 14,567, dated April 1, 1856.

To all whom it may concern:

Be it known that I, STIMMEL LUTZ, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Spark-Arrester for Locomotives and also for Stationary Steam-Engines, &c.; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification, Figure 1 being a perspective view of my improved spark arrester; Fig. 2, a vertical section thereof; Fig. 3, a horizontal section in the plane x x, Fig. 1; Figs. 4, 5, and 6, views of parts detached.

Like letters designate corresponding parts in all the figures.

A, is the smoke pipe, closed at its upper end by a strong metallic plate D, or its equivalent, substantially as shown in Fig. 2.

B, B, are branch pipes, extending horizontally a convenient distance, and then bending or curving up vertically, as seen in Fig. 2. There may be any convenient number of these branch pipes, care being taken to make the aggregate areas of their cross sections equal to, or greater than, that of the smoke pipe A. This is not absolutely essential but preferable, so that the flue space may increase upward.

C, is a reservoir or cap, inverted so that its open end shall cover the smoke pipe and branches thereof, the upper end and sides being perfectly tight. In the center of its top, or upper end, is a cavity G, shaped substantially like the hollow frustum of a cone, or pyramid. Through the top of this cavity is an aperture, which is closed by a valve H, except when the fire is kindling in the furnace; during which time it is kept open, in order to facilitate the draft. The valve may be controlled by means of a rod I, within the reach of the engineer, or by any other convenient device. Said reservoir, or cap, rests on projections, or shoulders, J, J, on the branch pipes B, B, or by some equivalent means. Its top is represented as slightly convex, but that is not essential; nor is the particular shape of the cavity G, above described, necessary. Any form, which will collect the sparks into the center of the cap, will answer.

K, is a jacket, or external case, starting from the smoke pipe A, some distance below its branches B, B, thence extending upward, in the form of an inverted cone P, to about the height of the bottom of the cap C; thence upward, in a cylindrical form, so as to leave an annular space around said cap, or reservoir, of sufficient capacity to allow the free passage of the smoke up through it, to a little distance above the top of said cap; and finally terminating in a flaring top, substantially as represented in the drawings. Across the throat (or top of the cylindrical portion) of this jacket, is situated a reticulated, or perforated, partition M; and over the top is placed a cap L, of similar construction, but having its meshes, or perforations, larger than those of the partition M, say in the same proportion as the mouth of the jacket is larger than its throat.

N, N, are pipes extending upward from the exhaust-steam pipes O, O, (shown by dotted lines in Fig. 2) and terminating with horizontal T shaped branches, (as seen in Figs. 3 and 6,) in the annular space E. The T shaped branches are curved so as to conform to the shape of said annular space.

Q, Q, Q, are pipes, (of a convenient number, say from 1 to 3, or 4,) extending from the conical space P, downward any convenient distance, and forming communications between the interior of the spark arrester and the open air. The upper ends may project a few inches into the interior of the space P, in order to prevent the ashes or cinders lodging therein, as they fall down; and the lower ends are provided with flaring mouths W, W, W, which may be turned horizontally forward so as to receive additional air by the motion of the locomotive. There are also dampers R, S, T, in these pipes, for regulating the quantity of, or entirely stopping, the currents through them. The use of these pipes is to increase the draft of the spark arrester.

E, E, (Fig. 1,) are doors opening into the bottom of the conical space P, for clearing out occasionally the ashes and cinders collected there.

The operation of the spark arrester is as follows:—The smoke, loaded with the sparks, as it ascends through the smoke pipe A, first strikes the plate D, heating it quite hot, and is then deflected through the branch pipes B, B, from which it passes, in several currents, into the cap, or reservoir C. Here the momentum of the sparks causes them to ascend to the top of the reservoir and by means of the cavity G, are mostly concentrated into the center thereof and fall upon the top of the plate D; where they are in a great measure consumed by the great heat of said plate. The remaining cinders pass with the smoke down around the bottom of the reservoir, into the annular space E, where they are enveloped in the vapor of condensed steam issuing from the exhaust pipes N, N, and completely extinguished. Here, in the form of moistened ashes and cinders, all the remains of the sparks fall down into the conical space P, while the smoke and draft proceed upward and out at the top of the arrester. Any cinders which may be carried up through the annular space E, by the force of the draft, are arrested by the partition M.

The object of the cap L, having larger meshes, or perforations, than the partition M, is to exclude, as much as possible, any gusts of air, or other substances, from the outside, and also, in connection with the flaring shape of the top of the jacket K, to assist in the discharge of the smoke. The cinders or extinguished sparks are all arrested by the partition L. Perhaps said cap might be dispensed with, but I believe it to act beneficially and therefore prefer its use.

I do not claim simply a cap, or deflector, for arresting the sparks, while the smoke proceeds onward; nor do I claim partitions, or caps, of wire gauze or perforated sheets of metal, alone; but

What I claim as my invention and desire to secure by Letters Patent is,

The combination of the plate D, branch pipes B, B, and the cap, or reservoir, C, provided with a central cavity G, or its equivalent, in its upper end; arranged and operating substantially in the manner and for the purposes herein set forth.

The above specification of my new and improved spark arrester signed by me this twenty second day of January 1856.

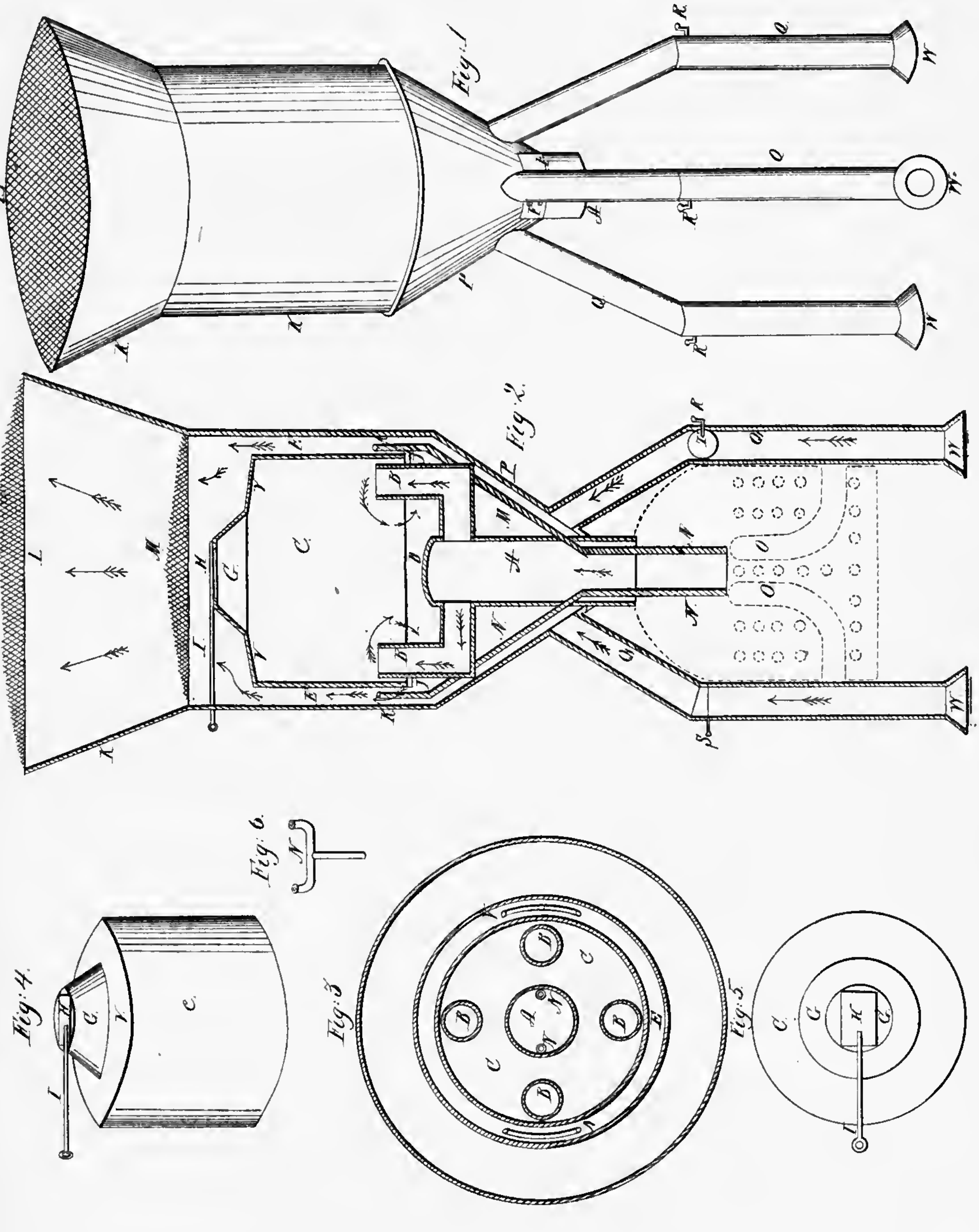
STIMMEL LUTZ

Witnesses:
JOHN THOMPSON,
JAMES BLACK.

S. Lutz,

Spark Arrester,

№ 14,567. Patented Apr. 1, 1856.



(No Model.) 2 Sheets—Sheet 1.

O. B. SCHIER.

PASTEURIZING APPARATUS.

No. 562,038. Patented June 16, 1896.

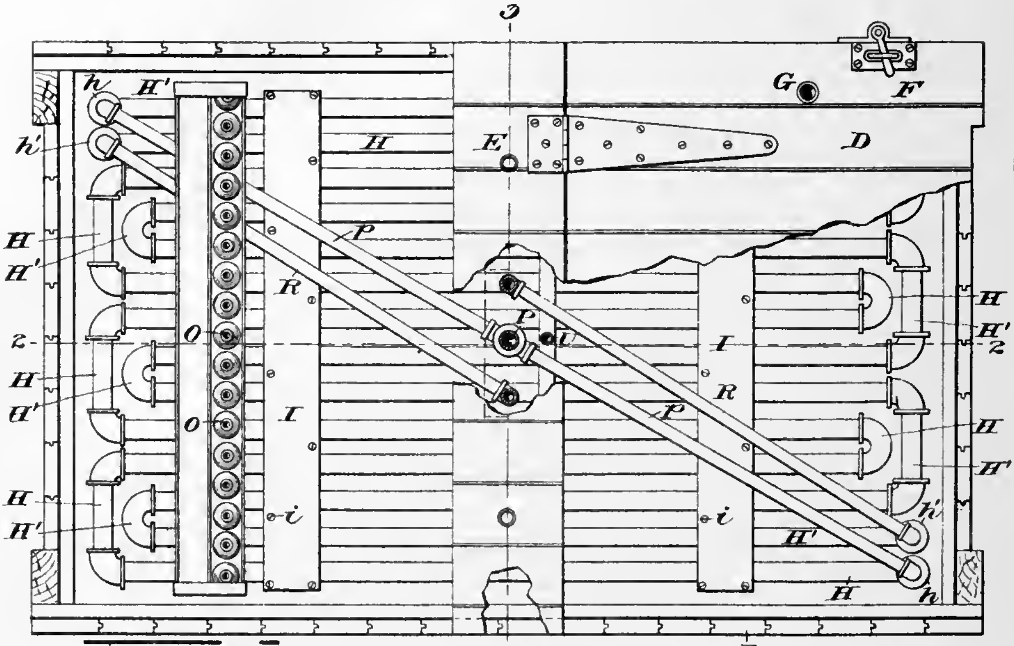


FIG. 1.

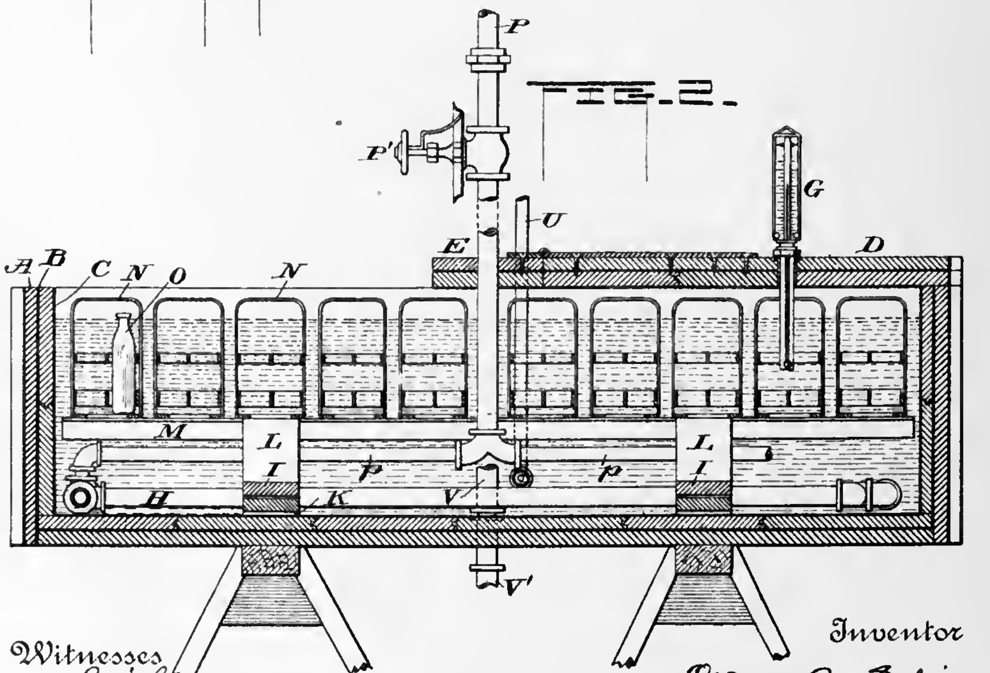


FIG. 2.

Witnesses
C. W. Smith
Marie Dillon

Inventor
Oscar B. Schier
By [signature]
Attorney

(No Model.)

2 Sheets—Sheet 2.

O. B. SCHIER.

PASTEURIZING APPARATUS.

No. 562,038. Patented June 16, 1896.

FIG. 3.

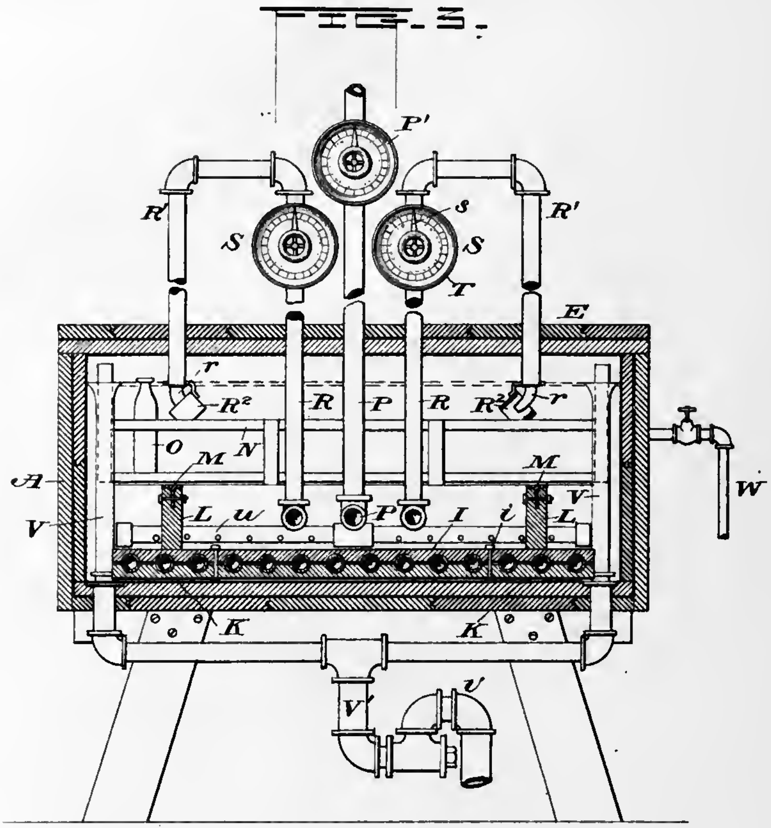
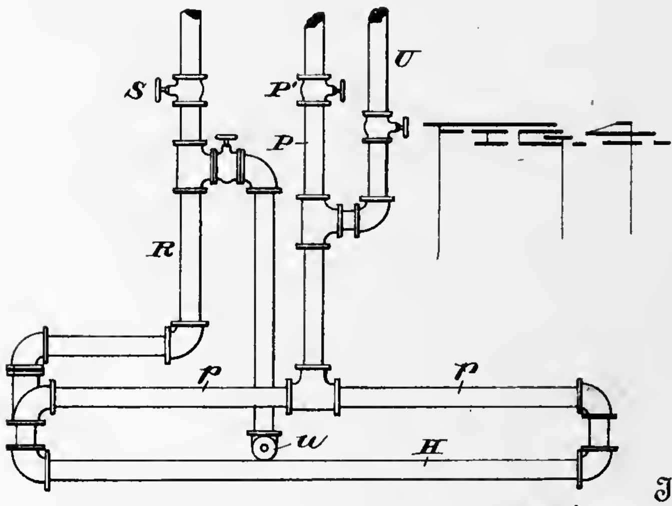


FIG. 4.



Witnesses
C. W. Smith
Marie Dillon

Inventor
Oscar B. Schier
By [signature] Attorney

UNITED STATES PATENT OFFICE.

OSCAR B. SCHIER, OF BALTIMORE, MARYLAND.

PASTEURIZING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 562,038, dated June 16, 1896.

Application filed January 25, 1896. Serial No. 576,807. (No model.)

To all whom it may concern:

Be it known that I, OSCAR B. SCHIER, a citizen of Germany, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Pasteurizing Apparatus; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to apparatus for pasteurizing or sterilizing milk and other articles of food. In carrying out these processes it is quite necessary to maintain an even temperature throughout the entire chamber in which the bottles or other food-containing vessels are contained, so that the results may be uniform in all the vessels. Heretofore it has been difficult to do this, owing to the imperfect or wrong construction of the apparatus employed. My invention overcomes this difficulty and produces a temperature in the heating-chamber which does not vary one-half a degree from a given rate at any point therein.

In pasteurizing and sterilizing the object is to destroy by heat the germs which may be contained in the milk or other liquid food. For sterilizing a temperature of 100° centigrade (212° Fahrenheit) to 102½° centigrade (216½° Fahrenheit) is required. Pasteurizing, on the contrary, requires a temperature between 68° centigrade (155° Fahrenheit) and 75° centigrade, (166° Fahrenheit.) The principle of pasteurizing is to heat the liquid quickly to the given temperature and expose it to the same for twenty-five to thirty-five minutes, according to the season of the year. After a proper exposure it must be cooled down as quickly as possible.

In sterilizing it is easy to obtain and maintain the necessary temperature by the use of steam whose temperature ranges from 100° centigrade upward; but some difficulty arises from using steam directly when the temperature is below boiling, owing to the well-nigh impossibility of controlling the heating effect. In almost all devices for pasteurizing, therefore, water is used as the heating medium, from which arises the difficulty of getting an even temperature in all parts of the apparatus.

In my improved apparatus I use a water-tank, containing a steam-coil of peculiar construction, whereby the water is evenly heated to any given temperature. Suitable arrangements are made for cooling quickly, and in practice the apparatus has proved most satisfactory.

In the drawings, Figure 1 is a top plan view of my apparatus. Fig. 2 is a longitudinal sectional elevation on line 2 2, Fig. 1. Fig. 3 is a cross-section on line 3 3, Fig. 1. Fig. 4 is a modification.

The tank A is of any suitable size and shape, preferably rectangular, and is composed, preferably, of tongue-and-grooved boards. The walls are preferably double, with a layer of non-conducting material B, as asbestos, between them. The tank is lined with metal C, such as galvanized iron, and has a suitable cover, preferably two lids D, hinged to a middle cross-bar E. The lids may be fastened by lever-handles F, such as are used upon ice-chests. At any convenient point or points, such as in one of the lids D, is inserted one or more thermometers G, having the bulb depending through the lid into the tank and the scale located above the lids, as shown.

In the lower part of the tank is the double steam-coil made in two similar parts H H′, each composed of a pipe arranged in parallel loops, the loops of one part fitting into and between the loops of the other part, just as the tines of two forks might be alternated with each other. The two coils H H′ are exactly alike, and when placed in position the inlet h of one lies adjacent to the outlet h' of the other, preferably at diagonally opposite corners of the tank, as shown. The two coils are held in position, with all the pipes in the same plane and parallel with the bottom of the tank, by means of spacing-bars I, of wood or metal, having semicylindrical notches to receive the pipes. They are placed one above and below the pipes and are fastened together by bolts i. Thin blocks K raise the clamping-bars and coils to a suitable height above the bottom of the tank. From the clamping-bars

I rise standards L, in which are secured the metallic T-rails M, running parallel with each other the length of the tank and serving to support the metallic crates N, containing the bottles or other vessels O for the liquid to be treated. The main steam-pipe P has a stop-valve P′ and enters the tank at the middle, being preferably passed through and supported by the cross-bar E. From it branch pipes p run diagonally above the coils H H′ to the opposite corners of the tank, where they connect with the inlets h of the coils. The adjacent outlets h' are connected with escape-pipes R, which run back parallel with the pipes P and rise through the cross-bar E near the main steam-pipe P. In each escape-pipe R there is a stop-valve S, the stem of which has an index s moving over a circular scale T, secured to the body of the valve. Above the valve the pipe has a return-bend R′ and extends down toward or into the tank A. At the lower end the part R′ has an elbow or nozzle r, preferably inclined downward at about forty-five degrees. It is preferably surrounded by a hood or short length of pipe R^2, extending a little beyond the mouth of the nozzle. Adjacent to the main steam-pipe P or at any other convenient point is a pipe U, connected with a cold-water supply and depending into the tank. At its lower end it connects with one or more perforated headers u, so that a supply of cooling-water can be led into the tank in jets. The perforations in the header u are so arranged that the jets are directed downward away from the bottles O. If desired, the cooling-water may be caused to traverse the steam-coils before entering the tank, as by the arrangement of pipes shown in Fig. 4.

At two or more points in the tank are upright overflow-pipes V, whose open tops stand at the predetermined level of the water, and whose lower ends fit removably into outlet-pipes passing down through the bottom of the tank and uniting in a common discharge-pipe V′, in which is a trap v to prevent the entrance of cold air into the tank. A discharge-pipe W may be provided to draw off the hottest water and carry it to a reservoir for further utilization, such as washing the bottles.

The operation of the apparatus is as follows: To sterilize the empty bottles before they are filled, they are placed, after cleaning and washing and providing them with the disk stoppers described in my Patent No. 522,135, in galvanized baskets N, which are put into the tank upon the rails M. The tank is then filled with water high enough to just cover the coils H H′. All the steam-valves are then opened wide until the water of condensation begins to leave the outlets. Then the outlet-valves B are partially closed to allow only steam enough to flow through the coils to heat the water quickly to the boiling-point. The space above the water is filled with the live steam thus generated, which sterilizes the empty bottles. After cooling down gradually they are ready to be filled. If milk is the liquid to be treated, it must be fresh and should be thoroughly strained or run through a centrifugal separator. The filled bottles are put into the baskets and placed in the tank, which is filled with water high enough to reach an inch above the bottles. Steam is then turned into the coils, passing in opposite directions through them, so that the sum of the heating capacity of any two adjacent lengths of pipe in different loops is constant at any part of the tank. In this way a complete equalization of temperature is secured, the outlet-valves S being set exactly alike, so that the quantity of steam passing through one coil is precisely the same as that passing through the other. The water of condensation escaping through the outlet-valves S is conducted back into the tank by the pipes R′, and being injected with some force by the steam behind it it acts as a mixing-jet to stir up the water and assist in equalizing its temperature. The hoods T aid in this effect by causing the water to flow past the nozzles in a certain direction.

The degree of temperature is regulated by the valve P′ in the main steam-pipe, admitting more or less, as may be required. When the required temperature is reached, it can be easily maintained, since the non-conducting character of the walls of the tank prevents any serious amount of radiation and reduces to a minimum the quantity of steam required to keep up the even heat. If desired, some of the thermometers may be inserted into the bottles to enable the temperature of the milk to be watched.

As soon as the heating process is completed cool water is admitted through the pipe U, thereby displacing the hot water from below and cooling the bottles quickly, yet at an even rate, so as to prevent them from breaking. The tank can be entirely emptied by pulling up the overflow-pipes V and allowing the water to escape through the outlets V′.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An apparatus for sterilizing or pasteurizing, comprising a tank having a double steam-coil in its lower part, each coil comprising loops alternating with those of the other coil, substantially as described.

2. An apparatus for sterilizing or pasteurizing, comprising a tank having in its lower part two parallel steam-coils, the inlet of one being adjacent to the outlet of the other, substantially as described.

3. An apparatus for sterilizing or pasteurizing, comprising a tank having in its lower part two steam-coils, the pipes composing one of said coils lying parallel with and adjacent to those of the other coil, and all in the same plane, a main steam-pipe having branches

leading to the inlets of the two coils, and a separate outlet-pipe for each coil provided with a stop-valve, the inlet of one coil being adjacent to the outlet of the other substantially as described.

4. An apparatus for sterilizing or pasteurizing, comprising a tank containing a double steam-coil, the inlet of each coil being adjacent to the outlet of the other, a main steam-pipe having branches leading to the inlets, a stop-valve in said pipe, and two separate outlet-pipes each having a stop-valve, and terminating below the level of the water in the tank, substantially as described.

5. An apparatus for sterilizing or pasteurizing, comprising a tank having a steam-coil, an outlet-pipe for said coil provided with a valve and terminating below the level of the water in said tank, and a nozzle on the end of said pipe surrounded by an open-ended hood, substantially as described.

6. An apparatus for sterilizing or pasteurizing, comprising a tank containing a steam-coil in its lower part, a cold-water-supply pipe, and a header connected with said pipe and lying just above and transverse to said coil and containing perforations directed downwardly, substantially as described.

7. An apparatus for sterilizing or pasteurizing, comprising a tank containing a steam-coil, a cold-water-supply pipe, a perforated header lying just above said coil, and connections for directing the cooling-water through the steam-coil before it reaches the header, substantially as described.

8. An apparatus for sterilizing or pasteurizing, comprising a tank containing a double steam-coil, notched spacing-bars clamped upon said coil, and crate-supports carried by said bars, substantially as described.

9. An apparatus for sterilizing or pasteurizing, comprising a tank containing means for heating water therein, an outlet pipe or pipes leading from the bottom of said tank, and upright overflow-pipes removably inserted into said outlet-pipes, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

OSCAR B. SCHIER.

Witnesses:

C. EUGENE KLEIN,

CHARLES T. DAVIS.

(No Model.)

G. FREIWALD.
BOTTLED BEER STEAMER.

No. 562,460. Patented June 23, 1896.

Fig. 1

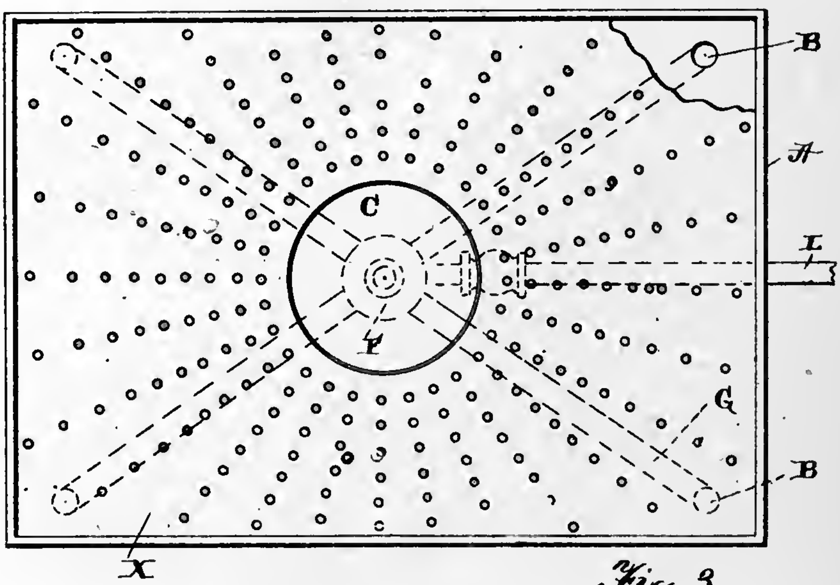


Fig. 3.

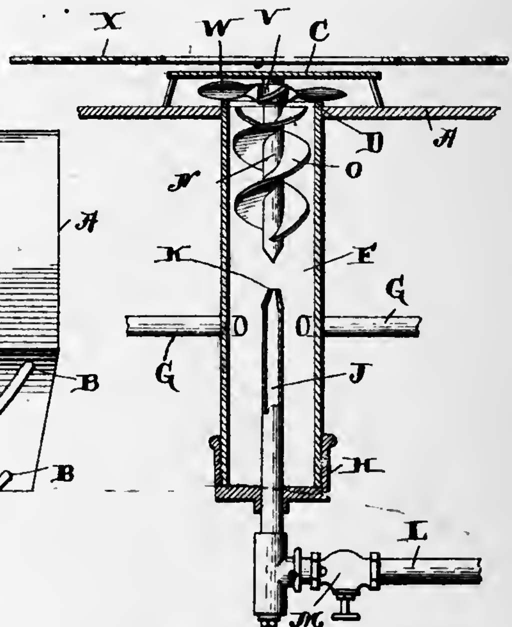
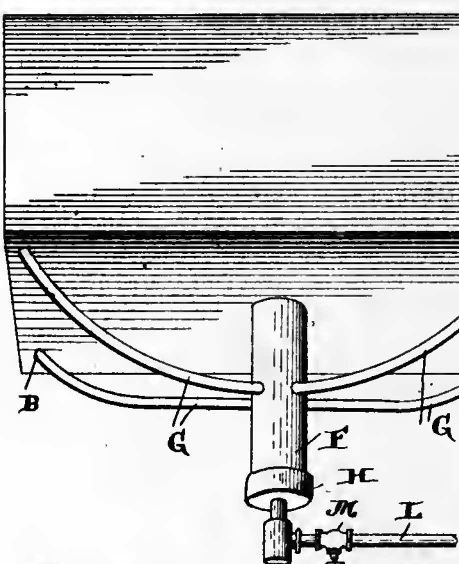


Fig. 2.



Witnesses
Geo. E. Frech.
W. S. Boyd.

Inventor
Gustav Freiwald.
By John G. Manahan
Attorney

UNITED STATES PATENT OFFICE.

GUSTAV FREIWALD, OF STERLING, ILLINOIS, ASSIGNOR OF ONE-HALF TO LOUIS G. SPIES, OF SAME PLACE.

BOTTLED-BEER STEAMER.

SPECIFICATION forming part of Letters Patent No. 562,460, dated June 23, 1896.

Application filed August 26, 1895. Serial No. 560,530. (No model.)

To all whom it may concern:

Be it known that I, GUSTAV FREIWALD, a citizen of the United States, residing at Sterling, in the county of Whiteside and State of Illinois, have invented certain new and useful Improvements in Bottled-Beer Steamers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention has reference to improvements in bottled-beer steamers; and it consists in certain novel and efficient mechanism for accomplishing the steaming of the bottled beer in a uniform, convenient, and satisfactory manner.

As is well known to those familiar with the business of bottling beer, it is impracticable to eliminate all of the yeast principle from the beer when the latter is in readiness and condition otherwise for being bottled. The presence of the smallest particle of living yeast, if permitted to remain in the bottles, will soon begin a fermentation which will sour and destroy the beer.

The difficulty in the work of steaming beer after the latter has been bottled arises from the fact that it requires a certain temperature to effectually kill the yeast, so as to preclude any future fermentation therefrom, and that this degree of heat necessarily expands the air, gases, and vapor within the bottles with the resultant danger of bursting the latter, and if the temperature is permitted to rise much above that necessary, as aforesaid, the bursting of the bottle is almost certain to ensue. The method heretofore employed for this purpose has been to fill and effectually cork the bottles by appliances which will not permit the cork to escape, then to place the bottles thus filled and corked in a vessel containing sufficient water to submerge the bottle and then heat the water to the desired temperature by means of steam injected therein. In order to have the necessary progress in this work, a large number of these filled bottles must be treated at the same time. The receptacle therefor being necessarily somewhat capacious, the difficulty has been to heat all of the water at a uniform temperature sufficient to kill the yeast as aforesaid. This difficulty is increased by the fact that the bottles are seated in the receptacle very closely together and the movement of the water thereby greatly impeded.

My purpose is to overcome these difficulties and to impart to the whole body of water an equal temperature to any desired degree by drawing the water downwardly through the bottom of the vessel or receptacle at different localities in the base of the latter and to discharge the water thus drawn upward through the bottom of said receptacle with a swirl and in connection with steam and at as many points as the size of the receptacle may render desirable.

I have reduced my invention to actual practice and in the use thereof have proven by experience that it will accomplish the result desired.

I attain the above objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan of a steaming-receptacle provided with my invention. Fig. 2 is a view in perspective of the bottom of said receptacle exhibiting the application to the latter of my invention. Fig. 3 is a detail, partly in section, of the mechanism for commingling the steam and water, including the inlet and discharge openings.

Similar letters refer to similar parts throughout the several views.

A is a receptacle in which the beer-bottles, after being effectually filled and corked, are placed in an erect position. This receptacle may be of any desired shape or size. In the base of the receptacle A are formed openings B, located preferably near the corners or margins of the receptacle and in such number as may be desired.

C is a circular plate suitably supported from the bottom of the receptacle A about an inch above the upper end of the combined steam and water inlet opening D.

F is a vertical tube suitably attached to the base of the receptacle A and projected through the opening D in the bottom of the latter, directly under the plate C.

G G are water-pipes communicating at their outer ends with the openings B in the base of A and at their inner ends with the interior of the vertical tube F.

H is an inverted cap, screw-seated in the lower end of the tube F. A hollow steam-stem J is rigidly seated centrally in the base of the cap H and extended upwardly through the latter and projected within the tube F to a point about an inch above the junction with the latter of the water-pipes G. The upper end of the stem J is of a conical form and provided with a central opening K. The stem J extends a suitable distance below the cap H and is seated at its lower extremity in the steam-pipe L, the latter being provided with the usual adjusting and stop cock M.

On the lower surface of the plate C there is rigidly seated and projected downwardly into the upper end of the tube F the steam and water diverter N, provided peripherally with double spiral flanges O.

A rotating collar V, provided with distributing-wings W, is loosely seated on the diverter N directly under the plate C and serves to thoroughly distribute the water and steam received through the tube F, and from the diverter N.

A perforated bottom X, provided with short legs 1, is seated on the inner surface of the bottom of the receptacle A and about an inch and one-half above said bottom. This perforated bottom is preferably placed in sections for convenience of removal and replacement in cleaning up. The bottles rest on the bottom X, leaving the space below it and the bottom of the said receptacle for the free and unobstructed passage of the water to the openings B and from the opening D. As the water can pass freely through the perforated bottom X both up and down, between the bottles, portions of water of different degree are readily and thoroughly intermixed.

The operation of my invention is as follows: The receptacle A being suitably filled with the bottles of beer submerged in water, steam is admitted through the inlet-pipe L to the lower portion of the steam-stem J and driven up through said stem through the tube F, spirals O, and thrown outwardly in opposite directions into the receptacle A in the bottom of the water therein. This action creates a suction in the tube F and causes the water to flow downwardly through the openings B (the mouth of the latter being covered with perforated plates P to prevent the inflow of anything which might clog the pipes) through the pipes G into the pipe F, and from thence the water is carried by the action of the steam and heated meanwhile and discharged therewith into the main body of water in the receptacle A radially from under the plate C. The water by this means is caused to circulate not only through the pipes G and tube F, but also through the various parts of the interior of the receptacle A. The steam has two actions in heating the water: first, by its contact therewith in the tube F, and, second, by its direct discharge therewith into the main body of water. Another advantage is that the water is given a momentum while passing up the tube F by its aforesaid connection with the steam and is thereby thrown out into the receptacle A with greater force than the steam would exert alone or the water would have if it was simply a matter of circulation.

An additional advantage is the discharge of the combined steam and steam-heated water into the lower portion the body of the water in the receptacle A, as the natural tendency is for the heated water to remain at the top.

My invention draws the cooler water from the bottom through the openings B and discharges the heated water and steam into the receptacle A close to the bottom of the latter, from whence it gradually rises toward the top, and thus the entire body of water is uniformly heated.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In a bottled-beer steamer, the combination, with a receptacle, the bottom of which is provided with inlet and outlet openings, a tube communicating with the inlet-opening, a steam-stem projecting into the interior of the tube, pipes communicating with the outlets of the bottom of the receptacle and with the tube below the end of the steam-stem, a diverter above the end of the tube, and a rotatable deflector at the upper end of said diverter, substantially as set forth.

2. In a bottled-beer steamer, the combination, with a receptacle, of a tube in the bottom thereof, a steam-stem projecting into the tube, a plate above the end of the tube, a diverter rigidly secured to the plate and projecting into the tube, the periphery of which is provided with a spiral, a collar loosely mounted upon the tube between the spiral and the plate, and wings secured to the collar and movable between the plate and the bottom of the receptacle, substantially as set forth.

3. The combination of the receptacle A provided with openings B in its base, a tube F seated in the base of receptacle A, pipes G connecting the openings B with the interior of tube F below said receptacle, a plate C seated over the outlet of tube F, a diverter N provided with peripheral flanges O seated centrally in the upper end of the tube F, steam-stem J provided with opening K in its upper end and projected within the lower portion of the tube F, the rotating collar V, provided with wings W, and a feed-steam pipe L communicating with the lower portion of the stem J substantially as shown and for the purpose described.

4. In a bottled-beer steamer, a receptacle having a plate suitably supported above the bottom thereof, a tube attached to the base of the receptacle and communicating by pipes with the same, a steam-stem projecting into said tube a stationary diverter having a spiral periphery in the upper end of said tube, and a rotatable deflector at the upper end of said diverter and below said plate, said parts being combined, substantially as described.

5. In a bottled-beer steamer, a receptacle having a plate suitably supported above the bottom thereof, a tube connected with the base of the receptacle, pipes communicating with said receptacle and said tube, a steam-stem projecting into said tube, a stationary diverter in said tube, and a rotatable deflector above said diverter, said parts being combined, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GUSTAV FREIWALD.

Witnesses:
JOHN G. MANAHAN,
LOUIS G. SPIES.

566,268

UNITED STATES PATENT OFFICE.

LORENZO G. FAGERSTEN AND CLAUS F. P. KORSSELL, OF CHICAGO, ILLINOIS.

PROCESS OF PASTEURIZING MILK.

SPECIFICATION forming part of Letters Patent No. 566,268, dated August 18, 1896.

Application filed June 27, 1895. Serial No. 554,246. (No specimens.)

To all whom it may concern:

Be it known that we, LORENZO G. FAGERSTEN and CLAUS F. P. KORSSELL, citizens of the United States, and residents of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Processes of Sterilizing or Pasteurizing Milk, Modified Milk, and Cream, of which the following is a specification.

The objects of our invention are to preserve or pasteurize milk, modified milk, and cream without physical or chemical change from the condition in which they are found by destroying germs, ferments, or other elements of decomposition by an inexpensive and simple process without the addition of sugar or other preservatives, and, further, to apply means whereby the finished article can be shipped and handled without the risk of the agitation of the package churning the butter out of the substance.

In carrying out our process we place the article to be treated in packages of any size desired at ordinary temperatures, also placing in the top of the package a hydrocarbon of high melting-point, say about 125° Fahrenheit, or any similar substance, as paraffin, wax, &c., sufficient to form a covering-layer, when melted, on the surface of the article under treatment. Space is also left in the top of the package for a volume of atmospheric air, with which the package is then charged, of sufficient pressure or of adequate relative proportion to the quantity of the liquid and the size of the package to insure a pressure during the process commensurate with the increasing vapor-tension, the gas-pressure to exceed the vapor-tension by one atmosphere or more at any stage during the process. After thus charging the package it is then hermetically sealed and subjected to heat so regulated that it does not at any time exceed the conductivity of the substance under treatment. The heating part of the process is completed when the temperature of the substance under treatment has reached about 230° Fahrenheit.

All mechanical agitation or churning of the contents, which would favor the separating out of the butter or fats, must be carefully avoided until after the contents have been rapidly cooled to the solidification-point of the hydrocarbon, paraffin, wax, or other similar covering on the top of the substance, when it will be found that the contents are inhibited from agitation or churning under ordinary handling.

We do not claim, broadly, the use of paraffin, wax, or similar substances in the preserving of foods, but only the use of them to prevent churning of milk during transportation and handling.

We claim—

1. The process of sterilizing or pasteurizing milk, modified milk, or cream by heating it in hermetically-sealed original packages, the package being charged with a superimposed volume of common atmospheric air sufficient to develop a pressure exceeding by one atmosphere or more the vapor-tension generated at any stage of the process, and at any temperature used, thus preventing any vaporizing of the article under treatment.

2. The process of sterilizing or pasteurizing milk, modified milk, or cream, by placing the article to be treated in original packages together with a hydrocarbon of high melting-point, paraffin, wax, or similar substance, then charging the package with common atmospheric air, sufficient to develop a pressure exceeding by one atmosphere or more, the vapor-tension generated during the following steps, and then hermetically sealing the package and subjecting it to heat so regulated as not to exceed the conductivity of the article under treatment at any point of the package or during any stage of the process; the degree of heating depending upon how long it be desired to keep the article and ranging from 140° to 230° Fahrenheit.

LORENZO G. FAGERSTEN.
CLAUS F. P. KORSSELL.

Witnesses:
FRED P. KENNEDY,
HENRY WEIGAND, Jr.

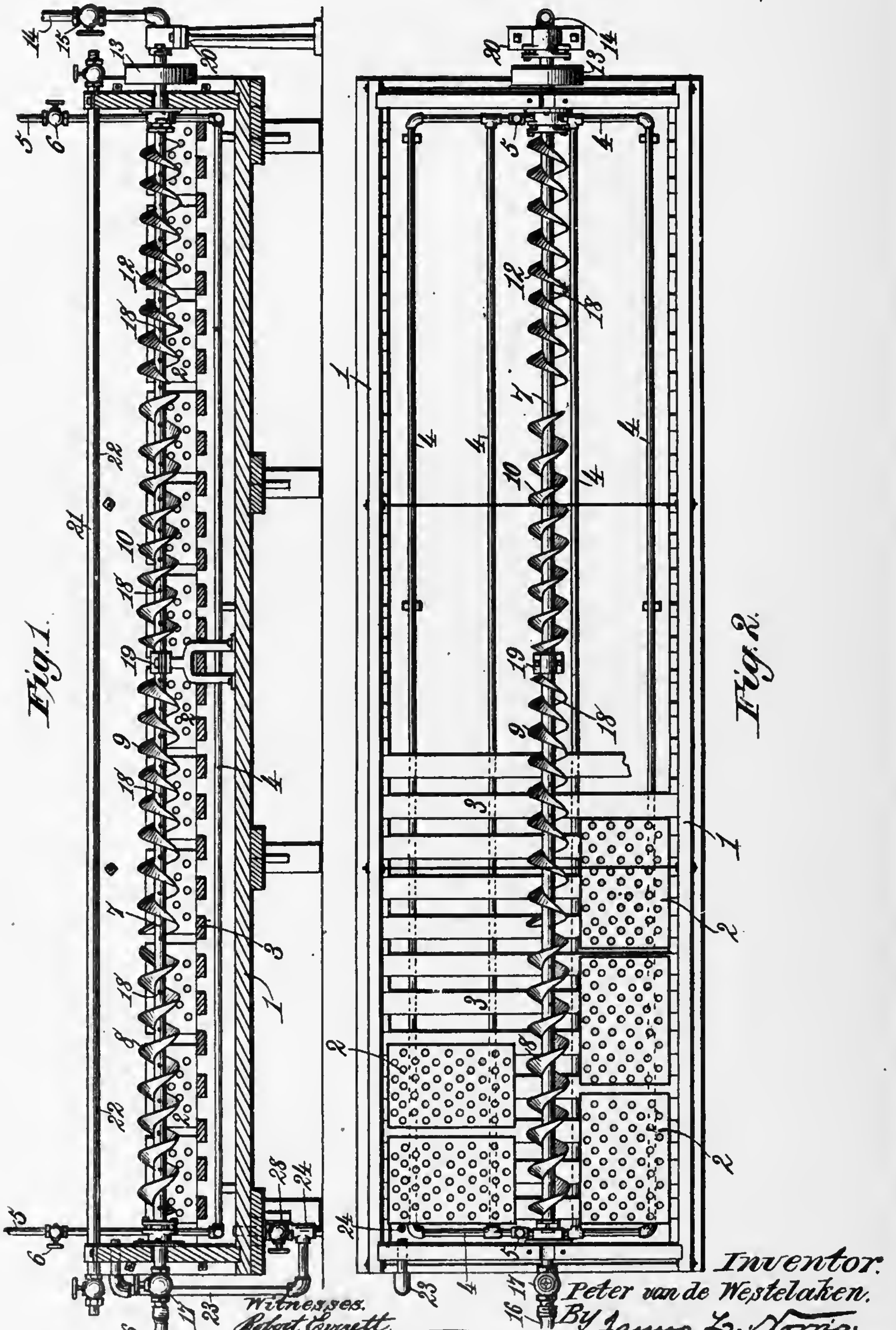
(No Model.)

3 Sheets—Sheet 1.

P. VAN DE WESTELAKEN.

PASTEURIZING BOTTLED LIQUIDS.

No. 593,140. Patented Nov. 2, 1897.



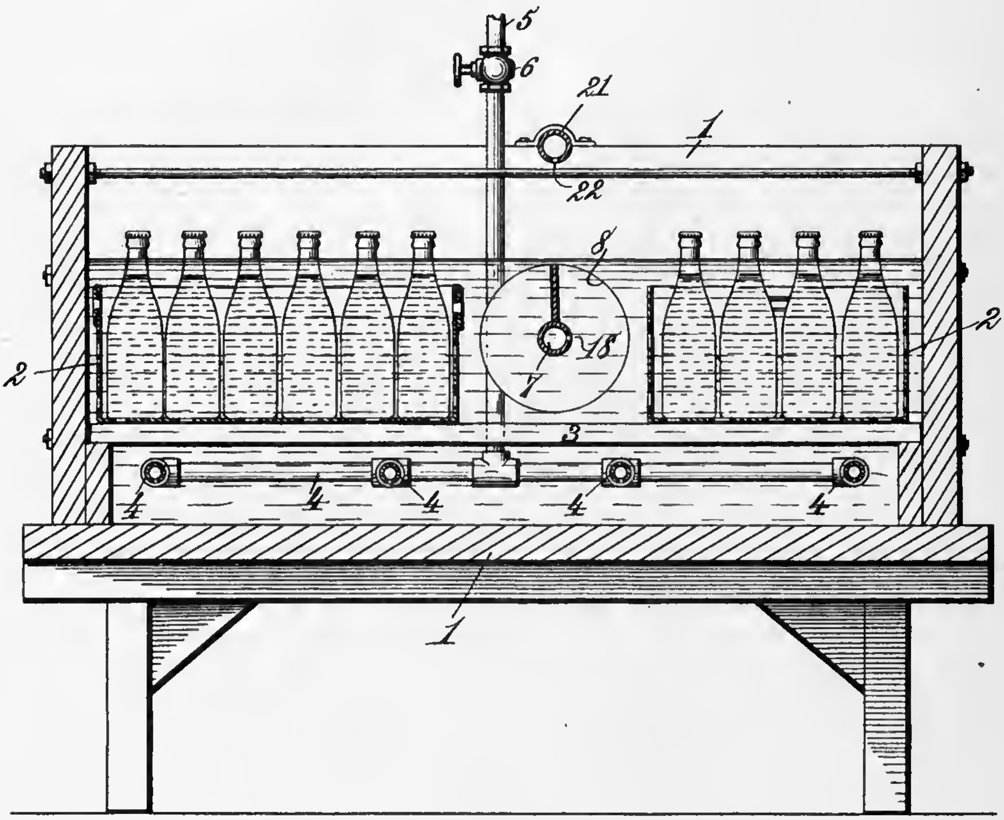
(No Model.) 3 Sheets—Sheet 2.

P. VAN DE WESTELAKEN.

PASTEURIZING BOTTLED LIQUIDS.

No. 593,140. Patented Nov. 2, 1897.

Fig. 3.



Witnesses.
Robert Everett.
Albert H. Norris.

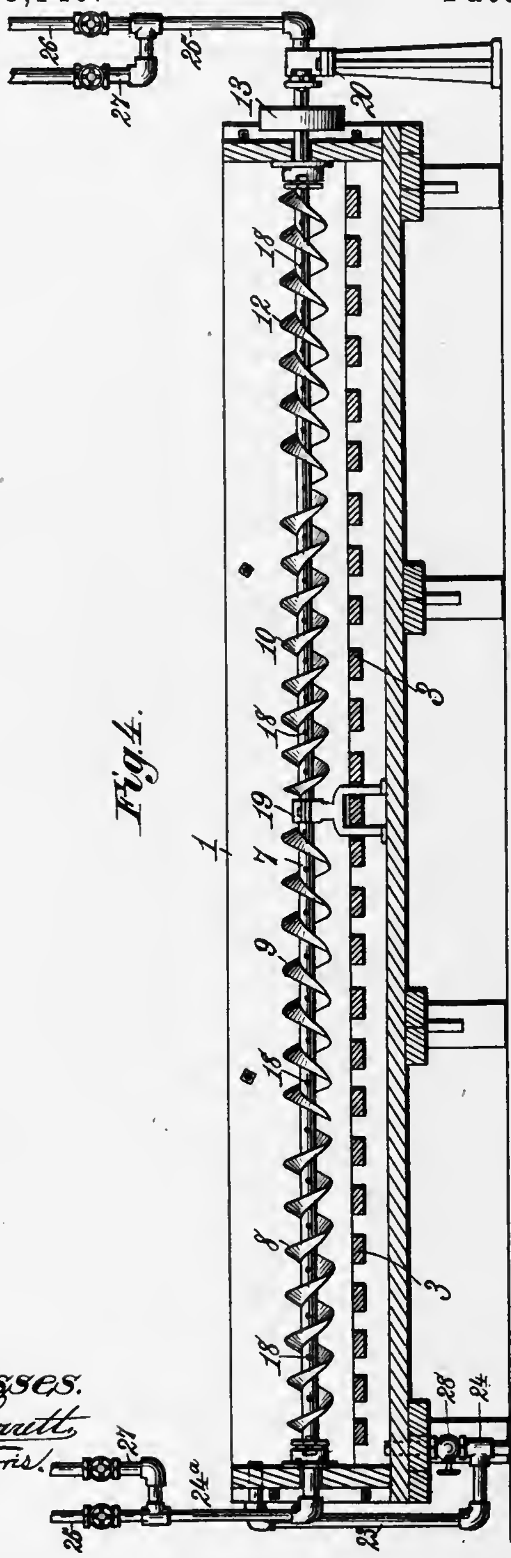
Inventor.
Peter van de Westelaken.
By James L. Norris.
Atty.

(No Model.) 3 Sheets—Sheet 3.

P. VAN DE WESTELAKEN.

PASTEURIZING BOTTLED LIQUIDS.

No. 593,140. Patented Nov. 2, 1897.



Witnesses.
Robert Everett,
Albert H. Norris.

Inventor.
Peter van de Westelaken.
By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

PETER VAN DE WESTELAKEN, OF ALEXANDRIA, VIRGINIA, ASSIGNOR TO HIMSELF, PERCY McKNIGHT BALDWIN, JOHN T. SWEENEY, JOHN T. JOHNSON, AND EMANUEL F. DOWNHAM, OF SAME PLACE.

PASTEURIZING BOTTLED LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 593,140, dated November 2, 1897.

Application filed May 4, 1897. Serial No. 635,031. (No model.)

To all whom it may concern:

Be it known that I, PETER VAN DE WESTELAKEN, a citizen of the United States, residing at Alexandria, in the county of Alexandria and State of Virginia, have invented new and useful Improvements in Pasteurizing Bottled Liquids, of which the following is a specification.

In pasteurizing beer and other liquors contained in corked or stoppered bottles to destroy the living particles of yeast, fungi, and spores for improving the quality and insuring the preservation of the beer the bottles are partially or wholly submerged in a body of water contained in a capacious tank. The water is first gradually heated by steam to the required temperature and is then gradually cooled to place the beer in the proper or best condition for the market.

A source of considerable expense, not to mention annoyance and vexation, incident to ordinary methods or processes of pasteurizing bottled beer resides in the breakage of a comparatively large number of bottles in each charge placed in the tank for treatment. The filled and corked bottles break not only during the time that the water is gradually heated to a temperature of about 55° Réaumur, but also during the time that the water is gradually cooled, due to the fact that all particles of the body of water in the tank are not by the means usually employed equally or uniformly heated and subsequently cooled. Many attempts have been made to provide a pasteurizing apparatus wherein water will be equally or uniformly heated throughout its extent to avoid breakage of bottles during the heating step, but none, so far as I am aware, have been entirely satisfactory and successful, chiefly because of the difficulty of quickly heating all particles of the body of water to exactly or nearly the same temperature, and also because proper provision has not been made for rapidly cooling all particles of the body of water equally or uniformly during the cooling step.

It has been proposed to avoid breakage of bottles during the pasteurizing process by securing a circulation of the water both during the heating and cooling steps, but the slow motion incident to circulation heretofore obtained is insufficient to secure the result of heating or cooling all particles of the body of water to exactly or nearly exactly the same temperature in a comparatively short period of time.

I have discovered that the serious objection incident to pasteurizing bottled beer, residing chiefly in the breakage of bottles, is entirely avoided by violent agitation of practically all particles of the body of water contained in the pasteurizing-tank during the time the water is being heated and while it is being cooled. This agitation is not a mere circulation of the water at comparatively slow speed, nor is it confined to any particular point in the body of the water, but is distributed throughout the entire body of water, in consequence of which, if the water is being heated, the entire body of water can be rapidly heated and all particles thereof raised to exactly the same temperature, or nearly so, while if the water is being cooled the cold inflowing water will be quickly and uniformly distributed throughout the body of water in the tank, and thus the body of water is rapidly cooled and the temperature of all particles lowered to practically the same degree of temperature. By this means no one part of any bottle is subjected to a measurable degree of heat or cold greater than another part of such bottle, and consequently the danger of breakage in the heating and cooling steps is reduced to a minimum, if not absolutely avoided.

I have found by actual practice of the invention at the brewery of The Robert Portner Company, Alexandria, Virginia, that it is possible in about one hour to properly and successfully pasteurize at one charge of the tank sixty dozen properly filled and corked or stoppered bottles of beer without breakage of a single bottle, thereby saving the large expense incident to breakage of a large number of bottles in each charge during the sterilizing process.

The chief object of my present invention is to provide novel, simple, efficient, and economical means for agitating the water substantially the full length of the tank during the time the water is being heated and also during the time it is being cooled, whereby the entire body of water in the tank is practically heated uniformly and subsequently cooled uniformly.

The object of my invention is accomplished in the manner and by the means hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view taken centrally through the pasteurizing-tank. Fig. 2 is a top plan view of the same, showing a portion of the false bottom to more clearly illustrate the steam heating-pipes by which the water in the tank is heated to the required temperature. Fig. 3 is a transverse sectional view of the same, and Fig. 4 is a longitudinal central sectional view showing a modification of the invention.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to the accompanying drawings, wherein—

The numeral 1 indicates a water-holding tank of any capacity and construction suitable for the purpose in hand. I have actually used my invention in connection with a tank approximately twenty-two feet in length and five feet in width, adapted to contain at one charge seven hundred and twenty bottles of beer, which bottles are arranged in perforated metal baskets or boxes 2, placed in two rows, one row at each side portion of the tank, to provide a continuous longitudinal space between the two rows along the length of the tank, for a purpose which will hereinafter appear. The capacity of the tank can be increased or diminished any desired extent to suit the conditions required or the number of bottles which it is desired to place in the tank at one charge. The tank is provided at a short distance above its imperforate bottom wall with a false bottom of any desired construction, but composed, as here shown, of transverse slats 3, supported at their ends and separated one from another for the purpose of providing recesses or spaces through which water is susceptible of freely passing. The chamber beneath the false bottom is in Figs. 1, 2, and 3 designed to receive steam heating-pipes 4, supplied at the ends of the tank through the medium of steam-supply pipes 5, having a suitable globe or other valves 6. The steam heating-pipes extend horizontally the full length of the tank between its ends, and the pipes are distributed in a manner suitable to heat the water in the tank until it reaches the required temperature.

In the continuous longitudinal space between the two rows of bottle-holding baskets or boxes is arranged a water-agitator extending substantially the full length of the tank between its ends and positively and swiftly driven by mechanical power from the exterior of the tank in such manner that it will violently agitate practically all particles of the body of water contained in the tank, thereby rapidly distributing the heated particles of the water throughout the entire tank for the purpose of gradually but quickly heating all particles of the body of water to exactly or nearly the same temperature. The agitator, as here shown, is composed of a horizontal shaft 7, having its ends mounted in suitable bearings carried by the end walls of the tank and provided with a plurality of rigidly-attached helical blades 8, 9, 10, and 12, which are distributed along the shaft the entire length thereof between the bearings in which the shaft is adapted to rotate. The helical blades 8 and 10 extend in a spiral path the reverse of the helical blades 9 and 12, so that the water is forcibly driven back and forth longitudinally and back and forth laterally, thus producing such commotion that all particles of the water contained in the tank are rapidly thrown about in all directions, and the particles as they become heated in juxtaposition to the steam heating-pipes are quickly distributed throughout the tank, which results in the gradual but rapid raising of the temperature of the water and the heating of practically every particle thereof to exactly or approximately the same degree.

As before stated, the agitator is positively driven by mechanical power from a point outside the tank, and while this may be effected in many different ways I prefer to drive the agitator through the medium of a pulley 13, secured to the shaft outside the tank, Figs. 1 and 2, and adapted to be rapidly rotated by a belt connection with a suitable power-driven shaft not necessary to illustrate. As here shown, the agitator-shaft is in communication at its ends with water-supply pipes 14 and 16, having suitable valves 15 and 17. The shaft is hollow or tubular, and at various points along its length it is constructed or provided with jet orifices or perforations 18, through which water will pass when permitted to flow into the shaft under pressure from the supply-pipes 14 and 16. The shaft is supported centrally between its ends through the medium of a shaft-bearing 19, supported by the bottom wall of the tank and projecting a suitable distance above the false bottom. The end of the shaft to which the driving-pulley 13 is secured may be and is preferably supported by a pillow-block 20, having a bearing in which the shaft rotates and provided with a suitable coupling for the attachment of the water-supply pipe 14. The construction is preferably such that while the agitator-shaft rapidly rotates the water-inlet pipes 14 and 16 remain motionless or are non-rotary

An elevated water-supply pipe 21 is shown as arranged longitudinally along the top portion of the tank and is constructed with jet orifices or perforations 22 throughout its length between the ends of the tank. This pipe is designed to connect with a water-supply, so that a secondary supply of water may be introduced into the tank. The pipe may be supported in any suitable manner, but as here shown it is mounted directly upon the end walls of the tank.

The tank is provided with an overflow-pipe 23, which, as shown, extends to and communicates with a tank-discharging pipe 24. It is proper to state here, however, that I do not wish to be understood as limiting myself to any particular means for introducing the water into the tank, heating the water in the tank, and supplying the cool water.

I have illustrated in Figs. 1, 2, and 3 practicable and satisfactory means for filling or nearly filling the tank and for heating the water and for introducing cool water whenever required, but the same results can be otherwise accomplished. For instance, in the modification Fig. 4, where the same reference-numerals hereinbefore used indicate parts corresponding to those previously described, I show the hollow or tubular shaft of the agitator provided at its ends with pipes 24[a] and 25, each of which connects with a water-supply pipe 26 and a steam-supply pipe 27, whereby it is possible to first introduce steam into the agitator-shaft, so that it will pass directly into the tank for heating the same, and subsequently it is possible to shut off the steam and permit cold water to flow into the agitator-shaft and pass therefrom into the water in the tank.

In pasteurizing bottled beer according to my invention the bottles should be properly filled and corked or stoppered and then placed in the metal baskets or boxes, which are located in two rows, one row at each side portion of the tank. Ordinarily the tank is supplied with a sufficient quantity of water that the bottles are immersed up to or near their corked or stoppered mouths, but they may be entirely submerged. The steam is then permitted to flow into the steam heating-pipes or into the tubular agitator-shaft, and the agitator is positively and rapidly rotated by mechanical power, as before explained. The temperature of the water is gradually raised to about 35° Réaumur, at which temperature it is held for ten minutes, more or less, and is then raised to about 55° Réaumur and held at this temperature about thirty minutes. I suggest twenty minutes be allowed to raise the temperature from 35° Réaumur to 55° Réaumur, but I do not wish to be understood as confining myself with precision to the degree of heat or the time for raising the temperature, as above set forth.

During the time the steam is supplied to the steam heating-pipes or to the agitator-shaft the agitator is rapidly rotating and acting upon the water the full length of the tank. The reverse helical blades violently agitate the water and move some parts thereof back and forth longitudinally and other parts laterally in opposite directions, so that such a commotion is produced that practically every particle of water in the tank is in violent motion.

The helical agitator on the rotary shaft acts to move the water laterally and to distribute it to the bottle-holding receptacles arranged along opposite sides of the tank practically the full length thereof. By constructing the helical blade with portions running lengthwise of the shaft first in one direction and then in the opposite direction the water is not only moved laterally but longitudinally in opposite directions at different portions of the tank. The lateral and other motions of the water in the tank can be made rapid or slow by increasing or decreasing the speed of rotation of the shaft.

After the beer is heated, as above set forth, it is essential that the bottles and the beer contained therein be properly and rapidly cooled for the purpose of placing the beer in the proper or best condition for the market, so that its quality is improved and it is preserved and can be kept for a long time without danger of fermentation or deleterious changes. In the cooling step the steam is shut off and cool water is permitted to flow into the tank in any suitable manner, preferably through the medium of the devices illustrated in the drawings hereinbefore described. As the cool water flows into the water already in the tank the cooler particles of water are swiftly distributed throughout the tank and the entire body of water gradually and uniformly cools, and no one part of any beer-bottle is cooled to a measurably greater or less extent than some other part or parts of such bottle, whereby breakage of bottles is reduced to a minimum, if not entirely avoided. If perfect bottles are properly filled and corked or stoppered, it is possible with my invention to pasteurize any number of bottles at one charge without breaking a single one by the heating or cooling action.

While the cool water is flowing into the tank for cooling the bottles, water should discharge from the tank in proportion to the quantity which is flowing thereinto. This can be conveniently effected by properly adjusting the valve 28 of the discharge-pipe 24. If the water-level in the tank rises above a certain point, some of the water will pass off through the overflow 23. In practice the water discharged from the tank is conveyed to another tank to economize in the use of water.

The equal or uniform heating of all particles of the water equalizes the heating of all parts of the bottles, and likewise the equal or uniform cooling of all the particles of water in the tank equalizes the cooling of all parts of the bottles.

In the practical use of the steam heating-pipes 4, arranged in the chamber beneath the false bottom of the water-tank, it is preferable to provide them with jet orifices or perforations in their lower sides, so that the steam can pass directly into the water; but it is possible to use the steam-pipes for heating purposes without providing them with such jet orifices or perforations.

Having thus described my invention, what I claim is—

1. The combination, in an apparatus for pasteurizing bottled liquids, of a water-tank having means for supporting the bottles therein, means for heating and subsequently cooling the water, a plurality of helical blades, one extending in a spiral path the reverse of another, and means for driving the helical blades, substantially as described.

2. The combination, in an apparatus for pasteurizing bottled liquids, of a water-tank, means for heating the water in the tank, a shaft having helical blades rotating in the water and one extending in a spiral path the reverse of another, and means for driving the shaft, substantially as described.

3. The combination, in an apparatus for pasteurizing beer in bottles, of a water-tank in which gangs of beer-bottles are supported along the opposite sides thereof, a shaft extending centrally the full length of the tank between the gangs of beer-bottles and having a helical water-agitator running substantially the full length thereof, and means for rotating the shaft from the exterior of the tank, substantially as described.

4. The combination, in an apparatus for pasteurizing beer in bottles, of a water-tank in which gangs of beer-bottles are supported along the opposite sides thereof, a perforated tubular shaft extending the full length of the tank between the gangs of bottles and having a helical water-agitator thereupon which runs substantially the full length of the shaft, means for introducing water into said shaft, and means for rotating the shaft, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

PETER VAN DE WESTELAKEN.

Witnesses:
JAMES L. NORRIS,
LEONARD MARBURY.

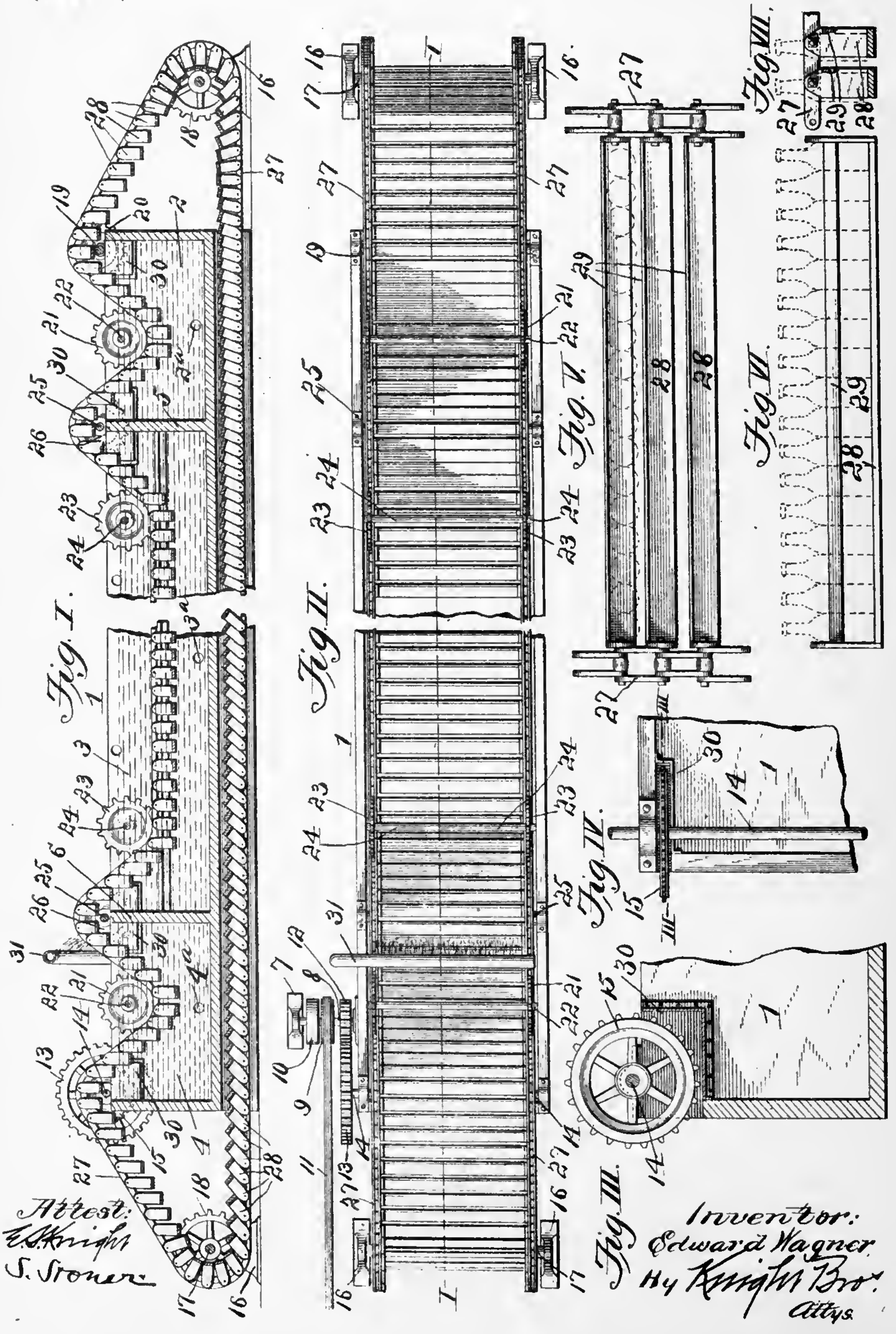
No. 607,304. Patented July 12, 1898.

E. WAGNER.

BEER PASTEURIZING APPARATUS.

(Application filed Jan. 3, 1898.)

(No Model.)



Attest:
E. S. Knight
S. Stoner

Inventor:
Edward Wagner
By Knight Bros.
Attys.

UNITED STATES PATENT OFFICE.

EDWARD WAGNER, OF ST. LOUIS, MISSOURI.

BEER-PASTEURIZING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 607,304, dated July 12, 1898.

Application filed January 3, 1898. Serial No. 665,350. (No model.)

To all whom it may concern:

Be it known that I, EDWARD WAGNER, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Beer-Pasteurizing Apparatuses, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to that character of apparatus in which bottled beer is treated to the action of hot water to destroy the life of yeast molecules and germs contained in the beer, whereby further fermentation is prevented.

My invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I illustrates a vertical longitudinal section taken on line I I through the apparatus. Fig. II is a top or plan view of the apparatus. Fig. III is a sectional view taken on the line III III, Fig. IV. Fig. IV is a detail top view of one of the corners of the apparatus, showing one of the chain-receiving sprocket-wheels and the pocket in which it turns. Fig. V is a top view of a portion of the conveyer. Fig. VI is a side view of one of the bottle-receiving receptacles. Fig. VII is a detail view of a portion of one of the conveyer-chains and shows a cross-section of two of the bottle-receiving receptacles.

1 designates a tank which is preferably divided into three compartments 2, 3, and 4, into which water is fed by inlets 2^a, 3^a, and 4^a and overflow-outlets. The compartment 2 is separated from the compartment 3 by a partition 5, and the compartment 4 is separated from the compartment 3 by a partition 6.

The compartment 2 is designed to receive warm water, the compartment 3 hot water, and the compartment 4 cold water, and in the operation of the apparatus the bottles containing the beer are conveyed in the manner to be hereinafter described, first through the warm-water compartment, where they are slightly heated, then through the hot-water compartment, where the pasteurization of the beer is accomplished, and finally through the cold-water compartment to cool the bottles.

7 designates a standard located at one side of the tank, and 8 the driving-shaft for the conveyer, mounted in said standard, the inner end of which is mounted in the adjoining side of the tank. On the shaft 8 are tight and loose pulleys 9 and 10, that receive a driving-belt 11.

12 designates a spur-wheel on the shaft 8, the teeth of which mesh with the teeth of a spur-wheel 13, mounted on a shaft 14, that is journaled in boxes on the tank 1. This shaft 14 extends from side to side of the tank and bears a pair of sprocket-wheels 15, located interior of the walls of the tank.

16 designates standards exterior of the tank 1 and located short distances from the ends of the tank. These standards are arranged in pairs, each pair receiving a shaft carrying a pair of sprocket-wheels 18, located in proximity to the standards.

At the opposite end of the tank to that where the driving mechanism is located is a shaft 19, that carries a pair of sprocket-wheels 20.

In each of the compartments 2 and 4 of the tank is a pair of sprocket-wheels 21, carried by shafts 22, mounted in the side walls of the tank.

23 designates sprocket-wheels carried by shafts 24, mounted in the side walls of the tank and within the central compartment 3.

Approximately in line with the division-partitions 5 and 6 are shafts 25, mounted in the side walls of the tank, that carry pairs of sprocket-wheels 26.

27 designates endless chains that travel in engagement with the various sprocket-wheels described, the course of such chains being over some of the sprocket-wheels and under some of them, as will hereinafter appear.

28 designates bottle-receptacles pivotally connected to the chains 27 at frequent intervals and preferably to the pins that join each link of the chains to the adjoining link. The receptacles are of U shape, the inturned ends receiving the pins by which the receptacles are connected to the chains. At one side of each receptacle is a bar 29, such bars being arranged at a corresponding side of each receptacle, so that in each instance a pocket is formed for the bottles, inasmuch as the bottles in any one of the receptacles rest between

the inner face of the bar 29 of the receptacle in which they are contained and the outer face of the bar 29 on the next adjoining receptacle. The position the bottles assume in the receptacles is illustrated in Figs. V, VI, and VII.

In order to avoid arranging the sprocket-wheels 15, 19, and 25 at an elevation and thus cause the conveyer to travel a considerable distance upwardly out of the tank, I form openings in the end walls of the tank and the partitions 5 and 6. These openings I close by means of pockets 30, in which the sprocket-wheels operate, the pockets preventing the water from flowing from the tank or the water of varying temperatures in the different compartments from mixing.

For the purpose of gradually cooling the bottles and the beer contained by them I provide a spray-pipe 31, from which a spray of cold water is directed upon the bottles as they leave the hot-water compartment and before they enter the succeeding compartment, in which they are immersed in cold water.

In the operation of the apparatus the bottles containing the beer to be pasteurized are fed into the receptacles 28 at one end of the machine, and the conveyer, receiving motion from the driving mechanism, conveys them through the tank. The conveyer is intended to travel at a slow speed, and the bottles first entering the compartment 2 are thoroughly warmed by the warm water in such compartments. In traveling through the next succeeding compartment containing hot water the yeast molecules contained in the beer are destroyed by the action of the heat, as are also any germs that may be present in the beer. From the hot-water compartment the conveyer carries the bottles next into the cold-water compartment 4 for the purpose of cooling them; but before they enter the cold water they receive a spray of water from the spray-pipe 31, that causes their temperature to be gradually lowered, so that they will not be broken by entering the cold water while still hot from the effect of the hot water. When the bottles leave the compartment 4, the pasteurization of the beer is completed, and the bottles are removed from the receptacles by an attendant stationed at that end of the apparatus.

While I have described the apparatus for use in pasteurizing beer, I wish it understood that I do not limit myself to its use for this purpose. Another use to which I desire to put it is to the soaking of empty bottles in cleansing them. It is well adapted to this use, and in such use the partitions 5 and 6 may be employed, or, if desired, such partitions may be omitted and the tank therefore contain but a single compartment.

I claim as my invention—

1. In an apparatus of the character described, the combination of a tank, a pair of endless chains, sprocket-wheels in engagement with which said chains are adapted to travel, bottle-receiving receptacles pivoted to said chains, and means for driving said chains, substantially as described.

2. In an apparatus of the character described, the combination of a tank, a pair of endless chains, sprocket-wheels in engagement with which said chains are adapted to travel, bottle-receiving receptacles pivoted to said chains, said receptacles comprising U-shaped bars and cross-bars arranged on corresponding sides of said U-shaped bars, and means for driving said chains, substantially as described.

3. In an apparatus of the character described, the combination of a tank divided into three compartments for warm, hot and cold water, a conveyer arranged to travel through said compartments, said conveyer comprising a pair of endless chains, and bottle-receiving receptacles pivoted to said chains, sprocket-wheels in engagement with which said chains are adapted to travel, means for driving said chains, and a spray-pipe arranged to direct a spray of water onto the bottles in the conveyer after they leave the hot-water compartment of said tank, substantially as described.

EDWARD WAGNER.

In presence of—
E. S. KNIGHT,
N. V. ALEXANDER.

DISCLAIMER.

607,304.—*Edward Wagner*, St. Louis, Mo. BEER-PASTEURIZING APPARATUS. Patent dated July 12, 1898. Disclaimer filed October 23, 1903, by the patentee and the assignee, *The Model Bottling Machinery Company.*

Enter their disclaimer—

"To that part of the claim in said specification which is in the following words, (being lines 54, 55, 56, 57, 58, 59, 60, 61, 62, and 63 on page 2 of the specification,) to wit:

"While I have described the apparatus for use in pasteurizing beer, I wish it understood that I do not limit myself to its use for this purpose. Another use to which I wish to put it is to the soaking of empty bottles in cleansing them. It is well adapted to this use, and in such use the partitions 5 and 6 may be employed, or, if desired. such partitions may be omitted and the tank therefore contain but a single compartment."—[*Official Gazette, October 27, 1903.*

Pasteurizer
July 1898

No. 607,770. Patented July 19, 1898.

W. J. RUFF.

APPARATUS FOR PASTEURIZING BEER.

(Application filed June 5, 1897.)

(No Model.)

Fig. I.

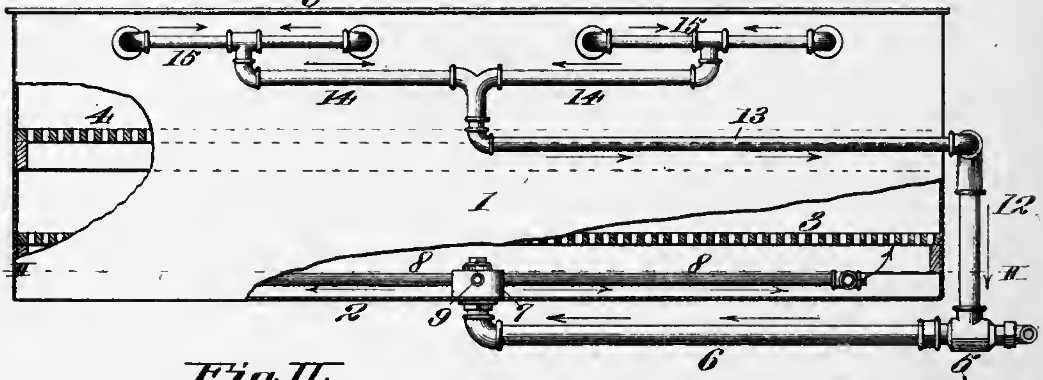


Fig. II.

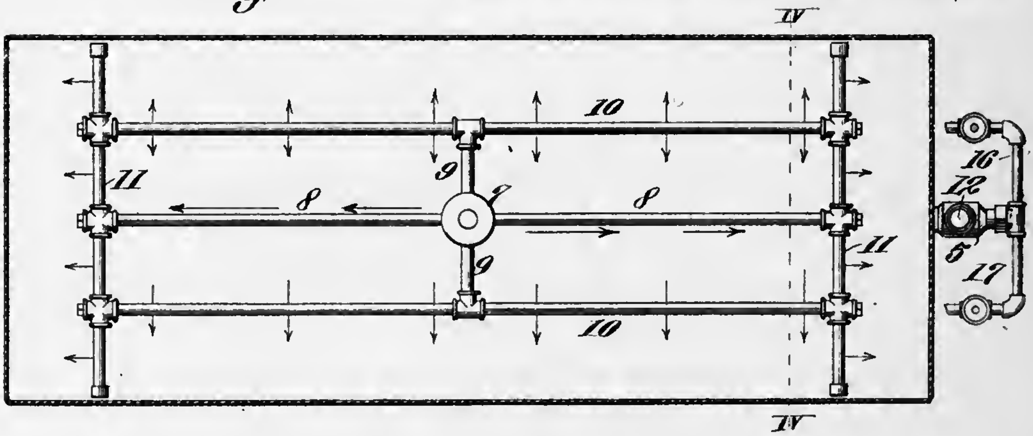


Fig. III.

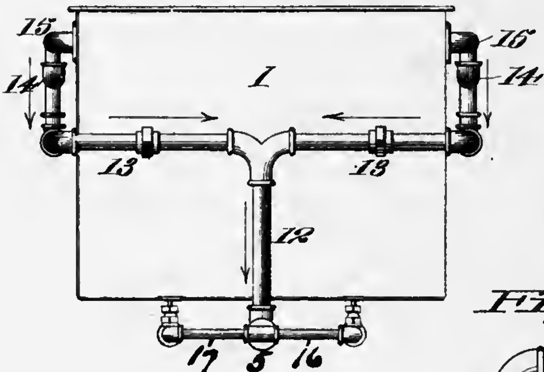


Fig. IV.

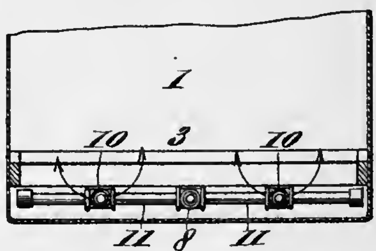


Fig. V.

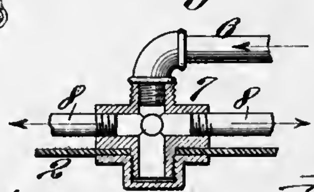


Fig. VI.

Attest:

H. Finley.
C. C. Moore

Inventor:
William J. Ruff
By Knight Bro
Att'ys

UNITED STATES PATENT OFFICE.

WILLIAM J. RUFF, OF QUINCY, ILLINOIS.

APPARATUS FOR PASTEURIZING BEER.

SPECIFICATION forming part of Letters Patent No. 607,770, dated July 19, 1898.

Application filed June 5, 1897. Serial No. 639,581. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. RUFF, a citizen of the United States, residing at Quincy, Adams county, State of Illinois, have invented a certain new and useful Improvement in Apparatus for Pasteurizing Beer, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention has for its object an improved apparatus to be utilized in pasteurizing beer, whereby the operation is more perfectly carried out and the beer more effectually and uniformly treated and its chemical properties preserved.

The manufacture of beer is based upon many material changes, many of which are of a chemical nature, both in the raw material employed and in the product itself. The barley by proper manipulation becomes malt to properly fit it for brewing, as the starch is put in a condition for saccharification by being exposed to diastatic action at proper temperatures, which converts the starch into sugar and dextrin, the latter being a by-product of starch. The albuminoids are in part extracted and in part remain unchanged in the beer. The albuminoids and the dextrin which remain unchanged in the beer impart fullness of taste and body to the beer and are considered the nutritive qualities of the beer. During fermentation the sugar is converted into alcohol and carbonic-acid gas. Some forms of albumen are absorbed by the yeast, while others remain unchanged (in solution) in the beer, as stated above.

When beer is ready for market and it is intended to preserve it for a long-distance shipment or where the same will be used slowly, it is customary to accomplish this to use chemical preservatives or to sterilize the beer by means of heat. This latter is commonly termed "pasteurization" of beer, and is the method usually employed, as the beer is more healthful than where chemical preservatives are used; but there are also objections to this method, notably the secretions of albumen from the soluble to the insoluble form, which greatly impairs the nutritive quality of the beer. This change, which is of a chemical nature, is the result of exposing the beer to heat, and is also proportionate to the length of time the beer is exposed to the heat. It is therefore important to rapidly heat the beer and to rapidly cool it after it has been sufficiently heated, as the rapid heating shortens the duration of the process and the rapid cooling removes the beer in a few moments from the hurtful effects of the heat, which are the secretions of albumen, losses of the highly-expanded carbonic-acid gas, and the volatile alcohol contained in the beer through the pores of the cork. Rapid cooling condenses the gas, which, with the alcohol, is reabsorbed and retained by the beer.

It has heretofore been the practice to heat the beer by introducing steam or hot water into the tank containing the bottles immersed in cold water, and this process is necessarily slow, because if the steam or hot water is introduced too fast the bottles will break under the sudden change of temperature. After the beer has been heated sufficiently it has been the practice heretofore to allow the bottles to stand in the hot water, and the only efforts to reduce this temperature and avoid the chemical changes referred to have been, so far as my knowledge goes, an attempt to cool the beer by the introduction of cold water to the tank. This method of cooling is also necessarily very slow for the reason that if cold water is admitted otherwise than very slowly to the tank the bottles will be broken, and this method, therefore, requires considerable time to cool the bottles, and the beer thus remains hot for a long time and secretions occur and also the loss of expanded gas and alcohol, and the action of the hot water on the corks makes them spongy and extracts tannic acid therefrom, which percolates into the beer, and this being a reagent for albumen makes the beer turbid, and thus it will be seen that chemical actions are directly involved, both in the time consumed in heating the beer and the time consumed in cooling it. With my improved apparatus, which is hereinafter described, and pointed out in the claims, I heat the beer by introducing water of gradually-increasing temperature, which can be done rapidly without danger of breaking the bottles, and I cool the beer by water of gradually-decreasing temperature, usually in ten or fifteen minutes, thus gradually yet rapidly and effectually reducing the chances of changes occurring in the beer and retaining the chemical properties in the beer, and it remains more healthful, has more nutritive and stimulating qualities, and has all the characteristics of fresh keg-beer and there are absent the usual secretions deposited out of coagulated albumen, and by preventing these secretions the beer remains almost unchanged and is only effected during the time actually necessary to expose it to sufficient heat to insure stability.

Referring to the drawings, Figure I is a side view, part in vertical section and illustrative of my improved apparatus. Fig. II is a horizontal section taken on line II II, Fig. I. Fig. III is an end view. Fig. IV is a detail vertical section taken on line IV IV, Fig. II. Fig. V is an enlarged detail view, part in section and part in elevation and showing a modification. Fig. VI is a sectional view of the jet-pump.

1 represents a tank having a closed bottom 2, above which is a perforated false bottom or partition 3. About midway of the height of the tank there is also preferably placed a perforated partition 4. The bottles are placed on the partitions 3 and 4. 5 represents a jet-pump, which may be of any well-known form or type. (See Fig. VI.) 6 is an eduction-pipe leading from the pump to the center of the bottom of the tank, through which it extends. This pipe connects with a head 7, located within the tank beneath the false bottom 3. Communicating with this head 7 are longitudinal imperforate feed-pipes 8 and transverse imperforate feed-pipes 9. The pipes 9 communicate with longitudinal perforated distributing-pipes 10, and at the ends of the pipes 10 and the pipes 8 are transverse perforated distributing-pipes 11. The perforations in the pipes 10 are preferably in each side thereof, so that the water will escape in both directions from these pipes, as indicated by the arrows, Figs. II and IV, and the perforations in the pipes 11 are preferably made in the outer sides thereof, so that the water will escape toward the end of the tank, as shown by the arrows in Fig. II, and I thus obtain an even and uniform distribution of the water.

12 represents a pipe connecting with the suction side of the pump 5. This pipe has branches 13 extending to the right and left, as shown in Fig. II, and which project around the sides of the tank, preferably about to the center thereof, as shown in Fig. I. These pipes 13 have extensions 14 leading to the right and to the left and communicating with pipes 15, that communicate with the interior of the tank.

16 represents a steam-pipe, and 17 a water-pipe connecting with the pump 5.

In operation the bottles are placed in the tank on the partitions 3 and 4, and the tank is then filled with water up to the height or a little above the line of the pipes 15, the various pipes referred to being filled with water passing from the tank. Steam is now turned on by opening the valve in pipe 16, and it creates a circulation of water through the pipes and the tank, as indicated by the arrows, the water being gradually heated outside the tank and the circulation being kept up at a rapid rate, preferably at the rate of about sixty gallons per minute. This is continued until shortly before the final maximum temperature contemplated in pasteurizing processes is reached at the top of the tank, and the steam is then turned off. The reason for turning off the steam before the temperature of the water at the top of the tank indicates the final temperature desired is because heat naturally rises and the water being some degrees warmer at the bottom of the tank the temperature will diffuse itself equally throughout the tank, so that when the steam is turned off the water at the top of the tank will continue to increase in temperature, and hence the desirability of turning off the steam shortly before the water at the top of the tank indicates the temperature finally desired. After the steam has been turned off for some time the temperature of the water will fall, partly owing to contact with the surrounding atmosphere and partly owing to the beer in the center of the bottles being still cooler than that adjacent to the walls of the bottles. The steam is therefore turned on again after a lapse of a few minutes and the temperature brought up to the desired point, and this is repeated until there is no more perceptible falling off of the temperature. Not more than one-half of an hour to three-quarters of an hour ought to be consumed for this purpose. The apparatus is now allowed to stand for about one hour, so that the beer in the bottles is uniformly heated throughout and all germs destroyed, and the cooling process is then started, and to fully preserve the chemical properties of the beer this also must be done as speedily as possible. This with my improved apparatus can be accomplished very rapidly, within ten or fifteen minutes, and thus the chemical properties of the beer be preserved, as explained. To cool the beer, the jet-pump is started by turning on cold water in pipe 17. The pump now draws the hot water from the tank through the suction-pipe and its branches and mixes it with the cold water, by which it is moderated, and this water is forced through the pipe 6 at the bottom of the tank. The flow is kept up, additional cold water being turned on, if necessary, until the beer in the bottles has cooled to a proper temperature, and the bottles may then be removed. The mixing of the cold water with the hot water taking place outside of the tank causes the former to be moderated by the latter before it reaches the tank; and thus the bottles and the beer are gradually cooled down without danger of the bottles being broken, whereas, if cold water were admitted by itself to the tank the bottles would be broken, and thus it will be observed how the chemical properties in the beer may be maintained by the use of my improved method and which would be to a great extent lost, as explained, if the beer were allowed to stand until it cooled off by the natural escape of heat.

The foregoing has been demonstrated by practical experience in the use of my method and apparatus.

By providing the feed and distributing pipes in the bottom of the tank, as shown and explained, there is an even distribution of the water at the bottom of the tank, and providing the suction-pipe 12 with the pipes communicating therewith and with the top of the tank the water is taken from the tank evenly during the process of circulation.

If desired, the pipe 6 may pass through the tank from one end or side to the head 7, as shown in Fig. V, and this I prefer in many cases, as the water surrounding said pipe 6 and the imperforate pipes still further moderates the temperature of the incoming water during the cooling process and also condenses the steam and attemperates the water during the heating period.

While I prefer and while my improvement is most effectually carried out by both heating the beer by water of gradually-increasing temperature and cooling it by water of gradually-decreasing temperature, still my invention may in a measure be carried out by heating the beer by the use of water of gradually-increasing temperature and then cooling the beer in the old way or by heating the beer in the old way and then cooling it by the use of water of gradually-decreasing temperature, as in either instance the duration of the pasteurizing process will be shortened, and the chemical and alcoholic properties of the beer will be preserved to the extent that my improvement is used.

I claim as my invention—

1. An apparatus for pasteurizing bottled liquids comprising a tank adapted to receive the bottled liquid to be treated, means for circulating water through said tank, and means located outside of the tank for commingling a heating or a cooling liquid with the water, as it passes from and to the tank, for changing the temperature of the water before it is introduced into the tank; whereby the temperature of the bottled liquid to be treated is raised and lowered by constantly replacing the tank-contained water by water of changed temperature until the desired temperature within the tank is reached for both heating and cooling the beer; substantially as described.

2. In an apparatus for pasteurizing beer, the combination of a tank for containing water, a perforated partition within the tank for supporting the bottles, a jet-pump, suction-pipe connecting with the jet-pump and having branches communicating with the upper part of said tank, an eduction-pipe connected to the jet-pump and extending to the bottom of the tank, and steam and cold-water pipes connecting with said pump, substantially as set forth.

3. In an apparatus for pasteurizing beer, the combination of a tank for containing water, a perforated partition within the tank for supporting the bottles, a jet-pump, a suction-pipe connecting with the jet-pump, and having branches communicating with the upper part of said tank, an eduction-pipe connected to the jet-pump and extending to the bottom of the tank, distributing-pipes located within the tank at the bottom thereof and communicating with said eduction-pipe, and steam and cold-water pipes connecting with said pump, substantially as set forth.

4. In an apparatus for pasteurizing beer, the combination of a tank containing water, a perforated partition within the tank for supporting the bottles, a jet-pump, a suction-pipe connecting with the jet-pump and having branches communicating with the upper part of said tank, an eduction-pipe connected to the jet-pump and extending to the bottom of the tank, feed-pipes 8 and 9, and distributing-pipes 10 and 11 located within the tank at the bottom thereof and communicating with said eduction-pipe, and steam and water pipes connecting with said pump, substantially as set forth.

5. In an apparatus for pasteurizing beer, the combination of a tank for containing water, a perforated partition within the tank for supporting the bottles, a jet-pump, a suction-pipe connecting with the jet-pump, and communicating with the upper part of the tank through means of pipes 13, 14 and 15, an eduction-pipe connected to the jet-pump and extending to the bottom of the tank, feed-pipes 8 and 9, and distributing-pipes 10 and 11 located within the tank at the bottom thereof and communicating with the said eduction-pipe, and steam and cold-water pipes connecting with said pump, substantially as set forth.

WILLIAM J. RUFF.

In presence of—
GERHARD G. ARENDS, Jr.,
J. H. DUKER.

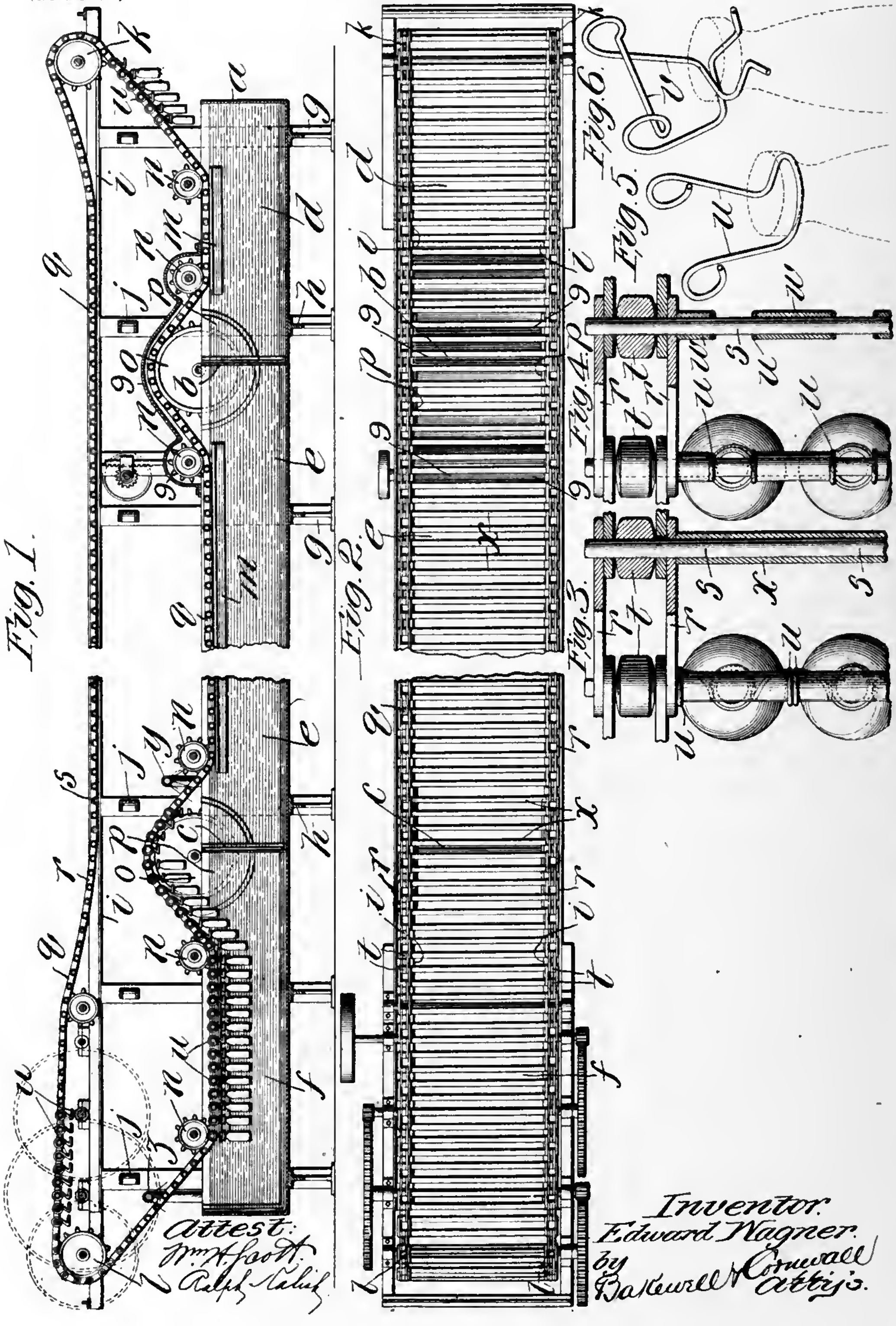
No. 654,369. Patented July 24, 1900.

E. WAGNER.

APPARATUS FOR PASTEURIZING BEER.

(Application filed June 30, 1899.)

(No Model.)



UNITED STATES PATENT OFFICE.

EDWARD WAGNER, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE MODEL BOTTLING MACHINERY COMPANY, OF SAME PLACE.

APPARATUS FOR PASTEURIZING BEER.

SPECIFICATION forming part of Letters Patent No. 654,369, dated July 24, 1900.

Application filed June 30, 1899. Serial No. 722,439. (No model.)

To all whom it may concern:

Be it known that I, EDWARD WAGNER, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Apparatus for Pasteurizing Beer, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to an improved apparatus for pasteurizing beer, the object being to provide a simple, cheap, and convenient apparatus for treating the bottled beer to destroy the yeast molecules and germs contained therein, whereby further fermentation is prevented.

The invention consists in the improved apparatus hereinafter fully described, particularly pointed out in the claims, and clearly illustrated by the accompanying drawings, in which—

Figure 1 is a vertical longitudinal sectional view of my improved apparatus. Fig. 2 is a top plan view of the same. Fig. 3 is an enlarged detail view of the chain on which the bottle-carriers are mounted. Fig. 4 is a similar view illustrating a slightly-different manner of mounting the bottle-carriers on the chain. Fig. 5 is a detail view of the bottle-support. Fig. 6 is a detail view of a modified form of bottle-support.

Referring now more particularly to the drawings, *a* indicates a tank made, preferably, of sheet metal and divided by partition-walls *b* and *c* into compartments *d*, *e*, and *f*, adapted to contain a pasteurizing fluid, the compartments being provided with suitable supply and overflow pipes. (Not shown.) Said tank is supported by vertical standards *g*, between which are arranged cross-pieces *h*, preferably T-shaped in cross-section. The standards extend some distance above the tank and are connected at their upper ends by horizontally-arranged L-shaped rails *i*, while cross-pieces *j* also connect the upper ends of the standards. Rails *i* carry suitable journal-boxes, in which are mounted shafts having sprocket-wheels *k* and *l*, the former being located at the front end of the machine and the latter at the rear end thereof. These sprockets *k* and *l* are preferably arranged in pairs and are fixed to their respective shafts.

m indicates L-shaped rails or elongated brackets, which are secured to the inner faces of the side walls of the several compartments of the tanks near the upper edges thereof, while above the ends of said rails are mounted pairs of idle sprockets *n* on suitable shafts extending across the top of the tank.

o indicates idle sprockets of somewhat larger diameter than the sprockets *n* or of such diameter that the bottles carried by the supports will clear the shafts of said sprockets. The tank is provided with suitable pockets or offsets *p* in its side walls for receiving the idlers *o* for the purpose of enabling said sprockets to run free and not to be partially submerged in the contents of the tank. These sprockets *o* are in juxtaposition to the partition-walls *b* and *c* and also arranged between the ends of the several rails *m* in the tank.

q indicates parallel endless chains, which run over sprockets *k*, *l*, and *o* and under the sprockets *n*, which last-mentioned sprockets force the chains down onto the rails *m*, while the sprockets *o*, between said rails, cause the chains to rise over the partitions in the tank. Chains *q* preferably consist of the links *r*, through whose eyes pass rods *s*, said rods being common to both chains. The usual spacing-blocks *t* are arranged between the links of the chain for well-understood purposes. Rods *s* carry bottle-supports, preferably such as shown in Figs. 5 and 6, in which former the support (marked *u*) consists of a rod or wire so bent as to form eyes at its extremity, which encircle the rods *s*, while the middle portion of the rod or wire is looped and then bent to form the rearwardly-opening pocket for receiving the neck of the bottle, the flange forming the mouth of the bottle resting on the rod or wire and supporting the bottle, as shown by dotted lines in Fig. 5.

In Fig. 6 the bottle-support consists of a wire *v*, formed with eyes or bent portions, by which the same may be attached to the rods *s*, the extremities of said rod or wire crossing each other and forming a yielding support, having a contracted mouth through which the neck of the bottle is forced and tightly held in position, the bottle being supported by the flange forming the mouth, as shown by dotted lines.

In using the construction shown in Fig. 5 the pocket preferably opens toward the rear end of the machine, so that the resistance encountered by the bottles passing through the pasteurizing fluid of the compartments tends to firmly seat the bottle in this support.

The support shown in Fig. 6 in grasping the neck of the bottle may open either toward the front or rear end of the machine, as is obvious, but preferably toward the rear end, and this construction has the advantage of being capable of employment in connection with empty bottles when it is desired to wash them in the tank, the yielding mouth preventing the empties from floating and escaping from their supports.

As shown in Fig. 3, the eyes of the supports which encircle the rods *s* abut against each other, and thus space the supports the proper distance apart, or, as shown in Fig. 4, washers *w* may be strung on the rods *s*, between the supports, to act as spacers therefor. Sleeves *x* are also preferably employed on the rods *s* to act as distance-pieces between the chains; but these sleeves can be dispensed with, in which event the bottle-supports proper will act as distance-pieces. Any suitable gearing or power-transmitting device may be employed for driving either of the sprockets *k* or *l*; but I prefer to drive the rear sprocket, as the weight in the construction shown in Fig. 1 is on the lower side of the chain and will then be pulled through the tank.

An attendant stands at the front end of the machine and introduces the bottles in their supports, which bottles are then carried onward by the chains and submerged in the pasteurizing fluid of compartment *d*. The sprockets are partially relieved of the weight of the bottles by the rails *m*, the sprockets *n* at the ends of said rails holding the chains in the proper position thereon. As the bottles approach the rear end of the first compartment the chain is elevated by the first pair of sprockets *o* and the bottles clear the partition *b*, after which they sink into the pasteurizing fluid of the second compartment *e*, wherein the chains are likewise supported by rails *m*, the idle sprockets *n* at the ends holding said chains in their proper position. As the chains are elevated by the second pair of sprockets *o* in order that the bottles may clear the partition *c* said bottles receive the spray from a pipe *y*. The chains in this compartment are supported on said rails *m*, being held thereon by idle sprockets *n*, as already described, after which the chains rise upwardly to the driving-sprockets *l*, and in rising the bottles receive the spray from a second pipe *y*. An attendant at the rear end of the machine receives the bottles as they emerge from the last tank and removes them from their supports.

By arranging the endless conveyer whereby it passes downwardly at an inclination into the tank at the forward end thereof and upwardly at an inclination from the rear end and in returning travels above the same every bottle on the conveyer is at all times accessible to the operator's hand and inconvenience in loading and unloading is obviated, because the operator can stand close under the approaching or receding line of bottles and with ease place or remove the same. It is also obviously easier to install a plant of this character, where the conveyer passes on supports over instead of under the machine.

In order to take up the slack of the chains, one pair of the idle sprockets *n* are preferably vertically adjustable by means of a pinion-rack mechanism operated by a handwheel. (Shown in Fig. 1.)

To prevent the bottles being affected by the atmosphere after they are dipped in the pasteurizing fluid of compartment *d*, I provide a housing 9, which incloses the first pair of sprockets *o* and the adjacent sprockets *n*, said housing extending across the machine, so as to form a chamber.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In an apparatus of the character described, the combination with a tank of an endless carrier, and bottle-supports pivotally mounted on said carrier, the pockets of which open toward the rear end of the machine, said supports coöperating with the necks of the bottles to suspend them, substantially as described.

2. In an apparatus of the character described, the combination with a tank of an endless carrier, individual bottle-supports carried by said carrier, said supports coöperating with the necks of the bottles to suspend them, whereby each support and its suspended bottle is capable of independent movement, substantially as described.

3. In an apparatus of the character described, the combination with a tank of an endless carrier dipping into said tank and independently-movable bottle-supports pivoted to said endless carrier, said bottle-supports coöperating with the necks of the bottles to suspend them, substantially as described.

4. In an apparatus of the character described, the combination with a tank of an endless carrier, comprising parallel chains and connecting-rods, and bottle-supports pivotally mounted on said rods for suspending the bottles by their necks, substantially as described.

5. In an apparatus of the character described, the combination with a tank of an endless carrier, comprising a pair of chains and connecting-rods, and independently-movable bottle-supports pivoted to said rods

for suspending the bottles by their necks, substantially as described.

6. In an apparatus of the character described, the combination with a tank of an endless carrier, comprising a pair of chains and connecting-rods, means for driving said carrier, and bottle-supports pivotally mounted on said rods for suspending the bottles by their necks, the pockets in said supports opening only toward the rear end of the machine, substantially as described.

7. The combination with parallel chains, composed of links and spacing-blocks, of pivot-rods or pintles passing through the eyes of said links and spacing-blocks, and bottle-supports mounted on said rods or pintles and interposed between said chains, said bottle-supports receiving the necks of the bottles whereby said bottles are suspended and capable of independent movement, substantially as described.

8. The combination with parallel links and chains, composed of links and spacing-blocks, of pivot-rods or pintles passing through the eyes of said links and spacing-blocks, and a plurality of bottle-supports mounted on said rods or pintles, said bottle-supports being so arranged as to assist in spacing the chains, substantially as described.

9. The combination with parallel chains composed of links and spacing-blocks, of pintles common to both chains and passing through the eyes of said links and spacing-blocks, sleeves or washers on said pintles between the chains, and a plurality of bottle-supports mounted on the pintles between said chains, substantially as described.

10. The combination with parallel chains, composed of links and spacing-blocks, of pivot-rods or pintles passing through the eyes of said links and spacing-blocks, sleeves encircling said pintles for spacing said chains, and a plurality of bottle-supports mounted upon said pintles between said chains, substantially as described.

11. The combination with a tank, of sprockets arranged at each end thereof, idle sprockets arranged above the tank in pairs, some of which idle sprockets are of larger diameter than others, an endless carrier passing over and under said sprockets, bottle-supports pivotally mounted on said endless carrier for suspending the bottles by their necks, and partition-walls in the tank opposite the sprockets of larger diameter, substantially as described.

12. The combination with a tank having rails arranged therein and rails supported thereabove, sprockets at the ends of said rails, an endless carrier composed of parallel chains and connecting-rods coöperating with said rails and sprockets, and bottle-supports pivotally mounted on said rods for suspending the bottles by their necks, substantially as described.

13. The herein-described bottle-carrier comprising a rod or wire bent or formed with eyes or attaching devices, the ends thereof crossing each other to form an open-ended pocket with a contracted mouth, substantially as described.

14. The combination with a tank of rails supported thereabove, sprockets mounted on said rails beyond the ends of the tank, sprockets mounted along the upper edges of the tank, an endless carrier composed of chains and connecting-rods which coöperate with said sprockets in such manner that the chains travel at an angle downwardly into and upwardly from the ends of the tank and follow a serpentine course or zigzag path between the ends of the tank, and bottle-carriers mounted on said connecting-rods, substantially as described.

15. The combination with a tank of an endless carrier, bottle-carriers pivotally mounted on said endless carrier adapted to coöperate with the necks of the bottles, rails supported above said tank extending beyond the ends thereof, sprocket-wheels mounted upon said rails beyond the ends of the tank, and sprocket-wheels mounted upon the upper edges of the tank at or near its end, so that said endless carrier will, in its course of travel, pass at an angle downwardly into the front end of the tank and upwardly and outwardly from the rear end of the tank, substantially as described.

16. The combination with a tank having sprockets mounted thereon, of sprockets supported above and beyond each end of the tank, and an endless carrier passing around all of the sprockets and thereby in its course of travel passing downwardly at an angle into the tank at the front end thereof and upwardly and outwardly at the rear end thereof, substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 22d day of June, 1899.

EDWARD WAGNER.

Witnesses:
HUGH K. WAGNER,
A. S. GRAY.

No. 672,788.

Patented Apr. 23, 1901.

A. LIEBER & A. MEIMBERG.

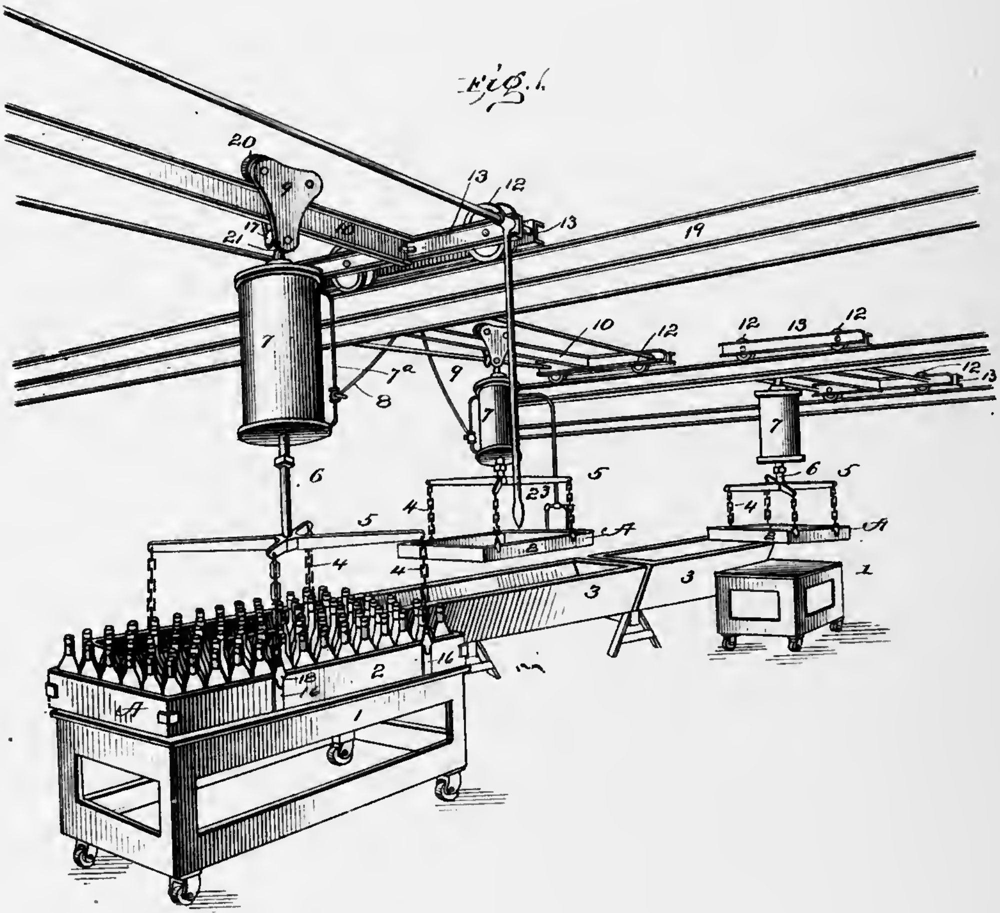
DEVICE FOR HOISTING AND TRANSFERRING BOTTLED BEER IN BOTTLING ESTABLISHMENTS.

(Application filed July 30, 1900.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.



Witnesses:
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D. E. Wilson

Inventors:
Albert Lieber
August Meimberg

C. J. Stockman
Associate Attorney

No. 672,788. Patented Apr. 23, 1901.

A. LIEBER & A. MEIMBERG.

DEVICE FOR HOISTING AND TRANSFERRING BOTTLED BEER IN BOTTLING ESTABLISHMENTS.

(Application filed July 30, 1900.)

(No Model.) 3 Sheets—Sheet 2.

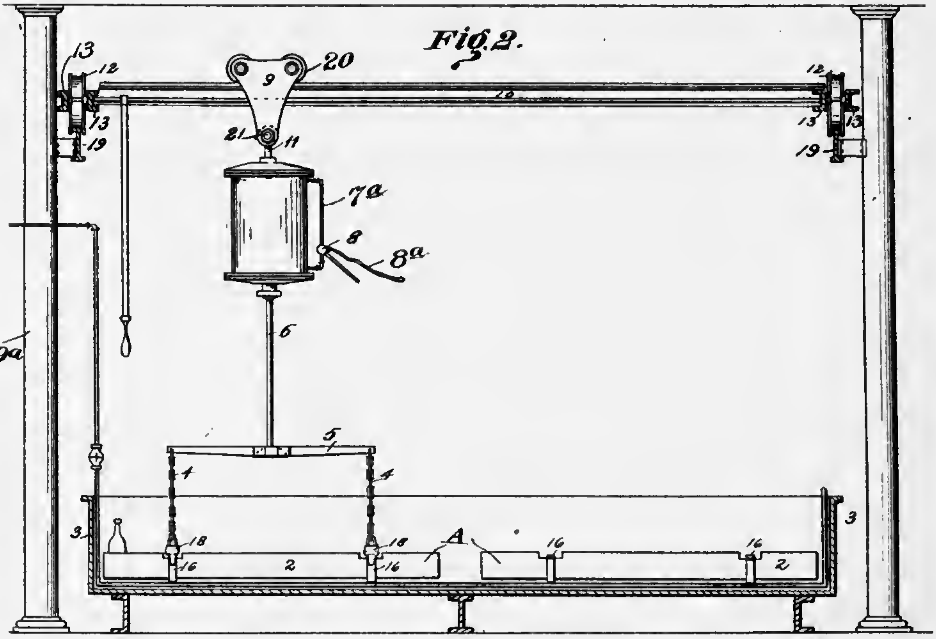


Fig. 2.

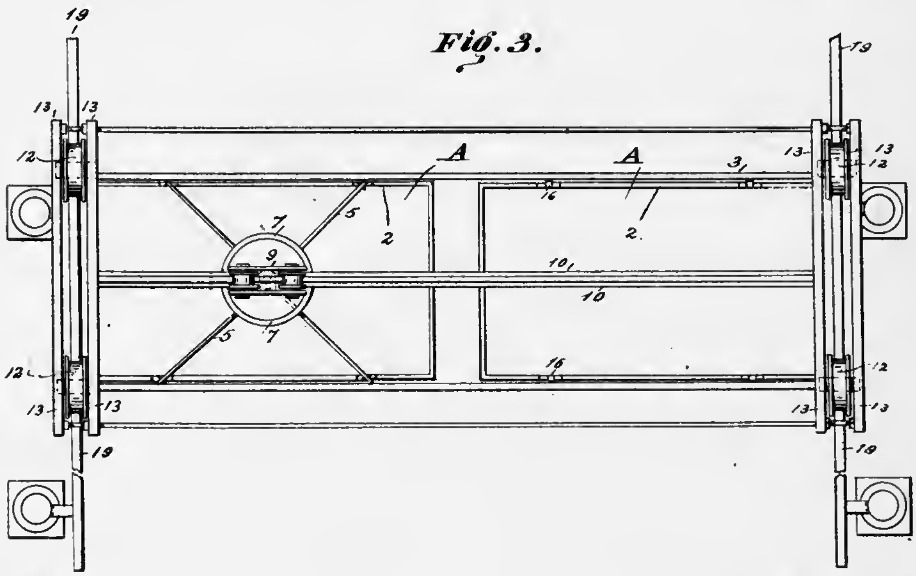


Fig. 3.

Witnesses.
Otto P. Kalusse.
James E. Broden

Inventors
Albert Lieber
August Meimberg
by Jacob W. Loeper, Atty.

No. 672,788. Patented Apr. 23, 1901.

A. LIEBER & A. MEIMBERG.

DEVICE FOR HOISTING AND TRANSFERRING BOTTLED BEER IN BOTTLING ESTABLISHMENTS.

(Application filed July 30, 1900.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 1.

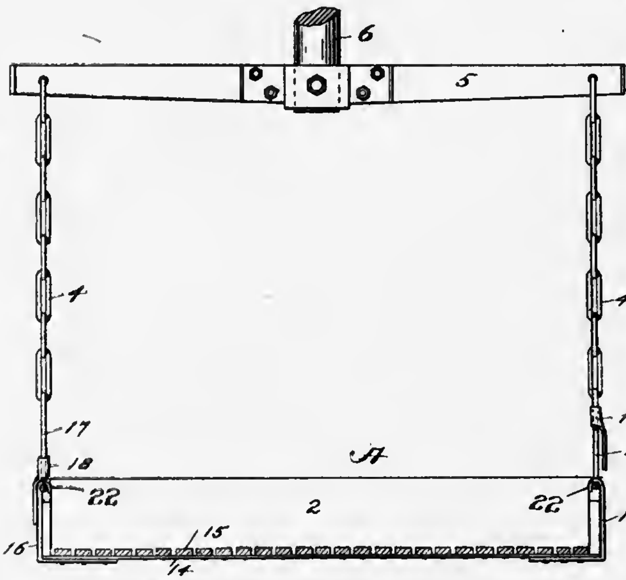


Fig. 5.

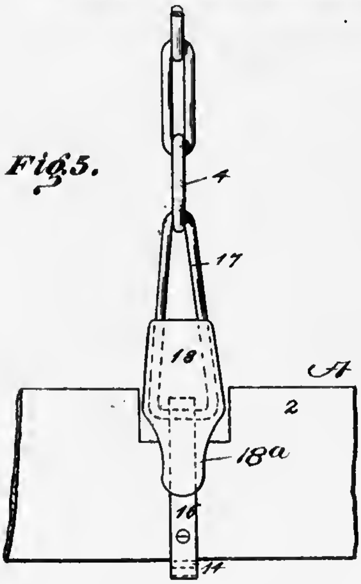
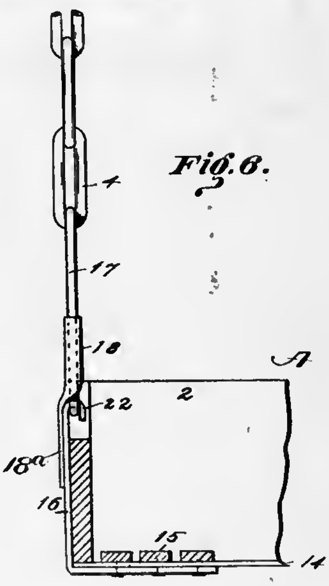


Fig. 6.



Witnesses.
Otto P. Oelrichs
James E. Broden

Inventors
Albert Lieber
August Meimberg
by Jacob W. Loeper
Atty.

UNITED STATES PATENT OFFICE.

ALBERT LIEBER AND AUGUST MEIMBERG, OF INDIANAPOLIS, INDIANA.

DEVICE FOR HOISTING AND TRANSFERRING BOTTLED BEER IN BOTTLING ESTABLISHMENTS.

SPECIFICATION forming part of Letters Patent No. 672,788, dated April 23, 1901.

Application filed July 30, 1900. Serial No. 25,253. (No model.)

To all whom it may concern:

Be it known that we, ALBERT LIEBER and AUGUST MEIMBERG, citizens of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented new and useful Improvements in Devices for Hoisting and Transferring Bottled Beer in Bottling Establishments by Means of Air-Hoists and Transverse Carriers, of which the following is a specification.

Our invention relates to an improvement in the means for handling of large quantities of bottled beer for the purpose of "pasteurizing." During the operation of this process the bottled beer has to be transferred in trays by means of trucks from the place of filling to the pasteurizing-tanks. Arriving at the tanks, the trays loaded with bottled beer must be elevated, so that the tray may be moved over the steaming-tank and then lowered into the same. It has been customary heretofore to perform these operations by means of hand or chain-hoists, necessitating the employment of a large number of men.

Our invention comprehends, in addition to the pasteurizing tank or tanks and the trays in which the bottled beer is contained while being transported and pasteurized, a raising and lowering means which travels on overhead tracks and carries the beer to position over the tank in which it is to be pasteurized and from said tank after it (the beer) has been pasteurized. The raising and lowering means preferred by us comprises a cylinder having therein a piston-head and provided with a piston-rod having means by which a tray is detachably connected therewith. Said cylinder is also provided with means by which a suitable means or medium, preferably compressed air, is conveyed thereto for the purpose of actuating the piston and raising and lowering the tray with its contained bottles of beer. The construction is preferably such that the compressed air enters the cylinder at points which are both above and below the limits of travel of the piston-head and is conveyed to the inlets by pipes which have their contiguous ends joined by a valve-casing having a suitable valve, actuable to cause the compressed air to enter the upper part of the cylinder in order to drive the piston downward, and thereby lower the tray, with its contained bottles of beer, into the pasteurizing-tank or onto a truck after the beer has been pasteurized and to cause the air to enter the lower port in the cylinder when it is desired to raise the piston, and thereby lift the tray and beer from a truck or from said pasteurizing-tank. This means of raising and lowering the trays, with their contained bottles, by compressed air or other suitable fluid admitted below and above the piston-head, respectively, has especial advantages in the handling of bottled goods, as the action of the piston in both directions of its travel is cushioned by said fluid, and said piston, together with the parts carried thereby, is caused to move slowly, steadily, and without jar, whereby the liability of breaking the bottles is reduced to a minimum and is materially less than it would be if the piston were caused to descend by gravity. The means adopted for detachably connecting the hoisting device with the trays are of peculiar construction and include pendent eyes or loops carried by said device to engage hooks on the trays, together with a slidable or movable safety device adapted to prevent accidental disconnection of the parts from each other.

Other novel features are embodied in the complete embodiment of the invention, which will appear hereinafter.

In the accompanying drawings, illustrating the invention, Figure 1 is a perspective view of part of the interior of a plant for pasteurizing beer embodying our improvements. Fig. 2 is a detail view which illustrates the construction of the conveying means and the pasteurizing-tank, the latter being shown in section. Fig. 3 is a plan view of the parts shown in Fig. 2. Fig. 4 is a detail view intended principally to show the construction of the tray and the means for connecting the hoisting device therewith, said tray being shown in section; and Figs. 5 and 6 are a front and side view, respectively, of the means by which the tray is detachably connected with said hoisting means.

Similar reference characters designate similar parts in the several views.

A designates the tray which contains the bottled beer while the same is being transported to and from the pasteurizing-tank 3 and while it is in said tank. Said tank 3 is or may be of the ordinary construction. The plant shown in the drawings comprises a number of trays and transporting means therefor, all of similar construction, respectively, so that a description of one will suffice for all. The tray A is formed of side pieces 2, which may be of wood, and a bottom formed of slats 15, spaced suitable distances apart and supported upon metallic strips 14, which are attached to the ends of the tray. The tray is also provided with L-shaped straps 16, having their lower ends secured to strips 14 and their upper ends formed to provide hooks 22, which hooks are adapted to be engaged by loops 17 at the ends of chains 4. In order to prevent accidental disconnection of the loops 17 and hooks 22, a safety-buckle is mounted on one of the parts and is movable into engagement with the other part. The safety device shown in the accompanying drawings comprises a slide 18, formed of sheet metal and having its edges bent so that it incloses the loop 17 and provided with a depending portion adapted to engage the hook end of the contiguous strap 16, and thereby prevent relative movement of the loop and hook. In order that the slide may be most reliably held in its lower position, to which it is adjusted when in use, and may be readily raised to permit disconnection of the loop and hook, said loop is preferably triangular in shape and has its base presented to said hook, and the upper portion of the slide is similarly formed, as clearly shown in Fig. 5. The chains 4 depend from the ends of the arms of a crosshead 5, which latter is bolted or otherwise firmly secured to the lower end of a piston-rod 6. Said rod extends into a cylinder 7 and has within said cylinder a piston-head acted on by the power fluid employed to raise and lower the piston, and thereby raise and lower the tray suspended therefrom. The cylinder is also provided with a pipe 7ª, which conveys the power fluid, preferably compressed air, thereto, and the respective ends of said pipe open into said cylinder at places above and below said piston-head through inlet-ports with which the cylinder is provided. Said pipe has at a suitable place a valve-casing 8, which contains a valve. There will be suitable hose or other air-conveying pipes (indicated best at 8ª, Fig. 2) connecting the valve-casing with a suitable compressed-air reservoir. The construction will preferably be of that well-known type wherein the valve may be manipulated to permit the air to pass under the piston-head for moving the load upward and to pass above said piston-head to move the load downward, so that the piston will be cushioned in both directions of its travel, so as to prevent breakage of the bottles with which the tray is loaded. Said cylinder 7 is pivotally suspended, as indicated at 21, from a wheeled frame 9, which straddles an eye-beam 10, formed to provide a track upon which the wheels of said frame may run, thus providing for an adjustment of the cylinder and the parts carried thereby in a direction lengthwise of the tank 3, and each end of said eye-beam 10 is suitably fixed to the inner member of a wheeled frame consisting of two flanged irons 13, supporting wheels 12 between them, which wheels traverse tracks provided by suitable eye-beams 19, which are supported by suitable pillars or by any other suitable means, whereby the trays may be rapidly and easily adjusted in a direction at right angles with that afforded by the wheeled frame 9, above referred to.

In the operation of the apparatus the tray is filled in one portion of the plant with bottled beer to be pasteurized and is loaded on a truck 1, on which it is conveyed to a place adjacent to a pasteurizing-tank, at which place it is coupled to the hoisting means. Air is now admitted beneath the piston-head, thus lifting the tray from its truck and elevating it to a height above the pasteurizing-tank. The carrying means are now adjusted on the beams 19 to a place over said tank by the operator, who grasps a handle 23, provided for this purpose, and is then adjusted to a place over an unoccupied portion of said tank on the track 10. Air is then admitted above the piston-head, so as to lower the tray into the tank, after which the loops 17 are uncoupled from the hooks 22 and the tray, with its contained bottles, allowed to remain in the tank until the beer is pasteurized. When the beer has been subjected to the action of the pasteurizing medium the required length of time, its tray is recoupled to the hoisting and carrying means, and the apparatus is operated to place it on a truck 1 provided therefor, and it is conveyed away on said truck.

A plant equipped with the apparatus above described will be enabled thereby to handle a maximum amount of goods with very little manual labor and without liability of loss due to breakage of bottles, thus materially reducing the proportionate running expenses of the plant.

Having thus described our device for handling bottled beer during the pasteurizing process and its advantages, what we claim as new, and desire to secure by Letters Patent, is the following:

1. The chain 4, loop 17, hook 22, with safety-buckle 18, cross-arms 5, in combination with tray 2.

2. In a pasteurizing apparatus, the combination with a pasteurizing-tank, a tray for containing the bottled liquid to be pasteurized, and a means constructed to raise and lower said tray, of devices for detachably connecting the tray with the raising and lowering means, said connecting means embracing hooks on one part, loops on the other part, and adjustable safety-buckles which engage said hooks and loops and prevent accidental disconnection thereof.

3. The combination with a pasteurizing-

tank, and a hoisting and lowering means, having triangular loops, of a tray having hooks to engage said loops, and slides adapted to said loops and adjustable thereon to also engage said hooks, so as to prevent accidental disconnection of the loops and hooks, substantially as described.

Signed by us at Indianapolis, Indiana, this 19th day of July, 1900.

ALBERT LIEBER.
AUG. MEIMBERG.

Witnesses:
OTTO P. DELUSE,
JAMES E. BRODEN.

Pa
Je 1901

675,336

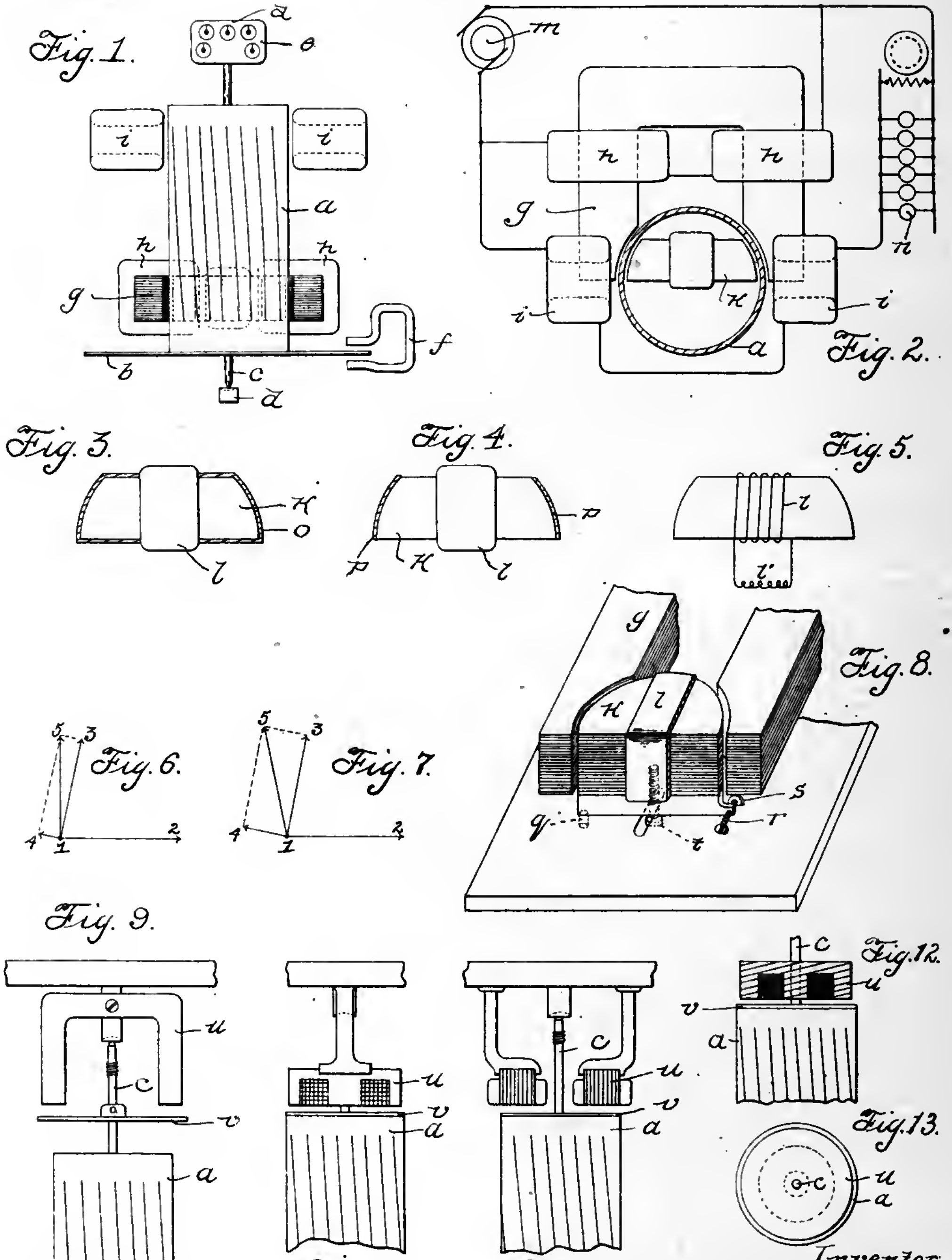
No. 675,996. Patented June 11, 1901.

L. GUTMANN.

ELECTRIC METER.

(Application filed June 6, 1900.)

(No Model.)



Witnesses:
May W. Zabel.
H. S. Gaither.

Inventor:
Ludwig Gutmann

By Charles A. Brown & Cragg
Attorneys.

UNITED STATES PATENT OFFICE.

LUDWIG GUTMANN, OF PEORIA, ILLINOIS.

ELECTRIC METER.

SPECIFICATION forming part of Letters Patent No. 675,996, dated June 11, 1901.

Application filed June 6, 1900. Serial No. 19,282. (No model.)

To all whom it may concern:

Be it known that I, LUDWIG GUTMANN, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented a certain new and useful Improvement in Electric Motors and Meters, (Case No. 100,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to motors and meters.

The invention in some of its aspects relates to devices of this kind that are operated through the agency of alternating, intermittent, or pulsating currents.

The invention may be employed in connection with integrating, recording, and indicating meters.

Other features of my invention may be adapted for service in connection with meters or motors operable through the agency of any suitable current and are applicable to indicating or recording meters.

One feature of my invention relates particularly to meters for measuring the true watts in a power-circuit. This feature of the invention may be generally described as consisting in improved means for producing a resultant pressure-field that is maintained in quadrature with the impressed electromotive force, this field coacting with a series of current-fields to effect the rotation of an armature inductively associated with these fields to secure motion of the armature proportional to the true watts. This feature of my invention is particularly adaptable to constructions illustrated in Patent No. 614,225, granted to me November 15, 1898, although other applications of the invention may be made. In practicing this feature of my invention I employ a compound magnet system having two physically-distinct cores, one of which is magnetized by a primary current, which in the case of wattmeters traverses the shunt or pressure winding, and the other by a secondary placed about the same, whereby the desired phase relation of the resultant field due to the component fields of the distinct cores is secured with relation to the impressed pressure. This result is secured by means of my invention in a very simple, effective, and accurate manner.

Another feature of my invention consists in magnetic means for reducing the friction to which the rotatable element is subjected, comprising in the preferred embodiment of this feature of the invention a magnetizable portion carried by the rotatable element of a magnet in whose field the said magnetizable portion is placed, whereby the lower bearing of the rotatable element or armature is relieved of the weight of the latter element.

A third feature of my invention consists in an adjusting device for modifying a magnetic field comprising main and supplemental magnetic cores relatively movable with regard to each other, the supplemental core having an eccentric mounting, whereby the adjustment may be rapidly and effectively secured.

I will explain my invention more particularly by reference to the accompanying drawings, illustrating the preferred embodiment thereof as applied to meters.

Figure 1 is a side elevation illustrating the construction of a meter equipped in accordance with the invention. Fig. 2 is a plan view of the structural parts illustrated in Fig. 1, the relation of the instrument to the system of distribution being diagrammatically indicated. Figs. 3, 4, and 5 illustrate modifications of the supplemental core and its secondary winding. Figs. 6 and 7 are vector diagrams illustrating the field-current and pressure phase relations. Fig. 8 is a perspective view illustrating my improved adjusting means for modifying the pressure-field. Figs. 9, 10, 11, and 12 are detailed views of my improved means for relieving the rotatable element or armature of excessive friction, Fig. 11 being a side view of the structure illustrated in Fig. 10, while Fig. 13 is a plan view of the magnet illustrated in Fig. 12. Fig. 13 is a plan view of the magnet entering into the device illustrated in Fig. 12.

Like parts are indicated by similar characters of reference throughout the different figures.

Referring more particularly to Fig. 1, the armature a therein illustrated is constructed in accordance with the aforesaid patent granted to me, being preferably provided with a damping-disk b at its lower end, the armature and damping-disk being mounted upon a common spindle c, journaled in upper and lower bearings d d. The armature is preferably cup-shaped, as illustrated.

The instrument shown is a recording-wattmeter, a counting-train e being shown in operative engagement with a spindle or shaft c. Damping-magnet f is in inductive relation to the disk b to properly retard the rotation of the armature. A magnetizable laminated core g is shown in the form of a horseshoe and is located upon the exterior of the armature, this core being provided with a shunt-winding, which constitutes a primary winding and is preferably subdivided into two coils h h, each disposed upon a leg of the core. The shunt core and coils are shown at the lower part of the armature arranged in a plane parallel with the plane of rotation of the armature, the series or current coils i i being located above the shunt-coils and preferably near the top of the armature. Any suitable means may be employed for supporting the coils of the instrument. Where the structure is employed in a meter, the current-coils i i may be unprovided with magnetizable cores. By the arrangement illustrated the windings h and i do not coöperate to produce a rotating field.

The core g forms one part of the compound magnet system. The remaining part or core portion k of this system is contained within the armature and is preferably located in the same plane with the core g and at right angles to the contiguous legs of the latter core. This core portion k not only serves to reduce the magnetic reluctance of the magnetic circuit for the flux due to the shunt-winding, but also serves, in combination with a closed conductor l, to maintain the resultant pressure-field in quadrature with the impressed pressure. The closed conductor l may be in the form of a conducting-band of suitable metal, as copper, or may be in the form of a number of turns of wire, and, as illustrated in Fig. 5, included in a closed circuit with a resistance l'.

As illustrated in Fig. 2, the meter is connected in circuit with a suitable source of alternating current m, supplying translating devices n, which may be either inductive or non-inductive, or both inductive and non-inductive, the meter serving to measure properly the true watts, irrespective of the nature of the load. The current and pressure coils are shown conductively included in circuit, the current-coils being included in one of the mains, while the pressure-coils are in bridge of the mains. By locating the closed conductor upon the supplemental core k a component magnetic field is created that is displaced nearly one hundred and eighty degrees from the impressed electromotive force and from the current when the load is non-inductive, being in quadrature with the current in the shunt-winding.

Referring to the vector diagrams illustrated in Figs. 6 and 7, it will be readily understood in what manner the phase adjustment is secured. The line 1 2 in each figure represents the impressed electromotive force which is in phase with the current when there is a non-inductive load. The line 1 3 represents a component field due to the shunt-winding. The line 1 4 represents the component field due to the supplemental core of the compound magnetic system, while the line 1 5 represents the resultant field, whose phase relation with respect to the electromotive force may be determined.

In Fig. 6 the resultant magnetic field is shown in quadrature with the impressed electromotive force, while in Fig. 7 it is slightly greater than ninety degrees, this adjustment being determined by the resistance in the closed conductor of the supplemental core. I secure this result by making the core portion k separate from the core g, whereby two distinct component fields are produced, one due to the core k and the other to the core g, the core k, which is initially threaded by lines of force from the core g, having additional magnetic flux superimposed upon the initial flux by means of the closed conductor l, whereby the phase of the flux flowing through the core k is modified sufficiently to secure the desired resultant pressure-field. The supplemental core k may be constructed as shown in Fig. 2, where a core of readily-magnetizable laminated iron, homogeneous throughout, is illustrated, or the construction illustrated in Fig. 3 may be employed, where I have illustrated the core inclosed by a conducting-sheathing o. The construction illustrated in Fig. 4 may be employed, if desired, where the pole-faces of the core k are alone provided with metallic-faced plates p. These separately-applied facings of the core k are well adapted for the generation of Foucault currents. These facings supplement the action of the closed secondary conductors about the core k and serve to still further increase the lag between the impressed pressure and the component field due to the core k, as they act in the capacity of closed conductors. To secure this result, these facings are placed transversely to the flux. For specific compensations either the conductor l or the facings p may be alone employed.

The form illustrated in Fig. 5 is well adapted for power-motors.

The operation of the apparatus will now be understood. The magnetic core g is energized by the shunt-winding h, polar regions opposite the armature being established at the ends of the core. Magnetic flux passes through the core k, due to the inductive action of the core g, this core k being subjected to a secondary magnetization due to the closed conductor l. The poles of the inner core face those of the outer core, a difference in phase existing between the poles of the inner core and the poles of the outer core, which serves to secure the desired phase relation between the resultant pressure-field due to these cores *g* and *k* and the impressed pressure, the component fields due to the cores, however, serving in no wise to effect rotation of the armature. This is an important feature of my present invention, as by this means I am enabled to secure the required phase adjustment without causing the armature to rotate on no load, which it would be liable to do if these component fields of displaced phase acted to secure rotation. Any meter that has no automatic compensation is liable to run backward when the power factor of the circuit is low, because in such event the shunt-current will lead, while with non-inductive loads the shunt-current lags behind the series current.

In Fig. 8 I have shown my improved means for effecting the adjustment of the core portion *k*. This core portion is provided with a mounting eccentric to the axis of rotation of the armature, one end being preferably mounted upon a pivot *q*, projecting from the base of the core *k*. The other end of the core *k* is provided with an adjusting-screw *r*, which engages a lug *s*, projecting from the base of the meter, this screw serving to secure delicate adjustment of the core *k* upon its eccentric pivot. A screw *t* is employed to secure the cork *k* in its adjusted position. By this adjusting means I am enabled to readily effect a compensation for friction in the movable parts of the meter, so that the instrument will measure on the slightest load.

I have illustrated in Figs. 9 to 13, inclusive, means constructed in accordance with my invention for reducing the friction to which the armature is subject.

In Fig. 9 I have illustrated a permanent horseshoe-magnet *u*, stationarily disposed, and a magnetizable disk *v*, of iron or steel, carried by the armature and facing the magnet. The pressure or weight of the armature upon its lower bearing is thus decreased.

I am aware that it has heretofore been proposed to overcome armature friction by magnetic means, which in the course of time become weakened and which cause stray magnetic fields, which improperly modify the operation of the meter.

By the construction illustrated in Fig. 9 the magnet is practically close-circuited, whereby its strength is maintained, the disk *v* acting also as a shield that magnetically separates the magnet *u* from the remainder of the instrument.

In Figs. 10 and 11 electromagnets are shown, these magnets acting on the plate or disk *v*. The windings of the magnets may be included in circuit with the shunt-winding *h*. The disk *v* in this instance also acts as a cover to the cylindrical armature.

In Fig. 12 I have shown an electromagnet having a circular winding contained in an annular recess of the core. This magnet may be connected in circuit with a suitable source of current.

I have herein shown and particularly described the invention as applied to alternating-current wattmeters; but I do not wish to be limited to the application of the invention to this class of devices, as the invention may be applied to meters and motors of other construction and possessing other modes of operation; but,

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In an electric motor, the combination with an armature, of a compound magnet system having two distinct cores inductively related to said armature, a primary energizing-winding for one of said cores, a secondary closed conductor about the remaining core, the latter core being unprovided with any primary winding, and means coacting with said magnet system for effecting rotation of the armature, substantially as described.

2. In a wattmeter, the combination with an armature, of a compound magnet system having two distinct cores inductively related to said armature, a primary energizing-winding for one of said cores, a secondary closed conductor about the remaining core, the latter core being unprovided with any primary winding, a current-winding also in inductive relation with the armature, and a measuring element operated by the armature, substantantially as described.

3. In an electric meter, the combination with current and pressure field windings, of a cylindrical armature subjected to the action of the fields due to said windings, a measuring element actuated by said armature, a compound magnet system having two distinct cores arranged in a plane transverse to the axis of rotation of the armature, one of said cores being upon the interior of the armature and the other upon the exterior, one of said cores being associated with the pressure-winding, and a closed conductor for the remaining core, substantially as described.

4. In an electric meter, the combination with current and pressure field windings, of an armature subjected to the action of the fields due to said windings, a measuring element actuated by said armature, a compound magnet system having two distinct cores, the said pressure-winding coöperating with one of said cores to produce one component magnetic field, and means coöperating with the second core for producing a second component field substantially in quadrature with the aforesaid component field, whereby a resultant pressure-field is produced substantially in quadrature with the pressure, substantially as described.

5. In an electric motor, the combination

end of said armature having one of its sides exposed to said magnet-poles, substantially as described.

22. In a friction-reducing device, the combination with a stationary magnet, of an energizing-coil for said magnet, an armature operating the latter, and a magnetic shield interposed between the fields actuating said armature and the field of the first-named magnet, substantially as described.

In witness whereof I hereunto subscribe my name this 23d day of May, A. D. 1900.

LUDWIG GUTMANN.

Witnesses:

FLORENCE WICKLIN,
HARVEY L. HANSON.

678,724

Pa

July 1901

No. 678,724. Patented July 16, 1901.

L. GANGLOFF.

APPARATUS FOR PASTEURIZING LIQUIDS IN BOTTLES.

(Application filed Dec. 1, 1900.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

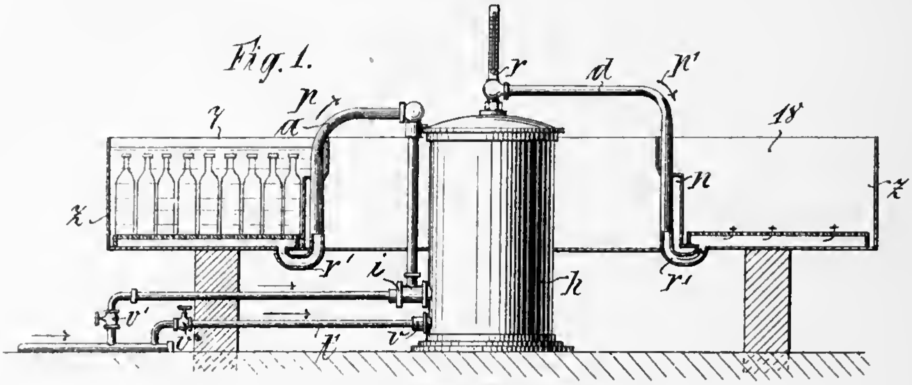
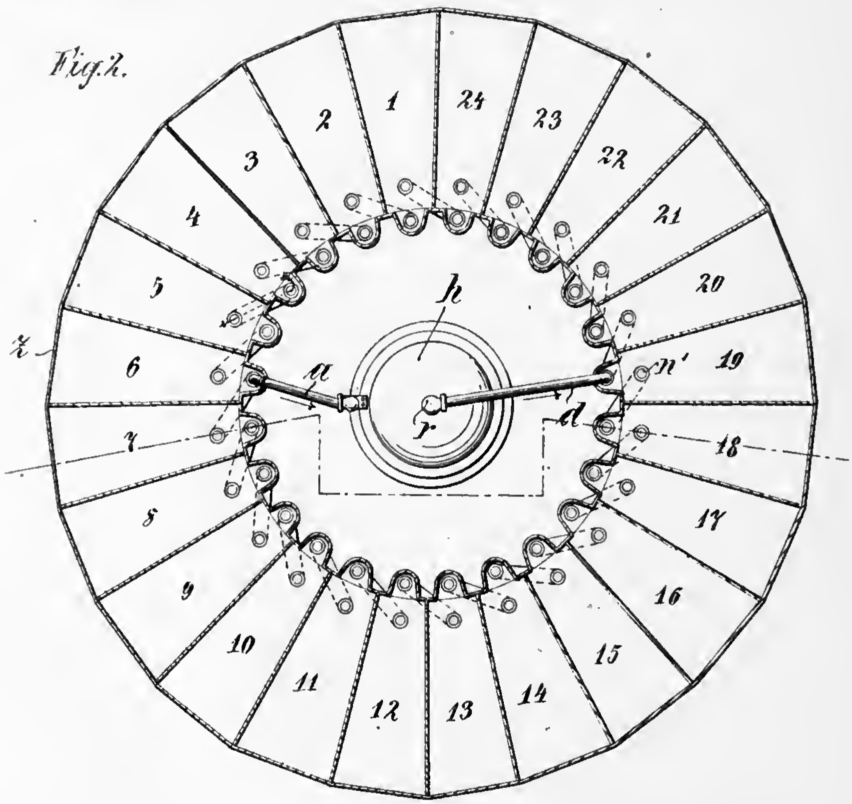


Fig. 2.



Witnesses
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Waldo M. Chapin

Inventor
Louis Gangloff
by Wm. H. Rosenbaum
atty.

No. 678,724. Patented July 16, 1901.

L. GANGLOFF.

APPARATUS FOR PASTEURIZING LIQUIDS IN BOTTLES.

(Application filed Dec. 1, 1900.)

(No Model.) 4 Sheets—Sheet 2.

Fig. 4.

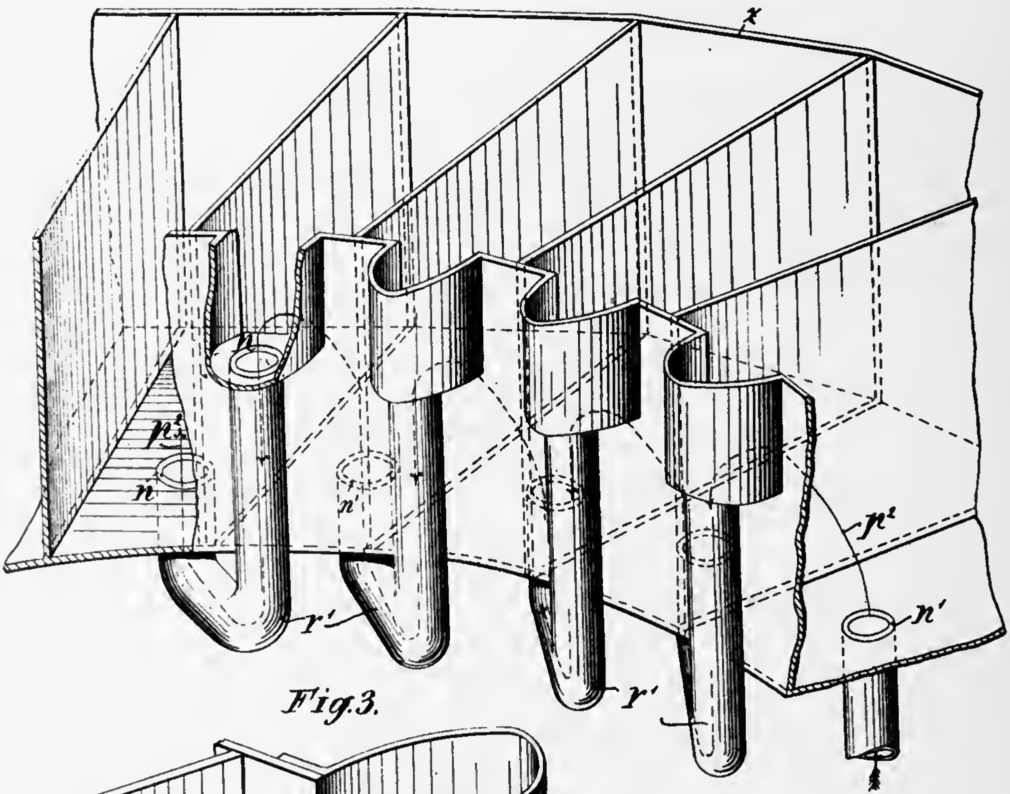
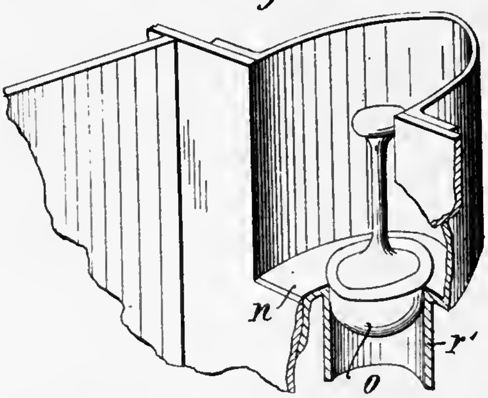


Fig. 3.



Witnesses
Frank S. Ober
Waldo M. Chapin

Inventor
Louis Gangloff
by Wm. H. Rountree
atty

No. 678,724. Patented July 16, 1901.

L. GANGLOFF.

APPARATUS FOR PASTEURIZING LIQUIDS IN BOTTLES.

(Application filed Dec. 1, 1900.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 5.

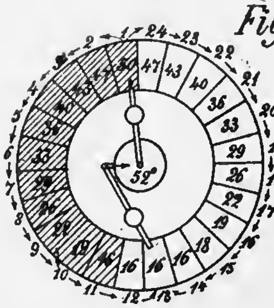


Fig. 11.

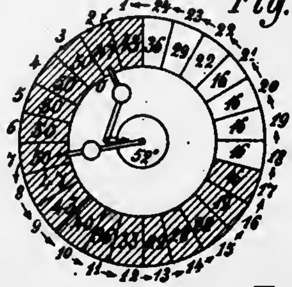


Fig. 17.

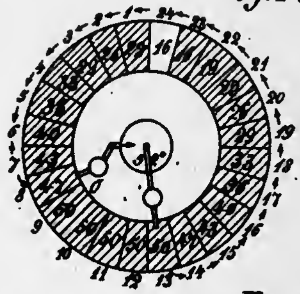


Fig. 6.

Fig. 12.

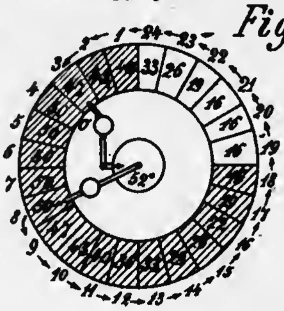


Fig. 18.

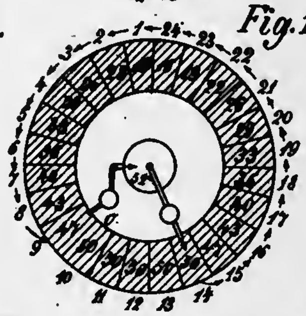


Fig. 7.

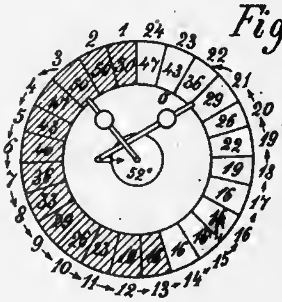


Fig. 13.

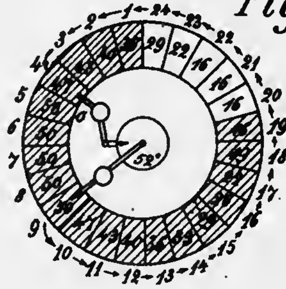
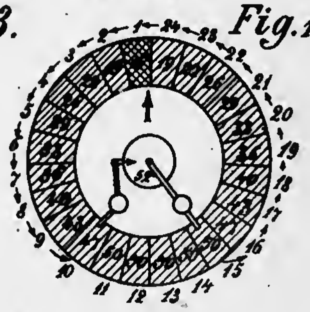


Fig. 19.



Witnesses

Frank S. Ober

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No. 678,724. Patented July 16, 1901.

L. GANGLOFF.

APPARATUS FOR PASTEURIZING LIQUIDS IN BOTTLES.

(Application filed Dec. 1, 1900.)

(No Model.) 4 Sheets—Sheet 4

Fig. 8.

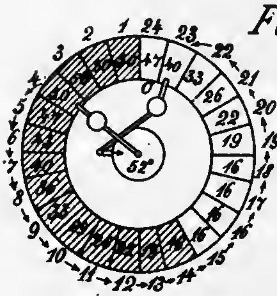


Fig. 14.

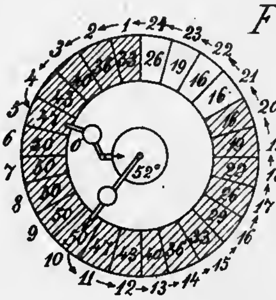


Fig. 20.

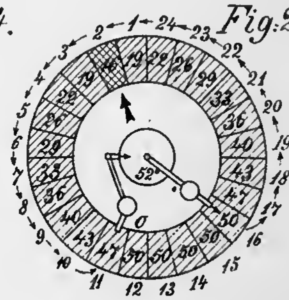


Fig. 9.

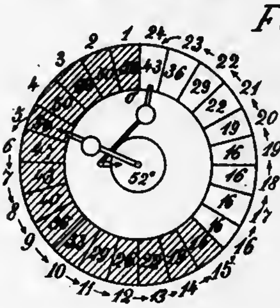


Fig. 15.

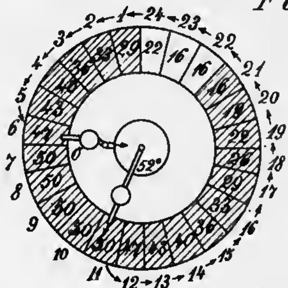


Fig. 21.

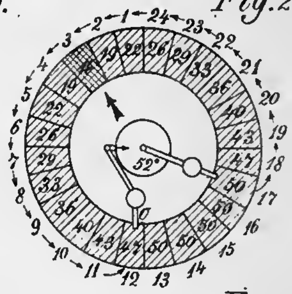


Fig. 10.

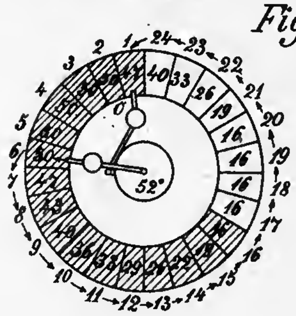


Fig. 16.

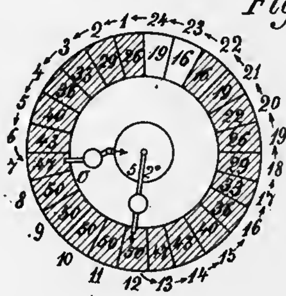
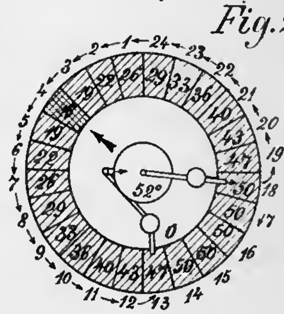


Fig. 22.



Witnesses
Frank S. Ober
Waldo M. Chapin

Inventor
Louis Gangloff
By Wm A. Rosenbaum
Atty.

UNITED STATES PATENT OFFICE.

LOUIS GANGLOFF, OF HAGENAU, GERMANY.

APPARATUS FOR PASTEURIZING LIQUIDS IN BOTTLES.

SPECIFICATION forming part of Letters Patent No. 678,724, dated July 16, 1901.

Application filed December 1, 1900. Serial No. 38,320. (No model.)

To all whom it may concern:

Be it known that I, LOUIS GANGLOFF, a subject of the German Emperor, residing at Hagenau, Alsace, in the German Empire, have invented certain new and useful Improvements in Apparatus for Pasteurizing Liquids in Bottles and the Like, (for which I have applied for patent in Germany, dated October 5, 1899,) of which the following is a specification.

My present invention relates to an apparatus for uniformly pasteurizing bottled beer and the like in which the bottles can be gradually raised to the required temperature and when desired reduced gradually to the normal temperature without danger of their being broken.

According to my invention the bottles to be pasteurized are placed continuously into the compartments (hereinafter called "cells") of the apparatus in order to be raised to the desired temperature, and after being pasteurized and cooled are removed from the apparatus without interrupting the operation. This method of gradually heating and cooling the bottles to be pasteurized and their continuous feed and removal is carried into effect by the apparatus shown in the accompanying drawings, in which—

Figure 1 is a cross-section, and Fig. 2 a horizontal section, of the apparatus. Fig. 3 is a perspective view of the stopper shown in position on one of the overflow-pipes of the cells. Fig. 4 is a perspective view showing the manner of connecting the separate cells of the apparatus, while Figs. 5 to 22 are diagrams illustrating the operation of the apparatus.

The pasteurization of the bottles is effected in a number of cells 1 to 24, arranged adjacently in a ring and all heated from a common source. These cells are connected together by overflow-pipes r' in the manner hereinafter described. The heating is effected by steam in an apparatus shown in Fig. 1 at h. This apparatus consists of a hollow vessel, which is situated at the center of the system of cells (1 to 24, Fig. 2) and is provided with a steam-pipe t' and a steam-injector i. By means of the injector i the water to be heated is fed into the heater h in the well-known manner. Through the pipe t' steam can be admitted into the heater h direct, and the temperature of the water contained therein can be raised to the degree desired. To the heater h a suction-pipe a and an overflow-pipe d are connected. These pipes are so constructed and arranged that they can connect the heater h with each and every one of the cells. The cells are uniformly filled with water before putting the apparatus to work.

The heater operates in the following manner: On opening the valve v' the steam-injector is put into operation, the suction-pipe a having been previously connected with the overflow-pipe of one of the cells, and the cold water therein is conducted in the direction of the arrow p into the heater h. By opening the valve v^2 the temperature will be further raised. The heater h, which for the purpose of enabling the temperature to be better regulated, is provided with a thermometer r, and the water which has been raised to the desired temperature is conducted by the pipe d in the direction of the arrow p' to the cell where the pasteurization commences.

Owing to the peculiar relative position of the cells and the arrangement of the heater with regard to the same all the cells can be successively raised to the temperature required for pasteurizing—say, for example, 50° centigrade—while the peculiar form and arrangement of the cells enables the uniform cooling of the contents of the same after the pasteurization has been effected.

The principle of conducting the water from the one cell into the heater h and then delivering this water at a higher temperature to another cell is utilized in order to obtain the uniform successive heating and cooling of all the cells. In order to render this possible, the cells are connected together in the manner shown in Fig. 4. Each cell is provided with a projecting chamber at n, to which one end of the overflow-pipe r' is connected, the other end of which is connected to the adjacent cell, so that when the water has reached a certain level in one cell it overflows into the next one.

The change in the level of the water, which is effected by the injector of the heater, causes the gradual circulation of the contents from cell to cell. As now all the cells are not uniformly heated, but one compartment alone receives the principal share of the heat in each case. The temperature of each cell is communicated gradually, commencing with the hottest one, to all the others to an extent depending on the quantity of hot water overflowing from cell to cell. It will be evident that inasmuch as the one cell delivers its excess hot water to the next one a gradual heating of the contents of all the cells thus of the bottles in the same is effected. In order to insure a uniform continuance of the operation, it is, however, necessary to enable the cells which have attained the highest temperature to be cut off from the others. For this purpose stoppers o, Fig. 3, are provided to fit the overflow-pipes of the cells. By means of these stoppers the attendant can interrupt the operation at any time.

The entire operation of an apparatus having twenty-four cells is illustrated in Figs. 5 to 22 of the drawings. The figures between the arrows on the extreme circumference represent the numbers of the cells, while the numbers in the cells represent the temperature in the same. The arrows on the pipes a and d and at the periphery show how the water circulates at each step in the operation. Where the peripheral arrows are omitted, the cells have been cut off from the others, as will be explained by the temperature given. According to the diagram shown the entire operation is as follows: When all the cells have received sufficient water, the cells 1 to 11 are filled with the bottles to be pasteurized, Fig. 1. The suction-pipe a is now placed in connection with the cells 13 and the overflow-pipe d with the cell 1 in the manner shown in Fig. 1, this motion being permitted by flexible hollow couplings of common construction placed at the angles of the pipes, adjacent to the boiler. On opening the valve of the steam-injector water will be conducted through the pipe a into the heater h, and when the heater is full it will overflow through the pipe d into the cell 1. The temperature can, as above mentioned, be accurately regulated by means of a thermometer. For pasteurizing beer a temperature of 50° has been found to be the best, and this temperature is obtained by such a heater in fifty minutes. As now water is taken from one cell when the water is at the same level in all the cells and this water is conducted to another cell, the water in all the cells is caused to circulate. It will be evident that when water is drawn from the cell 13 the level of the water in this cell will differ from that in the neighboring cells 12 and 14, and water will consequently flow from these cells 12 and 14 into the cell 13 in order to attain a like level. This change of level will take place throughout the whole series of the cells. In addition to the change of level in the cells, which is caused by drawing off the water from one of the cells, a further change of level is produced by the overflowing into the neighboring cells of the hot water from the cell to which the hot water is delivered from the heater. The water flowing through the pipe d into the cell 1 raises the level of the water in this cell, and water will accordingly overflow into the cells 2 and 24. This change of level and overflow takes place throughout all the cells, and two different directions of flow or currents are accordingly produced, as shown by the arrows at the periphery in Fig. 5. It will be evident that the hot or warm water overflowing from cell to cell in this manner will gradually raise the temperature of the water in the cell in proportion to the circulation throughout the cells. The heating action proceeds from the cell 1 to the cell 11 and from the cell 24 to the cell 16, and the differences of temperature produced in this manner in each of the cells are shown by the numbers placed in the cells in the diagram.

The differences of temperature in the cells represented in Fig. 5 are produced in the following manner: The water entering the cell 1 through the pipe d has a temperature of 50°, and owing to the fact that water is being drawn from the cell 13 through the tube a the hot water becomes gradually mixed with the cold water in the cells. The water overflowing from the cell 1 is distributed at the commencement of the operation in the manner shown in Fig. 5, passing through the cells 2, &c., and 24, &c., to the cell 13. In passing through the cells 1 to 11 the hot water is cooled by contact with the cold bottles in the same, while in passing through the cells 24 to 13 it is only cooled by the cold water in these cells. When the cell 1 has been raised to 50° centigrade, which will take about fifty minutes, the operation of the apparatus is altered by the attendant placing the suction and overflow pipes in connection with two other cells. This change can be effected at periods of, say, five minutes, which may be indicated by the striking of a special clock.

In Fig. 6 the cells 1, 24, 23, and 22 have been cut off from the others. The water is taken from the cell 21 and delivered from the heater to the cell 2. As the water taken from the cell 21 is not quite cold, the direct feed of the steam into the heater must of course be regulated accordingly in obtaining the 50° centigrade desired. The cut-off which is represented by o in Fig. 3 and at the cell 22 in Fig. 6 and in the same manner in the following figures prevents the overflow of the cells 22, 23, 24, and 1. The water flowing through the pipe d into the cell 2 does not pass into the cell 1, as the water in this latter cell, as in the other cells 24, 23, and 22, is at the same level as the water in the cell 2, but overflows into the cell 3, from whence it overflows into the cell 4, &c., to the cell 21, where the suction-pipe a assists the circulation.

The step-by-step increase of the temperature in the cells 2 to 11, which will be noticed on examining the diagram, is obtained by each of the cells receiving water from a cell the temperature of which is somewhat higher than its own temperature. It should be noticed that the hottest part of the water in the one cell is mixed with the coldest part of the water in the next one, and it is due to this fact, which constitutes a peculiarity of the apparatus, that each cell is fed with water having a higher temperature than the water it contains itself.

When the pipe a is removed from the cell 13 to the cell 21, Fig. 5, and a stopper is placed on the cell 22, the hot water does not flow in two directions, as before, but passes alone from 2 to 3, &c., to 21, from which it passes at a temperature of 33° through the pipe a into the heater. In the cell 12 the cold bottles to be pasteurized are placed. The water flowing from the cell 11 through the cell 12 is cooled by the bottles, and the temperature in this cell is reduced to 16°. At the stage shown in Fig. 6 the water is fed to the heater at a temperature of 33°, and as the stopper is placed on the cell 22 the water in the cell 21 will be displaced by the water of the cell 20, which has the temperature of 29°, and the water of each cell down to the third one will be displaced in a like manner. The operation is the same at the stage shown in Fig. 7, in which the cold bottles are placed in the cell 13. In this case, too, the temperature of the water overflowing from the cell 12 is reduced to 16°

By placing the cold bottles into the cells at periods of five minutes a cooling agent is provided for the warm water, which is such that the coldest bottles always come into contact with the coldest water, and the bottles are gradually warmed to an extent depending on the quantity of water overflowing from cell to cell.

The temperature of the cells 12 to 24 is only raised when they contain bottles, because then only water having a higher temperature than the remaining cells can enter.

After the stage shown in Fig. 6, according to which several cells are cut off from the others and the cell 1 has been maintained at a temperature of 50° for five minutes, the stopper is removed from the cell 1, the pipe d is connected to the cell 3, the pipe a to the cell 22, and the stopper is placed on the cell 23, Fig. 7. While now the pasteurized bottles are gradually cooling, the bottles which have been subsequently placed in the coldest cells are gradually heated. At the stage shown in Fig. 7 the water circulates from the cell 3 to the cell 22, and the cells 23, 24, 1, and 2 are cut off from the others and maintain their temperature. Since the commencement of the operation of the apparatus, the cell 1 has at this stage been kept at the temperature of 50° for ten minutes, the cell 2 for five minutes, and the cell 3 now reaches this temperature. In five minutes the pipe d is connected to the cell 4, the pipe a with the cell 23, and the stopper is placed on the cell 24, Fig. 8. The water now circulates from the cell 4 to the cell 23, and the cells 24, 1, 2, and 3 remain at the same temperature. The cell 1 has now been maintained at 50° for fifteen minutes, the cell 2 for ten minutes, the cell 3 for five minutes, and the cell 4 reaches the temperature required. In the meantime bottles have been placed in the cell 14. The pipes remain in the position shown in Fig. 8 for five minutes.

After the pipes have been changed into the position shown in Fig. 10 the cell which was raised to the temperature of 50° centigrade during the first fifty minutes and has been kept at this temperature for twenty minutes begins to cool down. At this point the cooling down of the apparatus commences and, what constitutes a feature of great importance, the steam of the injector alone will now suffice to heat the water to the desired temperature without the assistance of direct steam. At this stage of the process the cell 2 has been maintained at the maximum temperature for twenty minutes, the cell 3 for fifteen minutes, the cell 4 for ten minutes, the cell 5 for five minutes, while the cell 6 has just reached its highest temperature.

From the foregoing it will be evident that the time during which the bottles to be pasteurized are kept at the desired temperature in the cells may be varied within wide limits. If a longer time is necessary to pasteurize, the time between each change of the suction and overflow pipes must be lengthened.

Figs. 5 to 22 illustrate the operation with a change at every five minutes. By successively modifying the hot, warm, and cold currents the liquids are heated and again cooled. At the stage shown in Fig. 19 the first part of the operation is completed.

The operation, as further illustrated in Figs. 20 to 22, can be followed in the same manner as above.

It is clearly shown by the diagram that the bottles in the cell 1, which were at first cold, were gradually heated up to 50° centigrade, which lasted fifty minutes, kept at this temperature for twenty minutes, and then gradually cooled down by the water circulating through the apparatus during forty-five minutes until the normal temperature possessed by the bottle on entering the apparatus is obtained. The bottles in the cell 1 have therefore been gradually heated, pasteurized, and again cooled, and can now be removed from the cell and be replaced by other bottles which have to be pasteurized. At the stage shown in Fig. 19 the pasteurized bottles which have been cooled down have been removed and replaced by new bottles, which have also to be pasteurized. In this figure the suction-pipe, overflow-pipe, and stopper have each been moved from one cell to the next. The water coming from the cell 24 is now cooled down by the new cold bottles, so that the temperature in the cell is cooled down to 19, whereupon the bottles in this cell are removed and new cold bottles are inserted. This operation lasts five minutes, whereupon, as shown in Fig. 16, the suction-pipe, overflow-pipe, and stopper are again changed, and the pastenrized bottles are removed from the cell 3 and replaced by new ones. In another five minutes, Fig. 17, the parts are again changed and the bottles replaced. The operation of the apparatus proceeds in this manner continuously, the suction-pipe, overflow-pipe, and stopper being changed and the pasteurized bottles replaced by new cold bottles at each period.

What I claim, and desire to secure by Letters Patent of the United States, is—

An apparatus for pasteurizing liquids in bottles or other receptacles, consisting of a series of cells adapted to receive the bottles or receptacles, said cells being arranged in an endless chain and being connected successively by overflow-pipes provided with valves, in combination with a source of hot water, two pipes leading respectively to and from said source, means for maintaining a circulation of the water therethrough, and means whereby said pipes may be shifted to connect with any two of the series of cells, whereby the bottled material in the cells can be gradually raised in temperature and then gradually reduced in temperature, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two witnesses.

LOUIS GANGLOFF.

Witnesses:
KARL GEETER,
MAX ADLER.

Pasteurizer

Je 1902

701,622

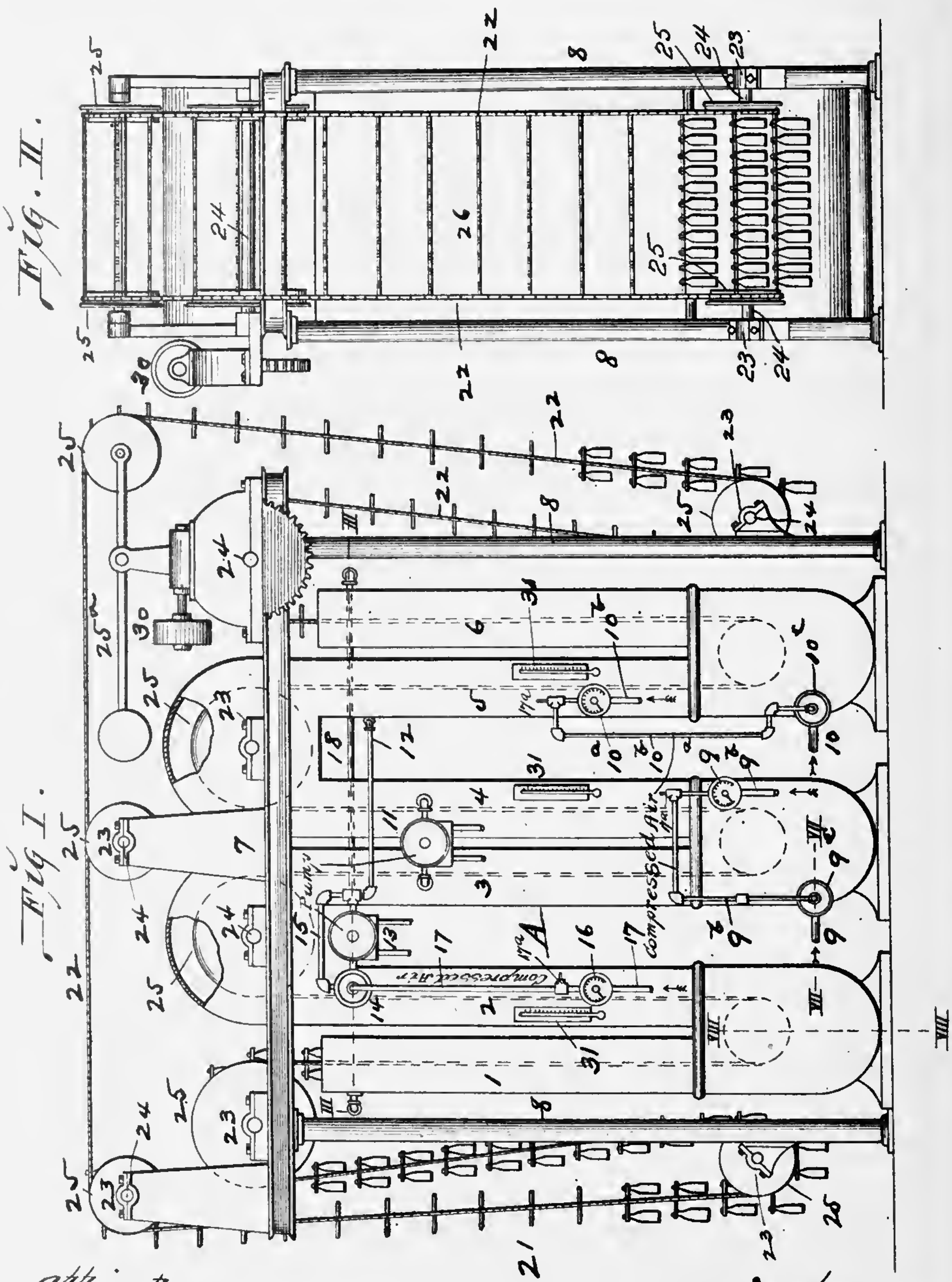
No. 701,622. Patented June 3, 1902.

W. J. RUFF.

PASTEURIZER.

(Application filed Sept. 16, 1901.)

(No Model.) 3 Sheets—Sheet 1.



Attest:—
M. Smith
E. S. Knight

Inventor:—
Wm. J. Ruff:—
By Knight Bros
Atty's.

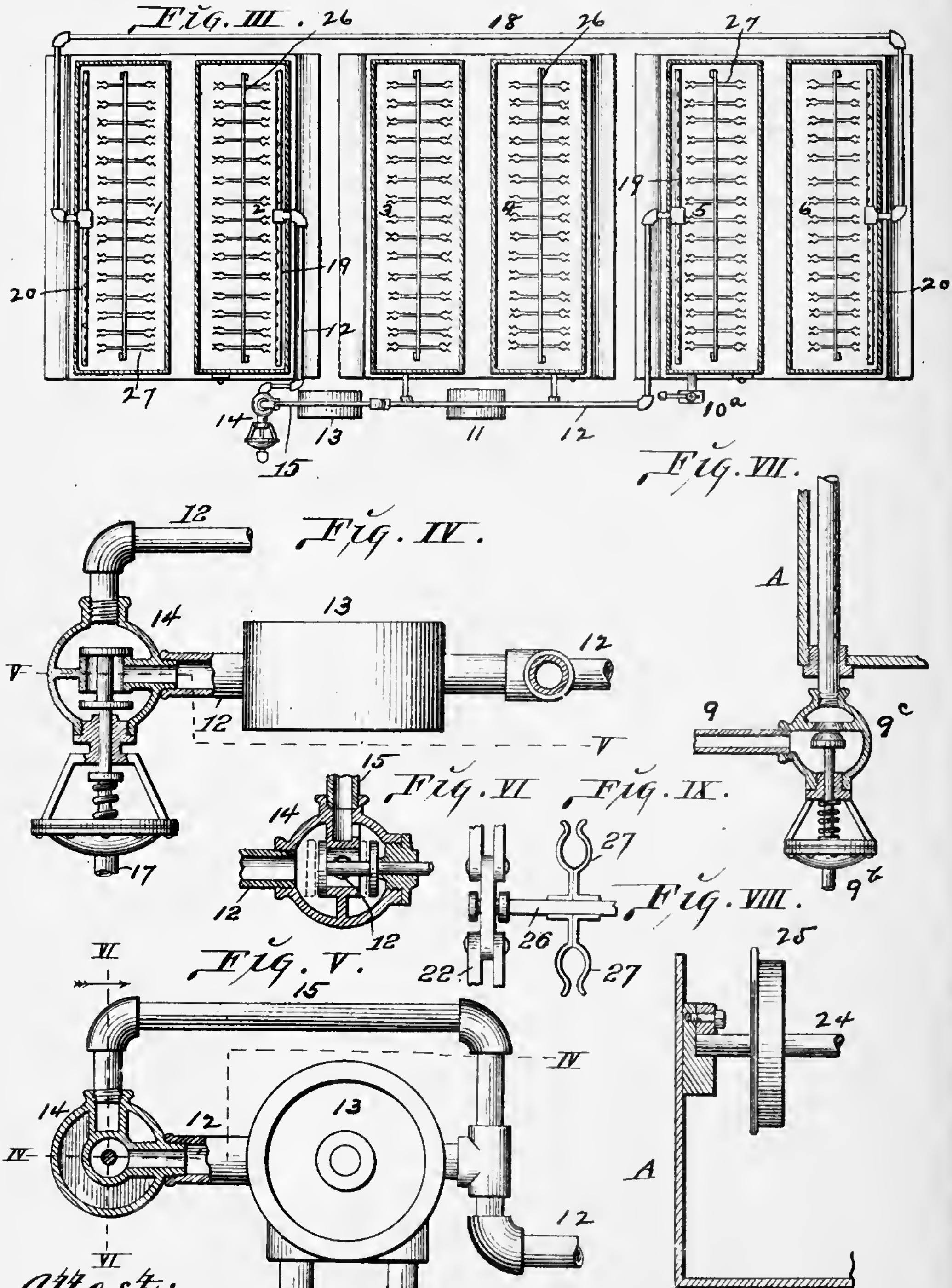
No. 701,622. Patented June 3, 1902.

W. J. RUFF.

PASTEURIZER.

(Application filed Sept. 16, 1901.)

(No Model.) 3 Sheets—Sheet 2.



Attest:—
M. P. Smith,
E. S. Knight

Inventor:—
Wm. J. Ruff:
By Knight Bros
Atty's.

No. 701,622. Patented June 3, 1902.

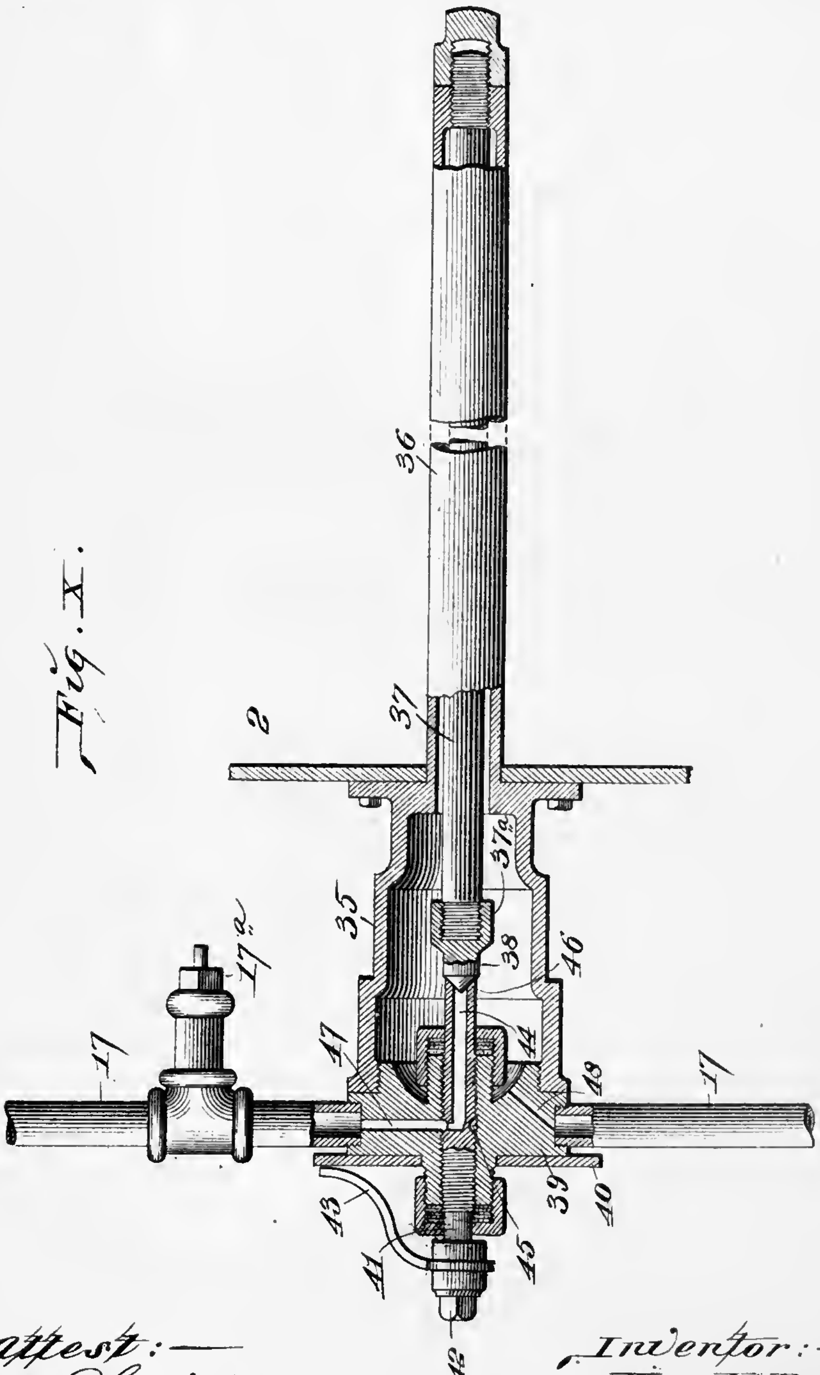
W. J. RUFF.

PASTEURIZER.

(Application filed Sept. 16, 1901.)

(No Model.) 3 Sheets—Sheet 3.

Fig. X.



Attest:—
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E. S. Knight

Inventor:—
Wm. J. Ruff;
By Knight Bro
atty's.

UNITED STATES PATENT OFFICE.

WILLIAM J. RUFF, OF QUINCY, ILLINOIS.

PASTEURIZER.

SPECIFICATION forming part of Letters Patent No. 701,622, dated June 3, 1902.

Application filed September 16, 1901. Serial No. 75,509. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. RUFF, a citizen of the United States, residing in Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Pasteurizers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My present invention relates to a pasteurizer or sterilizer wherein the temperatures of the beer itself (or other material being treated) both before and after entering the machine are utilized through the automatic operation of the machine to maintain the proper temperature of the water, thereby increasing the economic operation of the machine.

When beer is being bottled and before it is pasteurized, it is kept at a very low temperature—about 37° Fahrenheit—to prevent foaming, and in pasteurizing it is heated to about 142° Fahrenheit and should be cooled down to less than 100° Fahrenheit before leaving the machine to prevent too rapid cooling and to avoid danger of breaking the bottles and to utilize through the automatic operation of the machine the waste heat in the cooling of the bottles for the initial heating of the bottles and at the same time to utilize the cold temperature of the bottles just as they are entering the machine for the purpose of keeping down the temperature of the water caused by the cooling of the hot bottles is, as stated, the object of my present invention.

With these objects in view my present invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a side elevation of my improved pasteurizer. Fig. II is an end view. Fig. III is an enlarged horizontal section taken on line III III, Fig. I, the pumps, valves, and regulators being shown in plan view. Fig. IV is a section taken on line IV IV, Fig. V. Fig. V is a section taken on line V V, Fig. IV. Fig. VI is a section taken on line VI VI, Fig. V. Fig. VII is an enlarged section taken on line VII VII, Fig. I. Fig. VIII is an enlarged section taken on line VIII III, Fig. I. Fig. IX is an enlarged detail view showing the manner of connecting the bottle-holding bars to their carrying-chains. Fig. X is a side elevation, partly in section, illustrating one of the temperature-regulators made use of in my improved pasteurizer.

A represents a casing or housing forming a conduit consisting of vertical legs 1, 2, 3, 4, 5, and 6, which are preferably rectangular in cross-section, as shown in Fig. III. This casing rests within a frame 7, mounted on posts 8. The legs 1 and 6 are open at top and connect at the bottom, respectively, with the legs 2 and 5. The legs 2 and 5 are connected at top, respectively, with legs 3 and 4, and the legs 3 and 4 are connected at bottom, all of which is illustrated in Fig. I. The bottles pass through the machine first down leg 1, thence up leg 2, down leg 3, up leg 4, down leg 5, and up leg 6, where they leave the conduit. In the use of the machine the conduit is filled with water in any suitable manner—such, for example, as by means of valved pipes (not shown)—it being filled nearly to the top of legs 1 and 6, the water in legs 3 and 4 being heated by means of steam introduced through a pipe 9 until the temperature is raised sufficiently high to effect the pasteurization of beer. In starting the machine and subsequently, if necessary, the water in legs 5 and 6 is likewise heated to the proper cooling temperature by means of steam introduced through a pipe 10. The introduction of steam through the pipes 9 and 10 is automatically controlled by regulators 9^a and 10^a, which are attached to the respective legs and which may be of any well-known form or type. The regulators control the passage of compressed air through pipes 9^b and 10^b, said pipes leading from a suitable compressed-air supply, (not shown,) which may be of any suitable form, such as a compressed-air tank, into which air is forced by any well-known form of air-compressor, which air acts to close the valves 9^c and 10^c in the respective pipes 9 and 10 when the temperature of the water in the machine rises to that which is desired. To maintain the water at a uniform temperature in legs 3 and 4, I provide a rotary pump 11, connected to the upper portion of these legs and which maintains a circulation of the water between the two legs. This pump may be of any well-known form or type.

As already stated, there is in the pasteurizing of beer a change in the temperature from a very low to a high temperature and back again to a low temperature, and it adds very much to the economic operation of the machine if these temperatures can be utilized to keep the water at the proper temperature in the different parts of the machine, (by dispensing to this extent with the use of fuel for heating and water for cooling.) With my improved machine I am able to do this, the machine acting automatically to maintain the temperature even at all times.

12 represents a pipe forming a connection between legs 5 and 2, and in this pipe is located a rotary pump 13, that acts to conduct the water from leg 5 to leg 2, thus bringing water that has been heated in cooling the beer from leg 5 into leg 2, where the waste heat is utilized for the preliminary or initial heating of the beer. In the pipe 12 is a valve 14, (shown in detail in Figs. IV, V, and VI,) this valve controlling the passage of water through the pump. When the valve is in the position shown by dotted lines in Fig. VI, the water circulates through the pipe 12 from the leg 5 to the leg 2; but when the valve is moved to the position shown in full lines in Fig. IV the water circulates around the pump through a by-pipe 15, so that at this time there is no movement of the water from leg 5 to leg 2, and the water is caused to take this course when the water in leg 2 is at the desired temperature through means of a regulator 16, attached to the leg 2 and which is connected to the valve 14 by means of a compressed-air pipe 17, said pipe 17 leading from the hereinbefore-mentioned compressed-air supply. As soon as the temperature of the water in leg 2 falls beneath the desired point the regulator 16 operates, whereupon the pump will start a circulation of water from leg 5 to leg 2. As soon as the temperature in leg 2 reaches the desired height the regulator 16 operates again and the water simply circulates around the pump through pipe 15. It will thus be seen that the machine operates automatically to maintain the water in the warming or attemperating legs 1 and 2 at the desired temperature.

Any desirable form of a temperature-regulator may be made use of in my improved pasteurizer; but I prefer to use a regulator similar to the one illustrated in Fig. X, this form being simple in construction and positive in operation. In this construction a cylindrical casing 35 is secured in any suitable manner to the legs of the pasteurizer, and to said casing is formed integrally a tubular portion 36, that extends some little distance into the leg to which it is attached. Screw-seated in the outer end of this tubular portion 36 is the end of a rod 37, the opposite end of which carries a valve-plug 37^a, having a conical end 38. The outer end of the casing 35 is closed by a cap 39, on the outer face of which is provided a dial 40. Passing through the center of this plug 39, in alinement with the center of the rod 37, is a screw-threaded rod 41, the outer end of which is provided with a nut 42 and indicating-finger 43. Passing approximately half-way throughout the length of this rod 41 is a bore or passage-way 44, the inner end of which extends laterally through the rod 41 and communicates with a groove 45, formed in the screw-threaded portion of the rod. The inner end of the tubular portion of this rod 41 terminates in a valve-seat 46, adapted to receive the conical end of the valve-plug 38. Formed in the plug 39 is a passage-way 47, the inner end of which communicates with the groove 45. One end of the air-pipe 17 is tapped into the plug 39 and is in communication with the passage-way 47. On the opposite side of the plug 39 one end of the air-pipe 17 is tapped into said plug and is in communication with a bore or passage-way 48, the inner end of which communicates with the chamber within the tubular casing 35. The regulator is set by adjusting the nut 42, which turns the rod 41 in the desired direction to bring the finger 43 to the proper point on the dial 40, and by this operation the position of the valve-seat 46 relative to the end of the conical plug is varied, for the reason that the rod 41 is moved toward or drawn away from the valve-plug 38, according to the direction in which said rod is turned. The proper temperature within the leg expands the tubular portion 36 sufficiently to cause the valve-plug 38, carried by the rod 37, to remain unseated, and while in this position the compressed air from the pipe 17 passes through the bore 48 into the chamber within the casing 35, from thence through the bores 44 and 47 into and through the upper pipe 17 to the diaphragm-valve to keep said valve closed, at which time the pump is simply circulating the water around itself through the pipe 15. When the temperature within the leg 2 falls below the proper point or the point at which the valve is set to actuate, the contraction of the tubular portion 36 due to the lowering of the temperature will move the conical plug 38, carried by the rod 37, which is in turn carried by the tubular portion 36 toward and against the valve-seat 47, thus closing the passage of the compressed air through the regulator. The supply of compressed air thus being shut off will allow the diaphragm-valve to open and the pump will conduct the water from leg 5 to leg 2. When the valve 38 closes, the air in the upper part of the pipe 17 escapes through a valve 17^a, which is so adjusted as to always have a small leak. The regulator-pipe 9^a of pipe 9 is the same and operates the same as the regulator 16, which is above described.

To complete the circulation between legs 2 and 5, a connection is made between legs 1 and 6 by the use of a pipe 18, as shown in Figs. I and III, the cool water produced by the initial heating of the beer thus passing around to legs 6 and 5 and acting to keep down the temperature in these legs which has been created by the hot beer as it passes through these legs from the sterilizing-legs 3 and 4, the cool temperature of the beer when entering the machine being thus utilized to keep down the temperature created by the cooling of the beer, while the high temperature produced by the cooling of the beer is utilized to offset the lowering of the temperature in heating the beer. The pipe 12 communicates with the legs 5 and 2 by means of perforated headers 19, (see Fig. III,) and the pipe 18 communicates with the legs 1 and 6 by means of perforated headers 20.

21 represents the bottle-carrier, consisting of endless chains 22, that pass around pulleys 25, secured to shafts 24, journaled in boxes 23. The chains are connected together at intervals by means of cross-bars 26, that have pivoted connection with the chains. (See Fig. IX.) These cross-bars are provided with spring-fingers 27, formed to receive the necks of the bottles, as shown in Fig. III, and which support the bottles in a vertical position as they are carried through the machine. The fingers 27 project on each side of the bars 26, and thus provide for the carrying of double the quantity of bottles through the machine that could be carried with a single set of fingers. One pair of the pulleys 25 is supported on a pivoted counterbalanced frame 25ª for the purpose of keeping the carrier-chains taut.

30 represents a driving-pulley geared to one of the shafts 24 for imparting movement to the carrier.

31 represents thermometers attached to the water-legs to indicate the temperature of the water.

The legs 1 and 2 may be referred to as an "attemperating-compartment," the legs 3 and 4 as a "sterilizing-compartment," and the legs 5 and 6 as a "cooling-compartment," and these parts are so referred to in the following claims.

It will be observed that the circulation of water through the legs 1 and 2 and through the legs 5 and 6 is in a direction contrary to that in which the bottles are moved through the legs. The pump 11 is run to pump water from leg 4 into leg 3, and therefore maintains a circulation of water in these legs in the direction of the movement of the bottles through the legs.

I do not herein claim a pasteurizer consisting of an attemperating-tank, a cooling-tank, a sterilizing-tank without communication with said tanks, means for moving the substance to be sterilized from one tank to another, means for causing a circulation of water between the attemperating-tank and the cooling-tank, and means for maintaining the water in the sterilizing-tank at a higher temperature than the water in the other tanks, as such is the subject-matter of my application filed April 15, 1901, Serial No. 55,899.

I claim as my invention—

1. In a pasteurizer, the combination of an attemperating-compartment, a sterilizing compartment, a cooling-compartment, means exterior of the machine and out of communication with the sterilizing-compartment for creating a circulation between the attemperating and cooling compartments, means for automatically starting and stopping said circulating means, and means for carrying the substance to be sterilized through said compartments, substantially as set forth.

2. In a pasteurizer, the combination of a pair of water-legs forming an attemperating-compartment, a pair of water-legs forming a sterilizing-compartment, a pair of water-legs forming a cooling-compartment, means for conveying the bottles through said legs, and means for creating a circulation of water between the attemperating-compartment and cooling-compartment, substantially as set forth.

3. In a pasteurizer, the combination of an attemperating-compartment, a sterilizing-compartment, a cooling-compartment, means exterior of the machine and out of communication with the sterilizing-compartment for creating a circulation between the attemperating-compartment and the cooling-compartment, and means for automatically starting and stopping said circulating means, substantially as set forth.

4. In a pasteurizer, the combination of an attemperating-compartment, a sterilizing-compartment, a cooling-compartment; and automatic means exterior of the machine and out of communication with the sterilizing-compartment for creating a circulation of water between the attemperating-compartment and cooling-compartment, substantially as set forth.

5. In a pasteurizer, the combination of an attemperating-compartment, a sterilizing-compartment, a cooling-compartment, a pump and a return-pipe exterior of the machine and out of communication with the sterilizing-compartment for creating a circulation of water between the attemperating-compartment and cooling-compartment, and a valve and regulator for automatically controlling the passage of water from said pump to said attemperating-compartment as the temperature therein rises and falls, substantially as set forth.

6. In a pasteurizer, the combination of a pair of water-legs forming an attemperating-compartment, a pair of water-legs forming a sterilizing-compartment, and a pair of water-legs forming a cooling-compartment, means for conveying the bottles through said water-legs, and automatic mechanism for creating a circulation of water between the attemperating-compartment and the cooling-compartment, substantially as set forth.

7. In a pasteurizer, the combination of a pair of water-legs forming an attemperating-compartment, a pair of water-legs forming a sterilizing-compartment, a pair of water-legs forming a cooling-compartment, means for conveying bottles through said compartments, and means for causing a circulation of water from one water-leg of the sterilizing-compart-

ment to the other water-leg thereof, substantially as set forth.

8. In a pasteurizer, the combination of a pair of water-legs forming an attemperating-compartment, a pair of water-legs forming a sterilizing-compartment, a pair of water-legs forming a cooling-compartment, means for conveying the bottles through said water-legs, means for creating a circulation of water between the attemperating-compartment and the cooling-compartment, and means for creating a circulation of water between the two water-legs of the sterilizing-compartment, substantially as set forth.

9. In a pasteurizer, the combination of a pair of water-legs forming an attemperating-compartment, a pair of water-legs forming a sterilizing-compartment, a pair of water-legs forming a cooling-compartment, means for conveying the bottles through said compartments, automatic means for controlling a circulation of water from the cooling-compartment to the attemperating-compartment as the temperature rises and falls, and means for maintaining a circulation of water between the two water-legs of the sterilizing-compartment, substantially as set forth.

10. In a pasteurizer, the combination of a pair of water-legs forming an attemperating-compartment, a pair of water-legs forming a sterilizing-compartment, a pair of water-legs forming a cooling-compartment, means for conveying the bottles through said compartments, means for causing a circulation of water through the attemperating and cooling compartments in a direction contrary to that in which the bottles move, and means for causing a circulation of water through the sterilizing-compartment in the same direction that the bottles move, substantially as set forth.

11. In a pasteurizer, the combination of an attemperating-compartment, a two-part sterilizing-compartment, a cooling-compartment, means for creating a circulation between the attemperating-compartment and cooling-compartment, means for creating an independent circulation between the two parts of the sterilizing-compartment, and means for carrying the substance to be sterilized through said compartments, substantially as set forth.

12. In a pasteurizer, the combination of a pair of water-legs forming an attemperating-compartment, a pair of water-legs forming a sterilizing-compartment, a pair of water-legs forming a cooling-compartment, means for conveying the bottles through said legs, means for creating a circulation of water between the attemperating-compartment and the cooling-compartment, and means for causing an independent circulation of water through the two legs of the sterilizing-compartment, substantially as set forth.

WILLIAM J. RUFF.

In presence of—

E. S. KNIGHT,

M. P. SMITH.

No. 708,738.

Patented Sept. 9, 1902.

B. F. SCHIRMER.

PASTEURIZING APPARATUS.

(Application filed Mar. 4, 1902.)

(No Model.)

2 Sheets—Sheet 1.

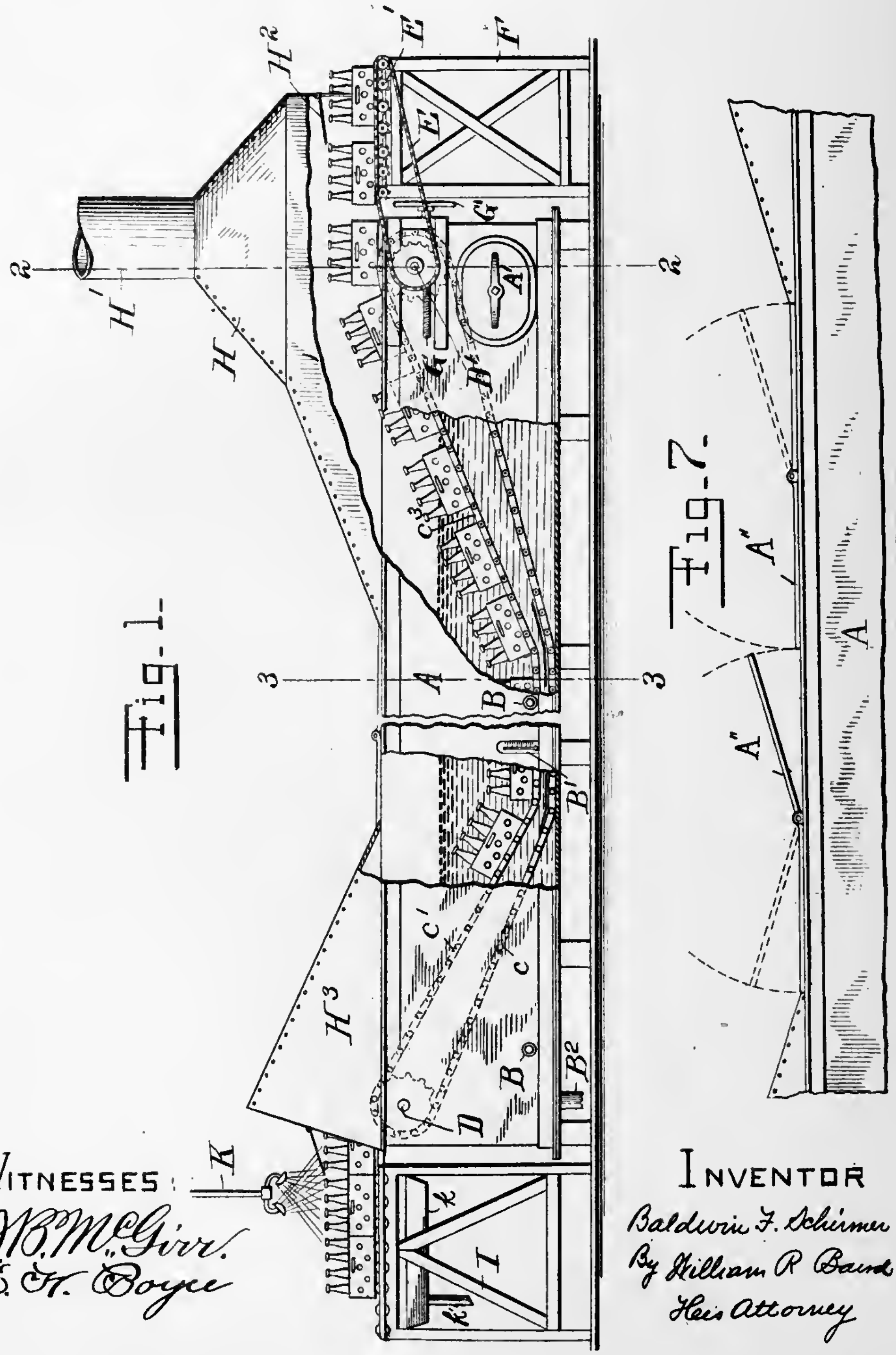

Fig. 1.

Fig. 7.

WITNESSES:

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E. H. Boyce

INVENTOR

Baldwin F. Schirmer
By William R Baird
His Attorney

No. 708,738. Patented Sept. 9, 1902.

B. F. SCHIRMER.

PASTEURIZING APPARATUS.

(Application filed Mar. 4, 1902.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

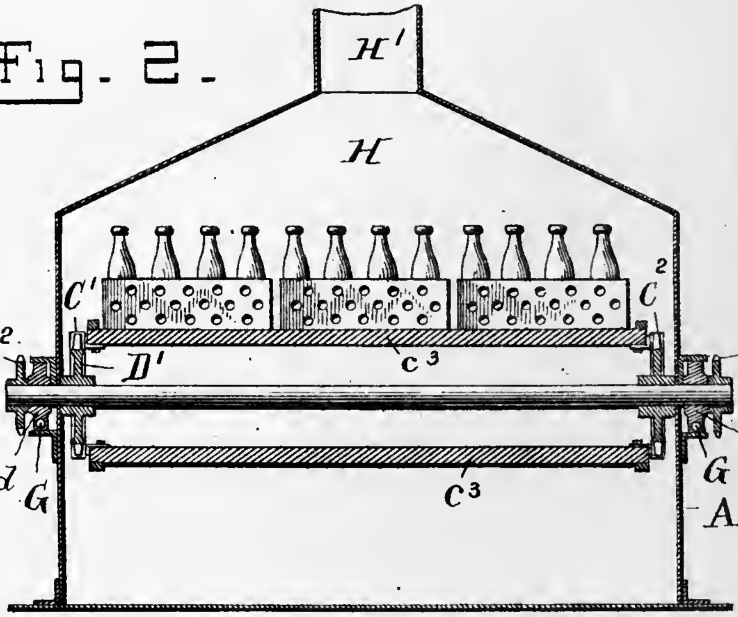


Fig. 3.

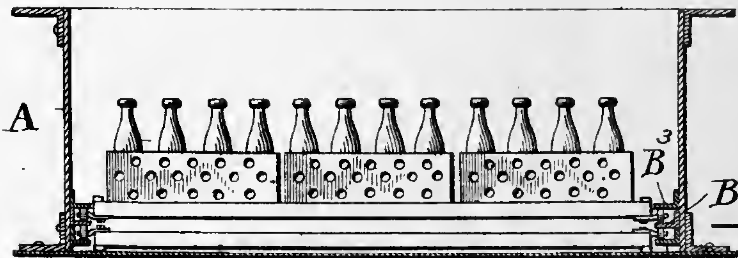


Fig. 5.

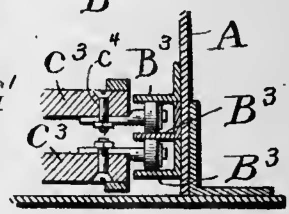
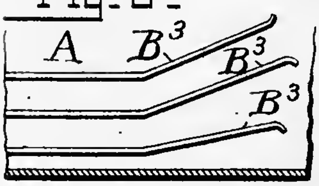


Fig. 6.



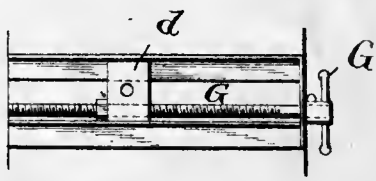


Fig. 4.

Witnesses

J. B. McGirr.
E. H. Boyce.

Inventor

Baldwin F. Schirmer
By William R. Baird
His Attorney

UNITED STATES PATENT OFFICE.

BALDWIN F. SCHIRMER, OF INDIANAPOLIS, INDIANA.

PASTEURIZING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 708,738, dated September 9, 1902.

Application filed March 4, 1902. Serial No. 96,598. (No model.)

To all whom it may concern:

Be it known that I, BALDWIN F. SCHIRMER, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented a certain new and useful Improvement in Pasteurizing Apparatus, of which the following is a specification.

My invention relates to that form of pasteurizing apparatuses in which an endless carrier is employed to cause the articles to be pasteurized to move into, through, and out of a liquid which has been heated to the proper degree in order to secure the destruction of the germs which it is the purpose of the heat to kill.

The novelty of my apparatus consists in the construction and adaptation of the parts, as will be more specifically pointed out in the claims.

In the drawings, Figure 1 is a side elevation and a partial section of my apparatus, portions being cut away to show concealed parts. Fig. 2 is a vertical section on the plane of line 2 2 in Fig. 1. Fig. 3 is a similar section on the plane of the line 3 3 in Fig. 1. Fig. 4 is a detail of the take-up apparatus of the main carrier-chain, showing the means of moving longitudinally the sprocket-wheel bearings. Fig. 5 is an enlarged sectional detail of the guides for the carrier, and Fig. 6 is a side elevation thereof. Fig. 7 is a side elevation of the upper middle portion of the tank, showing the doors which close it at the top.

In the drawings, A is a fluid-tank made of any suitable material, oblong in shape and provided near one end with a door A′ to admit of access to its interior and on top with doors A″ A″, opening upward and arranged to swing on hinges or pintles in the usual manner. It is also provided with means for heating its interior and any fluids which may be contained therein, consisting of transverse pipes, as B, connected with a source of steam-supply. (Not shown.) Thermometers B′ are mounted along its sides to enable the temperature within to be ascertained from the outside, and means for drainage, such as the pipe B^2, are provided at proper places. An endless carrier and means for propelling the same are mounted within the tank. The carrier C consists of two parallel chains C′ and C^2, each consisting of links c and rollers c', secured together in the usual way. Placed transversely between the chains are slats or plates c^3, secured to the links in any suitable manner—for instance, by screws c^4. Near the discharge end of the tank sprocket-wheels D (one only being shown) are mounted near the opposite ends of a shaft driven from a source of power (not shown) and mounted in suitable bearings in the side of the tank, which wheels engage with the carrier-chains and propel them through the tank. Near the inlet end of the tank there is similarly mounted in bearings d a second shaft carrying sprocket-wheels D′ D′, Fig. 2, which also engage with the carrier-chains. The wheels D′ may be idlers rotated by the motion of the carrier C or may be driven to assist in propelling the carrier, if deemed desirable. In the latter case their shaft would be connected with a source of power (not shown) by a belt or similar mechanism. The shaft of the wheels D′ extends beyond the side of the tank A, and carried by it at its ends are two other sprocket-wheels D^2 and D^3, which drive a supplemental carrier E, consisting of a series of rollers E′, mounted in bearings placed on a table or platform F, arranged alongside of the tank A, the rollers being provided with sprockets adapted to engage with one or two chains which are actuated by the wheels D^2 and D^3. The wheels E′, &c., are placed about on a level or a little above the level of the carrier C at its highest point.

The bearings d for the wheel D′ are adjustable longitudinally of the tank A, a screw G passing through the frame on which they are mounted and operated by a hand-wheel G′, serving to move them forward or backward, and thus take up the slack, if any, in the main carrier C.

It will be observed that the wheels D and D′ are each mounted within the tank A at its opposite ends and near the top of the same.

It is my purpose to propel the carrier through the tank close to the bottom. I therefore provide the tank with guides consisting of strips of angle-iron B^3, with the under surface of which the rollers come into contact and are thereby kept near the bottom in passing through the tank.

A hood H is secured to and above the tank and extends over a part of the table or platform F. It is made of sheet-iron or other suitable material and terminates upward in a chimney H'. It is also provided with an opening to admit of the entrance of the bottle-holding receptacles. This opening is closed by an automatic door H^2, opening inward, of common construction, so that the steam or hot air within the tank does not readily escape into the outer air. At the discharge end of the tank is a similar hood H^3 without a chimney and a similar automatically-closing door.

Alongside of the discharge end of the tank is placed a table or platform I, provided on its upper surface with rollers I' I' in a position slightly lower than the highest position of the carrier C at that end. As the carrier C moves upward the boxes holding the bottles are carried to the highest point, and then as the carrier turns to move downward around the sprocket-wheel D the boxes are pushed over onto the rollers I' I', where they are removed by the operator as they pass through the door of the hood H^3. A cooling device consisting of one or more rose-spouts at the end of a pipe K, connected with a source of water-supply whereby a fine spray of cold water is showered upon the bottles, is arranged above the platform. A drip-pan k and drainage-pipe K' are arranged beneath the platform. The bottle-holding receptacles are boxes with perforated sides or baskets made of steel wire or other suitable material.

The operation of my apparatus is as follows: The tank A is filled more than half full with water and the upper doors A'' A'', &c., are closed. The steam is turned on and the water thereby heated to the desired temperature, which can be ascertained from the thermometers B'. By means of chimney H^2 a draft toward the inlet end of the tank is created. Power is then applied to the shaft of sprocket-wheels D D and, if necessary or desired, to that of sprocket-wheels D' D'. This causes the propulsion of the carrier C through the tank. It is made to move very slowly. The filled bottles to be pasteurized having been already placed in the proper receptacles are then placed upon the supplementary carrier E. This causes them to move forward and drop upon the slats of the main carrier C. They then move downward, passing under the hood H and becoming heated as they slowly go through the current of steam and vapor which is drawn into the chimney. As the carrier continues its forward and downward course the bottle-holders and bottles gradually pass into the hot water, and so onward until they reach the intended level near the bottom of the tank. They then pass on through the water until the point is reached where the carrier is deflected upward. Continuing they gradually emerge from the water and thence to the highest point above the sprocket-wheel D. At this point the boxes drop upon the rollers I' I' upon the platform, one box pushing the other over the series of rollers and out through the door, which closes behind them, the operator removing the boxes as they are discharged. The cool water assists in lowering the temperature of the bottles, so that they can be handled without injury.

By means of this apparatus the bottles are first heated in the vapor above the water before they reach the liquid, the chimney in the hood creating a current in the direction of the inlet. The danger of cracking the bottles by a sudden change in temperature is thus in part avoided, and as a further precaution the immersion of the bottles in the liquid takes place slowly. The bottles are also gradually cooled as they emerge from the fluid. The apparatus is simple, economical, and little likely to get out of order.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a pasteurizing apparatus, the combination with a fluid-tank having inlet and outlet openings at opposite ends, of means for heating the tank, a normally closed door at each opening, an endless carrier in the tank, a supplementary carrier connected therewith, means for propelling the supplementary carrier through the inlet-opening, bottle-holders on the supplementary carrier for opening the inlet-door, and means for receiving the bottle from the main carrier at the outlet-door.

2. In a pasteurizing apparatus the combination with a fluid-tank having inlet and outlet openings at opposite ends, normally closed doors at said openings, an endless carrier in the tank, a shaft and sprocket-wheels at the inlet end for supporting and driving said carrier, a supplementary carrier mounted at its inner end on said shaft and extending through the inlet-opening, means for adjusting the shaft to take up slack, and bottle-holding receptacles carried by the supplementary carrier and serving to open the normally closed inlet-door.

3. In a pasteurizing apparatus, the combination with a normally closed fluid-tank, a main endless carrier, means for propelling it through the tank, inwardly-projecting side flanges on the side of the tank engaging the carrier and deflecting it downward from the inlet end to the center of the tank and upward from the center to the outlet end, a supplementary carrier mounted upon and driven by the shaft at the inlet end of the main carrier, bottle-holders on the supplementary carrier serving to open the inlet of the tank, a receiving roller-carrier outside the outlet of the tank, and means for projecting the bottle-holders on the main carrier through the outlet and upon the receiving roller-carrier.

4. In a pasteurizing apparatus, the combination with a fluid-tank, of a transverse shaft at each end near the outlet and inlet respectively and near the top of the tank, sprocket-wheels on said shafts, an endless carrier engaging said sprocket-wheels, horizontal flanges projecting inwardly from the sides of the tank

at its mid-length and near the bottom, said flanges being parallel with the bottom of the tank for some distance and provided with upwardly-inclined ends, and rollers at the sides of the carrier engaging between and guided by said flanges.

Witness my hand this 15th day of February, 1902, in the presence of two subscribing witnesses.

BALDWIN F. SCHIRMER.

Witnesses:
CHARLES H. LOEW,
WILLIAM R. BAIRD.

No. 713,952. Patented Nov. 18, 1902.

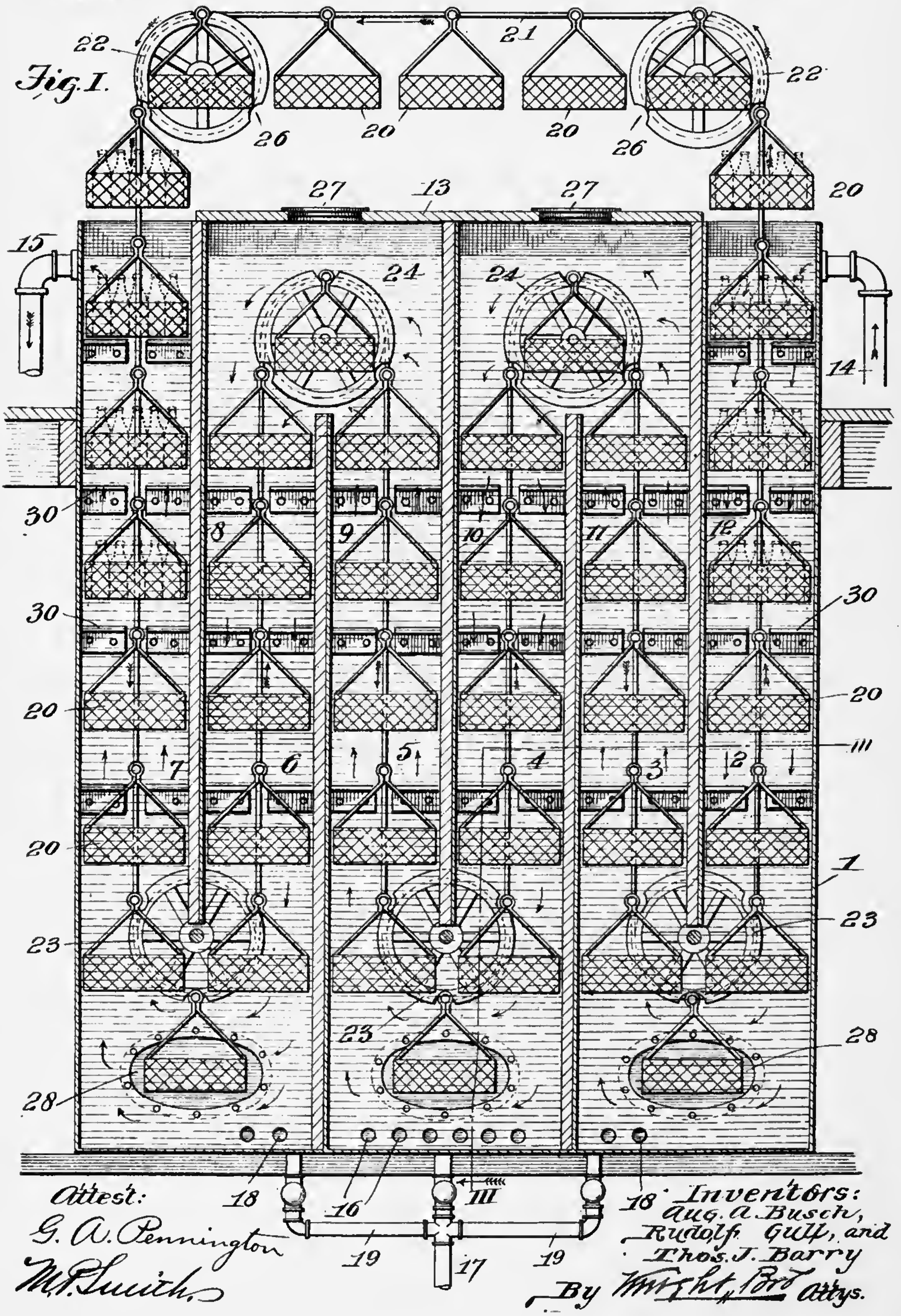
A. A. BUSCH, R. GULL & T. J. BARRY.

PASTEURIZER.

(Application filed June 22, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. I.



Attest:
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M. P. Smith

Inventors:
Aug. A. Busch,
Rudolf Gull, and
Thos. J. Barry
By Wright Bros Attys.

No. 713,952. Patented Nov. 18, 1902.

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PASTEURIZER.

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(No Model.) 2 Sheets—Sheet 2.

Fig. II.

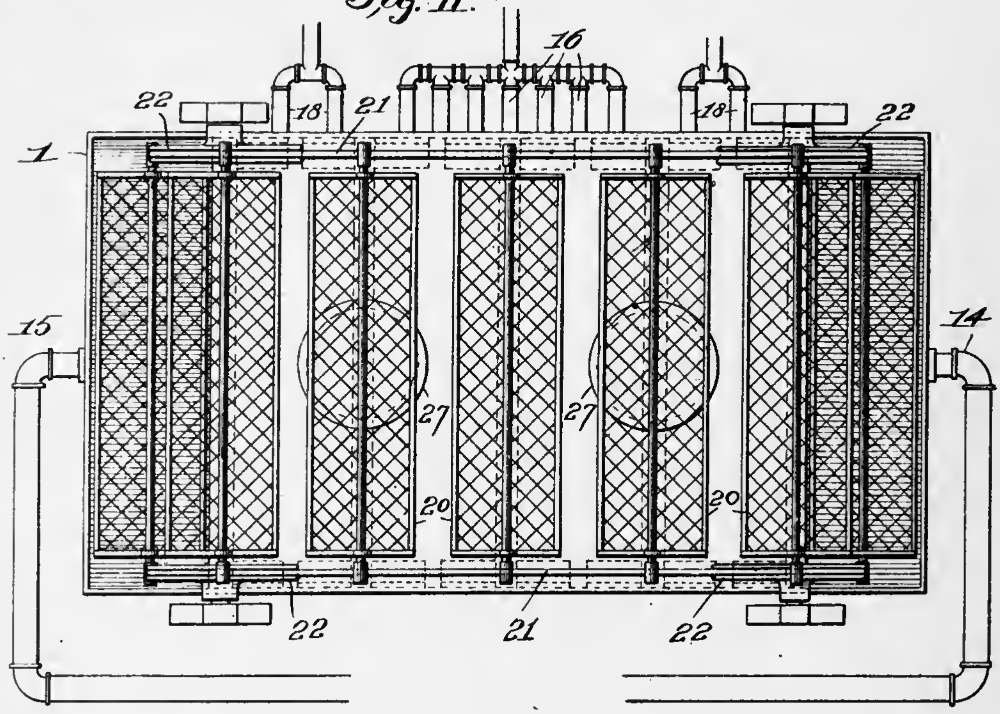
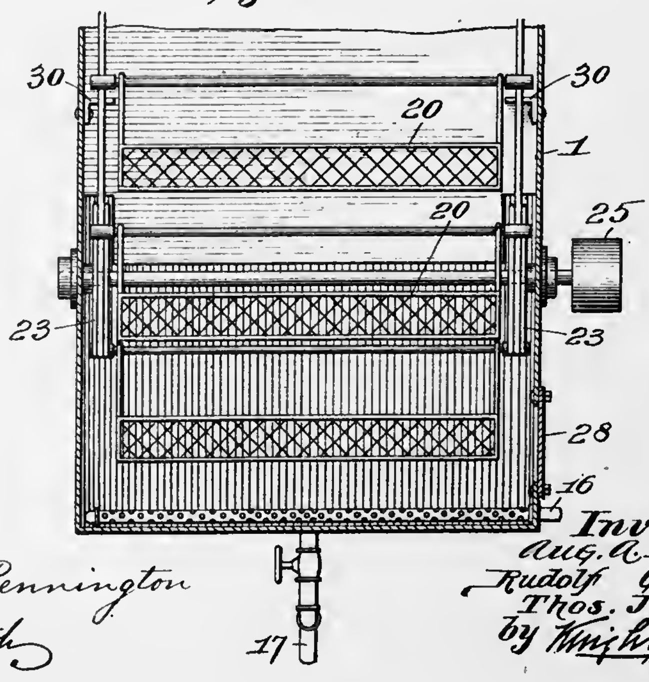


Fig. III.



Attest:
G. A. Pennington
M. P. Smith

Inventors:
Aug. A. Busch,
Rudolf Gull and
Thos. J. Barry,
by Knight Bros
Attys.

UNITED STATES PATENT OFFICE.

AUGUST A. BUSCH, RUDOLF GULL, AND THOMAS J. BARRY, OF ST. LOUIS, MISSOURI.

PASTEURIZER.

SPECIFICATION forming part of Letters Patent No. 713,952, dated November 18, 1902.

Application filed June 22, 1901. Serial No. 65,627. (No model.)

To all whom it may concern:

Be it known that we, AUGUST A. BUSCH, a citizen of the United States, RUDOLF GULL, a citizen of Switzerland, and THOMAS J. BARRY, a citizen of the United States, all residing in the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Pasteurizers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

Our invention relates to an apparatus particularly intended for pasteurizing beer, but which may be used for sterilizing milk and other substances.

The object of the invention is to produce a pasteurizer or sterilizer in which there is a gradual heating of the substance being sterilized to the maximum temperature and then a gradual cooling of the substance to about atmospheric temperature, so that while undergoing sterilization the substance is not subjected to deleterious effects, and to further accomplish this result the vessels containing the substance to be sterilized are retained in the bath from the beginning to the end of the operation.

With these objects in view our invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a vertical section of our improved pasteurizer. Fig. II is a top or plan view. Fig. III is a detail vertical section taken on line III III, Fig. I, and looking in the direction of the arrow that crosses the section-line.

Referring to the drawings, 1 represents a closed casing or housing interiorly divided into compartments 2, 3, 4, 5, 6, and 7 by means of vertical partitions 8, 9, 10, 11, and 12, the compartments forming a continuous conduit through which the heating water or liquid is passed in one direction and the substance to be sterilized is passed in the opposite direction. The partitions 8, 10, and 12 extend downwardly from the top 13 of the casing and the partitions 9 and 11 extend upwardly from the bottom of the casing. The top 13 of the casing covers the compartments 3, 4, 5, and 6, so that the heat in these compartments is largely retained, while the compartments 2 and 7 are left open at top to permit the passage of the bottle-carrying receptacles.

14 represents a water-supply pipe leading into the upper part of compartment 2, and 15 represents a water-discharge pipe leading out of the upper part of compartment 7. Located in the lower part of the compartments 4 and 5 is a heating-coil 16, (a perforated pipe being preferably used,) that receives hot air or steam from a pipe 17, and if desirable a heating-coil 18 may be located in the bottom of compartments 3 and 6, which would receive the heating fluid from branches 19 of the pipe 17.

20 represents baskets or receptacles for receiving the substance to be sterilized, this substance being contained in bottles or other closed vessels. The baskets are connected to endless cables 21, that pass over sheaves 22, located above the casing, under sheaves 23, located in the lower part of the compartments, as seen in Fig. I, and over sheaves 24, located in the upper part of the compartments. These sheaves are secured to shafts suitably journaled in the casing, one or more of the shafts being provided with a driving-pulley 25. The sheaves are grooved and their flanges are provided with notches 26 to receive the rods that connect the baskets to the cables.

The top 13 of the casing is provided with manholes 27, through which access may be had to the upper part of the interior of the casing, and the lower part of the casing is provided with manholes 28 to provide access to the interior of the lower part of the casing.

The operation is as follows: The water passes into the casing from the pipe 14 and out of the casing through the pipe 15, a circulation being maintained through the conduit formed by the various compartments, the passage of the water being in the direction indicated by the featherless arrows. When the water in the compartments 4 and 5 has become sufficiently heated for sterilizing purposes—say to about 145° Fahrenheit—the basket-carrying cables are set in motion, moving the baskets in the direction of the feathered arrows, the material being sterilized thus being moved in the opposite direction to the circulation of the water, so that the cold bottles are upon entering the casing brought into contact with the warm water leaving the apparatus, while the hot bottles are brought into contact with the cold water entering the apparatus, the result being that the substance in the bottles is gradually heated after first entering the apparatus until the maximum temperature is reached in the bottom of the compartments 5 and 4, and then the bottles are gradually cooled off until they pass out of the compartment 2, at which time the substance is about the temperature of the atmosphere. As there is a constant circulation of water through the baskets, (which are made of wire-netting or other open-work,) a thorough heating and cooling of the bottles is effected, thus producing perfect sterilization or pasteurization, and as the vessels do not leave the bath after they once enter until they are cooled down to about atmospheric temperature there is no danger of the bottles being broken by being subjected to sudden changes of temperature, and at the same time deleterious effects by the sudden changes of temperature on the contents of the bottles are prevented.

To insure a perfect circulation of water through the baskets and to prevent a stronger flow of water up the sides of the conduit through the spaces left at the ends of the baskets to accommodate the sheaves 23 and 24, we secure L-shaped brackets 30 to the inside of the casing, as shown in the drawings, these brackets acting to deflect the water into the path traveled by the baskets should there be a tendency for a stronger current of water at the ends of the baskets than through the baskets.

We claim as our invention—

1. In a pasteurizer, the combination of a closed casing having inlet and outlet openings, said casing divided into compartments formed in interior conduit, means for moving the substance to be sterilized through said inlet, the conduit and said outlet in one direction, means for causing a circulation of water through the conduit in the opposite direction to that in which the substance is moving, and means for heating the water in the central part of the conduit, substantially as set forth.

2. In a pasteurizer, the combination of a closed casing having inlet and outlet openings, said casing divided into vertical compartments forming a conduit, means for causing a circulation of water through the conduit in one direction, means for moving the substance to be sterilized through said inlet, the conduit and said outlet, in the opposite direction to that in which the water moves, and means for heating the water in the central part of the conduit; the substance being sterilized entering the conduit at the end thereof at which the water is discharged, substantially as set forth.

3. In a pasteurizer, the combination of a casing having inlet and outlet openings, said casing divided interiorly into a conduit by partitions projecting downwardly from above the water-line, but not extending to the bottom of the casing and upwardly-projecting partitions that do not extend to the top of the casing, means for causing a circulation of water through the conduit in one direction, means for moving the substance to be sterilized through said inlet, the conduit and said outlet in the opposite direction to that in which the water moves, and means for heating the water in the central part of the conduit.

4. In a pasteurizer, a casing divided interiorly into a conduit by partitions extending downwardly from the top thereof, but not extending to the bottom of the casing, and upwardly-extending partitions that do not extend to the top of the casing and which terminate beneath the water-line, means for heating the water in the central part of the conduit, means causing a circulation of water through said conduit in one direction, and a carrier for moving the substance to be sterilized through the conduit in the opposite direction without removing the substance to be sterilized from the water-bath from the time it enters the machine until it leaves the machine.

5. In a pasteurizer, the combination with a water-casing divided interiorly into an attemperating compartment, a sterilizing compartment, and a cooling compartment, of means for heating the water in the sterilizing compartment, means causing a circulation of water through said compartments in one direction, and means conveying the substance to be sterilized through each of said compartments in the opposite direction, without removing the same from the water-bath, from the time it enters the casing until the time it leaves the casing.

6. In a pasteurizer, the combination of a casing having inlet and outlet openings, said casing having interior vertical partitions forming a conduit, means for causing a circulation of water through the conduit in one direction, means for moving the substance to be sterilized through said inlet, the conduit and said outlet in the opposite direction to that in which the water moves, and means for heating the water in the central part of the conduit; the central portion of the conduit being closed at top and the ends of the conduit being left open for the passage of the receptacles, substantially as set forth.

7. In a pasteurizer, the combination of a closed casing having inlet and outlet openings, said casing having an interior conduit, means for creating a circulation of water through the conduit in one direction, means for heating the water in the central part of the conduit and means for carrying the substance to be sterilized through said inlet, the conduit and said outlet in the opposite direction to that in which the water moves; said last-mentioned means consisting of cables passing over sheaves and bottle-receiving receptacles pivotally connected to the cables, substantially as set forth.

8. In a pasteurizer, the combination of a

closed casing having inlet and outlet openings, said casing having an interior conduit, means for causing a circulation of water through the conduit in one direction, bottle-carrying baskets arranged to move through said inlet, the conduit and said outlet in the opposite direction to that traveled by the water, means for heating the water in the central part of the conduit, and brackets 30 secured to the inside of the casing, substantially as set forth.

9. In a pasteurizer, the combination of a casing having inlet and outlet openings, said casing having an interior conduit, means for causing a circulation of water through the conduit in one direction, bottle-carrying baskets arranged to move through said inlet, the conduit and said outlet in the opposite direction to that traveled by the water, deflectors on the walls of said conduit insuring a perfect circulation of water through said baskets, and means for heating the water in the central part of the conduit.

10. In a pasteurizer, the combination of a casing having inlet and outlet openings, said casing divided into compartments formed in interior conduit, sheaves located above said casing and sheaves located within said casing, endless cables carried by said sheaves, baskets for conveying the substance to be sterilized, said baskets carried and adapted to be moved by said cables through said inlet, the conduit and said outlet in one direction, and means for causing a circulation of water through said conduit in an opposite direction, said means comprising a water-supply pipe near said outlet-opening and a waste-pipe near said inlet-opening, of deflectors on the walls of said conduit insuring a perfect circulation of water through said baskets, and heating-coils located in the bottom of said compartments whereby the water may be heated to different degrees of temperature in different parts of the conduit.

11. In a pasteurizer, a suitable casing, means for causing a circulation of water through said casing in one direction, means for moving the substance to be sterilized through said casing in the opposite direction, and means for heating said water in the central part of said casing.

AUG. A. BUSCH.
RUDOLF GULL.
THOMAS J. BARRY.

In presence of—
E. S. KNIGHT,
M. P. SMITH.

No. 725,489. PATENTED APR. 14, 1903.

B. F. SCHIRMER.

PASTEURIZER.

APPLICATION FILED JAN. 6, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

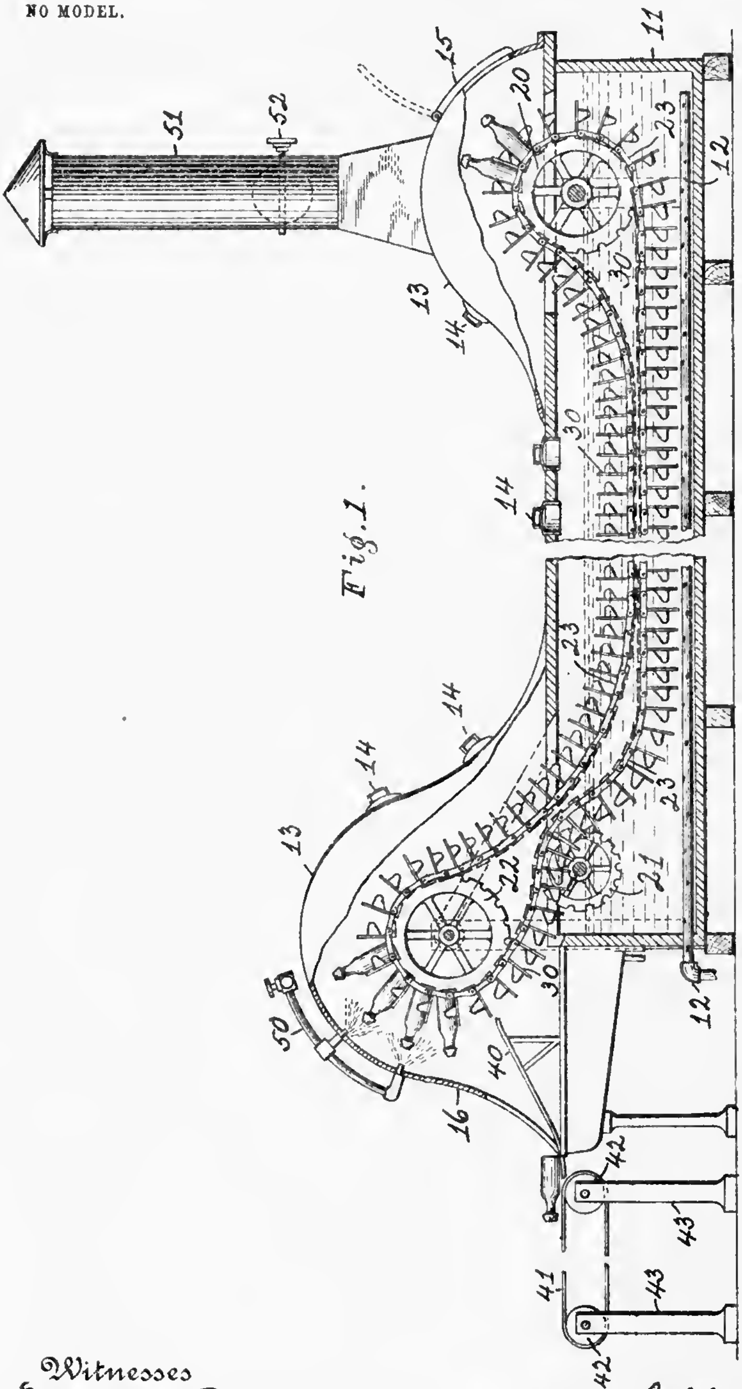


Fig. 1.

Witnesses
Ernest W. Boise
Herman Meyer

Inventor
Baldwin F. Schirmer
By His Attorney
William R. Baird

No. 725,489. PATENTED APR. 14, 1903.

B. F. SCHIRMER.

PASTEURIZER.

APPLICATION FILED JAN. 6, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

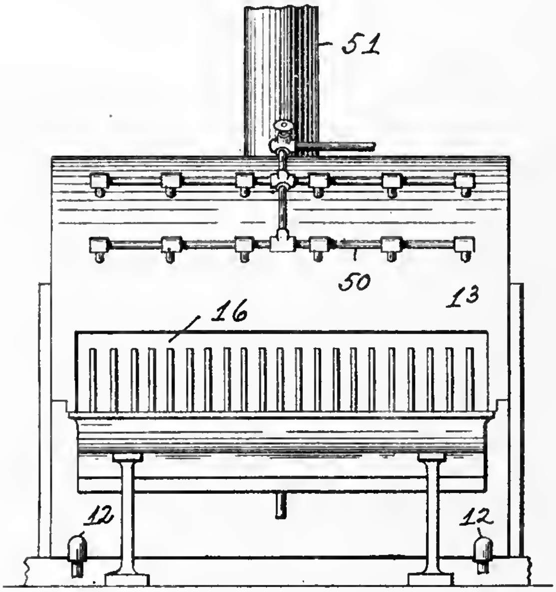


Fig. 3.

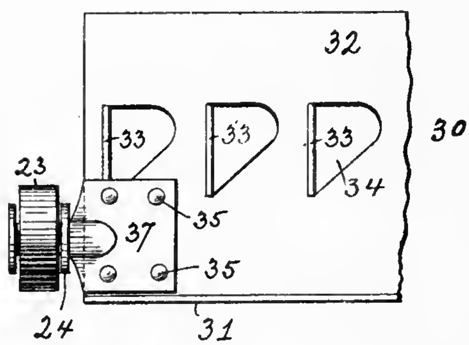
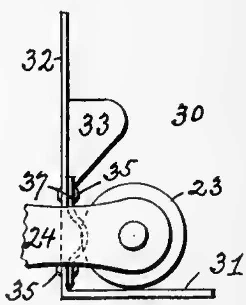


Fig. 4.



Witnesses
Ernest H Boise
Herman Meyer

Inventor
Baldwin F Schirmer
By His Attorney
William R. Baird

UNITED STATES PATENT OFFICE.

BALDWIN F. SCHIRMER, OF CLEVELAND, OHIO.

PASTEURIZER.

SPECIFICATION forming part of Letters Patent No. 725,489, dated April 14, 1903.

Application filed January 6, 1903. Serial No. 138,056. (No model.)

To all whom it may concern:

Be it known that I, BALDWIN F. SCHIRMER, a citizen of the United States, and a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Pasteurizers, of which the following is a specification.

My invention relates to a pasteurizing apparatus for the treatment of beer-bottles and the like; and its novelty consists in the construction and adaptation of the parts, as will be more fully hereinafter pointed out.

In the drawings, Figure 1 is a central vertical longitudinal section and partial plan view of my improved apparatus, the center portion being shown cut away to permit of the illustration of the end portions on the one sheet of drawings. Fig. 2 is an end plan view looking toward the apparatus from the delivery end. Fig. 3 is an enlarged detail plan view of a part of one of the jaw-plates and chain to which it is attached, and Fig. 4 is a side view thereof.

In the drawings, 11 is a fluid-tank adapted to hold a quantity of water and provided with means for heating the same—for example, a steam-pipe 12 and its connections. It is closed at the top by means of a long hood 13, projecting upward at the receiving and delivery ends to permit of the elevation of the sprocket-wheels above the level of the top of the tank. This hood is provided with suitable openings closed by covers 14 14 along its upper surface and another opening closed by a door 15 at the receiving end and a similar permanent opening 16 at the delivery end of the apparatus.

Mounted in suitable bearings on each side of the tank 11 are three sets of sprocket-wheels 20, 21, and 22, which are adapted to be rotated by suitable mechanism from a source of power not shown and the nature of which is immaterial to the operation of the apparatus. Actuated by these sprocket-wheels are two sprocket-chains 23, mounted in parallel vertical planes. Transversely secured between these sprocket-chains is a series of jaws 30, constituting with the chains and sprocket-wheels an endless bottle-carrier. Each jaw consists of a transverse flat plate 31, adapted to receive the bottle in an upright position. Rigidly attached thereto or made integral therewith is a second plate 32, substantially at right angles thereto. This plate 32 is provided with upwardly-extending flanges 33, struck out from the plate 32 by a die or embossing-roll, leaving an aperture 34 after the flange 33 has been bent upward. These flanges form guards between which the bottles are placed and which prevent their lateral motion. The plates 32 are secured by rivets 35 or otherwise to a flange 37, which is in turn secured to a link 24 of the chain 23. Each of these plates 32 is divided by the guards 33 into a series of pockets or compartments preferably adapted to hold six or twelve bottles across the width of the apparatus.

It will be observed that the sprocket-wheel 20 is so arranged that the bottles may be placed on the transverse jaws so as to stand upon the plates 31 in an upright position, access being had to the carrier by the opening in the hood when the door 15 is lifted. The endless carrier then dips down into the solution with which the tank is wholly or partly filled and is caused slowly to travel forward toward the delivery end of the apparatus. As it reaches a point near such end it is gradually caused to be elevated by reason of the elevation of the sprocket-wheel 22 above the upper surface of the tank. Turning around the sprocket-wheel 22 the several jaws of the carrier are reversed in position, so that the bottle no longer rests against the plate 31, but rests against the plate 32, and finally as the carrier continues to move forward the bottle drops out from the carrier by its own weight.

There is provided to receive it a sliding table 40, so placed that the bottles falling from the carrier will gently drop thereon and slide toward the delivery end thereof. At this point there is provided an endless belt or apron 41, mounted upon two rollers 42, supported upon brackets 43 of a suitable height and caused to be rotated by mechanism not shown. This traveling belt or apron carries the bottles away from the pasteurizing apparatus, moving each row forward and out of the path of the succeeding row delivered from the carrier.

Near the delivery end of the carrier the hood is provided with pipes 50, connected with a water-supply and suitably perforated, so as to deliver a stream of water upon the bottles in the form of a fine spray. This serves to cool the bottles after they have arisen out of the hot solution.

The carrier having delivered its load of bottles is caused to be returned through the tank toward the receiving end of the apparatus. At this end the hood is provided with a chimney 51, the opening in which is controlled by a suitable damper 52. This device serves to draw the vapors and steam arising from the heated solution in the tank toward the receiving end of the apparatus and to raise the temperature of the bottles as they are caused to be moved downward toward the solution, so as to prevent the shock arising from a sudden change in their temperature, and thus lessen the liability to breakage.

Each of the jaws 30 is so arranged upon the sprocket-chains that there is little more than sufficient space between any plate 32 and its neighbor in front or behind it to permit a bottle to stand upright. Consequently any plate 32 will limit the rearward movement of the bottle and prevent it falling out of the carrier from the pocket immediately in front of it.

My apparatus is made of simple materials, is strong in construction, is readily repaired, and is efficient in its operation.

What I claim as new is—

1. A jaw for a bottle-carrier consisting of a plate adapted to receive the bottles in an upright position, a second plate adapted to prevent their forward movement and a series of guards adapted to separate the bottles from contact with each other, the whole being made integral.

2. A jaw for a bottle-carrier consisting of a plate adapted to receive the bottles in an upright position, a second plate adapted to prevent their forward movement, and a series of guards struck out and bent up from one of said plates and adapted to separate the bottles from contact with each other, the whole being made integral.

3. A jaw for a bottle-carrier consisting of a plate adapted to receive the bottles in an upright position, a second plate adapted to limit their forward movement and a series of guards struck out and bent up from one of said plates dividing the plates into a plurality of bottle-receiving pockets, the whole being made integral.

4. The combination with an endless carrier, of a plurality of transversely-held bottle-holding jaws, each consisting of a plate adapted to receive the bottles in an upright position, a second plate substantially at right angles thereto and a series of guards struck out and bent up from one of said plates and dividing each of the jaws into a plurality of bottle-receiving pockets, the parts of each jaw being made in one piece.

5. In a pasteurizing apparatus, the combination with a fluid-tank having inlet and outlet openings at opposite ends, of an endless carrier, a plurality of transversely-held bottle-holding jaws each consisting of a plate adapted to receive the bottles in an upright position, another plate adapted to prevent or limit the forward movement of the bottles and a series of guards separating the bottles from contact with each other, means for propelling the carrier and means for inclosing the tank.

6. In an apparatus of the class described, the combination with a pair of sprocket-chains mounted to move in the same direction in parallel planes, of a plurality of transversely-held bottle-holding jaws each consisting of a plate adapted to receive the bottles in an upright position, a second plate adapted to limit the forward movement of the bottles and a series of guards adapted to separate the bottles from contact with each other, the plate which is adapted to limit the forward movement of the bottles serving also to limit the rearward movement of the bottles placed upon the jaw immediately in front of it on the carrier.

7. In an apparatus of the class described, the combination with a pair of sprocket-chains mounted to move in the same direction in parallel planes, of a plurality of transversely-held bottle-holding jaws each consisting of a plate adapted to receive the bottles in an upright position, a second plate adapted to limit the forward movement of the bottles and a series of guards adapted to separate the bottles from contact with each other, the plate which is adapted to limit the forward movement of the bottles serving also to limit the rearward movement of the bottles placed upon the jaw immediately in front of it on the carrier, means for moving the sprocket-chains and an endless traveling apron adapted to carry away the bottles at the delivery end of the carrier.

8. In an apparatus of the class described, the combination with a pair of sprocket-chains mounted to move in the same direction in parallel planes, of a plurality of transversely-held bottle-holding jaws each consisting of a plate adapted to receive the bottles in an upright position, a second plate adapted to limit the forward movement of the bottles and a series of guards adapted to separate the bottles from contact with each other, the plate which is adapted to limit the forward movement of the bottles serving also to limit the rearward movement of the bottles placed upon the jaw immediately in front of it on the carrier, means for moving the sprocket-chains and an endless traveling apron adapted to carry away the bottles at the delivery end of the carrier, and a slide placed intermediate the carrier and the traveling apron.

9. The combination with an endless carrier of a series of transversely-held bottle-holding jaws each consisting of a plate adapted to re-

ceive the bottles in an upright position, a second plate substantially at right angles thereto, and a series of guards adapted to separate the bottles from contact with each other, of means for moving the carrier consisting of sprocket-wheels whereby the bottles are transported through a tank in an upright position and by a change of direction of the carrier are caused to rest upon the second plate of the jaw and finally to slide therefrom at the delivery end of the apparatus by the force of gravity.

Witness my hand this 3d day of January 1903, at the city of Cleveland, in the county of Cuyahoga and State of Ohio.

BALDWIN F. SCHURMER.

Witnesses:
LOUIS J. GROSSMAN,
ARTHUR H. LICHTIG.

7. [illegible] 1903

No. 727,575. PATENTED MAY 12, 1903.

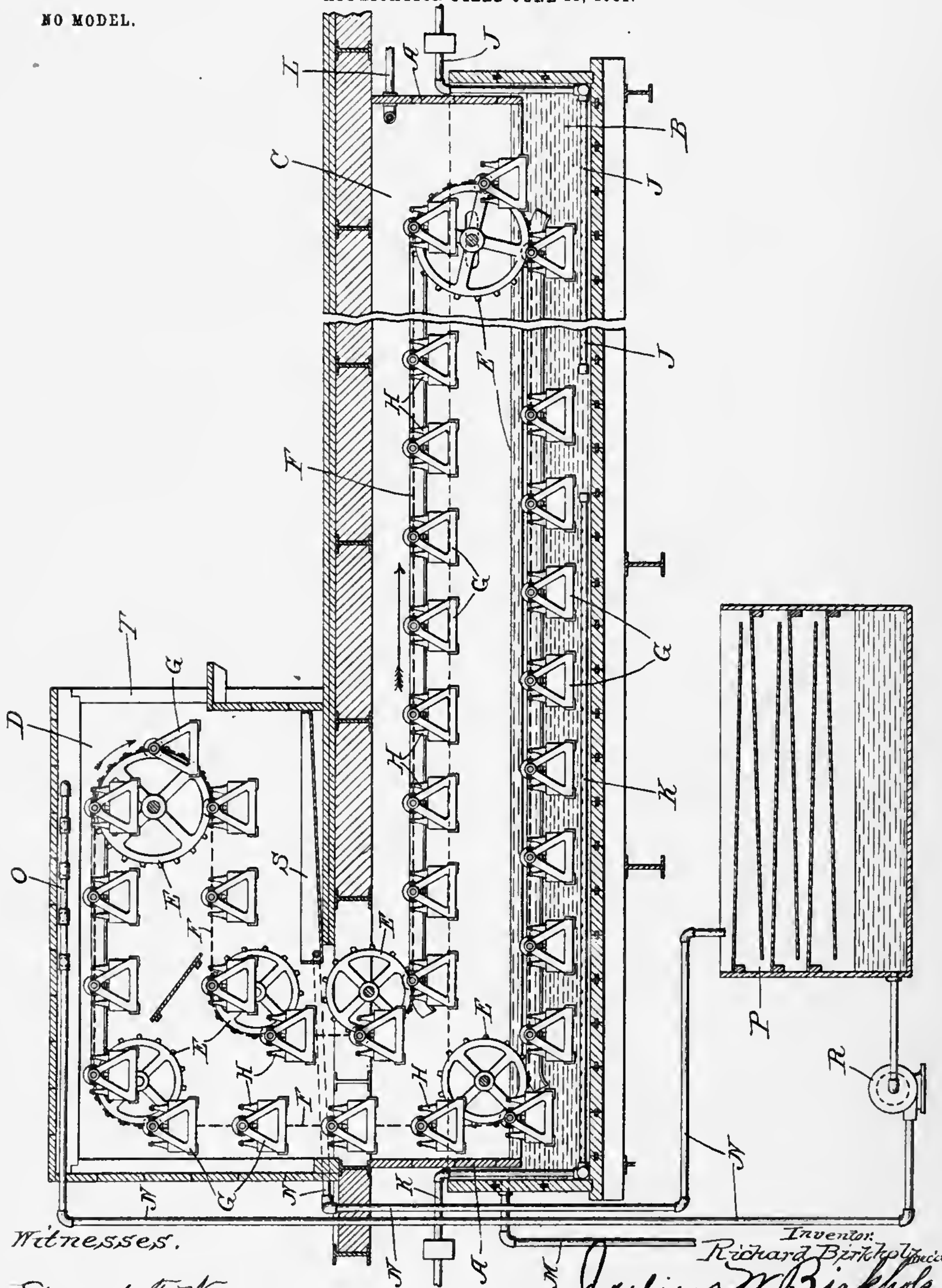
R. BIRKHOLZ, DEC'D.

J. W. BIRKHOLZ, ADMINISTRATOR.

PROCESS OF TREATING BOTTLED GOODS.

APPLICATION FILED JUNE 13, 1901.

NO MODEL.



Witnesses.

Edward T. Wray.

Homer L. Kraft.

Inventor:

Richard Birkholz, dec'd

Julius W. Birkholz

Administrator

by Parker & Carter

Attorneys.

No. 727,575. Patented May 12, 1903.

UNITED STATES PATENT OFFICE.

JULIUS W. BIRKHOLZ, OF MILWAUKEE, WISCONSIN, ADMINISTRATOR OF RICHARD BIRKHOLZ, DECEASED, ASSIGNOR TO THE LINK BELT MACHINERY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PROCESS OF TREATING BOTTLED GOODS.

SPECIFICATION forming part of Letters Patent No. 727,575, dated May 12, 1903.

Application filed June 13, 1901. Serial No. 64,347. (No specimens.)

To all whom it may concern:

Be it known that RICHARD BIRKHOLZ, deceased, late a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, did invent a certain new and useful Improvement in Processes of Treating Bottled Goods, of which the the following is a specification.

Said invention relates to a process for treating by variations in temperature bottled goods, and has particular reference to a succession of steps in a process whereby the bottles are safely raised from a relatively low temperature to a relatively high temperature and the temperature is then reduced, by means in which the heat extracted from he bottles in cooling them is preferably conserved for the purpose of assisting in raising the temperature of the incoming cool bottles.

There are various steps, as above suggested and hereinafter to be more fully explained, which may be variously combined and some of them omitted to carry out the invention.

The drawing illustrates a longitudinal section through an apparatus adapted to carry out the process.

Like parts are indicated by the same letter in the drawing.

A is a closed tank having the body of still water B in the bottom thereof and the hot-vapor chamber C at the top.

D is an upper chamber; E E, a series of pulleys or sprocket-wheels over which runs the belt F, provided with the carriers G G, in which the receptacles or bottles H H are contained.

J is a pipe entering the tank at one end and discharging steam or hot water into one end of the tank, and K is a similar pipe at the other end of the tank.

L is a pipe through which steam or hot water can be introduced into the vapor-chamber, and M a pipe through which the overflow in the tank A can be drawn off.

N N are a series of pipes connected at one end with the spray-pipe O, provided with discharge-apertures in the upper part of the vapor-chamber D, above the line of travel of the bottles, and connected at the other end with the cooling-tank P and the device R for keeping up the circulation of the water.

S is a pan which receives the water discharged from the apertures in the pipe O, and thus a circulation is maintained from the pan S through the pipes N to the cooling-chamber P, thence by pipe N through the circulation device or pump R, thence through the pipes N to the discharge-apertures in the pipe O, thence down across the two lines of travel of the bottles to the pan.

T is the opening into the chamber D, whereby the bottles are removed from and placed in the carriers.

The operation of the several devices is as follows: The bottles at some point along the line of travel are put into the receptacle. As they pass along they are first subjected to a spray of water which is hotter than the bottles, and which therefore heats the bottles somewhat and is itself relatively cooled and then falls into the tank or pan below. The bottles pass on and are then subjected to the action of the vapor-chamber and then to the still water in the tank. This tank-water is preferably of varying temperature along the line of travel of the bottles and the bottles are very considerably heated. They then emerge from this tank and continue their journey until they reach the point where they are again subjected to the action of the circulating water, preferably the same as the water to which they were previously subjected, and which therefore is at this point cooler than the bottles, for the bottles have now become highly heated and the water has become cooled by its exposure to the cool bottles and perhaps, also, by the action of the cooling-coil or the cooling-chamber, if either or both of these devices should be employed. The water is now heated by the hot bottles and returned by the pipes to the point where it is discharged upon the incoming bottles, while the bottles which have just passed through the tank are removed.

It will be evident that the arrangement of parts can be very greatly varied without departing from the spirit of the invention and that some steps in the process may be omitted without affecting the action of the other or remaining steps.

What is claimed is—

1. The process of treating bottled goods, which consists in subjecting the filled bottles in their relatively cool condition, to the action of relatively hot circulating water, then passing them through a heating medium and simultaneously exposing their thickened portions to a heat greater than that to which the rest of the bottles are exposed.

2. The process of treating bottled goods, which consists in subjecting the filled bottles in their relatively cool condition, to the action of relatively hot circulating water, then passing them through a heating medium and simultaneously exposing their thickened portions to a heat greater than that to which the rest of the bottles are exposed, then passing them through a body of heating-water.

3. The process of treating bottled goods, which consists in subjecting the filled bottles in their relatively cool condition, to the action of relatively hot circulating water, then passing them through a heating medium and simultaneously exposing their thickened portions to a heat greater than that to which the rest of the bottles are exposed, then passing them through a body of heating-water, then exposing them to the action of the said circulating water in its relatively cool condition.

4. The process of treating bottled goods, which consists in subjecting the filled bottles in their relatively cool condition, to the action of relatively hot circulating water, then causing them to travel through a hot vapor, simultaneously exposing their thickened portions to a heat greater than that to which the rest of the bottles are exposed, then passing them through a body of water, which varies in temperature along the line of their travel.

JULIUS W. BIRKHOLZ,
Administrator of the estate of Richard Birkholz, deceased.

Witnesses:
FRED A. FOSTER,
CHAS. E. WILD.

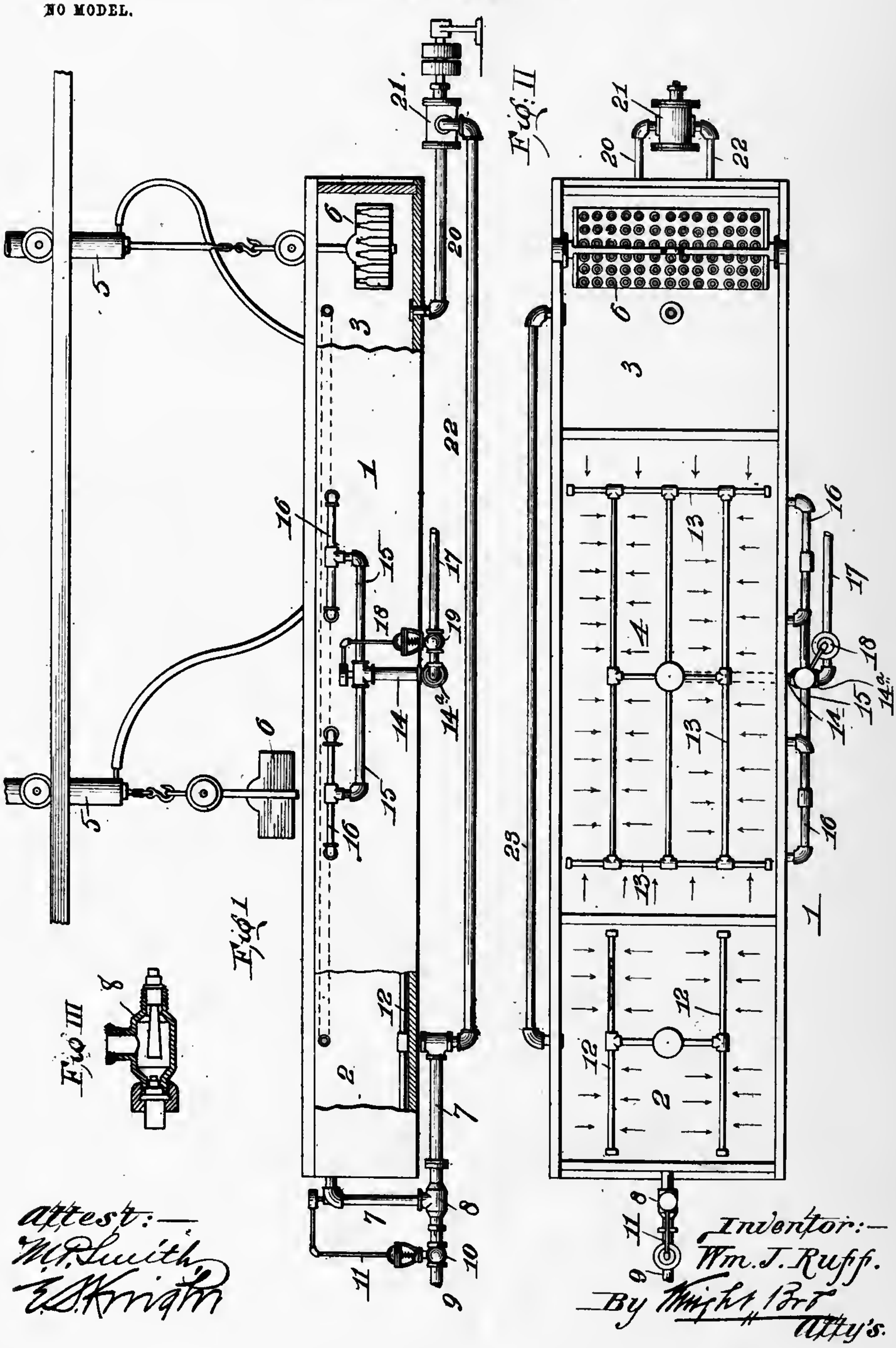
No. 731,131. PATENTED JUNE 16, 1903.

W. J. RUFF.

PASTEURIZER.

APPLICATION FILED APR. 15, 1901.

NO MODEL.



Attest:—
M. P. Smith
E. S. Knight

Inventor:—
Wm. J. Ruff.
By Knight Bro.
Atty's.

No. 731,131. Patented June 16, 1903.

UNITED STATES PATENT OFFICE.

WILLIAM J. RUFF, OF QUINCY, ILLINOIS.

PASTEURIZER.

SPECIFICATION forming part of Letters Patent No. 731,131, dated June 16, 1903.

Application filed April 15, 1901. Serial No. 55,889. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. RUFF, a citizen of the United States, residing at Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Pasteurizers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

The object of my present invention is to provide an apparatus for pasteurizing beer (and which may be used for sterilizing milk and other substances) which is inexpensive in construction as well as effective in operation, and which can be used without danger of breaking the bottles, and which will do the work in a minimum space of time without deleterious effect on the beer due to too rapid heating and cooling of the beer.

My invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a side view illustrative of my invention, part in section. Fig. II is a top or plan view showing one of the branch pipes broken away to show perforations therein, and Fig. III is a sectional view of one of the jet-pumps.

Referring to the drawings, 1 represents a tank having end compartments 2 and 3 and a middle compartment 4.

5 represents one or more traveling cranes or hoists by which the bottle-carrying receptacles 6 are handled.

7 represents a water-pipe forming a communication between the upper and the lower part of compartment 2. In this pipe is a jet-pump 8, which may be of any well-known form or type, and with the jet-pump there connects a pipe 9. In the pipe 9 is a valve 10, between which and the upper part of the pipe 7 is a regulator 11, which may be of any well-known form or type and which acts to open and close the valve 10 in conformity with the temperature in the pipe 7. The pipe 7 has perforated branches 12 located within the compartment 2, so that as the water is introduced into the bottom of the compartment from the pipe 7 it is distributed over the bottom of the compartment.

In the bottom of the compartment 4 are a number of branch pipes 13, perforated in the same manner as the pipes 12 and communicating with a water-pipe 14, that extends beneath the tank and up on one side of the tank, its upper end being provided with branches 15, that communicate with the upper portion of the tank through subbranches 16. In the pipe 14 is a jet-pump 14^a, which corresponds in construction and operation to the pump 8, and to this pump there connects a steam-pipe 17.

18 represents a regulator forming a communication between the pipe 14 and a valve 19 in the pipe 17, this regulator corresponding to the regulator 11 of the pipe 7.

20 represents a water-pipe forming a connection between the bottom of compartment 3 and a pump 21, and 22 represents a pipe forming a communication between the pump and the pipe 7 where the latter enters the compartment 2.

23 represents a pipe forming a communication between the upper portions of the compartments 2 and 3.

In operating the apparatus the compartments 2, 3, and 4 are filled with water up to about the line of the pipe 23. Steam is then turned on through the pipes 9 and 17 to heat the water in the compartments 2 and 4, the water in the former being heated to approximately 100° to 105° Fahrenheit and the water in the latter being heated to approximately 144° to 148° Fahrenheit. The pump 21 being set in operation water will circulate from the compartment 2 to the compartment 3 and back again through the pipes 23 and 22, and thus the water in these two compartments will be raised to and maintained at approximately the same temperature. When the water is thus properly heated, the receptacle 6, loaded with bottles, is lowered into the compartment 2 for the initial heating of the beer, the temperature in this compartment not being sufficient to heat the bottles rapidly enough to break them or not being hot enough to have any deleterious effect on the beer on account of too rapid heating. After the bottles have remained in the compartment 2 for approximately thirty minutes the receptacle is shifted into the compartment 4, where it is allowed to remain for approximately one hour and in which the beer is heated sufficiently to be thoroughly pasteurized. The receptacle is then shifted into the compartment 3, where the beer and bottles are cooled down sufficiently to avoid deleterious effects on the beer from being too rapidly cooled by contact with the atmosphere and the bottles sufficiently cooled down to avoid breakage by contact with the atmosphere.

The apparatus is one in which beer or other substances can be quickly and effectively sterilized with a small amount of labor and within a minimum period of time.

There may be any desired number of receptacles 6 and hoists 5 used at one time, the number being controlled by the size of the tank and its compartments.

It is well known that if beer in pasteurizing it is heated beyond a certain temperature or even if it remains at a minimum pasteurizing temperature beyond a stated length of time changes in the composition of the beer will take place, such as coagulation of the albumenoids and in some cases elimination of the same, and the brilliancy of the beer will thereby be affected and the taste of the beer changed to a disagreeable and an unnatural one, and the beer will also take on an objectionable odor. With my system of handling the bottles and transferring them bodily from one compartment to another of different temperature the length of time that they are allowed to remain in either compartment can be regulated as circumstances may require, and in neither compartment need the bottles be allowed to remain longer than is necessary to produce the best results, and this system of pasteurizing, wherein the bottles are bodily changed from one compartment to another, is very advantageous when quarts and pints are being treated at the same time. It requires a longer time to pasteurize beer in quart bottles than it does in pint bottles, because it takes longer for the maximum temperature to reach the center of the bottles. With my system one receptacle may be loaded with quarts and the other with pints and each allowed to remain in the different baths the requisite time required for each, whereas with the old system of conveying the bottles by means of an endless carrier no beer can be removed until the tank is cooled, and consequently the beer contained in pint bottles would suffer deleterious effects before the beer contained in the quart bottles becomes thoroughly pasteurized.

In my apparatus the compartment 2 may be termed an "attemperating-tank," the compartment 4 the "sterilizing-tank," and the compartment 3 the "cooling-tank."

By forming a communication between the tanks 2 and 3 and causing the water to circulate from one to the other the condition of the beer itself is utilized for attemperating purposes—that is to say, when the hot beer is moved from the sterilizing-tank into the cooling-tank it would raise the temperature of the water in the latter tank above the desired cooling-point were it not for the fact that the water is caused to circulate from the tank 3 to the tank 2, thus causing water to be brought from the tank 2 (which has been cooled by the cold beer) into tank 3, and the warmer water taken from tank 3 to tank 2 acts to assist in raising the temperature in the latter tank to a desired degree for attemperating purposes. In this way I economize in the use of an independent heating medium for the water in tank 2 and in the use of an independent cooling medium for the water in the tank 3.

I claim as my invention—

1. In a pasteurizer, the combination of an attemperating-tank, a cooling-tank, a sterilizing-tank without communication with said tanks, means for moving the substance to be sterilized from one tank to another, means for causing a circulation of water between the attemperating-tank and the cooling-tank, and means for maintaining the water in the sterilizing-tank at a higher temperature than the water in the other tanks, substantially as set forth.

2. In a pasteurizer, the combination of an attemperating-tank, a cooling-tank, a sterilizing-tank without communication with said tanks, means for moving the substance to be sterilized from one tank to another, means for heating the water in the attemperating and cooling tanks, means for causing a circulation of water between the two last-mentioned tanks, and means for maintaining the water in the sterilizing-tank at a higher temperature than the water in the other tanks, substantially as set forth.

3. In a pasteurizer, the combination of an attemperating-compartment, a sterilizing-compartment, a cooling-compartment, means exterior of said compartments creating a circulation between the attemperating-compartment and cooling-compartment, said means being without communication with the sterilizing-compartment, and means carrying the substance to be sterilized through said compartments, substantially as set forth.

4. In a pasteurizer, the combination of an attemperating-tank, a sterilizing-tank, a cooling-tank, means for heating the sterilizing-tank, and means for distributing heat from the sterilizing-tank to the attemperating and cooling tanks, the heating medium in the attemperating and cooling tanks being out of communication with the sterilizing-tank.

WILLIAM J. RUFF.

In presence of—

GERHARD G. ARENDS,
HENRY DAMHORST.

Portuwright
Oct 1903

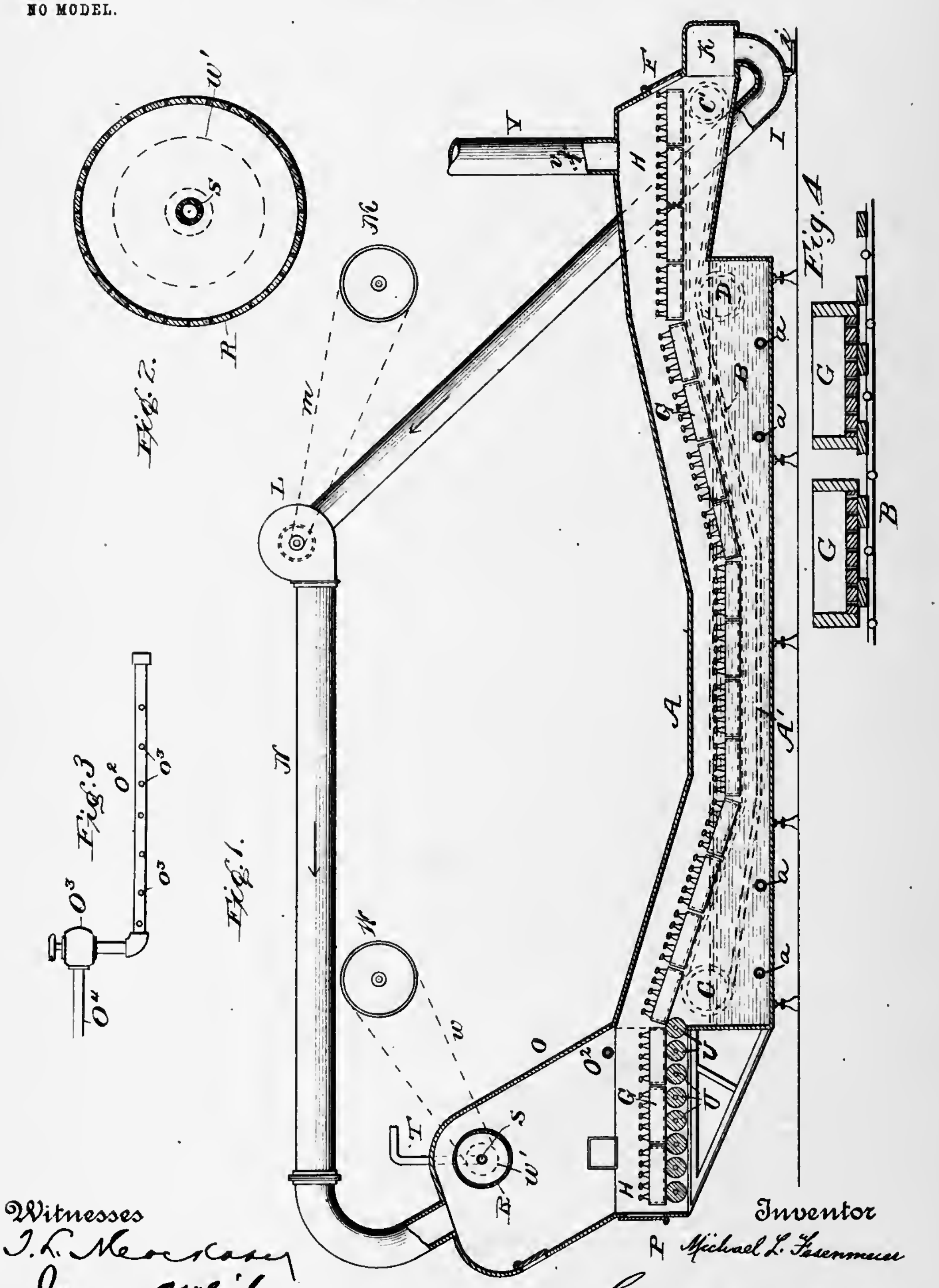
No. 740,837. PATENTED OCT. 6, 1903.

M. L. FESENMEIER.

APPARATUS FOR PASTEURIZING BEER.

APPLICATION FILED JUNE 20, 1903.

NO MODEL.



Witnesses

J. L. Meer...

James Orril

Inventor

Michael L. Fesenmeier

by Connolly Bros.

Attorneys

No. 740,837. Patented October 6, 1903.

UNITED STATES PATENT OFFICE.

MICHAEL L. FESENMEIER, OF CUMBERLAND, MARYLAND.

APPARATUS FOR PASTEURIZING BEER.

SPECIFICATION forming part of Letters Patent No. 740,837, dated October 6, 1903.

Application filed June 20, 1903. Serial No. 162,387. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL L. FESENMEIER, a citizen of the United States, residing at Cumberland, in the county of Allegheny and State of Maryland, have invented new and useful Improvements in Apparatus for Pasteurizing Beer, of which the following is a specification.

This invention has relation to apparatus for pasteurizing beer, and has for its object the provision of novel means whereby the bottled beer coming from the hot-water tank will be rapidly cooled and the heat therefrom transferred to the inlet end of the apparatus and utilized to give the bottles a preliminary heating prior to their immersion in the hot-water tank, whereby a large amount of heat is utilized that has heretofore been wasted and the breakage of bottles greatly reduced.

In apparatus for pasteurizing beer as heretofore commonly constructed the bottles have been carried on a conveyer through a tank of water maintained at a high temperature and on emerging from the tank have been suddenly cooled by a stream of cold water thrown directly on the bottles, which at this time are exposed to the air. The result has been that the heat which the bottles have acquired from the hot water in the tank has been dissipated in the open air and wasted, and the subjection of the hot bottles to the sudden impact of a large quantity of cold water has involved considerable loss in the breakage of bottles and the loss of their contents.

In carrying my invention into effect I cool the bottles as they come from the hot-water tank and while they are within a closed chamber or hood arranged at the outlet end of the hot-water tank by means of water in such a finely-divided condition as to be in the form of a mist or vapor, and after the heat of the bottles has been transferred to and absorbed by the watery vapor or mist I draw the latter to the inlet end of the apparatus by suction and bring it into contact with cold incoming bottles, which are thereby heated prior to their immersion in the hot water of the tank. After the mist or watery vapor has parted with its heat to the incoming bottles I convey it back to the outlet end of the apparatus and into the hood before mentioned, and having added to it an additional quantity of watery vapor I pass it through the apparatus as before, thus maintaining a cycle of operations which results in the rapid and economical pasteurizing of the beer with a minimum amount of breakage of bottles and with comparatively little consumption of fuel.

My invention consists in the novel construction, combination, and arrangement of parts hereinafter described and claimed.

In the accompanying drawings, illustrating my invention, Figure 1 is a vertical longitudinal sectional view of the complete apparatus; Fig. 2, a detail sectional view of the water spraying or separating devices. Fig. 3 is a side view of a perforated pipe for introducing live steam into the apparatus, and Fig. 4 a sectional view of a part of a conveyer and boxes for carrying bottles through the apparatus.

A designates a closed chamber or casing containing a hot-water tank A′, the water in which is heated by steam-pipes *a a*. Within the chamber A is an endless conveyer B, which runs around drums C C′ and over a drum D and hangs slack between the drums C and D, so as to dip into the hot-water tank A′. A series of rollers U U at the end of the conveyer serve to receive the boxes G G, in which the bottles H H are carried, and deliver them to the outlet-door P on the end of casing A. At the inlet end of the casing a door F is located, through which the bottles are placed on the conveyer. A large pipe or conduit I leads from the bottom of an extension K of the chamber or casing A to a fan L, which is driven from a pulley M by a belt *m*, and from the fan L a pipe or conduit N leads to a hood O, which is arranged at the outlet end of the apparatus, a door P being provided through which the bottles are removed from time to time and after they have been sufficiently cooled. Within the hood O is arranged a perforated drum R, which turns on a hollow perforated shaft S, to which water is supplied through a pipe T, and the drum is revolved by means of a pulley *w′* (shown in dotted lines in Fig. 1) outside the hood, to which motion is communicated by a belt *w* from a pulley W. At the inlet end of the apparatus a chimney V is located, and a damper c within the chimney serves to regulate the escape of heated air and vapor which it may be desired to draw off from that end of the apparatus. A drain-pipe i at the bottom of the bend of pipe I serves to carry off condensed water from said pipe I.

Operation: The boxes G, which have perforated bottoms and which contain the bottles H, are placed on the conveyer at the inlet end of the chamber or casing A and are carried through the hot water in tank A', from which they emerge into the hood O on the rollers U. As the bottles come into the hood they are in a heated condition and are cooled by being subjected to the action of the water coming into the hood through pipe T, which is broken up into such small particles by the revolving perforated drum R as to be in substantially the condition of a mist or watery vapor. The bottles are also subjected to the action of the cooled mist or vapor coming into the hood through pipe or conduit N. After passing over and around the bottles and cooling the same the watery vapor or mist from drum R and pipe N is drawn through the apparatus over the water in tank A' to the inlet end, where it passes over the incoming cold bottles and is drawn into the extension K by the suction of the fan L and then up to the fan through pipe or conduit I and from thence back to the hood O. The incoming cold bottles are heated by contact with the mist or watery vapor, and the latter passes to the fan in a cooled condition, and any condensed water resulting from the cooling of the watery vapor will lodge in the bend of pipe I and can be drawn off through waste-pipe i.

From the foregoing description it will be seen that the watery vapor is circulated within the apparatus, being heated by contact with the hot bottles coming from the tank and then cooled by the cold bottles at the inlet end of the apparatus, and that the watery vapor or mist cools the heated bottles and heats the cold bottles, and that in this manner a cycle of operations is effected within the apparatus which results in the rapid and effectual pasteurizing of the beer with a minimum consumption of fuel and a very small percentage of loss by breakage of bottles.

In order to produce a denser, better, and stronger mist, I propose to use in connection with the apparatus hereinbefore described means for supplying live steam, which is added to the mist or watery vapor produced as before described at a point where such mist or watery vapor after cooling the bottles is being transferred to the other end of the apparatus. In the drawings I have shown at O^2 a perforated steam-pipe, through which live steam is conveyed into the apparatus, where it mingles with the mist or watery vapor and serves to increase the density and strength of such mist or watery vapor. This pipe is shown in side elevation in the detail view, Fig. 3, on an enlarged scale, and it is provided with a supply-pipe O^4, a stop-cock O^3, by means of which the supply of steam may be regulated, and with holes o^3 o^3 for the passage of the live steam into the apparatus.

Having described my invention, I claim—

1. In an apparatus for pasteurizing beer, the combination of a closed chamber, comprising a tank and a conveyer within said chamber, with a hood at the outlet end of said chamber, a pipe connecting the inlet end of the chamber with said hood and a fan adapted to force vapor through said pipe, substantially as described.

2. In an apparatus for pasteurizing beer, the combination of a closed chamber or casing, comprising a tank and a conveyer within said chamber adapted to transport bottles through said tank, with a hood at the outlet end of said chamber or casing, a water-distributing device in said hood and a pipe leading from the inlet end of the chamber or casing to the said hood and adapted to convey vapors to said hood from the inlet end of the apparatus, substantially as described.

3. In an apparatus for pasteurizing beer, the combination of a closed casing, comprising a tank, a conveyer extending through the casing and dipping into said tank and a hood at the outlet end of the casing, with a pipe connected to the casing below the conveyer at the inlet end and leading to said hood and means for forcing vapor through said pipe, substantially as described.

4. In apparatus for pasteurizing beer, the combination with a chamber comprising a tank for hot water, a conveyer within said chamber and a hood at the outlet end of the chamber, of a pipe or conduit for conveying vapor from the inlet end of the chamber to said hood and a chimney for the escape of surplus vapor, substantially as described.

5. In apparatus for pasteurizing beer, the combination with a chamber or casing, comprising a hot-water tank and a conveyer within said chamber or casing, of a water distributing or spraying device arranged at the outlet end of said chamber and consisting of a perforated shaft and a perforated revolving drum surrounding said shaft, substantially as described.

6. In an apparatus for pasteurizing beer, the combination of a closed casing, comprising a tank, a conveyer extending through the casing and dipping into said tank and a hood at the outlet end of the casing, with means for supplying watery vapor within said hood and means for adding live steam to such watery vapor, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MICHAEL L. FESENMEIER.

Witnesses:

CHARLES E. METZ,

R. E. TAYLOR.

Jan. 1904

749 547

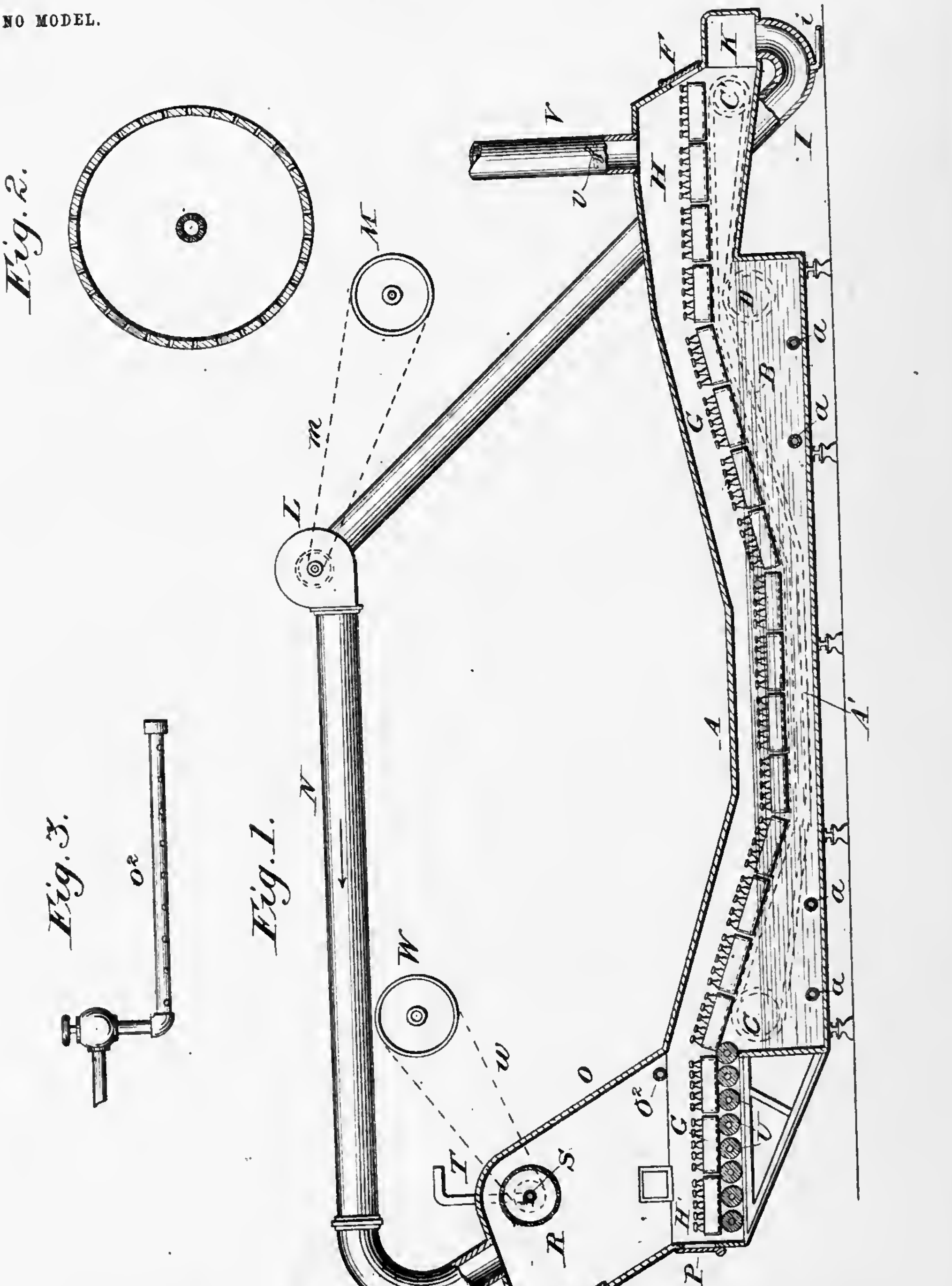
No. 749,547. PATENTED JAN. 12, 1904.

M. L. FESENMEIER.

METHOD OF PASTEURIZING.

APPLICATION FILED AUG. 3, 1903.

NO MODEL.



Witnesses:
George Kane
Thos. F. Nelson

Inventor:
Michael L. Fesenmeier
by Connolly Bros. Attys.

UNITED STATES PATENT OFFICE.

MICHAEL L. FESENMEIER, OF CUMBERLAND, MARYLAND.

METHOD OF PASTEURIZING.

SPECIFICATION forming part of Letters Patent No. 749,547, dated January 12, 1904.

Application filed August 3, 1903. Serial No. 168,116. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL L. FESENMEIER, a citizen of the United States, residing at Cumberland, in the county of Allegany and State of Maryland, have invented new and useful Improvements in Methods of Pasteurizing, of which the following is a specification.

This invention has relation to methods of pasteurizing liquids, and has for its object the provision of a novel method whereby liquids in closed vessels will be rapidly and effectively pasteurized or sterilized with an economical consumption of fuel for heating purposes.

In carrying my invention into effect I utilize the heat which has been imparted to the vessels and their liquid contents in sterilizing or pasteurizing the latter to heat a vaporous matter, which is then conveyed to and brought into contact with cold vessels containing liquids about to be submitted to the pasteurizing process, to which it imparts its heat, thereby effecting a preliminary heating of the same, and is then conveyed back to the point where it again meets with and abstracts the heat from a fresh supply of vessels the contents of which have been pasteurized, thus operating through a cycle by which great economy in fuel expenditure is effected and loss through breakage reduced to a minimum.

In the accompanying drawings, in which I have shown an apparatus adapted to carry into effect my improved method, Figure 1 is a vertical longitudinal sectional view of the complete apparatus; Fig. 2, a detail sectional view of a water-spraying device used in connection therewith, shown on an enlarged scale. Fig. 3 is a side view of a perforated pipe for introducing live steam into the apparatus.

A designates a closed chamber or casing containing a hot-water tank A′, the water in which is heated by means of steam passing through pipes *a a*.

Within the chamber A is an endless conveyer B, which passes around drums C C′ and over a drum D and hangs slack between the drums C and D, so as to dip into the hot water in tank A′. A series of rollers U U at the end of the conveyer receive the boxes G G, in which the vessels H H, which contain the liquid to be treated, are contained, and deliver the boxes to an outlet-door P on the end of casing A. At the inlet end of the casing a door F is located through which the boxes containing the vessels are placed on the conveyer. A large pipe or conduit I leads from the bottom of an extension K of the chamber or casing A to a fan L, which is driven from a pulley M by a belt *m*, and from the fan L a pipe or conduit N leads to a hood O, which is arranged at the outlet end of the apparatus, a door P being provided through which the bottles are removed from time to time and after they have been sufficiently cooled. Within the hood O is arranged a perforated drum R, which turns on a hollow perforated shaft S, to which water is supplied through a pipe T, and the drum is revolved by means of a pulley outside the hood, to which motion is imparted by a belt *w* from a pulley W.

At the inlet end of the apparatus a chimney V is located, and a damper *v* within the chimney serves to regulate the escape of heated air and vapor which it may be desired to let off from that end of the apparatus. A drain-pipe *i* at the bottom of the bend of pipe I serves to carry off water from said pipe I.

The operation of the above-described apparatus is as follows: The boxes G, which have perforated bottoms and which contain the vessels H, are placed on the conveyer at the inlet end of the chamber or casing A and are carried through the hot water in tank A′, from which they emerge into the hood O onto the rollers U U. As the bottles emerge from the hot water in tank A′ into hood O they are in a heated condition and are cooled by being subjected to the watery vapor sprinkled into the hood by the revolving drum R, which receives a supply of water from the pipe T. The action of the revolving drum R is such that it breaks the water up into such small particles that it is suspended in the air in substantially the condition of a mist or vapor. At the same time the vessels are subjected to contact with the cooled mist or vapor which, as will be presently described, is brought from the other end of the apparatus through conduit N. After passing over and around the heated vessels and absorbing heat therefrom the watery vapor and air are drawn to the other end of the apparatus by the suction created by fan L, where they pass over and around the incoming vessels, giving the same a preliminary heating, and thereby parting with the greater part of their heat, and are drawn into the extension K of casing A by the suction of the fan and thence up through conduit I and from the fan to the hood O through conduit N.

By properly regulating the supply of water to drum R and the escape of condensed water and vapor at the inlet end of the apparatus the air within the same can be kept charged with watery vapor to any desired extent.

The method which constitutes my present invention and which is performed by the apparatus above described and which it will be readily understood can be effected with other apparatus involves the imparting of heat from the vessels coming from the hot-water tank to a watery vapor, the conveying of the heated vapor to the incoming cool vessels, the imparting of heat from the watery vapor to such incoming cool vessels, and the transference of the cooled watery vapor to the starting-point. The supply of finely-divided water and the drawing off of condensed vapor, it is to be understood, are subsidiary features provided for the purpose of facilitating the carrying out of my improved method.

As an additional feature to the method hereinbefore described and in order to produce a better and stronger mist or watery vapor I propose to supply live steam to the apparatus and mingle it with the mist or watery vapor at a point where such mist or watery vapor after cooling the heated bottles or other vessels in which the material is contained is being transferred to the other end of the apparatus.

In the drawings I have shown at O^2 a perforated steam-pipe arranged transversely of the chamber A at the point where it joins the hood O. Steam is supplied to this pipe from a suitable source of supply and mingles with the mist or watery vapor after the latter has passed over and cooled the heated vessels on the rollers U U.

Having described my invention, I claim—

1. The method of pasteurizing or sterilizing material in closed vessels, consisting in passing the vessels through a heating medium, then subjecting them to contact with a cool vapor, then conveying the vapor to and bringing it in contact with cool vessels about to be heated, whereby the vessels are given a preliminary heating and the vapor is cooled, and then returning the cooled vapor to the starting-point.

2. The method of pasteurizing or sterilizing material consisting in passing vessels containing the material through a heating medium, then subjecting them to contact with a cool watery vapor, then conveying the heated vapor to and bringing it in direct contact with vessels about to be heated, then returning the cooled vapor to the starting-point, additional watery particles being added to the vapor and condensed water abstracted at suitable points to maintain the desired degree of saturation.

3. The method of pasteurizing or sterilizing material consisting in passing vessels containing the material through a heating medium, then subjecting them to contact with a cool vapor, then mingling live steam with such vapor then conveying the mingled vapor and steam to and bringing them in contact with cool vessels about to be heated, whereby the vessels are given a preliminary heating and then returning the cooled vapor to the starting-point.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MICHAEL L. FESENMEIER.

Witnesses:

CHARLES E. METZ,

R. E. TAYLOR.

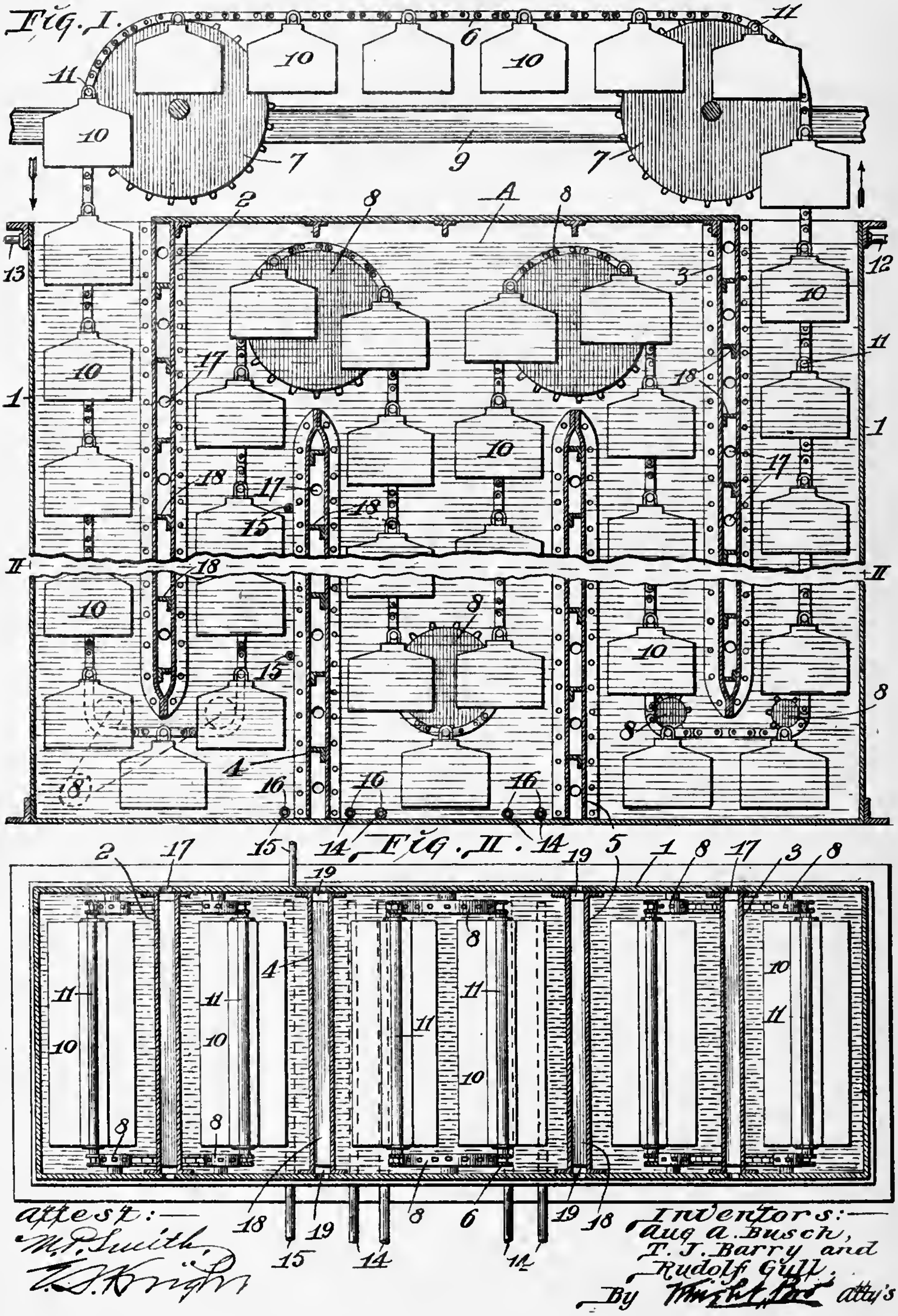
No. 755,108. PATENTED MAR. 22, 1904.

A. A. BUSCH, R. GULL & T. J. BARRY.

J. H. BARRY, EXECUTRIX OF T. J. BARRY, DEC'D.

PASTEURIZER.

NO MODEL. APPLICATION FILED MAY 26, 1902. 4 SHEETS—SHEET 1.



No. 755,108. PATENTED MAR. 22, 1904.

A. A. BUSCH, R. GULL & T. J. BARRY.

J. H. BARRY, EXECUTRIX OF T. J. BARRY, DEC'D.

PASTEURIZER.

NO MODEL. APPLICATION FILED MAY 26, 1902. 4 SHEETS—SHEET 2.

Fig. III

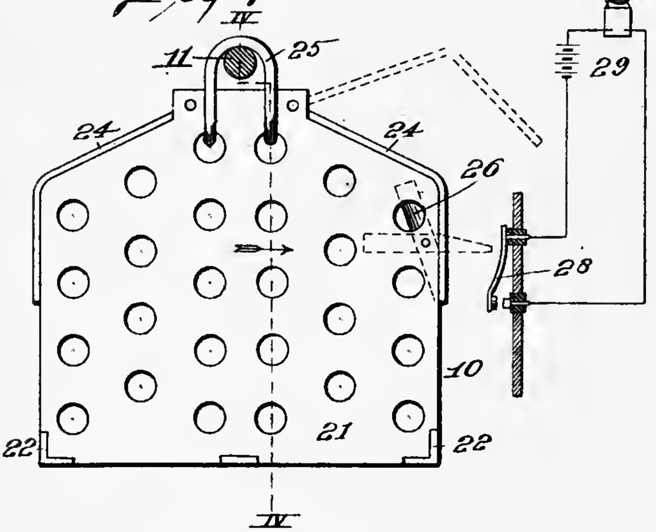


Fig. IV.

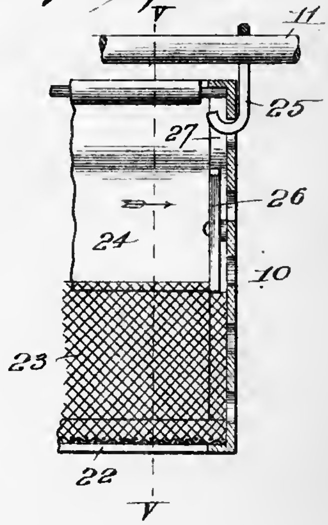


Fig. V.

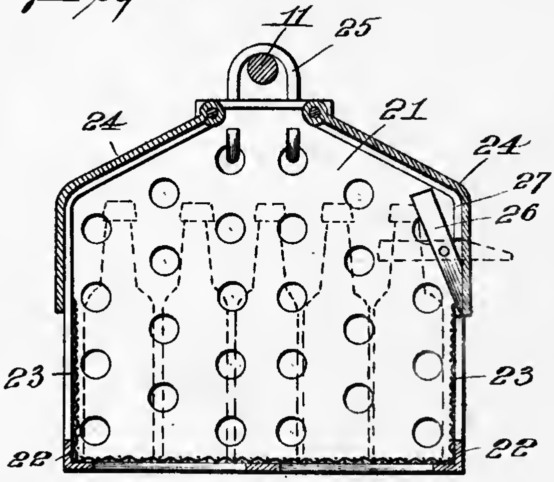
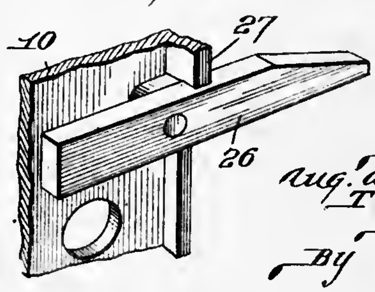


Fig. VI



Attest:—
M. P. Smith
[illegible] Knight

Inventors:—
Aug. A. Busch,
T. J. Barry and
Rudolf Gull.
By Knight Bros atty's

No. 755,108. PATENTED MAR. 22, 1904.

A. A. BUSCH, R. GULL & T. J. BARRY.

J. H. BARRY, EXECUTRIX OF T. J. BARRY, DEC'D.

PASTEURIZER.

NO MODEL. APPLICATION FILED MAY 26, 1902. 4 SHEETS—SHEET 3.

Fig. VII.

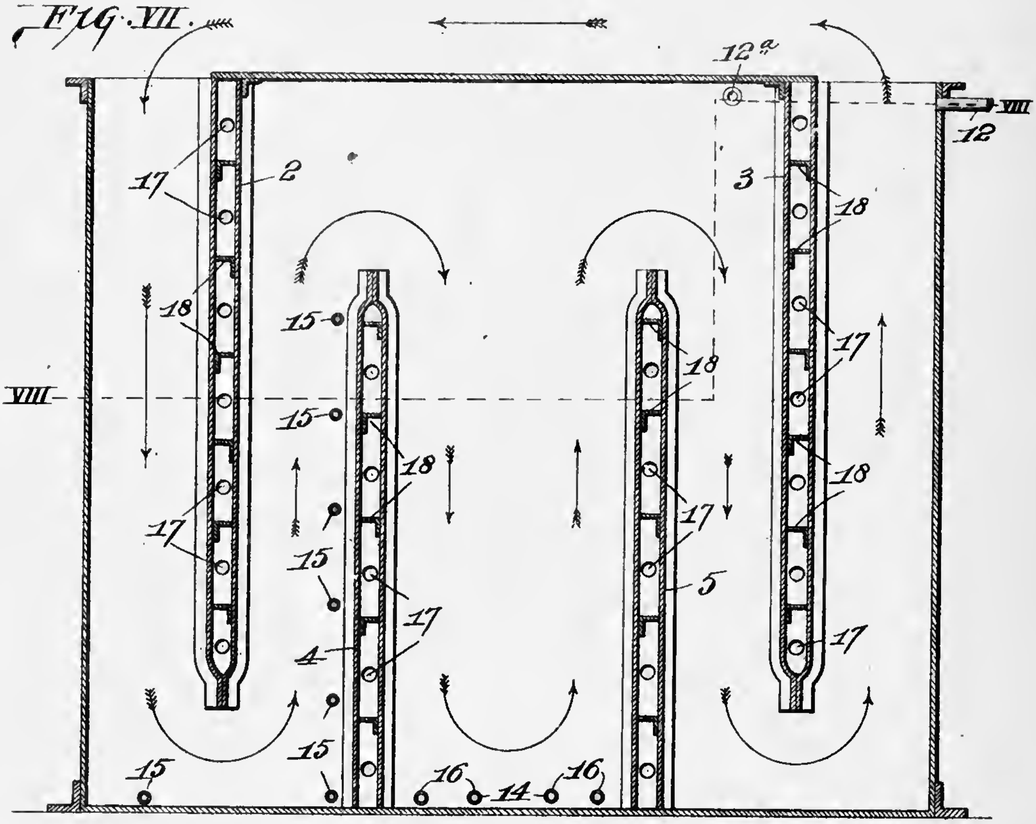
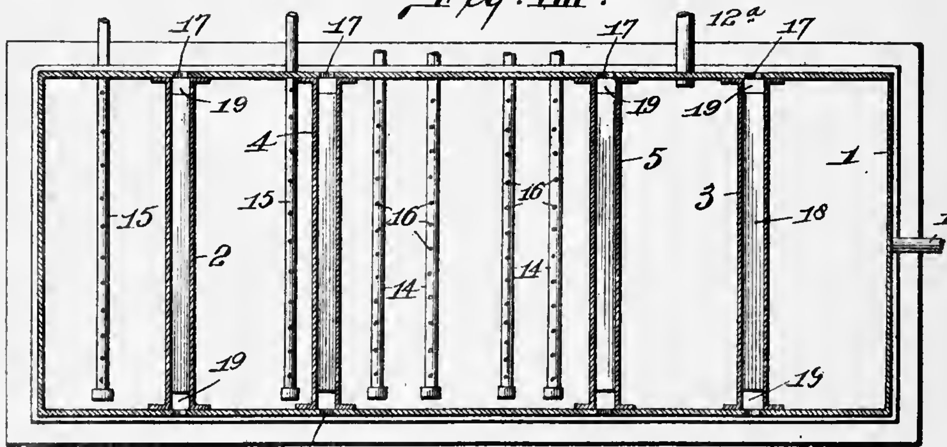


Fig. VIII.



Attest:—
M. P. Smith,
E. S. Knight

Inventors:—
Aug. A. Busch,
T. J. Barry and
Rudolf Gull:—
By Knight Bros
atty's.

No. 755,108. PATENTED MAR. 22, 1904.

A. A. BUSCH, R. GULL & T. J. BARRY.

J. H. BARRY, EXECUTRIX OF T. J. BARRY, DEC'D.

PASTEURIZER.

NO MODEL. APPLICATION FILED MAY 26, 1902. 4 SHEETS—SHEET 4.

Fig. IX.

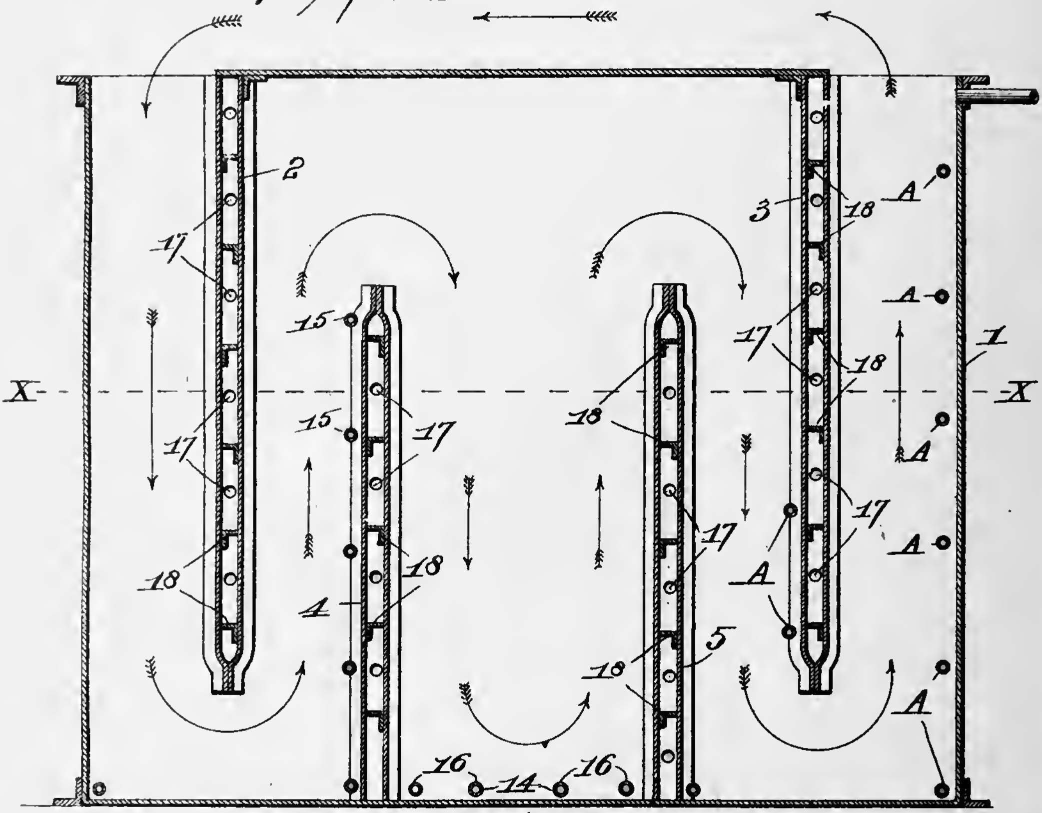
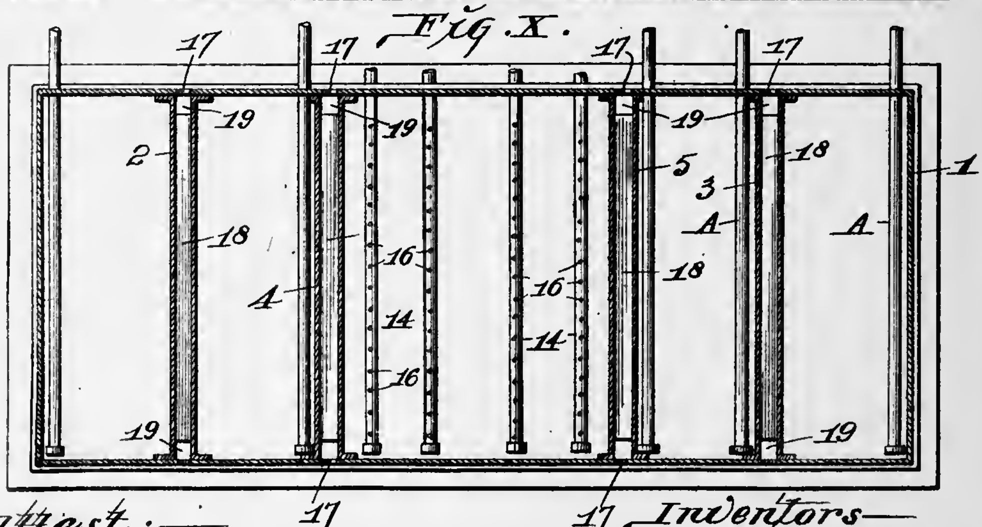


Fig. X.



attest:—
M. P. Smith,
E. S. Knight

Inventors—
Aug. A. Busch,
T. J. Barry and
Rudolf Gull
By Knight Bro
atty's.

No. 755,108. Patented March 22, 1904.

UNITED STATES PATENT OFFICE.

AUGUST A. BUSCH, RUDOLF GULL, AND THOMAS J. BARRY, OF ST. LOUIS, MISSOURI; JOSEPHINE H. BARRY EXECUTRIX OF SAID THOMAS J. BARRY, DECEASED.

PASTEURIZER.

SPECIFICATION forming part of Letters Patent No. 755,108, dated March 22, 1904.

Application filed May 26, 1902. Serial No. 108,924. (No model.)

To all whom it may concern:

Be it known that we, AUGUST A. BUSCH, a citizen of the United States, RUDOLF GULL, a citizen of Switzerland, and THOMAS J. BARRY, a citizen of the United States, all residing in the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Pasteurizers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

The object of our invention is to produce a pasteurizer in which the beer contained in bottles is conveyed first through attemperating-water, then through water of maximum temperature to sterilize the beer, and thence through cooling-water, the construction of the pasteurizer being such that the bottles do not leave the water-bath from the time they enter the attemperating-water until they leave the cooling-water, thus avoiding danger of broken bottles resulting from their exposure to the atmosphere while passing from one stage of water to another and likewise avoiding the accumulation on the bottles of suspended matter in the water, which is objectionable inasmuch as the suspended matter will dry on and stick to the bottles if the latter are passed through the atmosphere in a hot condition.

A further object of our invention is to produce a pasteurizer in which the temperature of the water in one compartment does not by radiation materially affect the temperature of the water in the other compartments.

A further object of our invention is to construct a basket or receptacle for holding the bottles, into which the bottles can be readily placed and readily removed and which is provided with a "telltale" attachment, so that an alarm will be sounded if the cover is not closed before the basket enters the machine.

Our invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a vertical longitudinal section of our improved pasteurizer. Fig. II is a horizontal section taken on line II II, Fig. I. Fig. III is an end view of one of the baskets and a detail section of the wall of the tank, showing the electric alarm. Fig. IV is a detail section taken on line IV IV, Fig. III. Fig. V is a section taken on line V V, Fig. IV. Fig. VI is a detail perspective view of one of the baskets. Fig. VII is a vertical section of a modified form of the tank portion of the pasteurizer. Fig. VIII is a horizontal section taken on line VIII VIII, Fig. VII. Fig. IX shows another modified form of the tank portion of the pasteurizer. Fig. X is a horizontal section taken on line X X, Fig. IX.

1 represents a tank having outer partitions 2 and 3 near each end of the tank and inner partitions 4 and 5. The partitions 2 and 3 extend from the top of the tank in a downwardly direction, but not to the bottom of the tank, while the partitions 4 and 5 extend upwardly from the bottom of the tank, but not to the top thereof.

6 represents endless chains that travel over and under pulleys or chain-wheels 7 and 8 (the pulleys 7 being journaled to a frame 9, located over the tank, while the pulleys 8 are journaled in the sides of the tank) and between which the bottle-receiving baskets or receptacles 10 are supported on rods 11. The chains and baskets constitute a carrier, that passes into the machine between one end thereof and the partition 2, thence under the partition and upwardly between it and the partition 4, thence over the partition 4 and downwardly and upwardly between it and the partition 5, thence over the partition 5 and downwardly between it and the partition 3, and thence beneath the partition 3 and upwardly between it and the other end of the tank, from where it passes out of the machine and over the pulleys 7. The bottles are placed in the baskets as they enter the tank and are removed therefrom as the baskets leave the tank.

12 is the water-supply and 13 the water-

discharge pipe of the tank. The water-level in the tank is shown at A, Fig. I, and the upper pulleys or wheels 8 are located beneath this line, so that the bottles remain in the water from the time they enter the machine until they leave it, although they are passed through water of different degrees of temperature, the change from one temperature to another being gradual, and by virtue of not being exposed to the atmosphere there is avoided the danger of breaking the bottles and the collection of foreign matter on the bottles.

The water in the central part of the tank is heated by steam coils or pipes 14, and the water in the compartment to the left of partition 4 may, if necessary, be heated by steam-pipes 15, all of these pipes being preferably perforated within the tank, as shown at 16.

The partitions 2, 3, 4, and 5 are formed with double walls closed at their ends, as shown in Fig. I, so that each partition has a live-air chamber within it. These chambers are open to the outside atmosphere, for which purpose the side walls of the tank are perforated, as shown at 17. With the partitions thus made substantially no heat will radiate through them from one compartment to another, and the temperature of the water in the different compartments can be predetermined and maintained. The walls of the partitions are held apart against the pressure of the water by angle-strips 18, located between the walls, but which do not extend entirely across the partitions, as shown at 19, Fig. II, and thus the circulation of air within the chamber is not prevented by the strips.

The baskets 10 have end walls 21, made of perforated metal and joined at their bottom by angle-pieces 22. 23 represents a wire-netting covering the bottom of the baskets and extending up on each side to about midway of the height of the baskets. 24 represents doors hinged to the perforated ends of the baskets and which extend down, as shown, to about the top or upper edge of the wire-netting 23. The doors can be opened up into a vertical position, thus allowing for access to the baskets in placing the bottles into them and removing the bottles therefrom, one of the doors being shown partially raised in Fig. III. The baskets are suspended from the rods 11 by means of U-shaped stirrups 25, the lower ends of which are formed into hooks and passed through the upper perforations in the ends of the baskets, as shown in Fig. V.

It is important that the doors 24 be closed when the baskets are passing through the machine, so that in case a bottle should become broken the pieces will not float out of the baskets, and to provide against the doors being accidentally left open and the baskets passing into the machine without it being noticed that the doors are open we provide a telltale arrangement consisting of a bar or trigger 26, that is pivoted to one end of the basket, as shown in Fig. VI. The inner end of this bar is heavier than the outer end, so that when the door on this side of the basket is opened, which is the door through which the bottles are placed into the baskets, the bar will fall into a horizontal position, in which position it is held by an overhanging flange 27 on the end of the basket. If the door is closed, this bar will be forced into the position shown in Fig. III; but if the door is not closed the bar will stand in the position shown in Fig. VI and by dotted lines in Fig. III, and its outer end will come against a spring contact-bar 28 of an electric bell 29, the spring contact-point being fastened to the wall of the tank. As the basket descends (when the door is left open) the outer end of the bar 26 will come against the contact-point 28 and sound the alarm, whereupon the operator will close the door.

With the tank of the pasteurizer constructed as shown in Figs. I and II there is a circulation of water through the conduit from pipe 12 to pipe 13; but this circulation of water is not essential, and the tank can be made as shown in Figs. VII and VIII, the cooling-water passing in through pipe 12, as in the other case, and out through a pipe 12^a, located on the far side of the partition 3 from the pipe 12. With this construction of tank we prefer to use more of the heating-pipes 15 than in the construction shown in Fig. I. Again, the machine can be made to operate without the circulation of water through any part of the tank. This arrangement is shown in Figs. IX and X, where A represents cooling-pipes for keeping down the temperature of the water on the delivery side of the machine.

We claim as our invention—

1. In a pasteurizer, a tank formed into compartments by means of upwardly and downwardly extending partitions; said partitions being formed with air-chambers and the walls of said partitions being supported by means of strips that do not extend entirely across the partitions; the walls of said tank being perforated opposite the partitions, substantially as set forth.

2. In a pasteurizer, the combination of a tank divided into compartments, endless chains passing through the compartments, and baskets carried by said chains, said baskets consisting of perforated end pieces and wire-gauze bottoms and sides, and having doors hinged at their upper ends to the ends of the baskets, substantially as set forth.

3. In a pasteurizer, the combination of a tank divided into compartments, endless chains

passing through the compartments, baskets carried by the chains and having hinged doors, bars pivoted to the baskets and which are adapted to be moved to an inclined position by the closing of the doors and to be held in a horizontal position if the doors are not closed, and an electric bell adapted to be sounded by said bars when in a horizontal position, substantially as and for the purpose set forth.

AUG. A. BUSCH.
RUDOLF GULL.
THOMAS J. BARRY.

In presence of—
E. S. KNIGHT,
NELLIE V. ALEXANDER.

Pa
July 1904

No. 764,657. PATENTED JULY 12, 1904.

W. CLASMANN.

PASTEURIZING APPARATUS.

APPLICATION FILED APR. 25, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 2.

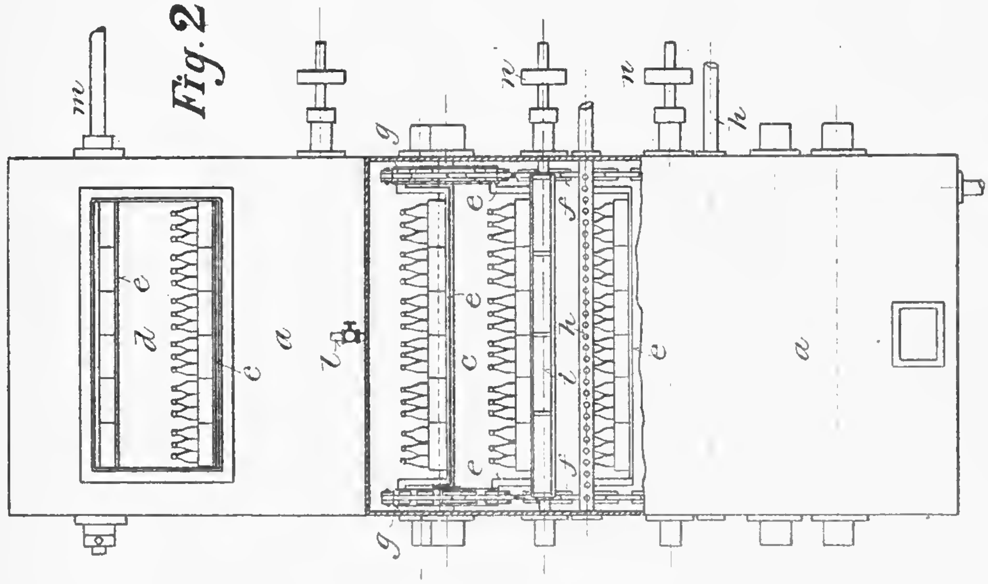
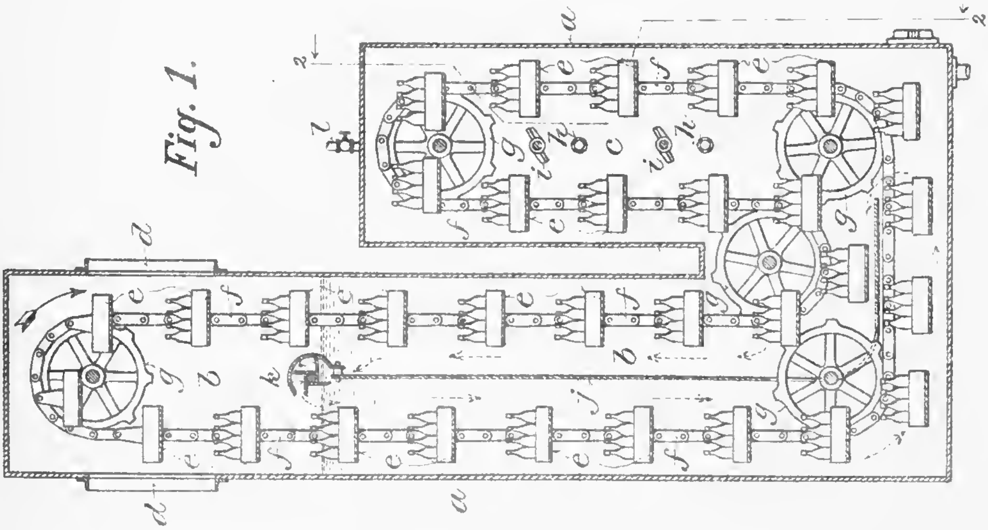


Fig. 1.



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No. 764,657. PATENTED JULY 12, 1904.

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PASTEURIZING APPARATUS.

APPLICATION FILED APR. 25, 1902.

NO MODEL. 3 SHEETS—SHEET 2.

Fig. 4.

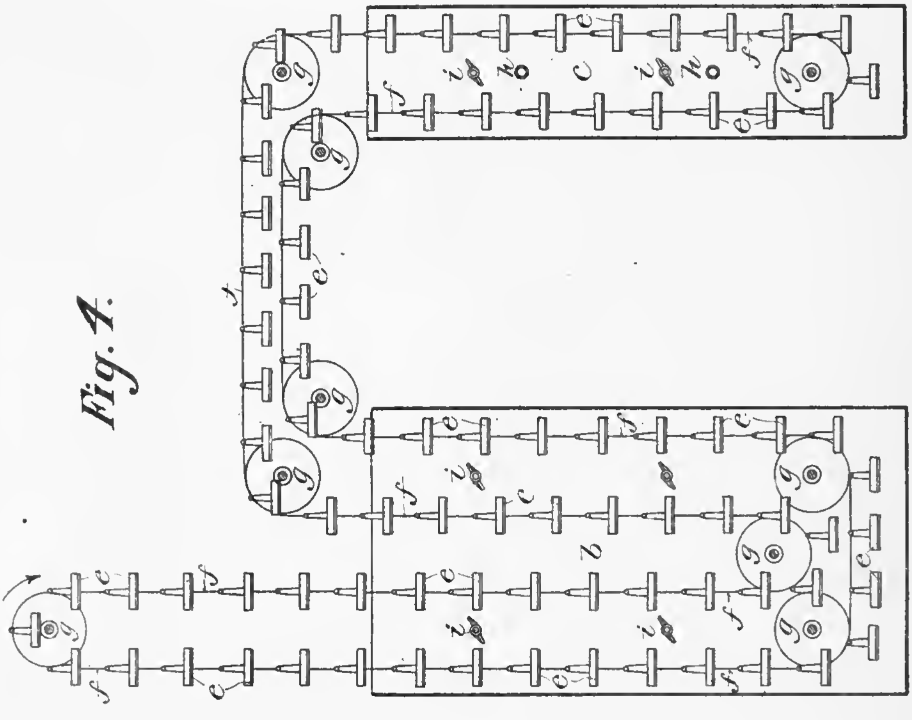
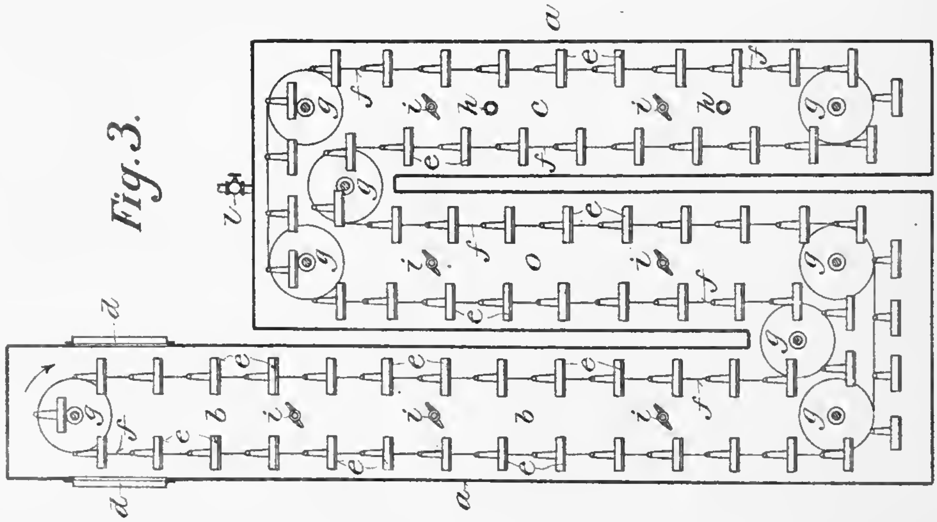


Fig. 3.



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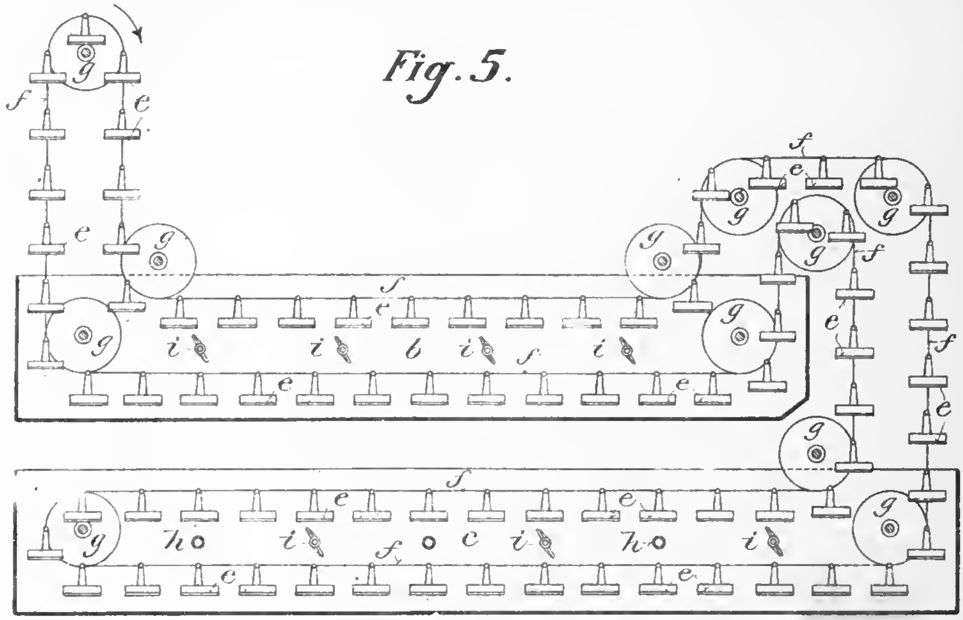
PASTEURIZING APPARATUS.

APPLICATION FILED APR. 25, 1902.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 5.



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No. 764,657. Patented July 12, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM CLASMANN, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO PABST BREWING COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

PASTEURIZING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 764,657, dated July 12, 1904.

Application filed April 25, 1902. Serial No. 104,611. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM CLASMANN, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates particularly to apparatus for pasteurizing or sterilizing bottled beer and other products, beverages, food, or perishable substances contained in sealed or closed receptacles—such as bottles, cans, jars, and the like.

The main objects of the invention are to gradually heat the beer or other material to be treated to a pasteurizing temperature, to hold it at that temperature for a certain time and then gradually cool it, to save heat, to avoid waste of water, to economize space, and generally to improve the construction and operation of apparatus of the class to which the invention relates.

It consists in certain novel features in construction and in the arrangement and combinations of parts hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a vertical section of one form of apparatus embodying the invention. Fig. 2 is an elevation and partial section on the line 2 2, Fig. 1, of the apparatus shown in Fig. 1 as viewed from the right with reference to Fig. 1; and Figs. 3, 4, and 5 are sectional views corresponding with Fig. 1 of modified forms of the apparatus.

Referring to Figs. 1 and 2, *a* is a tank or receptacle adapted to hold water or other liquid for conveying and distributing heat to and from the bottled beer or other material to be treated in the apparatus, as hereinafter explained. This tank or receptacle has two vertically-disposed compartments *b* and *c*, which communicate with each other at their lower ends. The compartment *b*, which may be called the "warming" and "cooling" compartment, extends above the compartment *c* and is provided with one or more openings *d* for placing the material to be treated in and removing it from the apparatus. The compartment *c*, which may be called the "heating" or "sterilizing" compartment, is closed at the top. An endless conveyer, consisting of trays or holders *e*, suspended at the ends from chains or link belts *f*, which are carried and guided by suitably-arranged sprocket-wheels *g*, is adapted to carry the material to be treated downward through the compartment *b*, thence upward and downward through the compartment *c*, thence back and upward through the compartment *b*, opposite parts of the conveyer traveling simultaneously in opposite directions through each of said compartments. The heating-compartment *c* is provided with perforated steam-pipes *h* for heating the liquid therein and with rotary agitators *i* for producing or accelerating circulation of said liquid and more evenly distributing the heat conveyed thereby to the material carried by oppositely-moving parts of the conveyer. As shown in Fig. 1, the compartment *b* may be provided with a vertical partition *j* between the descending and ascending parts of the conveyer. At the top of this partition, which terminates at or near the desired liquid-level, a paddle-wheel *k* or other suitable device is provided to transfer water from one side of said partition to the other and produce a current, as indicated by dotted arrows, in a direction opposed to the travel of the conveyer. The heating-compartment *c* is provided at the top with a valve-controlled vent and air-supply connection *l*, by means of which air entrapped in the upper part of said compartment may be released, so that the compartment will fill with water or other liquid or by means of which air may be forced into said compartment to displace more or less of the water or other liquid in the upper part thereof. In this way by varying the depth of the water or other liquid in the heating-compartment *c* the material to be treated therein may be subjected to a pasteurizing temperature a longer or shorter time for any given speed of the conveyer, while the time for warming and cooling the material in the compartment b remains the same. The conveyer may be driven by power applied to the shaft m of the sprocket-wheels in the upper end of the compartment b or to any other convenient part of the machine, and the agitators i may be driven by means of pulleys n on the agitator-shafts which project through the stuffing-boxes in the tank a, as shown in Fig. 2.

Referring to Fig. 3, showing a modification of the apparatus, the tank a has an extra or third compartment o between the compartments b and c. This compartment o communicates at its upper end with the upper end of the heating-compartment c and at its lower end with the lower end of the compartment b, constituting, in effect, an extension of the warming and cooling compartments. In this form of the apparatus the partition in compartment b is omitted and agitators i are provided to produce or accelerate circulation of the liquid and distribute the heat. The compartment o is or may be also provided with agitators. In other respects the apparatus is like that shown in Figs. 1 and 2.

Referring to Fig. 4, the warming and cooling and the heating or pasteurizing compartments b and c are entirely separate from each other and are open at the top, the conveyer passing over suitably-located sprocket-wheels from the top of one to the top of the other. The compartment or tank b is in this case made larger horizontally to accommodate the two extra runs of the conveyer, but is not as high as it is shown in Figs. 1 and 3. In other respects the apparatus is essentially like that shown in the preceding figures.

Referring to Fig. 5, the warming and cooling and the heating compartments b and c are, as in Fig. 4, entirely separate from each other and are open at the top, but in this case they are arranged horizontally instead of vertically, and the sprocket-wheels by which the conveyer chains or belts are guided are arranged to carry the trays or holders e horizontally in opposite directions through the liquid in each of said compartments.

In the operation of each of the several forms of apparatus herein shown and described it will be apparent that the heat given off by the outgoing material is taken up by the liquid and transferred to the cool incoming material, the temperature of which is thereby gradually raised by heat which would otherwise be lost. The cool incoming material absorbing heat from the liquid through which the outgoing material passes cools the outgoing material to the desired temperature. The material being carried by the conveyer through the heating compartment or tank in opposite directions tends to distribute the heat and to maintain an approximately uniform temperature therein, the temperature being governed and regulated by the admission of more or less steam into said compartment through the pipes h. The proper distribution and application of the heat to gradually raise the incoming material to a pasteurizing temperature, to maintain it for a certain period at that temperature and then gradually cool it, is most advantageously effected without loss either of heat or of water or other liquid by the counter-currents produced by oppositely-moving portions of the conveyer in the several compartments of the apparatus, aided if necessary or desired by the agitators i, the paddle-wheel k, as shown in Fig. 1, or other means.

The gradual change effected by my improved apparatus in the temperature of the material as it is heated to and cooled from a pasteurizing temperature avoids to a great extent the breaking of bottles or other fragile receptacles and consequent loss resulting from too abrupt change of temperature.

It will be observed that the apparatus may be arranged so as to occupy little available floor-space. For instance, with the forms shown in Figs. 1, 2, and 3 only the upper end of the compartment b need extend above the working floor, and with the forms shown in Figs. 4 and 5 only that portion of the conveyer passing over the upper sprocket-wheels from and into the warming and cooling compartment or tank b need extend above the working floor.

Various changes in details of construction and arrangement of parts may be made within the spirit and intended scope of the invention.

I claim—

1. In pasteurizing apparatus the combination of a heating-receptacle adapted to contain a liquid, means for heating the liquid contained in said receptacle, a warming and cooling receptacle also adapted to contain a liquid, and an endless conveyer arranged to travel through the liquid contained in said warming and cooling receptacle, thence through said heating-receptacle and thence back through the liquid in said warming and cooling receptacle in an opposite direction, whereby heat is transferred by the liquid from the outgoing to the ingoing material carried by said conveyer, the ingoing material is gradually heated and the outgoing material is gradually cooled, substantially as described.

2. In pasteurizing apparatus the combination of a heating-receptacle, a receiving and delivering receptacle divided into warming and cooling compartments, an endless conveyer arranged to travel through said warming-compartment, thence through said heating-receptacle and thence through said cooling-compartment, and means for heating the liquid in said heating-receptacle, substantially as described.

3. In pasteurizing apparatus the combination of a heating-receptacle, a receiving and delivering receptacle divided into warming and cooling compartments, an endless conveyer arranged to travel through said warming-com-

partment, thence through said heating-receptacle and thence through said cooling-compartment, means for heating the liquid in said heating-receptacle, and means for producing a circulation of the liquid through the warming and cooling compartments in a direction opposite to the travel of the conveyer, substantially as described.

4. In pasteurizing apparatus the combination of a vertically-disposed closed heating-tank adapted to contain a liquid, a vertically-disposed warming and cooling receptacle provided above said heating-tank with a feed and discharge opening and communicating below said opening with said heating-tank, and an endless conveyer arranged to travel in opposite directions through said warming and cooling receptacle and through said heating-tank, and means for heating the liquid in the heating-tank, substantially as described.

5. In pasteurizing apparatus the combination of a receptacle, having a warming and cooling compartment adapted to contain a liquid and a pasteurizing-compartment communicating with the warming and cooling compartment and also adapted to contain a liquid, means for heating the liquid in said pasteurizing-compartment, and an endless conveyer arranged to travel through the liquid contained in said warming and cooling compartment, thence through said pasteurizing-compartment and thence back through the liquid in said warming and cooling compartment in an opposite direction, substantially as described.

6. In a pasteurizing apparatus the combination of a warming and cooling tank, adapted to contain a liquid, a pasteurizing-tank also adapted to contain a liquid, means for heating the liquid of said pasteurizing-tank, and a conveyer arranged to carry the article to be pasteurized through the liquid of said warming and cooling tank, thence through the liquid of said pasteurizing-tank, thence back through the liquid of said warming and cooling tank.

In witness whereof I hereto affix my signature in presence of two witnesses.

WILLIAM CLASMANN.

Witnesses:

CHAS. L. GOSS,
ALICE E. GOSS.

August, 1904

767,960

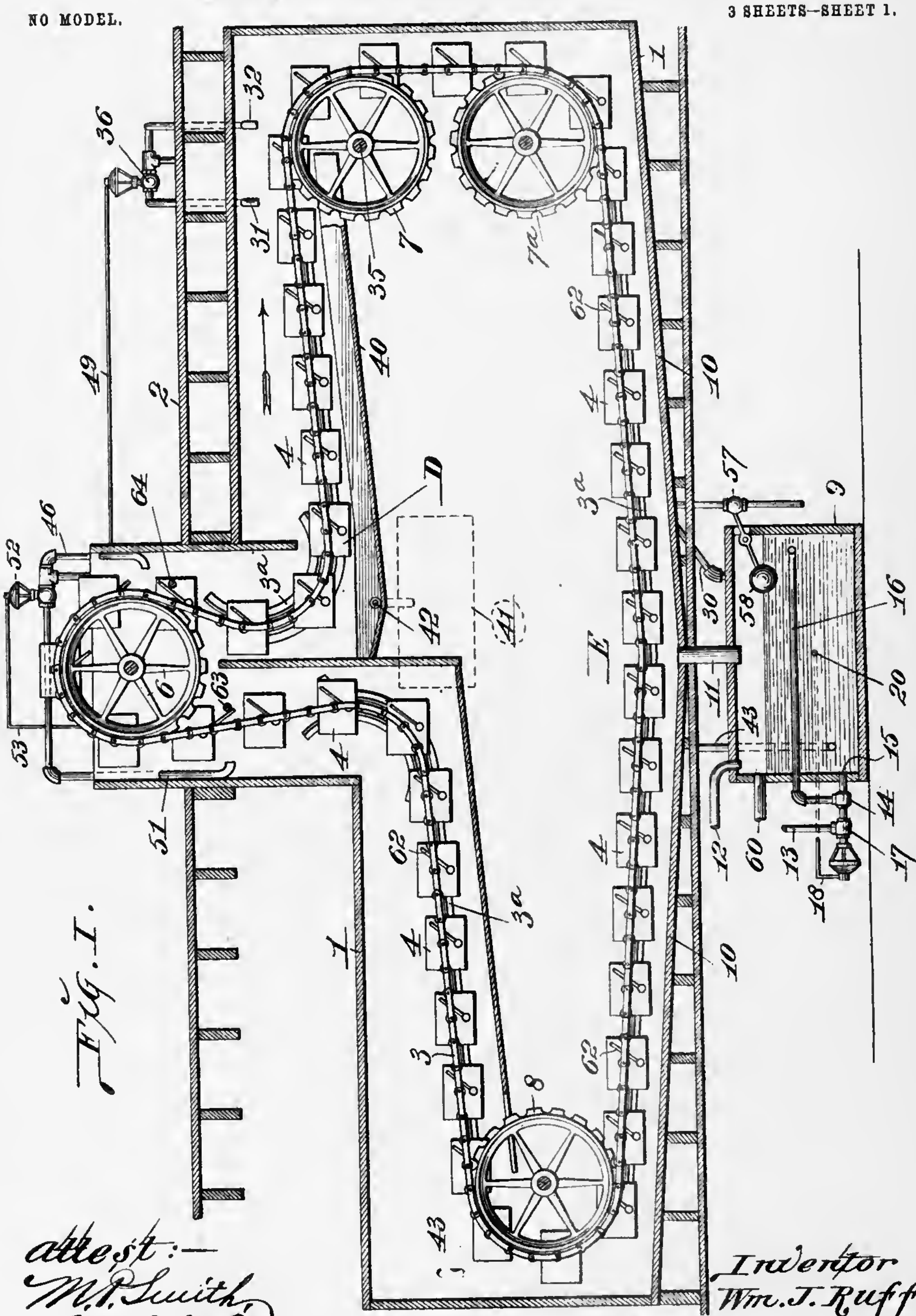
No. 767,960. PATENTED AUG. 16, 1904.

W. J. RUFF.

PASTEURIZER.

APPLICATION FILED FEB. 13, 1903. RENEWED DEC. 16, 1903.

NO MODEL. 3 SHEETS—SHEET 1.



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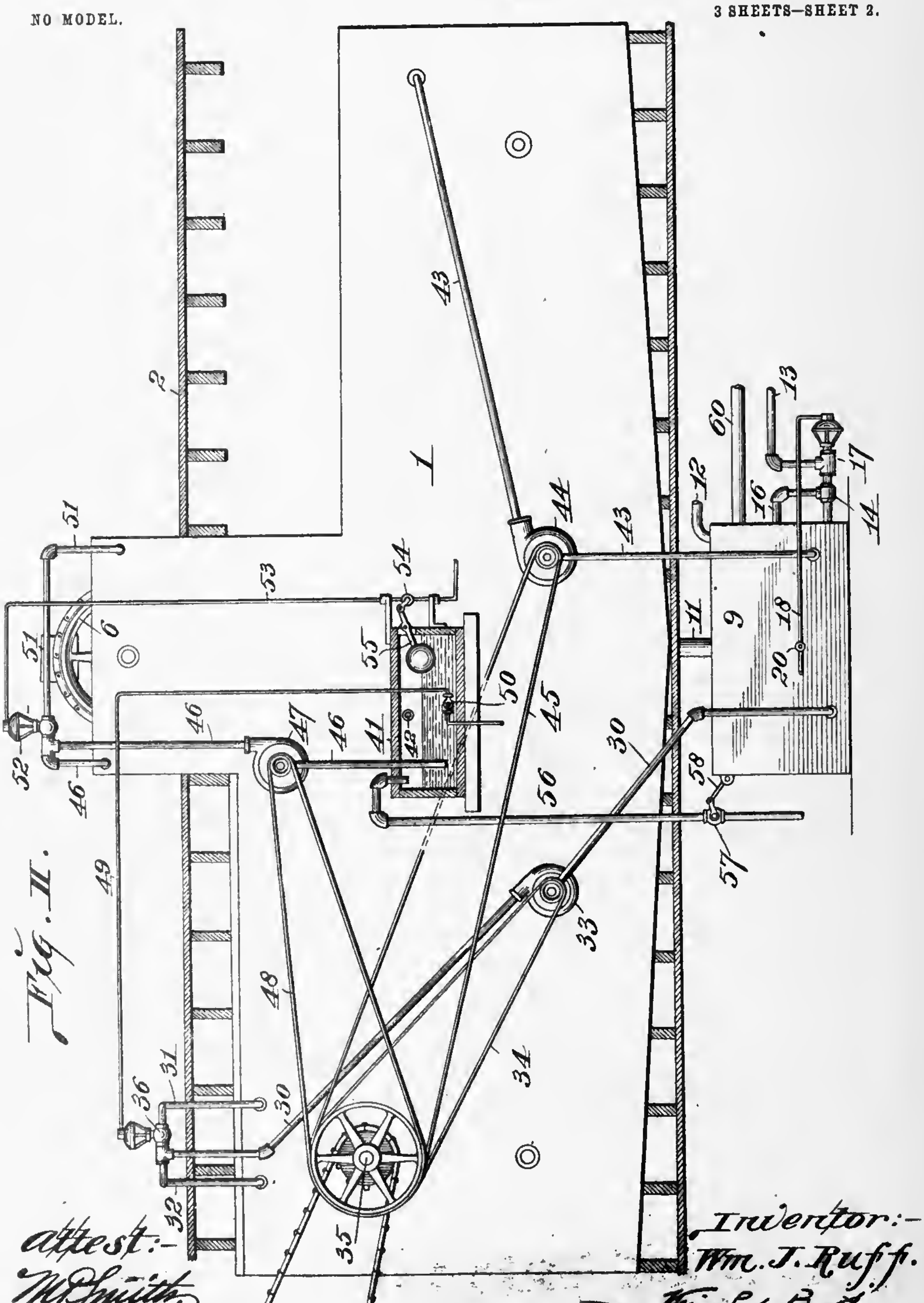
No. 767,960. PATENTED AUG. 16, 1904.

W. J. RUFF.

PASTEURIZER.

APPLICATION FILED FEB. 13, 1903. RENEWED DEC. 16, 1903.

NO MODEL. 3 SHEETS—SHEET 2.



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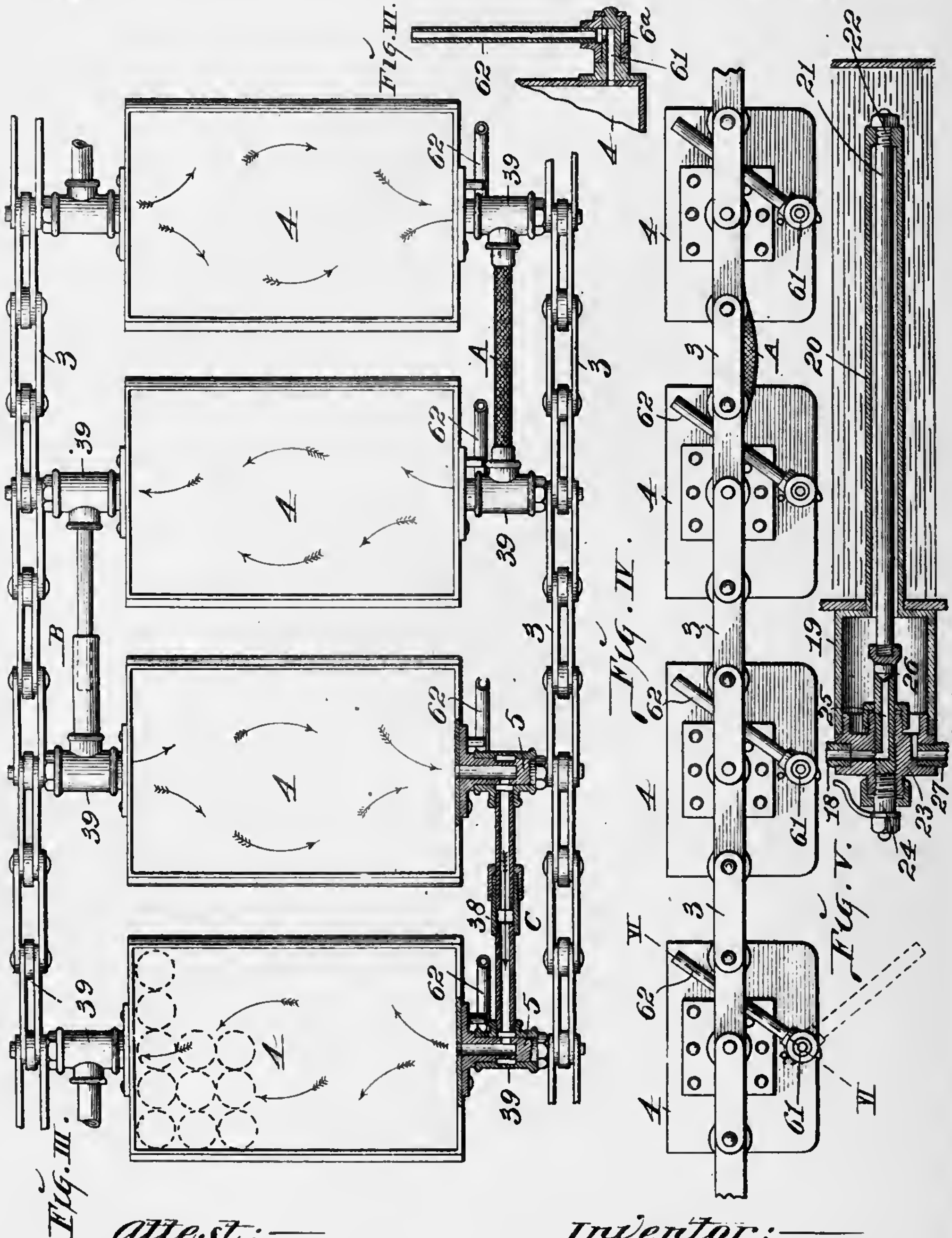
No. 767,960. PATENTED AUG. 16, 1904.

W. J. RUFF.

PASTEURIZER.

APPLICATION FILED FEB. 13, 1903. RENEWED DEC. 16, 1903.

NO MODEL. 3 SHEETS—SHEET 3



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No. 767,960. Patented August 16, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM J. RUFF, OF QUINCY, ILLINOIS.

PASTEURIZER.

SPECIFICATION forming part of Letters Patent No. 767,960, dated August 16, 1904.

Application filed February 13, 1903. Renewed December 16, 1903. Serial No. 185,447. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. RUFF, a citizen of the United States, residing in Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Pasteurizers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My present invention relates to an apparatus for pasteurizing beer, one of the principal objects of my invention being to simplify the construction and cheapen the cost of the apparatus, as well as improving its efficiency, by dispensing with a tank through which the bottles of beer are carried to expose them to the different temperatures—to wit, in first attemperating the beer, then heating it to the maximum temperature, and finally cooling it to approximately atmospheric temperature.

My invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a side elevation of my improved pasteurizer, the housing, drip-trough, and main supply-tank being shown in vertical section. Fig. II is a side elevation showing the auxiliary supply-tank in vertical section. Fig. III is an enlarged detail top or plan view, part in section. Fig. IV is an enlarged detail side elevation. Fig. V is an enlarged longitudinal section showing one of the regulators. Fig. VI is a detail section taken on line VI VI, Fig. IV.

Referring to the drawings, 1 represents a housing, that may be of any desired construction and which is preferably located beneath the floor 2 of a building. This housing is not indispensable; but I prefer to use it for the purpose of inclosing the working parts and protecting them from view and air-currents.

3 represents a pair of endless chains between which baskets or receptacles 4 are supported, preferably by means of stems or trunnions 5 projecting from the ends of the baskets, as shown in Fig. III. The baskets are adapted to receive the bottles of beer to be pasteurized, and they, with the chains, form the endless carrier of the apparatus. The chains pass over a pair of upper sprocket-wheels 6, behind a set of sprocket-wheels 7 7ª at one end of the machine, and behind a pair of sprocket-wheels 8 at the other end of the machine, the sprocket-wheels being secured to shafts suitably journaled in the housing 1 or other support.

3ª represents guide-rails for directing the movement of the chains.

9 represents a main water-supply tank that communicates with a drip-floor 10 through means of a pipe 11, the floor being inclined upwardly in both directions from the center of the machine, as shown in Fig. I. The tank 9 is initially supplied with water through means of a pipe 12, and the water in this tank is heated and maintained at the proper temperature for pasteurizing—say 148° Fahrenheit—through means of steam admitted to the tank through a pipe 13 and a jet-pump 14, such as is shown in Fig. VI of my Patent No. 607,770, dated July 19, 1898. The jet-pump connects with the tank through means of a lower pipe 15 and an upper pipe 16, the latter preferably extending a considerable distance across the tank, so that when the pump is working there will be a circulation of water from the upper part of the tank through the pump and into the lower part of the tank.

17 represents a diaphragm-valve such as is shown in Fig. VII of my Patent No. 701,622, dated June 3, 1902, in the pipe 15 outwardly beyond the pump 14. In order that this valve 17 may be automatically controlled to maintain a constant temperature of the water in the tank 9, I provide the regulator shown in Fig. V. The regulator connects with the diaphragm of the valve 17 by means of a pipe 18. The regulator consists of a cylinder 19, secured to the wall of the tank 9 and having a tube 20, that extends into the tank. Within the tube 20 is a thermostatic bar or rod 21, the inner end of which is made fast to the end of the tube, as shown at 22, Fig. V. In the outer end of the cylinder 19 is fitted a plug 23, into which is tapped a stem 24, having a port 25, that communicates with the pipe 18. The inner end of the stem 24 forms the seat for a valve 26 on the outer end of the thermostatic rod 21.

27 is a compressed-air pipe tapped into the

plug 23 and which communicates with the interior of the cylinder 19. When the temperature in the tank 9 falls below a given point—say 148° Fahrenheit—the bar 21 will contract and open the valve 26. Compressed air will then pass through the pipe 27, (which is connected to a suitable compressed-air tank, not shown,) through the stem 24, and through the pipe 18 to the diaphragm-valve 17, thus causing the valve to be opened and starting up the jet-pump by the passage of steam through the pipe 13. When the temperature in the tank 9 is restored, the bar 21 will expand, closing the valve 26, thus stopping the action of the pump by shutting off the steam in the pipe 13. The stem 24 may be turned to adjust it inwardly or outwardly, so that the valve 26 will close sooner or later, thus enabling the operator to provide for the exact temperature desired in the tank 9.

I make no claim as inventor to the construction of the regulator which I have described, and any desired form of regulator may be used.

30 represents a pipe communicating with the supply-tank 9 and which extends to one of the upper corners of the machine, where it is provided with branches 31 and 32, that are located over the bottle-carrier, as shown in Fig. I. In the pipe 30 is a rotary pump 33 of any ordinary well-known construction, driven by a belt 34 from a pulley on a driving-shaft 35. When the machine is in operation, the pump 33 operates continuously and conducts water from the supply-tank 9 through the branch 32, from which it flows into the passing baskets of the carrier. A portion of the water passing through the pipe 30 escapes through the branch 31 of the pipe except when this branch is closed by an automatic diaphragm-valve 36, that corresponds in construction and operation to the valve 17. Water escaping through the branch 31 is deposited in the passing baskets of the carrier. It will be noted that the carrier moves in an upwardly direction toward the wheel 7 and as it leaves the wheel moves in a downwardly direction. The branch 31 of the pipe 30 deposits water into the baskets on the advance side of the wheel 7, and the branch 32 deposits water into the baskets on the other or retreating side of the wheel 7. The stems or trunnions 5 of the baskets are made hollow, as shown in Fig. III, and they are connected together by means of flexible pipes 38 and loose sleeves 39, the sleeves fitting loosely on the trunnions, so as to be free to turn as the carrier passes around the sprocket-wheels. The pipes may either be made of flexible tubing, as shown at A, Fig. III, or may be made of plain telescoping sections, as shown at B, or may be made of sections joined by a stuffing-box union, as shown at C. The trunnions of the baskets are connected together alternately at opposite ends of the baskets, as shown, so that water entering one end of each basket passes across the same and leaves at the other end, thereby producing a circulation of water through the baskets. As the water enters the baskets through the branch 31 of the pipe 30 it circulates through the baskets, passing from one to another until it reaches the lowest point, which is at D, Fig. I, and will here overflow into a catch-basin 40, from which it passes to the auxiliary tank 41 through a pipe 42, and the water entering the baskets through the branch 32 circulates from one basket to the next until it reaches the lowest point in the underrunning part of the carrier, which is at E, Fig. I, and here the water overflows onto the inclined floor 10, from where it passes into the supply-tank 9 through the pipe 11. It will thus be seen that while the bottles are passing from the wheels 7 to the point E there is a flow of water of the maximum temperature of 148° constantly circulated around them, and to prolong this period of exposure of the beer in the bottles to the maximum temperature I provide another pipe 43, that extends from the tank 9 to a point at the rear of the wheels 8. This pipe is provided with a rotary pump 44, driven from the shaft 35 by a belt 45. The pipe 43 deposits water into the baskets, and this water circulates from one basket to another to the point E, where it overflows and passes back into the tank 9.

Extending from the auxiliary tank 41 to a point near the supporting-wheel 6 of the carrier is a pipe 46, provided with a rotary pump 47, driven from the shaft 35 by a belt 48. This pipe deposits water from the tank 41 into the baskets as they descend from the supporting-wheel 6, and the water passes from one basket to another until it reaches the low point D of the carrier, where it overflows into the catch-basin 40 and passes back into the tank 41 through the pipe 42. This water provides for the initial warming of the beer, and it is maintained at the desired temperature by means of water passing from the tank 9 into the baskets through the branch pipe 31, which, as stated, passes from one basket to another until it reaches the point D, where it overflows into the catch-basin and enters the tank 41. For automatically controlling the passage of water through the branch pipe 31 I provide the diaphragm-valve 36, which is connected by a pipe 49 to a regulator 50, located in the tank 41. The construction and operation of this regulator is the same as that shown in Fig. V, of which a description has been given. It will thus be seen that the temperature of the water in the tank 41 is utilized to control the valve 36 and admit water from the maximum hot-water-supply tank 9 to regulate the heat of the attemperating or warming water in the tank 41.

For the purpose of cooling the bottles of beer while the carrier is passing from the wheels 8 to the wheels 6 I provide the pipe

46 with a branch 51, that terminates at a point near the wheels 6 on the opposite side of the wheels to the point where the attemperating-water is discharged into the baskets, as seen in Fig. I. This water circulates from one basket to another and cools off the beer in the bottles. It overflows from the baskets at about the location of the wheels 8 as it is caused to back up by the flow of water from pipe 43 into the baskets. The pipe 51 is provided with a diaphragm-valve 52 of the same construction and operation as the valves 18 and 36. With this diaphragm-valve connects a compressed-air pipe 53, provided with a valve 54, connected to a float 55, located in the tank 41. When the water rises in the tank 41 after the machine has been started in operation, the float opens the valve 54 and compressed air passes to and opens the valve 52 in the pipe 51, thus permitting a flow of water through the latter pipe for cooling the beer.

It is apparent that when the use of the machine is to be temporarily stopped or stopped for the time being and it is desired to remove all of the bottles from the baskets there will be less water escaping from the baskets at the point E than when the machine is in full operation, this difference being equal to the amount of displacement caused by the introduction of fresh bottles into the baskets, which has now been stopped or discontinued owing to the fact that it is desired to empty the machine. This diminished flow of water into the tank 9 must be compensated for, for the reason that the use of cooling-water is required for some time after the insertion of bottles into the baskets has been discontinued. To compensate for this diminished flow of water, I employ a pipe 56, connected with a water-main or other source of supply and which is provided with a valve 57, connected to a float 58, located in the tank 9. When the machine is in full operation, this float is held in its raised position and keeps the valve 57 closed. When the flow of water from the baskets into the tank 9 is diminished by no more bottles being placed in the baskets, the falling of the water in the tank 9 allows the float 58 to drop and open the valve 57, whereupon a flow of water passes through the pipe 56 into the tank 41, thereby keeping up a supply of water in tank 41 for cooling purposes.

60 represents an overflow-pipe through which water can pass from the tank 9 and prevent the overcharging of the tank in case this condition should be likely to arise.

It is desirable to have the baskets drained of water at the time that they reach the point where the bottles are taken from the baskets. To accomplish this, I provide each basket with a hollow stem 61 (see Fig. VI) near its bottom, upon which fits a sleeve 6ª, carrying a short pipe 62. Just before the baskets reach the wheels 6 these pipes come against a stationary stop 63, (see Fig. I,) causing them to be turned from an upwardly-inclined to a downwardly-inclined position, so that the water will drain from the baskets through the pipes and fall upon the inclined floor 10, from where it passes back into the tank 9 to be reused. As the baskets pass over the wheels 6 they are emptied and refilled with bottles, and as they are passing to a point beneath the pipe 46 the pipes 62 come against another stationary stop 64 and are moved from a downwardly to an upwardly inclined position, thus shutting off the escape of water from the baskets.

It will be seen from the foregoing that the bottles of beer are subjected to the action of attemperating-water from the point where the pipe 46 discharges to the point D of low elevation and on up to the point where the carrier passes around the wheels 7, and from here on the bottles are subjected to the maximum temperature until they reach the back of wheels 8, and from there on to the pipe 51 they are subjected to the action of the cooling-water discharging from pipe 51. The bottles are removed from the baskets with the beer fully pasteurized at the side of the machine where the pipe 51 is located, and fresh bottles are placed in the baskets on the side of the wheels 6 where the pipe 46 is located.

By a machine thus constructed the beer is attemperated, pasteurized, and cooled down without the use of any tank and by the use of water circulating from basket to basket while the carrier is moving to bring the respective baskets from the receiving to the discharge side of the wheels 6.

I claim as my invention—

1. In a pasteurizer, the combination of a single tank for holding attemperating and cooling water, a pump for conducting water from said tank, a pipe connected to said pump for attemperating the beer, another pipe connected to said pump for cooling the beer, a tank for holding water of maximum temperature, a pump for conducting water from the last-mentioned tank through a pipe, and a carrier for moving the bottles past the discharge ends of said pipes to receive water therefrom, substantially as set forth.

2. In a pasteurizer, the combination of a single tank for holding attemperating and cooling water, a pump for conducting water from said tank through a pipe for attemperating the beer and through another pipe for cooling the beer, a tank for holding water of maximum temperature, a pump communicating with the last-mentioned tank for conducting water therefrom through a pipe located over the first-mentioned pipe, diaphragm-valves located in said pipes, a regulator located in the first-mentioned tank and which is adapted to control the flow of water through both of said pipes, and a carrier for moving the bottles past the discharge ends of said pipes to receive water therefrom.

3. In a pasteurizer, the combination of a

single tank for holding attemperating and cooling water, a tank for holding water of maximum temperature, a pump communicating with each of said tanks, pipes communicating with said pumps for conducting water from said tanks to attemperate, pasteurize and cool the beer, and a carrier for moving the bottles past the discharge ends of said pipes to receive the water therefrom.

4. In a pasteurizer, the combination of a single tank for holding attemperating and cooling water, a pump for conducting water from said tank through a pipe for attemperating the beer and through another pipe for cooling the beer, a tank for holding water of maximum temperature, a pump for conducting water from said tank through a pipe provided with a series of nozzles, and a carrier for moving the bottles past the discharge ends of said pipes to receive the water therefrom, whereby the beer is attemperated, pasteurized and cooled without having to be passed through a tank containing liquid to effect the different temperatures, substantially as set forth.

5. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, and means for discharging water into said baskets; said baskets being connected together so that the water will pass from one to another to a point of lower travel of the carrier, substantially as set forth.

6. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pastuerized, means for discharging attemperating-water into said baskets, and means for discharging water of maximum temperature into said baskets; said baskets being connected together so that the water will pass from one to another, substantially as and for the purpose set forth.

7. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, means for discharging attemperating-water into said baskets at a point beneath which the carrier moves in a downwardly direction, and means for discharging water of maximum temperature into said baskets at a point to which the carrier moves in an upwardly direction and from which it moves in a downwardly direction; said baskets being connected together so that the water passes from one to another to points of lowest travel of the carrier, substantially as set forth.

8. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, means for discharging attemperating-water into said baskets at a point from which the carrier moves in a downwardly direction, means for discharging water of maximum temperature into said baskets at a point toward which the carrier moves in an upwardly direction and from which it moves in a downwardly direction, and flexible tubes forming communication between said baskets so that the water will pass from one to another, substantially as and for the purpose set forth.

9. In a pasteurizer, the combination of a traveling carrier having baskets adapted to receive the bottles of beer to be pasteurized, means for discharging attemperating-water into said baskets at a point from which the carrier moves in a downwardly direction, and means for discharging water of maximum temperature into said baskets at another point from which the carrier moves in a downwardly direction; said baskets being connected together so that the water will pass from one to another, substantially as set forth.

10. In a pasteurizer, the combination of a traveling carrier having baskets adapted to receive the bottles of beer to be pasteurized, and means for discharging water of maximum temperature into said baskets at a point from which the carrier moves in a downwardly direction; said baskets being connected together alternately at opposite ends so that the water will circulate through said baskets and pass from one to another, substantially as set forth.

11. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, means for discharging water of maximum temperature into said baskets at a point from which the carrier moves in a downwardly direction, and flexible tubes connecting said baskets together alternately at opposite ends so that the water will circulate through said baskets from one to another to the point of lowest travel of the carrier, substantially as set forth.

12. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, means for discharging attemperating-water into said baskets at a point from which the carrier moves in a downwardly direction, means for discharging water of maximum temperature into said baskets at a point toward which the carrier moves in an upwardly direction and from which it moves in a downwardly direction, and a catch-basin located between said two points of water-discharge; said baskets being connected together so that water will pass from one to another, substantially as set forth.

13. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, means for discharging attemperating-water into said baskets at a point from which the carrier moves in a downwardly direction, means for discharging water into said baskets at a point toward which the carrier moves in an upwardly direction and from which it moves in a downwardly direction, a catch-basin located between said two points of water-discharge, an

inclined floor beneath said carrier, and a tank communicating with said inclined floor; said baskets being connected together so that the water will pass from one to another to the point of lowest travel of the carrier, substantially as set forth.

14. In a pasteurizer, the combination of a traveling carrier having baskets adapted to receive the bottles of beer to be pasteurized, an inclined floor located beneath said carrier, a tank communicating with said floor, means for heating the water in said tank, and means for conducting the water from said tank and discharging it into the baskets at a point from which the carrier moves in a downwardly direction; said baskets being connected together so that the water will pass from one to another to the point of lowest travel of the carrier, substantially as set forth.

15. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, a supply-tank, means for heating water in the supply-tank, and means for conducting water from said tank and discharging it into said baskets at a point from which the carrier moves in a downwardly direction; said baskets being connected together so that the water will pass from one to another, substantially as set forth.

16. In a pasteurizer, the combination of a traveling carrier having baskets adapted to receive the bottles of beer to be pasteurized, a supply-tank, means for heating water in the tank, means for conducting water from the tank and discharging it into said baskets at one end of the machine at a point from which the carrier moves in a downwardly direction, and means for conducting water from the tank and discharging it into the baskets at a point toward which the carrier moves in an upwardly direction; said baskets being connected together so that the water will pass from one to another to the point of lowest travel of the carrier, substantially as set forth.

17. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, a supply-tank provided with means for heating the water, a pipe for conducting the water from said tank and which is provided with branches, one of which discharges water into the baskets at a point from which the carrier moves in a downwardly direction and the other of which discharges water into the baskets at a point toward which the carrier moves in an upwardly direction; said baskets being connected together so that the water will pass from one to another, substantially as set forth.

18. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, means for discharging attemperating-water into said baskets at a point from which the carrier moves in a downwardly direction, connections between said baskets whereby the water is allowed to pass from one to another to a point from which the carrier moves in an upwardly direction where it overflows, a tank adapted to receive the overflow water, a pipe for discharging water of maximum temperature into said baskets at a point toward which the carrier moves in an upwardly direction, a diaphragm-valve located in said pipe, and a temperature-regulator located in said tank and adapted to control said valve, substantially as and for the purpose set forth.

19. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, an auxiliary tank, a pipe adapted to conduct attemperating-water from said tank and deposit it into the baskets at a point from which the carrier moves in a downwardly direction, a supply-tank provided with means for heating the water to a maximum temperature, a pipe for conducting water from the last-mentioned tank and depositing it into the baskets at a point toward which the carrier moves in an upwardly direction, a diaphragm-valve located in the last-mentioned pipe, and a regulator located in said auxiliary tank, and which is adapted to operate said valve; said baskets being connected together so that the water will pass from one to another to the point of lowest travel of said carrier between said two points of water-discharge, where it overflows and passes to said auxiliary tank, substantially as set forth.

20. In a pasteurizer, the combination of a traveling carrier having baskets adapted to receive the bottles of beer to be pasteurized, an auxiliary tank, and means for conducting water from said tank and discharging it into said baskets on the receiving side of the machine to attemperate the beer and on the discharge side of the machine for cooling the beer; said baskets being connected together so that the water will pass from one to another, substantially as set forth.

21. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, an auxiliary tank, a pipe for conducting water from said tank and discharging it on the receiving side of the machine to attemperate the beer and on the discharge side of the machine for cooling the beer, a diaphragm-valve located in the branch of the pipe that leads to the discharge side of the machine, a float in said tank, and a compressed-air pipe connecting with said diaphragm-valve and which is provided with a valve adapted to be operated by said float; said baskets being connected together so that the water will pass from one to another, substantially as and for the purpose set forth.

22. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, means for discharging attemperating-water into said bas-

kets at a point from which the carrier moves in a downwardly direction, means for discharging water of maximum temperatnre into said baskets at a point from which the carrier moves in a downwardly direction, and means for discharging cooling-water into said baskets at a point toward which the carrier moves in an upwardly direction; said baskets being connected together so that the water will pass from one to another, substantially as set forth.

23. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, means for discharging attemperating-water into said baskets at a point from which the carrier moves in a downwardly direction, means for discharging water of maximum temperature into said baskets at a point from which the carrier moves in a downwardly direction, means for discharging water of maximum temperature into said baskets at a point toward which the carrier moves in an upwardly direction, and means for discharging cooling-water into said baskets at a point toward which the carrier moves in an upwardly direction; said baskets being connected together so that the water will pass from one to another substantially as set forth.

24. In a pasteurizer, the combination of a traveling carrier having baskets adapted to receive the bottles of beer to be pasteurized, a supply-tank, an auxiliary tank, means for conducting water of maximum temperature from said supply-tank and discharging it into said baskets at a point from which the carrier moves in a downwardly direction, means for conducting cooling-water from said auxiliary tank and discharging it into the baskets at a point toward which the carrier moves in an upwardly direction, a water-pipe 56 communicating with said auxiliary tank, and a float located in said supply-tank and connected to a valve in said water-pipe to open said valve when the water in the supply-tank falls beneath its normal level; said baskets being connected together so that the water will pass from one to another, substantially as set forth.

25. In a pasteurizer, the combination of a traveling carrier having baskets to receive the bottles of beer to be pasteurized, means for discharging water of maximum temperature into said baskets at a point from which the carrier moves in a downwardly direction, means for connecting the baskets together so that the water will pass from one to another, and for emptying said baskets consisting of pipes communicating with the lower parts of the baskets adapted to engage stops on the delivery side of the machine to drain the baskets and on the receiving side of the machine to close the baskets, substantially as set forth.

26. In a pasteurizer, the combination of a series of bottle-receptacles, means for discharging water into the receptacles and means for moving the bottle-receptacles past the point of water-discharge; said receptacles being connected together so that water will pass from one to another to effect respectively the attemperating, maximum heating, and cooling of the beer, substantially as set forth.

WILLIAM J. RUFF.

In presence of—
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FRANK A. LUBBE.

No. 767,961. PATENTED AUG. 16, 1904.

W. J. RUFF.

PASTEURIZER.

APPLICATION FILED APR. 24, 1903. RENEWED DEC. 16, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

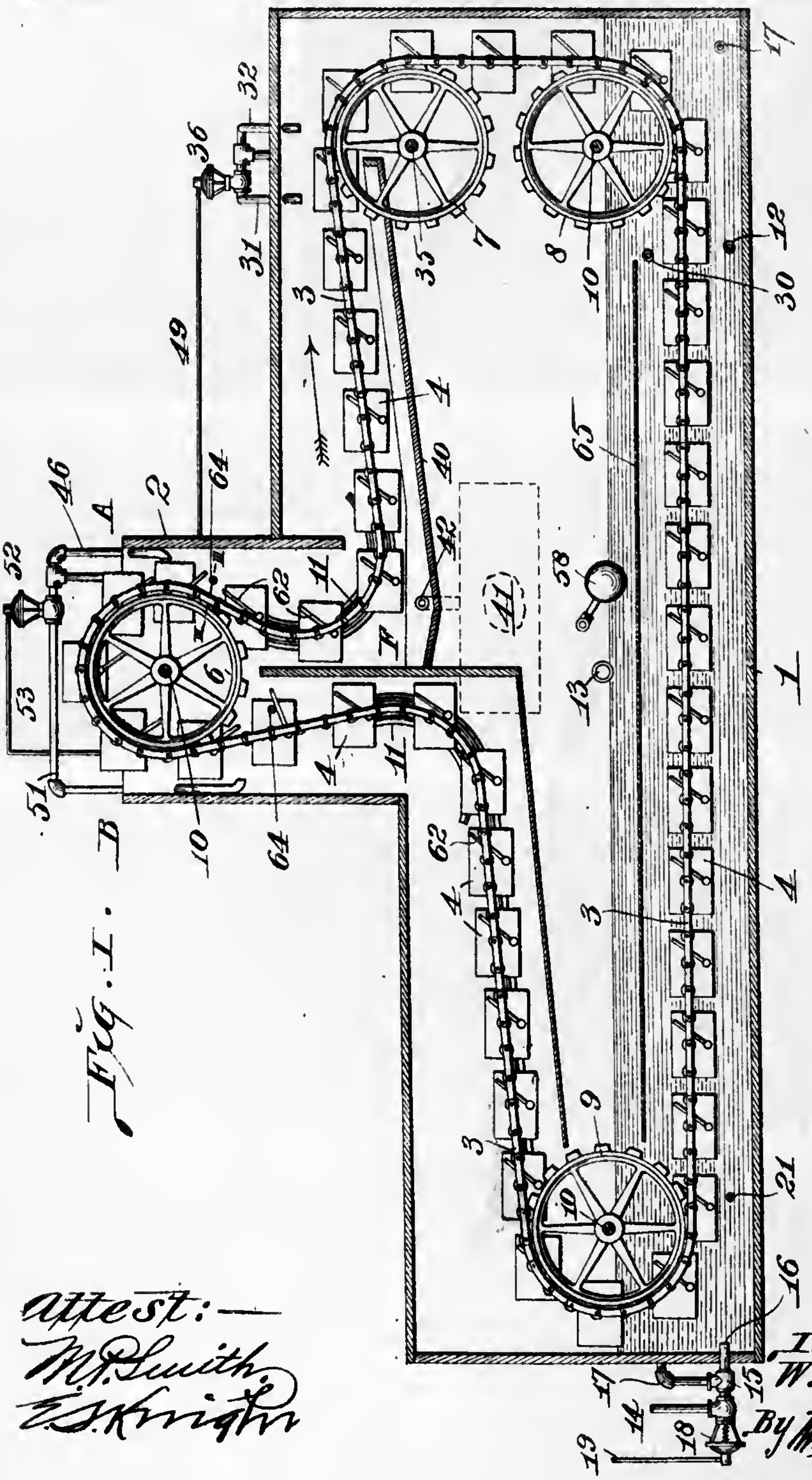

Fig. 1.

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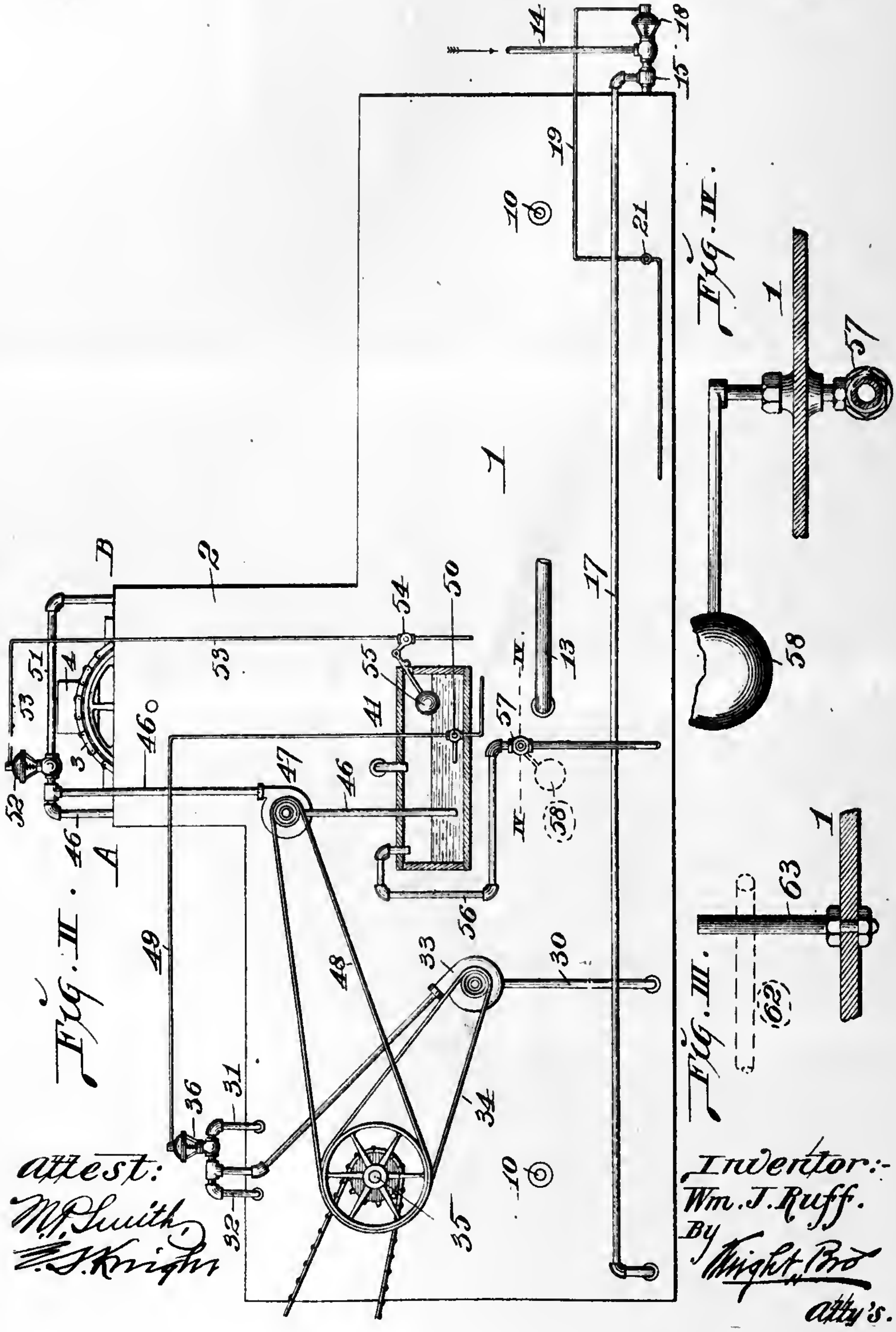
APPLICATION FILED APR. 24, 1903. RENEWED DEC. 16, 1903.

NO MODEL. 3 SHEETS—SHEET 2.



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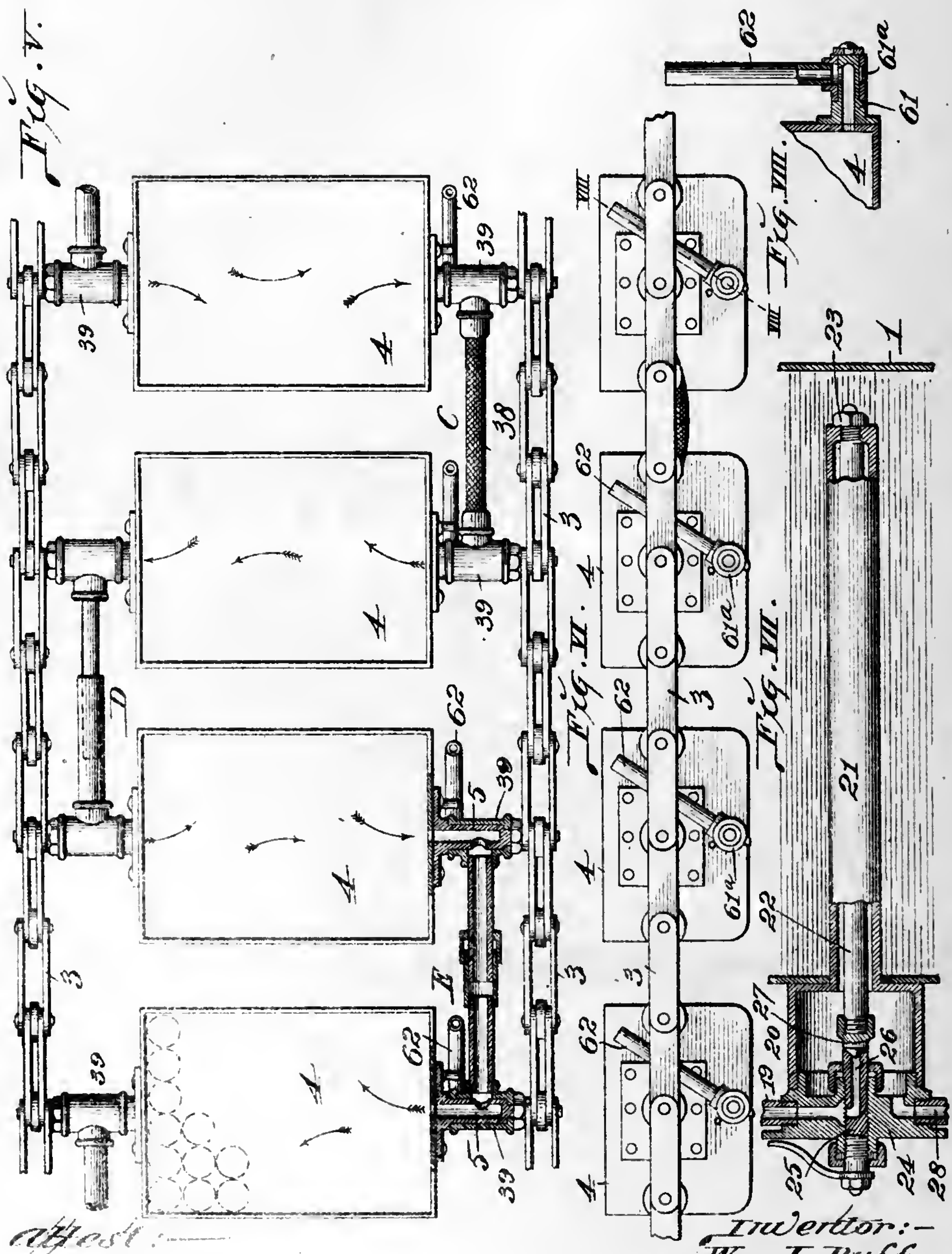
APPLICATION FILED APR. 24, 1903. RENEWED DEC. 16, 1903.

NO MODEL. 3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

WILLIAM J. RUFF, OF QUINCY, ILLINOIS.

PASTEURIZER.

SPECIFICATION forming part of Letters Patent No. 767,961, dated August 16, 1904.

Application filed April 24, 1903. Renewed December 16, 1903. Serial No. 185,448. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. RUFF, a citizen of the United States, residing in Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Pasteurizers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

The object of my present invention is to produce a pasteurizer wherein the bottles of beer are submerged in a water-bath during the time that they are subjected to the maximum temperature, while the preliminary heating and final cooling of the beer is effected without having the bottles submerged in the bath, the result being that a comparatively small amount of water is necessary to accomplish the work of pasteurization.

My invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a side elevation illustrating my invention, the tank being shown in vertical section. Fig. II is a side elevation, the auxiliary tank being shown in vertical section. Fig. III is an enlarged detail section taken on line III III, Fig. I, and illustrating one of the stop-arms that act to turn the drain-pipes of the baskets or receptacles. Fig. IV is an enlarged detail section taken on line IV IV, Fig. II. Fig. V is an enlarged detail top view, part in section, showing a portion of the endless carrier. Fig. VI is a detail side view of the carrier. Fig. VII is an enlarged longitudinal section showing one of the regulators. Fig. VIII is a section taken on line VIII VIII, Fig. VI, and showing part of one of the baskets or receptacles and its drain-pipe.

In all pasteurizers it is necessary to attemperate or warm the beer before it is submitted to the maximum temperature, and it is also necessary to cool the bottles off after they leave the maximum temperature before they are subjected to the outside atmosphere.

The object of my invention is to construct a machine wherein the bottles are submerged in a bath of maximum temperature, while the preliminary heating is effected before the bottles enter this bath, and the final cooling is effected after the bottles leave this bath, the result being that a comparatively small amount of water is needed to effect the pasteurization of the beer.

Referring to the drawings, 1 represents a tank which may be of any desired size and which has a top extension, through which the carrier passes, to permit the bottles to be placed in their baskets or receptacles and to be removed therefrom, the bottles being inserted at A and removed from the carrier at B. The carrier consists of a pair of endless chains 3, between which the bottle-containing baskets or receptacles 4 are placed and to which the baskets are pivotally connected, preferably by means of stems or trunnions 5, that project from the ends of the baskets, as shown in Fig. V. The chains pass over a pair of upper sprocket-wheels 6 behind a set of sprocket-wheels 7 8 at one end of the machine and behind a pair of sprocket-wheels 9 at the other end of the machine, the sprocket-wheels being secured to shafts 10, suitably journaled in the tank 1.

11 represents guide-rails for directing the movement of the carrier.

The tank 1 is supplied with water of sufficient depth to cover the underrunning part of the carrier, as seen in Fig. I, the water being supplied through means of a pipe 12. 13 represents an overflow-pipe to be used in case of too much water being let into the tank. This water in the lower part of the tank 1 is heated and maintained at the proper maximum temperature for pasteurizing the beer (say at 148° Fahrenheit) through means of steam admitted to the tank through a pipe 14 and a jet-pump 15, such as is shown in Fig. VI of my Patent No. 607,776, dated July 19, 1898. The jet-pump connects with the tank through means of a lower pipe 16 and an upper pipe 17, the pipe 17 being preferably extended to the far end of the tank from the pump 15. When the pump is working, there will be a circulation of water from the upper part of the body of water in the tank through the pump and into the lower part of the body of water.

18 represents a diaphragm-valve (such as is shown in Fig. VII of my Patent No. 701,622,

dated June 3, 1902) in the pipe 16 outwardly beyond the pump 15. In order that this valve 18 may be automatically controlled to maintain a constant temperature of the water in the tank 1, I provide the regulator shown in Fig. VII. The regulator connects with the diaphragm of the valve 18 by means of a pipe 19. The regulator consists of a cylinder 20, secured to the wall of the tank 1 and having a tube 21, that extends into the tank. Within the tube 21 is a thermostatic bar or rod 22, the inner end of which is made fast to the end of the tube, as shown at 23, Fig. VII. In the outer end of the cylinder 20 is fitted a plug 24, into which is tapped a stem 25, having a part 26, that communicates with the pipe 19. The inner end of the stem 25 forms the seat of a valve 27 on the outer end of the thermostatic bar 22.

28 is a compressed-air pipe tapped into the plug 24 and which communicates with the interior of the cylinder 20. When the temperature in the tank 1 falls below a given point, (say 148° Fahrenheit,) the bar 22 will contract and open the valve 27. Compressed air will then pass through the pipe 28, which is connected to a suitable compressed-air tank (not shown) through the stem 25 and through the pipe 19 to the diaphragm-valve 18, thus causing the valve to be opened and starting up the jet-pump by the passage of steam through the pipe 14. When the temperature in the tank 1 is restored, the bar 22 will expand, closing the valve 27, thus stopping the action of the pump by shutting off the steam in the pipe 14. The stem 25 may be turned to adjust it inwardly or outwardly, so that the valve 27 will close sooner or later, thus enabling the operator to provide for the exact temperature desired in the tank 1.

I make no claim as inventor to the construction of the regulator which I have described, and any desired form of regulator may be used.

30 represents a pipe communicating with the tank 1 below the water-level and which extends to one of the upper corners of the machine, where it is provided with branches 31 32, that are located over the bottle-carrier, as shown in Fig. I. In the pipe 30 is a rotary pump 33 of any ordinary well-known construction, driven by a belt 34 from a pulley on a shaft 35. When the machine is in operation, the pump 33 operates continuously and conducts water from the lower part of tank 1 through the branch 32 of the pipe 30, from which it flows into the passing baskets of the carrier. A portion of the water passing through the pipe 30 escapes through the branch 31 of the pipe except when this branch is closed by an automatic diaphragm-valve 36, that corresponds in construction and operation to the valve 18. Water escaping through the branch 31 is deposited in the passing baskets of the carrier. It will be noted that the carrier moves in an upwardly direction toward the wheels 7 and as it leaves the wheels moves in a downwardly direction. The branch 31 of the pipe 30 deposits water into the baskets on the advance side of the wheels 7, and the branch 32 deposits water into the baskets on the other or retreating side of the wheels 7. The stems or trunnions of the baskets are made hollow, as shown in Fig. V, and they are connected together by means of flexible pipe 38 and loose sleeves 39, the sleeves fitting loosely on the trunnions, so as to be free to turn as the carrier passes around the sprocket-wheels. The pipes may either be made of flexible tubing, as shown at C, Fig. V, or be made of plain telescoping sections, as shown at D, or may be made of sections joined by a stuffing-box union, as shown at E. The trunnions of the baskets are connected together alternately at opposite ends of the baskets, as shown, so that the water entering one end of each basket passes across the same and leaves at the other end, thereby producing a circulation of water through the baskets. As the water enters the baskets through the branch 31 of the pipe 30 it circulates through the baskets, passing from one to another until it reaches the low point, which is at F, and will here overflow into a catch-basin 40, from which it passes to the auxiliary tank 41 through a pipe 42, and the water entering the baskets through the branch 32 circulates from one basket to the next until it reaches the lowest part in the underrunning part of the carrier, where it mingles with the water in the lower part of the tank 1. It will thus be seen that while the baskets are passing from the wheels 7 to the water-bath in the bottom of the tank the bottles therein are subjected to the action of hot water, which is constantly circulated around them, and while the baskets are passing through the bath they are all the time subjected to the water of maximum temperature, so that by the time the baskets reach the wheels 9 the beer has become thoroughly pasteurized. Extending from the auxiliary tank 41 to a point near the supporting-wheels 6 of the carrier is a pipe 46, provided with a rotary pump 47, driven from the shaft 35 by a belt 48. This pipe deposits water from the tank 41 into the baskets as they descend from the supporting-wheels 6, and the water passes from one basket to another until it reaches the low point F of the carrier, where it overflows into the catch-basin 40 and passes back into the tank 41 through the pipe 42. This water provides for the initial warming of the beer, and it is maintained at the desired temperature by means of water passing from the tank 1 into the baskets through the branch pipe 31, which, as stated, passes from one basket to another until it reaches the point F, where it overflows into the catch-basin and enters the tank 41. For automatically controlling the passage of water through the branch pipe 31 I provide the dia-

phragm-valve 36, which is connected by a pipe 49 to a regulator 50, located in the tank 41. The construction and operation of this regulator is the same as that shown in Fig. VII, of which a description has been given. It will thus be seen that the temperature of the water in the tank 41 is utilized to control the valve 36 and to admit water from the tank 1 to regulate the temperature of the attemperating or warming water in the tank 41.

For the purpose of cooling the bottles of beer while the carrier passes from the wheels 9 to the wheels 6 I provide the pipe 46 with a branch 51, that terminates at a point near the wheels 6 on the opposite side of the wheels to the point where the attemperating-water is discharged into the baskets, as seen in Fig. I. This water circulates from one basket to another and cools off the beer in the bottles. It overflows from the baskets at about the surface of the water in the tank 1. The pipe 51 is provided with a diaphragm-valve 52 of the same construction and operation as the valves 18 and 36. With this diaphragm-valve connects a compressed-air pipe 53, provided with a valve 54, connected to a float 55, located in the tank 41. When the water rises in the tank 41 after the machine has been started in operation, the float opens the valve 54 and compressed air passes to and opens the valve 52 in the pipe 51, thus permitting a flow of water through the latter pipe to cool the beer.

It is apparent that when the use of the machine is to be temporarily stopped or stopped for a time being and it is desired to remove all of the bottles from the baskets that there will be less water escaping from the baskets at the point F than when the machine is in full operation, this difference being equal to the amount of displacement caused by the introduction of fresh bottles into the baskets, which has now been stopped or discontinued, owing to the fact that it is desired to empty the machine. This diminished flow of water into the tank 41 must be compensated for, for the reason that the use of cooling-water is required for some time after the insertion of bottles into the baskets has been discontinued. To compensate for this diminished flow of water, I employ a pipe 56, connected with a water-main or other source of supply and which is provided with a valve 57, connected to a float 58, located on the surface of the water in the tank 1. When the machine is in full operation, the float is held in its raised position and keeps the valve 57 closed. When the flow of water from the baskets into the tank 1 is diminished by no more bottles being placed in the baskets, the fall of the water in the tank allows the float 58 to drop and open the valve 57, whereupon a flow of water passes through the pipe 56 into the tank 41, thereby keeping up a supply of water in the tank 41 for cooling purposes.

It is desirable to have the baskets drained of water at the time that they reach the point where the bottles are taken from the baskets. To accomplish this, I provide each basket with a hollow stem 61 (see Fig. VIII) near its bottom, upon which fits a sleeve 61^a, carrying a short pipe 62. Just before the baskets reach the wheels 6 these pipes come against a stationary stop-arm 63, (see Figs. I and III,) causing them to be turned from an upwardly-inclined to a downwardly-inclined position, so that the water will drain from the baskets through the pipe 62 and fall into the tank 1. As the baskets pass over the wheels 6 they are emptied and refilled with bottles, and as they are passing to a point beneath the pipe 46 the pipes 62 come against another stationary stop-arm 64 (the same as the stop 63) and are moved from a downwardly-inclined to an upwardly-inclined position, thus shutting off the escape of water from the baskets.

65 represents a baffle-plate placed in the tank 1 over the underrunning portion of the carrier for the purpose of deflecting pieces of broken glass in case any of the bottles explode, such as sometimes happens.

In a machine thus constructed the beer is attemperated, submitted to a bath of water of maximum temperature, and cooled, all with the use of a very small amount of water as compared with what is ordinarily required where the beer is attemperated, submitted to the maximum temperature, and cooled all in a bath of water.

I claim as my invention—

1. In a pasteurizer, the combination of a tank, a carrier located within the tank and having baskets connected together so that water will pass from one to another, and sprocket-wheels supporting the carrier; the underrunning part only of said carrier being submerged in water contained by the tank, substantially as set forth.

2. In a pasteurizer, the combination of a tank, an endless carrier located within the tank, sprocket-wheels for supporting the carrier, and means for conducting water from one basket of the carrier to another; the underrunning part only of said carrier being submerged in water, substantially as set forth.

3. In a pasteurizer, the combination of a tank, an endless carrier located within the tank, and the baskets of which are connected together so that water will pass from one to another, means for conducting water from the lower part of the tank and discharging it into the baskets at the upper part of the carrier, and sprocket-wheels over which the carrier passes; the underrunning part only of said carrier being submerged in water, substantially as set forth.

4. In a pasteurizer, the combination of a tank, an endless carrier located within the tank, and the baskets of which are connected together so that water will pass from one to

another, means for discharging water into the baskets at the upper part of the carrier, and a baffle-plate located above the underrunning part of the carrier; the underrunning part of the carrier only being located in a water-bath, substantially as set forth.

5. In a pasteurizer, the combination of a tank, and an endless carrier located within the tank and having bottle-receiving baskets; the underrunning part only of the carrier being submerged in water, and said baskets being connected together so that water will pass from one to another, substantially as set forth.

WILLIAM J. RUFF.

In presence of—
GERHARD G. ARENDS,
JOHN L. DUKER.

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6

F

August, 1904

767,362

No. 767,962. PATENTED AUG. 16, 1904.

W. J. RUFF.

PASTEURIZER.

APPLICATION FILED AUG. 10, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

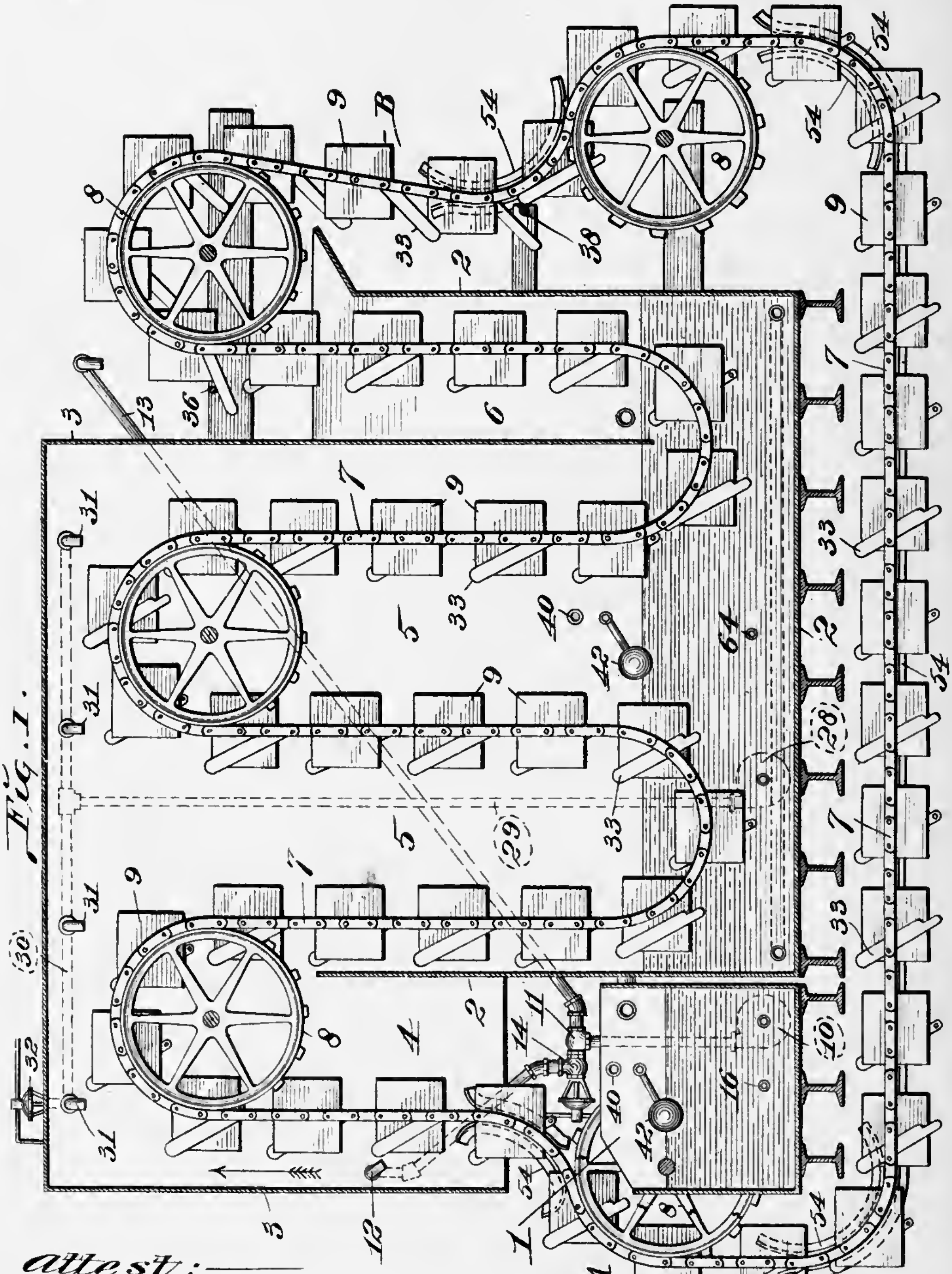

Fig. 1.

Attest:
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Wm. J. Ruff:
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Atty's.

No. 767,962. PATENTED AUG. 16, 1904.

W. J. RUFF.

PASTEURIZER.

APPLICATION FILED AUG. 10, 1903.

NO MODEL. 3 SHEETS—SHEET 2.

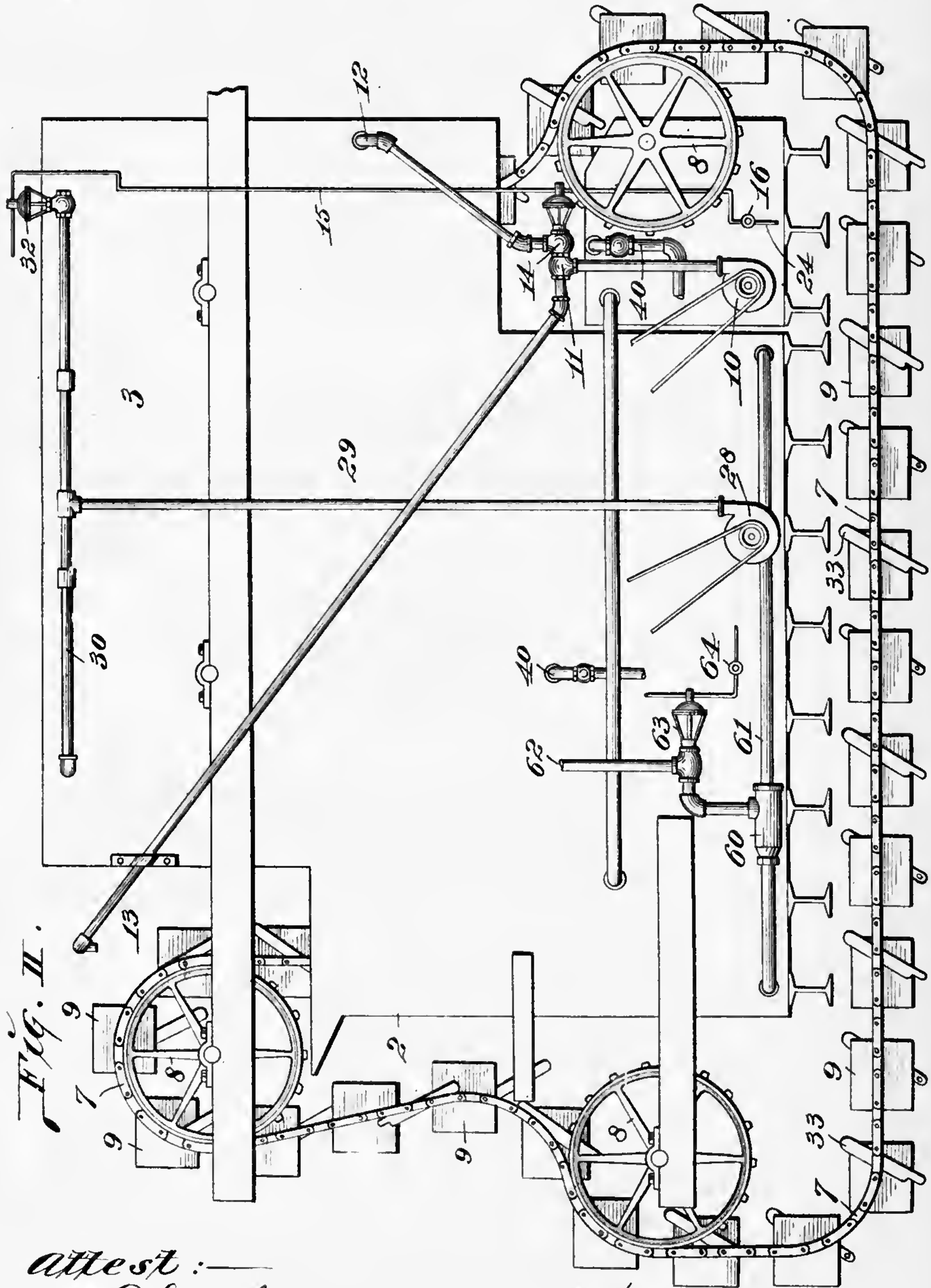

Fig. II.

Attest:—
M. P. Smith
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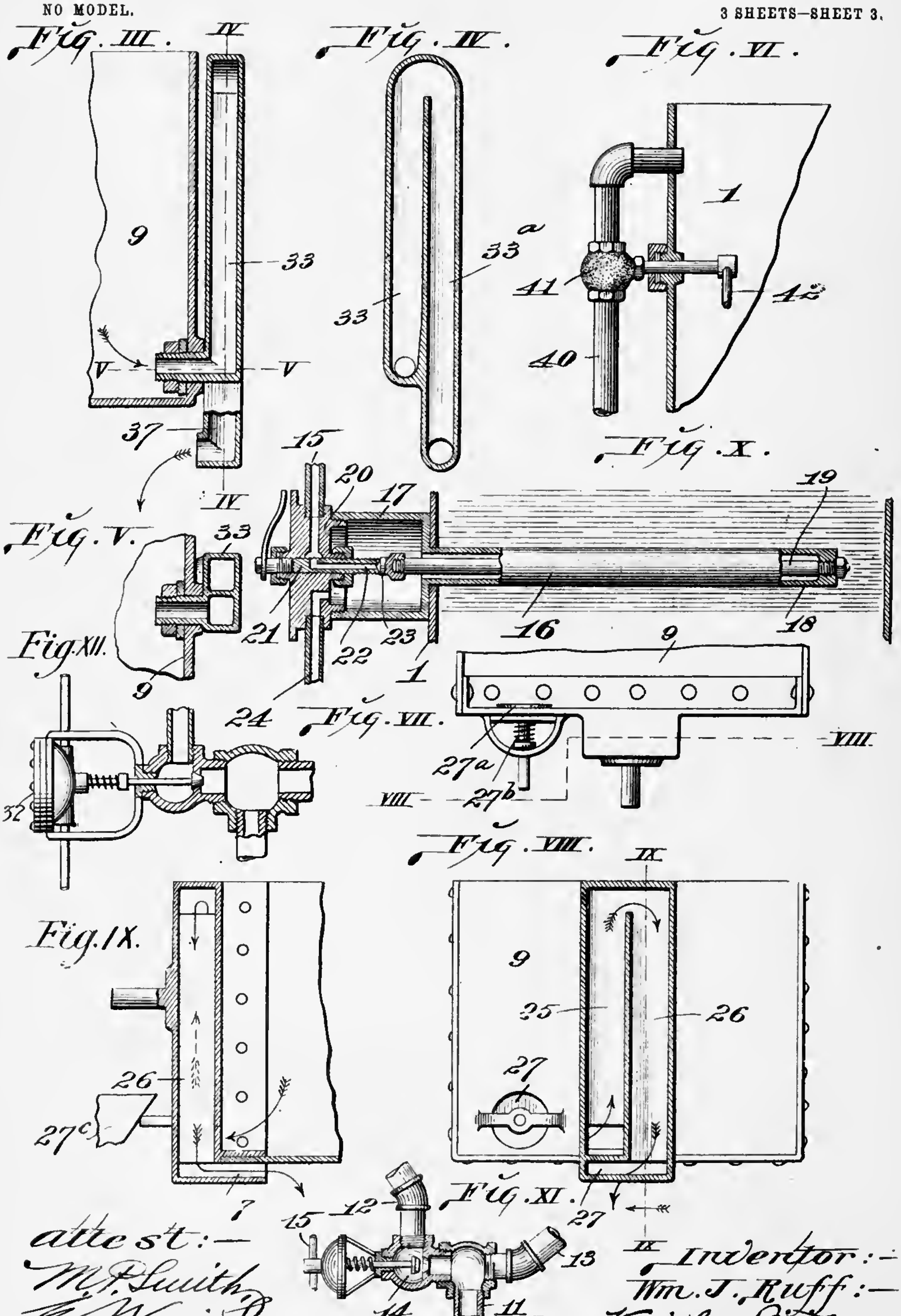
No. 767,962. PATENTED AUG. 16, 1904.

W. J. RUFF.

PASTEURIZER.

APPLICATION FILED AUG. 10, 1903.

NO MODEL. 3 SHEETS—SHEET 3.



attest:—
M. F. Smith
E. S. Knight

Inventor:—
Wm. J. Ruff:—
By Knight Bros
atty's.

No. 767,962. Patented August 16, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM J. RUFF, OF QUINCY, ILLINOIS.

PASTEURIZER.

SPECIFICATION forming part of Letters Patent No. 767,962, dated August 16, 1904.

Original applications filed February 13, 1903, Serial No. 143,177, and April 24, 1903, Serial No. 154,111. Divided and this application filed August 10, 1903. Serial No. 168,898. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. RUFF, a citizen of the United States, residing in Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Pasteurizers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My present invention relates to a machine for pasteurizing beer, &c., and belongs to the same class of machines as those shown and described in my United States applications for patents filed February 13, 1903, Serial No. 143,177, and April 24, 1903, Serial No. 154,111.

My present invention consists in features of novelty hereinafter fully described, and pointed out in the claims.

Figure I is a side view of my improved machine with the housing and tanks in vertical section. Fig. II is a side elevation. Fig. III is a detail vertical section showing part of one of the bottle-containing baskets and its drain-pipe. Fig. IV is a section taken on line IV IV, Fig. III. Fig. V is a horizontal section taken on line V V, Fig. III. Fig. VI is a detail section showing part of the attemperating and cooling tank and its supply-pipe. Fig. VII is a detail top view showing a modification. Fig. VIII is a vertical section taken on line VIII VIII, Fig. VII. Fig. IX is a section taken on line IX IX, Fig. VIII. Fig. X is a section showing the regulator. Fig. XI is a section showing one of the diaphragm-valves. Fig. XII is a view similar to Fig. XI, showing another of the diaphragm-valves.

Referring to the drawings, 1 represents a tank for holding the attemperating and cooling water, and 2 is a tank for holding water of maximum temperature. Fitting over these tanks and extending into the latter is a housing or hood 3, thereby forming a leg or space 4, in which the beer is attemperated, a leg or space 5, in which the beer is heated to and for a sufficient length of time retained at a maximum temperature, and a leg or space 6, in which the beer is cooled. The bottles of beer are conducted through these legs by means of a carrier composed of endless chains 7, supported by sprocket-wheels 8 and between which are the bottle-containing baskets 9, that are pivotally connected to the chains, so as to always maintain a horizontal position. The beer to be pasteurized is placed in the baskets at A, the carrier moving in the direction of the arrow, Fig. I. The carrier is driven by any suitable form of motor (not shown) connected up to the shaft of one of the sprocket-wheels 8. Communicating with the tank 1 is a rotary pump 10, from which extends a pipe 11, having a branch 12 for discharging attemperating-water into the baskets 9 in advance of the introduction of the water of maximum temperature and a branch 13 for discharging cooling-water into the baskets after the bottles have been submitted to the action of the water of maximum temperature. In the pipe 12 is a diaphragm-valve 14, (see Fig. XI,) such as is shown in my Patent No. 701,622, dated June 3, 1902. The air-supply pipe 15 of the diaphragm-valve communicates with a regulator 16, located in the tank 1. The regulator is shown in Fig. X and consists of a cylinder 17, secured to one wall of the tank 1 and having a tube 18, that extends into the tank. Within the tube 18 is a thermostatic bar or rod 19, the inner end of which is made fast to the end of the tube 18. In the outer end of the cylinder 17 is fitted a plug 20, into which is tapped a stem 21, having a port 22, that communicates with the pipe 15. The inner end of the stem 21 forms the seat for a valve 23 on the outer end of the thermostatic rod 19.

24 is a compressed-air pipe tapped into the plug 20 and which communicates with the interior of the cylinder 17.

When the temperature in the tank 1 falls below a given point—say 90° Fahrenheit—the bar 19 will contract and open the valve 23. Compressed air will then pass through the pipe 24, which is connected to a suitable compressed-air tank, (not shown,) through the stem 21, and through the pipe 15 to the diaphragm-valve 14, thus causing the valve to be closed and shutting off the flow of water from the pump 10 through a pipe 12 into the baskets 9. When the temperature of the water in the tank 1 rises above the desired temperature, the valve 23 closes again, thus permitting the flow of water through the valve 14 and pipe 12 into the baskets 9. As the baskets become nearly filled with water they overflow back into the tank 1—that is, so long as they are passing through the leg 4. This overflow is from basket to basket and is permitted by means of a double-legged pipe, (shown in Figs. III and IV,) and which consists of a leg 33, communicating at bottom with the basket with which it is pivotally connected and at top with a leg 33ª, having a discharge-opening 37, that terminates beneath the basket, so as to direct the water into the basket beneath.

28 represents a rotary pump communicating with the tank 2 and from which a pipe 29 extends to the top of the machine, where it is provided with branches 30, having nozzles 31 for discharging hot water into the baskets. The left-hand nozzle 31 is located in the upper part of the leg 4, and this nozzle is provided with a diaphragm-valve 32, corresponding to the valve 14, except that it is held open by the compressed-air pressure instead of being closed by the compressed-air pressure, so that when the valve 14 is closed the valve 32 is open, and vice versa, the result being that when the water in the tank 1 falls below the desired temperature the valve 32 will be opened and hot water will pass through the baskets in the leg 4 into the tank 1, and thus restore the temperature in the tank. As soon as the water rises above the desired temperature again the valve 32 will be closed and the valve 14 opened, and thus the cooling of the water caused by attemperating the cold beer is constantly counteracted by hot water passing from the tank 2 through the diaphragm-valve 32, the result being that the water in the tank 1 is maintained at approximately a uniform temperature at all times.

As the carrier is passing through the leg 5 the beer is submitted to the action of the water of maximum temperature which overflows from the baskets through the conduits 33 33ª back into the tank 2, where it is maintained at the maximum temperature in any suitable way—as, for instance, by means of a steam-jet 60, (see Fig. II,) located in a pipe 61, that connects the two ends of the tank together. In the pipe 62 of the jet-pump is a diaphragm-valve 63, corresponding to the valve 14, and connecting with the diaphragm-valve is a regulator 54, corresponding to the regulator 16. When the water falls beneath the point desired—say 148° Fahrenheit—the regulator 64 will open the valve 63, admitting steam to the tank through the pipe 61. As the carrier is passing up through the leg 6 the beer is submitted to the action of cooling-water deposited in the baskets through the pipe 13, which, as stated, communicates with the pump 10, that is located in the tank 1, and the bottles are thus gradually cooled down before being exposed to the atmosphere. As the baskets leave the top of the leg 6 the water commences draining therefrom into the baskets beneath, this being effected through means of the swiveled double-legged pipes 33. (See Figs. III and IV.) These pipes are connected to the lower portions of the baskets, as shown in Figs. III and V, and they are slowly turned into a horizontal position by coming against a pin 36. (See Fig. I.) As they are turned the water flows from their lower extended ends 37 and is discharged into the baskets beneath and finally back into the tank 2. The bottles are thus gradually cooled down as they move upwardly through the leg 6. When the carrier is moving downwardly from the sprocket-wheel that is located over the leg 6, the baskets are empty of water, so that the beer can be removed about the point B. Beneath this point there is located another stationary pin 38, against which the pipes 33 impinge and are turned back to their upwardly-inclined positions, so that the baskets are ready to take and hold water again when they reach the point A.

Any loss of water in the tanks is restored through pipes 40, provided with valves 41, to which are connected floats 42, located within the tanks. (See Figs. I and VI.) When the water falls beneath the desired level, the floats will by descending open the valves 41, thus permitting a flow of water into the tanks from the pipes 40, which are connected with any suitable source of water-supply.

54 represents stationary rails for guiding the endless chains of the carrier where they are deflected in the course of their travel.

In Figs. VII, VIII, and IX, I have shown a modification of the double-legged pipe 33 33ª, which consists in locating a fixed water-conduit at one end of the baskets, which conduit consists of a leg 25, communicating with the lower part of the basket and at top with a leg 26, having a lower extension 27, that terminates beneath the basket. This conduit permits the overflow of the water from the basket, and to discharge the water from the baskets (which in the other form is effected by the turning of the pipe 33 33ª, as described) I employ a valve 27ª, which is normally held to its seat by a spring 27ᶜ. The stem of the valve projects some distance beyond the basket and is adapted to come against a suitable stationary pin to effect the opening of the valve when the baskets reach the top of the leg 6. With a machine thus constructed a very small tank may be utilized, inasmuch as the attemperating and the cooling of the beer is effected without the use of a tank to hold the water through which the carrier is passing at the time that the attemperating and cooling processes are being carried on.

I claim as my invention—

1. In a pasteurizer, the combination of a

single tank for holding attemperating-water and cooling-water, a pump for conducting water from said tank, a pipe connected to said pump for conducting the water for attemperating the beer, another pipe connected to said pump for conducting the water for cooling the beer, a tank positioned between the points of attemperating and cooling for holding water of maximum temperature, a pump for conducting water from the last-mentioned tank through a pipe to a point of discharge above and over the same, and a carrier for moving the bottles past the discharge ends of said pipes to receive water therefrom, and through the water of maximum temperature; the baskets of said carrier being provided with means for allowing the water to pass from one to another.

2. In a pasteurizer, the combination of a single tank for holding attemperating and cooling water, a pump for conducting water from said tank through a pipe for attemperating the beer and through another pipe for cooling the beer, a tank for holding water at maximum temperature, a pump for conducting water from the last-mentioned tank through a pipe located over the first-mentioned pipes, diaphragm-valves located in said pipes, a regulator in said attemperating-tank and which is connected to said diaphragm-valves, and a carrier for moving the bottles past the discharge ends of said pipes to receive water therefrom and through the body of water at maximum temperature.

WILLIAM J. RUFF.

In presence of—

GERHARD G. ARENDS,

FRANK A. LUBHE.

No. 768,550. PATENTED AUG. 23, 1904.

E. WAGNER.

PROCESS OF PASTEURIZING BEER.

APPLICATION FILED JUNE 2, 1900.

NO MODEL.

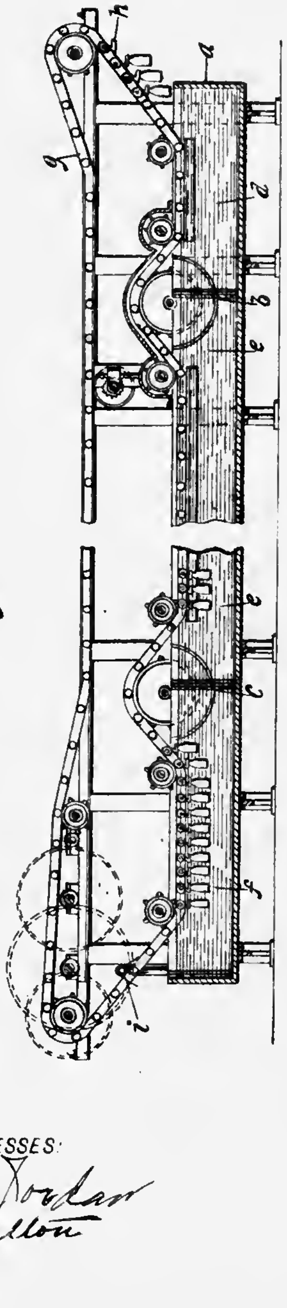


Fig. 1.

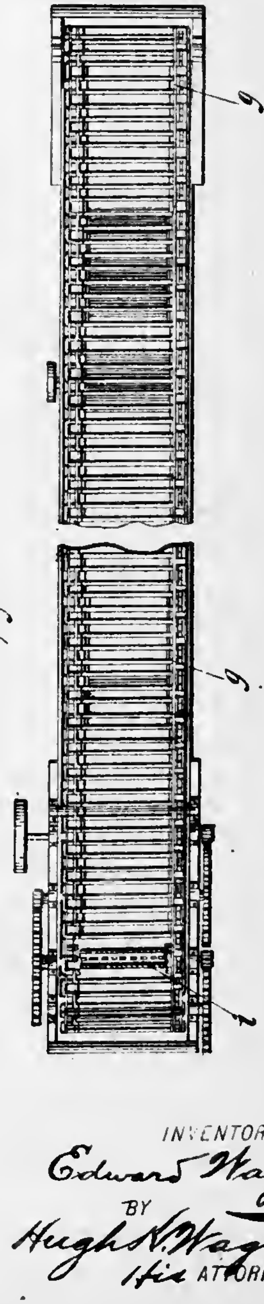


Fig. 2.

WITNESSES:

Sue G. Jordan

Gladys Hallon

INVENTOR:

Edward Wagner.

BY

Hugh K. Wagner,

His ATTORNEY.

No. 768,550. Patented August 23, 1904.

UNITED STATES PATENT OFFICE.

EDWARD WAGNER, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE MODEL BOTTLING MACHINERY COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI.

PROCESS OF PASTEURIZING BEER.

SPECIFICATION forming part of Letters Patent No. 768,550, dated August 23, 1904.

Original application filed June 30, 1899, Serial No. 722,439. Divided and this application filed June 2, 1900. Serial No. 18,812. (No specimens.)

To all whom it may concern:

Be it known that I, EDWARD WAGNER, a citizen of the United States, and a resident of the city of St. Louis, State of Missouri, (whose post-office address is St. Louis, Missouri,) have invented certain new and useful Improvements in Processes of Pasteurizing Beer, of which the following is a full, clear, and exact specification, this application being a division of one filed by me in the United States Patent Office June 30, 1899, Serial No. 722,439, in which the apparatus for practicing this process is fully described.

This invention relates to an improved process for pasteurizing beer, the object being to destroy the yeast molecules and germs contained in the beer in order to prevent further fermentation in a simple, cheap, and convenient manner.

For the sake of convenience in describing this process a drawing is filed herewith, it being understood, of course, that I do not limit myself to this form of apparatus for the practice of my improved process, but that the essential characteristics of said process are set forth in the claims.

In the drawings, Figure 1 is a longitudinal vertical sectional view through said apparatus; and Fig. 2 is a top plan view, partly broken away, to show in section the spray-pipe *i*.

a indicates a tank made, preferably, of sheet metal and divided by partition-walls *b* and *c* into compartments *d*, *e*, and *f*. Suitable supply and overflow pipes (not shown) are arranged at convenient points in the several compartments, and in practice the compartment *d*, which is at the front end of the apparatus, is designed to receive warm water, the compartment *e* hot water, and the compartment *f* cold water.

An endless chain *g*, carrying bottle-supports *h* in rows, as described in my above-mentioned application for patent for apparatus to carry out this process, in which the bottles containing the beer to be treated are carried, is caused to travel in a serpentine path into and out of the waters of different temperatures from the front end of the apparatus to the rear end. An attendant places the bottles containing the beer in their supports, and another attendant, at the rear end of the machine, receives the bottles after their contents have been treated and removes them from the apparatus.

In carrying out my improved process the bottles containing the beer to be treated are corked, as usual, and placed in their supports, whereby the bottles are first dipped in the compartment containing the warm water. While submerged they are caused to travel continuously for such time as is necessary to initially raise the temperature of the beer, after which the bottles pass to the next compartment, in which is contained the hot water. In this compartment the bottles are submerged and caused to travel continuously for quite a long time—say fifty minutes—until the pasteurizing process is completed, when the bottles are subjected to cooling influences, such as the atmosphere or a spray of water, whereby the beer is partly relieved of its great heat and its temperature partially reduced in readiness for the final lukewarm bath in the last compartment, after which it is subjected to a final spray of cold water.

It is obvious that sprays of water of the proper temperature, as above described, might at one or more points of the apparatus above referred to be substituted for the corresponding bath and that such change would not depart from the nature and principle of my invention, although in practice it would be found to a large extent less satisfactory than the successive baths of different temperatures hereinabove described.

Heretofore the process of pasteurizing beer has been to place the bottles in the bottom of a tank into which was admitted water at atmospheric temperature. Hot water was then admitted, and the cold water escaped through overflow-pipes provided for that purpose. The admission of the hot water being usually at one point of the tank made its distribution uneven, with the result that currents of hot and cold water would alternately strike the bottles, and it required the continued admission of hot water for a long period of time to secure a uniform heat throughout the tank. Not only this, but the natural tendency of the cold water to settle in the bottom of the tank around the bottles and the hot water to rise retarded the removal of the cold water, and this stratification of the waters at different temperatures was rendered doubly difficult to overcome on account of the protection offered the colder water by the bottles themselves, which obstructed the flow of the hot water and rendered the cold water inaccessible, thus preventing the commingling of the two.

When the pasteurizing process with the above-described uncertainties was completed, the water of the tank was withdrawn and cold water admitted with little or no preparation for its reception, which frequently resulted in the bottles being broken by reason of the too sudden change in temperature in the waters. When the bottles were cool, they were then taken from the tank by hand in the same manner as they had been thereinto introduced.

Another method sometimes practiced is to place the bottles in a tank provided with steam-coils, in which the tank is filled with water and the steam turned into the coils, resulting in a gradual increase in temperature of the water, after which when the pasteurization is completed the steam is turned off and cold water again introduced. This process, like the one just described, is objectionable in that the water being quiet will stratify and there will be a large waste in cooling the bottles, and the cost is likewise great on account of the quantity of steam employed for heating a single charge. Moreover, the time consumed is out of proportion to the benefits gained under the system first described.

My present process contemplates the initial preparation of the bottled beer by warming, after which it is introduced into a tank wherein the water is uniformly hot and then gradually reducing the temperature of the beer by means of a lukewarm bath or equivalent step of the process preparatory to the beer being brought to atmospheric temperature by the spray-pipe *j* throwing a jet or spray of cold water upon the beer.

In practice the warm-water bath is about 120° Fahrenheit, and the bottles containing the beer to be pasteurized remain therein about ten minutes. The hot-water bath is about 145° Fahrenheit, and the bottles remain in this hot bath for about fifty minutes. After leaving the hot bath the bottles are exposed to the atmosphere or the atmosphere and cooling-sprays for about five minutes and finally are treated to a relatively cold bath at 100° Fahrenheit for about twenty minutes.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The improved method of pasteurizing beer consisting in continuously moving the receptacles containing the beer through a pasteurizing agent.

2. The improved method of pasteurizing beer consisting in continuously moving the receptacles containing the beer at a uniform speed through a pasteurizing agent.

3. The improved method of pasteurizing beer consisting in continuously moving the receptacles containing the beer through a preparatory heating medium; then continuously moving the same through a warming-chamber; then continuously moving the same through a pasteurizing agent; and then gradually cooling the same.

4. The improved method of pasteurizing beer consisting in continuously moving the receptacles containing the beer through a pasteurizing agent and then reducing the temperature thereof by cooling-currents falling thereon.

5. The improved method of pasteurizing beer consisting in continuously moving the receptacles containing the beer through a pasteurizing agent, and then reducing the temperature thereof by means of cooling-sprays.

6. The herein-described process of pasteurizing beer consisting of continuously moving the receptacles containing the beer through a warming medium; then continuously moving said receptacles through a pasteurizing agent; and then continuously moving said receptacles through cooling media.

In testimony whereof I have hereunto affixed my signature, in the presence of two witnesses, this 18th day of May, 1900.

EDWARD WAGNER.

Witnesses:

Hugh K. Wagner,

A. E. Wagner.

Mar 1964

775144

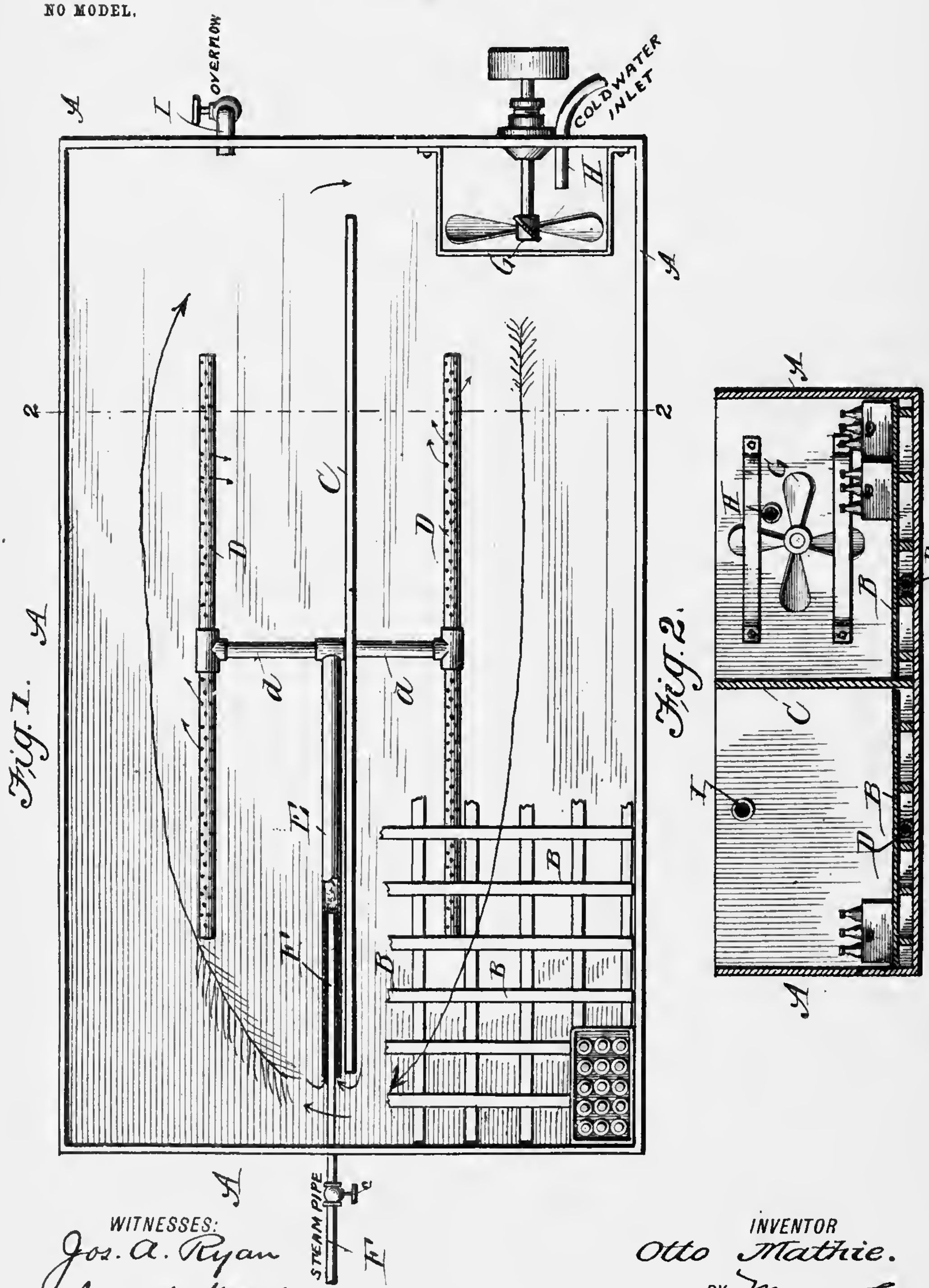
No. 775,144. PATENTED NOV. 15, 1904.

O. MATHIE.

PASTEURIZING BOTTLED LIQUIDS.

APPLICATION FILED JUNE 20, 1904.

NO MODEL.



WITNESSES:

Jos. A. Ryan

Amos W. Hart

INVENTOR

Otto Mathie.

BY Munn & Co.

ATTORNEYS

UNITED STATES PATENT OFFICE.

OTTO MATHIE, OF WAUSAU, WISCONSIN.

PASTEURIZING BOTTLED LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 775,144, dated November 15, 1904.

Application filed June 20, 1904. Serial No. 213,344. (No model.)

To all whom it may concern:

Be it known that I, OTTO MATHIE, a citizen of the United States, residing at Wausau, in the county of Marathon and State of Wisconsin, have made an Improvement in Pasteurizing Bottled Liquids, of which the following is a description.

The object of my invention is to provide an improved apparatus for use in sterilizing bottled liquids, especially beer. As is well known to experts, in carrying out the sterilizing process many bottles burst, whereby more or less loss is entailed. This result is due mainly to the fact that the water in which the bottles are wholly or partly submerged is not heated and then cooled equally or uniformly. Further, it is well known that in the sterilizing process beer is often so changed as to have a burned or other disagreeable and unnatural taste and also an objectionable odor. In order to prevent this result, it is necessary to first heat and then cool the beer quickly, and this must be done uniformly or in such manner as to avoid bursting of the bottles.

By my improved apparatus both the above-indicated results are avoided with certainty, so that a great economy is effected and an improved product obtained.

The details of construction, arrangement, and operation of parts constituting my improved apparatus are as hereinafter described, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of the apparatus, and Fig. 2 a transverse vertical section on the line 2 2 of Fig. 1.

A indicates a rectangular tank adapted for containing the water used in sterilizing and provided with a rack or false bottom B, upon which bottles containing beer or other liquid are placed. A vertical partition C is arranged along the longitudinal center of the tank A, and its ends are spaced from the ends of the tank, so that a free passage is provided at those points for the circulation of water. On each side of the said partition is arranged a perforated steam and water pipe D, the same being connected by feed-pipes *d* with an induction-pipe E and a steam-pipe F, the latter being provided exteriorly to the tank with a stop-cock *f*. The mouth of the induction-pipe E is within the tank A, and the steam-pipe F is introduced into the same and made of such smaller diameter that a space is provided between it and the induction-pipe E, so that when steam is introduced a current of water will be induced in the pipe E and mingled with the steam, and thus both will be discharged together from the perforations of the pipes D.

For the purpose of creating a current, and thereby due circulation, of the water in the tank I arrange an agitator or propeller G in the tank A near one end and side of the latter. At an adjacent point I also locate the discharge end of a cold-water pipe H. An overflow I is provided, as indicated in both figures.

The operation of my improved apparatus is as follows: A due quantity of water having been admitted to the tank A and the bottles containing the liquid to be pasteurized having been duly placed upon the rack or false bottom B, steam is admitted through the pipe F and the propeller G simultaneously set in motion, so that a simultaneous agitation and current result—that is to say, the mingled steam and water escaping from the pipes D agitate the main body of water on both sides of the partition C at the same time that the water is gradually yet uniformly heated, while the rotating propeller G sets up a more or less rapid current which passes around the partition C in the spaces provided at each end of the same. Thus the water is heated, agitated, and circulated in the most efficient manner and with such rapidity as required to effect the best results, and at the same time the bottles containing the beer or other liquid are heated with such equality or uniformity as to avoid bursting. When the beer or other liquid has been heated for a due length of time, the steam is shut off and cold water is admitted, and this being at a point contiguous to and behind the propeller G the latter mingles the cold with the warmer water in such manner that the whole body of water is cooled uniformly yet quickly.

I do not consider it necessary to state the temperature to which the water is raised nor the length of time during which the beer or other liquid may be heated nor the length of time nor the degree for effecting the cooling operation, since these are matters admitting of considerable variation and are well understood by experts. By my improved apparatus beer is pasteurized without loss by breakage of the bottles and without producing the undesirable taste and smell often incident to the operation as ordinarily effected.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The improved apparatus for sterilizing bottled liquids, comprising a tank having a vertical central partition which is spaced at its ends from the adjacent walls of the tank, thus leaving free passages for the circulation of water, perforated steam-pipes arranged on each side of the said partition, a means for setting up a circulating current in the whole body of water, and a cold-water inlet arranged adjacent to the means for producing the current, substantially as described.

2. The improved apparatus for sterilizing liquids, comprising a tank having a central partition whose ends are spaced from the adjacent walls of the tank, perforated steam-pipes arranged on opposite sides of said partition, a water-induction pipe communicating therewith and a steam-pipe introduced into the mouth of said induction-pipe and made of less diameter to permit the inlet of water, and means for setting up a current in the main body of water in the tank, substantially as described.

3. An improved apparatus for sterilizing beer or other bottled liquids, comprising the tank proper having a longitudinal central partition whose ends are spaced from the adjacent end walls of the tank, means for introducing steam for heating and agitating the body of water in the tank, and a rotatable device arranged adjacent to one corner of the tank whereby it is adapted for setting up a current in the main body of water in the tank, and a cold-water inlet arranged in rear of the said device, substantially as described.

4. In an apparatus for sterilizing bottled liquids, a water-tank having a central vertical partition whose ends are spaced from the ends of the tank, means for heating the water, the rotary propeller located in one corner of the tank, and a cold-water inlet located adjacent to the propeller, as shown and described.

OTTO MATHIE.

Witnesses:
W. J. GEHRKE,
A. E. MONTGOMERY.

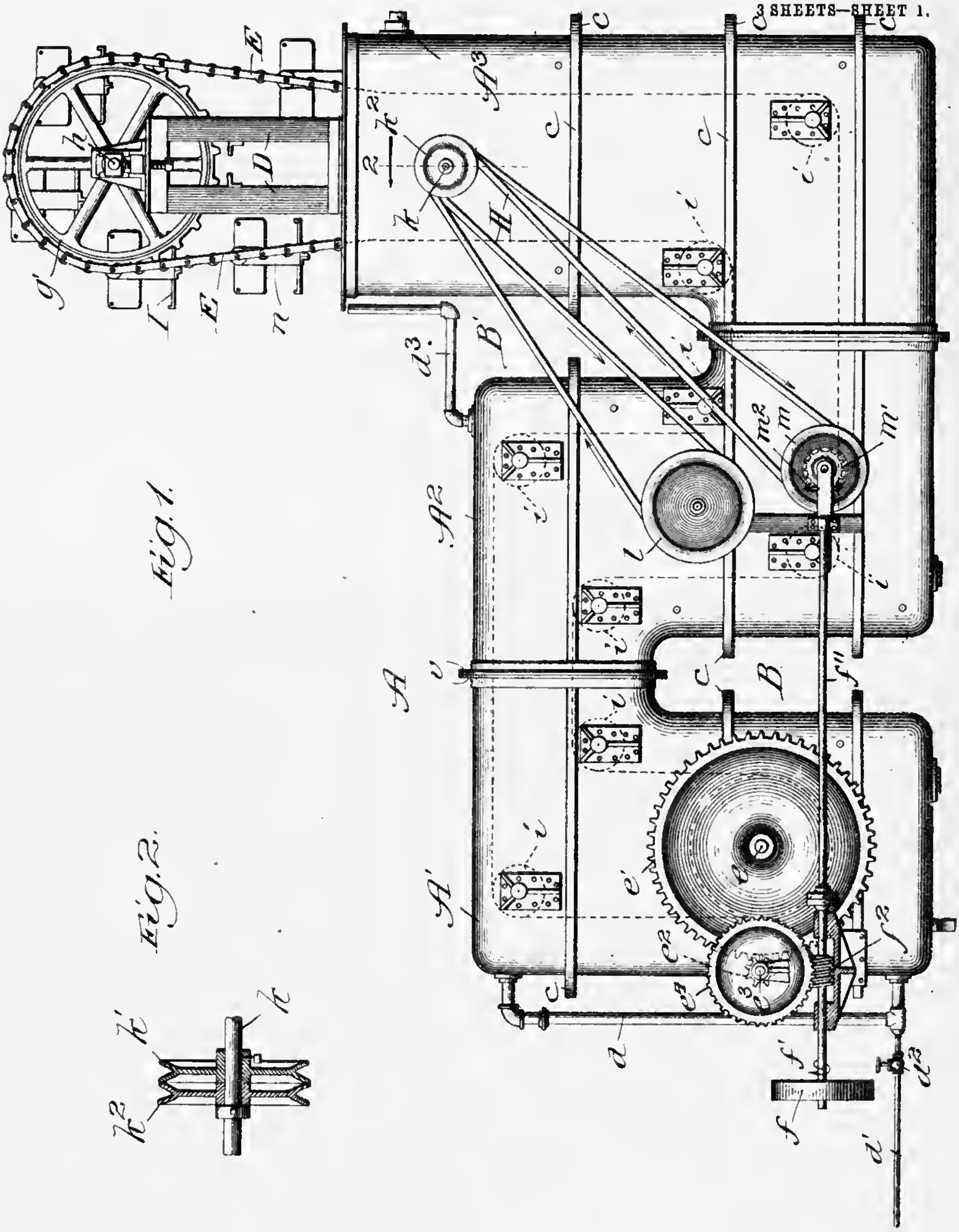
No. 781,860. PATENTED FEB. 7, 1905.

W. B. WRIGHT.

PASTEURIZING APPARATUS.

APPLICATION FILED SEPT. 5, 1903.

3 SHEETS—SHEET 1.



Witnesses;

Chas. E. Gaylord.

Geo. C. [illegible]

Inventor:

Walter B. Wright,

By Dyrenforth, Dyrenforth & Lee,

Att'ys.

No. 781,860. PATENTED FEB. 7, 1905.

W. B. WRIGHT.

PASTEURIZING APPARATUS.

APPLICATION FILED SEPT. 5, 1903.

3 SHEETS—SHEET 2.

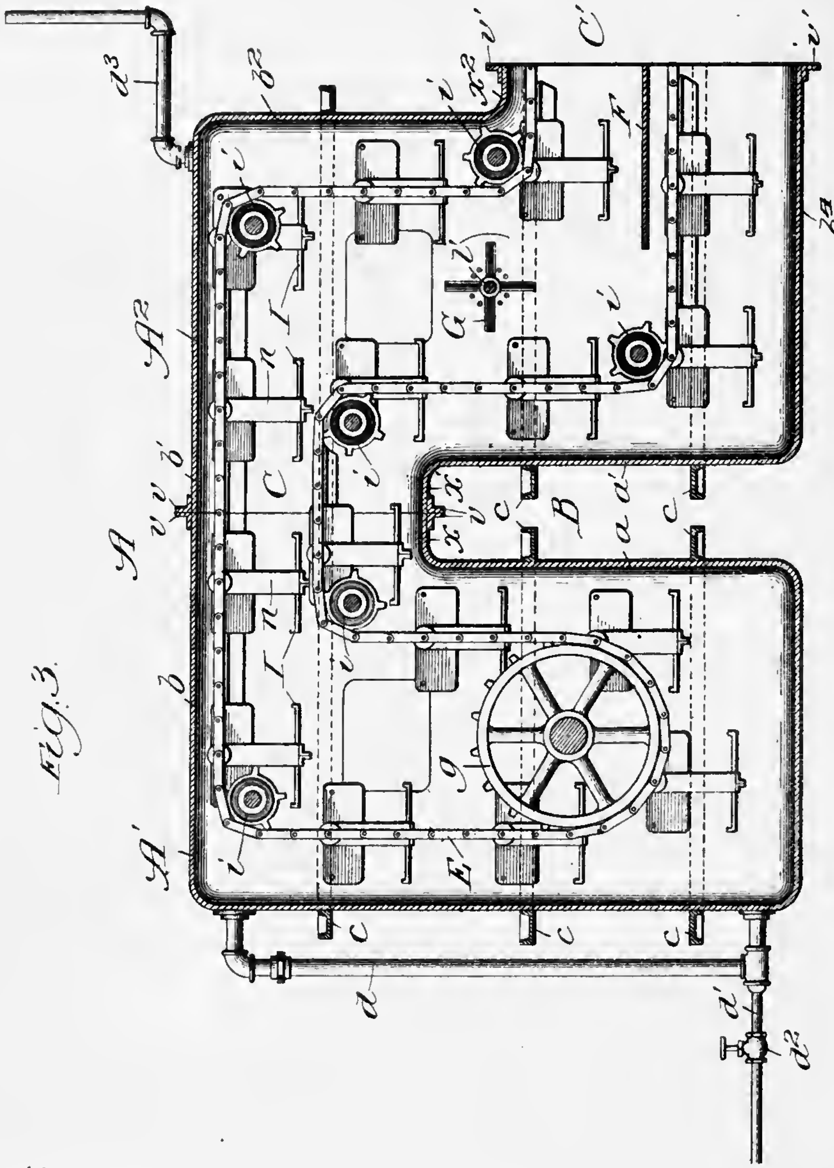


Fig. 3

Witnesses:

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No. 781,860. PATENTED FEB. 7, 1905.

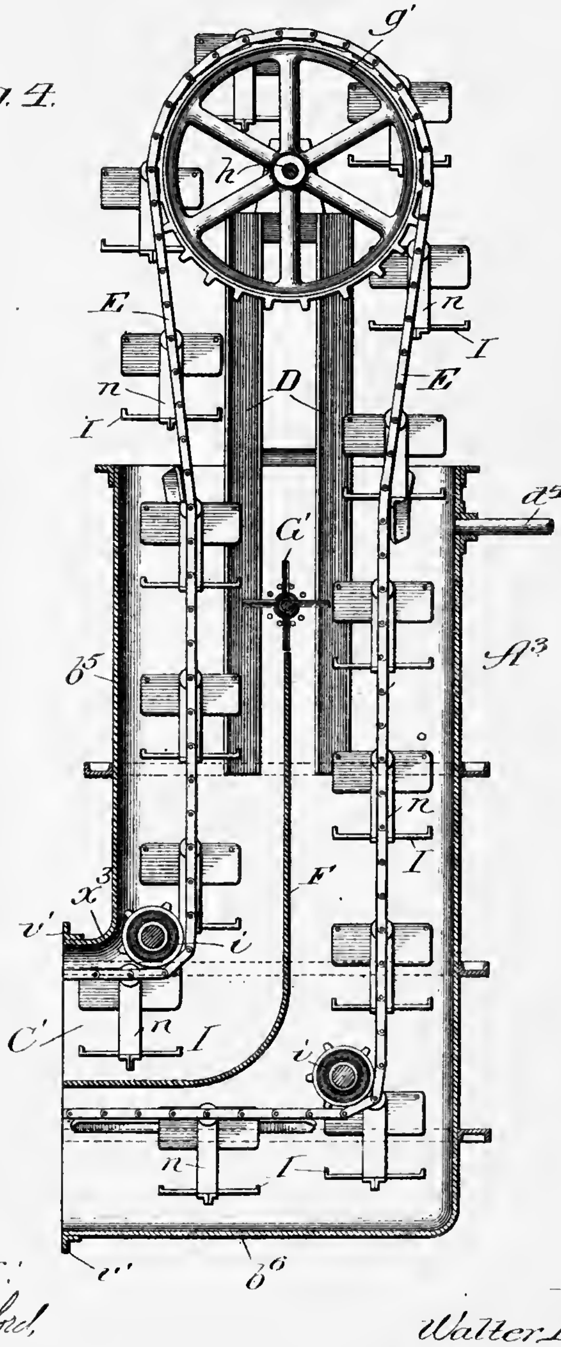
W. B. WRIGHT.

PASTEURIZING APPARATUS.

APPLICATION FILED SEPT. 5, 1903.

3 SHEETS—SHEET 3.

Fig. 4.



Witnesses:
Chas. E. Gaylord,
Geo. C. Lowrie

Inventor:
Walter B. Wright,
By Dyrenforth, Dyrenforth & Lee,
Att'ys

No. 781,860. Patented February 7, 1905.

UNITED STATES PATENT OFFICE.

WALTER B. WRIGHT, OF CHICAGO, ILLINOIS, ASSIGNOR TO E. GOLDMAN & CO., A CORPORATION OF ILLINOIS.

PASTEURIZING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 781,860, dated February 7, 1905.

Application filed September 5, 1903. Serial No. 172,041.

To all whom it may concern:

Be it known that I, WALTER B. WRIGHT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Pasteurizing Apparatus, of which the following is a specification.

My invention relates to an improvement in the class of apparatus employed for pasteurizing beer in bottles by supporting the filled bottles upon trays pivotally mounted on endless chains to travel through a holder containing water at different degrees of temperature in different parts or zones, through which the bottles are caused to pass.

The object of my invention is to provide a generally improved construction of the apparatus in matters of detail; and it consists in the combination of parts hereinafter described, and pointed out in the appended claim.

Referring to the accompanying drawings, Figure 1 is a view in side elevation, partly sectional, of a known general form of pasteurizing apparatus provided with my improvements; Fig. 2, a section taken at the line 2 on Fig. 1 viewed in the direction of the arrow and enlarged, showing pulley details; Fig. 3, a view showing two of the three sections in which I construct the apparatus fitted together with the casing or holder in longitudinal vertical section and the mechanism within it in elevation, and Fig. 4 a similar view of the third section of the apparatus disconnected from the other two sections thereof.

A is the holder, which my construction enables me to form of a single wall of metal in three sections A', A^2, and A^3, flanged where they fit together. The section A' is of the substantially rectangular shape illustrated, with the inner wall a extending upward only part way to the upper wall b and having its upper end portion turned, as at x, to extend at an angle to the wall a. The section A^2 is of the same general form with its inner wall a' extending only part way to the upper wall b' and turned, as to its upper end portion, at x', to extend at an angle to the wall a', whereby when the two sections A' and A^2 are put together to abut at their flanges v v they form the air-space B between them and the restricted connecting-passage C between the sections over the air-space. The end wall b^2 of the section A^2 extends short of the base-wall b^4 of that section and is turned outward at its lower end, as at x^2, and provided with a flange v' to form the restricted passage C' for communication with the section A^3. This section, which is open at its top, is also of general rectangular shape, but higher than the other sections, which are both of the same height, and its inner side wall b^5 extends short of the base-wall b^6 and is turned at its lower end to an angle, as at x^3, and provided with a flange v' to meet the flange at x^2 and form a continuation of the passage C'. The structure is shown to be surrounded at intervals with reinforcing-ribs c, represented in channel-iron form. The neck at x^2, connecting the sections of the passage C', forms an air-space B' between the sections A^2 and A^3. By the sectional construction of the holder A thus described, producing the air-spaces B and B', free circulation of air about the sections is afforded to tend to maintain the water contents of the holder at the desired different temperatures in the several sections, and all necessity of providing the structure with a double wall for insulating it is avoided, with the advantages of materially decreasing the expense of construction and of more effectually maintaining the varying temperatures in the different parts of the apparatus.

An overflow-pipe d leads from near the top of the section A' into the same near its bottom, where a steam-jet pipe d', containing a shut-off valve d^2, enters the overflow-pipe for the usual purpose hereinafter explained. A shaft e is journaled in the holder-section A' and carries on one projecting end a cog-wheel e', meshing with a pinion e^2 on a counter-shaft e^3, carrying a worm-wheel e^4, engaged by a worm f^2 on the drive-shaft f', which carries a belt-pulley f. Within the section A' the shaft e carries a pair of similar sprocket-wheels g, and on a frame structure D, extending above the open top of the holder-section A^3, is journaled a shaft h, carrying a pair of similar sprocket-wheels g'. Only one each of these sprocket-wheels is shown, owing to the nature of the views selected for illustration. An endless chain E passes about each set of the sprockets g and g', and these chains extend through the holder in parallel relation to each other over sprocket-pinions i i, journaled in suitable positions therein, and within the section A^3 the chains travel on opposite sides of a vertical central diaphragm F, reaching horizontally through the passage C' into the section A^2, this diaphragm extending downward from an agitator or stirrer G' on a shaft k, journaled in the holder-section A^3 and carrying on a projecting end a fixed pulley k' and an idler-pulley k^2, Fig. 2. A similar agitator G is provided in the sections A^2, on a rotary shaft l', carrying on one projecting end a belt-pulley l. A drive-pulley m is provided adjacent to the pulley l on the holder-casing and carries a beveled gear m', engaged by a beveled pinion m^2 on an extension f^{11} of the driving worm-shaft f'. An endless rope H passes from the pulley m about the idler k^2, thence about the pulleys l and k' to the pulley m, whereby driving the latter from the shaft f^{11} in the direction of the arrow on that pulley drives the rope, as indicated by arrows, to rotate the agitators G G'.

At I are represented the usual skeleton trays for the bottles (not shown) on hangers n, pivotally suspended at intervals on the chains to support between them the trays and adapt the latter always to maintain an upright position.

The operation is as follows: The bottles, the contents of which are to be pasteurized, are loaded upon the trays I as they attain in the travel of the chains E the upper end of the holder-section A^3, at which a platform (not shown) may be provided for the supply of filled bottles to be loaded and for the workmen in loading and unloading them. The holder, which is vented through a pipe d^3, is filled with water to the line of the overflow-outlet d^1 in the section A^3, and the steam injected from the pipe d' into the body of the water keeps it hot in the section A', while that in the section A^2 is cooler and that in the section A^3 still cooler or about the temperature of the surrounding atmosphere. The driving speed of the chains E is very slow, and the driving connection with the stirrers G and G' actuates them to maintain an easy circulation of the water through the holder to assist in maintaining therein the desired variations in temperature in the three sections. The bottles loaded upon the chains pass downward in the holder-section A^3 along the outer side of the diaphragm F into the water at about atmospheric temperature to avoid breaking the bottles by suddenly subjecting them to a temperature that is too high. As the bottles pass downward through the passage C' into the section A^2 the temperature of the water through which they pass increases until they enter the section A', wherein the water is hottest and wherein the pasteurizing effect is exerted. As the bottles travel in the contrary direction through the passage C into the section A^2 and through the passage C' into the section A^3 the temperature of the water gradually decreases until the bottles are delivered along the inner side of the diaphragm F to the upper end of the last holder-section, where they are unloaded from the trays as they emerge from the apparatus.

The diaphragm F and the agitators G and G', respectively, near its opposite ends, are important elements of my improved construction, for they coöperate with the conveyer E to effect the travel of the bottles on entering the apparatus along one side of the diaphragm through a temperature approximating that of the surrounding atmosphere and on delivery from the apparatus on the opposite side of the diaphragm through a similarly low temperature. These temperatures of the water toward the points of introduction and egress of the bottles at the upper end of the section A^3 of the apparatus are superinduced by the action of the agitator G, which tends to circulate the water from the warmer zone thereof in the apparatus along the upper and inner surface of the diaphragm, and by that of the agitator G', which carries the water on the outside of the diaphragm upward and into the chamber in front of the diaphragm.

What I claim as new, and desire to secure by Letters Patent, is —

In a pasteurizing apparatus of the character described, the water-holder built in sections forming restricted passages, at which they are secured together and through which the sections intercommunicate, and air-spaces between the sections, with the section at one end of the apparatus open at its top; a conveyer traveling through the apparatus; a diaphragm extending vertically and centrally through said end section and into the section adjacent to it; and agitators in said last-named two sections, substantially as and for the purpose set forth.

WALTER B. WRIGHT.

In presence of—

SAML. G. PRINCE,

WALTER N. WINBERG.

Feb 1905

782,878

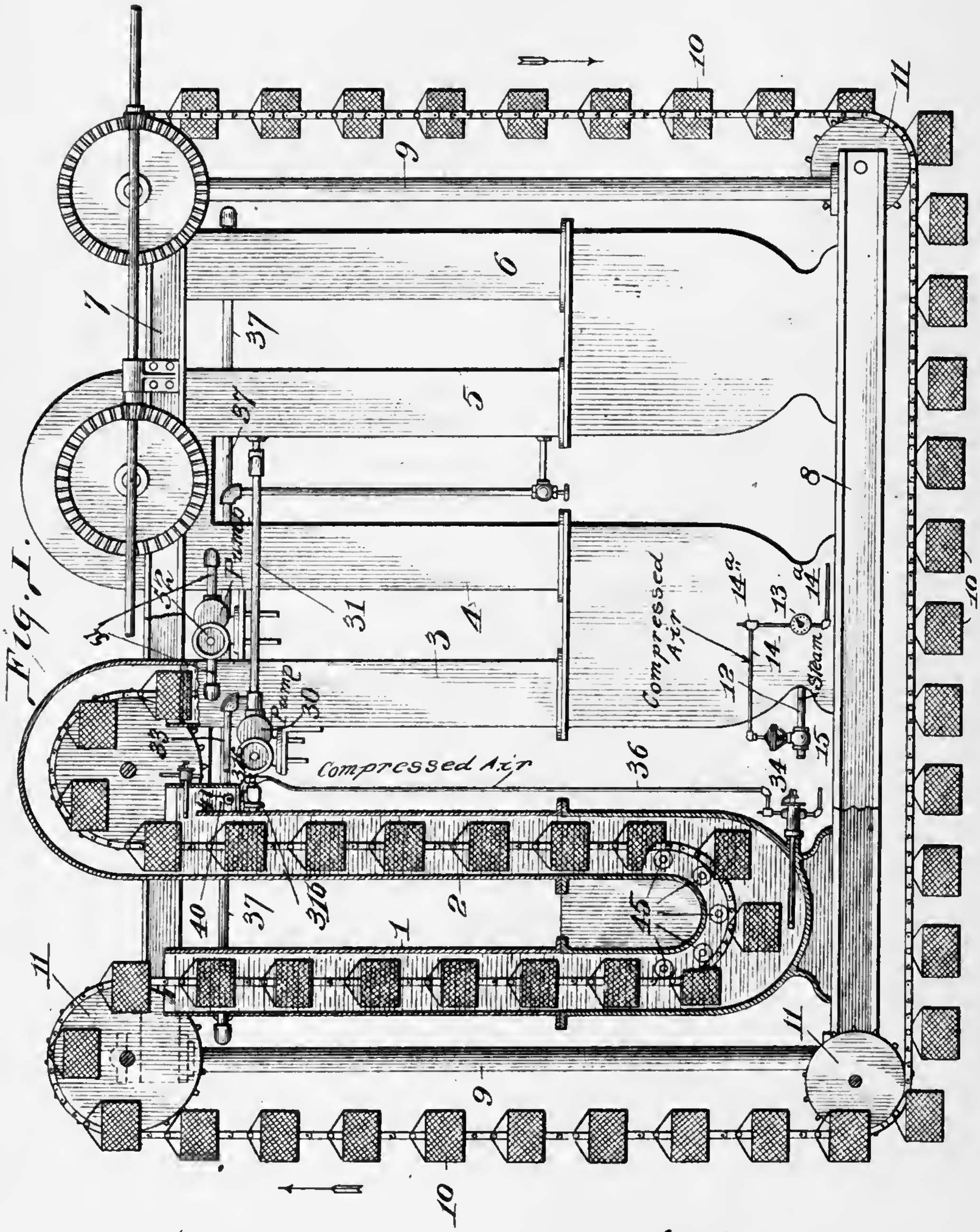
No. 782,878. PATENTED FEB. 21, 1905.

W. J. RUFF.

PASTEURIZER.

APPLICATION FILED JAN. 11, 1902.

2 SHEETS—SHEET 1.



Attest:—
M. P. Smith
E. S. Knight

Inventor:—
Wm. J. Ruff:
By Knight Bro
Atty's

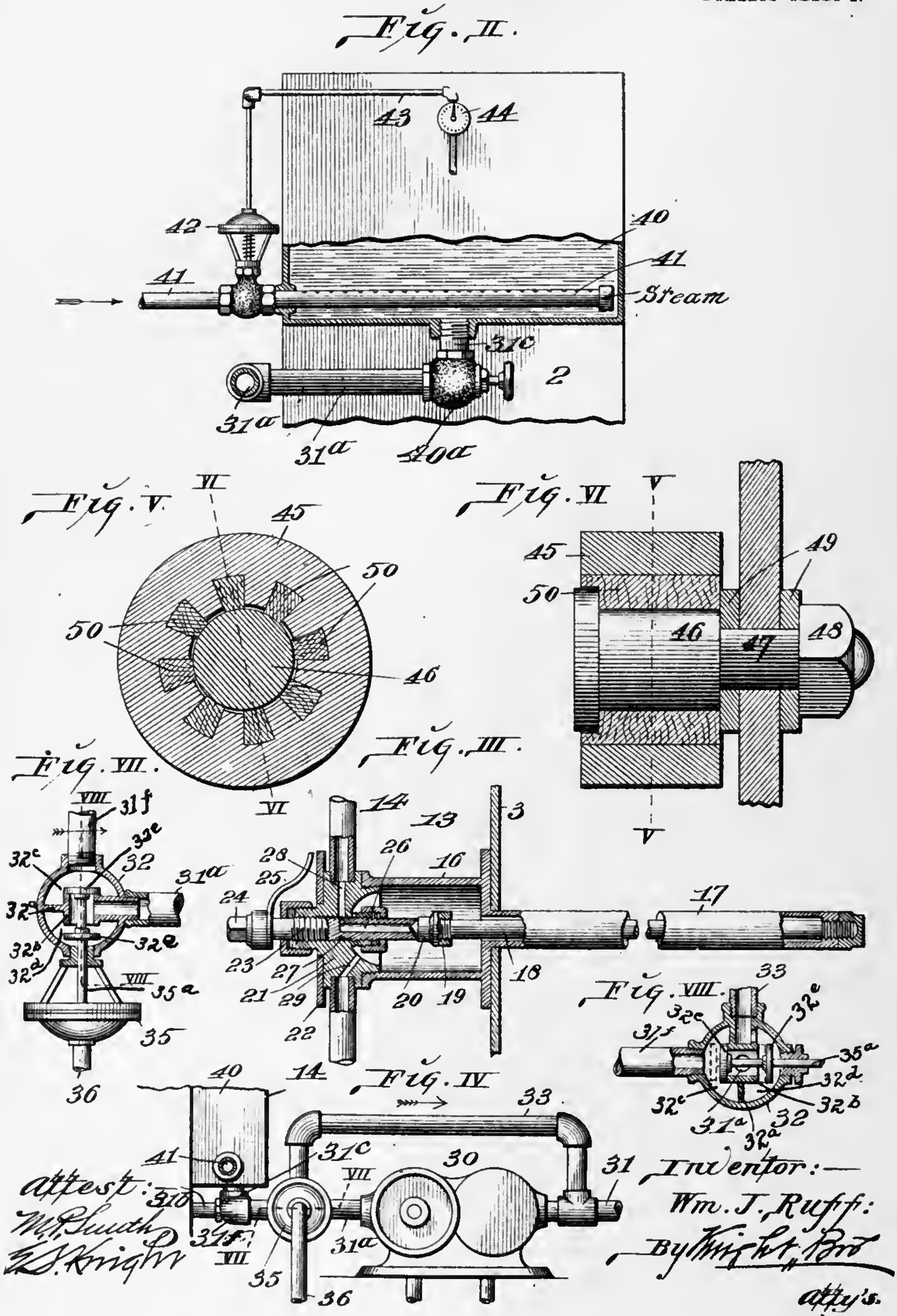
No. 782,878. PATENTED FEB. 21, 1905.

W. J. RUFF.

PASTEURIZER.

APPLICATION FILED JAN. 11, 1902.

2 SHEETS—SHEET 2.



No. 782,878. Patented February 21, 1905.

UNITED STATES PATENT OFFICE.

WILLIAM J. RUFF, OF QUINCY, ILLINOIS.

PASTEURIZER.

SPECIFICATION forming part of Letters Patent No. 782,878, dated February 21, 1905.

Application filed January 11, 1902. Serial No. 89,321.

To all whom it may concern:

Be it known that I, WILLIAM J. RUFF, a citizen of the United States, residing at Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Pasteurizers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to the same class of a pasteurizer as that shown and described in my application for Letters Patent filed September 16, 1901, Serial No. 75,509, wherein there is an attemperating-compartment for gradually heating the beer to something less than the maximum temperature to which the beer is exposed while passing through a sterilizing-compartment, from which the beer passes through a cooling-compartment, by which the temperature is reduced to approximately that of the atmosphere.

The principal object of my present invention is to provide means whereby the beer just before entering the sterilizing-compartment is heated to approximately as high a temperature as the temperature of the sterilizing-compartment, so that as it enters the sterilizing-compartment it will be of a temperature approximately equal to that of the sterilizing-compartment in order that during its entire passage through the compartment it will be subjected to the maximum sterilizing temperature of the machine and does not, as heretofore, travel through a portion of the sterilizing-compartment before reaching the maximum temperature of that chamber, the result being an increase in the capacity of the machine, as the beer can be moved along faster and yet be exposed for a sufficient length of time to the maximum temperature of the sterilizing-compartment to effect perfect pasteurization, because it does not go part way through the sterilizing-compartment before reaching the maximum temperature of that compartment.

My invention consists in details of construction hereinafter particularly described, and pointed out in the claims.

Figure I is a view of my improved machine, part in vertical section and part in elevation. Fig. II is a detail view showing the upper portion of one leg of the attemperating-compartment. Fig. III is an enlarged section showing one of the regulators. Fig. IV is a top or plan view of the automatic pump. Fig. V is a vertical section illustrating the manner of mounting the rollers located at the bottom of the attemperating, sterilizing, and cooling compartments and under which the traveling carrier passes, the section being taken on line V V, Fig. VI. Fig. VI is a vertical section taken on line VI VI, Fig. V. Fig. VII is a section taken on line VII VII, Fig. IV. Fig. VIII is a section taken on line VIII VIII, Fig. VII.

1 2 represent a pair of legs forming a compartment through which the beer first passes. 3 4 represent a pair of legs forming a compartment through which the beer next passes, and 5 6 a pair of legs forming a compartment through which the beer finally passes. The first pair of legs form what may be termed an "attemperating-compartment," for in these legs the beer is gradually heated toward the maximum temperature to which it is exposed while passing through the legs 3 and 4, which form the sterilizing-compartment wherein the beer is pasteurized. From the sterilizing-compartment the beer passes through the legs 5 and 6, which form what I call a "cooling-compartment," inasmuch as the temperature of the beer is here reduced and finally escapes therefrom at approximately atmospheric temperature, or at least so low a temperature that the bottles are not likely to become broken by sudden exposure to the atmosphere as they leave the machine. The legs are all connected by upper and lower elbows, so that the legs and elbows form a single continuous conduit or chamber from the open upper end of leg 1 to the open upper end of leg 6, and the beer is not exposed to the atmosphere from the time it enters the machine until it leaves it. The legs are located between upper sills 7 and lower sills 8, that are connected together by posts 9, or any other suitable means may be provided for supporting the legs.

The bottles are passed through the machine in the direction of the arrow, Fig. I, the bottles being placed in suitable receptacles 10, pivotally connected to an endless carrier composed of chains that pass over sprocket-wheels 11, located at the four corners of the machine.

In the use of the machine the three compartments are filled with water or other fluid nearly to their tops, the water in the sterilizing-compartment being heated by means of steam introduced through a pipe 12 until the temperature is raised sufficiently high to effect the pasteurization of the beer. In starting the machine (and subsequently, if desired) the water in the attemperating and cooling compartments may likewise be brought to the proper temperature through means of fluid introduced through pipes corresponding to the pipe 12. The introduction of steam through the pipe 12 is automatically controlled by a regulator 13, (see Figs. I and III,) which is attached to the lower portion of the sterilizing-compartment and which may be of any well-known form or type. The regulator controls the passage of compressed air through a pipe 14, which air acts to close the valve 15 in pipe 12 when the temperature of the water in the sterilizing-compartment has been raised to the desired height. As stated, any form of temperature-regulator may be employed; but I prefer to use such a regulator as is illustrated in detail in Fig. III, as it is simple in construction and positive in operation. In this construction a cylindrical casing 16 is secured in any suitable manner to the wall of the sterilizing-compartment, and to said casing is formed integrally a tubular portion 17, that extends some little distance into the lower part of the sterilizing-compartment. Screw-seated in the outer end of this tubular portion 17 is the end of a rod 18, the opposite end of which carries a valve-plug 19, having a conical end 20. The outer end of the casing 16 is closed by a plug or cap 21, on the outer face of which is provided a dial 22. Passing through the center of this plug 21 in alinement with the center of the rod 18 is a screw-threaded rod 23, the outer end of which is provided with a nut 24 and an indicating-finger 25. Passing approximately half-way through the length of the rod 23 is a bore or passage-way 26, the inner end of which extends laterally in one direction through the rod 23 and communicates with a groove 27, formed in the screw-threaded portion of the rod. The inner end of the tubular portion of this rod 23 terminates in a valve-seat adapted to receive the conical end of the plug 19. Formed in the plug 21 is a passage-way 28, the inner end of which communicates with the groove 27. The upper part of the air-pipe 14 is tapped into the plug 21 and is in communication with the passage-way 28. On the opposite side of the plug 21 the lower part of the air-pipe 14 is tapped into said plug and is in communication with a bore or passage-way 29, the inner end of which communicates with a chamber within the casing 16. The regulator is set by adjusting the nut 24, which turns the rod 23 in the desired direction to bring the finger 25 to the proper point on the dial 22, and by this operation the position of the valve-seat at the inner end of the rod 23 relative to the conical end of the plug is varied, for the reason that the rod 23 is moved toward or drawn away from the valve-plug 19, according to the direction in which said rod is turned. The proper temperature within the sterilizing-compartment expands the tubular portion 17 sufficient to cause the valve-plug 19 to remain unseated, and while in this position the compressed air from the pipe 14 passes through the bore 29 into the chamber within the casing, from thence through the bores 26 and 28 into and through the upper part of pipe 14 to the diaphragm-valve 15 to keep said valve closed. When the temperature within the sterilizing-compartment falls below the proper point, or the point at which the valve is set to actuate, the contraction of the tubular portion 17 due to the lowering of the temperature will move the conical plug 19, carried by the rod 18, which is in turn carried by the tubular portion 17, toward and against the valve-seat on the rod 23, thus closing the passage of the compressed air through the regulator. The supply of compressed air thus being shut off will allow the diaphragm-valve to open, and steam is admitted to the sterilizing-compartment through the pipe 12. When the valve 19 closes, the air in the upper part of the pipe 14 escapes under the steam-pressure through a valve 14^a, (see Fig. I,) which is so adjusted as to always have a small leak.

31 represents a pipe forming a communication between the leg 5 of the cooling-compartment and the suction side of a rotary pump 30 of any well-known construction.

31^a and 31^f are pipes forming a communication between the discharge side of the pump 30 and the leg of the attemperating-compartment. The pipes 31, 31^a, and 31^f and the pump 30 serve to conduct the water from the inner leg of the cooling-compartment to the inner leg of the attemperating-compartment, thus bringing water that has been heated in cooling the hot beer in the cooling-compartment into the attemperating-compartment, where the waste heat is utilized for the preliminary or initial heating of the beer.

Between the pipe 31^a and pipe 31^f is a valve 32, (see Figs. VII and VIII,) this valve controlling the passage of water from the pump to the leg 2. The valve 32 comprises a globular casing divided centrally by a partition 32^a into two compartments 32^c and 32^d, connected together by a passage-tube 32^b, into which leads the pipe 31^a, while the pipe 31^f is connected to the compartment 32^c. The pipe 33, the object of which will be hereinafter set forth, connects to the compartment 32^d. Extending through the valve-casing is a valve-stem 35^a, operated by a means hereinafter described and carrying disks 32^e, which upon the movement of the valve-stem simultaneously close one end of the tube 32^h and open the other end. When the valve is in the position shown by dotted lines in Fig. VIII, the water circulates through the pipes 31 and 31^a from the leg 5 to the leg 2; but when the valve is moved to the position shown in full lines, Fig. VIII, the water circulates around the pump through a by-pipe 33, which connects the outlet of the pipe to the inlet, so that at this time there is no movement of the water from leg 5 to leg 2, and the water is caused to take this course when the water in leg 2 is at the desired temperature through means of a regulator 34, attached to the leg 2 and connected to the diaphragm 35 of the valve 32 by means of a compressed-air pipe 36. The construction and operation of the regulator 34 is the same in all respects as the construction and operation of the regulator shown in Fig. III and which has been described. As soon as the temperature of the water in leg 2 falls beneath the desired point the regulator operates and the pump starts a circulation of water from leg 5 to leg 2, the regulator acting to move the valve from the position shown in full lines, Fig. VIII, to the position shown in dotted lines. As soon as the temperature in the leg 2 reaches the desired height the regulator 16 operates again and the water simply circulates around the pump through the pipe 33, the pump being thus kept in continuous operation. To complete the circulation between legs 2 and 5, a connection is made between legs 1 and 6 by the use of a pipe 37, (see Fig. I,) the cold water produced by the final heating of the beer thus passing around the legs 6 and 5 and acting to keep down the temperature in these legs which has been created by the hot beer as it passes through these legs from the sterilizing-compartment.

While I have described somewhat in detail the construction and operation of the regulators and the pump circulating system for the purpose of illustrating the operation of the machine that is shown in the drawings, yet I do not make any claims therefor in this application, as the same is the subject-matter of the invention claimed in my application referred to.

I will now proceed to describe the features that are specially claimed in this application and which may be used either with or without the regulator and circulating system that have been described.

As stated, the pasteurization of the beer takes place in the portions 3 4 of the conduit, the beer being gradually heated from the time it enters the machine and while it is passing through the compartment 1 2 of the machine. Necessarily the temperature in the main portion of the compartment 1 2 must be lower than the sterilizing temperature in the compartment 3 4, for if the cooled bottles were at first subjected to the temperature of the sterilizing heat they would be broken. The beer is therefore gradually heated as it advances toward the sterilizing-compartment; but so far as I know no pasteurizer has ever been made wherein the beer has been heated to approximately the maximum temperature of the sterilizing-compartment before entering said compartment, and therefore it passes part way through the sterilizing-compartment before it has been raised to the desired temperature for pasteurization. Beer has to be subjected to the pasteurizing heat a sufficient length of time to thoroughly effect pasteurization and when, as heretofore, it has been moved part way through the pasteurizing-compartment before reaching the maximum temperature it has to move corresponding slower in order to be subjected to the maximum pasteurizing heat a sufficient length of time before leaving the sterilizing-compartment. It is the principal object of my present invention to provide a means whereby the beer will be heated to approximately the maximum temperature of the sterilizing-compartment before entering said compartment, so that upon entering the compartment it is heated approximately to the maximum degree, and therefore is subjected to the maximum temperature all the time that it is passing through the sterilizing-compartment, the result being that the machine can be operated considerably faster and its capacity correspondingly increased. To accomplish this end, I provide the upper portion of the attemperating-compartment of the conduit with a chamber or enlargement 40, which is in communication with the upper portion of leg 2 of the attemperating-compartment, and means for heating the fluid in this chamber is provided and which may consist of a steam-pipe 41. The fluid is heated in this chamber to as an approximately high a temperature as that of the sterilizing-compartment of the conduit, so that as the bottles are passing through the last part of the attemperating-compartment they pass through approximately as high a temperature as that of the sterilizing-compartment, and they thus enter the sterilizing-compartment at as an approximately high a temperature as that contained in the sterilizing-compartment, and thus they are subjected to the sterilizing temperature all the time that they are passing through the sterilizing-compartment of the conduit. It will be observed that legs 2 and 3 of the conduit are connected by a closed elbow, so that the bottles do not pass into the open air as they are conducted from leg 2 to leg 3, but remain in approximately the same temperature as that to which they have been subjected before passing from one leg to the other. The legs 4 and 5 are likewise connected by an elbow, so that the beer at this point is not exposed to the atmosphere while moving from one leg to the other, and thus at no place in the machine is the beer subjected to atmospheric temperature from the time it enters the machine until the time it leaves.

The steam-pipe 41 is provided with a diaphragm-valve 42, connected to the chamber 40 by means of a pipe 43, provided with a regulator 44, that corresponds in construction and operation to the regulator 13, so that the steam is automatically turned on and off in the pipe 41 as the temperature in the chamber 40 rises above or falls below the temperature which the regulator has been set to maintain.

In order to maintain a substantially uniform temperature between the two parts of the sterilizing-compartment, I provide a pipe 51, forming a communication between the legs 3 and 4 and being connected to a rotary pump 52, like the pump 30, of any well-known construction to cause a circulation of water between the two points in the sterilizing-compartment.

The delivery end of the pipe 31^a is provided with two branches, 31^b and 31^c, one of which connects with the upper end of leg 2, while the other connects with the chamber 40 directly. At the junction of these branches is a valve 40^a, so that more or less of the water may be caused to pass through either branch, or all of the water may be caused to pass through one of the branches. By regulating the amount of water that passes through the branch that connects with the chamber 40 the area of the hot water in the upper part of the leg 2 will be increased or diminished, because the greater the flow of water through this branch (the heat in the pipe 41 being kept up accordingly) the greater will be the flow of hot water from the chamber 40 down through the leg 2, so that the beer will be subjected for a greater or less time, as desired, to this heat in leg 2, that corresponds approximately to the heat of the sterilizing-compartment.

In my application referred to the endless carrier passes beneath rollers or pulleys located in the lower elbows of the conduit. These pulleys occupy considerable room and necessitate the use of a long elbow, and they necessarily cause the bottle-carrying receptacles to traverse the elbows a considerable distance beneath the upper bends of the elbows, the result of which is that the bottles go through a different temperature of water as they round the elbows from what they were in before starting to pass through the elbows and a different temperature from what they are in when they emerge from the elbows. This is due to the fact that with a long elbow, which is necessitated by the use of wheels, the water in the upper part of the elbow is much warmer than the water in the lower part and is of approximately the same temperature as the water in the two legs of the compartment above the bend of the elbow, this difference in temperature being due to the fact that there is a large amount of practically dead cool water in the lower part of the elbow, for the warm water that circulates from one leg to another of the compartment of course passes through the upper part of the elbow, it being lighter, and leaves the water in the lower part of the elbow practically undisturbed, which becomes chilled, the result being, as stated, that the beer is passed through colder water as it rounds the elbow than it left before reaching the elbow and that it enters after it leaves the elbow. This is objectionable, as it is not desirable to have the beer chilled or cooled down in temperature while passing from one leg to another of a compartment. To obviate these difficulties, I journal friction-rollers 45 in these lower elbows to receive the carrier. By using the rollers instead of wheels a shallow elbow can be employed, and the temperature of the water in the lower part of the elbow is practically the same as the temperature of the water in the legs on each side of the elbow and there is practically a circulation of all of the water in the elbow, as the volume there is practically the same as it is in the vertical parts of the legs. As shown in Figs. V and VI, these rollers are mounted on studs 46, secured to the outer wall of the conduit by means of shanks 47, provided with nuts 48, gaskets 49 being employed to make a tight joint. The rollers are preferably provided with dovetailed hardwood fillers 50, that form a journal-bearing between the rollers and the studs. By using these friction-rollers the carrier can pass close up to the inner bends of the elbows, as shown in Fig. I.

I do not herein claim a pasteurizer comprising a pair of water-legs forming an attemperating-compartment, a pair of water-legs forming a sterilizing-compartment, a pair of water-legs forming a cooling-compartment, means for conveying the substance to be sterilized through said legs, and means for creating a circulation of water between the attemperating-compartment and cooling-compartment, as such forms the subject-matter of my application filed September 16, 1901, Serial No. 75,509, Patent No. 701,622.

By forming the legs that constitute the attemperating, sterilizing, and cooling compartments in their separated form and connecting them at the top and bottom by elbows atmospheric air is allowed to circulate between the different legs, so that the temperature of one leg will not radiate to another and effect the temperature of the water in such other leg.

I claim as my invention—

1. A pasteurizer having an attemperating-compartment, a sterilizing-compartment, and a cooling-compartment said attemperating-compartment being provided with means for heating the substance under treatment to approximately as high a temperature as that of the

sterilizing-compartment just before the substance leaves the attemperating-compartment; substantially as described.

2. A pasteurizer having an attemperating-compartment, a sterilizing-compartment, and a cooling-compartment, all formed in a continuous conduit, said attemperating-compartment being provided with means for heating the substance under treatment to approximately as high a temperature as that of the sterilizing-compartment just before the substance leaves the attemperating-compartment, substantially as set forth.

3. A pasteurizer consisting of an attemperating-compartment, a sterilizing-compartment, and a cooling-compartment, said attemperating-compartment being provided with an enlargement or chamber at its junction with the sterilizing-compartment, and said chamber being provided with means for heating the fluid to approximately as high a temperature as that of the sterilizing-compartment, whereby the substance being treated is heated to as an approximately high a temperature as that of the sterilizing-compartment just before entering the last-mentioned compartment, substantially as set forth.

4. A pasteurizer comprising an attemperating-compartment, a sterilizing-compartment, and a cooling-compartment, said attemperating-compartment being provided with an enlargment or chamber near its junction with the sterilizing-compartment, means for heating the water in said enlargement or chamber, and means for causing a circulation of water between the cooling-compartment and said chamber of the attemperating-compartment, substantially as set forth.

WILLIAM J. RUFF.

In presence of—

GERHARD G. ARENDS,

FRANK A. LUBBE.

Pasteurizer
Sept. 1905

798,833

No. 798,833. PATENTED SEPT. 5, 1905.

W. J. RUFF.

INTERMITTENT MOVEMENT IN PASTEURIZERS.

APPLICATION FILED DEC. 5, 1904.

2 SHEETS—SHEET 1.

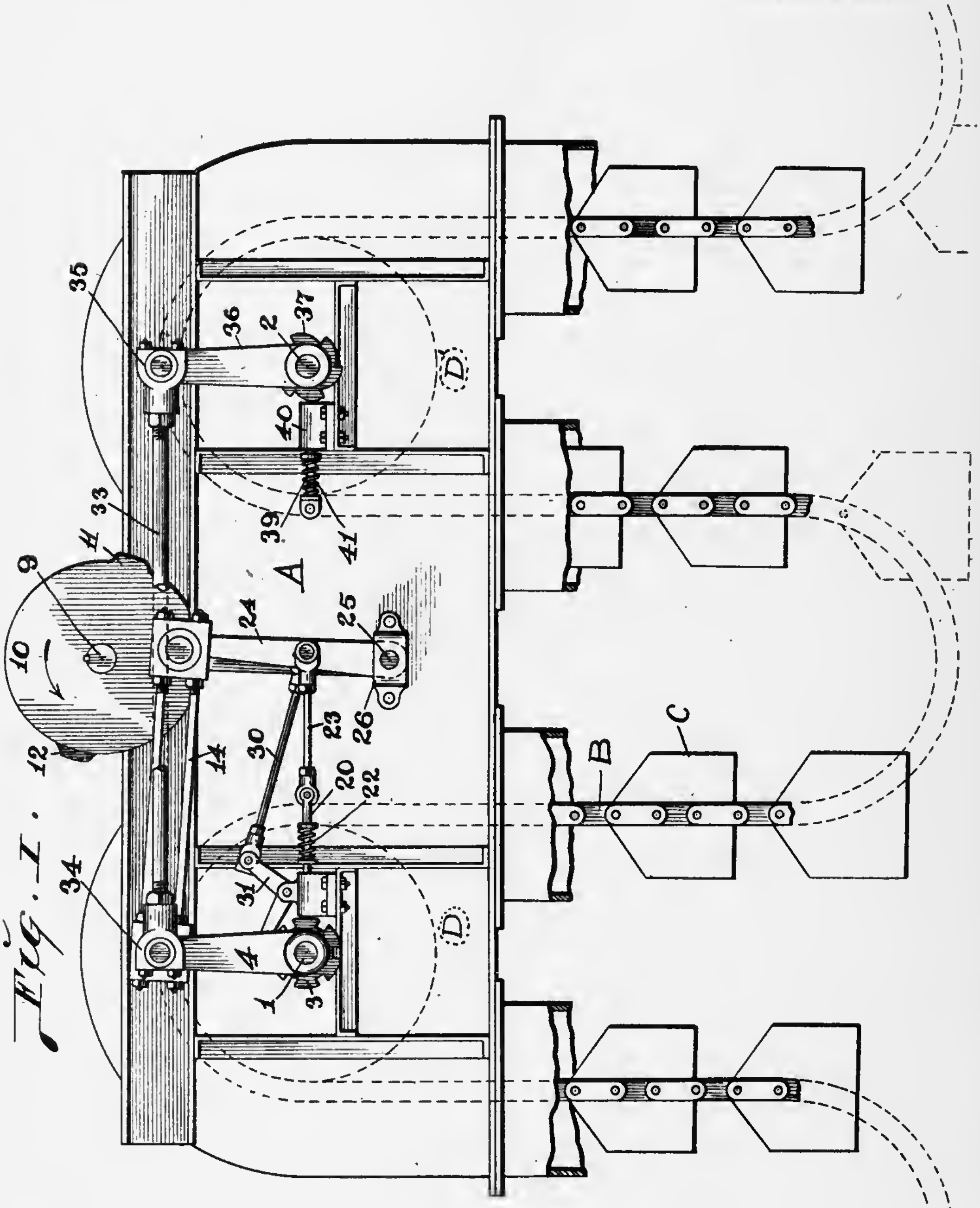


Fig. 1.

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No. 798,833. PATENTED SEPT. 5, 1905.

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INTERMITTENT MOVEMENT IN PASTEURIZERS.

APPLICATION FILED DEC. 5, 1904.

2 SHEETS—SHEET 2.

Fig. II.

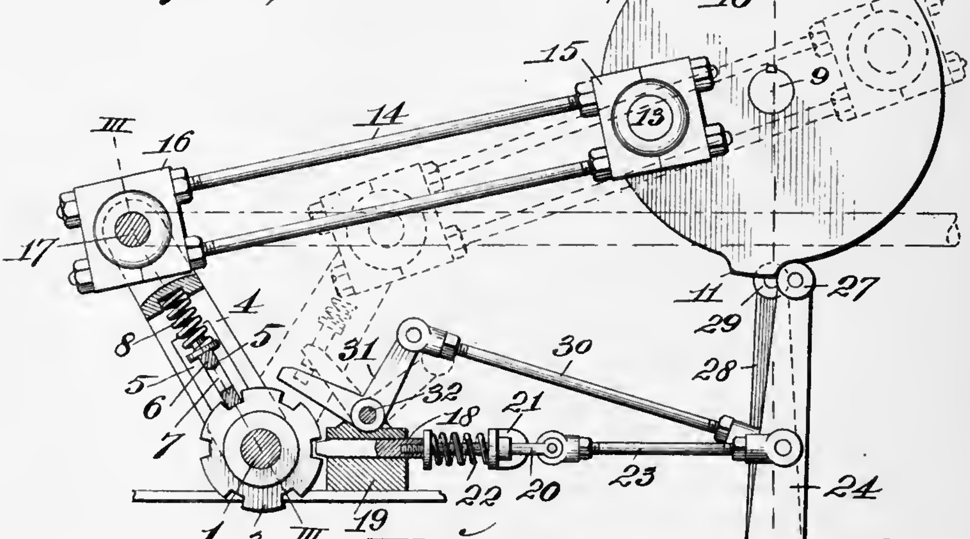


Fig. IV.

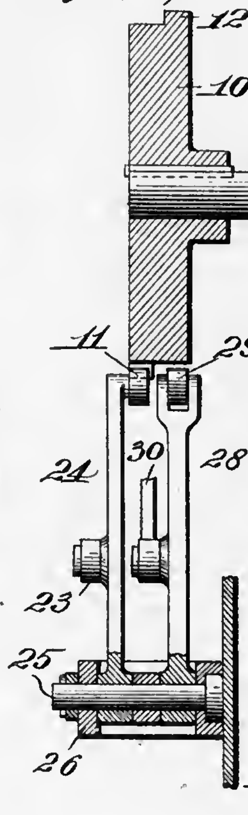


Fig. III.

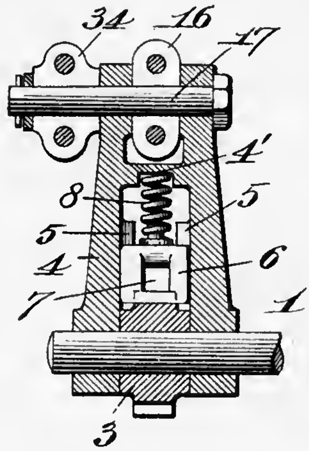
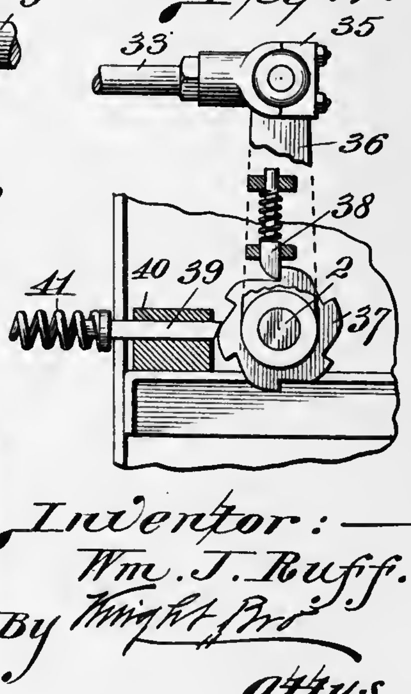


Fig. V.



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UNITED STATES PATENT OFFICE.

WILLIAM J. RUFF, OF QUINCY, ILLINOIS.

INTERMITTENT MOVEMENT IN PASTEURIZERS.

No. 798,833. Specification of Letters Patent. Patented Sept. 5, 1905.

Application filed December 5, 1904. Serial No. 235,526.

To all whom it may concern:

Be it known that I, WILLIAM J. RUFF, a citizen of the United States, residing at Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Intermittent Movements for Pasteurizers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to an intermittent movement for imparting a step-by-step movement to the bottle-carrier of a pasteurizer in which the receptacles of the beer or other material to be pasteurized are made to pass successively through vertically-superposed strata of a heat-transferring medium for gradually raising and then gradually lowering the temperature of the goods contained in such receptacles. In other words, the material is made to ascend or descend through different strata of a medium adapted to transfer heat to the material to be pasteurized or transfer it from said material, according to the stage of the pasteurization through which the material is passing. By this intermittent movement the material is not only subjected during the periods of rest to the temperature of the medium in which the receptacles are found at the respective steps, but during the periods of rest the baskets or other receptacles of the carrier may be loaded and unloaded as they are successively presented at the proper points for receiving and discharging the material to be treated.

The improvement is well adapted for use in pasteurizers such as illustrated in United States Letters Patent issued to me, Nos. 701,622 and 767,962, dated, respectively, June 8, 1902, and August 16, 1904, and one issued to A. A. Busch *et al.*, No. 713,952, dated November 18, 1902.

The object of the present improvement is to provide for an intermittent movement of the conveyer in a pasteurizer as distinguished from a continuously-moving conveyer, this intermittent movement being deemed much more favorable for the pasteurization for reasons that I will specify further. The merits of the substitution lie in that I am enabled to make better use of the different strata in temperature in the pasteurizer, more especially in types of such apparatus in which there is means for causing a very thoroughly-defined line of demarcation of temperature as between two different strata of water, as in the patents enumerated. These different strata in temperature are made use of by the intermittent movement in that the cages containing the receptacles holding material to be pasteurized are transferred by a step-by-step movement from one stratum of temperature to a different temperature, after which they are allowed to rest for a stated period in order the better to create an exchange of temperature between the water and the contents of the receptacles. This results in a more even heating and cooling of the material and a more thorough transferring of the temperatures in both directions. In carrying on the pasteurization in a pasteurizer in which the conveyer moves continuously the water that enters the cages containing the receptacles is displaced very gradually and there is not an immediate complete exchange of temperature taking place within the conveyer-cages when the cages move from one temperature stratum to another, owing to lack of rapid circulation from the cages. By moving the conveyer intermittently the cages are suddenly moved forward step by step, as there is less circulation in the cages and between the receptacles therein than there is in the water surrounding the cages. The rapid movement of the conveyer through the stratified temperature zones causes the water to be expelled from the cages rapidly, so that it is displaced and immediately replaced by either hotter or colder water as soon as the cages reach the next stratum of temperature. In this way I am enabled to get the direct benefit of each separate stratified course of water and its temperature conditions. The cages stop in their respective positions in each stratified course of water a stated length of time in order to absorb and give off temperatures to and from the water surrounding the receptacles in the cages. This is much to be preferred over a continuous movement in that it insures a more complete and even pasteurization of the material over what can be obtained in a continuously-moving conveyer, as in that case currents are produced which follow a less defined course and as a consequence of which some of the receptacles containing material to be pasteurized are affected more than others.

Figure I is a side elevation of a portion of a pasteurizer with my intermittent movement applied thereto. Fig. II is an enlarged side elevation of the main portion of my movement. Fig. III is a section taken on line III III, Fig. II. Fig. IV is a section taken on line IV IV, Fig. II. Fig. V is a view, partly in elevation and partly in vertical section.

A designates a portion of a pasteurizer (see Fig. I) that may be of the form illustrated in either of the patents hereinbefore alluded to or of any other desirable form.

B is an endless carrier (such as is shown in the patents referred to) that operates in the tank of the pasteurizer and the holders C of which may be in the form of baskets, as shown, or of any other suitable formation. The carrier B operates upon sheaves D and D'. (Indicated by dotted lines, Fig. I.)

1 designates a shaft to which the sheaves D are fixed, and 2 is a shaft to which the sheaves D' are fixed.

3 is a notched wheel carried by the shaft 1, and 4 is a bifurcated throw-lever that straddles the notched wheel 3 and the arms of which are loosely fitted to the shaft 1. Upon the inner faces of the arms of the throw-lever are guides 5.

6 is a pawl slidably positioned between the guides 5 to reciprocate within the throw-lever. This pawl is adapted for engagement with the notched wheel 3, as seen in Figs. II and III, and it is provided with an aperture 7. The pawl is held projected to the notched wheel by a spring 8, which bears at one end against the pawl and the other end of which rests against a seat 4', that is an integral part of the throw-lever.

9 designates a driving-shaft to which power is applied from any suitable source.

10 is a crank-disk fixed to the shaft 9 and bearing peripheral bosses 11 and 12, that are offset from each other, so that they travel in different paths.

13 is a wrist-pin projecting from one side of the disk 10 and forming a part of said disk.

14 is a pitman having at one end a box 15, that is loosely fitted to the wrist-pin 13. At the other end of said pitman is a box 16, that is pivoted to the outer end of the throw-lever 4 by a pin 17. The pitman 14 by its connection to the crank-disk and the throw-lever provides for the imparting of rocking movement to the throw-lever during the rotation of the crank-disk 10, and when the throw-lever is rocked and the spring-pressed pawl 6 is seated in one of the notches of the wheel 3 and the notched wheel is in freed condition rotation is imparted to said wheel and the shaft 1, to which it is fixed, so that the conveyer-supporting sheaves D will be moved to cause travel of the bottle-carrier to a degree corresponding to the movement imparted to said notched wheel.

18 designates a catch-bolt that is reciprocally positioned in a guide 19, located adjacent to the notched wheel 3 and the point of which is adapted to enter the notches of said wheel to prevent retrograde rotation of the wheel under a certain condition that will hereinafter be referred to. The catch-bolt has connected to it the shank 20, that operates through a suitably-supported bracket 21 and is surrounded by an expansion-spring 22, located between the head of the catch-bolt and said bracket and by which the bolt is normally pressed toward the notched wheel 3.

23 is a pull-rod having one of its ends connected to the catch-bolt shank.

24 is a pull-lever to which the other end of the pull-rod 23 is pivoted. The pull-lever 24 is rockingly supported at its lower end by a shaft 25, that is mounted in a bracket 26, suitably supported. At the upper or free end of the pull-lever 24 is a roller 27, that is positioned in the path of travel of the crank-disk boss 11, so that it is engaged by said boss when the boss travels thereto during the rotation of the crank-disk.

28 designates a second pull-lever mounted upon the shaft 25 independently of the pull-lever 24 and bearing at its upper or free end a roller 29, that is positioned in the path of travel of the crank-disk boss 12, so that said boss will strike thereagainst when it is rotated thereto.

30 is a connecting-rod, pivoted at one end to the pull-lever 28, and 31 is a bell-crank lever, to one arm of which the other end of said connecting-rod is pivoted. This bell-crank lever is mounted upon a rock-shaft 32, mounted upon the catch-bolt guide 19, and the second or free arm of said lever extends in a direction toward the spring-controlled pawl 6, carried by the throw-lever 4, so that it will enter the aperture in said pawl when the pawl is moved thereto by the rocking of the throw-lever.

The operation of my movement as thus far explained is as follows: The crank-disk 10 rotates in the direction indicated by the arrow, Fig. II, and while its crank-pin is traveling upon a dead-center with respect to the pivot-pin 17, that connects the pitman 14 to the throw-lever 4, the crank-disk boss 11 travels against the roller 27 of the pull-lever 24, thereby rocking said pull-lever and causing the catch-bolt 18 to be withdrawn from the notched wheel 3. As the crank-disk continues to rotate to carry the crank-pin 13 from the position seen in full lines to the position seen in dotted lines, Fig. II, the pitman 14 is drawn forwardly and the throw-lever 4 is rocked to rotate the notched wheel 3, shaft 1, and sheaves thereon a distance corresponding to the space between the notches in which the pawl 6 is seated and the notch next in advance of the one in which it is seated. When the sheaves are so rotated, the carrier B has a movement imparted to it corresponding to the spacing of the bottle-holders. The movement of the throw-lever, as stated, carries the pawl 6 to the free arm of the bell-crank lever

31, and said arm moves into the aperture in said pawl, as seen in dotted lines, Fig. II. At this time the crank-disk having made a half-revolution its boss 12 is brought to the roller 29 of the pull-lever 28, and said boss acts against said roller to throw said pull-lever rearwardly and through the medium of the connecting-rod 30 rocks the free arm of the bell-crank lever 31 upwardly for the purpose of withdrawing the pawl 6 from the notch in which it was previously seated. Previous, however, to the withdrawal of said pawl the catch-bolt 18 enters into a notch in the wheel 3, being projected thereinto by the spring 22 as soon as the throw-lever 4 is rocked to the limit of its movement. It will be understood that the point of the catch-bolt rides against the periphery of the notched wheel between notches thereof while the wheel is being rotated subsequent to the withdrawal of the catch-bolt, as previously explained. The notched wheel being now held by the catch-bolt, retrograde rotation thereof is prevented and the wheel held while the rotation of the crank-disk 10 is continued to bring the wrist-pin back to the starting-point and return the throw-lever to its former position and permit entry of the pawl 6 into the notch of the wheel 3 next adjacent to that it was seated in for the next operation, the pawl riding off of the bell-crank arm onto the notched wheel as the throw-arm is returned.

For the purpose of imparting rotation to the shaft 2, that carries the sheaves D′, so that said sheaves may be driven supplementarily to the driving of the shaft 1, I utilize a reach-rod 33, that is connected at one end to the pivot-pin 17 in the pull-lever 4 by a box 34. The other end of said reach-rod is pivotally connected by a box 35 to a bifurcated supplemental throw-lever 36, the arms of which are loosely mounted upon the shaft 2. 37 is a ratchet-wheel fixed to the shaft 2, and 38 is a spring-pressed pawl mounted in the throw-lever 36 and engaging the ratchet-wheel 37. This construction provides for actuation of the shaft 2 similar to the actuation of the shaft 1 as each movement of the throw-lever 4 is communicated to the lever 36 through the medium of the reach-rod 33, and when the last-named lever is actuated in a forward direction it causes rotation of the shaft 2, due to the engagement of the pawl 38 with the ratchet-wheel 37.

39 is a catch-bolt mounted in a guide 40 and having its point presented to the ratchet-wheel 37. The catch-bolt is pressed forwardly by a spring 41, and it acts to prevent retrograde rotation of the ratchet-wheel 37 when the pawl 38 is being returned after it has carried said ratchet-wheel in a forward direction.

The supplementary mechanism for operating the second shaft 2 of my intermittent movement is of more particular utility in constantly taking up the slack in the carrier of the pasteurizer and imparting movement to the carrier to compensate for wear therein, so that the carrier may be conducted in a uniform manner.

It is to be understood that while I have shown only two shafts driven by the movement herein described any greater number may readily be driven by properly connecting the additional shafts to the movement by suitable means, such as reach-rods.

I am aware that a German patent has been issued to Anders Anderson Pindstofte, dated December 9, 1896, for sterilizers, and I do not claim herein anything shown and described in said patent. There is no provision in the apparatus described in this patent for causing a step-by-step movement of the conveyer, the apparatus embracing merely a tank to contain a solid shallow body of water and a conveyer operating through said body of water, which is stopped from time to time for unloading and loading purpose, but which has no contemplation of an intermittent movement, whereby the cages of the conveyer are constantly carried forward step-by-step for the purpose of subjecting the receptacles therein and their contents to different temperature strata of water in a pasteurizer.

I claim as my invention—

1. The combination with the carrier of a pasteurizer in which the receptacles ascend or descend through varying strata of heat-transferring medium, of means for imparting intermittent movement to said carrier, substantially as set forth.

2. The combination with the carrier of a pasteurizer in which the receptacles successively pass through vertically-superposed strata of varying temperatures, of means for imparting intermittent movement to said carrier, and means for holding said carrier at rest periodically after movement has been imparted thereto, substantially as set forth.

3. The combination with the carrier of a pasteurizer in which the material to be treated is passed vertically through varying strata of temperatures, a sheave on which said carrier operates, and a shaft carrying said sheave; of means for imparting intermittent movement to said shaft, substantially as set forth.

4. A pasteurizer having means for developing vertically-superposed strata of varying temperatures and means causing the material to be treated to ascend or to descend through said strata of temperatures, by intermittent movements.

5. A pasteurizer having means for developing vertically-superposed strata of varying temperatures and means causing the material to be treated to ascend or to descend through said strata of temperatures by intermittent movements; the periods of rest between said intermittent movements occurring while the material is subjected to the different temperatures.

6. An apparatus for pasteurizing compris-

ing means for developing vertically-superposed strata of heat-transferring medium of varying temperatures and means causing the material to be treated to ascend or to descend through said strata to be brought to rest in each of said strata successively for a suitable period to enable the temperature of each stratum to produce the desired effect on the material to be treated.

WILLIAM J. RUFF.

In presence of—

HENRY DAMHORST,

FRANK A. LUBBE.

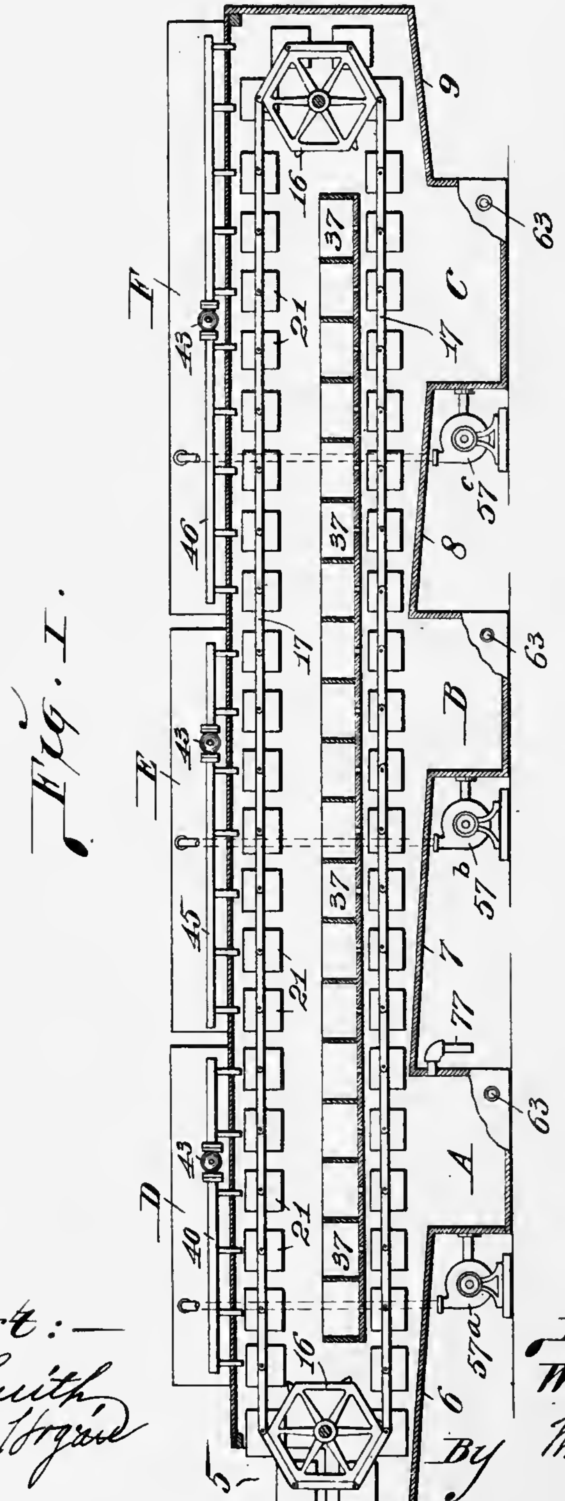
No. 801,693. PATENTED OCT. 10, 1905.

W. J. RUFF.

PASTEURIZER.

APPLICATION FILED JAN. 30, 1905.

4 SHEETS—SHEET 1.



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PASTEURIZER.

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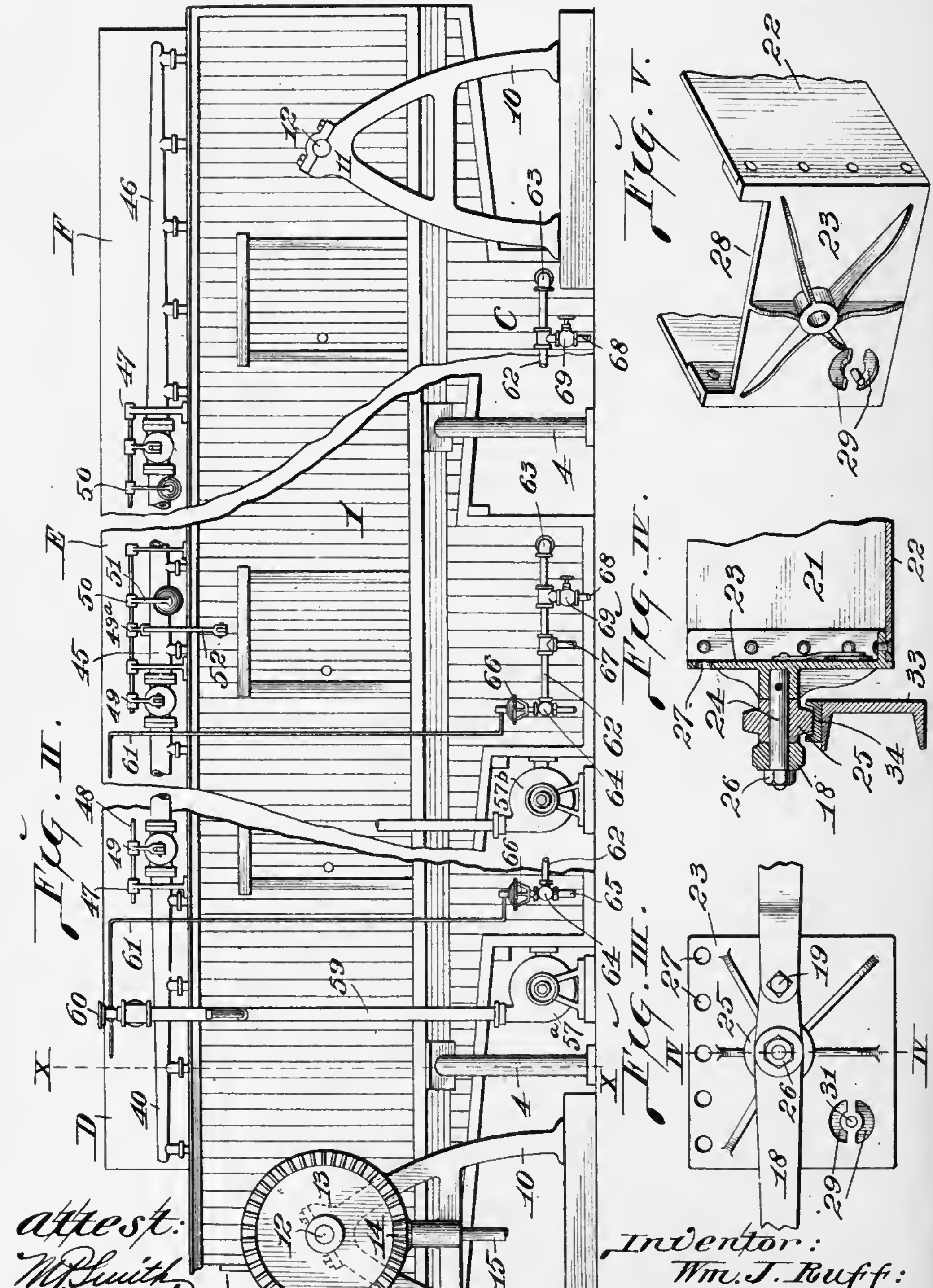
4 SHEETS—SHEET 2.



No. 801,693.

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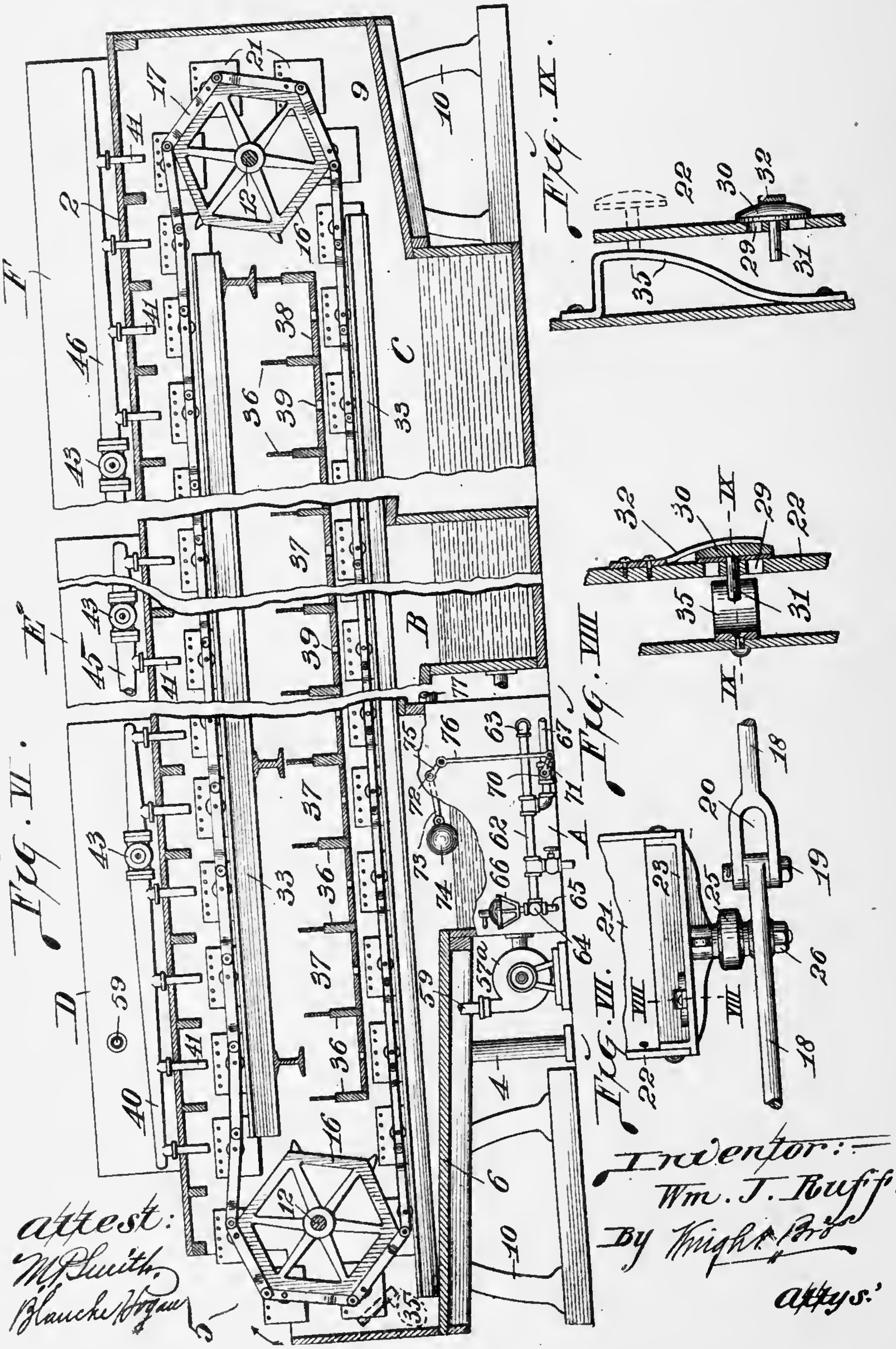
W. J. RUFF.

PASTEURIZER.

APPLICATION FILED JAN. 30, 1905.

4 SHEETS—SHEET 3.



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No. 801,693. PATENTED OCT. 10, 1905.

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PASTEURIZER.

APPLICATION FILED JAN. 30, 1905.

4 SHEETS—SHEET 4.

Fig. X.

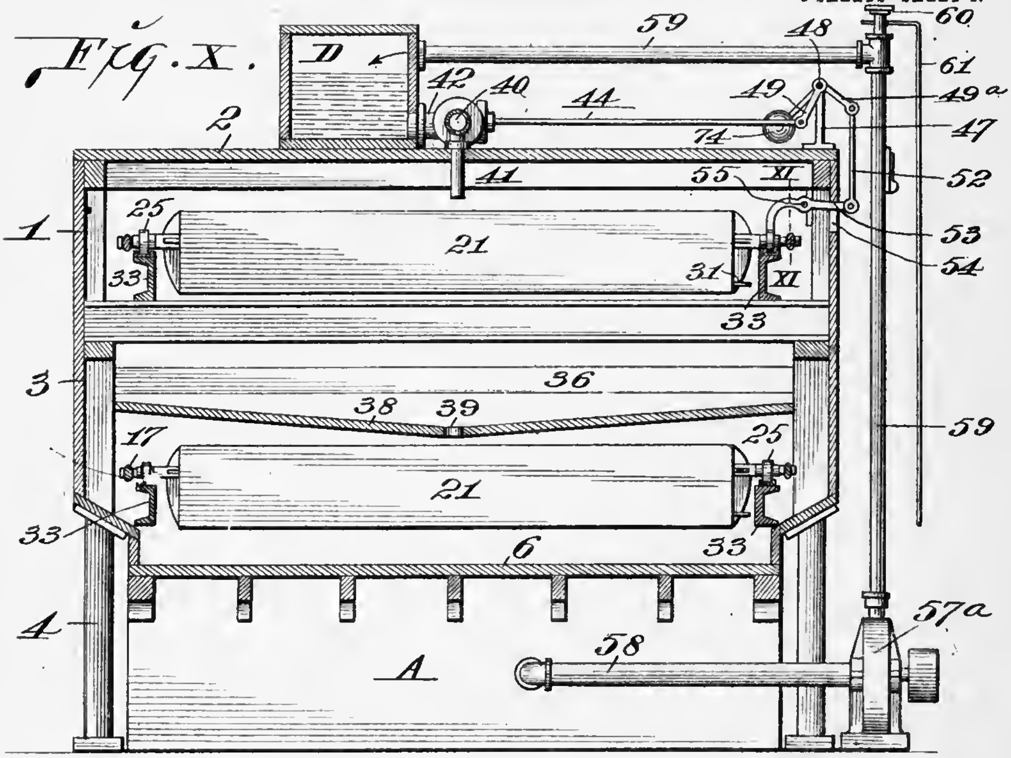


Fig. XI.

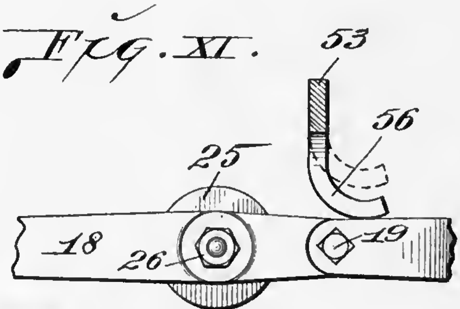
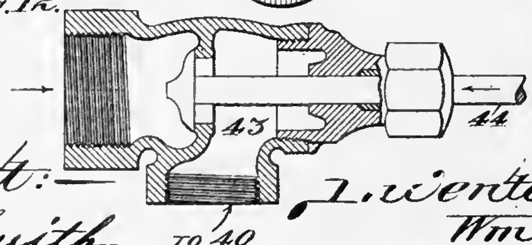


Fig. 12.



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PASTEURIZER.

No. 801,693. Specification of Letters Patent. Patented Oct. 10, 1905.

Application filed January 30, 1905. Serial No. 243,275.

To all whom it may concern:

Be it known that I, WILLIAM J. RUFF, a citizen of the United States, residing in Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Pasteurizers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

The object of my invention is to provide suitable means for pasteurizing beer wherein the heating agent is applied to the beer going into the machine with a gradually-increasing temperature and which heating agent is applied to the beer as it leaves the machine with a corresponding gradual decrease of temperature.

A further object of my invention is to construct a beer-pasteurizer wherein no cooling-water is made use of, but where the lower temperature of the cold beer entering the pasteurizer is utilized to lower the temperature of the beer after it has been pasteurized and is being discharged from the machine.

My invention consists in a pair of endless chains moving in horizontal planes and carrying between them carriers adapted to receive the bottled beer, a plurality of basins or tanks arranged beneath the chains and carriers, a corresponding plurality of tanks arranged above the chains and carriers, and various connections whereby water is taken from the tanks below the carriers and delivered to the tanks above the carriers, from whence said water discharges into the carriers and finally returns to the lower tanks or basins.

Figure I is a longitudinal section taken approximately through the center of a pasteurizer of my improved construction, this view being in the nature of a diagrammatical view and illustrating principally the chains, carriers, and tanks. Fig. II is a side elevation of the pasteurizer, parts thereof being broken away. Fig. III is an end elevation of one of the carriers made use of in carrying out my invention. Fig. IV is a vertical section taken on line IV IV, Fig. III. Fig. V is a perspective view of one end of a modified form of the carrier. Fig. VI is a vertical section taken longitudinally through the center of the machine. Fig. VII is a plan view of one end of one of the carriers. Fig. VIII is a detail vertical section taken at the end of one of the carriers through the discharge-valve thereof and showing a device for automatically opening said discharge-valve. Fig. IX is a horizontal section taken on line IX IX, Fig. VIII. Fig. X is an enlarged transverse section taken on line X X, Fig. II. Fig. XI is an enlarged detail section taken on line XI XI, Fig. X. Fig. XII is a view showing the interior arrangement of one of the valves, herein designated by the numeral 43.

1 indicates the housing of my improved pasteurizer, which is of an elongated box form having a flat top 2, framed together by the suitably-arranged timbers 3 and supported by posts 4. The housing thus constructed is entirely closed, with the exception of the top forward corner, which is left open, as indicated by 5, through which opening the beer is placed in and removed from the carriers of the machine. Located beneath the housing are three rectangular tanks or basins A, B, and C. The bottom section 6 of the housing, beneath the front end or the end in which the opening 5 is formed, slopes gradually downwardly from the extreme outer end of said housing to the top of the tank A. A bottom section 7 slopes gradually downward from the rear side of the tank A to the front side of the tank B. A bottom section 8 slopes gradually downward from the rear side of the tank B to the front side of the tank C, and a fourth bottom section 9 slopes from the extreme rear end of the housing downwardly to the rear wall of said tank C. Arranged on the sides of the housing, at each end thereof, are **A**-shaped frames 10, provided with bearings 11 at their upper ends, in which are journaled for rotation the shafts 12, that extend transversely through the side walls of the housing 1. On the forward one of these shafts 12 is mounted a beveled gear-wheel 13, with which meshes a pinion 14, carried by a shaft 15, suitably driven. Inside the housing and upon the shafts 12 are mounted the sprocket-wheels 16, around corresponding pairs of which pass the endless chains 17. These chains are made up of elongated links 18, pivotally connected together by bolts or pins 19, and each link is provided with a bifurcated end 20, that receives the teeth of the sprocket-wheel 16. While I prefer to construct the chain in the manner just described, any other suitable sprocket-chain could be utilized. The carriers 21 are positioned between each oppositely-arranged pair of links 18, these carriers each comprising a rectangular open-top body 22, to which is secured in any suitable manner the end walls 23. Fixed to these end walls 23 and projecting outwardly therefrom

are trunnions 24, on which are mounted rollers 25, and the outer ends of said trunnions pass through the links 18 and receive nuts 26 on their outer ends.

Formed in the top of each of the end walls 23 is a row of apertures 27, or the upper end of said end walls may be cut away, as indicated by 28 in the modification shown in Fig. V. Formed in one of the end walls 23 of each carrier are one or more discharge-apertures 29, that are normally closed by a valve 30, which is provided with a stem 31, that projects through the end wall. A leaf-spring 32 is secured to the inner face of the end wall provided with this valve, the free end of said leaf-spring bearing directly upon the rear side of said valve.

Located within the housing adjacent the side walls thereof and extending longitudinally between the shafts 12 are beams or channel-bars 33, the tops of which are provided with grooved tracks 34, in which the rollers 25 travel. These beams, which are supported by the framework of the housing, support the weight of the carriers of the pasteurizer and the loads carried thereby. Positioned on the side wall of the housing 1, adjacent the ends of the carriers in which the valves 30 are located and at a point just in front of and slightly below the front shaft 12, is a curved strap or plate 35, that lies directly in the path of travel of the valve-stems 31, and said strap or plate performs the function of a cam, against which the ends of the valve-stems engage to automatically open the valves in the carriers just previous to the time when said carriers are brought into a position immediately below the open end 5 of the housing. (See Figs. VIII and IX and dotted lines Fig. VI.) Extending transversely between the side walls of the housing and between the two rows of carriers are a series of vertically-arranged walls 36, that form a series of compartments 37, the same being slightly wider than are the carriers 22. The bottoms 38 of these compartments slope gradually from the ends toward the center, and a discharge-opening 39 is formed in the bottom of each compartment.

Positioned on top of the housing 1 and over the left-hand end thereof and above the tank A is a tank or water-tight compartment D. On top of the center of the housing and above the tank B is a second tank or water-tight compartment E, and on top of the right-hand end of the housing and above the tank C is a third tank or compartment F. Positioned on top of the center of the housing 1 and alongside of the tank D is a header-pipe 40, into the under side of which are tapped short sections of discharge-pipes 41, that lead downwardly through the top of the housing and terminate just above the path of travel of the tops of the upper series of carriers. These discharge-pipes 41 are so arranged as that they are directly above the centers of the compartments 37, previously described. Leading from the tank D to the header-pipe 40 is a T-union 42, in which is located a suitable cut-off valve 43, the stem 44 of which projects horizontally outward to the side of the machine. Header-pipes 45 and 46, similar in every way to the header-pipe 40 just described, occupy corresponding positions adjacent the tanks E and F, respectively, said last-mentioned header-pipes being provided with the discharge-pipes 41 and T-unions to said tanks E and F.

Arranged in suitable bearings 47 immediately in front of each tank at the side of the housing is a shaft 48, on which is fixed an arm 49, to the free end of which is pivotally connected the outer end of the valve-stem 44. Fixed to each shaft 48 is an arm 50, the end of which carries a weight 51, the normal tendency of which is to retain the arm 49 in the position seen in Fig. X, with the valve-stem 44 pulled out to its limit of movement, each valve 43 being closed when the parts occupy these positions. Carried by each shaft 48 is a third arm 49^a, to the lower end of which is pivotally connected the upper end of a vertically-arranged rod 52, the lower end of which is connected to the forward end of a lever 53, that passes through an aperture 54 in the side wall of the housing. This lever 53 is fulcrumed at 55 and has its inner end bent downwardly and then curved rearwardly, as indicated by 56, which curved end lies directly in the path of travel of the rollers 25. (See Figs. X and XI.)

The mechanism just described is for the purpose of automatically opening and closing the valves 43, and it will be understood that there is an independent operating mechanism for each valve. If desired, the entire valve mechanism can be dispensed with and the water can be pumped continuously from tanks A, B, and C through an ordinary set of pipe-headers 40, 45, and 46.

Located adjacent each of the tanks A, B, and C are rotary pumps 57^a, 57^b, and 57^c, and suitable tubular connections 58 lead from the tanks A, B, and C to said pumps. Leading from said pumps upwardly and discharging, respectively, into the tanks D, E, and F are suitable tubular connections 59. Suitably located in each tubular connection 59 is a temperature-regulator 60 of any of the well-known forms, to and from which leads a small compressed-air pipe 61, the valve in the regulator 60 controlling the passage of air through said last-mentioned pipe. Located adjacent the side wall at the base of each of the tanks A, B, and C is a horizontal pipe 62, one end 63 of which leads into the tank adjacent to which it is positioned. The opposite end of each pipe 62 is provided with a steam-ejector 64, which discharges into its respective tank, to which ejector 64 leads a steam-pipe 65. Each steam-ejector 64 is provided with a diaphragm-valve-controlling mechanism 66 of any well-known form, to which mechanism the corresponding compressed-air pipe 61 leads. Tapped into each one of the pipes 62 is a water-supply pipe 67, and leading from each of the pipes 62 is a drain-pipe 68, the latter each being provided with a valve 69. The water-supply pipe 67, leading into the pipe 62 of the tank A, is provided with a cut-off valve 70, to the stem of which is fixed a crank 71. Rotatably arranged in the upper portion of the side wall of the tank A is a shaft 72, on the inner end of which, inside said tank, is fixed an arm 73, carrying a float 74: To the outer end of said shaft 72 is fixed an arm 75, and a rod 76 connects the end of this arm 75 with the free end of the crank 71, this mechanism providing means for automatically opening the valve 70 in the water-supply pipe 67 when the water in the tank A is lowered beyond the required level. Located in the tank A at any suitable point and at the proper height is an overflow-pipe 77.

The operation of my improved pasteurizer is as follows: In pasteurizing beer in a machine of the foregoing description it is desirable that the water in tank A be of a temperature approximately 100° Fahrenheit, the water in the tank B at a temperature of about 125° Fahrenheit, and the water in the tank C at a temperature of approximately 142½° Fahrenheit. To maintain these temperatures, the various regulators 60 are so set as that they will act to allow air or other fluid under pressure to flow through the pipes 61 and cause the diaphragm-valve-operating mechanism 66 to be actuated to open the steam-ejectors 64 to allow steam to enter the tanks A, B, and C whenever the temperatures fall below the proper temperatures that are required to be maintained in said tanks. The driving mechanism 13, 14, and 15 of the pasteurizer is preferably arranged or driven as that the sprocket-wheels and chains move intermittently or with a stop movement—that is, the carriers are stopped for a predetermined length of time intermittently during their travel through the housing—and the chains and carriers are so spaced as that the carriers of the top row or those entering the machine and traveling toward the rear one of the sprocket-wheels 16 will stop directly beneath the discharge-pipes 41 and over the chambers 37, while the lower row of carriers passing out of the machine and toward the front one of the sprocket-wheels 16 stop at points immediately beneath the upper row of carriers and beneath the discharge-apertures 39 in the bottom of the chambers 37. The pumps 57ᵃ, 57ᵇ, and 57ᶜ being started, the water will be drawn from the tanks A, B, and C and be delivered, respectively, into the tanks D, E, and F or to headers 40, 45, and 46. The carriers are loaded and unloaded through the opening 5 in the housing during the time the carriers are stopped, and after said carriers are loaded they travel forwardly through the machine immediately beneath the discharge-pipes 41, the rollers 25 riding on the tracks 34. Whenever one of the rollers 25 contacts with the curved lower end 56 of the first of the levers 53, the corresponding shaft 48 will be rocked and the corresponding valve-rod 44 will be moved inwardly, opening the valve 43 of the tank D, and water therefrom will discharge through the T connection 42, open valve 43, into the header 40, and from thence through the discharge-pipes 41 into the carriers immediately below said pipes. The stay or rest of each receptacle beneath the respective discharge-pipes 41 is of sufficient duration or length of time to permit a flow of water equal to the capacity of the respective receptacles. As the receptacles are quite shallow, being only about twelve inches in depth, and as the flow of water from the pipes 41 is a forced flow, (due partly to gravity and partly to the fact that the tanks D, E, and F are closed tanks into which the water is discharged by the force-pumps 37ᵃ,) it to a great extent displaces the water in the tanks, or at least thoroughly mixes therewith, and thus acts to change the temperature units of the beer in the bottles. The levers 53 and corresponding valve-opening mechanisms are so arranged as to hold the valves open during the period of time that the carriers are stopped, so that water at a temperature of approximately 100° Fahrenheit pumped into the tank D from the tank A is being discharged into the carriers which have just been loaded with the cold beer. When the carriers beneath the tank D become filled with water, the overflow will discharge through the apertures 27 and pass downwardly into the compartments 37, and from thence the water will discharge through the apertures 39 in the bottoms of said compartments into the carriers immediately beneath said compartments, which latter carriers are the ones immediately over the tank A and which are about to pass out of the pasteurizer. The foregoing operation is repeated simultaneously with the two succeeding pairs of tanks B and E and C and F, the water of a temperature of approximately 125° Fahrenheit being pumped from the tank B into the tank E and being discharged therefrom through the header 45 and its discharge-pipes into the carriers beneath the tank E and thence passing downwardly into the compartments 37 and carriers beneath said compartments and finally back into the tank B. The water at a temperature of approximately 142° Fahrenheit is pumped from the tank C into the tank F and discharges from thence downwardly through the pairs of carriers arranged one above the other and finally passing back into said tank C. It will be noted that in my improved pasteurizer the water of gradually-increasing temperatures is applied to the beer in the carriers as the same travel along in the upper part of the housing from the front pair of sprocket-wheels toward the rear pair, and when the beer in said carriers reaches the first outlet-pipe 41 of header 46 it is receiving water of the maximum temperature, and from this point on back to rear sprocket-wheels 16 and through the lower portion of the housing up to a point immediately below said mentioned outlet-pipe 41 in header 46 this maximum-temperature application is maintained continuously. After leaving the point where the maximum temperature is last applied the temperature of the water applied to the beer gradually decreases as the water delivered to the ingoing carriers overflows and is caused to discharge into the corresponding outgoing carriers. As a result the beer is gradually brought up to the maximum temperature and correspondingly brought back to the minimum temperature of the water in the pasteurizer, and in so doing said beer is very effectually pasteurized. It is desirable that the outgoing beer be cooled so that it can be readily handled when taken from the carriers, and by my improved construction the low temperature of the water delivered to the first ingoing carrier is also delivered to the last outgoing carrier, for the reason that said carriers are arranged one above the other, and the water from the upper carrier after being cooled by coming in contact with the cold bottles of beer will discharge into the lower outgoing carrier and cool said beer to the desired degree. The beer in the successive ingoing carriers beneath the tank D, receiving water of a temperature approximately 100° Fahrenheit, will gradually become heated to a higher degree, and at the same time the water discharging into said carriers will become correspondingly cooled by coming in contact with the receptacles containing the beer, and said cooler water being displaced by the water of a higher temperature discharging from the pipes 41 will pass through the apertures 27 and discharge downwardly into the compartments 37, from thence into the corresponding outgoing carriers beneath said compartments, and finally out of said carriers back into the tank A. This action of gradually heating the ingoing and correspondingly cooling the outgoing beer is carried out as the carriers pass beneath the tanks E and F and over the tanks B and C. The temperatures in the tanks A, B, and C are kept at the proper degrees by the action of the regulators 60, which control the inlet of steam into said tanks. Just previous to the time that the carriers are brought into the open end 5 of the housing the valve-stems 31 successively contact with the plates or straps 35 and the valves 30 are opened, to be so held while the carriers are stopped, which allows all the water in said carriers to discharge out through the openings 29 onto the inclined bottom 6 and from thence into the tank A. The weights 51 and various connections automatically close the valves 43 in the pipes 40, 45, and 46 immediately after the rollers 25 pass from beneath the bent lower ends 56 of the levers 53, and said valves remain thus closed while the carriers are moving to their next stopping-point, thus cutting off the flow of water into the carriers while the latter are moving.

In the foregoing description the chains and carriers are specified as being moved intermittently, and while this movement is preferable it is not necessary, as practically the same results could be obtained in a machine where the carriers travel continuously instead of intermittently. Where the continuous movement is used, the valves 43 and their actuating mechanisms would be done away with and the water would be pumped continuously from the tanks A, B, and C into the tanks or headers on top of the housing. The movement of the carriers in a pasteurizer of my improved construction is necessarily very slow, and I find that the time required to obtain the best results for pasteurization is approximately forty minutes, and the movement of the chains and carriers may be correspondingly timed, so that this period of time will elapse from the first application of the water of maximum temperature to the carriers containing the beer to the time of the final application of the water of maximum temperature to said carriers. This initial and final application of the water of maximum temperature takes place under the left-hand one of the discharge-pipes 41 of the header 46 and immediately beneath the left-hand end of the tank F.

It will be seen that I have produced a pasteurizer wherein the beer in the carriers is very gradually heated step by step until it reaches the maximum temperature required for pasteurization, the highest temperature of water in the machine being the same as the temperature required for perfect pasteurization. In other words, it is not necessary to heat any of the water to a higher temperature than a proper degree required to completely pasteurize the beer or other product placed in the carriers.

I claim as my invention—

1. In a pasteurizer, an endless conveyer, carriers arranged on said conveyer for receiving the product to be pasteurized, means whereby warming-water is delivered to the carriers, means whereby water of maximum temperature is delivered to the carriers, and means for directing said first-mentioned water to the carriers after the latter have received the water of maximum temperature, substantially as set forth.

2. In a pasteurizer, an endless conveyer, carriers moved by said conveyer, means whereby warming-water of varying temperatures is delivered into said carriers means whereby

water of maximum temperature is directed to the carriers, and means whereby said water of varying temperatures is directed to the carriers after the latter have received the water of maximum temperature, substantially as set forth.

3. In a pasteurizer, an endless conveyer, means for moving said conveyer intermittently, carriers adapted to be moved by said conveyer and which receive the product to be pasteurized, means whereby warming-water is directed to the carriers, means whereby water of maximum temperature is directed to the carriers, and means whereby said first-mentioned water is directed to the carriers after the carriers have received the water of maximum temperature, substantially as set forth.

4. In a pasteurizer, an endless conveyer, carriers moved by said conveyer, means for imparting an intermittent movement to said conveyer, means whereby warming-water of varying temperatures is discharged into said carriers, means whereby water of maximum temperature is delivered to the carriers, and means whereby said water of varying temperatures is delivered to said carriers after the latter have received the water of maximum temperature, substantially as set forth.

5. In a pasteurizer, an endless conveyer arranged to move forward and return beneath itself, carriers adapted to be moved by said conveyer and to receive the product to be pasteurized, means whereby warming-water is delivered to the upper tier of the carriers, means whereby water of maximum temperature is delivered to the carriers, and means whereby said first-mentioned water is delivered to the lower tier of the carriers after the latter have received the water of maximum temperature, substantially as set forth.

6. In a pasteurizer, a carrier arranged to move forwardly in one direction and return beneath itself, carriers adapted to be moved by said conveyer and to receive the product to be pasteurized, means whereby warming-water of varying temperatures is adapted to be delivered to the upper tier of carriers, means whereby water of maximum temperature is adapted to be delivered to said carriers, and means whereby the water of varying temperatures is adapted to be delivered to said carriers on their return movement and after they have been subjected to the action of the water of maximum temperature, substantially as set forth.

7. In a pasteurizer, a carrier adapted to be moved in one direction and to return beneath itself, carriers adapted to be moved by said conveyer and to receive the product to be pasteurized, means whereby warming-water is delivered to the upper tier of carriers, means whereby water of maximum temperature is delivered to the upper tier of carriers, means whereby said water of maximum temperature is delivered to the lower tier of carriers, and means whereby the first-mentioned water is delivered to the lower tier of carriers after the latter have received the water of maximum temperature, substantially as set forth.

8. In a pasteurizer, a housing, an endless conveyer horizontally arranged in said housing, carriers on said endless conveyer, a plurality of tanks arranged in the lower portion of the housing, a corresponding plurality of tanks arranged on top of the housing, means whereby pasteurizing-water is conveyed from the lower tanks to the upper tanks, and means whereby said pasteurizing-water is conveyed from the upper tanks into and through the carriers and finally back into the lower tanks, substantially as set forth.

9. In a pasteurizer, a plurality of rows of carriers arranged one above the other, means whereby said rows of carriers are moved intermittently in opposite directions, means whereby pasteurizing-water is delivered to the upper row of carriers and caused to overflow therefrom into the lower row of carriers, and means whereby all of said carriers are emptied of the pasteurizing-water at a certain period of their travel, substantially as set forth.

WILLIAM J. RUFF.

In presence of—
GERHARD G. ARENDS,
JOHN L. DECKER.

Pasteurizer

Nov. 1905

805,025

No. 805,025. PATENTED NOV. 21, 1905.

N. F. NISSEN.

PASTEURIZING APPARATUS.

APPLICATION FILED OCT. 3, 1903.

3 SHEETS—SHEET 1.

FIG 1

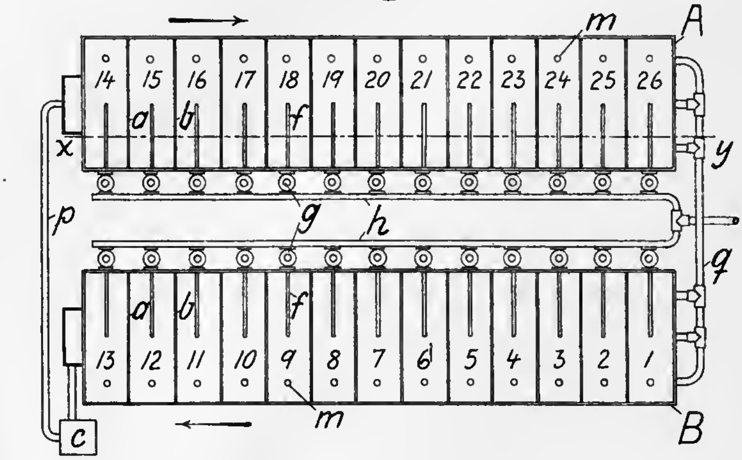


FIG 2

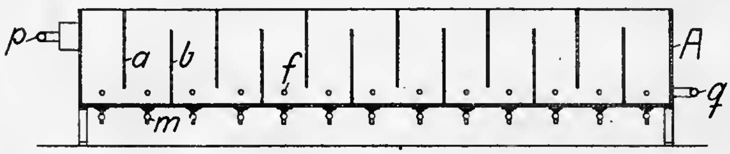
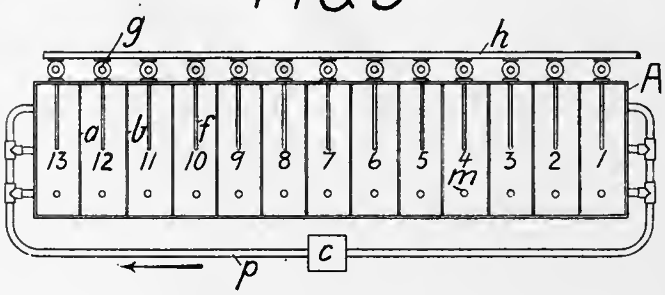


FIG 3



Witnesses.

Paul A Talbot

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3 SHEETS—SHEET 2.

FIG 4

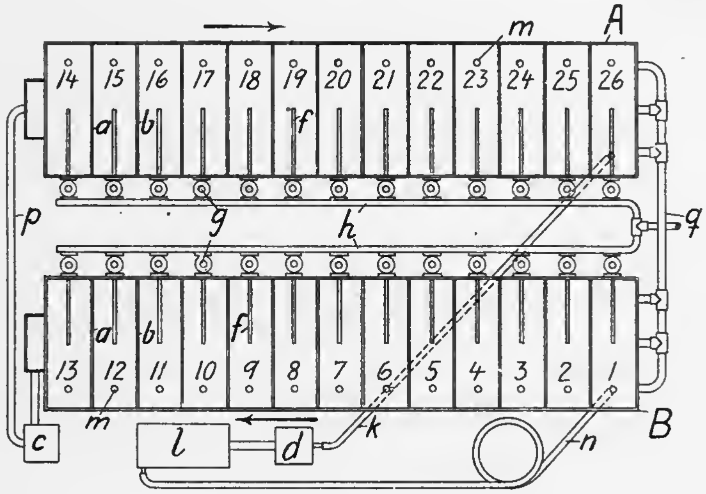

FIG 5

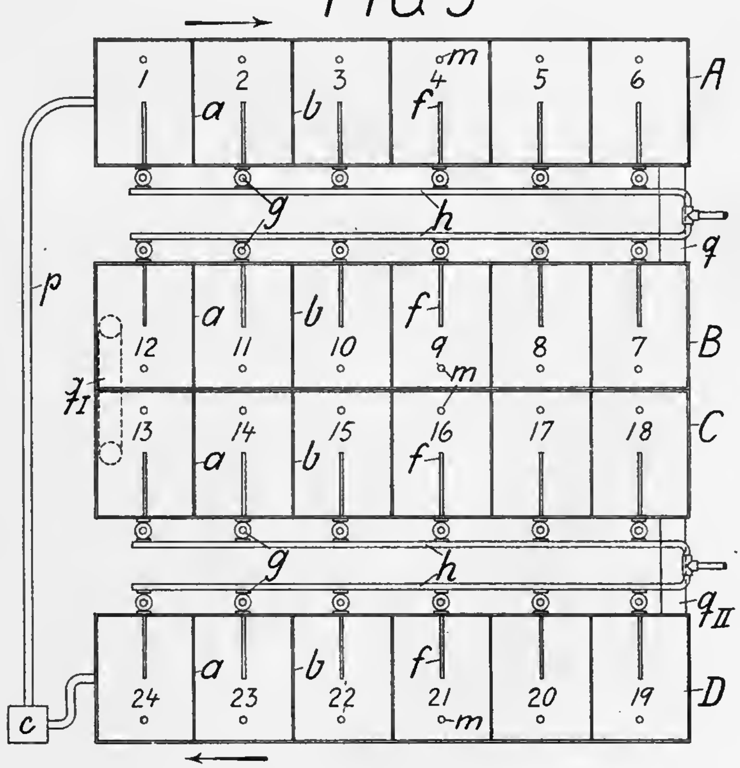

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Fig. 6.

Table of Manipulation for Pasteurising Apparatus

Compartment Number

Time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
7^{am}	20°	25°	26°	31°	35°	39°	43°	47°	52°	57°	60°	60°	60°	60°	60°	60°	57°	52°	47°	43°	39°	35°	31°	26°	23°	20°
7^{05}	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23
7^{10}	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26
7^{15}	26	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31
7^{20}	31	26	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35
7^{25}	35	31	26	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39
7^{30}	39	35	31	26	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43
7^{35}	43	39	35	31	26	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47
7^{40}	47	43	39	35	31	26	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52
7^{45}	52	47	43	39	35	31	26	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57
7^{50}	57	52	47	43	39	35	31	26	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60
7^{55}	60	57	52	47	43	39	35	31	26	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60
8^{00}	60	60	57	52	47	43	39	35	31	26	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60
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8^{15}	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20	20	23	26	31	35	39	43	47	52	57	60
8^{20}	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20	20	23	26	31	35	39	43	47	52	57
8^{25}	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20	20	23	26	31	35	39	43	47	52
8^{30}	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20	20	23	26	31	35	39	43	47
8^{35}	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20	20	23	26	31	35	39	43
8^{40}	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20	20	23	26	31	35	39
8^{45}	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20	20	23	26	31	35
8^{50}	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20	20	23	26	31
8^{55}	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20	20	23	26
9^{00}	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20	20	23
9^{05}	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20	20
9^{10}	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23	20
9^{15}	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26	23
9^{20}	23	20	20	23	26	31	35	39	43	47	52	57	60	60	60	60	60	60	57	52	47	43	39	35	31	26

Witnesses.

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UNITED STATES PATENT OFFICE.

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PASTEURIZING APPARATUS.

No. 805,025. Specification of Letters Patent. Patented Nov. 21, 1905.

Application filed October 3, 1903. Serial No. 175,695.

To all whom it may concern:

Be it known that I, NIELS FREDERIK NISSEN, engineer, of 16 Aaboulevard, Copenhagen, Denmark, have invented Improvements in Pasteurizing Apparatus, of which the following is a specification.

This invention relates to apparatus for pasteurizing beer and other liquids and will be described with reference to the accompanying drawings, wherein—

Figure 1 shows the apparatus in plan, and Fig. 2 shows one of the tanks in longitudinal vertical section on line *x y* of Fig. 1. Fig. 3 shows the apparatus provided with a special cooling device. Fig. 4 represents the device in the form of two tanks side by side. Fig. 5 shows the device in the form of several tanks side by side, and Fig. 6 is a table illustrating the temperature for different compartments at different times.

The apparatus consists of two tanks A and B, connected at the one end by a pipe *q* and at the other end by a pipe *p* and a pump *c*. Each of the tanks A and B is divided into a considerable number of compartments by means of transverse vertical and alternating partitions *a* and *b*, the partitions *a* extending from the top down to a short distance from the bottom of the box and those marked *b* from the bottom to a short distance from the top of the chamber. Thirteen such compartments are shown. Each of the compartments is provided with a steam-inlet pipe *f*, through which steam can be led into the compartment from the steam-conduit *h* by opening the steam-valve *g*, placed outside of the chamber.

m is an outlet-cock placed in the bottom of each compartment.

In preparing the apparatus for use it is filled with cold water until the water stands about an inch above the partitions marked *b* or those extending upward from the bottom. The water is then heated to different degrees in the different compartments by means of the steam-pipes. A number of the compartments (generally six) are heated to the pasteurizing temperature, and the compartments on both sides of these are heated to different degrees on a gradually-reduced scale, the temperature of the compartments nearest the hot compartments being highest, and the farther the compartments are situated away from the hot compartment the less they are heated. The heating is, for instance, started at six a. m., and at seven o'clock the compartments have been given the desired temperatures, as follows: The compartments 11 to 16, 60° centigrade, (the pasteurizing temperature;) 10 and 17, 57°; 9 and 18, 52°; 8 and 19, 47°; 7 and 20, 43°; 6 and 21, 39°; 5 and 22, 35°; 4 and 23, 31°; 3 and 24, 26°; 2 and 25, 23°; 1 and 26, 20°, or the temperature of the cold water. All the steam-pipes except those leading to the hottest or pasteurizing compartments are now shut. The temperatures which the different compartments have attained are also shown schematically on the first line of the table, where the respective spaces in each horizontal row represent the respective compartments 1 to 26, the figures in these spaces representing the temperatures which they have acquired at the given time. Each horizontal row represents the temperatures of the various compartments at the time represented by the corresponding figure in the first vertical row. The circles in some of the compartments indicate those compartments which contain beer. Compartment 1 is now filled with cold unpasteurized beer, the steam-pipe for compartment 11 is shut, and the pipe for compartment 17 is opened a little. The pump *c* is set at work at such a speed that it shifts the water from one compartment to the next, as from 13 to 14, in five minutes. The water that was in compartment 14 is thereby forced into 15, the water that filled 15 is forced into 16, and so on throughout the series. The water from compartment 26 is forced through the connecting-pipe *q* into compartment 1, the water from 1 into 2, &c., the water from 12 into 13—in short, the whole mass of water with its acquired temperatures is moved forward one compartment in the direction of the pumping. At 7.05 the temperature of the different compartments is therefore as shown by row 2 of the table. The circle in compartment 1 signifies that this compartment has been filled with beer. The compartment 2 is next filled with cold unpasteurized beer. The steam-valve to compartment 12 is closed and the valve to compartment 18 is opened. During the next five minutes the water and the temperature of all the compartments has moved one compartment farther in the direction of the pumping, (the pump constantly working at the same speed.) At 7.10 the temperature of the different compartments is therefore as shown on row 3. The beer in compartment 1 is now beginning to get warmed (23°) from the warmer water that is running into compartment 1 from 26. Compartment 3 is next filled with cold unpasteurized beer, the steam-valve to compartment 13 is closed, and the steam-valve to compartment 19 is opened a little, and during the next five minutes the water and the temperatures have again moved one compartment in the direction of the pumping. The temperatures of the different compartments at 7.15 is represented by the fourth row. In this way the filling is constantly carried out. Every five minutes the next compartment is filled with beer, and the temperature, the low as well as the high, is carried one compartment forward in the direction of the pumping. The beer in the compartments is gradually getting warmer and warmer. At 7.55 the compartment 1 has reached the highest temperature, (see row 12 on the table). The compartment 11 has been filled with cold beer. From 7.55 to 8.20 (see row 17) the temperature of compartment 1 is constantly kept at the highest temperature, whereon the cooling is commenced, the beer gradually being cooled down from the incoming colder water. At 9.10 the beer in compartment 1 has been cooled down as far as possible (20°) and is then removed. At 9.15 cold unpasteurized beer is placed in compartment 1, and the beer in compartment 2 has now been cooled down to the lowest temperature and is removed. At 9.20 cold unpasteurized beer is placed in compartment 2 and the beer in 3 has been cooled to the lowest temperature and is removed, and so on. At the same time the highest temperature is constantly moved forward one compartment every five minutes. The lowest and the highest temperatures are constantly kept diametrically opposite. The highest temperature is brought about by addition of steam. The low temperature is constantly produced by the cold unpasteurized beer which every five minutes is placed in the apparatus, and the compartments situated between the hottest and the coldest chambers contain water of intermediate temperatures. If it is preferred to cool the beer further down before removing from the compartments and there is a sufficient supply of cold water at hand, cold water is let into the respective compartments five minutes before the beer is removed, and a corresponding amount of water is let out of the apparatus from the outlet-cock *m* in the bottom of the compartment preceding it in the series. Suppose, for instance, that the cold water is 12°. This cold water is then at 9.05 let into compartment 1 and the cock *m* in 26 is opened. At 9.10 the beer in 1 is then cooled to, say, 15°, and the beer is removed. The cold water is now let into compartment 2, cock *m* in compartment 26 is closed, and cock *m* in compartment 1 is opened. At 9.15 the beer in 2 has been cooled to 15° and is removed. The cold water is now let into compartment 3, the outlet-cock in 1 is closed, and the outlet-cock in 2 is opened, and so on throughout the series. If it is necessary to cool the beer still more before it is removed from the apparatus, a special cooling device is put into operation. This cooling device consists of a pump *d*, connected with a refrigerating-tank *l*, a water-suction hose *k*, connected with the suction end of the pump, and a delivery-water hose *n*, connected with the refrigerating-tank. (See Fig. 4.) Say, for instance, that it is desired to reduce the temperature to 5°. The hose *k* is then at 9.05 o'clock placed in compartment 26, the pump *d* set at work, and the discharge-hose *n* placed in compartment 1. The water from compartment 26 is then drawn through the refrigerating-tank and there cooled down to the desired temperature (5°) and thence pumped into compartment 1. The temperature of this compartment will therefore be 5°. If the pump *d* runs with the same speed as pump *c*, no water will pass directly from compartment 26 to compartment 1 through pipe *q*; but a volume of water equal to that received from compartment 25 will be drawn off through pipe *k*, passed through the refrigerating-tank, and thence through pipe *n* into compartment 1, from which point it participates in the ordinary circulation induced by the pump *c*. The beer in compartment 1 is in this way cooled down to 5°. At 9.10 the beer is removed, hose *k* is placed in compartment 1, hose *n* in compartment 2, and the compartment 2 will now in its turn be cooled down to the desired temperature, and so on. In this way the temperature of all the compartments is each in its turn brought down to any temperature above the freezing point that is wanted before the beer is removed.

From the description it is evident how the water, which from each compartment runs into the adjoining compartment, gradually heats the cold unpasteurized beer almost to the pasteurizing temperature. This temperature is reached by addition of a little steam and kept there for a definite time, then the steam is shut off, and the beer is again cooled down by the circulating colder water. The water is kept at the highest temperature through a certain but constantly-moving portion of the cycle, and at the diametrically opposite point of the cycle the water is constantly cooled by the cold bottles placed there every five minutes. If the water is not thereby cooled sufficiently, an extra cooling device is applied, as described.

The pipe *q* is only a means of connection between adjacent ends of the tanks, while the pump *c* is the means of circulation. The pipe *q* may be omitted and the whole apparatus built as one tank A, the opposite ends of the tank being connected through the pump *c*. (See Fig. 3.) The apparatus can also be built as several tanks A B C D, as shown in Fig. 5, two and two of the tanks being connected through the connecting-pipes *q* *q'* *q''*, while only the first and the last compartments of the system are connected through the circulation-pump *c*. There are many other ways in which the mechanical arrangement of the parts may be varied without changing the essential character of the device. I do not, therefore, wish to be understood as limiting my invention to the exact apparatus and arrangement of parts shown and described.

What I claim is—

1. An apparatus for pasteurizing beer and other bottled liquids comprising a number of fluid-containing compartments connected together in series for circulation of their fluid contents, means for separately heating the fluid in each of said compartments, means for cooling such compartments as described and means for producing a circulation of the fluid contents of said compartments throughout the series.

2. An apparatus for pasteurizing beer comprising a number of tanks having cross-partitions alternately stopping short of the top and bottom of the tank, a water-circulating connection placing the various compartments thus formed in series, a steam-supply pipe having a branch entering each compartment, a controlling-valve for each branch and means for supplying cooling-water to any of the compartments.

3. An apparatus for pasteurizing beer comprising a number of tanks having cross-partitions alternately stopping short of the top and bottom of the tank, a water-circulating connection placing the various compartments thus formed in series, means for supplying heat independently to each of the compartments at will, a refrigerating-tank and a water-circulating mechanism adapted to draw water from and deliver water to each of the compartments at will.

4. An apparatus for pasteurizing beer comprising a number of tanks having cross-partitions alternately stopping short of the top and bottom of the tank, a permanent water-circulating connection between adjacent end compartments of the tanks, a steam-supply pipe extending alongside each tank, branch pipes extending from the steam-supply pipes into each compartment, a valve for each branch pipe and means for drawing warm water from and supplying cold water to each compartment.

In witness whereof I have hereunto set my hand in presence of two witnesses.

NIELS FREDERIK NISSEN.

Witnesses:

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Dec. 1905

806,266

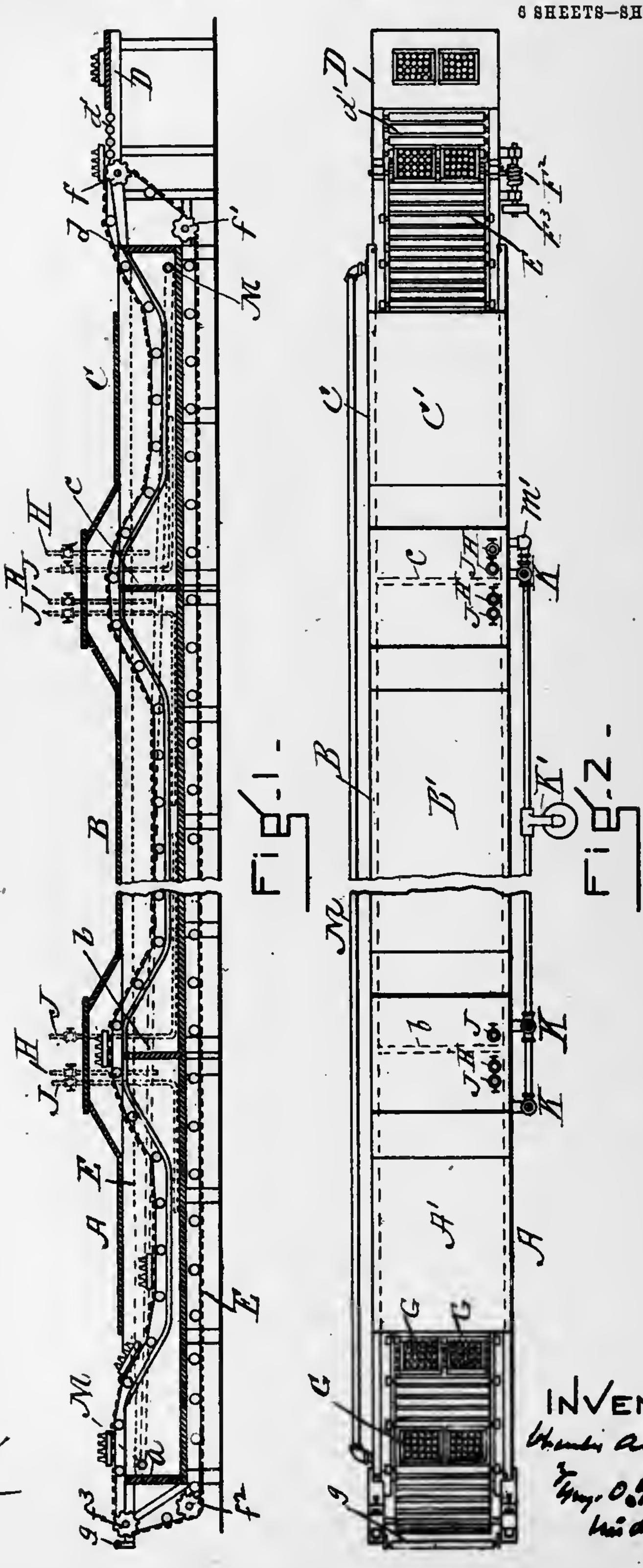
No. 806,266. PATENTED DEC. 5, 1905.

C. A. KING.

MACHINE FOR PASTEURIZING BEER.

APPLICATION FILED JULY 20, 1899.

6 SHEETS—SHEET 1.



WITNESSES

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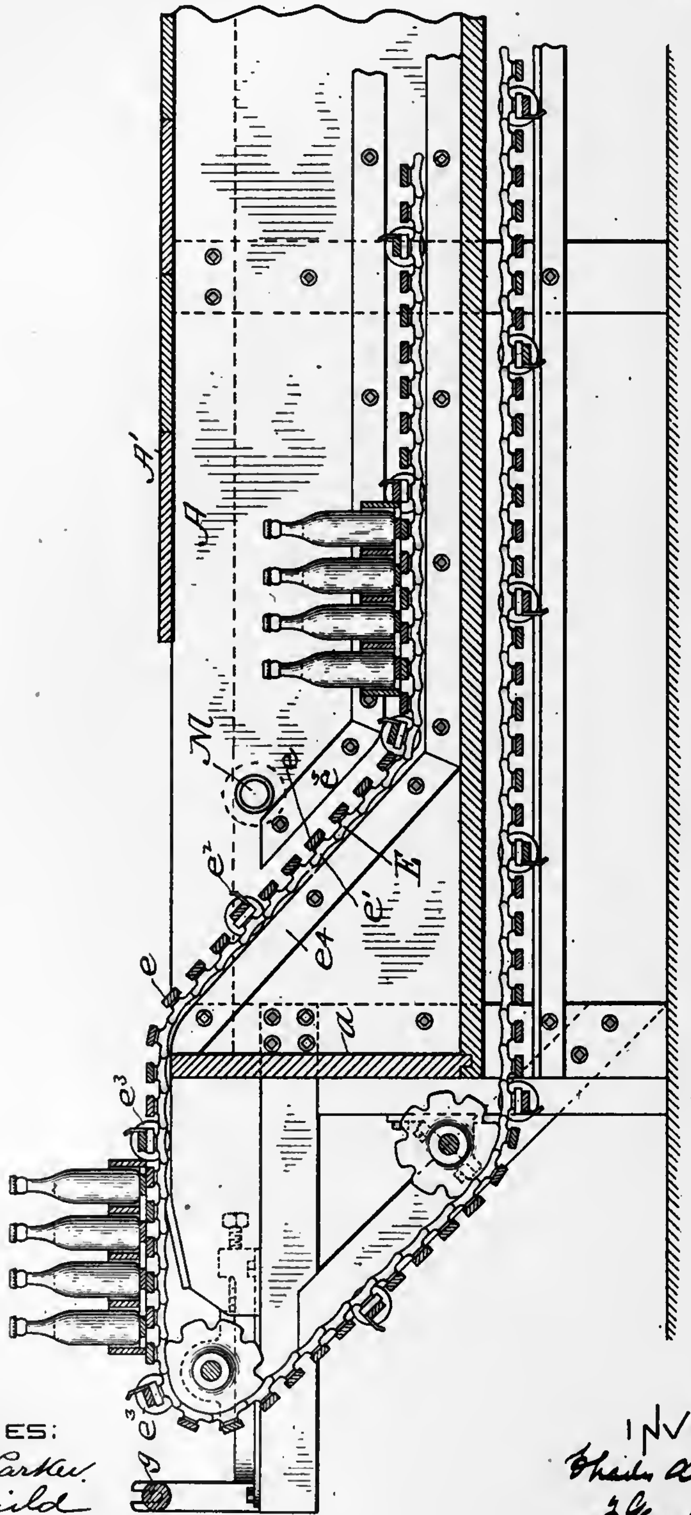

Fig. 3.

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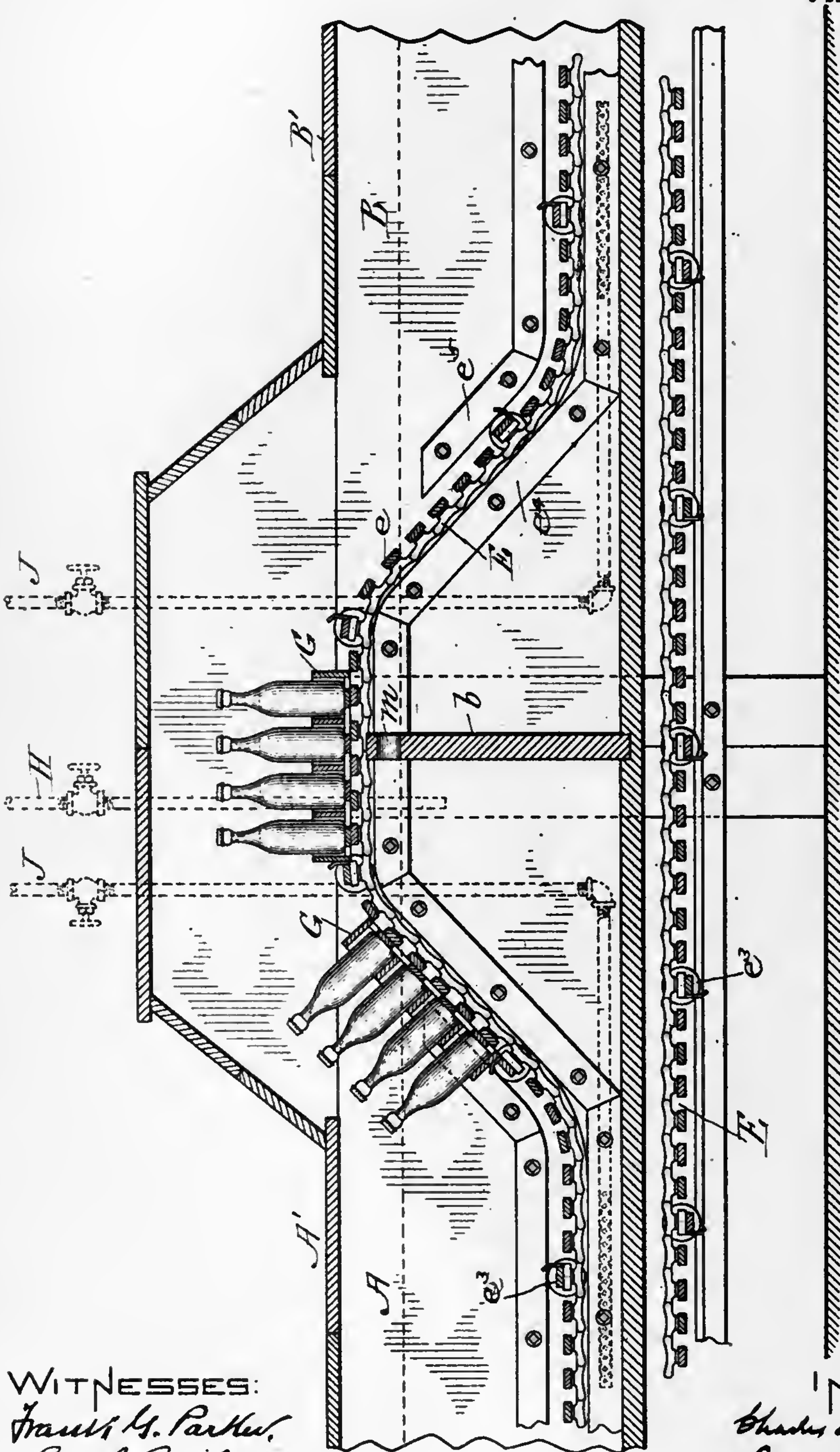

Fig. 4.

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6 SHEETS—SHEET 4.

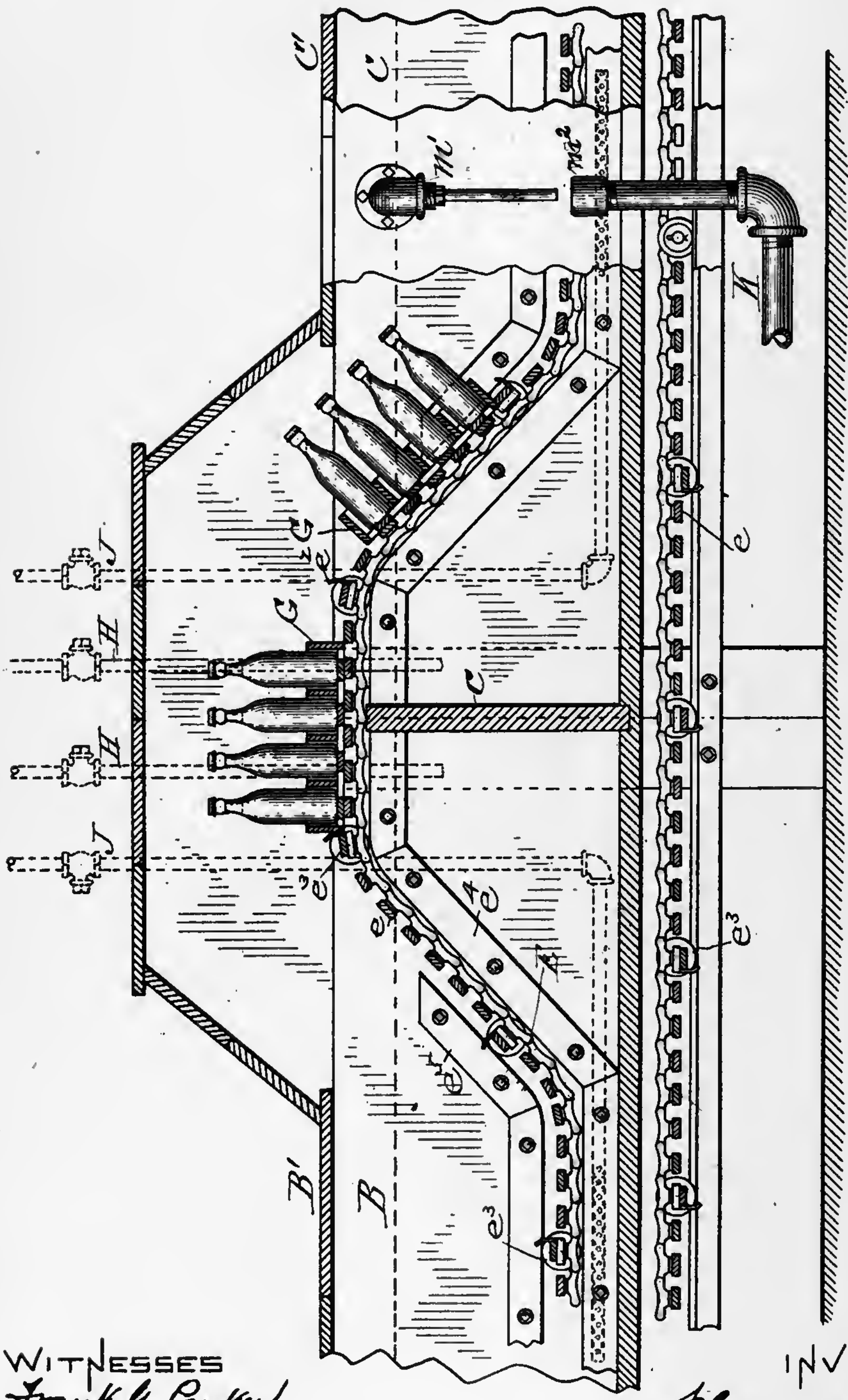

Fig. 5.

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6 SHEETS—SHEET 5.

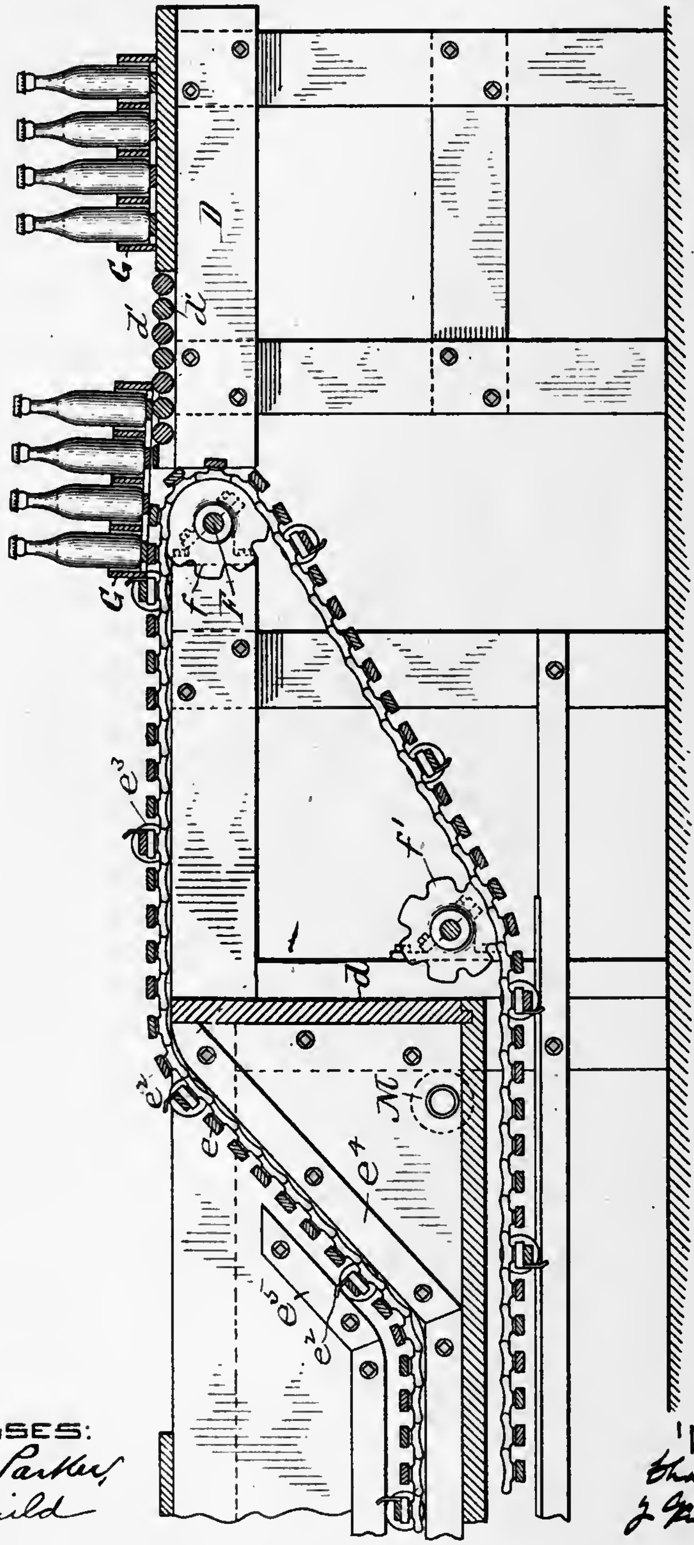

FIG. 6.

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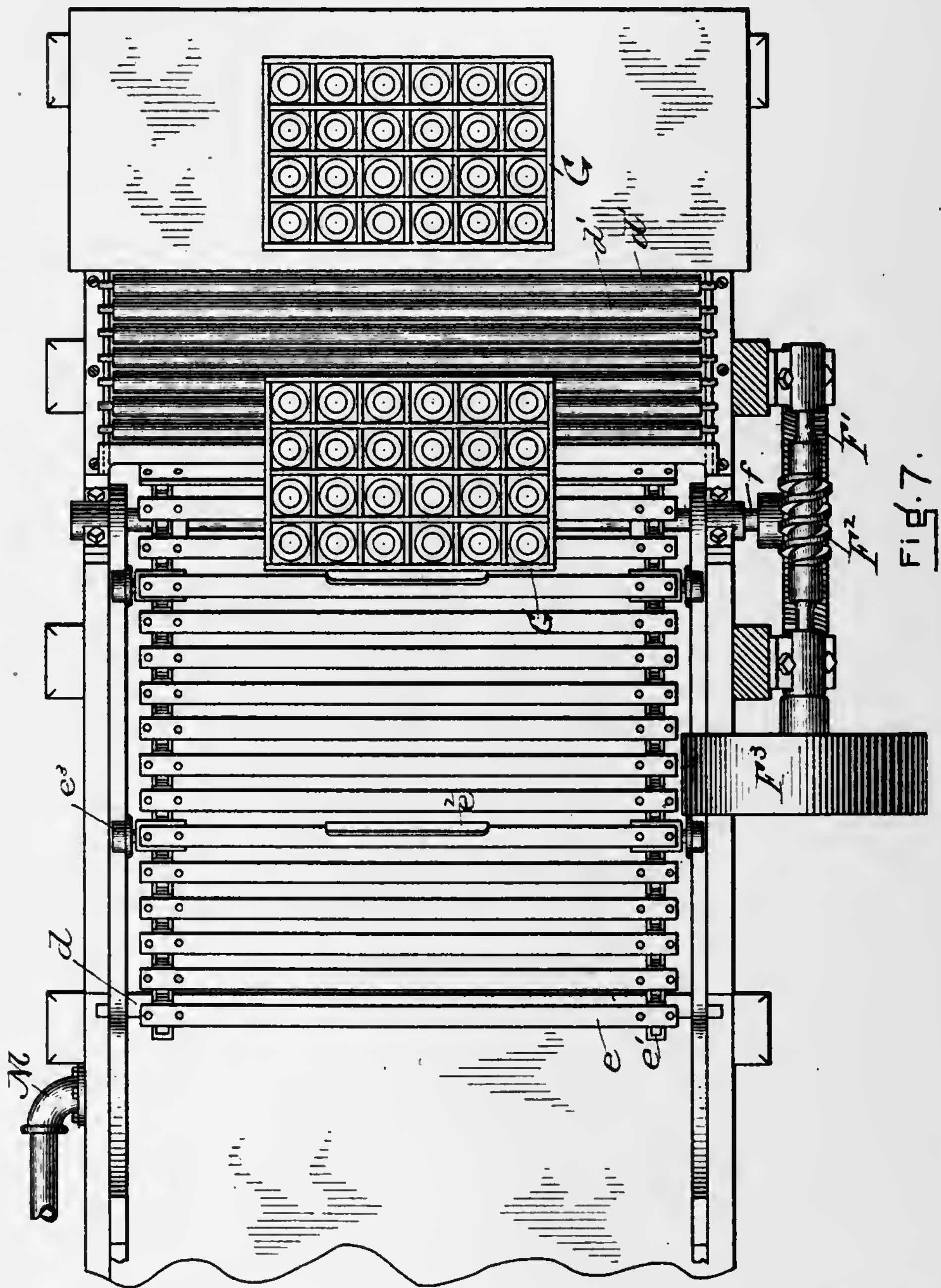
APPLICATION FILED JULY 20, 1898.

8 SHEETS—SHEET 8.



UNITED STATES PATENT OFFICE.

CHARLES A. KING, OF MATTAPOISETT, MASSACHUSETTS.

MACHINE FOR PASTEURIZING BEER.

No. 806,266. Specification of Letters Patent. Patented Dec. 5, 1905.

Application filed July 20, 1899. Serial No. 724,516.

To all whom it may concern:

Be it known that I, CHARLES A. KING, of Mattapoisett, in the county of Plymouth and State of Massachusetts, have invented a new and useful Improvement in Machines Especially Adapted for Pasteurizing Beer, of which the following is a specification.

My invention has for its object the production of a machine whereby bottled beer may be expeditiously and economically pasteurized.

The pasteurization of the bottled beer to destroy yeast-germs, &c., is ordinarily accomplished by heat applied to the bottles. To this end a pasteurizing temperature of at least 160° Fahrenheit is required, and in order that the bottles may not be broken in the operation the heat must be gradually applied and the bottles gradually cooled subsequently thereto. Water-baths of varying temperatures, into which the bottles are successively plunged, are favored in the art as a means of pasteurization because of the ease with which uniformity in the determination and maintenance of the proper temperatures is thereby secured. Ordinarily machines of this water-tank type comprise several tanks or baths, the pasteurizing-bath being a central tank maintained at a temperature of 160° Fahrenheit or over, while attemperating and cooling baths on either side thereof are maintained at temperatures considerably lower—say 90° Fahrenheit. In operation the bottles entering the first or warming bath at atmospheric temperature are heated therein to substantially the temperature of that bath and are then passed into the pasteurizing-bath to be heated to the higher or pasteurizing temperature. Thence passing to a third or cooling bath the temperature of the bottles is again lowered, whereupon they are then passed out of the machine. The bottles, however, on entering the first and second of these tanks naturally act to lower the temperatures thereof and upon entering the last-named tank to raise the temperature of that one. This action of the heat of the bottles to modify the required bath temperatures is ordinarily counteracted by a continuous application of heat to the first tank, as well as to the pasteurizing-tank, and by a simultaneous cooling of the last tank, these operations being independent in the sense that there is no automatic adjustment of temperature between the baths. I have conceived that in an apparatus of this type by placing the attemperating-tank and cooling-tank in proper relation to each other and to the pasteurizing-tank there may be produced a substantial equalization of temperature in the attemperating-tank and in the cooling-tank and that such condition may be continued without the further application of heat other than that admitted to the pasteurizing-tank. Accordingly I have constructed a machine which, briefly, comprises the three tanks in alinement, a bottle-carrier passing longitudinally through them, and in addition a communication from the pasteurizing-tank to the warming-tank, a communication from a point of the warming-tank remote from the pasteurizing-tank to the bottom of the cooling-tank, and an overflow from the cooling-tank. The pasteurizing-bath I maintain at a constant temperature in the usual way by the injection of steam. Although in this machine the action of the water-currents whereby the heat is transmitted from tank to tank is to me not entirely certain, the logical explanation is as follows: The steam condensing in the pasturizing-tank increases the volume of water therein, and this tank being in connection with the first tank a current of hot water enters the latter and tends to neutralize the cooling effect of the cold bottles entering therein. The portion of the warming-bath remote from the pasteuring-tank is of course least affected by the incoming current of hot water, and therefore tends to assume a lower temperature than the rest of that bath. From this point of the warming-tank, however, is the communication to the cooling-tank, and by reason of the increase in volume in the former, owing to the hot-water current mentioned, a current to the latter takes place. Such current being from the colder portion of the warming-bath tends on entering the cooling-tank to neutralize the heating effect of the bottles coming from the pasteurizing-tank, and the cold water from the warming-tank entering the bottom of the cooling-tank raises the water-level thereof and causes the hotter water at the surface to overflow to the waste-pipe.

Having set forth the general principle of my invention and my embodiment of the same, I will now describe the invention in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a broken longitudinal diagrammatic section of an apparatus embodying my invention, Fig. 2 being a plan thereof. Fig. 3 is a sectional view of the left-hand end of the apparatus, showing a portion of the first tank. Fig. 4 is a sectional view showing the arrangement of parts at the division between the first and second tanks. Fig. 5 is a corresponding view taken at the division between the second and third tanks. Fig. 6 is a sectional view showing the right-hand end of the apparatus; and Fig. 7 is a plan view of the receiving-table at the right of Figs. 1 and 2 showing also a portion of the conveyer in plan.

Referring to the drawings, my machine is shown as a long trough-like structure with end walls *a* and *d* and partitions at *b* and *c* to form three tanks A B C, the central tank B of which is the pasteurizing-tank and the tanks A and C the attemperating-tanks. The tanks have pipe connections H (see Figs. 1, 4, and 5) to a water-supply. In operation the water is maintained in the tanks at the level indicated in the drawings by the dotted line E. For initially heating the several baths to their respective operating temperatures the tanks are provided with steam connections J. (See Figs. 1, 4, and 5.) These connections enter the tanks and are there perforated to permit steam to be injected into the water of the tanks and condensed. Ordinarily in practicing my invention the steam connections to the tanks A and C are used only in bringing the baths to the proper temperatures prior to the operation of the machine, after which they are closed, the temperatures of the baths A and C being then automatically maintained, as heretofore described.

For providing communication from tank B to A there is in the partition *b* (see Figs. 1 and 4) at the water-level an opening *m*, and through this the hot water formed by steam condensing in B passes into tank A. From a point in the tank A just below the waterline a pipe M of large cross-section passes around outside of the tanks and enters the tank C at a point near the bottom thereof. (See Figs. 1, 6, and 7.) Communicating with tank C at the water-level therein (see Fig. 5) is a drip or waste pipe m^2, through which hot water from the surface of bath C passes to the sewer or waste through pipe K. For draining the three pipes at will each is provided with a drain-pipe K, controlled by suitable valves.

For feeding the bottled beer expeditiously through the machine I have provided the following means: Extending longitudinally through the three tanks is a way having rails e^4. This way or track passes from one tank to the other over the partitions *b* and *c* at inclines. On the track is an endless carrier comprised of slats *e*, linked, as at e', (see Figs. 3 and 7,) and engaging the rails e^4 by means of rollers e^3, with which the links at intervals are provided. The rollers also engage a guard-rail e^5, whereby the carrier is maintained properly submerged and on the railway during passage through the water-tanks. From tank C the carrier passes over sprockets *f* f' f^2 f^3 and around under the machine to the starting-point at tank A. The sprocket *f* is the carrier-driving gear and is driven from pulley F^3 (see Fig. 7) by means of a worm-gear F^2.

In order that the beer, which is conveyed in cases, may be rapidly supplied to the carrier, I provide a roll or idler *g*. The case is slid by the operator over the rolls until it is engaged by the carrier. That the carrier may properly engage the cases and hold them in position during the operation the slats *e* are at intervals provided with cleats e^2, one of which engaging the case from the rear holds it stationary on the carrier in advancing through the baths and up the inclines of the railway, while another cleat in the front of the case prevents it from sliding out of position when going down the inclines. That the carrier may be automatically relieved of the cases after passage through tank C there is provided a second set of rollers or idlers d', (see Fig. 7,) over which the cases are slid by the action of the carrier, as illustrated.

The operation of my machine is as follows: The tanks are first filled with cold water through the pipes H to the level E, after which these pipes are closed. The steam-pipes J are then opened to heat the water in the pasteurizing-tank B to a temperature of 160° Fahrenheit or over and the water in the tanks A and C each to a temperature of about 90°. The steam-pipes to the tanks A and C are then closed and the steam-pipe to the tank B adjusted to supply heat to maintain the baths at the proper temperatures during the pasteurizing process. The baths being thus prepared the process is commenced by the operator starting a case upon the carrier by sliding the same over the roller *g*. The case thus fed to the carrier is engaged by a cleat e^2 and fed forward into the bath A. Here the beer in the case is heated to a temperature of about 90° and in turn the bath is slightly cooled by the beer. Passing from tank A the case now enters the bath B, where the temperature of the beer is raised to at least 160° Fahrenheit and the beer pasteurized, this bath being also slightly cooled by the beer. The slight cooling effect of the beer is, however, immediately corrected by the steam constantly injected into tank B and there condensed, this condensation, as stated, causing an overflow from B to A, thus raising the temperature of A to the temperature had before the entrance therein of the beer, whereupon, in turn, there is caused an overflow of the slightly-cooled water through connection *m* to tank C. The beer at 160° passing on from tank B to tank C is there cooled to about 90°. The tendency of the hot bottles on entering C from B to raise the temperature of bath C is counteracted by the cool water coming from A, which entering the bottom of the tank C is diffused upward, causing an overflow of warm water from the surface of the bath through the pipes m' m^2 to the sewer. The case then emerging from tank C is slid by the movement of the carrier over the rollers d' to an operator at that end of the machine.

As case after case is started into the machine by the first operator the process above is automatically and continuously repeated. After the quantity of beer desired to be pasteurized has been so treated the tanks may be drained and cleaned through the pipes K by opening the valves therein.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an apparatus of the kind described, the combination of three tanks located in line, the tank at one end to contain an attemperating-bath, the tank at the other end to contain a cooling-bath, and the intermediate tank to contain a hot bath, said intermediate bath being in communication with the attemperating-bath, means for heating said intermediate bath, and a conveyer suitably mounted to travel through said tanks consecutively, and means for connecting the first and last tanks in series, whereby the temperatures and level of the baths in said tanks will be equalized.

2. In an apparatus of the kind described, the combination of three tanks located in line, the intermediate of said three tanks connecting with the first of said other tanks, a conveyer suitably mounted to travel through said tanks consecutively, and a pipe connecting the end tanks, said tank connections permitting of a flow for maintaining constant temperature and bath-level in said tanks, as and for the purposes set forth.

3. In an apparatus of the kind described, three or more tanks located in line, means whereby they may be filled with water and means whereby said water may be heated, and a conveyer suitably mounted to travel through each of said tanks in turn, and means whereby said conveyer is moved, in combination with a pipe connecting the end tanks and provision for an overflow from the pasteurizing-tank to the first tank, as set forth.

4. In an apparatus of the kind described, a series of tanks located in line, a conveyer passing through each of said tanks in turn, a pipe connecting the end tanks, an overflow connecting the pasteurizing-tank with the first of said tanks, and a drip connecting the last of said tanks with a suitable waste, and means whereby said tanks are filled with water, and the temperature of the water therein regulated, as and for the purpose set forth.

5. In an apparatus of the kind described, three tanks located in line, in combination with means for heating the intermediate water-tank to have a higher degree of temperature than the end water-tanks, means for connecting the first and last tanks in series, said intermediate tank being connected with the first of said other tanks, and a conveyer adapted to travel through said tanks consecutively, the said conveyer consisting of two endless chains to form a substantially continuous flexible floor, a series of friction-rolls located to support said endless floor, certain of the slats forming said floor being provided with cleats adapted to hold the case from sliding thereon while going up and down grade whereby a case of any dimensions less than the width of said conveyer and the distance of its cleats may be supported upon said floor and carried through said tanks, and the contents of cases may be subjected to a substantially equal temperature in said end tanks and a higher degree of temperature in said intermediate tank, as described.

6. In an apparatus of the kind described, the combination of a series of water-tanks located in line; means for controlling the temperature of each tank whereby the temperature of the intermediate tank will be higher than the temperature of the two end tanks, communicating means for the water between the two end tanks, said intermediate tank being connected with the first of said end tanks, a conveyer adapted to travel through said tanks consecutively and a support located at the receiving end of said conveyer and provided with a roll in close proximity to said conveyer whereby a case resting on said support and said conveyer will be drawn off from said support and carried through said tank by frictional contact of the entire bottom of said case with said floor, as and for the purposes described.

7. In a pasteurizer, the combination of an attemperating-tank, a cooling-tank, a sterilizing-tank in communication with the attemperating-tank, means for moving the substance to be sterilized from one tank to another, communicating means for the water between the attemperating-tank and the cooling-tank, and means for maintaining the bath in the sterilizing-tank at a higher temperature than the baths in the other tanks.

8. In a pasteurizer, the combination of an attemperating-tank, a cooling-tank, a sterilizing-tank in communication with the attemperating-tank, means for moving the substance to be sterilized from one tank to another, means for heating the bath in the attemperating and cooling tanks, communicating means for the water between the two last-mentioned tanks, means for maintaining the bath in the sterilizing-tank at a higher temperature than the baths in the other tanks.

9. In a pasteurizer, the combination of an attemperating-compartment, a sterilizing-compartment, a cooling-compartment, communicating means for the water exterior of said compartments between the attemperating-compartment and cooling-compartment, said means being without communication with the sterilizing-compartment, and means car-

rying the substance to be sterilized through said compartments.

10. In an apparatus of the kind described, a pasteurizing-bath, an attemperating-bath at one side thereof, a cooling-bath at the other side thereof, said attemperating and cooling baths being in direct communication with each other, and said attemperating-bath being in communication with the pasteurizing-bath, substantially as described.

11. In an apparatus of the kind described, a pasteurizing-bath, an attemperating-bath at one side thereof, a cooling-bath at the other side thereof, said attemperating and cooling baths being in direct communication with each other, and said attemperating-bath being in communication with the pasteurizing-bath, a fluid-waste drip for said cooling-bath and a fluid-inlet for the pasteurizing-bath, substantially as described.

12. In an apparatus of the kind described, a pasteurizing-bath, an attemperating-bath at one side thereof, a cooling-bath at the other, communicating means for the liquid between said attemperating and cooling baths, and between said attemperating-bath and the pasteurizing-bath substantially as described.

In witness whereof I have hereunto set my name this 18th day of July, 1899.

CHARLES A. KING.

Witnesses:

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No. 806,354. PATENTED DEC. 5, 1905.

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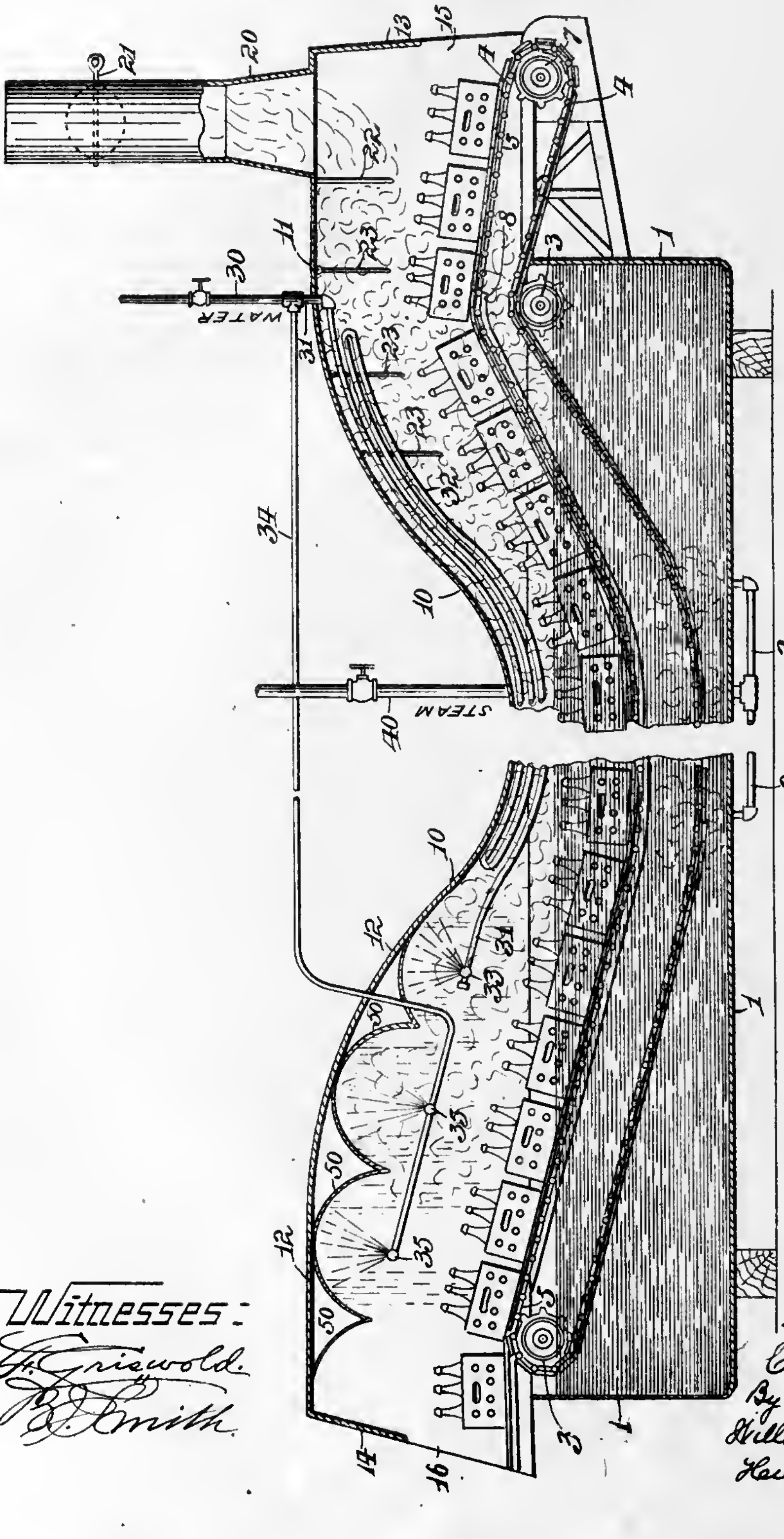
PASTEURIZER.

APPLICATION FILED NOV. 30, 1903.



Witnesses:

H. Griswold.

B. J. Smith

Inventor.

Charles H. Loew

By William R. Baird

His Attorney.

UNITED STATES PATENT OFFICE.

CHARLES H. LOEW, OF LAKEWOOD, OHIO.

PASTEURIZER.

No. 806,354. **Specification of Letters Patent.** **Patented Dec. 5, 1905.**

Application filed November 30, 1903. Serial No. 183,109.

To all whom it may concern:

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

My invention relates to pasteurizers for beer and similar liquids.

In pasteurizers of the type in which the liquids to be treated are while in packages slowly moved through a heated bath it has been found in practice that the changes of temperature upon going into and coming out of the apparatus are apt to be so abrupt as to crack the packages containing the liquids if such packages are made of glass, which is commonly the case, and if an economical rate of movement is maintained by the conveyer. In this type of apparatus the liquid-bath is commonly heated by steam forced into it under pressure, causing a large amount of steam to gather in the apparatus above the surface of the bath. If the steam is drawn toward the inlet end of the apparatus by means of a chimney, it is apt to escape, leaving that part of the apparatus cold, so that when the bottles enter the hot bath they will crack. If, on the other hand, the steam is not removed or prevented from reaching the inlet end, it accumulates at that place and is apt to be puffed out into the faces of the workmen engaged in loading the conveyer and scald them. At the outlet end another difficulty arises. It is necessary to cool the bottles as they emerge from the hot bath and to reduce them to a temperature approximating that of the outer air, and it is customary as they emerge from the boiling water to spray them with jets of cold water. The change in temperature thus caused is apt to be abrupt and again cause breakage of the bottles. Breakage of the bottles filled with beer has the serious consequence that the acids in the beer will attack the metal parts of the apparatus. The broken glass causes injury to the mechanism also. An effort has been made to equalize the temperature by a centrally-placed chimney; but this serves to draw the steam away from the ends of the apparatus and merely intensifies the mischief sought to be remedied.

The purpose of my invention is to overcome the difficulties sought to be enumerated, and it is accomplished in the apparatus about to be described.

The drawing is a central vertical section of the apparatus broken at the middle in order that the illustration may come within the limits of one sheet.

In the drawing, 1 is a long tank of iron or other suitable material and provided with suitable inlet and outlet ports and with steam-pipes 2 or other means for heating its contents and adapted to be filled with water. At each end of the tank and adapted to revolve in suitable bearings are sprocket-wheels 3 3, arranged in pairs. Over these pass chains 4, supporting transversely between them slats or rods 5, the whole forming an endless flexible conveyer adapted to carry through the bath the beer-bottles placed in cases. At the inlet end is mounted a third pair of sprocket-wheels 7, over which the conveyer also passes. The conveyer rises inwardly at the inlet end to one end of a guide 8. It rides down this guide into the bath, thence passes through the latter, and then up and out of it, emerging at the opposite end of the tank. The conveyer is propelled from a suitable source of power. (Not shown.)

Above the tank and over the entire apparatus is a long cover 10, terminating at the inlet end in a hood 11 and at the outlet end in a similar hood 12. The respective walls 13 and 14 of these hoods depend vertically from the edges thereof and are provided with ports 15 and 16, through which the bottle-containing boxes are passed.

At the inlet end of the hood 11 is placed a chimney 20, provided with a damper 21. Suspended from the roof of this hood are baffle-plates either rigidly fixed in position, as the plate 22, or hinged to swing from their upper edges, as the plates 23 23 23. These baffle-plates may or may not be perforated toward their upper end.

A water-pipe 30, leading from any suitable source of supply, is provided with a branch 31, let into the hood 11 and bent inwardly beneath the cover 10 in long bends 32 within the steam-space formed above the bath. This pipe 31 terminates in a transverse pipe 33, located toward the inner portion of the hood 12. The pipe 33 is perforated on its upper side to permit of the discharge of the water therefrom in upwardly-shooting jets.

Toward the center of the cover 10 is secured a vertically-disposed valve-controlled steam-pipe 40.

Near the outlet end of the tank and placed underneath the hood 12 are a series of deflecting-plates 50 50. Immediately beneath these are arranged transverse pipes 35 35, supplied with water by a branch 34, leading from the water-supply pipe 30. These pipes 35 35 are each perforated on their upper side to permit of the projection upward of the jets of water, so that these jets strike against the deflecting-plates 50 50 or the under surface of the hood 12, mingle with the vapors above the bath at that point and with each other, and cause the water to fall upon the bottles emerging from the bath in the form of a fine spray, which is warmer at the inner end of the hood 12 than toward the outer end, for the reason that the water passing through the pipe 13 and bends 32 becomes heated during its travel.

The purpose of allowing the jets to project upward and not downward is to prevent the water coming directly in contact with the bottles and to cause it to be equalized somewhat in temperature by passing through the steam above the liquid in the tank. It also serves to condense this steam and to use it up.

At the inlet end of the apparatus the chimney 20 may first be employed to draw the steam and vapors in that direction. This heats the baffle-plates 22 23. The damper 21 is then closed. The steam then has a tendency to escape through the aperture 15; but as it rises from the surface of the liquid in the tank it meets the first baffle-plate 23, and part of it is condensed and falls downward upon the bottles as hot water. It passes around and under this baffle-plate to meet the next baffle-plate, where a similar reaction takes place, so that little, if any, steam reaches the end of the hood 11 when the chimney-damper is closed. At the same time the bottles gradually moving toward the hot bath have been slowly heated.

It will be observed that the inlet portion of the hood 13, which covers the preliminary-heating chamber, is not arranged over the end of the tank, (in other words, it is arranged in advance of that portion of the tank which contains the heated liquid,) and that some of the baffle-plates are located immediately above said liquid, while others of the baffle-plates are arranged in the portion of the hood in front of the liquid-containing portion of the tank. Thus the gradual preliminary heating of the bottles by gradually decreasing the heating power of the steam or vapor from the outlet to the inlet of said chamber is better secured, because it will be obvious that the baffle-plate 22 nearest the inlet end of said chamber will find much less steam or vapor to condense than the others, not alone because most of the condensable matter has been condensed by said others before the end one is reached, but for the further reason that it is located at a greater or less distance from that portion of the apparatus from which the steam or vapors arise.

The baffle-blates 23 23 are hinged in order that one or more of them may be, if necessary, swung out of the way when a more rapid change in temperature is desired.

The steam-pipe 40 is employed either to draw the steam away from the center of the apparatus or to introduce it therein, as may be desired.

This apparatus is efficient in practice. The percentage of bottles broken when it is employed is surprisingly small. It permits the conveyer to be moved more rapidly than is the case in a pasteurizer not provided with my invention, and hence by its use a great capacity is secured.

What I claim as new is—

1. A machine of the class described, comprising a tank adapted to contain a heated liquid and also to contain the packages being treated, and means for supplying the tank above said heated liquid with jets of water which are wholly discharged toward the wall of the tank and in a direction away from said packages, substantially as described and for the purposes specified.

2. A machine of the class described, comprising a tank wherein the packages are subjected to a bath of heated liquid, and means for enveloping said packages in a mist of cooling vapor as they emerge from said bath, said cooling means comprising a stationary spray-pipe having its discharge-apertures directed away from said packages.

3. A machine of the class described, comprising a tank wherein the packages are subjected to a bath of heated liquid and means for enveloping said packages in a mist of cooling vapor as they emerge from said bath, said cooling means comprising deflecting-plates depending from the top wall of the tank into the cooling-space thereof, and a stationary spray-pipe having discharge-apertures directed toward said baffle-plates and away from said packages.

4. A machine of the class described, comprising a heated liquid, means for conveying the bottles through said liquid, and means for cooling the bottles as they emerge from said liquid, comprising a baffle-plate and a fluid-discharge pipe having its discharge-apertures directed toward said plate whereby said fluid is converted into a mist of vapor cooler than said heated liquid.

5. A tank adapted to contain heated liquid, a hood above the outlet end thereof and a spraying mechanism above said heated liquid and below the hood whereby the jets of water therefrom are directed away from the heated liquid and toward the hood.

6. A tank adapted to contain heated liquid, a hood above the outlet end thereof, a spraying mechanism intermediate the liquid-level and the hood, and having discharge-apertures

directed toward the hood, and a deflecting-plate against which the jets from the spraying mechanism are adapted to impinge.

7. A tank adapted to contain heated liquid, a hood above the outlet end thereof, a plurality of spraying mechanisms each discharging its jets upward toward the hood and means for varying the temperature of the liquid of the different spraying mechanisms.

8. A tank adapted to contain heated liquid, a hood above the outlet end thereof, a plurality of spraying mechanisms, each discharging its jets upward toward the hood and means for supplying the different mechanisms with water of different temperatures.

9. A tank adapted to contain heated liquid, a hood above the outlet end thereof, a plurality of spraying mechanisms, each discharging its jets upward toward the hood, and means for supplying water of a higher temperature to the spraying mechanism farthest from the outlet end of the apparatus.

10. A tank adapted to contain heated liquid, a hood above the outlet end thereof, a spraying mechanism discharging its jet upward toward the hood and away from the heated liquid, and means for heating the water supplied to such spraying mechanism, comprising a pipe leading from the source of water-supply through the space above the heated liquid to the spraying mechanism.

11. A tank adapted to contain heated liquid, a hood above the outlet end thereof, a spraying mechanism discharging its jet upward toward the hood and away from the heated liquid, and means for heating the water supplied to such spraying mechanism, comprising a pipe leading from the source of water-supply through the heated portion of the apparatus.

12. A tank adapted to contain heated liquid, a hood above the outlet end thereof, a plurality of spraying mechanisms each discharging its jets upward toward the hood the spraying mechanism nearest the outlet end being supplied with water directly from a source of water-supply and the spraying mechanism farthest from the hood being supplied with water through a pipe passing through the hot portions of the apparatus to increase the temperature of the water in said pipe.

13. In an apparatus of the class described, a tank adapted to contain heated liquid, a hood above the outlet end thereof and means for condensing the vapors intermediate the liquid and the hood, comprising a spraying mechanism, the jets of which are adapted to project upward.

14. In an apparatus of the class described, a tank adapted to contain heated liquid, a hood above the outlet end thereof, and means for condensing the vapors intermediate the liquid and the hood, comprising spaced deflecting-plates attached to and projecting downwardly from the inner surface of the hood.

15. In an apparatus of the class described, a tank adapted to contain heated liquid, a hood above the inlet end thereof and means for condensing the vapors arising from said liquid and projecting them so condensed downward, comprising baffle-plates secured to and depending from the inner surface of the hood.

16. In an apparatus of the class described, a tank adapted to contain heated liquid, a hood inclosing the inlet end of the tank and adjustable steam and vapor condensing baffle-plates arranged between the liquid-level and said hood, substantially as described and for the purposes specified.

17. In an apparatus of the class described, a tank adapted to contain heated liquid, hoods inclosing the same at each end thereof, and means for condensing the steam or heated vapors near the ends of said hoods, comprising baffle-plates at one end of the apparatus and a spraying mechanism at the other.

18. In an apparatus of the class described, a tank adapted to contain heated liquid, hoods inclosing the same at each end thereof and means for condensing the steam or heated vapors near the ends of said hoods, comprising baffle-plates at one end of the apparatus and spraying mechanisms at the other, and means for supplying water of different temperatures to the different spraying mechanisms.

19. In an apparatus of the class described, a tank adapted to contain heated liquid, hoods inclosing the same at each end thereof, and means for condensing the steam or heated vapors near the ends of said hoods, comprising baffle-plates at one end of the apparatus and spraying mechanisms at the other, the water supplied to one of said mechanisms being heated by passing the supply-pipe thereto through heated parts of the apparatus.

20. A pasteurizing apparatus comprising a covered tank having a space for a heated liquid and a space above the same for steam or heated vapors, and means for injecting fluids of different temperatures at different places into the last-mentioned space to mingle with the steam or vapors therein, substantially as described and for the purpose specified.

21. A pasteurizing apparatus comprising a covered tank having a space for a heated liquid and a space above the same for steam or heated vapors, means for injecting water into one portion of the last-mentioned space to mingle with the steam or vapor therein, and a second means for injecting water into said steam or vapor space comprising a coiled pipe arranged in said space and heated by the steam or vapor therein to a higher temperature than the first-mentioned water-injecting means, substantially as described and for the purposes specified.

22. A pasteurizing apparatus comprising a tank having a pasteurizing portion between its ends and provided at one end with a preliminary-heating chamber leading to said pasteurizing portion and its other end with a cooling-chamber leading from said pasteurizing portion, said chambers having steam or vapor containing portions through which are carried the articles being pasteurized, means in said preliminary-heating chamber acting in conjunction with the steam or vapor to produce a gradual increase in the heat applied in said chamber from its inlet to its outlet, and means in the cooling-chamber operating to produce an increasing cooling effect from the inlet to the outlet of said chamber.

23. A pasteurizing apparatus comprising a tank adapted to contain a heated liquid and provided at one end with a hood for steam or vapors, said hood having a part arranged beyond the end of said tank and provided with a plurality of devices for condensing the steam, a portion of said devices being arranged over the liquid in said tank and a portion thereof being arranged in the part of the hood which is beyond the end of said tank.

Witness my hand this 28th day of November, 1903, at the city of New York, in the county and State of New York.

CHARLES H. LOEW.

Witnesses:
HERMAN MEYER,
WILLIAM R. BAIRD.

? other

Ja. 1906

808,668

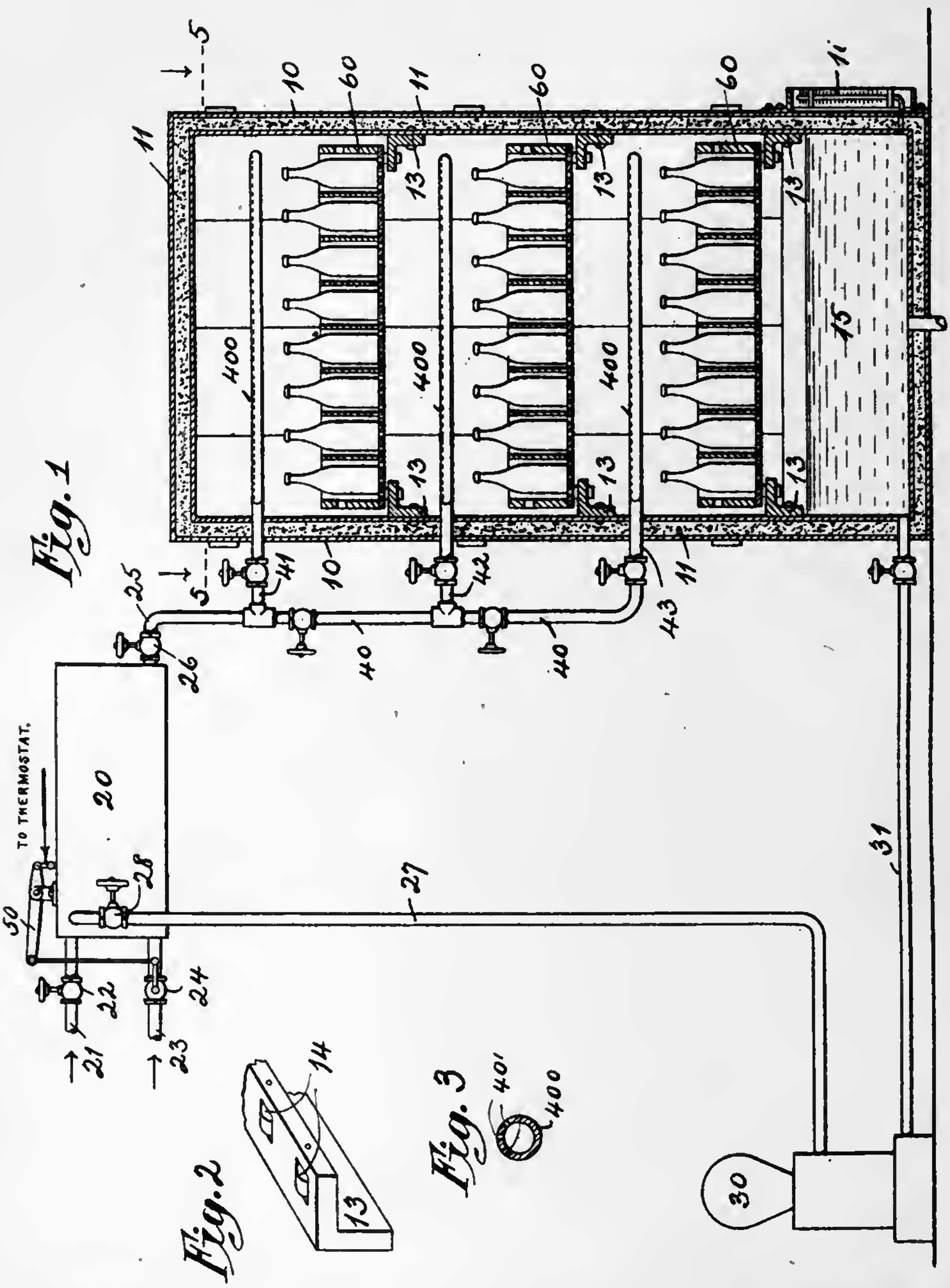
No. 808,668. PATENTED JAN. 2, 1906.

C. H. LOEW.

PROCESS OF PASTEURIZING BEER.

APPLICATION FILED FEB. 8, 1905.

2 SHEETS—SHEET 1.



Attest:
Herman Meyer
Stephen S. Newton

Inventor:
Charles H. Loew
by William R. Baird his Atty.

No. 808,668. PATENTED JAN. 2, 1906.

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PROCESS OF PASTEURIZING BEER.

APPLICATION FILED FEB. 8, 1905.

2 SHEETS—SHEET 2.

Fig. 5

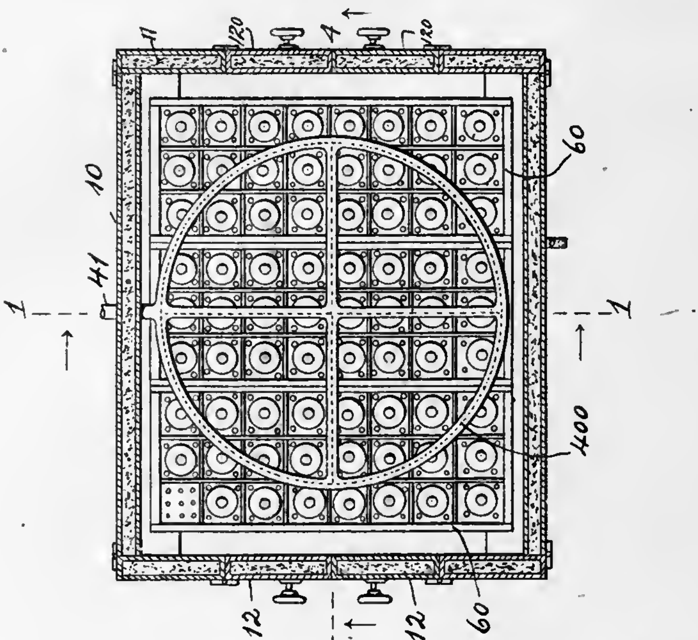
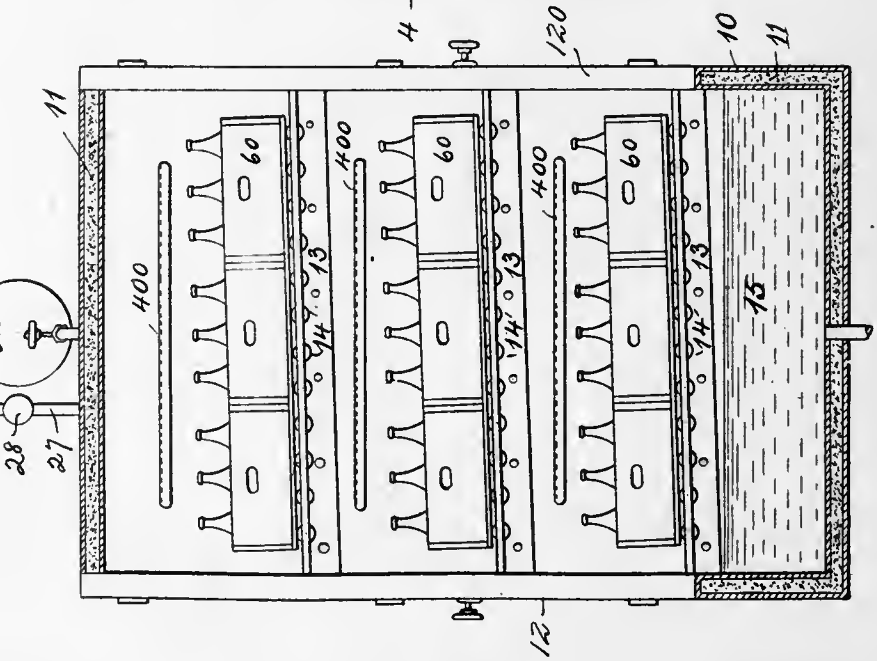


Fig. 4



Attest:
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by William R. Baird
his Atty.

UNITED STATES PATENT OFFICE.

CHARLES H. LOEW, OF LAKEWOOD, OHIO.

PROCESS OF PASTEURIZING BEER.

No. 808,668. Specification of Letters Patent. Patented Jan. 2, 1906.

Application filed February 8, 1905. Serial No. 244,689.

To all whom it may concern:

Be it known that I, Charles H. Loew, a citizen of the United States, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Processes of Pasteurizing Beer, of which the following is a specification.

My invention relates to a process for the pasteurization of beer in bottles; and its novelty consists in the several successive steps of the process employed to effectuate the desired purpose.

The pasteurization of beer in bottles is accomplished effectually if the beer can be maintained a sufficient length of time—say from about twenty to thirty minutes—say, at about 145° Fahrenheit, which will prevent the further development of the yeast in the beer. A higher temperature must be avoided, as it cooks the beer, and a lower temperature is not efficient. Beer has usually been pasteurized of late years by conveying the bottles containing it either singly or in groups through a suitable pasteurizing medium—for instance, hot water. It must be remembered that beer is bottled usually at a temperature of 36° Fahrenheit or thereabout. Consequently conveying the bottles directly into water of the necessarily much higher temperature causes breakage by reason of the sudden shock to the glass of which the bottles are composed. Breakage under these circumstances means not only the direct loss of the beer in the bottle and to the bottle itself, but it also means a contamination of the pasteurizing medium with the beer, which from the acid contained therein injuriously affects the vessels or receptacles in which the operations are carried on. Attempts have been made to pasteurize beer in the bottles by two distinct methods. The first of these consisted in placing the bottles in a suitable vessel and then admitting heated water to the vessel, which as it gradually arose therein heated the bottles to the required temperature and as it was released and conducted therefrom allowed the bottles gradually to sink to a temperature equal to that of the outside atmosphere. The second method, which has been somewhat extensively employed, has been to pass the bottles through a bath of hot water by placing the same on an endless conveyer going through this bath. As above stated, the sudden changes of temperature which necessarily take place in this operation are apt to break the bottles.

I have had much experience in this art, and I have discovered that when the bottles filled with the comparatively cold beer are brought into the presence of a warmer vapor, even although it be not much warmer than the temperature of the beer, a fine film of moisture immediately forms on the outside of the bottles, and if a much warmer fluid is then brought into contact with the outside of such bottles they do not break, being protected by this film of condensed vapor on their surface. I have utilized this discovery and overcome the disadvantages heretofore existing in the processes of pasteurizing the beer by the process which is the subject-matter of this application and which process consists, in brief, in subjecting the bottles containing the beer to be pasteurized to a spray of water of gradually and progressively increasing temperature within a suitable chamber until a predetermined temperature sufficient to pasteurize the beer in the bottles has been arrived at, then maintaining the temperature of the spray at that temperature or one slightly above that point for a sufficient time to pasteurize the beer in the bottles, and finally allowing the bottles to cool, either naturally by withdrawing the spray, or by lowering the temperature of the spray gradually, but continuing it. By this process I avoid the expense, labor, and power necessary to convey the bottles through the pasteurizing medium, because they remain stationary within the chamber while the operation is going on. By a somewhat ingenious device I use the water with which the bottles have been sprayed over and over again, so that the expense of continually heating a fresh quantity of water to the proper point is avoided. I avoid the disadvantages existing where the bottles are brought into contact with the body of liquid in which at times they are only partially immersed. I secure an even temperature throughout the pasteurizing chamber, so that the beer in all the bottles contained in the chamber is subjected to the pasteurizing conditions substantially the same length of time, and I utilize as a pasteurizing medium water which has been preheated by the waste steam which is common in all breweries and bottling establishments.

In carrying out this process I make use of a preferred form of apparatus which is illustrated in the accompanying drawings, and in which—

Figure 1 is a front elevation and partial vertical section of the same. Fig. 2 is a perspective detail view of one of the brackets or slideways. Fig. 3 is a transverse section through one of the atomizing-nozzles. Fig. 4 is a vertical sectional view on the line 4 4 of Fig. 5, partly in elevation; and Fig. 5 is a horizontal sectional view on the line 5 5 of Fig. 1 looking downward.

In the drawings there is illustrated a box or chamber made of any suitable size and material, but preferably of steel, and the walls 10 of which are lined with suitable insulating material 11, as mineral wool. It is provided with doors 12 12 at one side and similar doors 120 120 at the other side. Along the walls are arranged brackets or slideways 13 13 in pairs, made of angle-iron or other suitable construction, and which dip slightly from one end of the chamber to the other to facilitate the travel toward the latter of boxes containing the beer-bottles. If deemed desirable, these slideways may be provided with little friction-rollers 14 14; but in most cases these would not be necessary. The bottom portion 15 of the chamber comprises a water-tank, and it is provided with an external water-gage 16. In close proximity to this chamber and preferably conveniently arranged above it is the water-tempering chamber 20. This consists of a closed vessel of steel or other suitable material and having a capacity of several gallons. It is provided with a water-supply pipe 21, having a valve 22, a steam-supply pipe 23, having a valve 24, a spraying-system pipe 25, having a valve 26, and a pump-pipe 27, having a valve 28. The pipe 21 may be connected to any suitable source of water-supply (not shown)—as, for instance, a city main or reservoir. The pipe 23 may be connected with the exhaust system of the steam-engine or with any other source of steam under pressure. Also in close proximity to the pasteurizing-chamber is a pump, (indicated at 30,) which may be of any suitable form or size and which is connected to the reservoir 15 at the bottom of the chamber 10 by a pipe 31 and to the water-tempering chamber 20 by another pipe 27, above referred to.

Arranged alongside of and partly within the pasteurizing-chamber is the spraying system. This comprises the pipe 25, leading from the chamber 20 to the vertical pipe 40, which is provided with branches 41 42 43, which are each supplied with a suitable valve and each of which terminates in an atomizing nose or nozzle 400, whereby the water coming through the branch pipe and supplied thereto is projected upward in the form of a fine spray.

A thermostat of any approved form is arranged in close proximity to the water-tempering chamber and is so arranged that it controls the valve 24 of the steam-supply pipe 23, (through a lever 50,) so that if the temperature of the water in the chamber 20 arises above the point at which the thermostat is set the valve 24 will be shut to cut off the supply of steam, and if the temperature falls below that point the valve is opened to admit the steam thereto. Such thermostats are well known, and its special construction and mode of operation form no part of this invention.

The boxes 60, containing the beer in bottles, are simple trays divided into compartments, each of the latter being adapted to hold one bottle. The trays, however, must have a perforated bottom to permit of the water with which the bottles are sprayed to drip therefrom. Woven wire forms a good material for these boxes or trays; but their form and material are unimportant so long as they hold the bottles safely and allow the water to pass downward from them.

The mode of using the apparatus is as follows: The doors 12 12 are closed and the doors 120 opened. The workmen place the boxes containing the beer-bottles upon the slideways and the boxes slide down to the other side of the apparatus. This is continued until the pasteurizing-chamber is all filled. The doors 120 120 are then closed. The valves 22 and 26 and the valves on the branch pipes 41, 42, and 43 are then opened and water from the pipe 22 flows into the water-tempering chamber 20 until it is filled and water begins to flow into the spraying system through the pipe 40 and is forced through the nozzle 400 upward and striking against the roof of the pasteurizing-chamber or the bottoms of the bottle-boxes, as the case may be, falls upon the bottles within the boxes in the form of a fine rain or spray and begins to accumulate in the reservoir or tank 15, its depth being ascertained by an inspection of the water-gage 16. The valve 24 is then opened and connected with the thermostat 50, and as soon as the water in the tank 15 nearly fills the latter the pump 30 is started and begins to pump the water from the tank 15 through the pipe 31, pump 30, and pipe 27 back into the water-tempering chamber 20, where it is again heated by the steam and used over again through the spraying system. By these steps it will be observed that the spray first falling upon the bottles is of a temperature of the water in the supply-pipe 21. The steam warms these gradually as it circulates through the tempering-chamber 20 until a point is reached where it is kept at the temperature desired by the action of the thermostat. This latter should be set at a temperature a few degrees higher than that at which it is desired to keep the beer in the bottles to allow for inevitable losses by radiation and conduction. After the proper temperature has been maintained long enough the thermostat is disconnected and the steam shut off, but the pump 30 is kept in operation constantly to spray the bottles with the water, which gradually becomes cooler and finally reaches the normal temperature. The pump is then stopped. The doors 12 12 are then opened and the boxes removed.

It will be observed, using the apparatus in the manner described, that the bottles containing the beer have been first sprayed with a fine rain or spray of water at a temperature near the normal, that this temperature has been gradually increased until the pasteurizing temperature has been reached, and that the latter temperature has been maintained until the pasteurization has been effected, when the temperature has been gradually decreased. These steps, moreover, have been effected in such a way as not to produce any sudden changes in temperature, and consequently there has occurred no breakage of the bottles. The bottles have remained stationary during the operation, and no power has been required to move them. The only expense attendant upon the operation is that of the steam employed to heat the water and the cost of running the pump. Both of these are small. Using the water over and over effects a great economy, because it is pumped from the collecting or drip tank back to the tempering-chamber before it has time to lose much of its heat. The temperature within the pasteurizing-chamber is practically uniform.

Having described my invention, what I claim as new is—

1. The process of pasteurizing beer in bottles which comprises subjecting the bottles contained in a suitable chamber to a spray of water of progressively-increasing temperature until a predetermined temperature is arrived at.

2. The process of pasteurizing beer in bottles which consists in subjecting the bottles contained in a suitable chamber to a spray of water of progressively-increasing temperature until a predetermined temperature is arrived at and maintaining the spray at the chosen temperature for a sufficient time to pasteurize the beer in the bottles.

3. The process of pasteurizing beer in bottles which consists in subjecting the bottles contained in a suitable chamber to a spray of water of progressively-increasing temperature until a predetermined temperature is arrived at, maintaining the spray at the chosen temperature for a sufficient time to pasteurize the beer in the bottles, and finally subjecting the bottles to a spray of a gradually-decreasing temperature.

4. The process of pasteurizing beer in bottles which comprises subjecting the bottles contained in a suitable chamber to a spray of water of progressively-increasing temperature until a predetermined temperature is arrived at, and securing said increasing temperature by repeatedly passing the water so used for the steam-heating medium.

5. The process of pasteurizing beer in bottles which comprises subjecting the bottles contained in a suitable chamber to a spray of water of progressively-increasing temperature until a predetermined temperature is arrived at, and securing said increase of temperature by repeatedly passing the water so used through a water-tempering chamber provided with a suitable source of heat.

6. The process of pasteurizing beer in bottles which comprises subjecting the bottles contained in a suitable chamber to a spray of water of progressively-increasing temperature until a predetermined temperature is arrived at, and securing said increase of temperature by repeatedly passing the water so used through a water-tempering chamber provided with a suitable source of heat, and providing means for governing the admission of heat energy to the tempering-chamber.

7. The process of pasteurizing beer in bottles which consists in subjecting the same to the action of a spray of water at or near the normal temperature, heating the water-supply to the spray gradually to a predetermined temperature, maintaining the temperature of the water a predetermined suitable time, and withdrawing the heat therefrom after the lapse of said time.

8. The process of pasteurizing beer in bottles which consists in placing the same in a suitable closed chamber, subjecting the same to the action of a spray of water, which water has previously been heated in a tempering-chamber, returning the water after it has been brought into contact with the bottles to the tempering-chamber, gradually raising the temperature of said tempering-chamber until the spray falls in upon the bottles at a predetermined temperature and maintaining that temperature a suitable length of time at such degree of warmth that the beer within the bottles will be pasteurized.

In testimony whereof I affix my signature in presence of two witnesses.

CHAS. H. LOEW.

Witnesses:

FRED. H. BIERMANN,

EMMA L. HARMON.

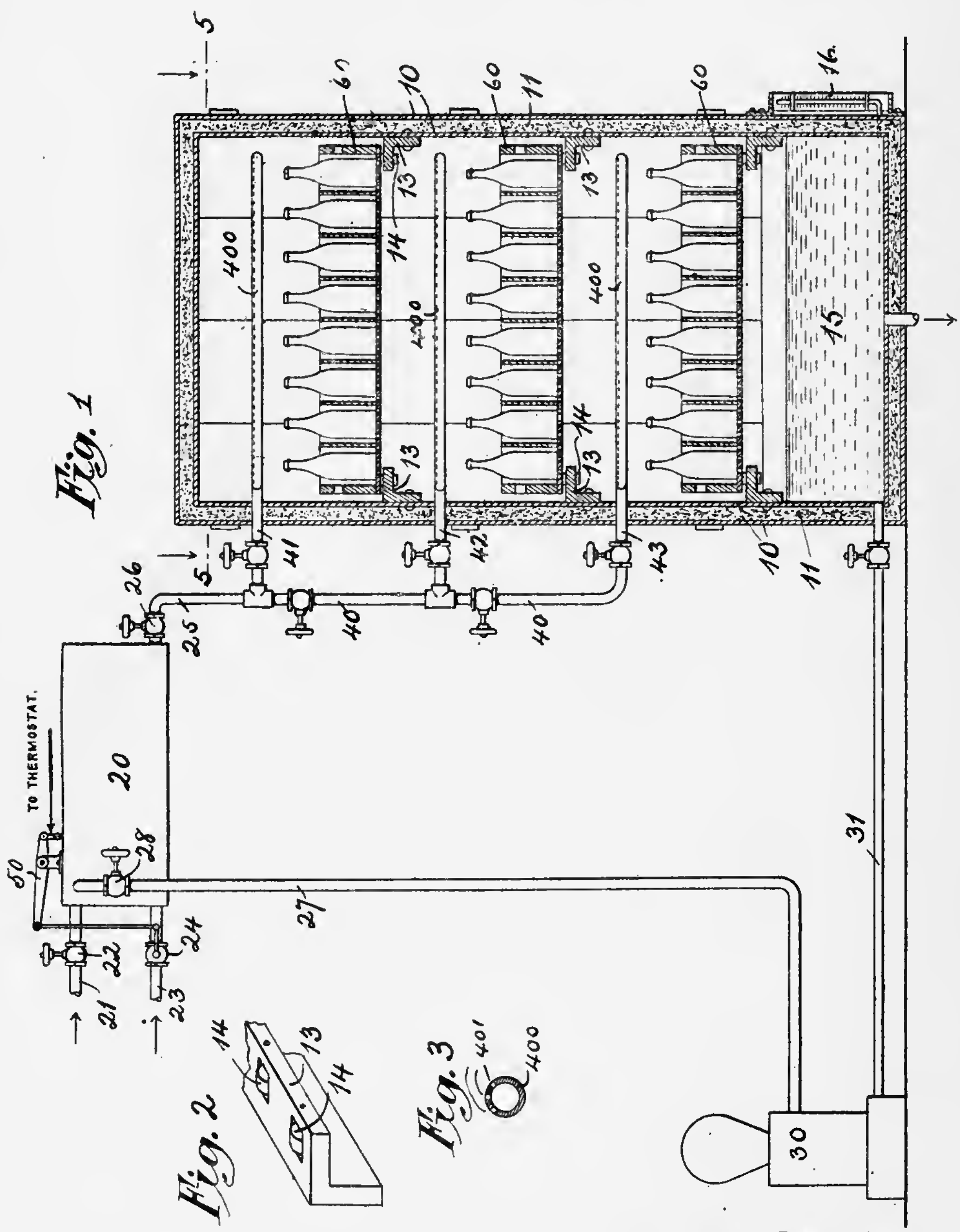
No. 817,495. PATENTED APR. 10, 1906.

C. H. LOEW.

PASTEURIZER.

APPLICATION FILED FEB. 7, 1905.

2 SHEETS—SHEET 1.



Attest:

Stephen S. Newton

Herman Meyer

Inventor:

Charles H. Loew

by William R. Baird, his Atty.

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PASTEURIZER.

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2 SHEETS—SHEET 2.

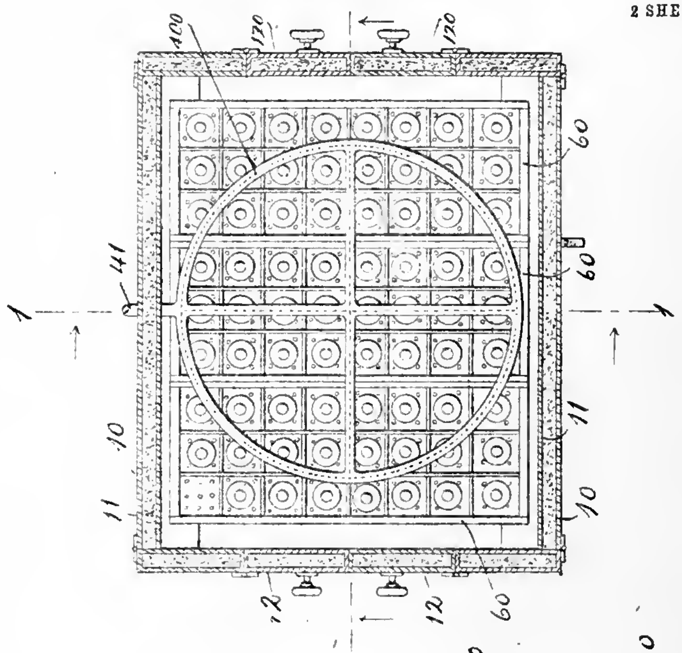


Fig. 5

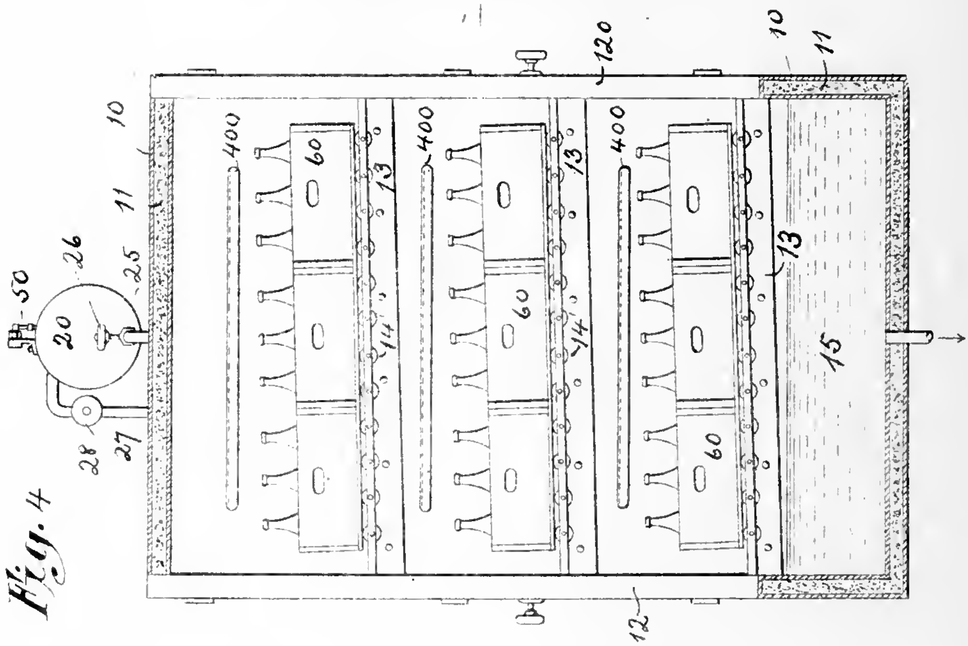


Fig. 4

Attest:

Stephen S. Newton

Herman Meyer

Inventor:

Charles H. Loew

by William R Baird

his Atty.

UNITED STATES PATENT OFFICE.

CHARLES H. LOEW, OF LAKEWOOD, OHIO.

PASTEURIZER.

No. 817,495. Specification of Letters Patent. Patented April 10, 1906.

Application filed February 7, 1905. Serial No. 244,578.

To all whom it may concern:

Be it known that I, Charles H. Loew, a citizen of the United States, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Pasteurizers, of which the following is a specification.

My invention relates to an apparatus for the pasteurization of beer in bottles, and its novelty consists in the construction and adaptation of the parts and in the means employed to effectuate the purpose desired.

The pasteurization of beer in bottles is accomplished if the beer can be maintained a sufficient length of time—say from about twenty to thirty minutes—at a temperature, say, of about 145° Fahrenheit, which will prevent the further development of the yeast in the beer. The higher temperature must be avoided, as it cooks the beer, and a lower temperature is not efficient.

Beer has been usually pasteurized of late years by conveying the bottles either singly or in groups through hot water. Now it must be remembered that beer is bottled usually at a temperature of 36° Fahrenheit or thereabout. Consequently conveying the bottles directly into water of the necessarily much higher pasteurizing temperature causes much breakage. Breakage under this circumstance means not only the direct loss of the beer in the bottle and the loss of the bottle itself, but it also means the contamination of the water used as the pasteurizing medium with the acid contained in the beer, which rusts the iron tanks and other parts in which these operations are carried on.

Attempts have been made to prevent such breakage by preheating the bottles before they are placed in the heated bath; but after all there is always the line of juncture between the body of liquid and the air above it and always a time when the bottle is only partly immersed, and it is at this point where the danger lies and where breakage occurs. A similar danger-point exists when the bottles emerge from the heated bath into a cooler atmosphere.

I have had much experience in this art, and I have discovered that when the bottles filled with the comparatively cold beer are brought into the presence of a warm vapor, even although it be not much warmer than the temperature of the beer, a fine film of moisture immediately forms on the outside of the bottles, and if a much warmer fluid is then brought into contact with the outside of such bottles they no not break, being protected by the film of condensed vapor on their surface.

The purpose of my invention is to overcome these difficulties, and I do so by the simple and efficient means which forms the subject-matter of this application and which consists, briefly, of a closed chamber into which the bottles are introduced and in which they remain at rest during the operation; means for supplying thereto a spray of water directed to fall upon the bottles in a fine rain; means for gradually raising the temperature of the sprayed water until the desired pasteurizing temperature is reached in the bottles; means for maintaining the said temperature during a proper length of time, and means for then gradually decreasing the temperature of the spray to cool the bottles, so that they may be safely handled.

It also consists of suitable appliances and adjuncts necessary to the operation and control of the means stated.

In the drawings there is illustrated a preferred form of my apparatus.

Figure 1 is a front elevation and partial vertical section of the same. Fig. 2 is an enlarged detail in perspective of part of one of the slideways. Fig. 3 is an enlarged transverse section of one of the spraying-pipes. Fig. 4 is a vertical longitudinal section of the apparatus; and Fig. 5 is a horizontal sectional view on the plane of the line 5 5 of Fig. 1 looking downward.

In the drawings, there is illustrated a box or chamber made of any suitable size and material, but preferably of steel, and the walls 10 of which are lined with suitable insulating material 11, as mineral wool. It is provided with doors 12 12 at one side and similar doors 120 120 at the other side. Along the walls are arranged brackets or slideways 13 13 in pairs made of angle-iron or other suitable construction and which dip slightly from one end of the chamber to the other to facilitate the travel toward the latter of boxes containing the beer-bottles. If deemed desirable, these slideways may be provided with little friction-rollers 14 14; but in most cases these would not be necessary. The bottom portion 15 of the chamber is a water-tank, and it is provided with an external water-gage 16.

In close proximity to this chamber and preferably conveniently arranged above it is the water-tempering chamber 20. This consists of a closed vessel of steel or other suitable material and having a capacity of several gallons. It is provided with a water-supply pipe 21, having a valve 22, a steam-supply pipe 23, having a valve 24, a spraying-system pipe 25, having a valve 26, and a pump-pipe 27, having a valve 28. The pipe 21 may be connected to any suitable source of water-supply, (not shown,)—as, for instance a city main or reservoir. The pipe 23 may be connected with the exhaust system of the steam-engine or with any other source of steam under pressure. Also in close proximity to the pasteurizing-chamber is a pump (indicated at 30) which may be of any suitable form or size and which is connected to the reservoir 15 at the bottom of the chamber 10 by a pipe 31 and to the water-tempering chamber 20 by another pipe 27, above referred to.

Arranged alongside of and partly within the pasteurizing-chamber is the spraying system. This comprises the pipe 25, leading from the chamber 20 to the vertical pipe 40, which is provided with branches 41 42 43, which are each supplied with suitable valves, and each of which terminates in an atomizing rose or nozzle 400, whereby the water coming through the branch pipe and supplied thereto is projected upward in the form of a fine spray.

A thermostat of any approved form is arranged in close proximity to the water-tempering chamber and is so arranged that it controls the valve 24 of the steam-supply pipe 23 through the lever 50, so that if the temperature of the water in the chamber 20 rises above the point at which the thermostat is set the valve 24 will be shut to cut off the supply of steam, and if the temperature falls below that point the valve is opened to admit the steam thereto. Such thermostats are well known, and their special construction and mode of operation form no part of this invention.

The boxes 60 containing the beer in bottles are simple trays divided into compartments, each of the latter being adapted to hold one bottle. The trays, however, must have a perforated bottom to permit of the water with which the bottles are sprayed to drip therefrom. Woven wire forms a good material for these boxes or trays; but their form and material is unimportant so long as they hold the bottles safely and allow the water to pass downward from them.

The mode of using the apparatus is as follows: The doors 12 are closed and the doors 120 opened. The workmen place the boxes containing the beer-bottles upon the slideways, and the boxes slide down to the other side of the apparatus. This is continued until the pasteurizing-chamber is all filled. The doors 120 are then closed. The valves 22 and 26 and the valves on the branch pipes 41, 42, and 43 are then opened, and water from the pipe 22 flows into the water-tempering chamber 20 until it is filled and water begins to flow into the spraying system through the pipe 40 and is forced through the nozzle 400 upward and striking against the roof of the pasteurizing-chamber or the bottoms of the bottle-boxes, as the case may be, falls upon the bottles within the boxes in the form of a fine rain or spray and begins to accumulate in the reservoir or tank 15, its depth being ascertained by an inspection of the water-gage 16. The valve 24 is then opened and connected with the thermostat 50, and as soon as the water in the tank 15 nearly fills the latter the pump 30 is started and begins to pump the water from the tank 15 through the pipe 31, pump 30, and pipe 27 back into the water-tempering chamber 20, where it is again heated by the steam and used over again through the spraying system. By these steps it will be observed that the spray first falling upon the bottles is of a temperature of the water in the supply-pipe 21. The steam warms these gradually as it circulates through the tempering-chamber 20 until a point is reached where it is kept at the temperature desired by the action of the thermostat. This latter should be set at a temperature a few degrees higher than that at which it is desired to keep the beer in the bottles to allow for inevitable losses by radiation and conduction. After the proper temperature has been maintained long enough the thermostat is disconnected and the steam shut off, but the pump 30 is kept in operation constantly to spray the bottles with the water, which gradually becomes cooler and finally reaches the normal temperature. The pump is then stopped. The doors 12 are then opened and the boxes removed. If it is desired to cool the bottles still further, the water in the supply-pipe is cooled gradually to the desired temperature by passing the same through a refrigerating medium or in any other convenient way.

It will be observed that using the apparatus in the manner described, the bottles containing the beer have been first sprayed with a fine rain or spray of water at a temperature near the normal, that this temperature has been gradually increased until the pasteurizing temperature has been reached, and that the latter temperature has been maintained until pasteurization has been effected, when the temperature has been gradually decreased. These steps, moreover, have been effected in such a way as not to produce any sudden changes in temperature, and consequently there has occurred no breakage of the bottles. The bottles have remained stationary during the operation and no power has been required to move them. The only expense attendant upon the operation is that of the steam employed to heat the water and the cost of running the pump. Both of these are small. Using the water over and over effects a great economy, because it is pumped from the collecting or drip tank back to the tempering-chamber before it has time to lose much of its heat. The temperature within the pasteurizing-chamber is practically uniform.

Modification can readily be made by the skilled workman in the form and material of the apparatus without departing from its essential principles; but the apparatus above described is the form which in the light of my present knowledge seems preferable.

What I claim as new is—

1. An apparatus for pasteurizing beer in bottles comprising a pasteurizing-chamber, a spraying mechanism within the chamber, means for supplying water thereto and means for gradually heating the water so supplied without interrupting its flow.

2. An apparatus for pasteurizing beer in bottles comprising a pasteurizing-chamber, a spraying mechanism within the chamber, means for supplying water thereto and means for gradually heating the water so supplied without interrupting its flow, consisting of a water-tempering chamber provided with a steam-supply pipe.

3. An apparatus for pasteurizing beer in bottles comprising a pasteurizing-chamber, a spraying mechanism within the chamber, means for supplying water thereto and means for gradually heating the water so supplied without interrupting its flow, consisting of a water-tempering chamber provided with a steam-supply pipe, and means, as a thermostat, adapted to control and regulate the steam-supply.

4. An apparatus for pasteurizing beer in bottles comprising a pasteurizing-chamber, a spraying mechanism within the chamber, means for supplying water thereto and means for gradually heating the water so supplied without interrupting its flow, until a predetermined temperature for the spray is arrived at and means for maintaining said temperature a suitable length of time.

5. An apparatus for pasteurizing beer in bottles comprising a pasteurizing-chamber, a spraying mechanism within the chamber, means for supplying water thereto and means for gradually heating the water so supplied without interrupting its flow, until a predetermined temperature for the spray is arrived at and means for maintaining said temperature a suitable length of time, consisting of a water-tempering chamber, a steam-supply pipe and a thermostat regulated by the temperature within the water-tempering chamber and controlling the steam-supply accordingly.

6. An apparatus for pasteurizing beer in bottles comprising a pasteurizing-chamber, a spraying mechanism within the chamber, means for supplying water thereto, means for gradually heating the water so supplied without interrupting its flow, means for collecting the said water after use, and means for restoring its temperature and returning it to the spraying mechanism.

7. An apparatus for pasteurizing beer in bottles comprising a pasteurizing-chamber, a spraying mechanism within the chamber, means for supplying water thereto, means for gradually heating the water so supplied without interrupting its flow, means for collecting the said water after use, and means for restoring its temperature and returning it to the spraying mechanism, consisting of a drip-tank, a pump, a water-tempering chamber provided with a steam-pipe.

8. An apparatus for pasteurizing beer in bottles comprising a pasteurizing-chamber, means for supporting bottles therein, a plurality of spraying devices each arranged above a suitable number of bottles, a common means for supplying the spraying devices with heated water and means for heating the water.

9. In an apparatus of the kind described, a pasteurizing-chamber, a plurality of spraying devices arranged one above another within the chamber, means intermediate for supporting the bottles under each spraying device, each support being adapted to allow the water to pass through the same, a drip-tank at the bottom of the chamber and means whereby the water from the drip-tank is conveyed to the spraying devices under pressure.

10. An apparatus for pasteurizing beer in bottles comprising a pasteurizing-chamber, a spraying mechanism within the chamber, means for supplying water thereto and means for gradually heating the water so supplied without interrupting its flow, until a predetermined temperature for the spray is arrived at and means for maintaining said temperature a suitable length of time, and means for finally reducing the temperature.

In testimony whereof I affix my signature in presence of two witnesses.

CHAS. H. LOEW.

Witnesses:

FRED. H. BIERMANN,

EMMA L. HARMON.

No. 832,581. PATENTED OCT. 2, 1906.

A. KOWARSCH.

APPARATUS FOR STERILIZING BOTTLED CARBONATED LIQUIDS.

APPLICATION FILED MAR. 13, 1905.

2 SHEETS—SHEET 1.

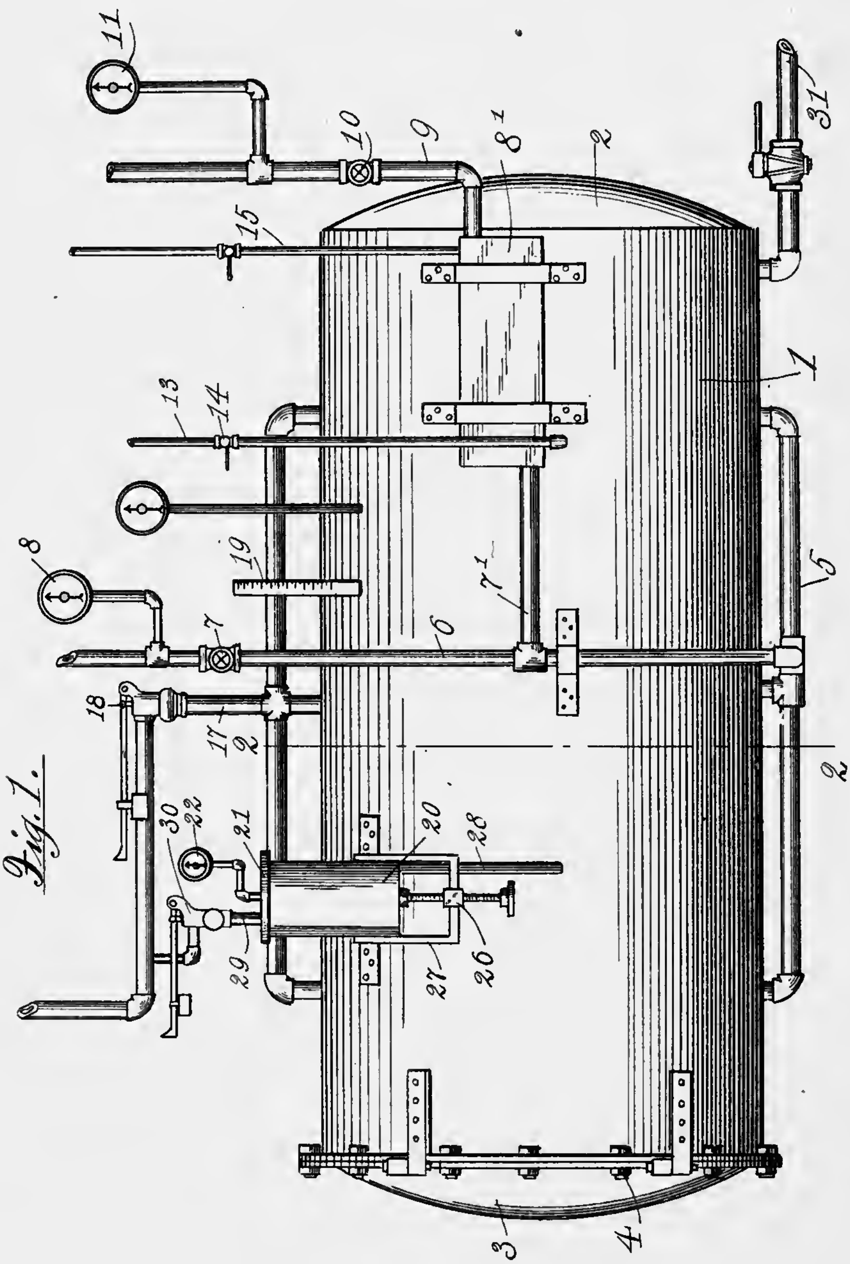


Fig. 1.

Witnesses

R. A. Fischer

E M Scherbarth

Inventor

Arthur Kowarsch

By Rudolph Wm. Lotz Atty.

THE NORRIS PETERS CO., WASHINGTON, D. C.

No. 832,581. PATENTED OCT. 2, 1906.

A. KOWARSCH.

APPARATUS FOR STERILIZING BOTTLED CARBONATED LIQUIDS.

APPLICATION FILED MAR. 13, 1905.

2 SHEETS—SHEET 2.

Fig. 2

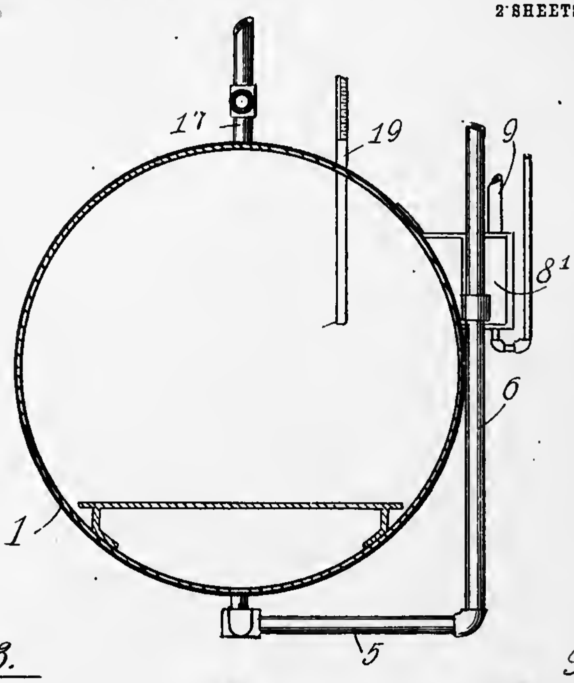


Fig. 3.

Fig. 4.

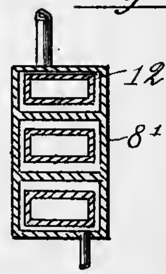
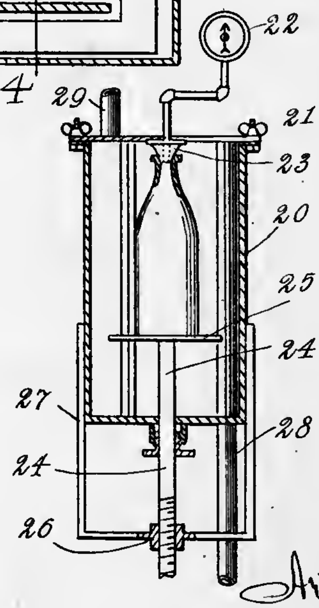


Fig. 5.



Witnesses

R. A. Fischer

E. M. Scherbarth

Inventor

Arthur Kowarsch

By Rudolph Wm Lotz Atty.

UNITED STATES PATENT OFFICE.

ARTHUR KOWARSCH, OF CHICAGO, ILLINOIS.

APPARATUS FOR STERILIZING BOTTLED CARBONATED LIQUIDS.

No. 832,581. **Specification of Letters Patent.** **Patented Oct. 2, 1906.**

Original application filed December 12, 1904, Serial No. 236,605. Divided and this application filed March 13, 1905. Serial No. 249,933.

To all whom it may concern:

Be it known that I, ARTHUR KOWARSCH, a citizen of Austria-Hungary, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Sterilizing Bottled Carbonated Liquids; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a novel apparatus for sterilizing bottled carbonated liquids, the object being to provide an apparatus in which the contents of the bottles may be heated to a sufficiently high temperature to thoroughly effect sterilization without danger of explosion by reason of the high pressure resulting from such high temperature.

My invention consists in the features of construction of such apparatus, as hereinafter fully described and claimed.

In the accompanying drawings, illustrating an apparatus constructed in accordance with my invention, Figure 1 is a side elevation of an apparatus constructed in accordance with my invention. Fig. 2 is a vertical transverse section of same on the line 2 2 of Fig. 1. Fig. 3 is a detail vertical section, on an enlarged scale, of a cooler for compressed air introduced into my said apparatus. Fig. 4 is a vertical transverse section on the line 4 4 of Fig. 3. Fig. 5 is a central vertical section of an auxiliary chamber for registering the pressure attained in the bottles and enabling the pressure in said apparatus to be regulated accordingly.

This is a division of my application for Letters Patent, Serial No. 236,605, filed December 12, 1904, for improvements in sterilizing apparatus and method.

In sterilizing or pasteurizing carbonated liquids, such as beer and the like, great loss is sustained by reason of explosion of bottles, due to the high pressure resulting from heat applied, and consequently to avoid excessive loss from this source the temperature employed is frequently insufficiently high to completely effect such sterilization.

The present methods generally employed consist in immersing the bottles in hot water, but by reason of the fact that the bottles when introduced into the water are generally very cold renders such sterilization very expensive by reason of the large quantities of hot water required and, furthermore, as hereinbefore stated, by reason of the bursting of a relatively large percentage thereof. To overcome these difficulties, I provide a sterilizing apparatus comprising a chamber 1, which is preferably cylindrical in form and horizontally disposed and is provided at its ends with dished heads 2 and 3, the head 3 being preferably hinged thereto and secured in place to seal said vessel by means of suitable fastening devices, such as the bolts 4 indicated or the like. Entering said chamber 1 at a plurality of points in the bottom thereof is a steam-supply 5, connected, by means of the pipe 6, with a source of supply of steam under pressure, there being a valve 7 interposed in said pipe and a pressure-gage 8 connected therewith. Connecting with said pipes 6 is a pipe 7′, which communicates, through a cooler 8′, with a source of supply of compressed air by means of the pipe 9, controlled by a valve 10 and having a pressure-gage 11 connected therewith. The said pipes 7′ and 9 communicate with a zigzag passage 12 in said cooler 8′, and connected with the said cooler by means of a pipe 13 is a source of supply of cold water controlled by a valve 14, introduced in said pipe 13. An exhaust or waste pipe 15 is connected with the other end of said cooler, the water introduced being caused to flow in a direction opposite to the flow of the air through the zigzag passage 12 by means of two walls 16, introduced in said cooler 8′ in a well-known manner. Connected with said chamber 1 at its upper end at a plurality of points is an exhaust-pipe 17, in which a safety-valve 18 of any suitable construction is interposed, said valve being adapted to maintain a given pressure in said chamber 1 in a well-known manner. Entering into said chamber 1 through the wall thereof at any suitable point is a thermometer 19, on which the temperature within said chamber may be read from the exterior thereof. Connected with the interior of said chamber, but disposed on the exterior thereof, is a cylindrical vessel 20, which is vertically disposed and is provided with a removable head 21, on which a pressure-gage 22 is mounted, the pipe connecting same with said head projecting through the latter and being provided on said projecting end with a conical plug 23, of rubber or similar yielding material. Entering said vessel through the bottom thereof is a vertically-disposed shaft 24, carrying a platform 25 at its upper end, the lower end portion of said shaft being threaded and passing through the threaded sleeve 26, mounted in a suitable frame 27, supported on said cylinder 20. Said vessel or chamber 20 is connected with the interior of said chamber 1 by means of the pipe 28 and is connected with the exhaust by means of the pipe 29, having flexible connection with said head or cover 21, there being a similar pressure-regulating valve 30 interposed in said connection, so that the pressure in said cylinder 20 will be maintained equal to the pressure within said chamber 1. Connected with the bottom of said chamber 1 is a valve-controlled drain-pipe 31, through which water from condensed steam is drained off.

My method of sterilizing as carried out in the above-described apparatus consists, primarily, in equalizing pressures on both sides of the walls of the bottles, so that the danger of bursting of said bottles or forcing out of stoppers or caps thereof is entirely obviated, thereby enabling the contents of such bottles to be heated to any desirable degree within reasonable limits, and thus thoroughly effect sterilization. Upon applying heat to carbonated liquids, which are generally bottled under pressure, the expansion of the contained gases is very great, and the result is that a very high pressure is contained in such bottles.

In carrying out my method it is essential, primarily, to carefully watch and ascertain as nearly as possible the pressure contained in the bottles and to so regulate the pressure without correspondingly increasing the temperature within the sterilizing vessel and on the exterior of the bottles as to substantially equalize such pressure, and thereby prevent loss. In carrying out the said method in the apparatus above described the bottles in large numbers are introduced into the chamber 1, so as to practically fill the same, and one of said bottles is opened and inserted in the cylinder 20, where it is supported on the platform 25, and the latter is raised so as to firmly insert the plug 23 in the neck of said bottle to seal the same. This bottle now communicates with the pressure-gage 22, and the pressure resulting from the applied heat will thus be indicated on said pressure-gage, as will be obvious.

If steam under pressure only were introduced in the chamber 1, it will be obvious that the heat corresponding to high pressure would be necessarily too intense and could at no time equalize the pressure in the bottles, by reason of the fact that the primary pressure therein exceeds steam-pressure at the boiling-point of water. In order to attain the desired temperature with a pressure in excess of the steam-pressure at such temperature, I introduce with or prior to the introduction of steam into said chamber 1 cold compressed air, so as to attain a pressure in said chamber 1 primarily which exceeds the normal pressure within the said bottle. I then introduce steam into said chamber, and as the same becomes heated I watch carefully the increase in pressure in the bottles indicated on the gage 22, and as the temperature increases I increase the pressure proportionately by partially opening the valve 10 to admit a further supply of compressed air, this operation being continued until the desired temperature and proportionate high pressure has been attained in said compartment 1, and this high temperature and pressure are maintained for a period sufficiently long to effect complete sterilization. The supply of steam is then shut off and the pressure maintained and gradually reduced by gradually exhausting the compressed air, the pressure of the latter being, however, always maintained slightly in excess of the pressure in the bottles and the latter being cooled to their original temperature before being removed from the apparatus. In this manner I am enabled to sterilize a large number of bottles of carbonated beverages at each operation at the expense of only a single bottle from each lot, which is required to indicate the increase in pressure for such lot by reason of the increase in temperature.

My said apparatus is exceedingly simple and efficient.

I claim as my invention—

An apparatus for sterilizing packed carbonated liquids, comprising a sealed vessel adapted to receive the package and communicating independently with sources of supply of air under pressure, steam and water, valves controlling all of said connections, an independent chamber communicating with said first-named chamber and adapted to receive an open package, an adjustable platform within said chamber supporting said open package, a pipe extending through the upper wall of said chamber and carrying a flexible stopper adapted to seal the said package, and a pressure-gage disposed on said pipe and indicating variations in pressure in said package due to variations in temperature of the contents thereof.

In testimony whereof I have signed my name in presence of two subscribing witnesses.

ARTHUR KOWARSCH.

Witnesses:

RUDOLPH WM. LOTZ,
E. M. SCHERBARTH.

No. 839,926. PATENTED JAN. 1, 1907.

P. G. GRIFFITH.

METHOD OF EFFECTING THE DESTRUCTION OF PATHOGENIC ORGANISMS IN WATER OR OTHER LIQUIDS.

APPLICATION FILED JUNE 3, 1905.

Fig. 2.

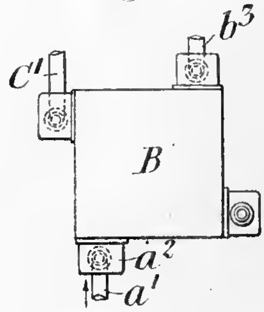
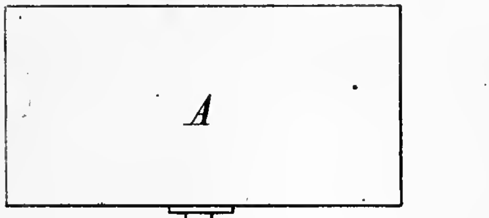
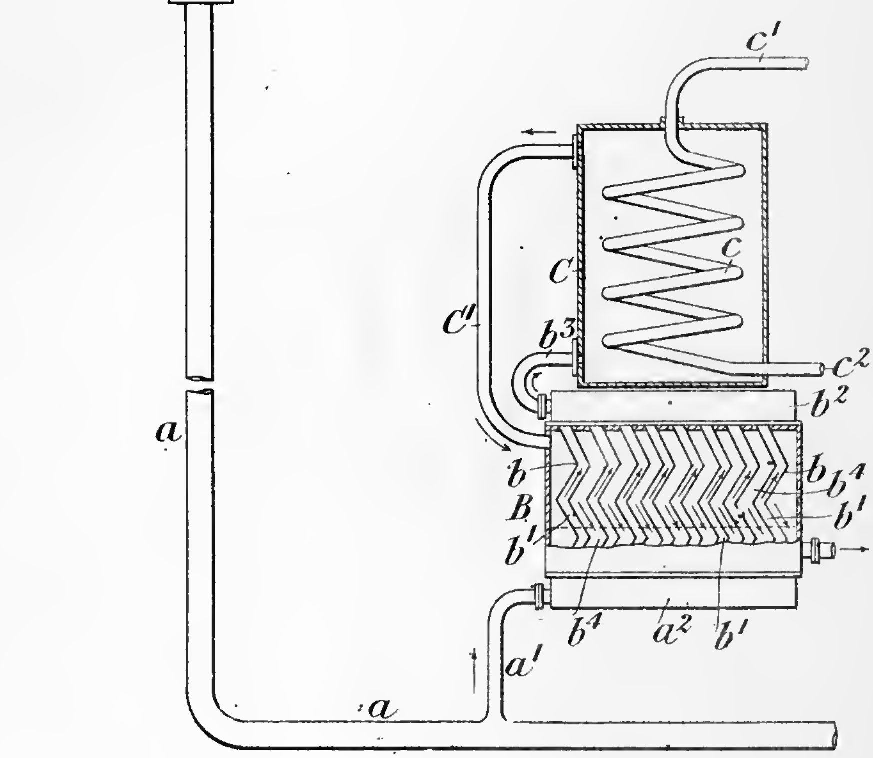


Fig. 1.





Witnesses
Wm L. Morrow
C. H. Grey

Inventor
Patrick J. Griffith
by Arthur L. Brown
his attorney

UNITED STATES PATENT OFFICE.

PATRICK GILL GRIFFITH, OF LONDON, ENGLAND.

METHOD OF EFFECTING THE DESTRUCTION OF PATHOGENIC ORGANISMS IN WATER OR OTHER LIQUIDS.

No. 839,926. **Specification of Letters Patent.** **Patented Jan. 1, 1907.**

Application filed June 3, 1905. Serial No. 263,570.

To all whom it may concern:

Be it known that I, PATRICK GILL GRIFFITH, a subject of the King of Great Britain, residing at Villa Molitor, 636 Green Lanes, London, England, have invented a new and useful Method of Effecting the Destruction of Pathogenic Organisms in Water or other Liquids, of which the following is a specification.

This invention relates to the purification of water, and is more particularly intended for use in connection with systems of water-supply for towns, districts, communities, corporations, and other areas or bodies.

The object of my invention is to effect the destruction of pathogenic organisms in the water or other liquid, and thereby prevent the more common disease germs, typhoid and the like, being conveyed through such systems to the recipients and consumers of the water.

According to my invention the water is raised to a temperature of 65° centigrade to 85° centigrade for a period not exceeding twenty-five seconds. This heating has the effect of destroying such pathogenic micro-organisms as commonly exist and are conveyed by the water.

In order that my invention may be clearly understood and readily carried into effect, I will proceed to describe the same with reference to the accompanying drawings, which represent diagrammatically a means whereby the objects hereinbefore mentioned may be accomplished, Figure 1 being a partial elevation and vertical section illustrating the arrangement of the apparatus, and Fig. 2 an end view of the chamber in which the water or liquid is received and from which the treated water or liquid is delivered.

According to the mode of carrying my invention into effect, described by way of example, I propose to convey the water to be treated by means of suitable conduits, such as pipes a from a head of water, which may be a tank, such as A, situated at a suitable elevation, to one or more chambers or receptacles B, which are preferably lagged or surrounded with some material which is a bad conductor of heat, the water reaching the said chambers B by way of branch pipes a' and heads a^2. These chambers are provided with tubes or closely-associated plates b b, of copper or other suitable metal or material, forming passages b' b' for the water, the latter passing, preferably, upwardly through the said tubes or passages in the said chambers and being led from thence by way of the head b^2 and pipe b^3 into receptacles C, adapted to raise the temperature thereof to the required degree. The heating-receptacles may comprise series of tubes c or the like suitably arranged for conveying the full effect of the heating means, which may be steam, fire, or other convenient medium, to the water circulating therethrough.

In the example illustrated it is assumed that steam is the heating medium employed and that same enters the tube or coil c by way of the pipe c' and leaves the tube or coil by way of the pipe c^2. After being thus raised in temperature the water is conveyed back to the first-mentioned chambers B in such a manner—say by way of pipes C′—that it is caused to flow by gravitation along the exterior surfaces of the tubes or passages b', conveying the untreated water to the heating-receptacles—that is to say, the treated water flows by way of the passages b^4 through the said chambers B. With a view to increasing the transference of heat from the treated to the untreated or from the outgoing to the ingoing water the tubes or plates b are preferably of bent, curved, zigzag, or any other tortuous or crooked form, so as to retard the progress of the water along their surfaces. The outgoing or treated water is hereby cooled or deprived of its heat by the water which feeds the heaters without actual contact therewith, while the heat given off from the heated water in the passages b^4 is taken up by the water circulating through the tubes or passages b' from the supply-tank A, a considerable economy in heating resulting and great expedition in the deprivation of the treated water of the heat contracted thereby in the heating-receptacle C.

Although in the foregoing description I have referred to a series of chambers and receptacles and the consequent plurality of heads and conducting-pipes, for the sake of clearness I have illustrated but one set of the appliances necessary for carrying out the invention. It will, however, be readily understood that the various pipes or appliances may be provided, as may be required, with means, such as valves or other devices, for regulating or cutting off the supply or otherwise varying the system in its actual working as circumstances or requirements may demand or the fancy of the operator may dictate. The temperature hereinbefore referred to and the period of time during which the water or other liquid is exposed thereto is found in practice, however, to be fatal to the existence of the common pathogenic organisms.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The herein-described method of purifying water or other liquids, consisting in raising the water or other liquid to a temperature of 65° centigrade to 85° centigrade for a period not exceeding twenty-five seconds, for the purpose specified.

2. The herein-described method of uninterruptedly purifying water or other liquids, consisting in raising the water or other liquid to a temperature of 65° centigrade to 85° centigrade for a period not exceeding twenty-five seconds and in causing the treated or outgoing water or other liquid to impart heat to the untreated or ingoing water or other liquid, substantially as described.

3. The herein-described method of purifying water or other liquid consisting in maintaining the water or other liquid at a temperature below a sterilizing temperature for a period of substantially twenty-five seconds, for the purpose specified.

4. The herein-described method of uninterruptedly purifying water or other liquids, consisting in raising the liquid to a temperature of between 65° centigrade and 85° centigrade for a period approximating twenty-five seconds, and maintaining a continuous flow of the liquid into and out from the heating zone, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

PATRICK GILL GRIFFITH.

Witnesses:

F. C. HAWTIN,

WALTER J. SKERTEN.

No. 862,623. PATENTED AUG. 6, 1907.

F. A. EMERICK.

STERILIZING APPARATUS.

APPLICATION FILED NOV. 9, 1905.

3 SHEETS—SHEET 1.

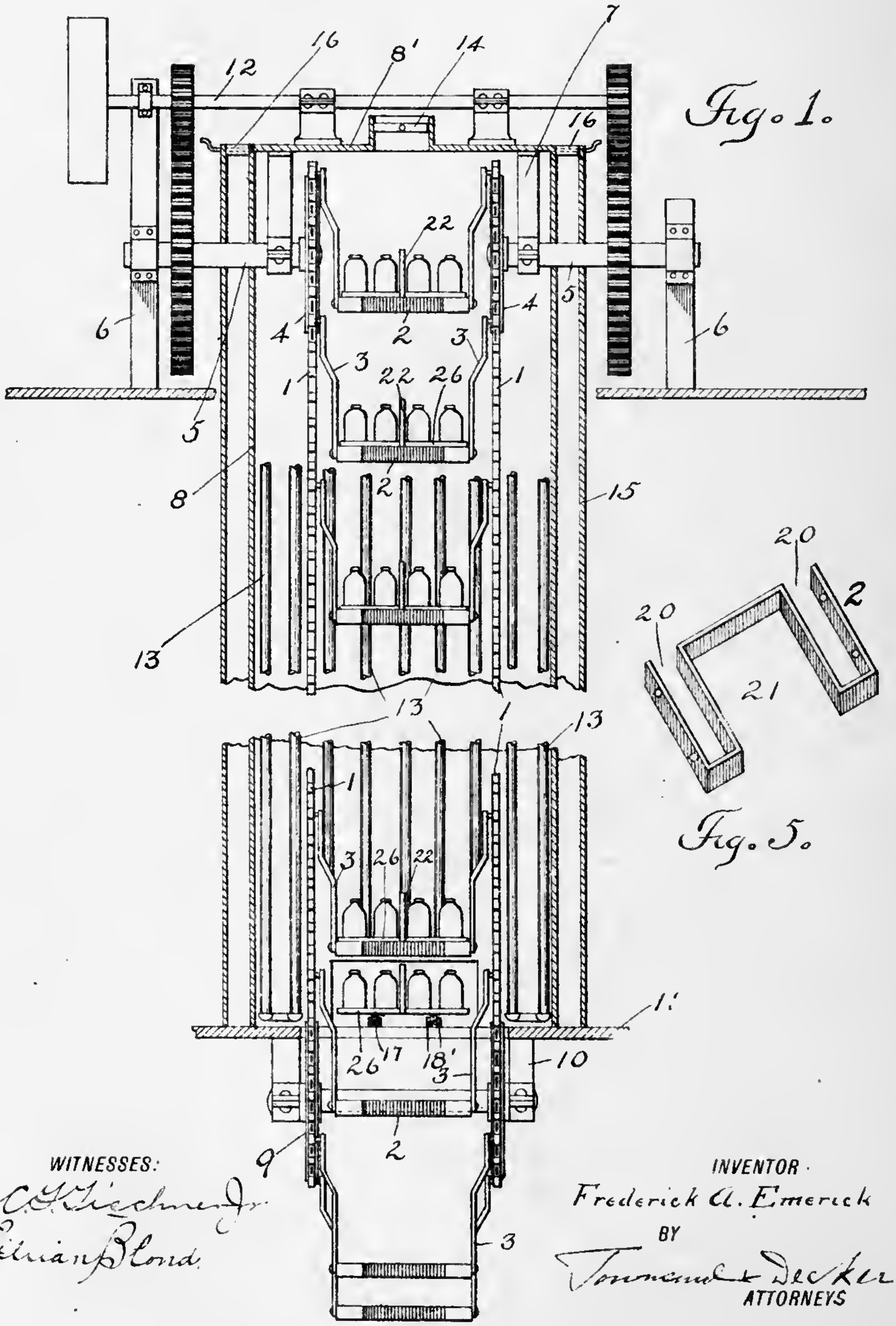


Fig. 1.

Fig. 5.

WITNESSES:

C. G. Kiechner Jr.

Lilian Blond.

INVENTOR

Frederick A. Emerick

BY

Townsend & Decker

ATTORNEYS

No. 862,623. PATENTED AUG. 6, 1907.

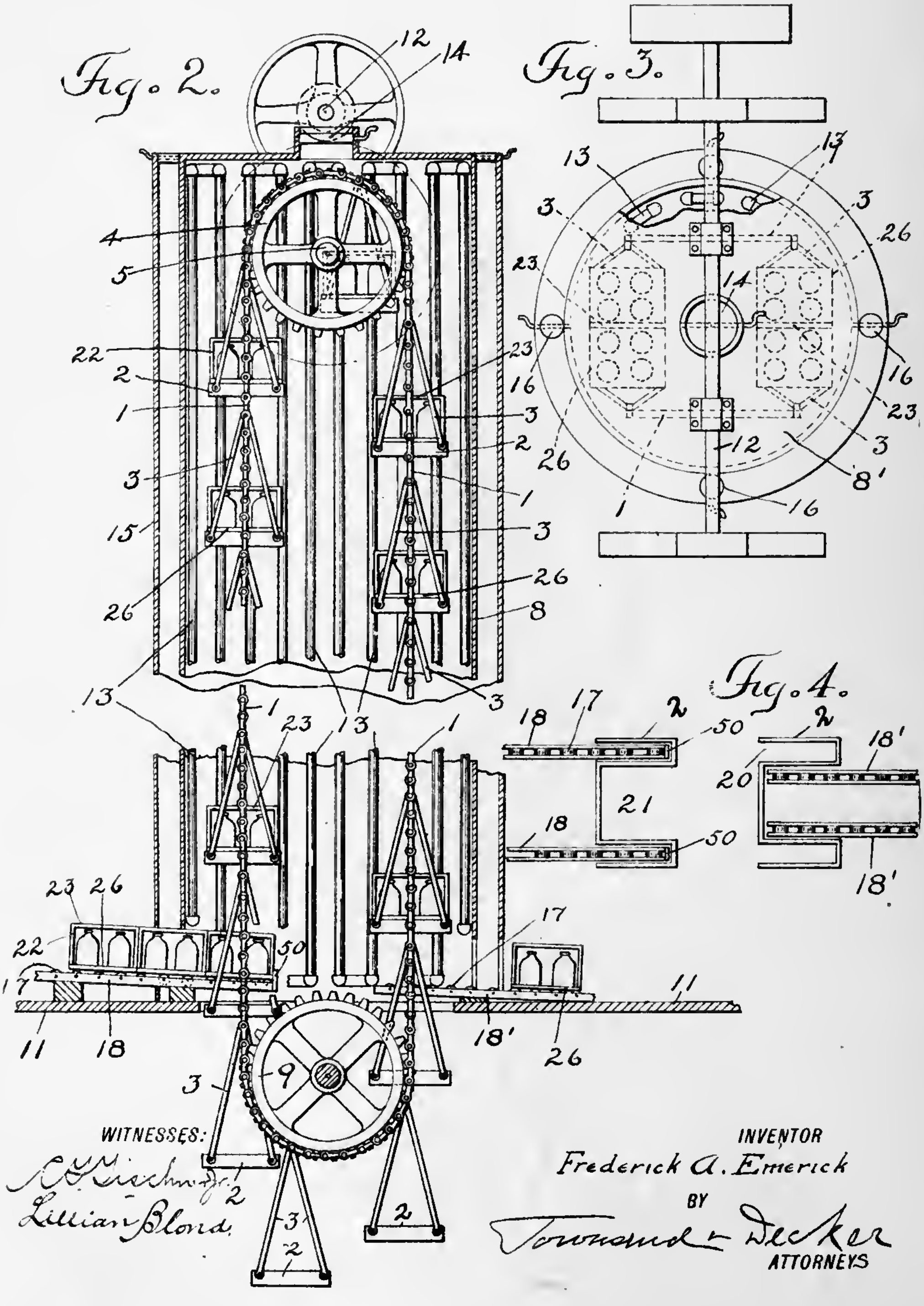
F. A. EMERICK.

STERILIZING APPARATUS.

APPLICATION FILED NOV. 9, 1905.

3 SHEETS—SHEET 2.

Fig. 2. Fig. 3. Fig. 4.



WITNESSES:

[illegible]

Lillian Blond

INVENTOR

Frederick A. Emerick

BY

Townsend & Decker

ATTORNEYS

No. 862,623. PATENTED AUG. 6, 1907.

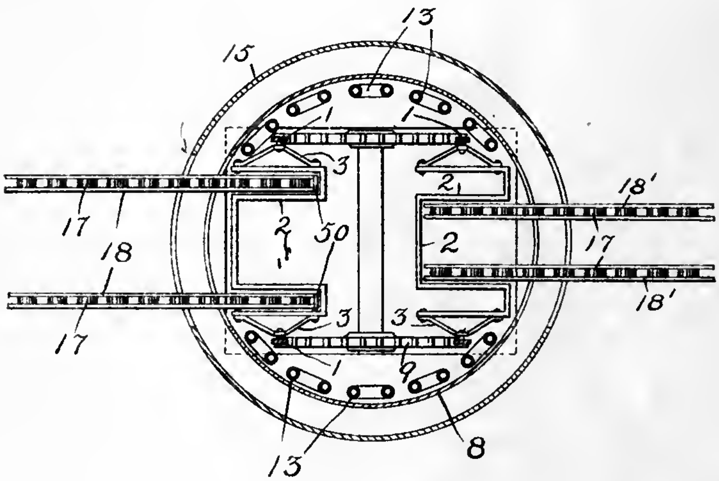
F. A. EMERICK.

STERILIZING APPARATUS.

APPLICATION FILED NOV. 9, 1905.

3 SHEETS—SHEET 3.

Fig. 6.



WITNESSES:

C. G. Fischer Jr.

Lillian Blond.

INVENTOR

Frederick A. Emerick

BY

Townsend & Decker

ATTORNEYS.

UNITED STATES PATENT OFFICE.

FREDERICK A. EMERICK, OF OSWEGO, NEW YORK, ASSIGNOR TO GREAT BEAR SPRING COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

STERILIZING APPARATUS.

No. 862,623. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed November 9, 1906. Serial No. 236,469.

To all whom it may concern:

Be it known that I, FREDERICK A. EMERICK, a citizen of the United States, and a resident of Oswego, in the county of Oswego and State of New York, (with post-office address Oswego, New York,) have invented certain new and useful Improvements in Sterilizing Apparatus, of which the following is a specification.

My invention relates to apparatus for heating bottles or other containers either empty or filled and is especially useful for sterilizing milk bottles or milk bottles and their contents. It may, however, be used for other articles which require to be subjected to heat for drying or for other purposes.

To this end my invention consists in the combination with a vertical chimney or tower, the interior of which is heated by any suitable means, of an endless conveyer or carrier, preferably of the chain type, pendulous trays hung from said carrier each constructed with two vertical openings or sets of openings extending respectively from opposite edges or sides of the tray entirely across the line of suspension of said trays and feed and discharge tracks or conveyers arranged as hereinafter described with the feed tracks or conveyers located at a point near the bottom of the heating tower but in line with one of the sets of vertical openings extending across the line of suspension of the trays and on the side of the endless conveyer which is ascending, while the said discharged tracks or conveyers are arranged on the down side in line with the other set of openings and extend entirely across the line of suspension of the said trays.

My invention consists further in the special combinations of devices and details of construction as more particularly hereinafter described and then specified in the claims.

In the accompanying drawings, Figure 1 is a vertical section through the tower showing the endless carrier in elevation together with its driving mechanism. Fig. 2 is a section of the tower with the endless carrier in side elevation and showing the feed and discharge ways or conveyers for feeding the pallets and receiving and carrying away the pallets after heating. Fig. 3 is a plan of the tower. Fig. 4 shows the relative location of the feed and delivery ways of the tracks to the trays at the point where the said trays pass the tracks for the purpose of picking up and dropping the pallets carrying the bottles. Fig. 5 is a perspective view of the preferred form of skeleton tray which I employ. Fig. 6 is a horizontal sectional view through the apparatus taken above the tracks and showing the carriers in operative position with respect thereto, the objects forming the load being omitted.

1 indicates the chains or belts of an endless carrier from which the trays 2 are suspended by a pivotal suspension or connection of the hangers 3 connected to the trays at their opposite sides and edges as shown better in Fig. 2, and pivotally connected with the belts or chains 1 of the endless carrier. Said belts pass over suitable drive wheels 4 which are carried by shafts 5. The journal bearings of said shafts are provided with posts 6 sustained by the floor of a building or by other means and by journal bearings carried by hangers 7 supported in any suitable manner. At the bottom of the tower the endless belts or chains pass around other wheels 9 as well understood in the art which may be mounted on shafts sustained by hangers 10 on a lower floor 11 of the building. Said floor 11 has suitable openings to permit the passage of the trays and endless belts as indicated more fully in Fig. 2. A counter shaft 12 driven in any suitable manner and geared to the shafts 5 operates the endless carrier. The up and down sides of the carrier both travel in the tower or vertical heating chamber 8, the interior of which may be heated by steam pipes 13 or by other means to secure the desired degree of temperature within the same necessary for sterilizing or for other result.

The top of the tower is closed in by the cover 8′ which is provided with an opening or escape controlled by the damper 14, whereby the temperature may be more readily regulated. The tower 8 has preferably a heat insulating jacket formed, preferably, by an exterior casing 15 separated from the chamber 8 by an air space to form an air jacket which prevents radiation of heat from the heating chamber. At the top of the air jacket a number of dampers 16 may be used to carry away any radiated heat should it be desirable to permit the escape of the same in order to prevent communication of the heat from the heating chamber to the room or apartment in which the tower is located. With this construction or arrangement of heating tower and endless carrier, it will be obvious that any bottles or other objects or containers placed upon the trays at or near the bottom of the up side of the carrier will be heated moderately and gradually in their ascent on the up side until they reach the more intense heat at the top of the chamber or chimney, while on their return on the down side they will be gradually cooled. Conveyers, tracks or ways are also provided for delivering the articles or pallets or boards carrying the same into position where they will be taken up by the upwardly traveling trays and for receiving said articles, pallets or boards from the downwardly traveling trays as they reach the bottom of the tower on their downward travel. These tracks, ways or conveyers may be of any suitable construction, but are preferably of such character and so built as to permit the articles to be fed and discharged or carried away by gravity.

Assuming that the apparatus is used for the sterilization or drying of bottles assembled upon pallets or boards 26, it is preferable to employ tracks or ways having anti-friction rollers 17; said tracks having a slight inclination, preferably, on both the feed and delivery sides. Said tracks or ways for the feed or delivery side are indicated at 18 and for the discharge side at 18′. Referring to the drawings, it will be seen that these tracks or ways on both sides of the tower extend into the path of the traveling trays and entirely across their line of suspension, so as in the case of the feed side, to bring the sustaining board or pallet 26 fully into position where it will be properly picked up by the tray, or in other words, will be fully under the center of suspension of said tray which will, therefore, not be in danger of canting or tilting and with consequent danger of the tray dropping the board or pallet or spilling the articles supported by it. In the same manner on the delivery side the tracks or ways extend back across practically the whole space or path embraced by the descending tray and entirely across their line of suspension so as to fully receive the descending pallet with its supported bottles or other articles.

In order to permit the trays to pass the tracks or ways or other conveying device, and to fully receive and properly deposit their load consisting of the pallets or other objects, I construct said trays with vertical openings which extend from their opposite sides across the line of suspension as more fully indicated in Figs. 4 and 5. In these figures, these openings, which permit the tray to pass the feed tracks or ways 18, are indicated at 20. The opening which extends across the tray in the opposite direction to permit it to pass the delivery tracks 18′ is indicated at 21. It is obvious that the shape of the tray to provide openings for this purpose may be greatly varied. I prefer, however, to make the tray in the form of a skeleton tray of metal as shown, proper provision being made at the sides for attachment of the hangers 3 as indicated. The pallets 26 with the bottles assembled thereon are fed by gravity or in any other suitable way to position for being picked up by the ascending trays as indicated in Fig. 2. A suitable stop 50 brings them to rest in position for being picked up. When a pallet is picked up by the ascending tray, it frees the next one which is then fed into position to be picked up by the next ascending tray. Suitable provision is preferably made to prevent the bottles on the pallet, which is about to feed into position for being lifted from engaging with the edge of the board or pallet which has just been lifted. Such provision consists of uprights 22 at the front and back of each pallet connected if desired by a cross piece or brace 23. These uprights 22 which rise to at least the height of the bottle act as stops to prevent the pallet from being fed forward into position for being lifted until it has been cleared by the pallet which has just been picked up. On the descending side each pallet is received by the delivery ways or tracks 18′ and immediately passes away by gravity from position where it will interfere with the load on the descending tray above.

In the operation of this apparatus, it will be seen that the labor is confined to simply placing the pallets in line upon the feed tracks 18 and to disposing of the pallets and their load as they are fed away from the delivery opening in the side of the tower on the tracks 18′. It will also be seen that inasmuch as the ascending and descending trays with their loads will balance one another, the power required for feeding the articles to be heated for sterilization or other purpose will be a minimum.

What I claim as my invention is:

1. The combination of a heating tower or chimney, an endless carrier arranged with its up and down sides traveling in said tower, pendulous trays having vertical openings extending respectively from opposite sides or edges of the tray across the line of suspension, feed tracks or conveyers extending into the path of the trays near the bottom of the tower and entirely across the line of suspension of the trays but in line with the vertical openings extending from one edge or side thereof, and discharge or delivery tracks or conveyers extending into the path of the trays on the down side but entirely across the line of suspension of the trays and in line with vertical openings extending from the opposite edge or side of said trays, as and for the purpose described.

2. In an apparatus for sterilizing bottles or other containers, the combination of an air jacketed heating tower having an endless carrier mounted to travel in a vertical direction within it, heating pipes on the inner walls of the tower, dampers at the top of the tower adapted to control the escape of air in the air jacket, pendulous skeleton trays hung from said carrier and having vertical openings extending from opposite edges of the tray across their line of suspension and feed and delivery tracks both extending across the line of suspension but with the feed tracks in line with the vertical openings extending from one edge of the trays and the delivery tracks in line with the openings extending from the opposite edge of the trays.

3. In an apparatus for heating bottles or other containers, the combination of a heating tower, an endless carrier mounted with up and down sides traveling in the tower, pendulous trays hung from the carrier and traveling therewith on its up and down sides, each said carrier being of skeleton form and having openings extending vertically through it and from its opposite edges across the line of suspension in different vertical planes and conveyer tracks or ways adapted to feed load sustaining devices into and out of the path of the trays, said conveyer tracks or ways extending across the line of suspension of the trays and being arranged on the up side in line with one set of vertical openings in said trays and on the down side in line with other vertical openings in said trays, as and for the purpose described.

Signed at Oswego, in the county of Oswego and State of New York, this second day of November, A. D. 1905.

FREDERICK A. EMERICK.

Witnesses:
W. M. PENNEY,
E. J. GREENE.

No. 866,870. PATENTED SEPT. 24, 1907.

C. H. LOEW.

PASTEURIZER.

APPLICATION FILED APR. 7, 1906. RENEWED AUG. 20, 1907.

Fig. 1

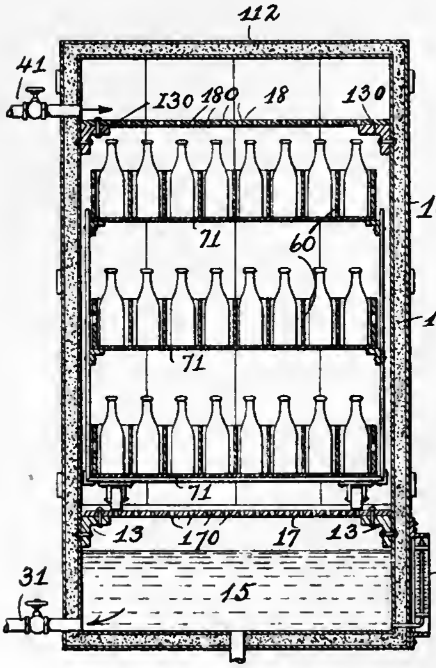


Fig. 2

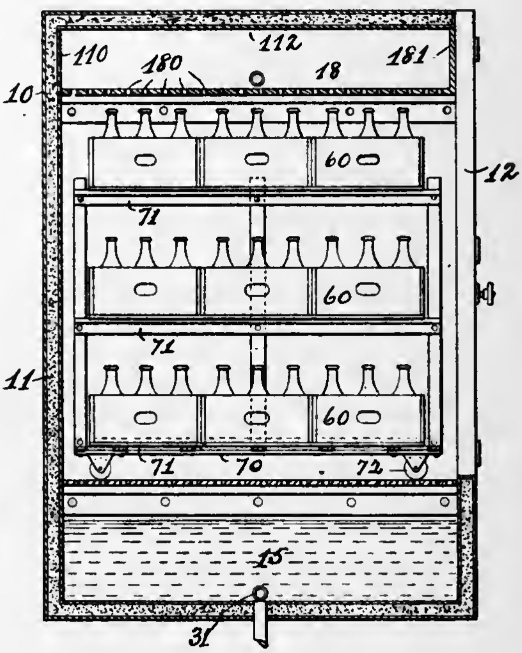
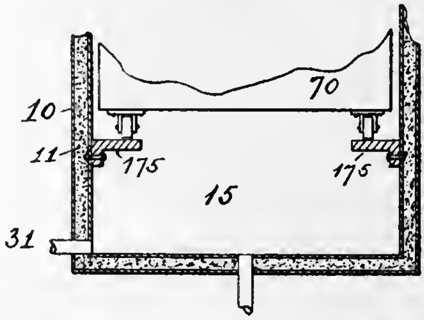


Fig. 3



Attest:
May Hughes
Alan McDonnell.

Charles H. Loew, Inventor:

by William R. Baird
his Atty.

UNITED STATES PATENT OFFICE.

CHARLES H. LOEW, OF LAKEWOOD, OHIO.

PASTEURIZER.

No. 866,870. **Specification of Letters Patent.** **Patented Sept. 24, 1907.**

Application filed April 7, 1906, Serial No. 310,397. Renewed August 20, 1907. Serial No. 389,401.

To all whom it may concern:

Be it known that I, Charles H. Loew, a citizen of the United States, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Pasteurizers, of which the following is a specification.

My invention relates to an apparatus for pasteurizing beer in bottles and its novelty consists in the construction and adaptation of the parts as will be more fully hereinafter pointed out.

In Letters Patent of the United States No. 808,668, issued to me Jan. 2, 1906, there is described and claimed a process of pasteurizing beer and in connection therewith there is described an apparatus for use in carrying out the said process which is itself the subject matter of Letters Patent of the United States No. 817,495 issued to me April 10, 1906.

My present invention has for its object the simplification and improvement of the apparatus above referred to.

In that apparatus I show a box or chamber with suitably insulated walls provided internally with shelving to receive the boxes containing the beer in bottles, and provided also with a spraying mechanism comprising a supply pipe and sundry branch pipes adapted to penetrate into the space between the tiers of bottles in boxes and provided with suitable atomizing nozzles whereby each row of bottles is separately sprayed. The shelves or supports for the bottle boxes are stationary.

In my present invention, I make the shelves or supports for the bottles removable, in other words, I employ a truck or carriage provided with suitable shelves on which the boxes containing the beer in bottles can be placed outside of the pasteurizing chamber and which can as an entirety, when loaded with bottles, be moved into said chamber. This is much more convenient than placing the bottles in boxes on a truck at the filling apparatus, conveying them to the pasteurizer, loading them into the pasteurizer and unloading them therefrom after the pasteurizing process has been completed. The present arrangement saves one operation and much time and labor. I also provide the pasteurizing chamber with a perforated false bottom on which the carriage described can rest and which will at the same time freely permit of the passage of the water to the collecting tank at the bottom of the chamber. I also simplify the spraying mechanism. I place a perforated false ceiling under the solid continuous ceiling of the chamber and into the intermediate space between the real and the false ceiling I conduct the supply pipe from the source of water supplied. The perforations in the false ceiling permit the water to drop upon the bottles in a shower, much in the same manner as it did when the spraying nozzles were employed and the branch pipes were used.

By properly proportioning the number and size of the perforations of this false ceiling to the cross sectional area of the supply pipe, a pressure can always be created within the space between the two ceilings so that the water will be projected from the perforated ceiling with more or less force in the form of jets. I have found by experience that the water will pass down through the bottles in the uppermost tier and as the boxes in which they are placed are not closed at the bottom, will continue to pass down and be brought into contact with the bottles on the second tier, and so on until it reaches the perforated bottom of the apparatus, whence it falls into the collecting chamber.

By this construction I simplify the apparatus, enable it to be made of standard materials, without any special shape, and improve the ease of its operation and save time and labor in its use.

In the drawings, Figure 1 is a central vertical section of the apparatus; Fig. 2 is a central vertical section of the same on a plane at right angles to the section in Fig. 1, the truck being shown in elevation, and Fig. 3 illustrates a modified form of the means for supporting the box truck.

In the drawings there is shown a box or chamber made of any suitable size and material, but preferably of steel, and the walls 10 of which are lined with any suitable heat insulating material 11, as, for instance, mineral wool. It is provided with doors 12, 12, at one side and it may have similar doors at the opposite side.

The bottom portion 15 of the chamber comprises a water collecting tank and is provided with an external water gage 16. A short distance above the bottom 15 are arranged brackets 13, 13, or other suitable supports for a false bottom 17 made of steel or other suitable material and which is provided with openings or perforations 170, 170, to admit of the free downward passage of the water.

A short distance below the ceiling are arranged other brackets 130, 130, or other suitable supports for a false ceiling 18 made of steel or other suitable material and which is provided with openings or perforations 180, 180, to admit of the passage of the water. At the front of the chamber the false ceiling 18 is provided with an end wall or partition 181 and this, with the upper portion 110 of the chamber wall on that side, the false ceiling 18 and the real ceiling 112 of the apparatus, constitute a water supply chamber supplied by means of a valve controlled pipe 41.

A valve controlled pipe 31 leads from the collecting chamber 15 at the bottom of the tank.

70 is a carriage or truck comprising a series of shelves 71, 71, 71, upon which the boxes 60 containing the

beer bottles are placed, and suitable wheels 72, 72 by means of which it may readily be moved.

It will be understood that the other instrumentalities described are the same as those shown and described in the patent above referred to and which are not shown herein. Such comprise, first, a reservoir in which the water is heated and which is controlled by a thermostat, and from which the pipe 41 is supplied; second, a pump to which the pipe 31 leads, and third, a pipe from the pump to the reservoir; so that the water collecting in the chamber 15 is pumped to the heating chamber or reservoir, and thence passes through the pipe 41 to the water supply chamber between the real and false ceiling.

The method of using the apparatus is as follows: The truck 70 is rolled to the filler where, as the bottles are filled, they are stacked in boxes on the shelves 71, 71. The truck is then rolled to the pasteurizer and placed within the same, its wheels resting upon the false bottom 17. The doors 12, 12, are then closed and the water turned on through the pipe 41. This water accumulates in the compartment or chamber above the false ceiling 18 and begins to fall through the openings 180, 180, in the form of a spray or shower upon the uppermost tier of bottles, and thence falls to the tier beneath and so on until it reaches the false bottom 17 through the openings in which 170 it passes to the collecting chamber 15. It is thence drawn by the pipe 31 and pumped around through the heating chamber to the pipe 41 again. As explained in the patents above referred to, the water is gradually heated, then maintained for a suitable length of time at a proper pasteurizing temperature and then gradually cooled. The water is then shut off, the doors opened and the truck and its load removed.

A modified form of the means for supporting the truck is shown in Fig. 3 in which the entire center portion of the false bottom 17 is cut away and two long shelves or rails 175, 175, are left for the wheels of the truck 70 to rest upon.

Other modifications can obviously be made in the details of the device without departing from its essential principles.

What I claim as new is:—

1. In a pasteurizer, the combination with imperforate side walls and ceiling, of a false ceiling having openings to admit of the downward flow of the water and means for supplying water between the two ceilings.

2. In a pasteurizer, a water collecting chamber, means for draining the same, a water supply chamber, a perforated ceiling forming the bottom thereof for delivering water therefrom in a shower, and removable means intermediate the supply and collecting chambers adapted to support bottles to be pasteurized by the heat extracted from the water passing from the supply to the collecting chamber.

3. A pasteurizer comprising a box or chamber divided into an upper water supply chamber, an intermediate pasteurizing chamber, and a lower water collecting chamber, a fixed perforated false ceiling separating the water supply chamber and the pasteurizing chamber, a fixed perforated plate separating the pasteurizing chamber and the water collecting chamber and serving as a support for a truck carrying the bottles of liquid to be pasteurized, and means for supplying water above the false ceiling.

4. A pasteurizer comprising a box or chamber divided into an upper water supply chamber, an intermediate pasteurizing chamber, a fixed perforated false ceiling separating the water supply chamber and the pasteurizing chamber, a fixed perforated plate separating the pasteurizing chamber and the water collecting chamber, a truck supported upon the last named perforated plate, removable perforated supports for the bottles on the truck, and a pipe for supplying water above the false ceiling.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES H. LOEW.

Witnesses:
MAY HUGHES,
ALAN McDONNELL.

No. 886,012. PATENTED APR. 28, 1908.

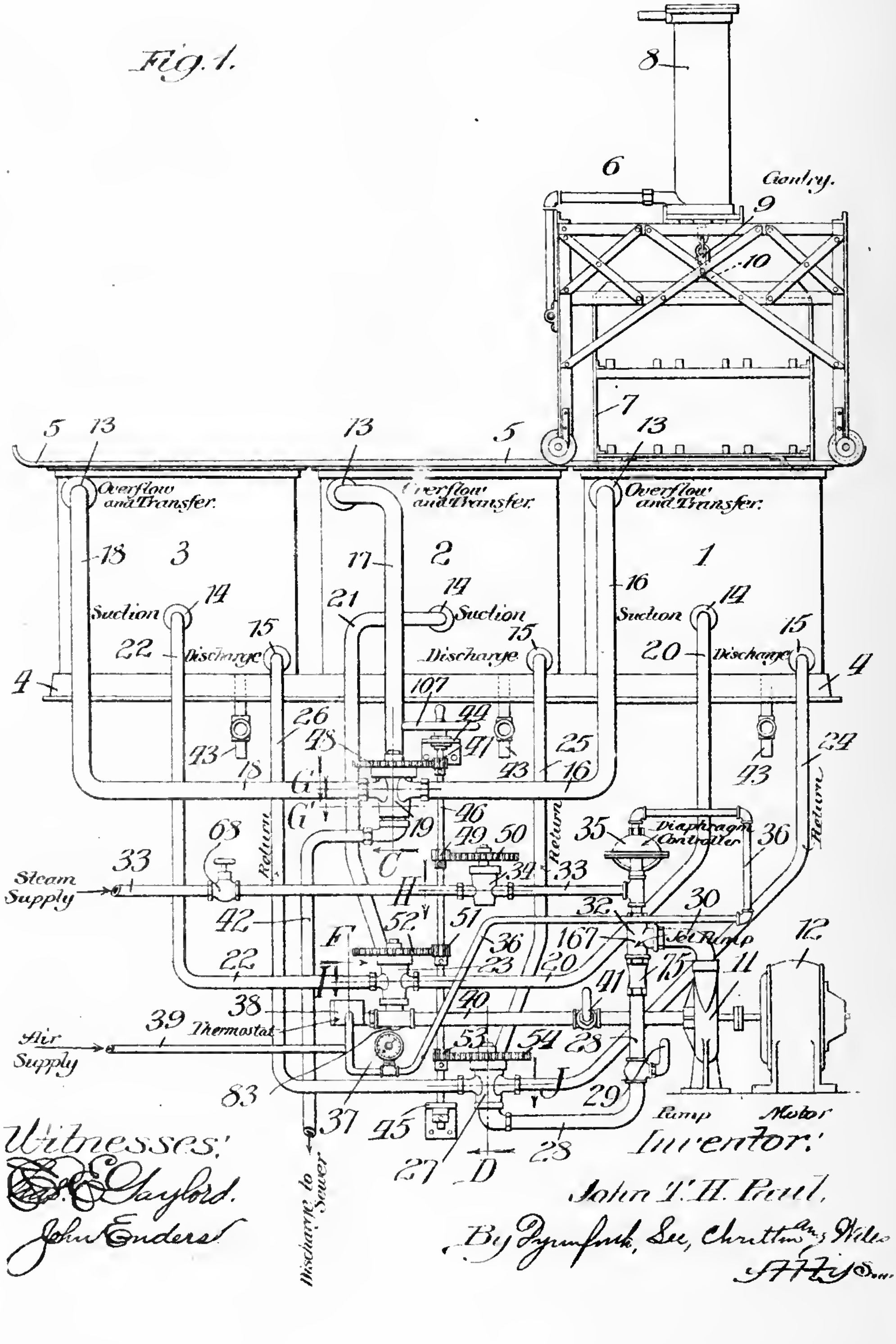
J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 17, 1907.

8 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

Geo. E. Gaylord.

John Enders

Inventor:

John T. H. Paul,

By Dyrenforth, Lee, Chritton & Wiles

Attys.

No. 886,012. PATENTED APR. 28, 1908.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 17, 1907.

8 SHEETS—SHEET 2.

Fig. 2.

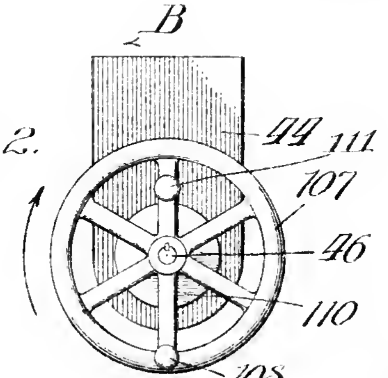


Fig. 3.

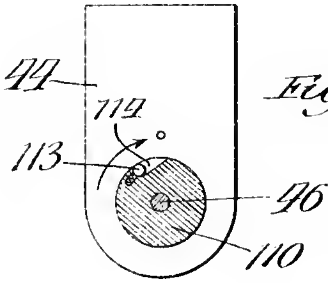
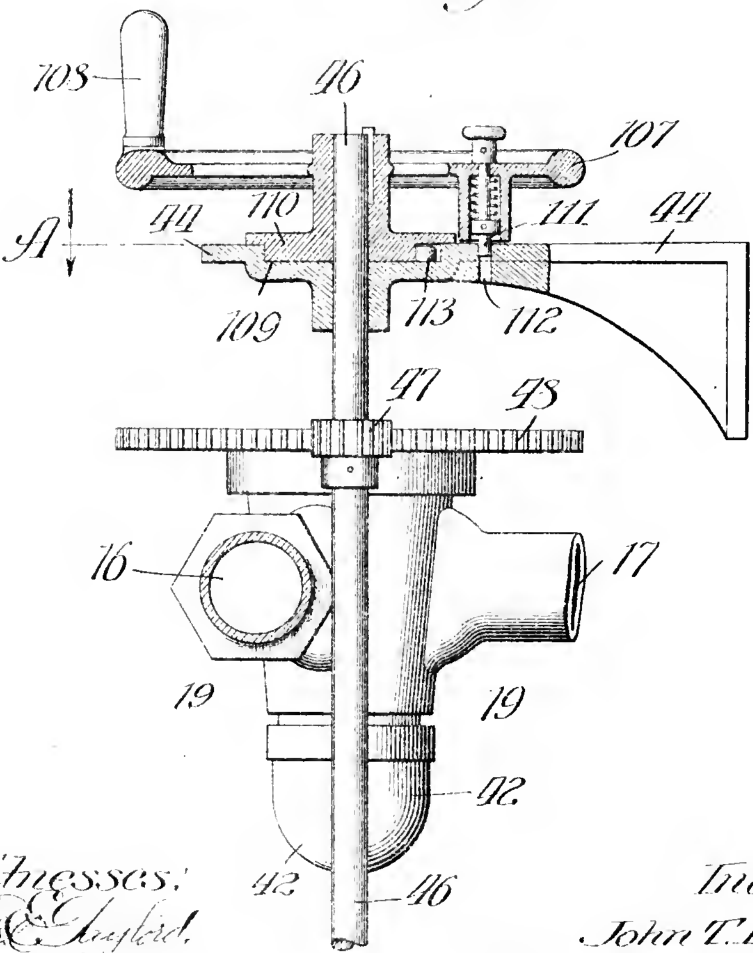


Fig. 4.



Witnesses:

Chas. E. Gaylord.

John Enders.

Inventor:

John T. H. Paul,

By Dyrenforth, Lee, Chritton and Wiles,

Att'ys.

No. 886,012. PATENTED APR. 28, 1908.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 17, 1907.

8 SHEETS—SHEET 3.

Fig. 5.

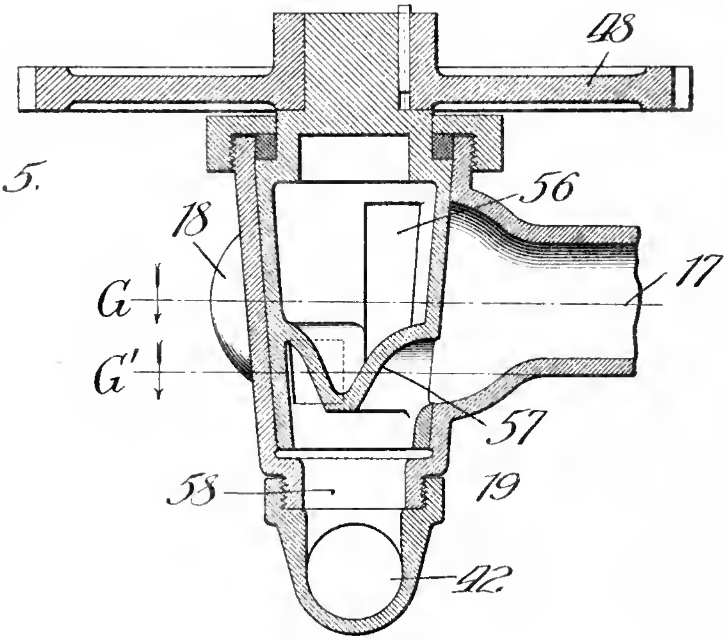
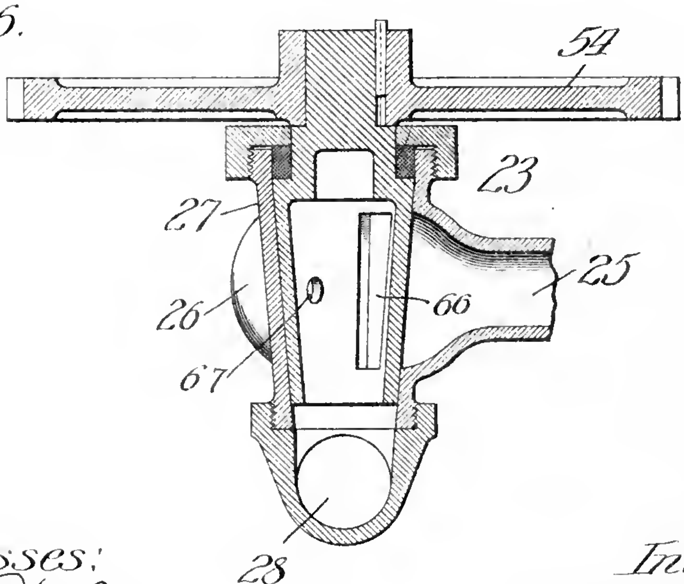


Fig. 6.



Witnesses:
E. E. Gaylord.
John Enders.

Inventor:
John T. H. Paul,
By Dyrenforth, Lee, Chritton & Wiles,
Att'ys.

No. 886,012. PATENTED APR. 28, 1908.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 17, 1907.

8 SHEETS—SHEET 4.

Fig. 7.

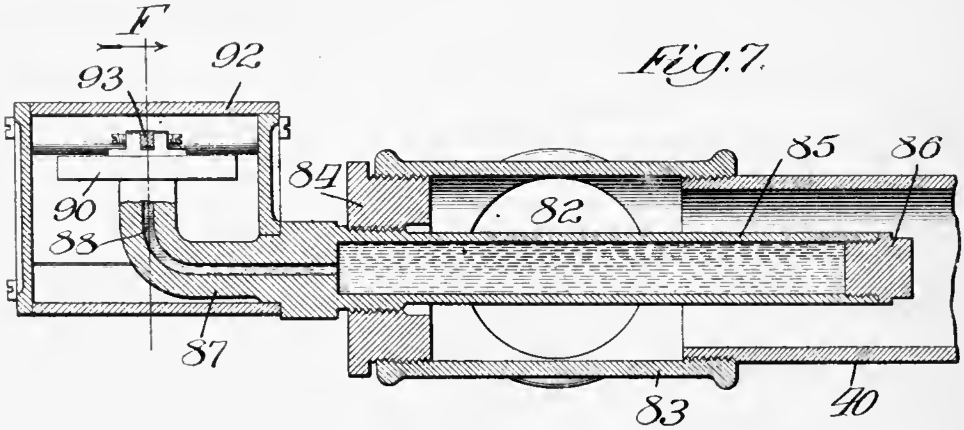
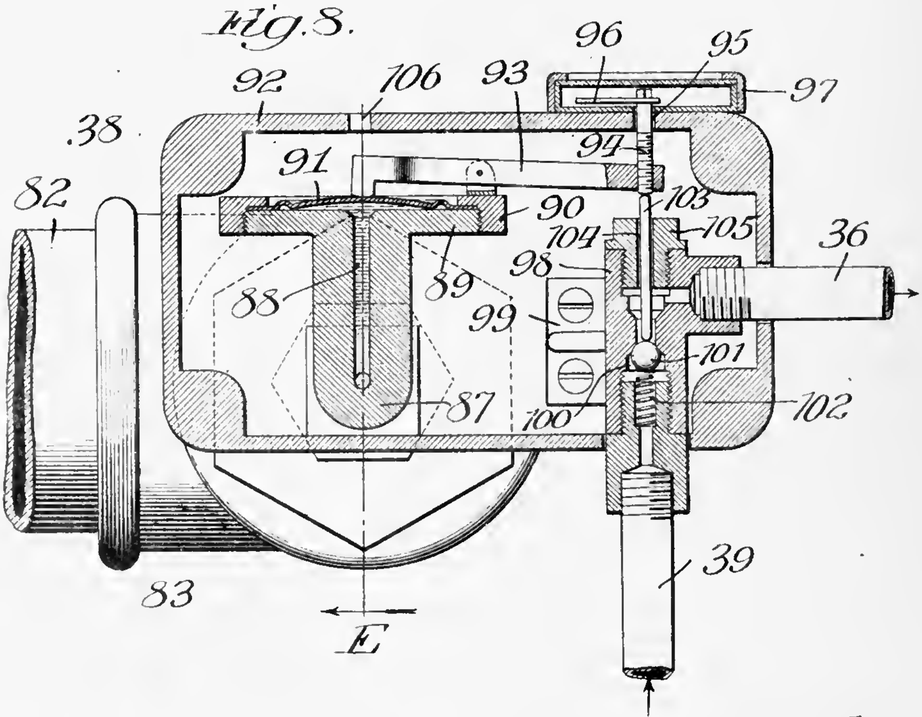


Fig. 8.



Witnesses:
Chas. E. Gaylord.
John Enders.

Inventor:
John T. H. Paul,
By Dyrenforth, Lee, Chritton & Wiles
Att'ys.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 17, 1907.

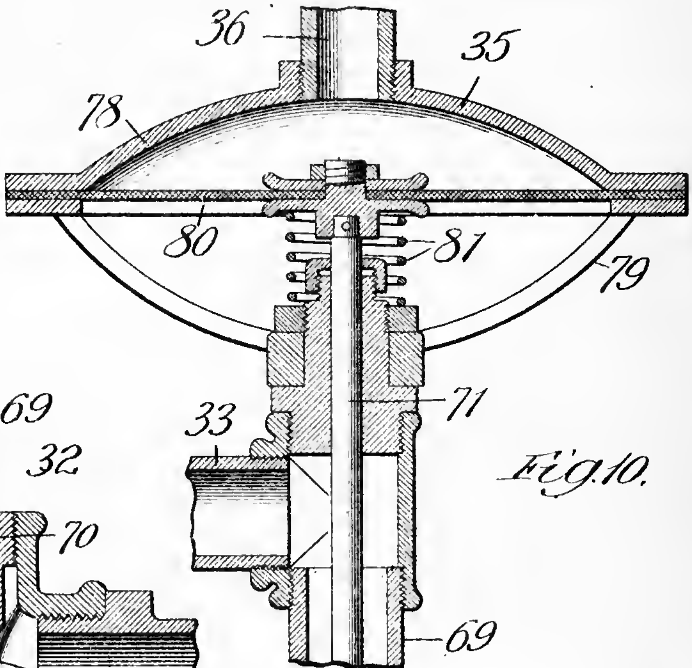
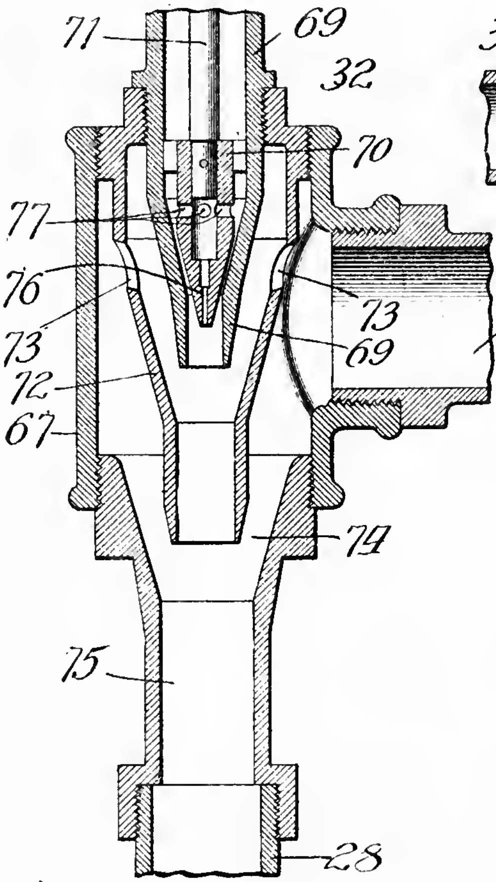


Fig. 10.

Fig. 9.



Witnesses:

E. E. Gaylord.

John Enders.

Inventor:

John T. H. Paul,

By Dyrenforth, Lee, Chritton & Wiles,

Attys.

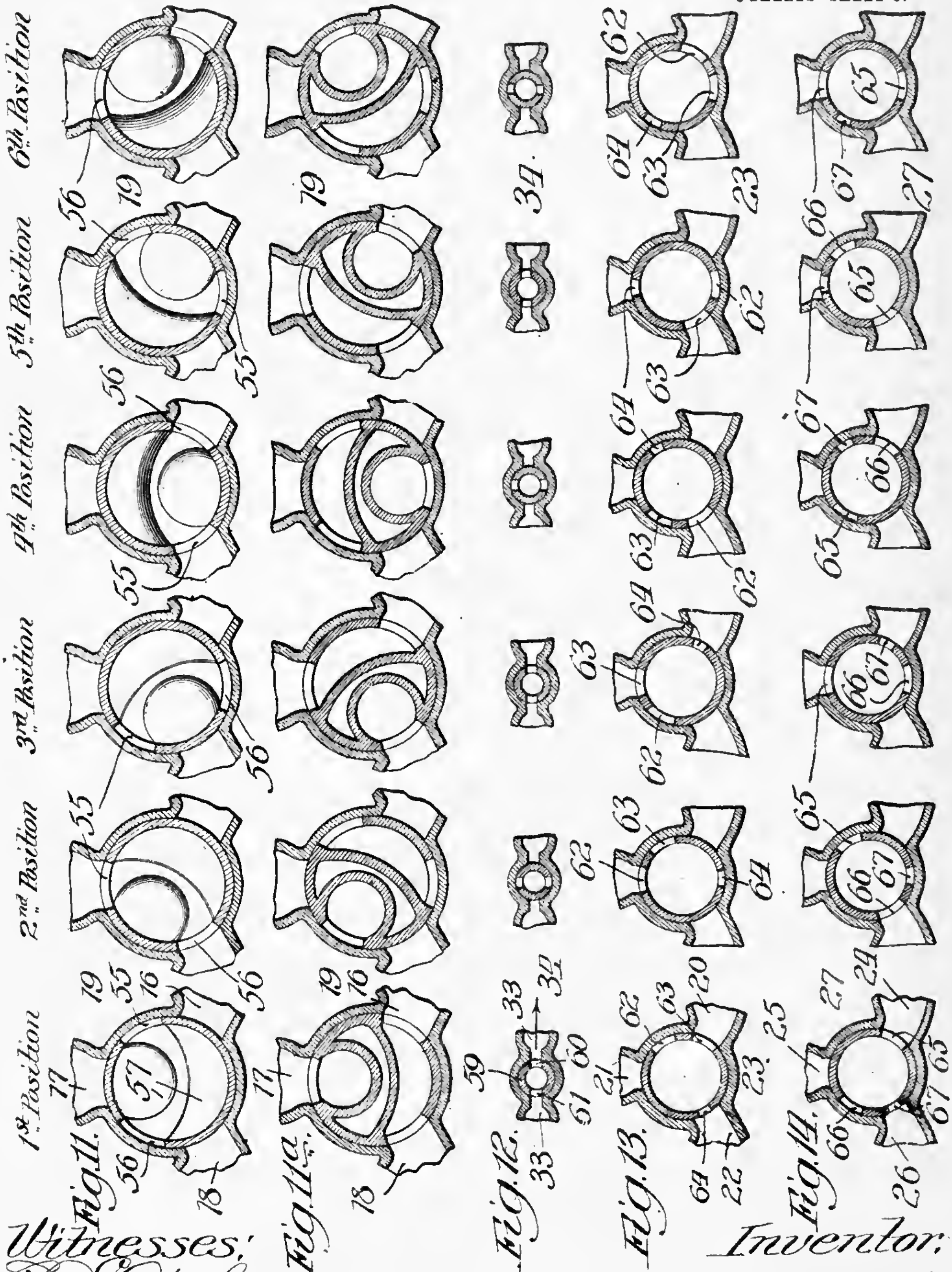
No. 886,012. PATENTED APR. 28, 1908.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 17, 1907.

6 SHEETS—SHEET 6.



Witnesses:
Chas. E. Gaylord,
John Enders

Inventor:
John T. H. Paul,
By Dyrenforth, Lee, Chritton and Wiles
Att'ys.

No. 886,012. PATENTED APR. 28, 1908.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 17, 1907.

8 SHEETS—SHEET 7.

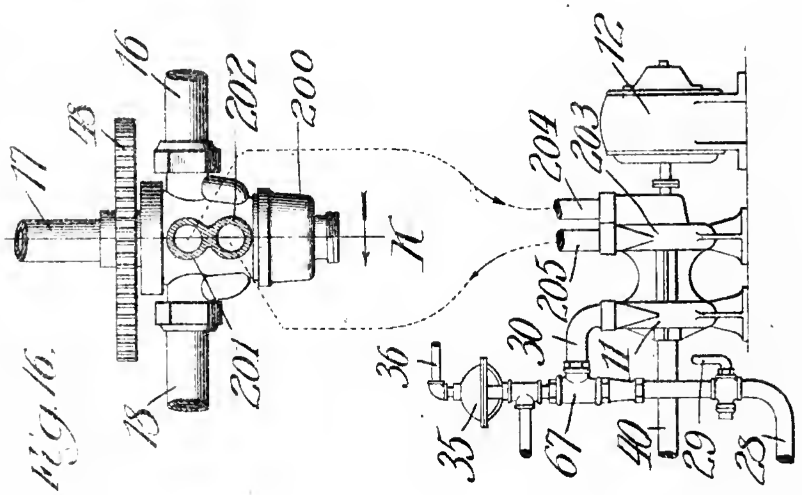


Fig. 16.

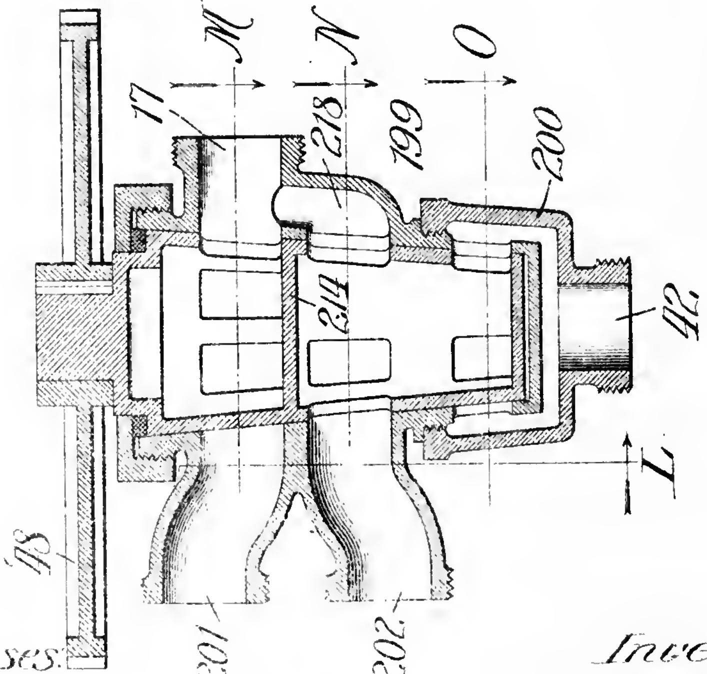


Fig. 15.

Witnesses:

Chas. E. Gaylord

[signature]

Inventor:

John T. H. Paul,

By Dyrenforth, Lee, Chritton & Wiles,

Att'ys.

No. 886,012. PATENTED APR. 28, 1908.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 17, 1907.

8 SHEETS—SHEET 8.

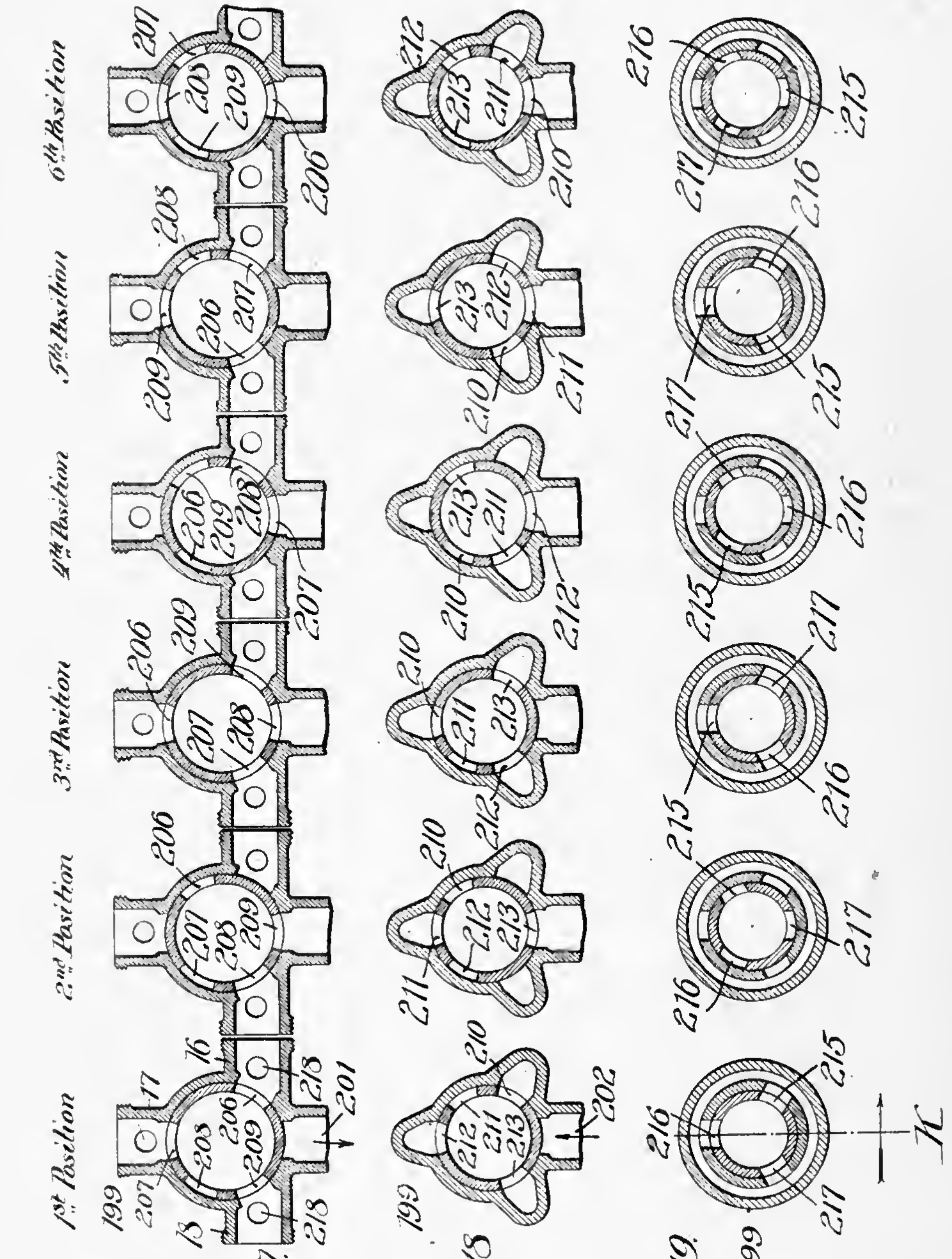


Fig. 17. Fig. 18. Fig. 19.

Witnesses:

[signature]

[signature]

Inventor:

John T. H. Paul,

By [signature] Attys.

UNITED STATES PATENT OFFICE.

JOHN T. H. PAUL, OF CHICAGO, ILLINOIS, ASSIGNOR TO E. GOLDMAN & COMPANY, INC., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PASTEURIZING APPARATUS.

No. 886,012. Specification of Letters Patent. Patented April 28, 1908.

Application filed June 17, 1907. Serial No. 379,530.

To all whom it may concern:

Be it known that I, JOHN T. H. PAUL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Pasteurizing Apparatus, of which the following is a specification.

This invention relates to improvements in pasteurizing apparatus of the variety in which the substance to be sterilized—beer in bottles, for example—is introduced into a tank containing the sterilizing liquid (more usually water) and is permitted to remain stationary in the liquid while the latter is gradually raised to the sterilizing temperature and maintained thereat for the proper length of time, after which the temperature of the liquid is gradually reduced preparatory to removing the sterilized material from the tank.

The invention involves the employment of a plurality of tanks, or compartments in a single tank, of which at least three are required (though the number may be greater) to enable the sterilizing operation to be practiced continuously, in the sense of being uninterrupted by the removal of material that has been sterilized for introduction of material to be sterilized, by a novel manner of controlling the production of different stages of temperature of the liquid sterilizing medium in the several tanks; and the primary object of my invention is to enable such control to be had from a single point on the apparatus by manipulating a single suitable handle. Certain features of my invention may be used to advantage, however, irrespective of the number of tanks employed, whether one or more.

This invention is also especially adapted for the pasteurization of sauces, catsup, preserves and canned, packed or bottled goods of all kinds, requiring to be sterilized to lend to them the necessary keeping quality, rather than treated with preservative chemicals. For the sterilization of such products, they require to be subjected to a comparatively high temperature—say from 172° F. to 210° F.—for a prolonged period of time, some times for several hours continuously, while the heating up and cooling down of the sterilizing medium should, for the sake of economy in time, be performed in comparatively short periods; and the present apparatus, involving a plurality of tanks or compartments, is peculiarly adapted for such work, because of the aforesaid continuous practice which the apparatus makes possible.

In the accompanying drawings—Figure 1 is a diagrammatic view showing the entire apparatus in elevation; Fig. 2 is a plan view of the valve-operating hand-wheel on its supporting bracket; Fig. 3, a section of the same taken at the line A on Fig. 4, showing means for locking the wheel against reverse turning, and Fig. 4, an enlarged vertical section through the hand-wheel, taken at the line B on Fig. 2, showing the valve-operating shaft and one of the four valves geared thereto. Fig. 5 is an enlarged section taken at the line C on Fig. 1, showing the valve-construction employed for controlling the overflow from, and transfer between, tanks of the sterilizing liquid; Fig. 6, a similar view on the line D on Fig. 1, showing the valve construction for controlling the liquid discharge from the pump through an external heating device, to a tank, the same construction of valve being employed for controlling the suction to the pump; Fig. 7 is an enlarged sectional view on the line E on Fig. 8, showing a preferred construction of thermostat used for controlling the supply of steam for heating the water in its course to the tanks, and Fig. 8 is a section of the same on line F of Fig. 7 or Fig. 1. Fig. 9 shows by a broken view in sectional elevation the preferred construction of jet-pump employed for heating the sterilizing liquid on its way to the tanks, and Fig. 10 shows by a similar view the construction for operating the steam-valve of the jet by air-pressure controlled by the thermostat, this view being a continuation of Fig. 9. Fig. 11 is a section taken at the line G on Fig. 1 or Fig. 5, showing the transfer-valve by six views, each representing a different position which it assumes in the operation of the apparatus; Fig. 11ª shows the same of the overflow-controlling portion of that valve by a section at line G¹ on Fig. 1 or Fig. 5; Fig. 12 shows in the same way, by an enlarged sectional view on the line H of Fig. 1, the successive positions assumed by the steam-valve; Fig. 13 is an enlarged section taken at the line I on Fig. 1, showing the suction-controlling valve by six views, each representing a different position which it assumes in the operation of the apparatus, and Fig. 14 shows the same with relation to the pump-discharge controlling valve by an enlarged section taken at the line J on Fig. 1.

Fig. 15 is a view like that presented in Fig. 5, but showing a modified construction of the valve of that figure, the sections being taken at the line K on Fig. 16, or at the line K through Figs. 17, 18 and 19; and Fig. 16 is a view in the nature of a diagram, showing this same valve, by a reduced section taken at the line L on Fig. 15, and a supplemental centrifugal pump communicating with the valve to produce, by pumping instead of gravity-flow, the transfer of the sterilizing water from one tank to another. Fig. 17 is a view like that presented in Fig. 11, being a section taken at the line M on Fig. 15, showing the six different positions assumed by the upper portion of the transfer-valve of Fig. 15 in the modified operation of the apparatus; Fig. 18 shows the same of the intermediate portion of the modified transfer-valve, the section being taken at the line N on Fig. 15, and Fig. 19 shows the same, by a section taken at the line O on Fig. 15, of the lower, overflow-portion of the modified valve.

Referring particularly to Fig. 1, three similar tanks, numbered 1, 2 and 3, respectively, are supported in separated relation on a common horizontal base 4 and are surmounted by parallel rails forming a track 5 for a traveling gauntree 6, of any suitable construction. The construction represented is that of a rectangular braced frame on wheels and adapted to receive a two-shelf rack 7, each shelf serving to support a plurality of bottle-containing baskets (not shown); and on the frame is mounted a hydraulic-lift device 8 having a hook 9 suspended from its piston to engage separably with an eye 10 on the rack for lowering and raising it into and out of a tank, in which it fits and with the height of which it corresponds, at least approximately.

It may here be stated that the apparatus shown is more particularly designed for sterilizing beer in bottles by raising the temperature of the water employed to the sterilizing temperature at 140° F., or thereabout; but it will be understood that the invention is not in any sense restricted with regard to the particular substance to be sterilized.

A centrifugal pump indicated at 11 in Fig. 1 is driven by a shaft-connection with a suitable motor, preferably electric, indicated at 12. Owing to the diagrammatic nature of the view selected for illustration in Fig. 1, the pump and motor are represented below the tanks, but it will be understood that they may occupy, in practice, positions on a level with the base 4; and that the various pipe-connections, diagrammatically represented in the figure, may all occupy, with the valves and other mechanism connected with them, space in the plane between the upper and lower ends of the tanks on one side of the latter.

Each tank is provided in one side near its upper end with an opening indicated at 13, which may be termed an overflow and transfer port. Below this opening, in the same side of each tank, is provided an opening indicated at 14, which may be termed the suction-port, because it communicates with the suction-side of the pump. Still lower down in the same side of each tank is provided an opening indicated at 15, which may be termed a return-port, because it communicates with the discharge-side of the pump. From the ports 13 lead, respectively, pipes 16, 17 and 18 to a valve-device 19 involving the construction hereinafter described. From the ports 14 lead the pipes 20, 21 and 22, respectively, to a valve-device 23 involving the construction hereinafter described; and pipes 24, 25 and 26 lead, respectively, from the ports 15 to a valve-device 27 involving the same construction as the valve-device 23. A pipe 28 containing a thermometer 29, communicates through a branch 30 with the pump 11 and contains at 32 a jet-pump device, hereinafter described, above which is connected with it at a T a steam-supply pipe 33 having interposed in it a valve-device 34, hereinafter described. The pipe 28 terminates in a diaphragm-device 35, communicating from above the diaphragm through an air-pipe 36, containing a pressure-gage 37, with a thermostat-device 38, of any suitable construction, such as that hereinafter described. Air under pressure is supplied from a proper source (not shown) to the thermostat-device through a pipe 39. A suction-pipe 40 connects the valve 23 with the pump and contains a thermometer 41. A discharge pipe 42 leads from the valve 19, as to a sewer, and each tank is equipped with a valved draw-off pipe 43, which may lead to the sewer.

Each of the valves 19, 23, 27 and 34 consists, generally stated, of a casing containing a rotary tapering plug-valve provided with ports, the valve 34 being of the straightway variety. Adjacent to these valves is journaled, in a bracket 44 at its upper end and in a bearing 45 at its lower end, a vertical spindle 46. On this spindle are provided a pinion 47 meshing with a gear 48 on the stem of the valve 19, and having a six-to-one diameter relative to the pinion, a pinion 49 meshing with a gear 50 on the stem of the valve 34 and having a four-to-one diameter relative to its pinion, a pinion 51 meshing with a gear 52 on the stem of the valve 23, and a pinion 53 meshing with a gear 54 on the stem of the valve 27. These two last-named pinions are alike, as also are the two last-named gears and have the same relative diameter, namely six-to-one, as the pinion 47 and gear 48.

The detailed construction of the valve-device 19 is most clearly shown in Figs. 5, 11 and 11ª. Its rotary hollow plug contains the two lateral ports 55 and 56, a partition 57 in the plane of the points of communication with the valve-casing of the pipes 16, 17, and 18, and a discharge-port 58 in its lower end communicating with the pipe 42.

The detailed construction of the valve-device 34 is only represented in horizontal section in Fig. 12 as involving a hollow plug 59 having the opposite side-ports 60 and 61 communicating with the casing in which the plug is contained.

In Figs. 6, 13 and 14 is shown the detailed construction of the valve-devices 23 and 27, the first-named involving the rotary plug in its casing containing the two similar lateral ports 62 and 63, close together, and the smaller lateral port 64, for the purpose hereinafter described, and the last-named having its rotary plug provided with two similar lateral ports 65 and 66 diametrically opposite each other and with the smaller port 67 near the port 66.

The jet-pump device 32, shown in detail in Figs. 9 and 10, comprises the following-described construction: Into the T-coupling 167 connecting the steam-pipe 33, which contains a shut-off valve 68, with the pipe 28, is projected a downwardly-tapering nozzle 69, in which seats a correspondingly shaped plug-valve 70 pinned on a vertical reciprocable stem 71. Within the coupling 167 is supported about the nozzle a mixing-chamber 72, of a generally tapering shape, containing lateral inlet-ports 73, and discharging into a downwardly tapering mixing-chamber 74 on the lower end of the casing in a tubular connection 75 thereof with the pipe 28. The valve 70 contains a central discharge-opening 76, of small bore, extending through its lower end from near its transverse center, where ports 77 are provided to adapt the bore to have open communication with the interior of the nozzle 69, whereby a relatively small quantity of steam may always leak through the valve, even when it is seated. The nozzle 69 terminates at its upper end in a diaphragm-device 35, consisting of a casing 78 supported on arms 79 extending from the nozzle and having its base formed of a flexible diaphragm 80 centrally to which is fastened the valve-stem 71 having confined about it a spiral spring 81 tending to raise the valve 70 from its seat by raising the diaphragm, upon reducing the air-pressure against the upper side of the latter. Interposed between the air-pipe 36 which leads from the diaphragm-chamber, and the air-supply pipe 39, is the thermostat-device 38 shown in Figs. 7 and 8 to involve the following construction: The valve 23 is connected from the lower end of its casing through a pipe 82 (Fig. 8), by means of a suitable coupling 83, with the pipe 40, which leads to the pump. In a reducer 84 screwed into one end of the T-coupling 83 is screwed the thermostat proper, consisting of a tube 85 closed at one end as by a plug 86, and adapted to contain a fluid, such as ether, that will expand and contract under variations in temperature, this tube terminating at its opposite end in a goose-neck 87 containing a reduced bore 88, and ending in a disk-shaped head 89 upon which is secured, by a ring-nut 90 screwed upon the disk, a diaphragm 91, to the center of which the bore in the goose-neck opens. This goose-neck end of the thermostat enters a casing 92 in which is fulcrumed on the ring 90 an angular lever 93 bearing at one end against the center of the diaphragm 91 and having a threaded vertical opening in its opposite end to receive a screw 94 passing through an opening 95 in the casing, beyond which it carries a dial-finger 96 within the casing 97 of a suitable dial, for the purpose hereinafter explained. Within the casing 92 the air-supply pipe 39 and air-conducting pipe 36 leading to the diaphragm-device 35, are coupled together by a head 98 having a bracket-extension 99, at which it is screwed to an inner wall of the casing. The head 98 contains a valve-chamber 100 in which is housed a ball-valve 101 supported on a spring 102 in the passage leading from the end of the pipe 39 in the head, and a plunger-rod 103, passing through a relatively wide bore 104 in a plug 105 screwed into the upper end of the head, bears at one end against the ball-valve and coincides at its opposite end with the screw 94. By means of this thermostat-device, when water passing through the pipe 40 attains a certain predetermined temperature, the heat, by expanding the fluid in the tube 85, causes it to raise the diaphragm 91, thereby actuating the lever 93 to depress the screw 94 against the plunger 103, and open the valve 101. Thus opening the valve admits air-pressure from the pipe 39 to the pipe 36, through which it acts against the diaphragm 80 to depress the rod 71 and seat the valve 70, thereby shutting off the steam-supply for heating the water, as hereinafter described, until the water in the pipe 40 is properly lowered in temperature to contract the thermostat-fluid and permit consequent lowering of the diaphragm 91 to be followed by the contacting end of the lever 93 under the recoil-action of the spring 102 to raise the ball 101 against its seat and shut off the air-supply to the pipe 36. Thereupon the air under pressure against the diaphragm 80 escapes by way of the pipe 36 through the opening 104 about the plunger 103 working in the plug 105, and discharges through a vent-opening 106 in the casing 92, with the result that the spring 81 is freed to restore the diaphragm 80 to its normal position of opening the valve 70 for resuming the flow of steam.

By screwing the adjusting-screw 94 into the lever 93 to raise the adjacent end thereof, the opposite end of the lever is pressed against the diaphragm 91 to adapt it to turn the lever under a lesser force of expansion of the thermostat-fluid, and thus to shut off the steam-supply at a lower temperature of the water in the pipe 40; and, obviously, by turning the screw in the opposite direction, a higher temperature of the thermostat-fluid will be required to effect opening of the valve 101. The dial-device 97 may be set for shutting off the steam at any desired temperature by removing the cover with which it is shown to be provided in Fig. 8 (and which should be transparent) to permit access to the finger for turning it to work the screws 94 and for setting the finger with relation to a suitable gage (not shown) marked on the dial over which the finger moves to indicate the predetermined temperature for the run of the apparatus.

The spindle 46, which works the different geared valves of the apparatus as and for the purpose hereinafter described, carries on its upper end a hand-wheel 107 equipped with a crank-handle 108. The bracket 44 forming the upper bearing for the spindle contains a circular recess 109 (Fig. 4) in its upper face to afford a bearing for the flanged disk-like head 110 on the hub of the hand-wheel. Diametrically opposite the handle 108 is provided, in the wheel 107, in a housing depending from it, a spring-pressed plunger-rod 111 adapted to register with a socket 112 in the bracket 44 in each complete revolution of the spindle, to lock the hand-wheel against making more than a complete turn, by engagement of the pin 111 with its retaining-socket, and requiring the pin to be raised preliminary to each operation of the spindle. Moreover, it is important for reasons which will be apparent from the description of the operation, hereinafter contained, that reversal of the turning of the spindle shall be prevented. To accomplish this purpose, a suitable clutch-device is provided, that shown being of well-known construction consisting of a spring-pressed roller 113 confined in a recess 114 provided in the disk-head 110, with its lower end bearing against the base of the recess 109, whereby any attempt to turn the hand-wheel backward will crowd the roller against the wall of the recess and bind the hub-disk, which is keyed to the spindle, against reverse turning.

The operation is as follows: The tanks 1, 2 and 3 are filled with cold water up to the ports 13 introducing the water, as by means of a hose, through the tops of the tanks. Each tank has stored in it, as a suitable place of storage, because thereby taking up other storage-room is avoided, a rack 7. The gauntree is moved on its track 5 over the tank 1 and operated to lower the hook 9 therein for coupling it with the rack in that tank, when the gauntree is operated to elevate the rack out of the tank to enable it to be filled with baskets of bottles containing beer to be pasteurized. At the beginning, all the parts occupy the relative positions in which they are illustrated, the geared valves being then as represented in the vertical column on sheet 6 under the heading "1st position". That is to say, the upper or "transfer" port of the valve 19 is closed to the pipes 16, 17 and 18, the lower or "overflow" portion of the valve is open to these pipes; the steam valve 34 opens the pipe 33; the valve 23 is closed to the pipe 21 but open to the pipes 20 and 22; and the valve 27 is closed to the pipe 25 but open to the pipes 24 and 26. It may be stated here that the most desirable position for these pipes 16, 17 and 18 and the valve 19 is in horizontal alinement with the ports 13 to produce a level flow in the transferring of water in one tank to another into the top thereof for the purpose hereinafter described. After the rack has been lowered by the gauntree into the first tank, the water in which is to be heated, and the gauntree has been released from that rack and its hook 9 raised, the operator turns on steam by opening the valve 68. Thus live steam courses through the pipe 33, valve 34 and jet-pump 32. Meantime, the pump 11 is started to suck a relatively small quantity of water from the tank 3 through the pipe 22 and small port 64 in valve 23, whence it discharges through the end-port in this valve into pipes 82 and 40 to enter the pump. The water sucked by the action of the pump in relatively larger quantity through the pipe 20 enters the valve 23 at its port 63 and also discharges to the pipes 82 and 40 to enter the pump, whence it enters the steam-jet device by way of the pipe 30 and encounters the steam, mixing thoroughly therewith in the chambers of the jet-device and becoming heated. The heated water then passes through the connection 75 and pipe 28 into the valve 27 through its end-port, escaping from that valve in relatively large quantity through the port 65 and pipe 24 to return to the tank 1, and through the port 67, in relatively small quantity, to enter the tank 3 by way of the pipe 26. This action is maintained throughout a period sufficient to heat the water in the tank 1 to the sterilizing temperature, which is 140° F., the time consumed being about twenty minutes; and this condition is maintained for an additional period of about thirty minutes. The heated return-water which enters the tank 3 preliminarily heats the water in that tank, though this preliminary heating is a mere incident, occurring because of the provision of the small port in the valve, which serves another purpose hereinafter explained. While so heating the tank 1, the gauntree is moved over tank 2 and the rack therein raised and filled and lowered back into that tank.

At the end of the twenty-minute period above referred to, the operator raises the pin 111 to free the wheel 107, which he then rotates through a complete turn, revolving the valves 19, 23 and 27 through one-sixth of a revolution and the valve 34 through one-fourth of a revolution, thereby turning these valves to the positions represented in the vertical column headed "2nd position". Thus the steam-supply is shut off through the valve 34, the valve 19 is opened to the pipes 17 and 18 with its lower part closed to the overflow, the valve 23 is opened to the pipe 21 and the valve 27 is opened to the pipe 26 with the following results: The water preliminarily heated in the tank 3 flows therefrom through the level pipe 18, valve 19 and pipe 17 upon the water in the tank 2, from the lower part of which the colder water in the tank is sucked by the pump through the pipe 21, valve 23 and pipes 82 and 40, and discharged through the pipe 30 into the jet-device 32, whence, by way of the pipe 28, it enters the valve 27 to be discharged through the pipe 26 into the tank 3 at the base thereof. This action consumes a period of about five minutes, during which the sterilizing temperature in tank 1 will not be materially reduced. As soon as this transfer from tank 3 to tank 2 is completed, the hand-wheel is again turned through a complete revolution to bring the geared valves to the position represented in column 3, headed "3rd position", with the following results: The valve 19 is closed to the pipes 16, 17 and 18, thereby shutting off the transfer between the tanks 2 and 3 and opening the three tanks to the overflow to permit any increase of level in the tanks, due to the condensed steam, to run into the sewer; the steam-valve 34 is opened to the jet-pump; the valve 23 is closed to the pipe 22, but open to the pipe 21 to permit the pump to suck the contents of tank 2 and heat the same in the jet-device, whence the heated water passes through pipe 28 and valve 27 into pipe 25 to enter the bottom of tank 2 and heat the water therein to the pasteurizing temperature, some of this heated water passing through port 67 and pipe 24 into the bottom of tank 1 to maintain the water therein at the sterilizing temperature, and meantime the action of the pump takes as much water as is added to the contents of tank 1 by the heating water introduced into it through the port 64 and pipe 20, whence it again enters the pump. This operation also consumes a period of about twenty minutes. Meantime the gauntree will have been moved over tank 3 to raise the rack therein to be filled with bottles and lower the filled rack into the tank. At the end of this period of twenty minutes, when the water in the tank 2 has reached the pasteurizing temperature, another complete turn of the hand-wheel is made, thereby bringing the geared valves to the position represented in the fourth column headed "4th position", with the following results: The water in tank 1 is transferred into the top of tank 3, the overflow from both these tanks is shut off, valve 34 is closed, valve 23 is opened to pipe 22 to cause the pump to suck the cold water from tank 3 and introduce it to the steam-jet device, and valve 27 is opened to pipe 24, whereby this heated water enters the lower port in valve 27 and passes therefrom through pipe 24 into the bottom of tank 1 to cool the water therein, after the beer in that tank has been sterilized, down to the temperature at which the bottles may be removed without danger of fracturing them. This operation consumes a period of about five minutes, and the water in tank 3 has next to be heated to the sterilizing temperature, while maintaining the water in tank 2 at that temperature. These functions ensue from another complete turn of the hand-wheel to bring the geared valves to the positions represented in the fifth column, headed "5th position", whereby the following-described conditions are produced: The valve 19 is closed to the pipes 16, 17 and 18, while it is open to the overflow through those pipes; the steam-valve 34 is open; valve 23 is open to the pipe 22 to permit the pump to suck the cold water from tank 3 through pipes 82 and 40 into the steam-jet device; and valve 27 is open to pipe 26 to permit the water thus heated to return through pipe 26 to tank 3 for raising the water therein to the sterilizing temperature, a portion of this heated water passing through the smaller port in valve 27, by way of the pipe 25, into tank 2 to maintain the water in the latter at the required temperature of 140° F.

While tank 3 is being heated, the gauntree is being manipulated to raise the rack out of tank 1, permit the pasteurized beer to be taken out, and permit the rack to be refilled with bottles of unpasteurized beer and lowered into that tank. When the temperature in tank 3 has been raised to that required for sterilizing, consuming a period of about twenty minutes, the operator again makes a complete rotation of the hand-wheel, thereby bringing the geared valves to the positions represented in the sixth column headed "6th position", with the following-described results: The valve 19 is open to pipes 17 and 16 to permit the transfer of the hot water in tank 2 to the top of the cold water in tank 1, the overflow through this valve being shut off, and the steam-valve 34 being closed; valve 23 is open to the pipe 20 to permit the cold water in tank 1 to be sucked by the action of the pump through the steam-jet device (but, of course, without heating the water), and the valve 27 is open to the pipe 25 to take the water from tank 1 into the bottom of tank 2 for cooling that tank down to the proper temperature for removing therefrom the bottles of pasteurized beer. This operation consumes a period of about five minutes, at the end of which another complete turn of the hand-wheel brings the geared valves to "1st position", thereby closing the transfer-valve between the tanks 1 and 2 and opening the overflow ports of that valve, as also opening the steam-valve to the jet-pump and the suction-valve 23 and delivery-valve 27 for circulating the water in tank 1 out of and into the same and gradually heating it to the pasteurizing temperature, as described of the first operation, which is thus repeated.

The successive operations of the hand-wheel for producing the six different positions of the geared valves may be repeated as often as required for completing a run of the apparatus on a quantity of the material to be sterilized, and at the end of the run the water in each tank may be drawn off into the sewer on opening the valves in the pipes 43, though the water in the tanks may be used over and over again, during weeks, without changing.

From the foregoing description of the mechanism and its operation, it will be readily understood that the sterilizing procedure is rendered continuous, in the sense of maintaining all of the tanks employed in uninterrupted use for conducting simultaneously in them different steps of the process, though when a greater number of tanks than three is employed, the same step of sterilizing, heating to the sterilizing temperature, or cooling the sterilizing liquid, may be practiced simultaneously in each of two or more of the tanks, without departing from the principle of the operation of the described apparatus. It will be apparent, moreover, that the operation consists, generally stated, in circulating the water in each tank in succession, beginning with any one, out of that tank through an extraneous heater and back into the same tank to raise the liquid gradually to the sterilizing temperature, utilizing the heated water of one tank after it has performed its sterilizing function therein, (during which it is maintained at the proper temperature by introduction into it through the heater of a relatively small quantity of water from another tank) through a valve port 67 to displace the colder water in another tank to preliminarily heat the bottles therein, from which last-named tank such colder water is meantime transferred to the tank in which the sterilizing was performed, for cooling the bottles. All of these operations are performed by mere turning of the hand-wheel, which can not be turned too far or reversed to disorganize the action of the apparatus, and the operation is rendered simple and reliable. By utilizing the hot water from each tank to gradually descend upon the cold bottles in another tank for preliminarily heating them, the advantage of economy ensues; and this advantage is greatly enhanced by heating the water for raising that in each tank to the sterilizing temperature, extraneously of the tank, since thereby the heating is rendered uniform instead of stratifying the heat through the water, which is thus reduced to a condition to adapt it to gradually raise the temperature in the tank to that required for sterilizing and avoid or greatly reduce the danger of breaking the bottles. The stratification referred to would result from injecting steam directly into the tanks, and even the provision of steam-coils in the tanks for heating the water would not effect the desired uniform heating thereof. These objections are completely avoided by the action of the jet-pump in thoroughly mixing the steam with the water, which a mere steam-jet would not accomplish because of its heat-stratifying tendency. Moreover, tendency to stratification of the heat in a tank at the sterilizing temperature, is prevented by the continued circulation therein through the medium of the supply of heated water which is introduced into that tank through a small valve-port, as hereinbefore described.

While the steam-jet device might be used to the exclusion of the pump, it would require too great pressure to be economical, so that it is preferred to supplement its action by that of the pump.

As will be realized, in providing, as herein described, for the transfer from one tank to another of the sterilizing-water by mere flow, unless the pipes through which such flow takes place are of adequately large diameter, the flow is undesirably slow. To avoid the use of such large pipes the flow may be expedited through suitable narrower ones by the modified construction illustrated in Figs. 15 to 19, inclusive, of which the following is a description: The valve 19 is supplanted by a valve 199 carrying the gear-wheel 48 to mesh with the pinion 47 on the operating-stem 46. The casing of this valve 199, shown with a bonnet 200 forming its lower end to which the sewer-pipe 42 leads, has the pipes 16, 17 and 18 connected with it, and is provided in the plane between the pipes 16 and 18, with an upper nozzle 201 and a similar lower nozzle 202 at which to connect a centrifugal pump 203, like the pump 11 and also on the shaft of the motor 12, the connection being made of the nozzle 201 with the suction-side of the pump 203 through a pipe 204 (Fig. 16) and of the nozzle 202 with the discharge-side of that pump through a pipe 205. The rotary tapering plug of this modified valve has an upper section containing the four ports

206, 207, 208 and 209, with which section the nozzle 201 registers, an intermediate section with which the nozzle 202 registers, containing the four ports 210, 211, 212 and 213, this section being divided from the upper section by a horizontal partition 214, and a lower, overflow-section having ports 215, 216 and 217 adapted to register with similar ports in the casing, open to the bonnet 200. At each junction with the casing of a pipe 16, 17, 18 a passage 218 leads from such connection in the casing to ports in the intermediate section of the valve-device with which the ports in that section of the plug-valve are adapted to register. With this modified construction in use, the operation becomes the following in transferring the water from one tank to another: The pump 203 being on the same motor-shaft with the pump 11 is, like the latter, in continuous motion under the working of the motor 12, though, obviously, neither pump produces circulation through "transfer" pipes 16, 17, 18 when the valve to which they are connected shuts off their intercommunication, as in the first, third and fifth positions in Fig. 11 and in Fig. 17. With the valve 199 in the condition represented in Figs. 17, 18 and 19 in the column headed "1st position", as also in the third and fifth positions, no circulation ensues through the transfer-pipes because the valve shuts off communication between the nozzles 201 and 202 (pipes 205 and 204), though the overflow-section of the valve is open; while in the "2nd position" of the valve, wherein its overflow-section (Fig. 19) is closed, the port 213 registers with the pipe 205 (nozzle 202), its port 211 with the pipe 17, its port 209 with the pipe 204 (nozzle 201) and its port 208 with the pipe 18, thereby permitting the action of the pump 203 to transfer the water from tank 3 through pipes 18, 204, and the pump and thence through the pipe 205, ports 213 and 211 and pipe 17 into the tank 2. With this valve in the "4th position", the pump 203 transfers the water from tank 1 through pipe 16, ports 208, 207 and pipe 204, and through pipe 205, ports 212 and 211 and pipe 18 into tank 3; and in the "6th position" of the valve, the pump transfers the water from tank 2 through ports 208 and 209 and pipe 204, and through pipe 205, ports 210, 211 and pipe 16 into tank 1.

What I claim as new, and desire to secure by Letters Patent, is:

1. In a pasteurizing apparatus, the combination with a plurality of tanks for the sterilizing liquid in each one of which the complete pasteurization is effected, of a system of pipes communicating with all said tanks, and valves in said pipes for controlling the flow of the liquid from any tank to any other tank, whereby the temperature of the liquid in one tank is raised, the temperature of the liquid in another tank kept substantially stationary, and in a third tank reduced.

2. In a pasteurizing apparatus, the combination with a plurality of tanks for the sterilizing liquid in each one of which the complete pasteurization is effected, of a series ~~of inlet~~ pipes one for each tank, said series having a common valve, and a series of outlet pipes one for each tank, said series having a common valve whereby the flow of the liquid is controlled.

3. In a pasteurizing apparatus, the combination with a plurality of tanks for the sterilizing liquid in each one of which the complete pasteurization is effected, of a system of pipes communicating with all of said tanks, valves in said pipes for controlling the flow of the liquid from any tank to any other tank and a heating device in said system, said parts operating so that the temperature of the liquid in one tank is raised while the temperature of the liquid in another tank is kept stationary, and in a third tank reduced.

4. In a pasteurizing apparatus, the combination with a plurality of tanks for the sterilizing liquid in each one of which the complete pasteurization is effected, of a system of pipes communicating with all of said tanks, valves in said pipes for controlling the flow of the liquid, and connections between said valves adapting them to be simultaneously set by a single operation, said parts operating so that while the temperature of the liquid in one tank is being raised the temperature of the liquid in another tank is kept substantially stationary, and in a third tank reduced.

5. In a pasteurizing apparatus, the combination with a plurality of tanks for the sterilizing liquid in each one of which the complete pasteurization is effected, of a system of outflow and return pipes through which said tanks intercommunicate valves in said pipes for controlling the flow of liquid from any tank to any other tank, a pump and heater in said pipe system, said parts being adapted and arranged so that while the temperature of the liquid in one tank is being raised the temperature of the liquid in another tank is held substantially stationary, and in a third tank reduced.

6. In a pasteurizing apparatus, the combination with a plurality of tanks for the sterilizing liquid in each one of which the complete pasteurization is effected, a system of outflow and return pipes through which said tanks intercommunicate valves in said pipes for controlling the flow of liquid from any tank to any other tank, a liquid heating steam jet pump in said pipe, said parts being so constructed and arranged that while the temperature of the liquid in one tank is being raised the temperature of the liquid in another tank is kept substantially stationary, and in a third tank reduced.

7. In a pasteurizing apparatus, the com-

bination of a plurality of tanks for the sterilizing liquid, a system of outflow and return pipes extraneous of the tanks, through which they intercommunicate, a pump and a heater in said pipe-system, rotary valves in the pipes, and non-reversible gear-connections between the valves operative from a single point on the apparatus to simultaneously set the several valves for controlling the flow of the liquid to and from the tanks.

8. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, a system of outflow and return pipes extraneous of the tanks, through which they intercommunicate, a pump and heater in said pipe-system, valves in the pipes, and an operating spindle on the apparatus having gear-connections with the valves for simultaneously turning and thereby setting them to control the flow of the liquid to and from the tanks.

9. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, a system of outflow and return pipes extraneous of the tanks, through which they intercommunicate, a pump and heater in said pipe-system, valves in the pipes, an operating spindle rotatably supported on the apparatus, having gear-connections with the valves for simultaneously turning them and thereby setting them to control the flow of the liquid to and from the tanks, and a clutch-device coöperating with the spindle to prevent reverse turning thereof.

10. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, a system of outflow and return pipes extraneous of the tanks, through which they intercommunicate, a pump and heater in said pipe-system, valves in the pipes, an operating spindle rotatably supported on the apparatus, having gear-connections with the valves for simultaneously turning them, and thereby setting them to change such intercommunication by each complete rotation of the spindle, to control the flow of the liquid to and from the tanks, and a releasable lock for the spindle operating to arrest it at the end of each complete rotation thereof.

11. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid having valved circulating-pipe connections for the liquid, a steam-jet pump in the circulation constructed and arranged to heat the liquid and circulate it simultaneously through said connections in relatively larger and smaller quantities into different tanks.

12. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, a system of outflow and return pipes through which said tanks intercommunicate, a pump and heater in said pipe-system, and valves in the pipes for opening and closing communication between them and containing ports operating to direct a relatively large quantity of the liquid from the heater into one tank while directing a relatively small quantity thereof into another tank for heating its contents.

13. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, valve-controlled heating-means for said liquid, transfer-pipes communicating with the tanks, and a valve common to said pipes for controlling the transfer through them of said liquid from one to another of the tanks, said valve having an overflow-section with a discharge-pipe leading therefrom.

14. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, valve-controlled heating-means for said liquid, transfer-pipes communicating with the tanks, a pump, a valve common to said pipes, and suction and discharge pipes connecting the pump with said valve.

15. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, valve-controlled heating-means for said liquid, transfer-pipes communicating with the tanks, a pump, a valve common to said pipes, having two sections, one above the other and communicating with each other, and suction and discharge-pipes each connecting the pump with one of said valve-sections.

16. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, valve-controlled heating-means for said liquid extraneous of the tanks, transfer-pipes communicating with the tanks, a pump, a valve common to said pipes, having inter-communicating upper and intermediate sections and a lower overflow-section, and suction and discharge-pipes respectively connecting the pump with said upper and intermediate valve-sections.

17. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, valve-controlled heating-means for said liquid extraneous of the tanks, transfer-pipes communicating with the tanks, a rotary-plug valve common to said pipes, having two sections one above the other with a partition separating them and passages in the valve-casing through which said sections intercommunicate, and suction and discharge-pipes each connecting the pump with one of said valve-sections.

18. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, valve-controlled heating-means for said liquid extraneous of the tanks, transfer-pipes communicating with the tanks, a rotary plug-valve common to said pipes, having an upper and intermediate section with a partition separating them and passages in

the valve-casing through which said sections intercommunicate, and a lower overflow-section provided with a discharge-pipe, and suction and discharge-pipes connecting the pump respectively with said upper and intermediate sections.

19. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, a transfer-pipe, a suction-pipe and a return-pipe on each tank, a valve common to the transfer-pipes, a second valve common to the suction-pipes and a third valve common to the return-pipes, a steam-jet pump communicating with said suction and return-pipes, a steam-supply pipe leading to said pump and containing a valve, and gear-connections between the valves operative from a single point on the apparatus to simultaneously set them, for the purpose set forth.

20. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, a transfer-pipe, a suction-pipe and a return pipe on each tank, a valve common to the transfer-pipes, a second valve common to the suction-pipes and a third valve common to the return-pipes, a heater and pump included in said suction and return-pipes, a steam-supply pipe leading to said heater and containing a valve, and means for setting the valves.

21. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, a transfer-pipe on each tank near its top, a suction-pipe on each tank near its bottom and a return-pipe on each tank still nearer its bottom, a valve common to the transfer-pipes, a second valve common to the suction-pipes and a third valve common to the return-pipes, a steam-jet pump communicating with said suction and return-pipes, and a steam-supply pipe leading to said pump and containing a valve.

22. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, a transfer-pipe on each tank near its top, a suction-pipe on each tank near its bottom and a return pipe on each tank still nearer its bottom, valves in the pipes for opening and closing communication between them, and a heater having communication with said suction and return pipes controllable through the valves therein, said valves containing ports operating to direct a relatively large quantity of the liquid from the heater into one tank while directing a relatively small quantity thereof into another tank for heating its contents.

23. In a pasteurizing apparatus, the combination with a tank for the sterilizing liquid, of a suction-pipe and a return-pipe communicating with said tank, a steam-jet pump having its suction and discharge sides connected with said pipes, respectively, a steam-supply pipe leading to said pump, an air-pressure-actuated valve in said pump, and a thermostat-device controlling the air-pressure action on said pump-valve.

24. In a pasteurizing apparatus, the combination with a tank for the sterilizing liquid, of a suction-pipe and a return-pipe communicating with said tank, a steam-jet pump having its suction and discharge sides connected with said pipes, respectively, a steam-supply pipe leading to said pump, a valve in said pump on a spring-pressed stem, a diaphragm-device with which said stem is connected, a valved air-pressure supply-pipe leading to the diaphragm-device, and a thermostat-device controlling the air-pressure valve.

25. In a pasteurizing apparatus, the combination with a tank for the sterilizing liquid, of a suction-pipe and a return-pipe communicating with said tank, a steam-jet pump having its suction and discharge sides connected with said pipes, respectively, a steam-supply pipe leading to said pump, an air-pressure-actuated valve in said pump, a thermostat-device controlling the air-pressure action on said pump-valve, and means for regulating the operation of the thermostat-device on said air-pressure valve.

26. In a pasteurizing apparatus, the combination with a tank for the sterilizing liquid, of a suction-pipe and a return-pipe communicating with said tank, a steam-jet pump having its suction and discharge sides connected with said pipes, respectively, a steam-supply pipe leading to said pump, a valve in said pump on a spring-pressed stem, a diaphragm-device with which said stem is connected, an air-pressure supply-pipe leading to the diaphragm-device and containing a spring-seated valve, a stem for opening the air-pressure valve, a thermostat-device in the course of circulation of the pump, a lever engaging at one end with the thermostat-device, a set-screw working in the opposite end of the lever against said stem of the air-pressure valve and carrying a pressure-setting finger, and a dial-device with which said finger coöperates.

27. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, a transfer-pipe, a suction-pipe and a return-pipe on each tank, a valve common to the transfer-pipes, a second valve common to the suction-pipes and a third valve common to the return-pipes, a steam-jet pump included in said suction and return pipes, a steam-supply pipe leading to said pump and containing a valve, gear-connections between the valves operative from a single point on the apparatus to simultaneously set them, an air-pressure-actuated valve in said pump, and a thermostat-device controlling the air-pressure actio on said pump-valve.

28. In a pasteurizing apparatus, the com-

bination of a plurality of tanks for the sterilizing liquid, a transfer-pipe, a suction-pipe and a return-pipe on each tank, a valve common to the transfer-pipes, a second valve common to the suction-pipes and a third valve common to the return pipes, a steam-jet pump included in said suction and return pipes, a steam-supply pipe leading to said pump and containing a valve, gear-connections between the valves operative from a single point on the apparatus to simultaneously set them, a valve in said pump on a spring-pressed stem, a diaphragm-device with which said stem is connected, a valved air-pressure supply-pipe leading to the diaphragm-device, and a thermostat-device controlling the air-pressure valve.

29. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, a transfer-pipe, a suction-pipe and a return pipe on each tank, a valve common to the transfer-pipes, a second valve common to the suction-pipes and a third valve common to the return-pipes, a steam-jet pump included in said suction and return pipes, a steam-supply pipe leading to said pump and containing a valve, gear-connections between the valves operative from a single point on the apparatus to simultaneously set them, an air-pressure-actuated valve in said pump, a thermostat-device in the course of circulation of the pump controlling the air-pressure action on said pump-valve, and means for regulating the operation of the thermostat-device on said air-pressure valve.

30. In a pasteurizing apparatus, the combination of a plurality of tanks for the sterilizing liquid, a transfer-pipe, a suction-pipe and a return-pipe on each tank, a valve common to the transfer-pipes, a second valve common to the suction-pipes and a third valve common to the return-pipes, a steam-jet pump included in said suction and return pipes, a steam-supply pipe leading to said pump and containing a valve, gear-connections between the valves operative from a single point on the apparatus to simultaneously set them, a valve in said pump on a spring-pressed stem, a diaphragm-device with which said stem is connected, an air-pressure supply-pipe leading to the diaphragm-device and containing a spring-seated valve, a stem for opening the air-pressure valve, a thermostat-device in the course of circulation of the pump, a lever engaging at one end with the thermostat-device, a set-screw working in the opposite end of the lever against said stem of the air-pressure valve and carrying a pressure-setting finger, and a dial-device with which said finger coöperates.

31. In a pasteurizing apparatus, the combination of a plurality of tanks, to the minimum number of three, for the sterilizing liquid, each having extending from it a transfer-pipe, a suction-pipe and a return-pipe, a valve common to the transfer-pipes, a second valve common to the suction-pipes and a third valve common to the return-pipes, a rotatable operating-rod having similar gear-connections with said valves adapted to turn them to the same extent and thereby set them with each complete rotation of said rod, a steam-jet pump having communication with said suction and return-pipes controlled through the valves therein, a steam-supply pipe leading to said pump, and a valve in said supply-pipe having a gear-connection with the operating-rod producing a different extent of turning the steam-valve by each complete rotation of said rod.

32. In a pasteurizing apparatus, the combination of a plurality of tanks, to the minimum number of three, for the sterilizing liquid, each having extending from it a transfer and overflow pipe and a suction-pipe and a return-pipe, a valve common to said first-named pipes, having a transfer-section and an overflow-section, a second valve common to the suction-pipes and a third valve common to the return-pipes, a rotatable operating-rod having similar gear-connections with said valves adapted to turn them to the same extent and thereby set them with each complete rotation of said rod, a steam-jet pump having communication with said suction and return-pipes controlled through the valves therein, a steam-supply pipe leading to said pump, and a valve in said supply-pipe having a gear-connection with the operating rod producing a different extent of turning the steam-valve by the complete rotation of said rod.

33. In a pasteurizing apparatus, the combination of a plurality of tanks, to the minimum number of three, for the sterilizing liquid, each having extending from it, near its top, a transfer and overflow pipe, from near its bottom a suction-pipe and from nearer its bottom a return-pipe, a valve common to said first-named pipes, a second valve common to the suction-pipes and a third valve common to the return-pipes, a rotatable operating rod having similar gear-connections with said valves adapted to turn them to the same extent and thereby set them with each complete rotation of said rod, a steam-jet pump having communication with said suction and return pipes controlled through the valves therein, a steam-supply pipe leading to said pump, and a valve in said supply-pipe having a gear-connection with the operating rod producing a different extent of turning the steam-valve by the complete rotation of said rod.

34. In a pasteurizing apparatus, the combination of a plurality of tanks, to the minimum number of three, for the sterilizing liquid, each having extending from it a tran

fer-pipe, a suction-pipe and a return-pipe, a valve common to the transfer-pipes, a valve common to the suction-pipes and a valve common to the return-pipes, a rotatable operating rod having similar gear-connections with said valves adapted to turn them to the same extent and thereby set them with each complete rotation of said rod, a steam-jet pump having communication with said suction and return-pipes controlled through the valves therein, a steam-supply pipe leading to said pump, a valve in said pipe having a gear-connection with the operating-rod producing a different extent of turning the steam-valve by the complete rotation of said rod, and a water-circulating pump coöperating with the steam-jet pump.

35. A pasteurizing apparatus comprising, in combination, tanks 1, 2, 3, each having a transfer-pipe extending from its top portion, a suction-pipe extending from it toward its bottom and a return-pipe extending from it nearer its bottom, a valve common to the transfer-pipes, a second valve common to the suction-pipes and a third valve common to the return-pipes, a rotatable operating-rod having a six-to-one gear-connection with each of said valves, a steam-jet pump having communication with said suction and return pipes controlled through the valves therein, a steam-supply pipe leading to said pump, a valve in said supply-pipe having a four-to-one gear-connection with the operating-rod, a liquid-circulating pump coöperating with the steam-jet pump, a thermostat-device interposed in the course of the pump-circulated liquid, a valve in said jet-pump, and an air-pressure-actuated diaphragm-device controllably connected with the jet-pump valve and having a pressure-shut-off valve in operative connection with the thermostat-device, all substantially as and for the purpose set forth.

JOHN T. H. PAUL.

In presence of—
J. H. Landes,
R. A. Schaefer.

Pa

Apr. 1908

886,013

No. 886,013. PATENTED APR. 28, 1908.

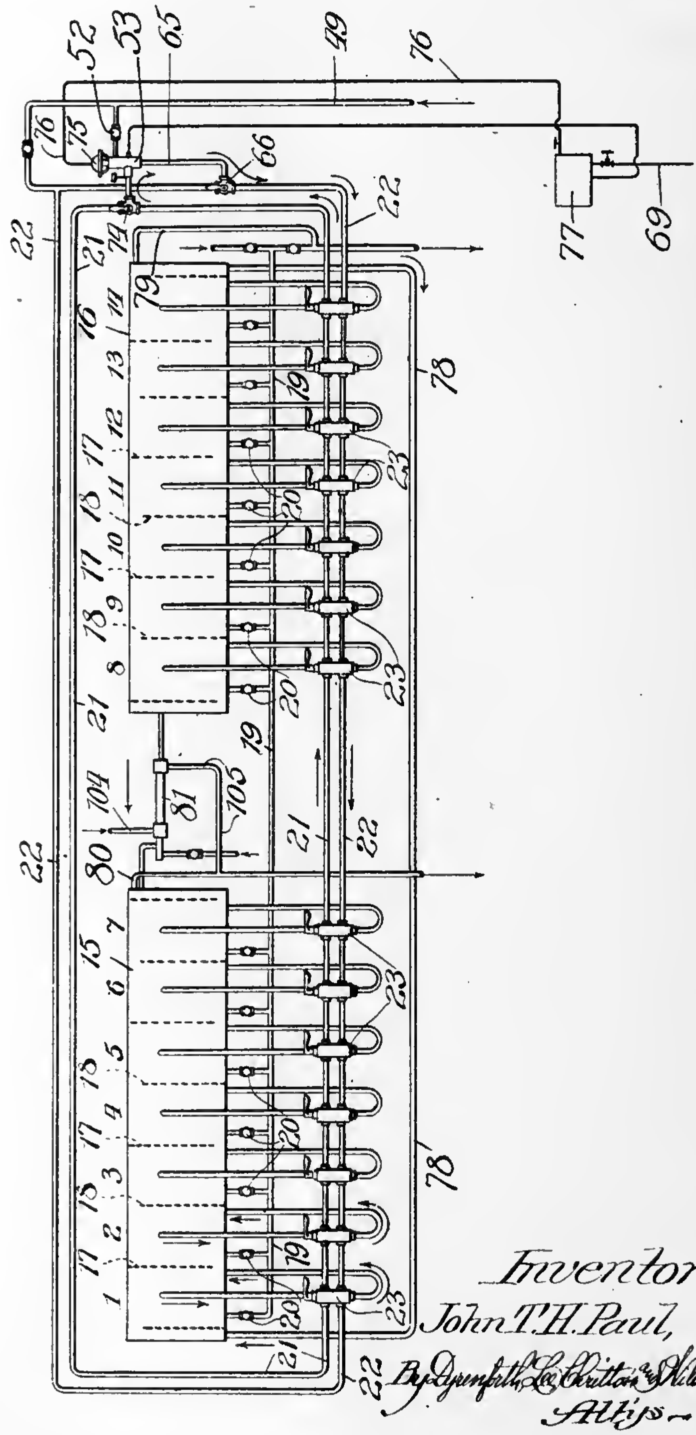
J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED JULY 25, 1907.

10 SHEETS—SHEET 1.

Fig. 1.



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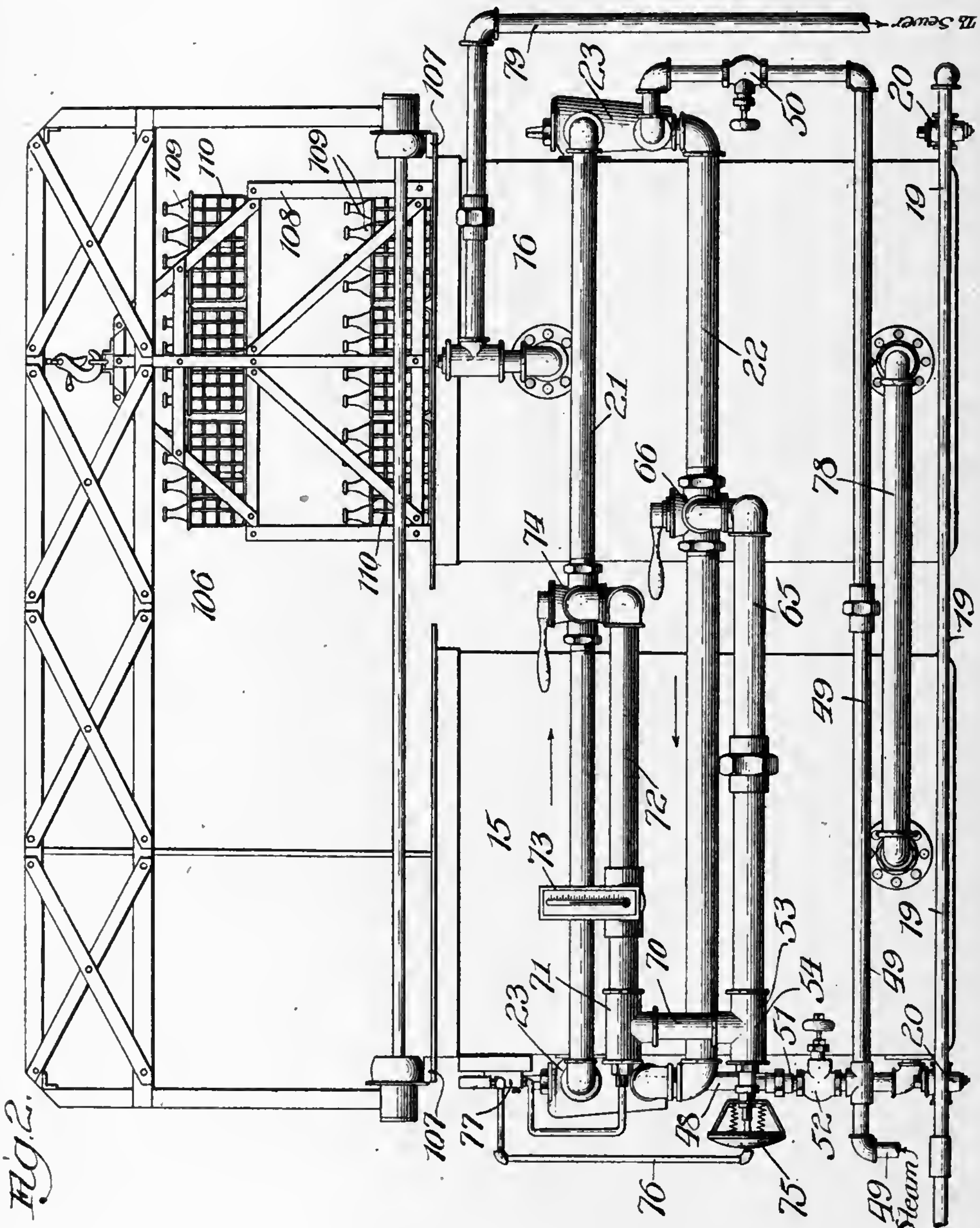
10 SHEETS—SHEET 2.



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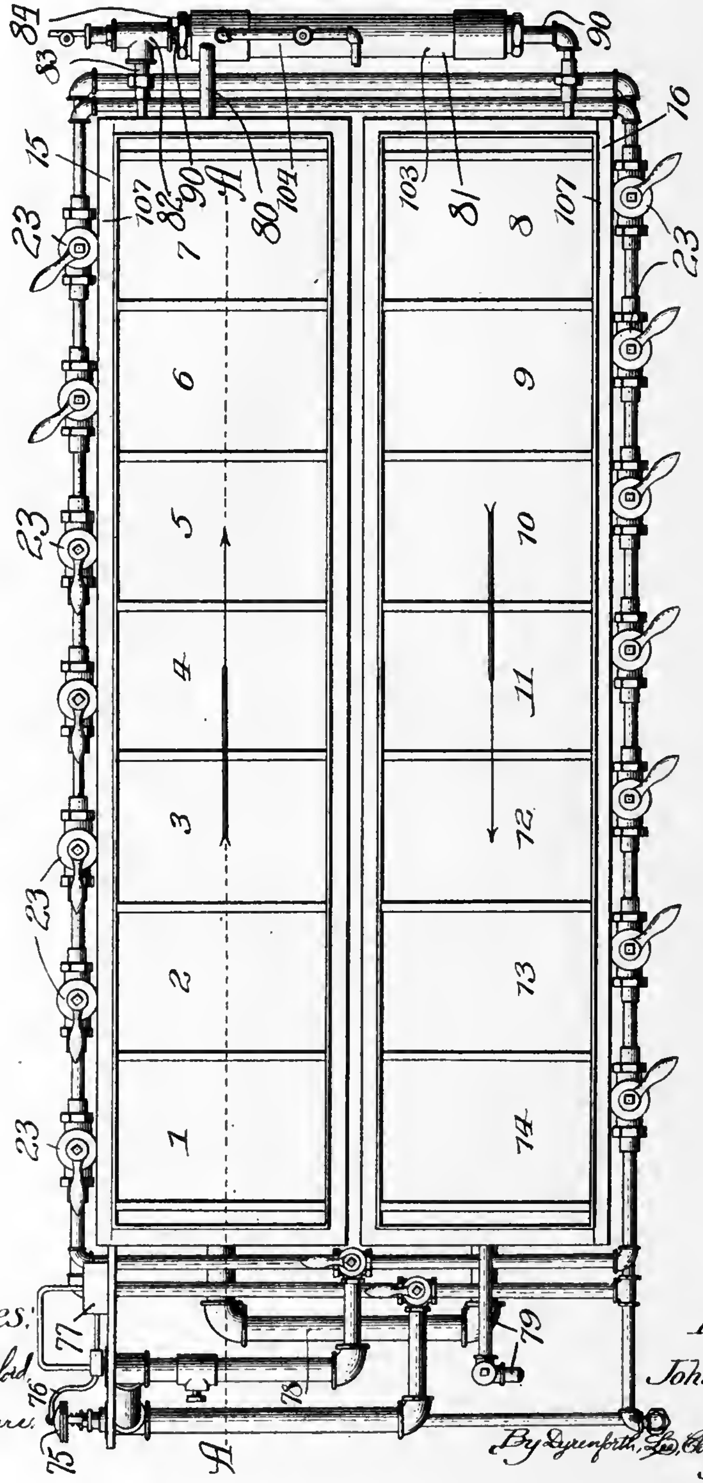
10 SHEETS—SHEET 3.

Fig. 3



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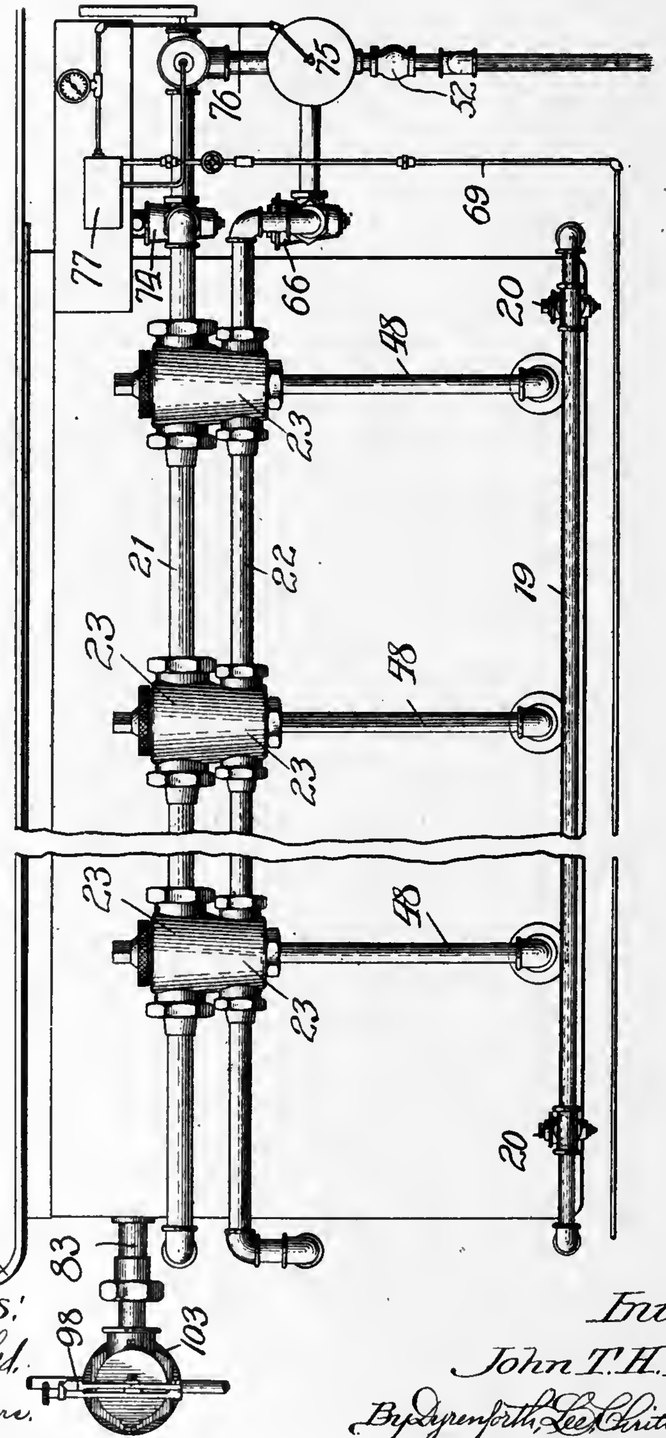
10 SHEETS—SHEET 4.

Fig. 4.



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10 SHEETS—SHEET 5.

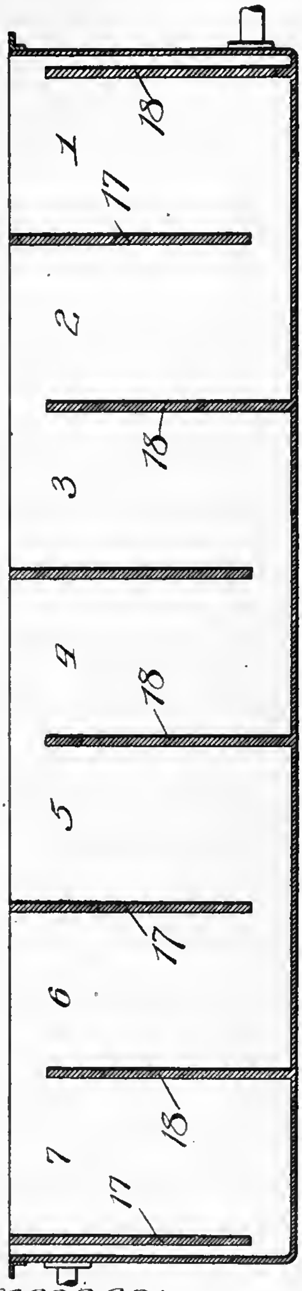

Fig. 5

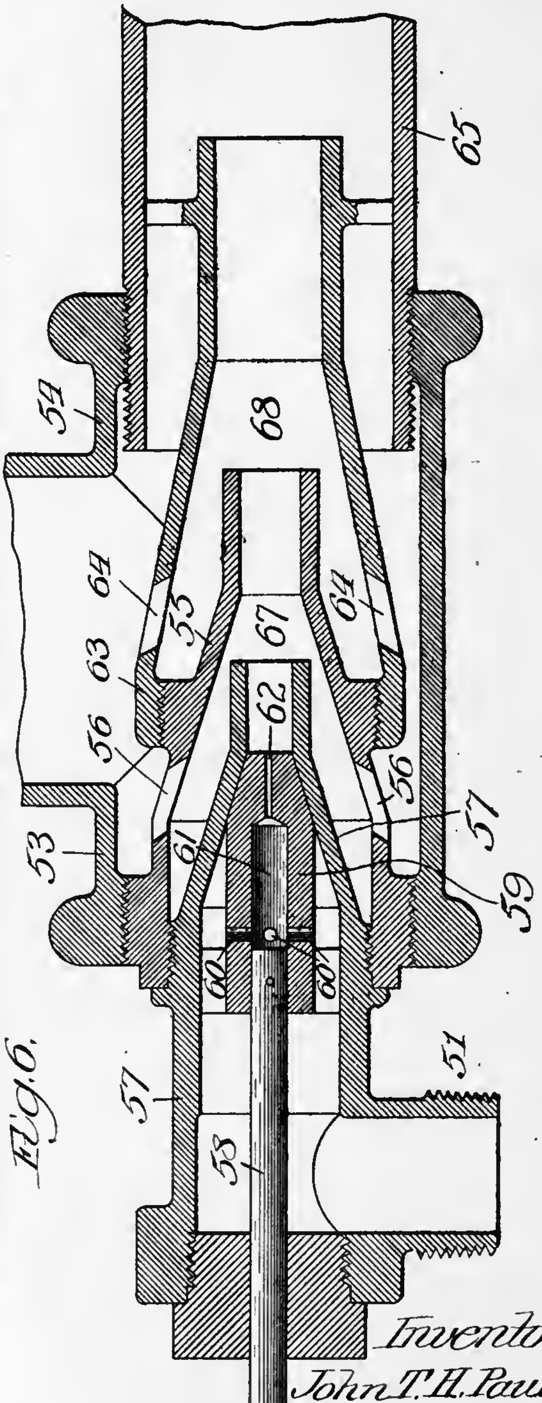

Fig. 6.

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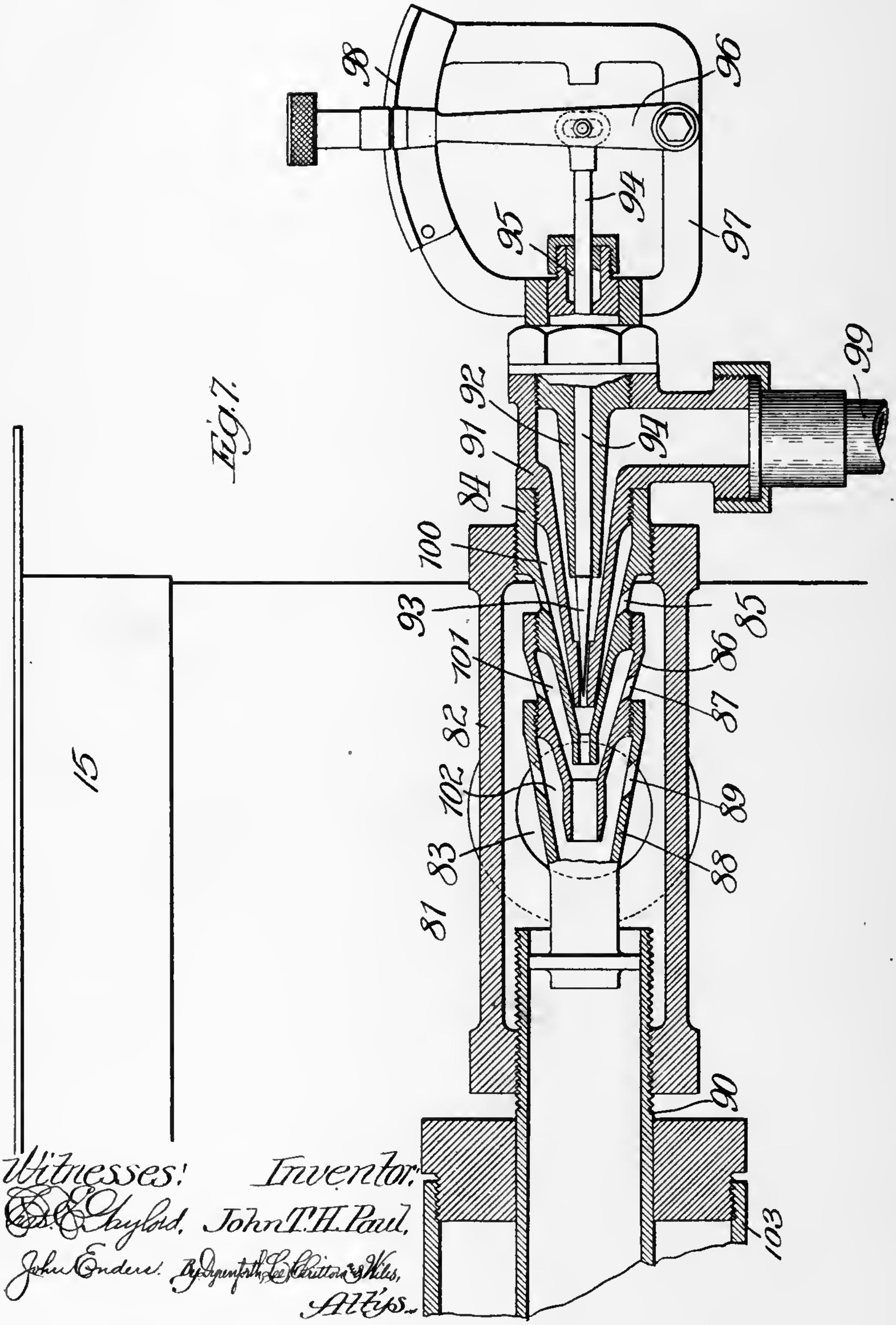
10 SHEETS—SHEET 6.



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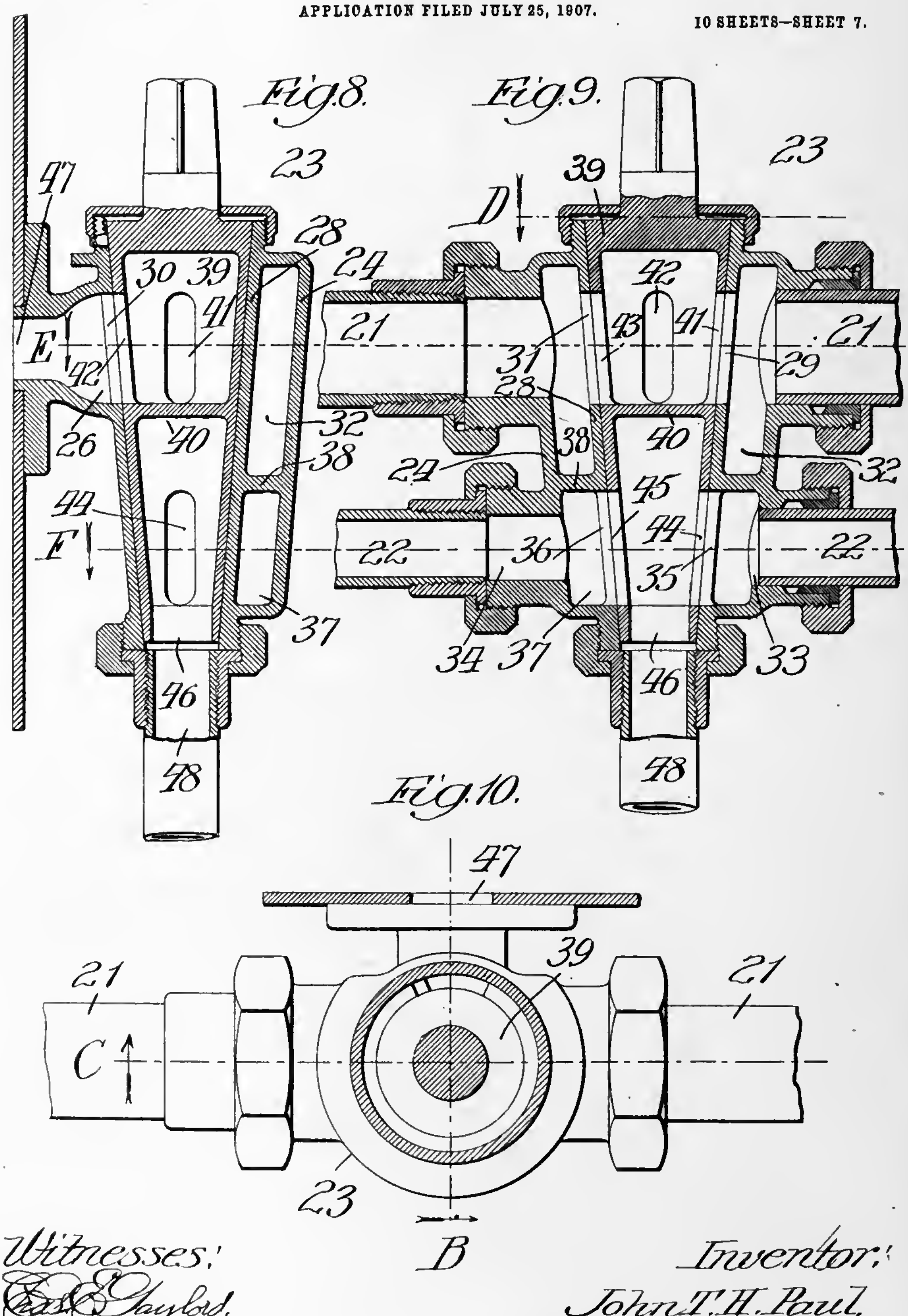
10 SHEETS—SHEET 7.



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APPLICATION FILED JULY 25, 1907.

10 SHEETS—SHEET 8.

Fig. 11.

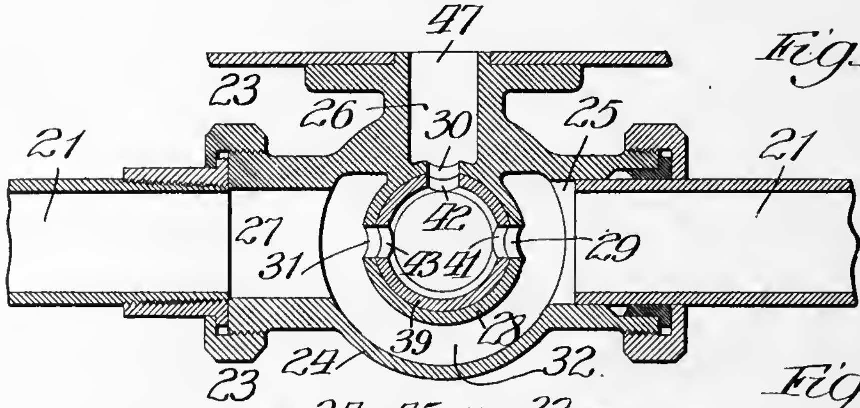


Fig. 12.

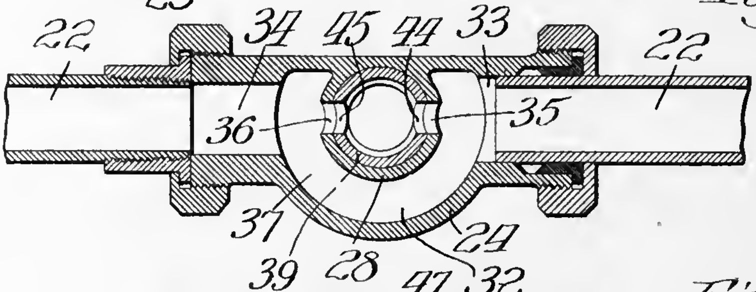


Fig. 13.

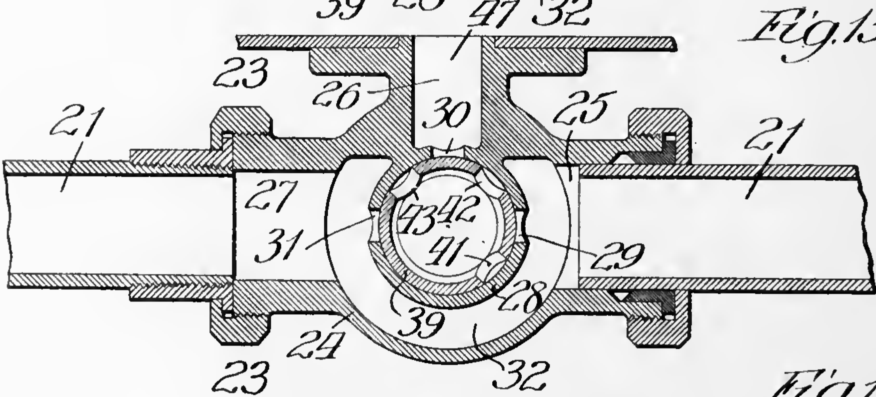
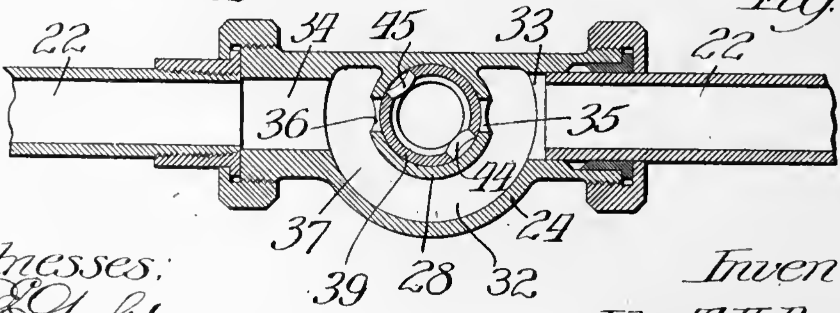


Fig. 14.



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THE NORRIS PETERS CO., WASHINGTON, D. C.

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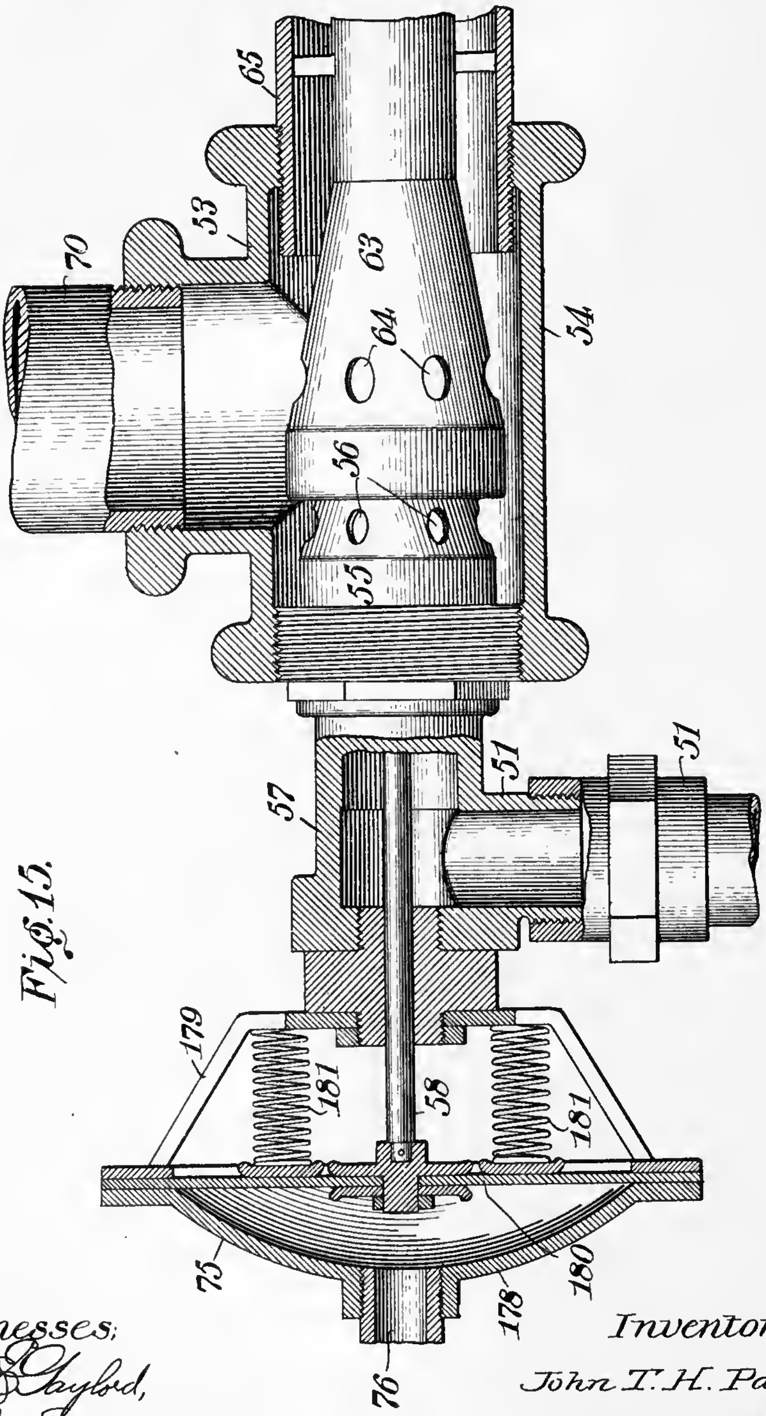
PASTEURIZING APPARATUS.

APPLICATION FILED JULY 25, 1907.

10 SHEETS—SHEET 9.



Witnesses;
Chas. C. Gaylord,
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No. 886,013. PATENTED APR. 28, 1908.

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APPLICATION FILED JULY 25, 1907.

10 SHEETS—SHEET 10.

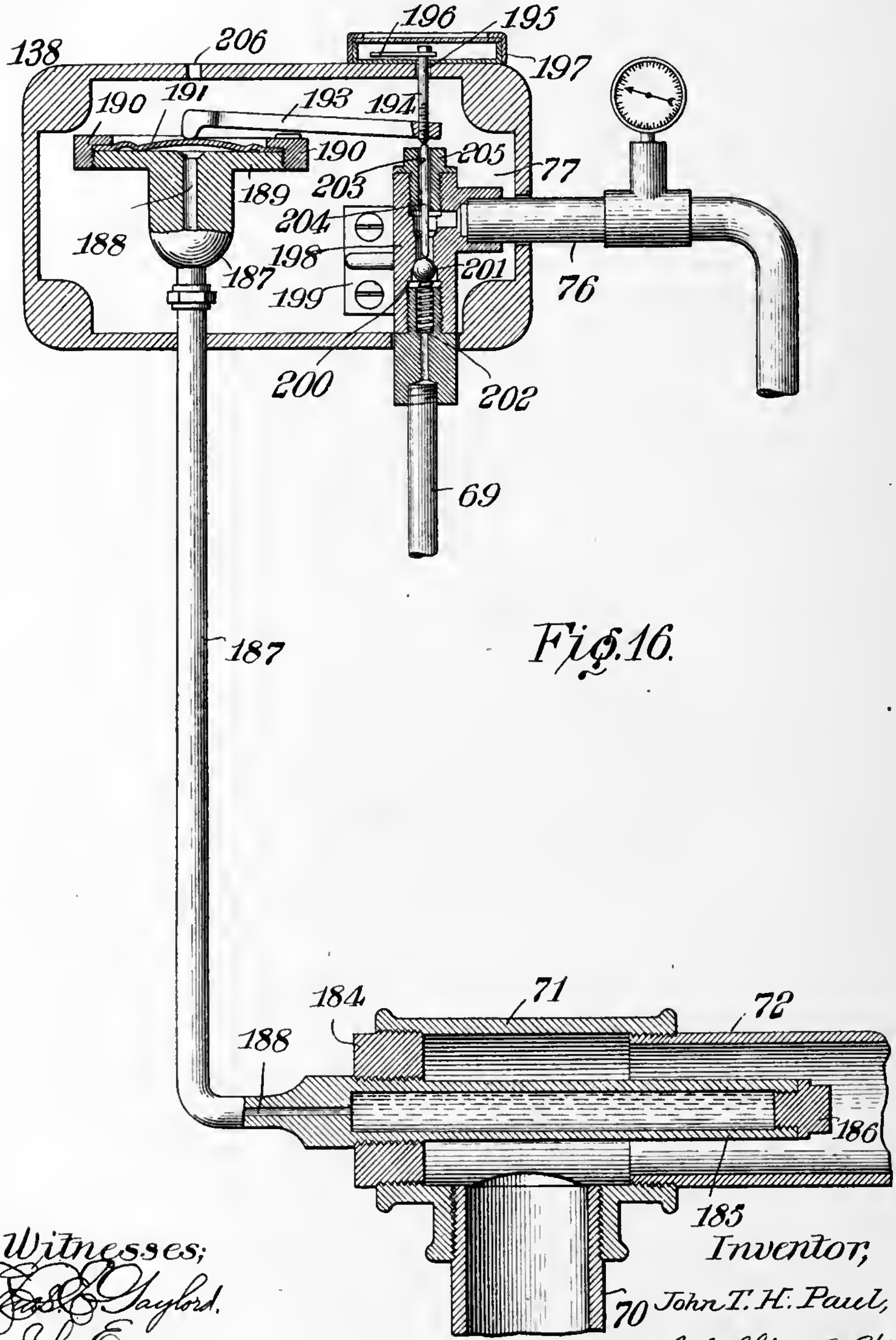

Fig. 16.

Witnesses;

[signature]

John Enders

Inventor;

John T. H. Paul,

By Dyrenforth, Lee, Chritton & Wiles,

Attys.

UNITED STATES PATENT OFFICE.

JOHN T. H. PAUL, OF CHICAGO, ILLINOIS, ASSIGNOR TO E. GOLDMAN & CO. INC., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PASTEURIZING APPARATUS.

No. 886,013. **Specification of Letters Patent.** **Patented April 28, 1908.**

Application filed July 25, 1907. Serial No. 385,460.

To all whom it may concern:

Be it known that I, JOHN T. H. PAUL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

This invention relates to improvements in pasteurizing apparatus of the class in which the pasteurizing liquid contained in a series of intercommunicating tanks or compartments is preliminarily heated to the sterilizing temperature in a number of consecutive members of the series, to be thereafter continuously circulated throughout the series for subjecting the material to be treated, successively introduced into such members, to different stages of temperature of the pasteurizing liquid; thereby rendering the operation of the apparatus continuous, in the sense that all of the members of the series may, during the operation, be in simultaneous use.

Referring to the accompanying drawings—Figure 1 shows the improved apparatus by a diagrammatic view. Fig. 2 is an end elevation of the apparatus surmounted by a traveling gauntree; Fig. 3, a plan view, and Fig. 4, a broken side view of the apparatus. Fig. 5 is a longitudinal vertical section through one of the two tanks employed, taken at the line A on Fig. 3. Fig. 6 is a broken longitudinal section showing the construction of the steam-jet pump employed for heating the liquid; and Fig. 7 is a similar view showing the construction of the steam-jet pump employed for circulating the liquid throughout the series of compartments. Figs. 8 and 9 are sections taken at right angles to each other, respectively, at the lines B and C on Fig. 10, showing the construction of valve employed for controlling the flow to and from each compartment under the action of the heating pump; and Fig. 10 is a sectional view of the same valve at line D on Fig. 9. Figs. 11 and 13 are sections of the same valve taken at the line E on Fig. 8 through its upper part and showing the ports in open and closed positions respectively; and Figs. 12 and 14 are similar sections through the lower part of the valve at line F on Fig. 8, showing the ports in open and closed position, respectively. Fig. 15 is a broken sectional view of the diaphragm-device employed in the system shown connected with the steam-jet heating-pump of Fig. 6, and Fig. 16 is a view in elevation mainly sectional and diagrammatic in its nature, of the spring-seated valve-device and thermostat, also employed in the system.

The apparatus, while intended for use in pasteurizing sauces, catsup, preserves, and canned or bottled goods of all kinds, requiring to be sterilized to afford to them the necessary keeping quality, rather than treated with preservative chemicals, has been more particularly devised for sterilizing beer in bottles, to the treatment of which, therefore, the description hereinafter contained is confined.

Two similar tanks 15 and 16, of desired capacity, are placed side-by-side, though so far as the purview of the invention is concerned a single tank may be used where its length would not cause it to take up too much room. Partitions 17 extending between the walls of each tank from their upper ends and short of the tank-bottom, and alternate partitions 18 rising from said bottom and extending short of the tops of the side-walls, divide the tanks into similar compartments, preferably to the same number in each tank to afford through it a serpentine course for circulating the water employed in the sterilizing treatment. It will be observed that the end-partitions 17 and 18 are close to the end-walls of the tanks and afford narrow spaces with said walls for the purpose hereinafter explained. Each tank is shown to be sub-divided into seven compartments, making fourteen in all, but that number may be decreased or increased according to particular requirements for which the apparatus may be constructed.

A cold-water supply-pipe 19 extends along the outer side and one end of each tank at the base thereof and communicates with the interior of the tanks through branches containing valves 20, which may be of the straight-way variety, seven such branches being shown to be provided for each tank according to the representation in the diagrammatic view. Two similar pipes 21 and 22 extend endlessly about both tanks above their centers, along their sides and across their ends, being sufficiently close together along the tank-sides to permit a single valve-device 23, hereinafter described, to be interposed in both. The valve-device referred to is shown in detail in Figs. 8 to 14, inclusive, and involves the following-described construction: The valve-casing is formed with an outer wall 24 containing ports 25, 26 and 27 in its upper portion, and an inner wall 28 containing a port 29 registering with the port 25, a port 30 registering with the port 26, and a port 31 registering with the port 27, these walls forming between them a by-pass chamber 32 extending part-way about the interior of the casing. The lower section of the casing is formed with a continuation of the outer wall 24 containing opposite ports 33 and 34, and with a continuation of the inner wall 28 containing the opposite ports 35 and 36, these lower sections of the walls forming between them a by-pass passage 37, extending like the passage 32, but divided therefrom by a horizontal partition 38 (Figs. 8 and 9). The valve-plug 39 is divided by a partition 40 into an upper section to fit rotatably in the corresponding sections of the casing and containing the three ports 41, 42 and 43, and a lower section to fit similarly within the corresponding section of the casing and containing the lateral ports 44 and 45 and the end-port 46 at the open lower end of the lower casing-section.

Coincident with each compartment in a tank, a valve-device 23 is interposed in the two pipes 21 and 22 by coupling into the pipe 21 at the ports 25 and 27 and by coupling into the pipe 22 at the ports 33 and 34, each valve-device being secured at the flanged side of its casing to a side-wall of a tank wherein a port 47 is provided (Figs. 11 and 13), to register with the port 26. A branch-pipe 48 is coupled at its upper end with each valve-casing at the end-port 46 therein and extends downward, being coupled at its lower end at a port in the tank-side near its bottom for conducting hot water, provided as hereinafter described, into the bottom of the tank.

A supply-pipe 49 for live steam extends across one end of the two tanks (Fig. 2) and is connected at the outer side of the tank 16 with the pipe 22, near which it is provided at 50 with a shut-off valve for controlling the admission of steam into that pipe for a purpose hereinafter explained; and the steam-pipe is provided adjacent to the outer side of the tank 15 with a branch 51 containing a shut-off valve at 52 and leading to a steam-jet pump 53, the detailed construction of which is shown in Fig. 6 to involve that described as follows: Into one end of a T-coupling 54, forming a casing, is screwed a nozzle 55 having lateral inlet-ports 56. Another, smaller, nozzle 57 is screwed into the outer end of the nozzle 55 to extend concentrically therewith and has at its outer end a right-angled connection with the steam-pipe branch 51, this last-named nozzle being closed at its outer end to afford a bearing for the reciprocating stem 58 of a valve 59 for controlling the flow of steam through the nozzle 57. This valve contains lateral ports 60 leading into a chamber 61 in the valve, which also contains a discharge-passage 62 leading from the inner end of the chamber to the extremity of the valve, so that a slight flow of steam may be maintained through the valve 59, when it is closed, from the branch 51. Within the casing 54 a third nozzle 63, larger than the nozzle 55, is screwed upon the latter to extend concentrically therewith, being provided with lateral water-inlet ports 64, like the ports 56, and centered for its support in a pipe 65 coupled to one end of the T-coupling 54 and leading to a three-way valve 66, of ordinary construction, provided in the pipe 22. This construction of pump affords the two mixing chambers 67 and 68 for steam and water discharging into the pipe 65.

The casing 53 is connected by a pipe-section 70 with a T-coupling 71 containing a thermostat-device, which is preferably substantially the same as that fully shown and described in an analogous situation and for the same purpose in my pending application, Serial Number 379,530, filed June 17, 1907. This thermostat-device is shown in detail in Fig. 16: In a reducer 184 screwed into one end of the T-coupling or casing 71 is screwed the thermostat proper, consisting of a tube 185 closed at one end by a plug 186 and adapted to contain a fluid, such as ether, that will expand and contract under variations in temperature, this tube terminating at its opposite end in a tube 187 containing a reduced bore 188 and ending in a disk-shaped head 189 upon which is secured by a ring-nut 190 screwed upon the disk, a diaphragm 191, to the center of which the bore 188 opens. This end of the thermostat enters the casing of the spring-seated valve-device 77 in which is fulcrumed on the ring 190 an angular lever 193 bearing at one end against the center of the diaphragm and having a threaded vertical opening in its opposite end to receive a screw 194 passing through an opening 195 in the casing, beyond which it carries a dial-finger 196 within the casing 197 of a suitable dial.

To the casing 71 is coupled one end of a pipe 72 containing a thermometer 73 and having its opposite end connected with a three-way valve 74 interposed in the pipe 21 and of the same construction as the valve 66.

A diaphragm-device 75, of the same construction and serving the same purpose as the corresponding device in the aforesaid application, is connected with the outer end of the valve-stem 58, and is shown in detail in Fig. 15 to consist of a casing 178 supported on arms 179 and having its base formed of a flexible diaphragm 180 supported by springs 181 and centrally to which is fastened the stem 58 of the steam-jet pump, whereby reducing the air-pressure against the upper side of the diaphragm raises the valve 59. An air-pressure pipe 76 leads to the diaphragm-device from an incased spring-seated valve-device, indicated at 77, for controlling, under the action of the thermostat-device, the supply of air-pressure through a pipe 69 (Fig. 4) to the diaphragm-device; this spring-seated valve being regulable from an indicator connected with a lever fulcrumed to engage with another diaphragm-device in the casing, into which last-named device the thermostatic-fluid expands. The incased spring-seated valve-device thus referred to is shown in detail in its connection with the thermostat-device in Fig. 16, and it involves the following-described construction: Within the casing 77 the air-supply pipe 69 and air-conducting pipe 76 leading to the diaphragm device are coupled together by a head 198 having a bracket-extension 199, at which it is screwed to an inner wall of the casing. This head contains a valve-chamber 200 housing a ball-valve 201 supported on a spring 202 in the passage leading from the end of the pipe 69 in the head, and a plunger-rod 203, passing through a relatively wide bore 204 in a plug 205 screwed into the upper end of the head, bears at one end against the ball-valve and coincides at its opposite end with the screw 194. By means of the thermostat-device, when water passing through the pipe 70 attains a certain predetermined temperature, the heat, by expanding the fluid in the tube 185, causes it to raise the diaphragm 191, thereby actuating the lever 93 to depress the screw 194 against the plunger 203 and open the valve 201. Thus opening the valve admits air-pressure from the pipe 69 to the pipe 76 through which it acts against the diaphragm 180 to depress the rod 58 and seat the valve 59, thereby shutting off the steam-supply for heating the water until the water in the pipe 70 is properly lowered in temperature to contract the thermostat-fluid and permit consequent lowering of the diaphragm 191 to be followed by the contacting end of the lever 193 under the recoil-action of the spring 202 to raise the ball-valve against its seat and shut off the air-supply to the pipe 76. Thereupon the air under pressure against the diaphragm 180 escapes by way of the pipe 76 through the opening 204 about the plunger 203 working in the plug 205, and discharges through a vent-opening 206 in the casing 77, with the result that the springs 181 are freed to restore the diaphragm 180 to its normal position of opening the valve 59 for resuming the flow of steam. By screwing the adjusting-screw 194 into the lever 193 to raise the adjacent end thereof, the opposite end of the lever is pressed against the diaphragm 191 to adapt it to turn the lever under a lesser force of expansion of the thermostat-fluid and thus to shut off the steam-supply at a lower temperature of the water in the pipe 70; and by turning the screw in the opposite direction, a higher temperature of the thermostat-fluid will be required to effect opening of the valve 201. The dial-device 197 may be set for shutting off the steam at any desired temperature by removing the cover with which it is shown to be provided (and which should be transparent) to permit access to the finger 196 for turning its work the screw 194 and for setting the finger with relation to a suitable gage (not shown) marked on the dial over which the finger moves to indicate the predetermined pressure for the run of the apparatus.

A water-pipe 78 connects the two tanks at one end near their bases; and the tanks are provided below their tops, on opposite ends, respectively, with overflow-pipes 79 and 80, leading preferably to a sewer.

For circulating the water in the tanks through them, a pump is provided preferably in the form of a steam-jet pump 81, shown in detail in Fig. 7, and involving the following-described construction: A T-shaped casing 82 has its horizontal branch connected with a pipe 83 leading out of the tank 15 near its top below the overflow-level, at the end opposite that at which the heating-pump 53 is provided. Into one end of this casing is screwed a tapering nozzle 84 containing lateral ports 85 and having screwed upon it within the casing a nozzle 86 containing lateral ports 87. A third nozzle 88 containing lateral ports 89 is screwed within the casing upon the nozzle 86 and is supported, to centralize it with the nozzles behind it, in a tube 90 screwed into the opposite end of the casing. Still another nozzle 91 is screwed into the outer end of the nozzle 84 to centralize it therewith and has screwed into its outer end a tapering bearing 92 for a needle-valve 93 having its stem 94, which works through a stuffing-box 95, pivotally connected at its outer end with a lever 96 fulcrumed at one end on a frame 97, presenting a segmental section 98 on its upper side, with which the handle-end of the lever is adapted to be releasably engaged for setting the needle-valve to control the admission into the pump of live steam, the nozzle 91 which enters through a pipe 99 extending from a suitable steam-supply (not shown). The nozzles thus described form mixing chambers 100, 101 and 102 for the steam with the water which enters the casing through the pipe 83. The pipe 90 communicates with the end of the tank 16 at a point corresponding to the connection of the pipe 83 with the tank 15; and this pipe 90 is surrounded by a water-jacket 103, plugged at its opposite ends about the pipe, and through which cold water is circulated from any suitable source through an inlet-pipe 104 and a discharge-pipe 105.

The operation is as follows, particular reference being had for elucidating the explanation to the diagrammatic representation in Fig. 1: All the compartments are filled, to the heights of the overflows from the tanks, with cold water through the pipe 19 and its branches by opening the valves 20 in the latter. When so filled, the contents of a desired number of the compartments are heated to the required pasteurizing temperature by opening the valves 23 on those compartments to the positions represented in Figs. 11 and 12, and starting the action of the jet-pump 53 by admitting steam into it on opening the valve 52. It may be supposed that the contents of the compartments numbered from 1 to 5, inclusive, in the tank 15 are to be thus initially heated, though the number will vary according to the length of time during which it is desired to maintain the beer to be pasteurized under subjection to the pasteurizing temperature, as will be more fully explained hereinafter. The action of the steam-jet in the heating pump 53 sucks the water from the upper portions of the five compartments through the ports 47 into the upper sections of the valve-plugs of the respective valves 23, whence it discharges into the pipe 21, wherein the three-way valve 74 has been opened to permit the flow, as has also the three-way valve 66 in the pipe 22. The valve 74 is so opened as to direct the flow from the pipe 21 through the pipe 72, past the thermostat-device 71 into the heater 53, whence it passes through the pipe 65 into the pipe 22 with the valve 66 therein so turned as to continue the flow in the pipe 22 in the opposite direction to that in the pipe 21, the suction being in the opposite direction to the discharge. In passing through the pump 53, the water and steam become throughly mixed in the mixing-chambers 67 and 68 in a manner to prevent stratification of the heat and produce uniform distribution thereof throughout the water, which enters the same compartments at their bases through the pipes 48 and lower sections of the respective valves 23. This heating circulation is maintained from and to the respective tanks through the endless pipes 21 and 22, and through the by-pass chambers 32 and 37 of the closed valves 23 in said pipes, until the contents of the five tanks are heated to the pasteurizing temperature. Thereafter this hot water is circulated throughout the series of compartments to supplant the cold water in each with the hot water from the initially heated tanks. This is done by any suitable pump, but preferably the steam-jet pump shown in Fig. 7, on opening its valve 93 to admit the passage of live steam through the pump for producing its operation in sucking the water through the pipe 83 from the narrow space in the adjacent end of the tank 15 produced by the respective end-partition therein, and discharging it into the corresponding space formed by the end-partition in the adjacent end of the tank 16 through the pipe 90. In this way a constant flow of the water in both tanks is maintained and the provision of the narrow spaces afforded by the end-partitions in the tanks assures circulation through the end-compartments, the contents of which would otherwise not discharge, but would tend to remain dormant. The partitions forming the compartments, by their alternating arrangement afford a serpentine course through the tanks for the water, to cause its circulation.

The described construction of the pump 81 renders it adequately powerful for its circulating work on the large body of water to be circulated, the plurality and arrangement of nozzles in the pump adapting it to circulate the water with the minimum consumption of steam. When the lever 96 is once set to set the valve 93 for a given apparatus and for a given period of time for completing the circulation, it need not thereafter be disturbed unless the discharge-opening in the nozzle 91 should become clogged, when, by working the lever back and forth, the valve will dislodge the material which causes the choking. It is not desired, though it can not be avoided because of the necessary use of steam for operating the pump 81, to heat the water pumped by it; and to counteract the slight heating effect of the steam, the water-jacket 103 is provided.

With the contents of the first five compartments heated, as described, a gauntree 106, of any suitable construction, shown of double form to extend across both tanks and travel on tracks 107 provided to extend along the tops of their outer sides, is brought into use. The gauntree is designed to elevate into it bottle-racks 108, which may be stored in the tank-compartments, one in each, and to lower a rack into a compartment, loaded with beer to be pasteurized in bottles 109 contained in baskets 110 fitting the racks. The gauntree is first moved, with the particular arrangement of compartments shown and described, over the compartment 8, into which a rack of the bottles is lowered. This is done before the circulating pump 81 is started. Thereafter, the circulation of the water during a period of about seven and one-half minutes will have introduced the water into the compartment 6 at a temperature somewhat below 140° F., that in the compartment 7 at a lower temperature, and that in the compartment 8 at a temperature at which it is safe to immerse the bottles without danger of fracturing them. At the end of the aforesaid period, during which the compartment 9 is filled with cold beer, by the use of the gauntree, the valve 23 of compartment 1 is closed and that of compartment 6 is opened to circulate its contents from that compartment through the heating pump 53 and back into the same compartment, thereby to raise its contents to the pasteurizing temperature. The continued circulation of the water by the action of the pump 81 will transfer the contents of the compartment 6 into compartment 7, that in compartment 7 into compartment 8, and so on, thereby subjecting the bottles in the latter to a higher temperature. This consumes another period of about seven and one-half minutes, during which compartment 10 is filled with cold beer, when the valve 23 of compartment 2 is closed and that of compartment 7 is opened. The contents of the compartment 7 are thus circulated and heated by the pump 53. This procedure of closing a valve 23 of one compartment and opening that of another compartment is continued with the effect of gradually raising the temperature of the water in each compartment in succession, supplying heat by the action of the pump 53 to compensate for the loss through radiation and introducing the cold bottles, for heating the contents of each compartment in succession to the pasteurizing temperature, at which it is maintained for a period of about thirty minutes, until all of the compartments have been filled with bottles; after which, in the continuation of the working of the apparatus, a rack of bottles containing pasteurized beer will be taken by the gauntree out of one compartment (namely that numbered 8), which will thereupon be immediately refilled with a rack of cold bottles to be pasteurized by gradually raising the temperature of the water in that compartment in the manner already described. Thereafter the procedure is repeated of closing a valve 23 in one compartment and opening the similar valve in the compartment three-removed therefrom, and during the period of seven and one-half minutes consumed in completely changing the water from each compartment into another, taking out a rack of the bottles that has been finished, as to pasteurizing, and introducing into that compartment another rack of cold bottles.

The three-way valves 66 and 74 serve a peculiar purpose which is of importance because of the lack of uniformity of the flow of water through the heating pump out of the compartments. That is to say, in initially heating the first five compartments, with the three-way valves turned to the position described, the greater flow and return of water will be from and to the compartment 5, with less from the compartment 4, still less from the compartment 3, and so on to the first compartment, whereby when the temperature in the compartment 5 shall have reached 140° F. or the pasteurizing temperature, that in each preceding compartment will be lower, say to the extent of 5°, than the temperature in the next adjacent compartment in advance of it; whereas it is necessary that the same temperature (140° F.) shall be provided throughout all of the five compartments. When, therefore, the maximum temperature has been attained in the tank number 5, the three-way valves are turned to the opposite position, or that of changing the direction of flow to and from the heater, whereby the greater proportion of flow is from and to the compartment 1, decreasing gradually to compartment 5. In this way provision is made for equalizing the temperature in the five tanks. When the temperature in the five tanks has been thus equalized, the three-way valves are turned back to the original position. Moreover, by providing these three-way valves they enable the water being heated to pass through each in opposite directions in pipes 21 and 22, which is sometimes desirable.

When it is desired to expedite heating the contents of the first five compartments, this may be accomplished by opening the valve 50 to introduce live steam into the water discharging from the heater 53 through the pipe 22, to supplement the action of the heater.

In an apparatus employing the fourteen compartments shown and described, it requires about one hour and forty-five minutes, after heating up the contents of the first five tanks, to complete the circuit of pasteurization in each compartment. Thus, the beer will be subjected to the pasteurizing temperature in each compartment for a period of about thirty seven and one-half minutes, during twelve and one-half of which the pasteurizing heat will have penetrated and be maintained in the center of the beer in the bottles. Where it is desired, or the material treated requires that it be subjected to the pasteurizing temperature during a period of only five minutes, or thereabout, the initial heating may be confined to four tanks, since it requires only four times seven and one-half minutes, or thirty minutes, for the heated contents of the four compartments to pass the compartment filled with beer to be pasteurized as against five times seven and one-half, or thirty seven and one-half minutes so to pass the heated contents of five compartments. For the same reason, where the material to be pasteurized requires subjection to the pasteurizing temperature during a period of, say, twenty minutes, the contents of six compartments require to be initially heated since it will take the contents of these compartments six times seven and one-half minutes, or forty-five minutes to pass the compartment in which pasteurization is taking place, thereby affording twenty-five minutes for heating up the bottles and twenty minutes for maintaining that heat in the center of the beer.

As will be understood, the two tanks 15 and 16 are, practically, one, the two shown being provided as a mere matter of preference, for convenience in erection and installation. It will also be understood that while fourteen compartments are herein shown and described, the number may vary according to the capacity required and purpose of the apparatus; and that the initial heating of the water to the pasteurizing temperature may be confined to any desired number of the compartments, according to the capacity of the tank and the time required for completing the circuit of the water therethrough.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a pasteurizing apparatus, the combination with a series of compartments for the pasteurizing liquid, forming a sinuous course for said liquid, an outlet and inlet pipe for each compartment in circuit therewith, a heating pump in said circuit and a circulating pump communicating at its suction and discharge sides, respectively, with the end compartments.

2. In a pasteurizing apparatus, the combination with a series of compartments for the pasteurizing liquid, forming a sinuous course for said liquid, an outlet and inlet pipe for each compartment in circuit therewith, a heating pump controllably communicating with all of said circuits, valves for controlling said communication, and a circulating pump communicating at its suction and discharge sides, respectively, with the end compartments.

3. In a pasteurizing apparatus, the combination with a tank for the pasteurizing liquid containing alternating partitions, forming compartments and a sinuous course through them for said liquid, an outlet and inlet pipe for each compartment in circuit therewith, a heating pump in said circuit and a circulating pump communicating at its suction and discharge sides, respectively, with the end compartments.

4. In a pasteurizing apparatus, the combination with a tank for the pasteurizing liquid, of alternating partitions in said tank forming compartments therein and a sinuous course through them for the liquid, the end partitions forming with the tank-walls relatively narrow spaces, an outlet and an inlet pipe for each compartment in circuit therewith, a heating pump for the liquid communicating with each circuit, a valve for controlling the communication, and a circulating pump communicating at its suction and discharge ends, respectively, with said relatively narrow spaces in the tank ends.

5. In a pasteurizing apparatus, the combination with a series of compartments for the pasteurizing liquid forming a sinuous course for the liquid, of a pair of pipes extending about said compartments, a heating pump communicating with said pipes, valve devices, one for each compartment, connected with both said pipes, outlet and inlet pipes for each compartment in circuit therewith and communicating through said valve device, and a circulating pump communicating at its suction and discharge sides, with the end compartments.

6. In a pasteurizing apparatus, the combination with a series of compartments for the pasteurizing liquid forming a sinuous course for the liquid, of a pair of pipes extending about said compartments, a heating pump communicating with said pipes, valve devices, a three-way valve in each of said pipes, and a circulating pump communicating at its suction and discharge sides, respectively, with the end compartments.

7. In a pasteurizing apparatus, the combination with a series of compartments for the pasteurizing liquid forming a sinuous course for said liquid, outlet and inlet pipes for each compartment in circuit therewith, a valve for each circuit, a steam-jet heating pump for the liquid controllably communicating with each compartment through its valve, a valved steam-supply pipe leading to said pump, and a circulating pump communicating at its suction and discharge sides, respectively, with the end compartments.

8. In a pasteurizing apparatus, the combination with a series of compartments for the pasteurizing liquid, a pair of pipes extending about said compartments, a steam-jet pipe communicating with said pipes, a steam-supply pipe leading to said pump, valve devices, one for each compartment connected with both said pipes, outlet and inlet pipes for each compartment connected to said valve-devices and in circuit with said compartments, whereby the communication between the pump and each compartment is controlled, and a circulating pump communicating at its suction and discharge sides, with the end compartments.

9. In a pasteurizing apparatus, the combination with a series of compartments for the pasteurizing liquid, an inlet and outlet pipe for each compartment in circuit therewith, a valve in said circuit, a steam-jet heating pump for the liquid in said circuit, said pump consisting of a casing containing a plurality of nozzles forming intercommunicating mixing chambers, and a regulable steam-inlet valve in the end-nozzle, a steam-supply pipe leading to said pump, and a circulating pump communicating at its suction and discharge sides, respectively, with the end-compartments.

10. In a pasteurizing apparatus, the combination with a series of compartments for

the pasteurizing liquid forming a sinuous course for the liquid, a pair of pipes extending about said compartments, a heating pump communicating with said pipes, an outlet and inlet pipe for each compartment in circuit therewith, valve devices for each compartment in said circuit and connecting said circuit to said pair of pipes, and means communicating with the end compartments to cause a circulation through all said compartments.

11. In a pasteurizing apparatus, the combination of a series of compartments for the pasteurizing liquid, forming a sinuous course for the liquid, a pair of pipes extending about said compartments, a heating pump communicating with said pipes, valve-devices, one for each compartment, each consisting of a casing containing a by-pass chamber provided with ports and divided into an upper section and a lower section, and a rotary plug-valve in the casing provided with ports and formed with an upper section and a lower section communicating, respectively, with a compartment at the upper and lower portions thereof, the casing extending through both said pipes, and a circulating pump communicating at its suction and discharge sides, respectively, with the end-compartments, for the purpose set forth.

12. In a pasteurizing apparatus, the combination of a series of compartments for the pasteurizing liquid, forming a sinuous course for the liquid, a pair of pipes extending about said compartments, a heating pump communicating with said pipes, valve - devices, one for each compartment, each consisting of a casing provided with outer and inner walls forming a by-pass chamber and having ports, with a partition dividing said chamber into an upper section and a lower section, and a rotary plug-valve in said casing provided with ports and formed with an upper section and a lower section communicating, respectively, with a compartment at the upper and lower portions thereof, the casing extending through both said pipes, and a circulating pump communicating at its suction and discharge sides, respectively, with the end-compartments, for the purpose set forth.

13. In a pasteuring apparatus, the combination of a series of compartments for the pasteurizing liquid, forming a sinuous course for the liquid, a pair of pipes extending about said compartments, a heating pump communicating with said pipes, valve-devices, one for each compartment, each consisting of a casing interposed in both said pipes and containing a by-pass chamber extending part way about the casing with a partition dividing said chamber into an upper section and a lower section with ports forming passages through the chamber, and a rotary plug-valve in said casing provided with ports and containing a partition forming an upper section and a lower section communicating, respectively, with a compartment at the upper and lower portions thereof, and a circulating pump communicating at its suction and discharge sides, respectively, with the end-compartments, for the purpose set forth.

14. In a pasteurizing apparatus, the combination with a series of compartments for the pasteurizing liquid, of means for causing the liquid to circulate successively through said series, an outlet and inlet pipe for each compartment in circuit therewith, and means connected to said outlet and inlet pipe for causing a circulation therethrough and for changing the temperature of the liquid.

JOHN T. H. PAUL.

In presence of—
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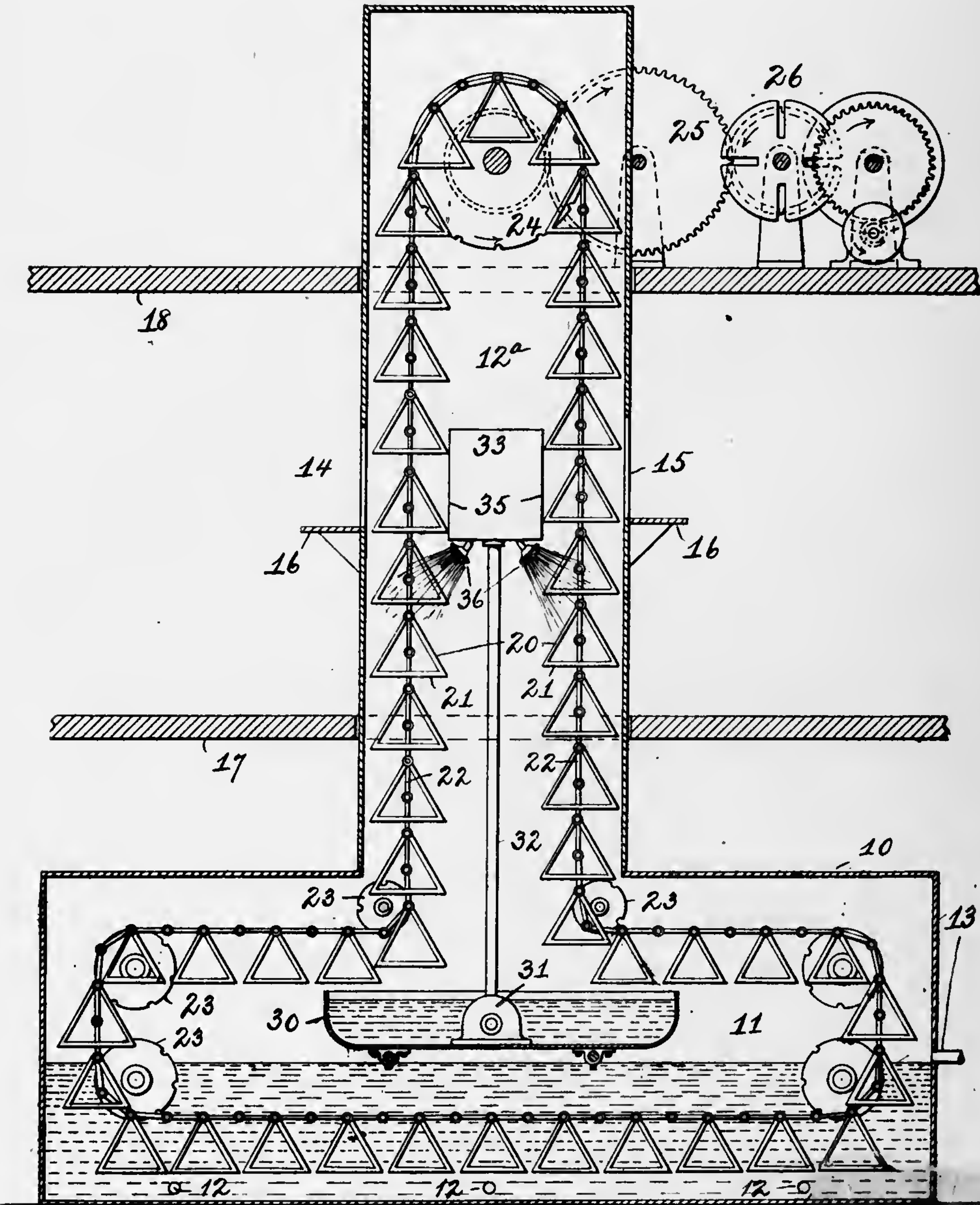
PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 27, 1907.

902,826. Patented Nov. 3, 1908.



Attest:
May Hughes
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Charles H Loew, Inventor:
by William R Baird
his Atty.

UNITED STATES PATENT OFFICE.

CHARLES H. LOEW, OF LAKEWOOD, OHIO.

PASTEURIZING APPARATUS.

No. 902,826. **Specification of Letters Patent.** **Patented Nov. 3, 1908.**

Application filed June 27, 1907. Serial No. 381,022.

To all whom it may concern:

Be it known that I, CHARLES H. LOEW, a citizen of the United States, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

My invention relates to a pasteurizing apparatus and more particularly to an apparatus designed to be employed in the pasteurization of beer in bottles, and its novelty consists in the construction and adaptation of the parts as will be more fully hereinafter pointed out.

In the drawing there is represented somewhat in diagrammatic form a vertical medial section and partial side elevation of a pasteurizer embodying my invention.

In the drawings 10 is a tank made of steel, iron, or other suitable material, and divided into two portions, namely, a lower portion 11 comprising a pasteurizing chamber and an upper portion 12ª comprising what I call an interchanging chamber, for the reasons hereinafter set forth. The pasteurizing chamber is supplied with suitable inlet ports indicated at 12 for the admission of steam or hot water thereto and with an overflow port indicated at 13, so that the water introduced into the chamber cannot rise above a certain level. It will be noted that the chamber 11 has no communication with the outer air.

The interchanging chamber 12ª is arranged immediately above the pasteurizing chamber over which it is centrally placed. It is closed at the top and is provided laterally with an opening 14 for the reception of the bottles to be pasteurized and a similar opening 15 on the other side for the discharge of the bottles after they have been pasteurized.

16, 16, indicate shelves projecting from the side walls of the interchanging chamber for the convenience of the workmen in resting the bottle boxes thereon.

17 indicates a flooring and 18 a ceiling for a room in which the bottles are received and discharged from the apparatus, the pasteurizing chamber 11 being placed beneath the floor and the driving mechanism for the conveyer (hereinafter referred to) being placed above the ceiling or on the floor of the story above.

Centrally arranged within the apparatus is an endless conveyer 20 made of any usual construction and comprising holders or receptacles 21 flexibly connected to chains 22 of which the conveyer is in part formed, so that the receptacles 21 maintain by gravity substantially the same relative position in their travel through the apparatus. This conveyer is suitably supported upon roller supports 23 placed at proper intervals throughout the apparatus and is propelled by a sprocket wheel 24, or other suitable device receiving power from a train of gearing 25 and which train of gearing includes a Geneva wheel 26 whereby an intermittent motion is imparted to the conveyer.

Arranged within the pasteurizing chamber and above the water level thereof is a shallow tank or water collector 30 within which is placed a centrifugal pump 31, or other suitable form of water lifting device, and which is connected by a pipe 32 to a reservoir 33 placed within the conveyer 20 and practically opposite the receiving and discharging apertures 14 and 15. The reservoir is provided with substantially vertical walls 35 and the receptacles 21 of the endless conveyer 20 as they pass by such walls may touch the same if they are swung upon the pivots upon which they are hung by the chains 20 so that these walls serve as a guard to prevent any displacement of the receptacles which would render it difficult or inconvenient to place the bottle boxes thereon or take them therefrom. A sprinkling device 36 of usual form is secured to the reservoir 33 and receiving the water therefrom is adapted to spray it downwardly upon the bottle receptacles as they pass by the same.

In using this apparatus the chamber 11 is first filled with water up to the level controlled by the position of the outlet pipe 13 and this water may either be preheated in a separate receptacle or may be heated by the admission of steam through the pipes 12. Whichever method is employed it should be heated to a pasteurizing temperature sufficient to kill the germs in the beer or other liquid in the receptacles intended to be passed through the same. Water is then placed in the collector 30. This water is preferably of a temperature intermediate that of the water in the pasteurizing chamber 11 and the outer air. The conveyer 20 is then started and the pump 31 is similarly started. The workmen then place the boxes containing the bottles of beer to be pasteurized upon the receptacles 21 as they pass the receiving aperture 14 and as such bottles are gradually brought past the sprinkling device 36 they are subjected to the action of a spray of water derived from the water collector 30 and which water is warmer than the outer air with which they have previously been brought into contact and is cooler than the water in the pasteurizing chamber 11. As the receptacles 20 pass downward the bottles are subjected to a constantly increasing heat derived from the vapors arising from the hot water in the chamber 11 until finally they pass into the water bath at the bottom of that chamber at a temperature substantially identical therewith. As the receptacles 20 emerge from the water bath and pass upward into the interchanging chamber they part with a portion of their heat and finally when they reach a proper location they are subjected to the action of the spraying device 36 which cools them to the temperature of the water contained in the collector 30 or a little below that temperature and they are then in a condition to be removed from the apparatus without danger of breaking when brought into contact with the temperature of the outer air.

It will be noted that my apparatus is simple in construction. It comprises few parts and those made of common standard materials. It involves the use of but one pasteurizing chamber and it employs the heat radiated from the surface of the water in that pasteurizing chamber to raise the temperature of the water in the sprinkling device, so that the modifications of temperature of the bottles may be accomplished slowly and gradually and without danger of their breaking. It will be noted also that there are no valves or trap doors in the apparatus and very little loss of heat from direct radiation by its use, and that by means of the construction described, I subject the liquids to be pasteurized to the action of heating and cooling mediums of different temperatures with respect to such liquids but all of which different temperatures are derived from the same source of heat and without any loss.

What I claim as new is:—

1. A pasteurizing apparatus, comprising a pasteurizing chamber, an interchanging chamber directly above the same and open to receive heated vapors therefrom, a spraying device located in said interchanging chamber, a water collector located within the pasteurizing chamber above and close to the water line and adapted to receive the water discharged from the spraying device so that it may be heated while in the collector from the heat in the pasteurizing chamber and means for forcing the water from the water collector to the spraying device.

2. A pasteurizing apparatus, comprising a pasteurizing chamber, an interchanging chamber directly above the same and open to receive heated vapors therefrom, a spraying device located in said interchanging chamber, a water collector located within the pasteurizing chamber above and close to the water line and adapted to receive the water discharged from the spraying device so that it may be heated while in the collector from the heat in the pasteurizing chamber and means for forcing the water from the water collector to the spraying device, and an endless conveyer adapted to pass through both chambers and past the spraying device.

3. A pasteurizing apparatus, comprising a pasteurizing chamber, an interchanging chamber, an endless conveyer provided with receptacles moving up one side and down the other side of the interchanging chamber and a spraying reservoir, centrally located in the interchanging chamber, the walls of which serve as guards to prevent the displacement of said receptacles as they pass by the same.

4. A pasteurizing apparatus, comprising a pasteurizing chamber, an interchanging chamber, an endless conveyer provided with receptacles moving up one side and down the other side of the chamber, and a spraying reservoir, centrally located in the chamber, the walls of which serve as a guard to prevent the displacement of said receptacles as they pass by the same, and means for supplying the reservoir with water.

5. A pasteurizing apparatus, comprising a pasteurizing chamber, an interchanging chamber, an endless conveyer provided with receptacles moving up one side and down the other side of the interchanging chamber, a spraying reservoir, the walls of which serve as guards to prevent the displacement of said receptacles as they pass the same, means for supplying the reservoir with water, and means for heating the water to a temperature intermediate that of the pasteurizing and interchanging chambers.

6. A pasteurizing apparatus, comprising a pasteurizing chamber, an interchanging chamber, an endless conveyer provided with receptacles moving up one side and down the other side of the chamber, a spraying reservoir centrally located in the chamber, the walls of which serve as guards to prevent the displacement of said receptacles as they pass the same, means for supplying the reservoir with water and means for heating the water to a temperature intermediate that of the pasteurizing and interchanging chambers, the last mentioned means consisting of a water collector within the pasteurizing chamber adapted to receive heat therefrom.

7. A pasteurizing apparatus, comprising a pasteurizing chamber, an interchanging chamber directly above the same and open to receive heated vapors therefrom, an endless conveyer provided with receptacles moving up one side and down the other side of the interchanging chamber and adapted to pass

through both chambers, receiving and discharging openings at suitable places in the walls of the interchanging chamber, and a spraying reservoir between the upward and downward moving portions of the conveyer near said openings, the walls of said reservoir being adapted to serve as guards to prevent the displacement of the receptacles.

8. A pasteurizing chamber, means for supplying hot water thereto, a water collector placed near the heated water in the pasteurizing chamber to receive the heat radiated therefrom, a reservoir, means for causing water to flow from the said collector to the reservoir, a sprinkling device connected to the reservoir and means for carrying the packages to be pasteurized past one side of said sprinkling device through the pasteurizing chamber and back again past the sprinkling device.

9. A pasteurizing chamber adapted to contain hot water, a water collector placed near the water level within said pasteurizing chamber to receive the radiated heat, a sprinkling mechanism, means for forcing the water heated in the collector to said sprinkling mechanism and means for carrying the packages to be pasteurized from the sprinkling device through the pasteurizing chamber on one side of the sprinkling device and back again on the opposite side thereof.

10. In a pasteurizer, containing a pasteurizing chamber adapted to contain hot water, a water collector placed therein near the water level thereof to receive the heat therefrom, a sprinkling mechanism in the interchanging chamber, means for forcing the water heated in the collector to said mechanism, means for carrying the packages of material to be pasteurized along one side of the sprinkler through the pasteurizer and back along the opposite side of the sprinkler and means for collecting the water falling from the sprinkler and forcing it into the sprinkler again, so that it may be repeatedly used.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES H. LOEW.

Witnesses:

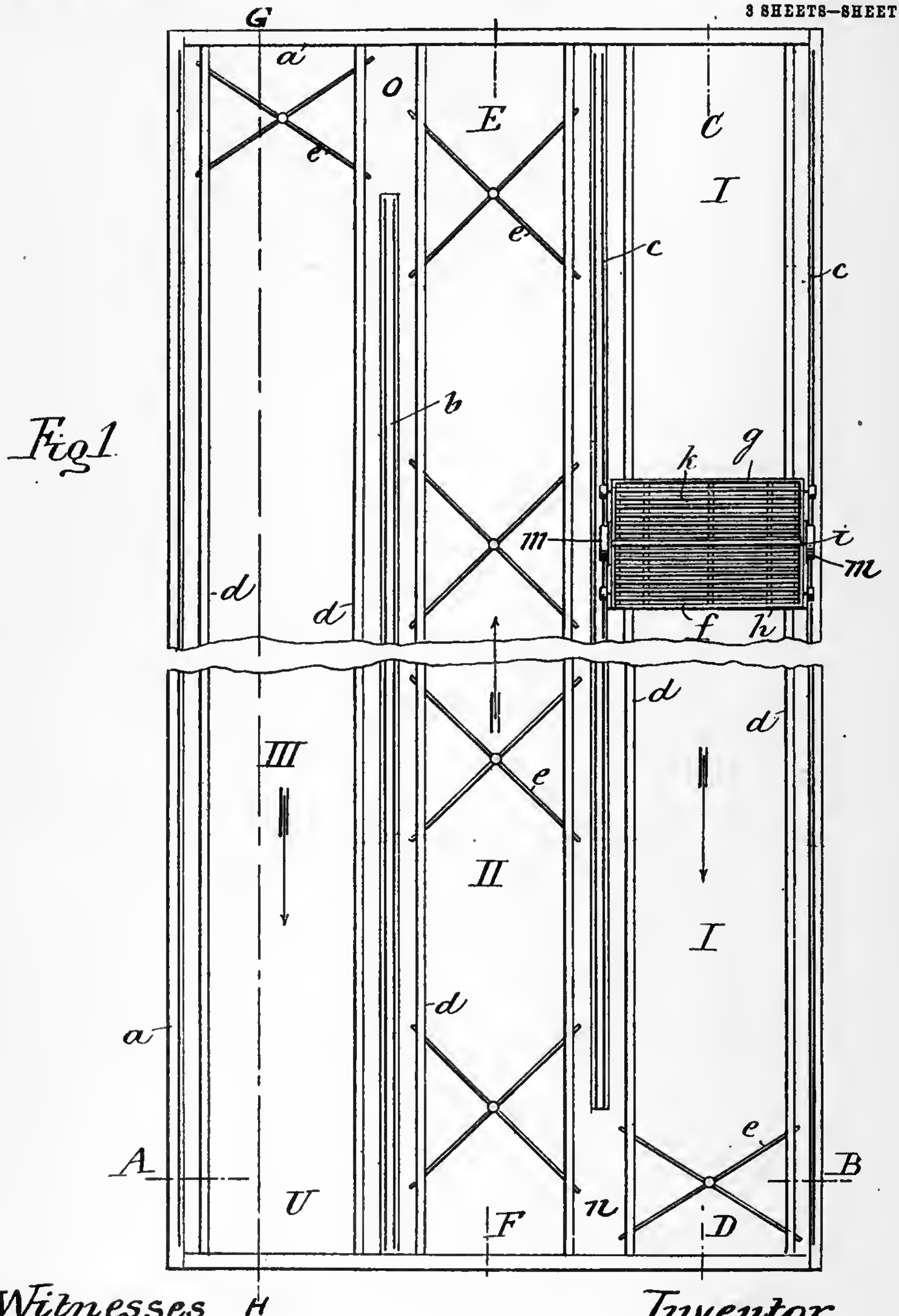
HERMAN MEYER,

ALAN McDONNELL.

A. A. PINDSTOFTE.
PASTEURIZING APPARATUS.
APPLICATION FILED JUNE 1, 1906.

904,986. Patented Nov. 24, 1908.

3 SHEETS—SHEET 1.



Witnesses
P. S. Trmek.
Wm. P. Hammond

Inventor
Anders Andersen Pindstofte
By Knight Bros
Attorneys

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PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 1, 1906.

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3 SHEETS—SHEET 2.

Fig. 2.

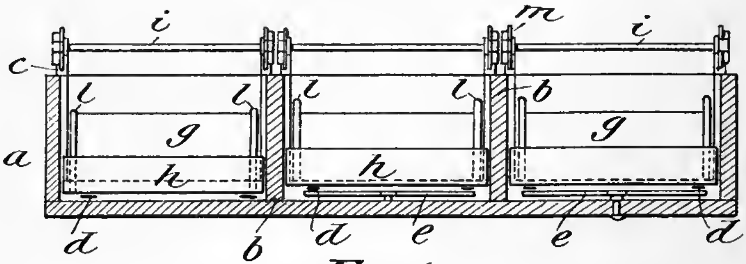
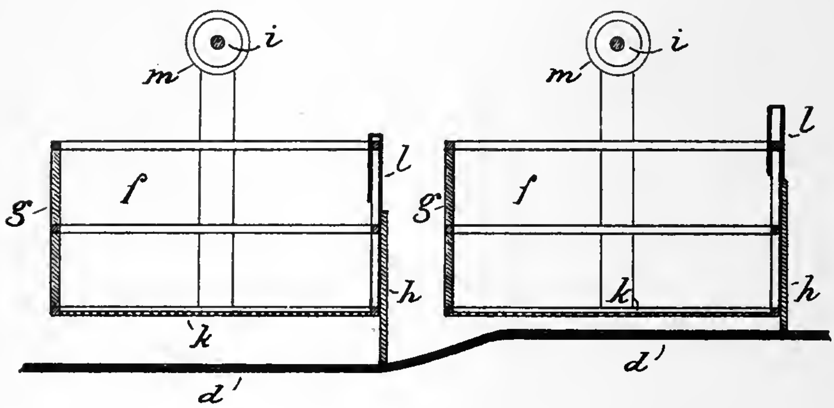


Fig. 6



Witnesses

Herbert H. Knight.
L. Flynn

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per
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Attorneys.

904,986.

A. A. PINDSTOFTE.

PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 1, 1906.

Patented Nov. 24, 1908.

3 SHEETS—SHEET 3.

Fig. 3

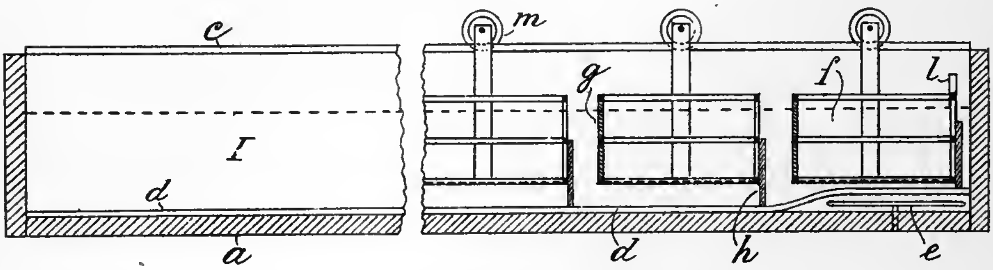


Fig. 4

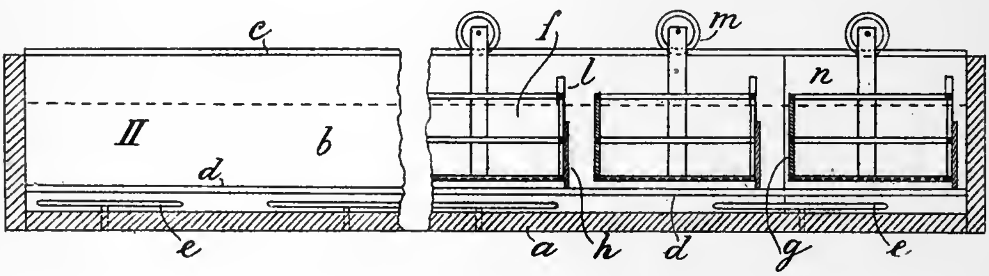
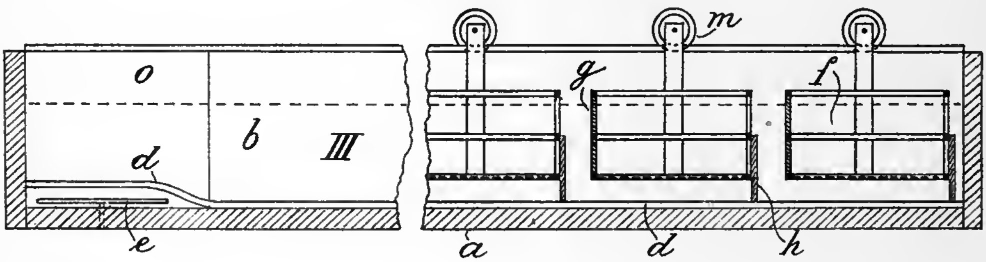


Fig. 5



Witnesses

Clara Hohenstein

E. C. Smith

Inventor

A. A. Pindstofte,

By Knight Bros

Attys.

THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ANDERS ANDERSEN PINDSTOFTE, OF FREDERIKSBERG, DENMARK.

PASTEURIZING APPARATUS.

No. 904,986. **Specification of Letters Patent.** **Patented Nov. 24, 1908.**

Application filed June 1, 1906. Serial No. 319,729.

To all whom it may concern:

Be it known that I, ANDERS ANDERSEN PINDSTOFTE, manufacturer, of Frederiksberg Alle 62, Frederiksberg, near Copenhagen, Denmark, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

The present invention relates to improvements in pasteurizing apparatus of the kind in which the bottles are placed in baskets moved through a water reservoir of suitable dimensions, the bottles being gradually heated in this reservoir to pasteurizing temperature. The water is maintained at pasteurizing temperature as long as required by means of heat supplied to the water by suitable devices, and the bottles afterwards being cooled by means of a cooling medium supplied to the water at a place near the outlet. In such apparatus the pasteurizing fluid is, of course, put into motion when the baskets are pulled or pushed through it, but this motion is not sufficient to cause the warmer water at the top to mix with the colder water at the bottom, and therefore the temperature of the upper water and that of the lower water presents so great differences that a pasteurizing process safe and free of breakage cannot be effected in such apparatus. These drawbacks are obviated in the present invention, the special construction of the baskets producing a perfect mixing of the upper and lower layers of water, during the motion of the baskets, so that the temperature is practically uniform throughout the reservoir.

In the accompanying drawings: Figure 1 is a top view of my improved apparatus showing a single basket. Fig. 2 is a vertical section on line A—B Fig. 1. Fig. 3 is a vertical section on line C—D Fig. 1. Fig. 4 is a vertical section on line E—F Fig. 1, and Fig. 5 a vertical section on line G—H Fig. 1. In Figs. 2 to 5 baskets are shown in all of the compartments. Fig. 6 is a longitudinal vertical section, on a larger scale, through two baskets.

The pasteurizing apparatus consists of a rectangular water reservoir *a*, divided into three compartments by partitions *b*. The bottles are inserted and successively attemperated in compartment I. In compartment II the pasteurization itself is effected, and in compartment III the bottles are cooled from which they are removed. In the three compartments the bottle-baskets move in the direction indicated by the arrows. In the right end of compartment I (Fig. 1) and the left end of compartment III are openings *n* (Figs. 1 and 4) and *o* (Figs. 1 and 5) respectively in the partitions *b* through which the baskets can pass from one compartment to the next.

On the side-walls and partitions *b* of the reservoir *a* are fixed the rails *c* and in the bottom of the reservoir are fixed the bottom-rails *d*, which, in the compartments I and III are placed directly upon the bottom of the reservoir and only elevated at the ends which communicate with compartment II. In the latter the bottom rails are also elevated through the whole length of the compartment so that the heating devices *e*, which supply steam or other heating medium to the water can be arranged below the bottom-rails.

Each basket *f* is of rectangular form and its walls are constructed of slats or bars. One of the end walls *g* (see Fig. 6) is a fixed wall, which extends from the bottom to the top of the basket, while the other consists of a plate *h*, which by means of hooks *l* is suspended on the top of the frame of the basket. The plate *h* rests on the bottom-rails *d* and extends nearly to the mouth of the bottles, that is to a line some distance below the top edge of the basket. In the bottom of the basket is placed a loose grate *k*, on which the bottles are placed and the baskets are supported by rollers *m* upon a shaft *i* fixed to the basket, which rollers run upon the rails *c* so that the baskets may easily be pushed or drawn through the water. The operation of the apparatus is as follows:—

The baskets containing the bottles are inserted in the left end of compartment I (Fig. 1) and moved through the several compartments in the direction of the arrows. The motion of the baskets causes the pasteurizing fluid to move in the opposite direction so that the fluid-current passes over the wall *h* sliding on the bottom-rails and then in over the bottles and down between these through the grate *k* and below the fixed wall *g*, which extends a little above the surface of the water indicated by a broken line in Figs. 3, 4 and 5. It will be obvious that in such a manner the fluid will be thoroughly mixed, so that the bottles in the baskets will be equally heated.

When the baskets pass from compartment

I into compartment II the elevated bottom-rails will lift the loose wall h, so that in compartment II the water heated by the steam or other heating fluid, which is furnished by the heating-devices e, can flow freely underneath the several baskets, while simultaneously the alternating up and down going motion of the water will continue. By this means the temperature in compartment II, will be maintained practically uniform not only at the top and bottom but also throughout the whole compartment. Further the elevated rails prevent the heating devices from damaging the loose walls h.

It is obvious that the invention is not limited to a pasteurizing-apparatus divided into three compartments arranged parallel to each other. Any number of compartments may be employed arranged in any manner which will permit the movement of the basket therethrough to accomplish the desired result.

Having now particularly described and ascertained the nature of the said invention I declare that what I claim is:

1. In an apparatus of the character described, the combination with a water reservoir having means for heating the water, an open bottle-basket movable through said reservoir having its bottom some distance above the bottom of the reservoir and its upper edge a little over the surface of the water, a closed wall fixed to one end of and extending from the bottom to the top of the bottle basket, and a closed vertically movable wall suspended in the opposite end of said bottle-basket and extending from the bottom of the reservoir to some distance below the top of the bottle-basket, and rails fixed to the bottom of the water-reservoir upon which said suspended movable end-wall of the bottle-basket rests during its passage through the reservoir, substantially as and for the purposes set forth.

2. In pasteurizing apparatus, the combination with a water reservoir having heating-devices arranged at the bottom and open bottle baskets movable through said reservoir with their bottom some distance above the bottom of the reservoir and their upper edge a little over the surface of the water of a closed wall fixed to one end of and extending from the bottom to the top of the bottle-basket, and a closed vertically movable wall suspended in the opposite end of the bottle-basket and extending upwards to some distance below the top of the bottle-basket, and rails fixed to the bottom of the water-reservoir but being elevated in that part of it, where the heating-devices are arranged, which rails support the lower edge of the suspended movable end-walls of the bottle-baskets during the passage through the reservoir, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANDERS ANDERSEN PINDSTOFTE.

Witnesses:

MAGNUS JENSEN,

HARAER FROST.

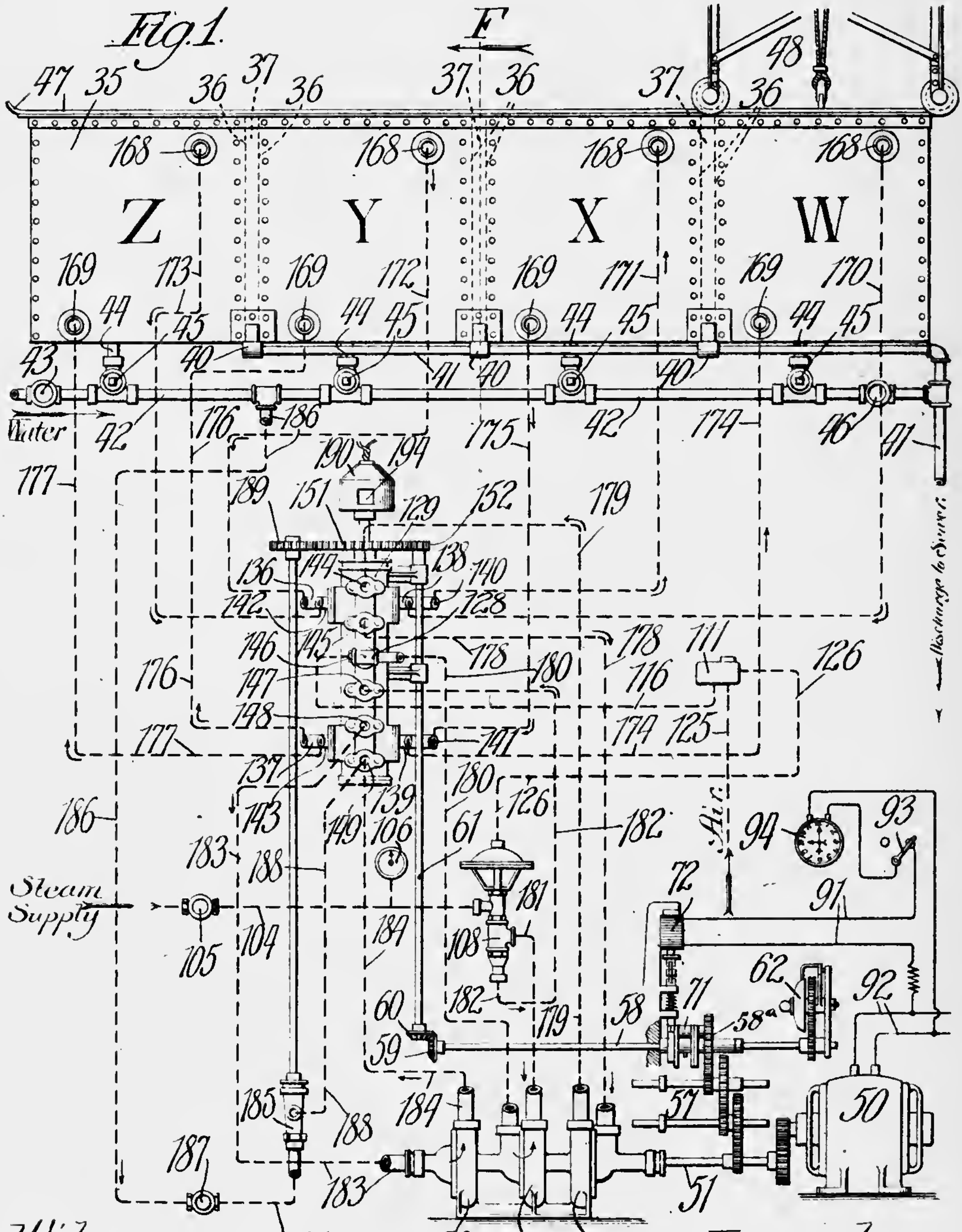
J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED MAR. 13, 1908.

907,639. Patented Dec. 22, 1908.

11 SHEETS—SHEET 1.



Witnesses:
Chas. E. Gaylord,
John Enders.

Inventor:
John T. H. Paul,
By Dyrenforth, Lee, Chritton and Wiles,
Att'ys.

J. T. H. PAUL.
PASTEURIZING APPARATUS.
APPLICATION FILED MAR. 13, 1908.

907,639.

Patented Dec. 22, 1908.
11 SHEETS—SHEET 2.

Fig. 2.

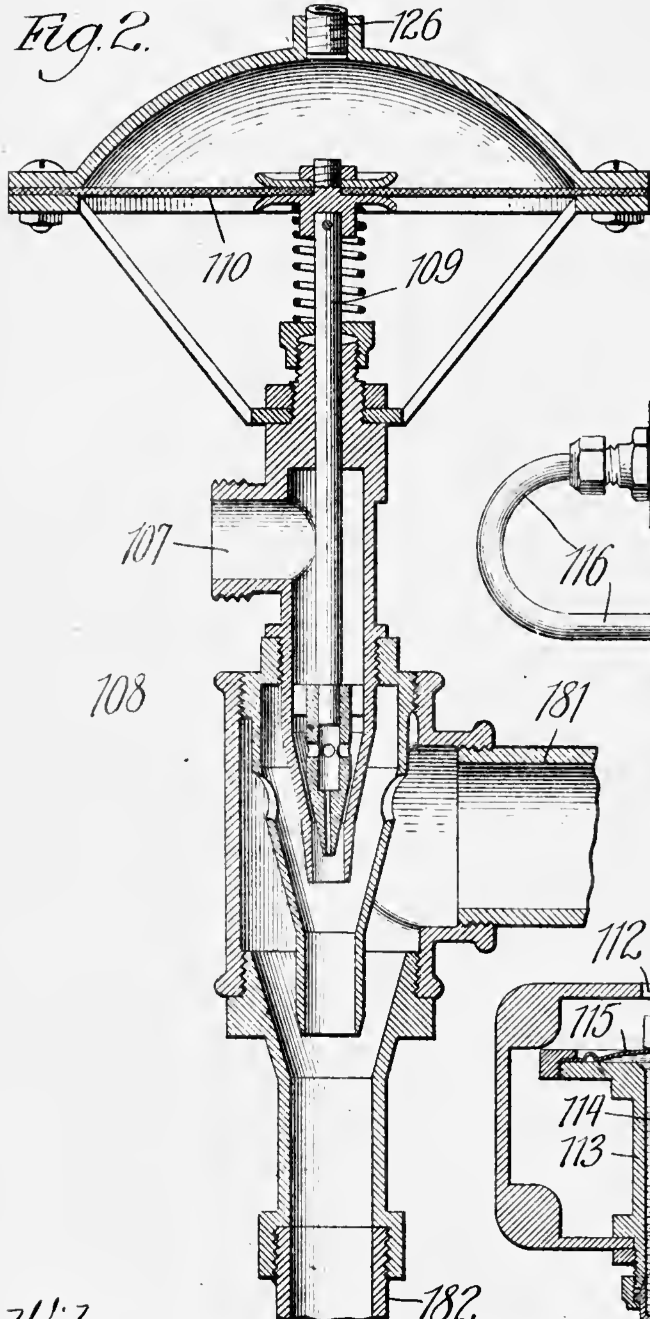


Fig. 3.

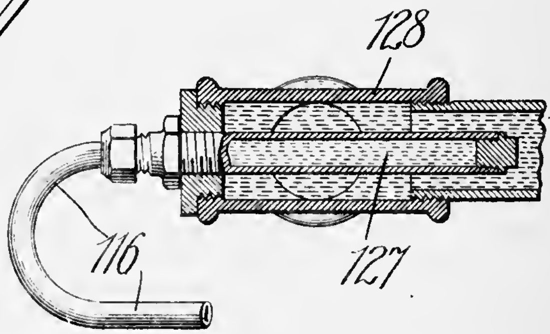
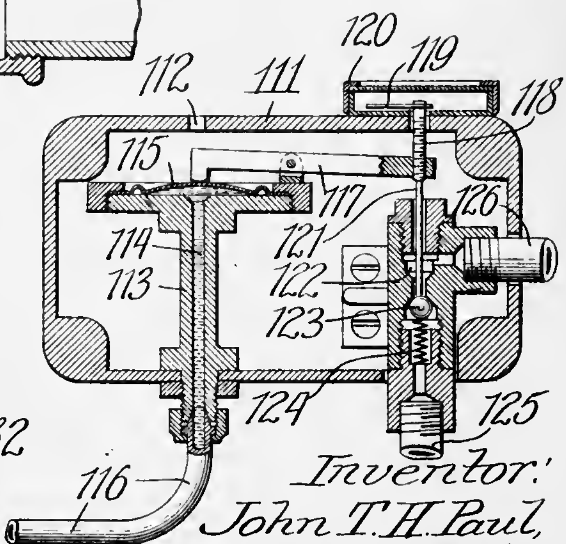


Fig. 4.



Witnesses:
C. E. Gaylord,
John Enders.

Inventor:
John T. H. Paul,
By Dyrenforth, Lee, Chritton and Wiles,
Attys.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

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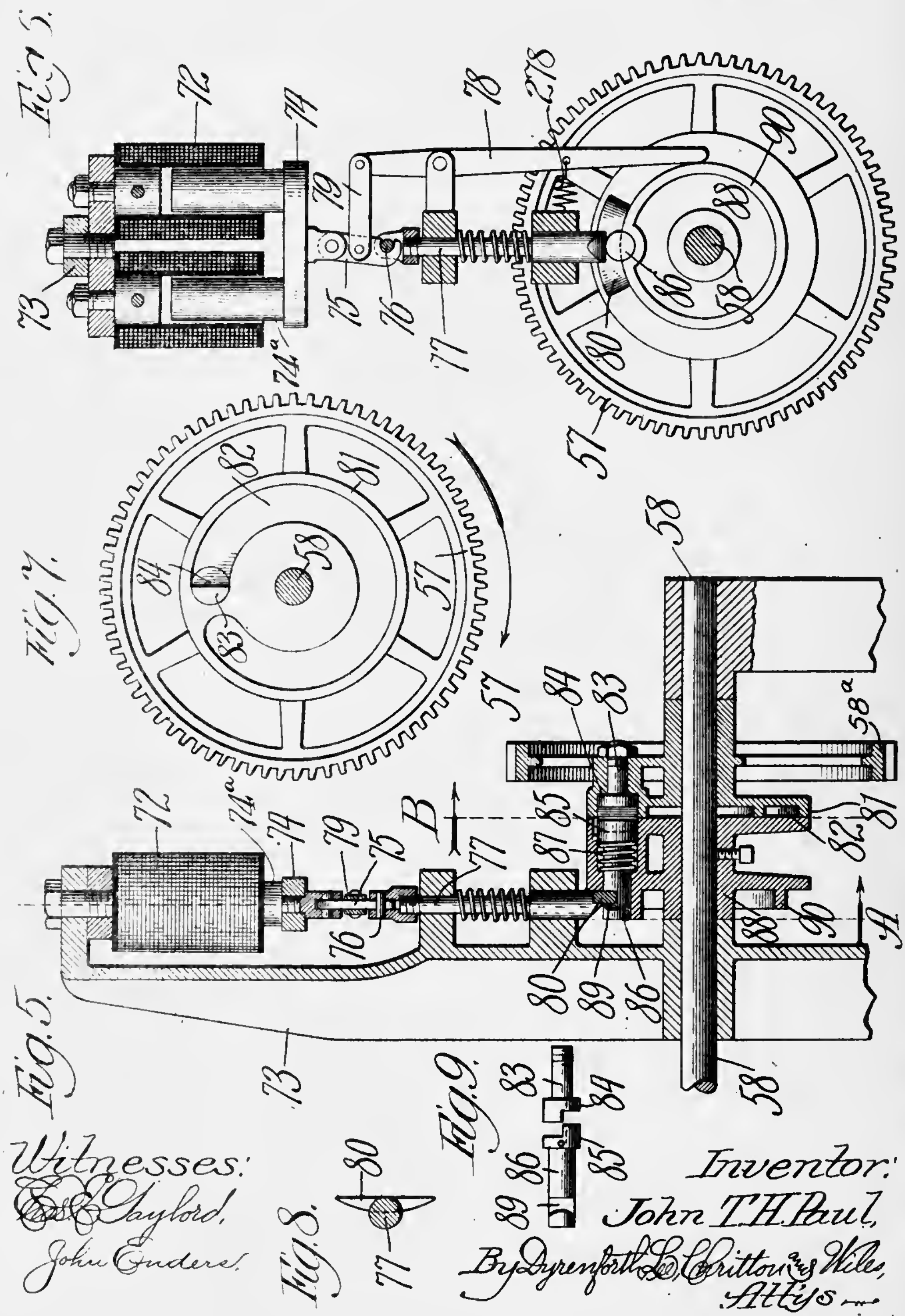
11 SHEETS—SHEET 3.



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Patented Dec. 22, 1908.

11 SHEETS—SHEET 4.

Fig. 10.

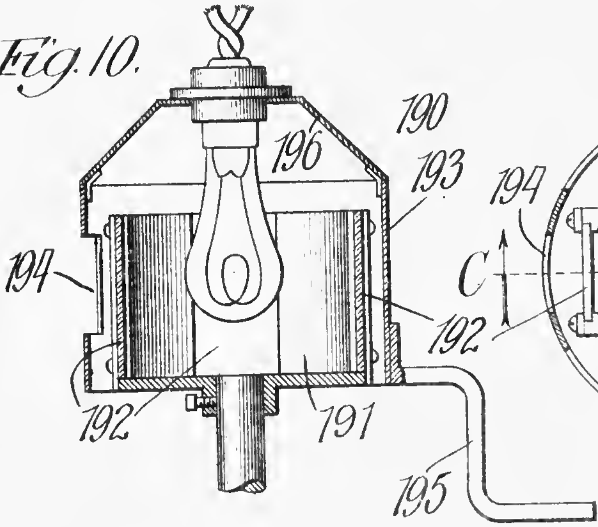


Fig. 11.

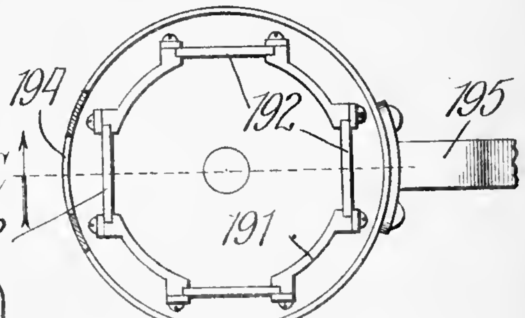


Fig. 12.

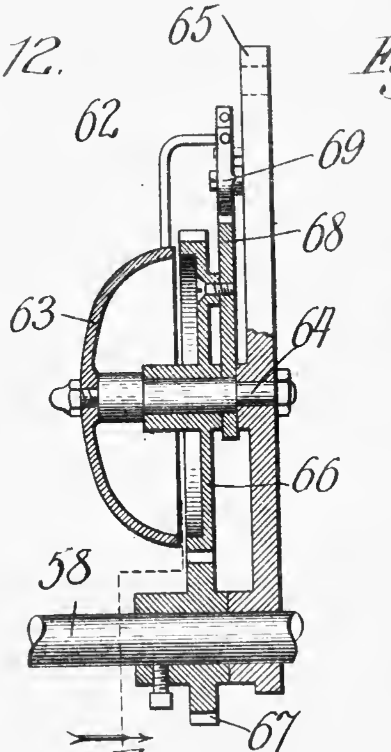
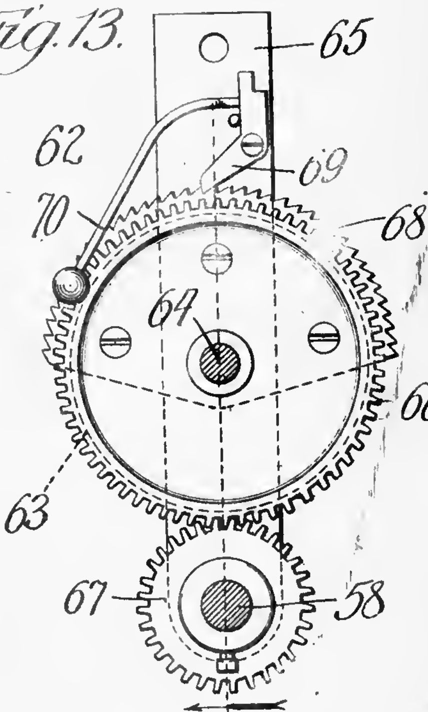


Fig. 13.



Witnesses: E

Chas. E. Gaylord.

John Enders.

Inventor:

John T. H. Paul,

By Dyrenforth, Lee, Chritton and Wiles, Attys.

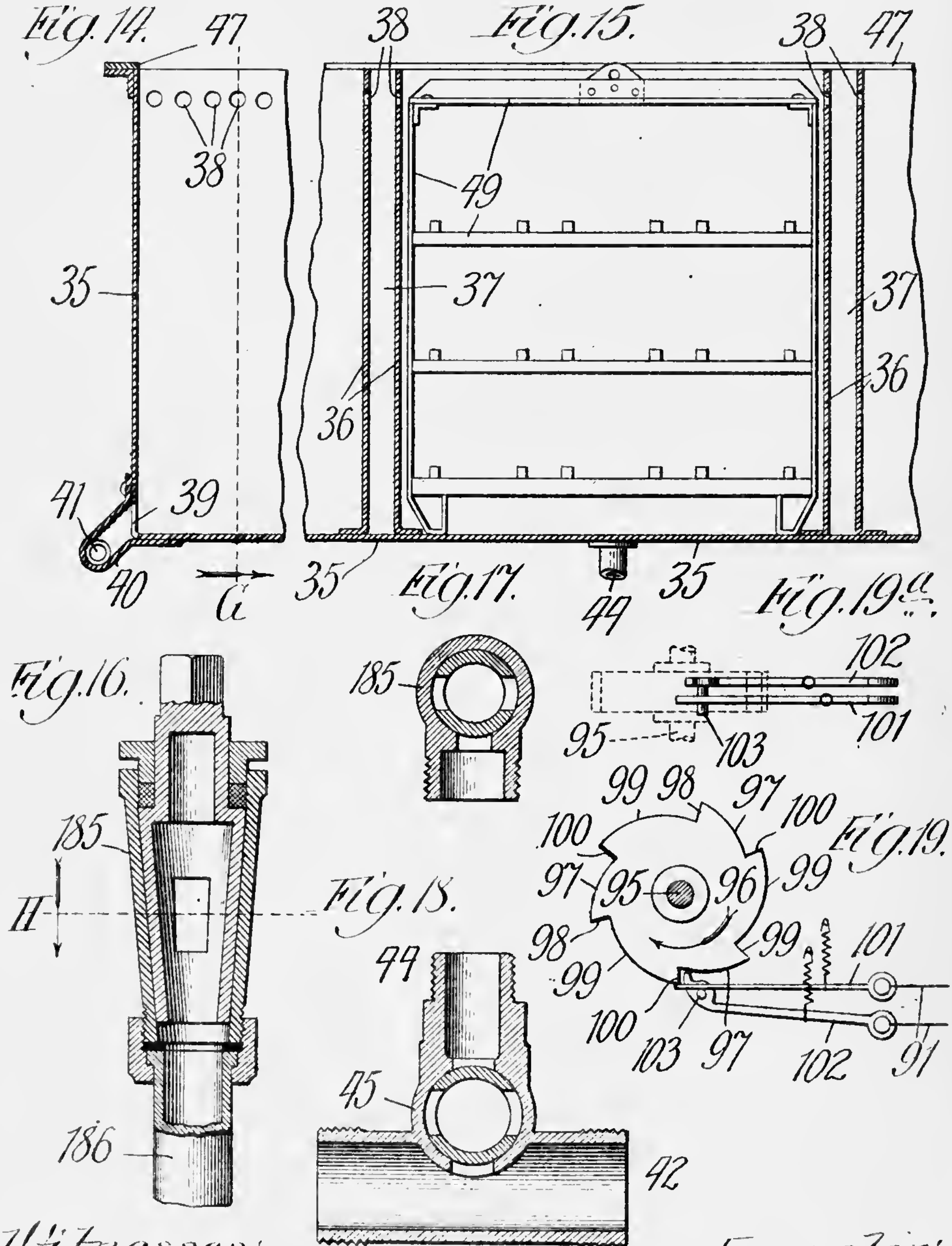
J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED MAR. 13, 1908.

907,639. Patented Dec. 22, 1908.

11 SHEETS—SHEET 5.



Witnesses:

Geo. E. Gaylord.

John Enders.

Inventor:

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Attys.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

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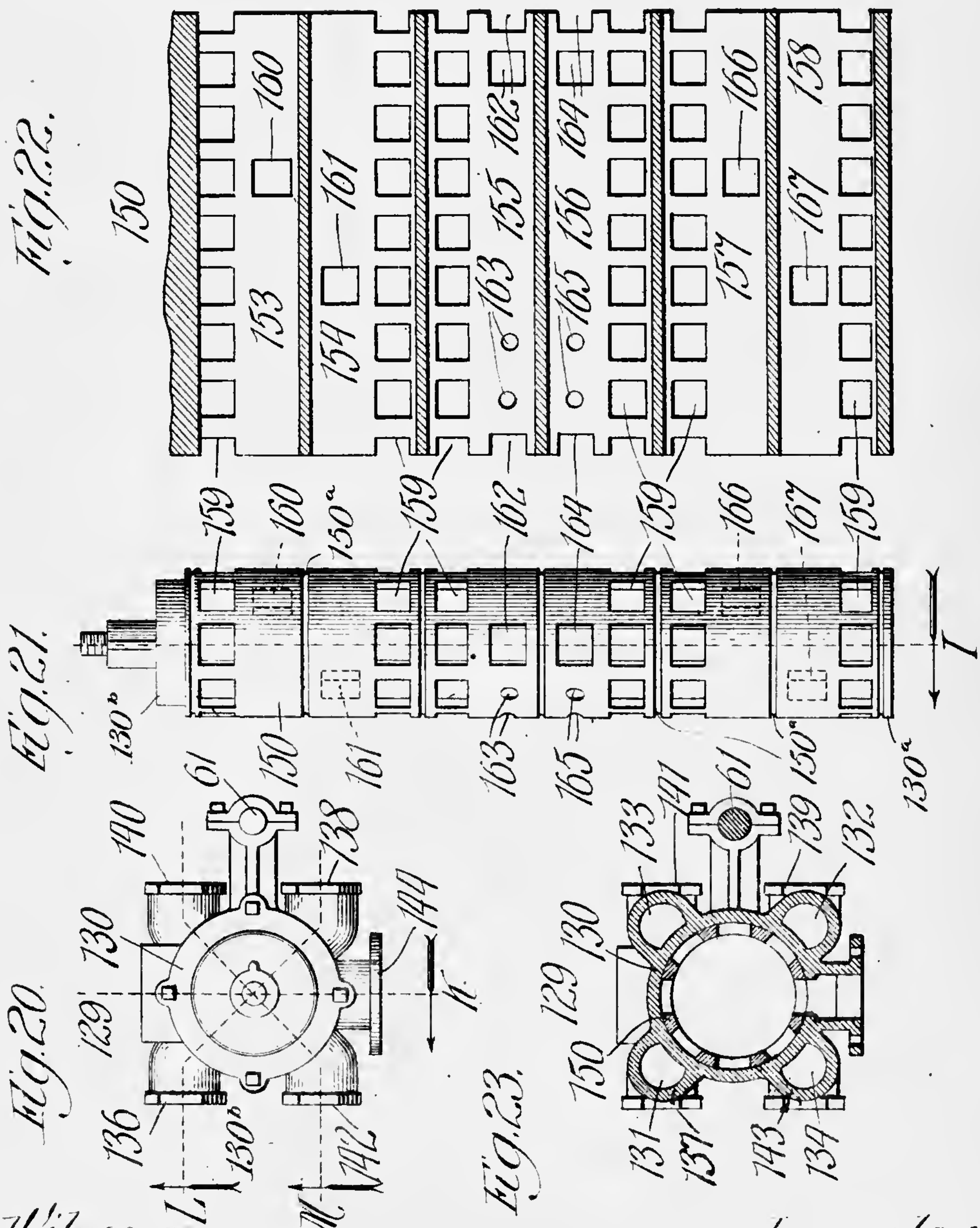
907,639. Patented Dec. 22, 1908.

11 SHEETS—SHEET 6.



Witnesses:

Chas. E. Gaylord.

John Enders.

Inventor:

John T. H. Paul,

By Dyrenforth, Lee, Chritton and Wiles,

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J. T. H. PAUL.

PASTEURIZING APPARATUS.

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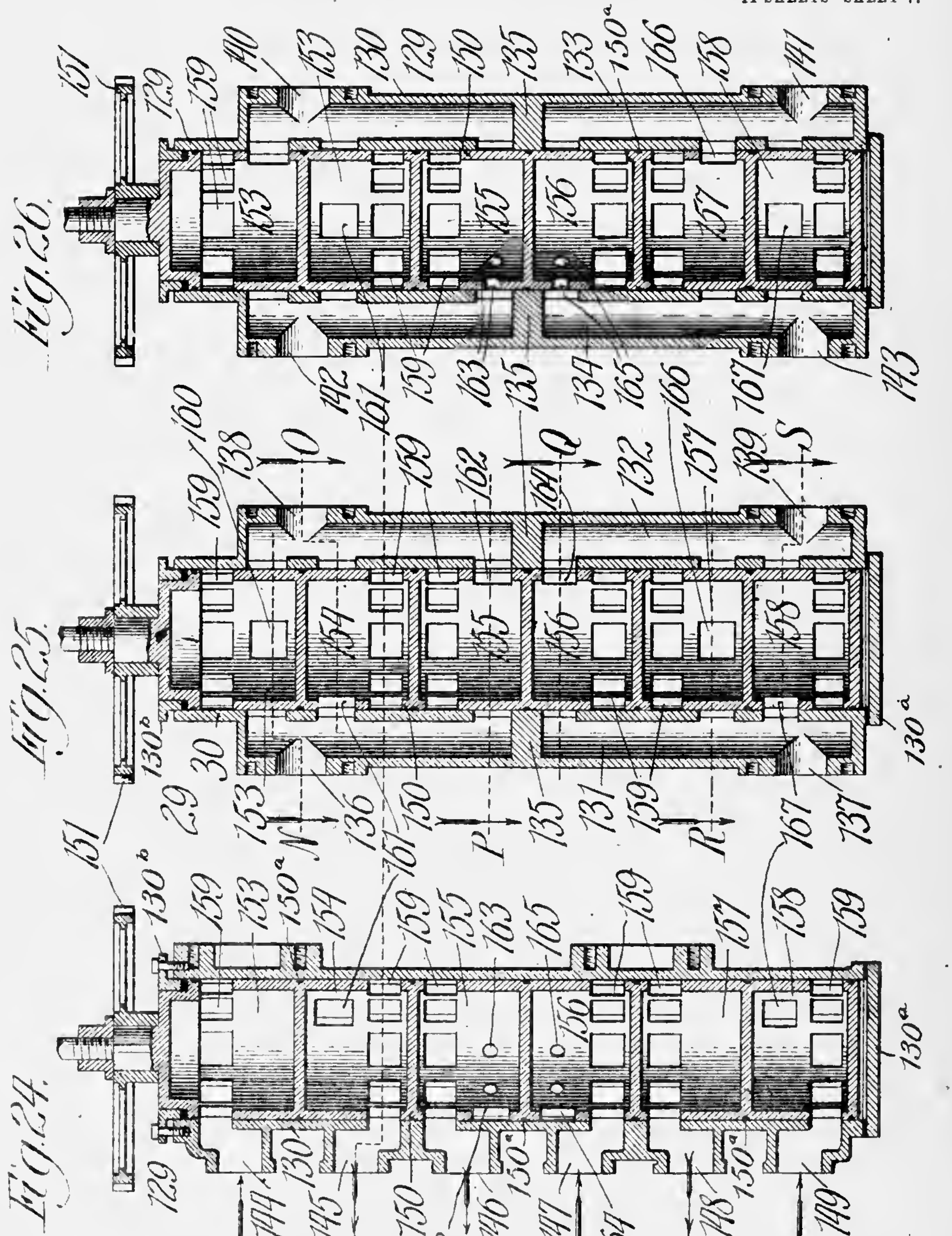

Witnesses:

Chas. C. Gaylord.

John Enders.

Inventor:

John T. H. Paul,

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Attys.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

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11 SHEETS—SHEET 8.

1st Position.

Fig. 27.

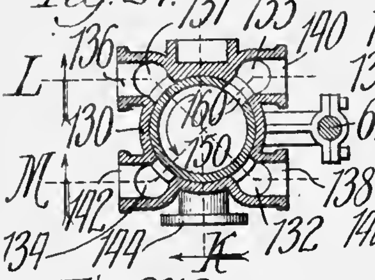


Fig. 27a.

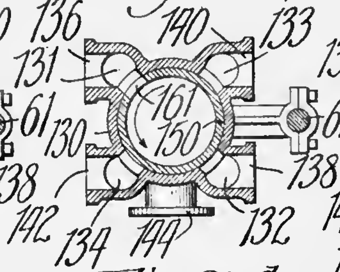


Fig. 27b.

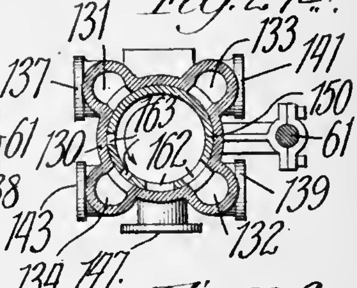


Fig. 27c.

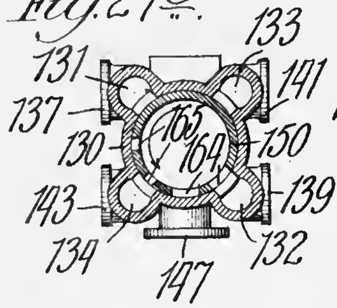


Fig. 27d.

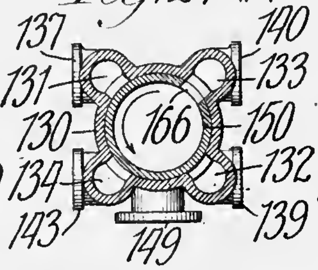
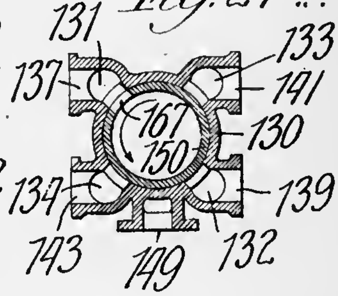


Fig. 27e.



2nd Position.

Fig. 28.

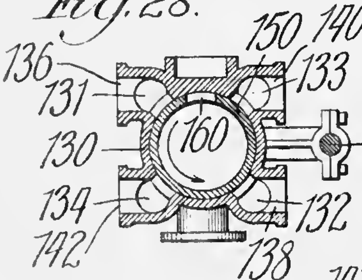


Fig. 28a.

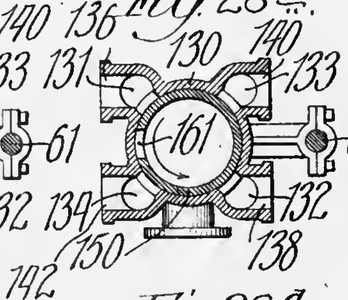


Fig. 28b.

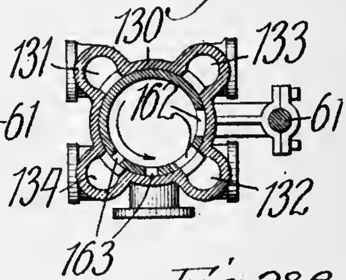


Fig. 28c.

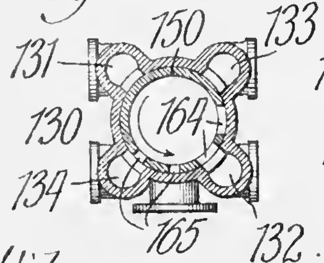


Fig. 28d.

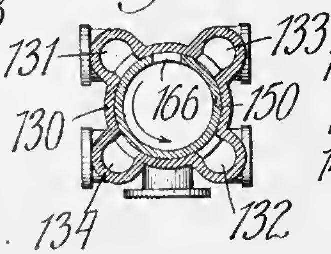
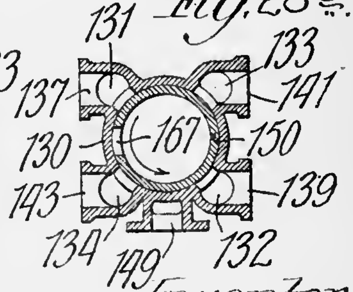


Fig. 28e.



Witnesses:

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John Enders.

Inventor:

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Attys.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED MAR. 13, 1908.

907,639. Patented Dec. 22, 1908.

11 SHEETS—SHEET 9.

3rd Position.

Fig. 29.

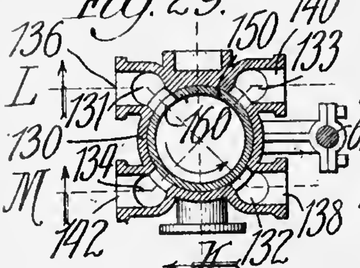


Fig. 29a.

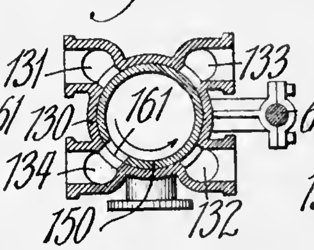


Fig. 29b.

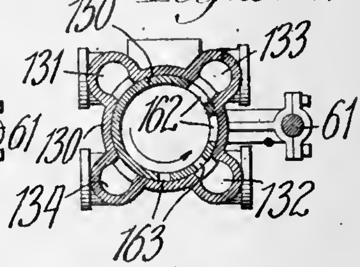


Fig. 29c.

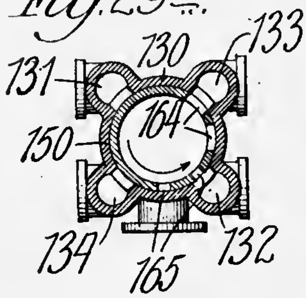


Fig. 29d.

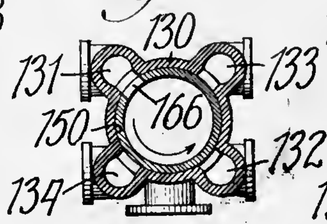
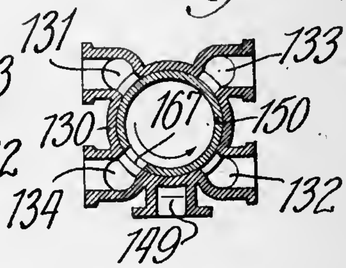


Fig. 29e.



4th Position.

Fig. 30.

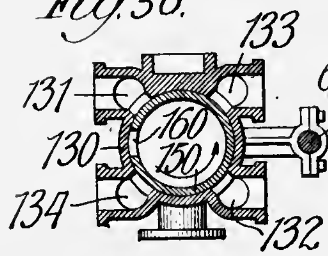


Fig. 30a.

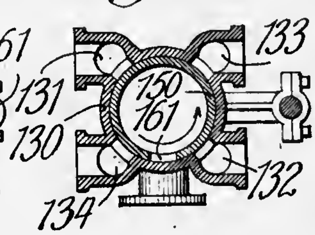


Fig. 30b.

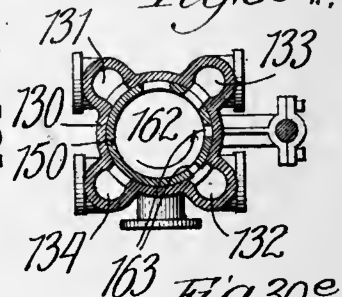


Fig. 30c.

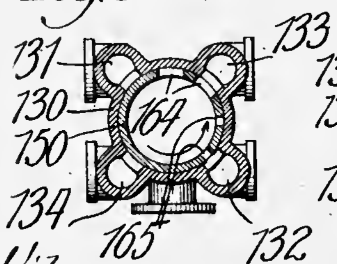


Fig. 30d.

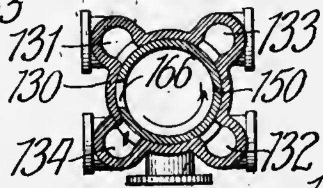
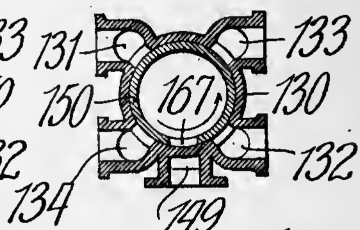


Fig. 30e.



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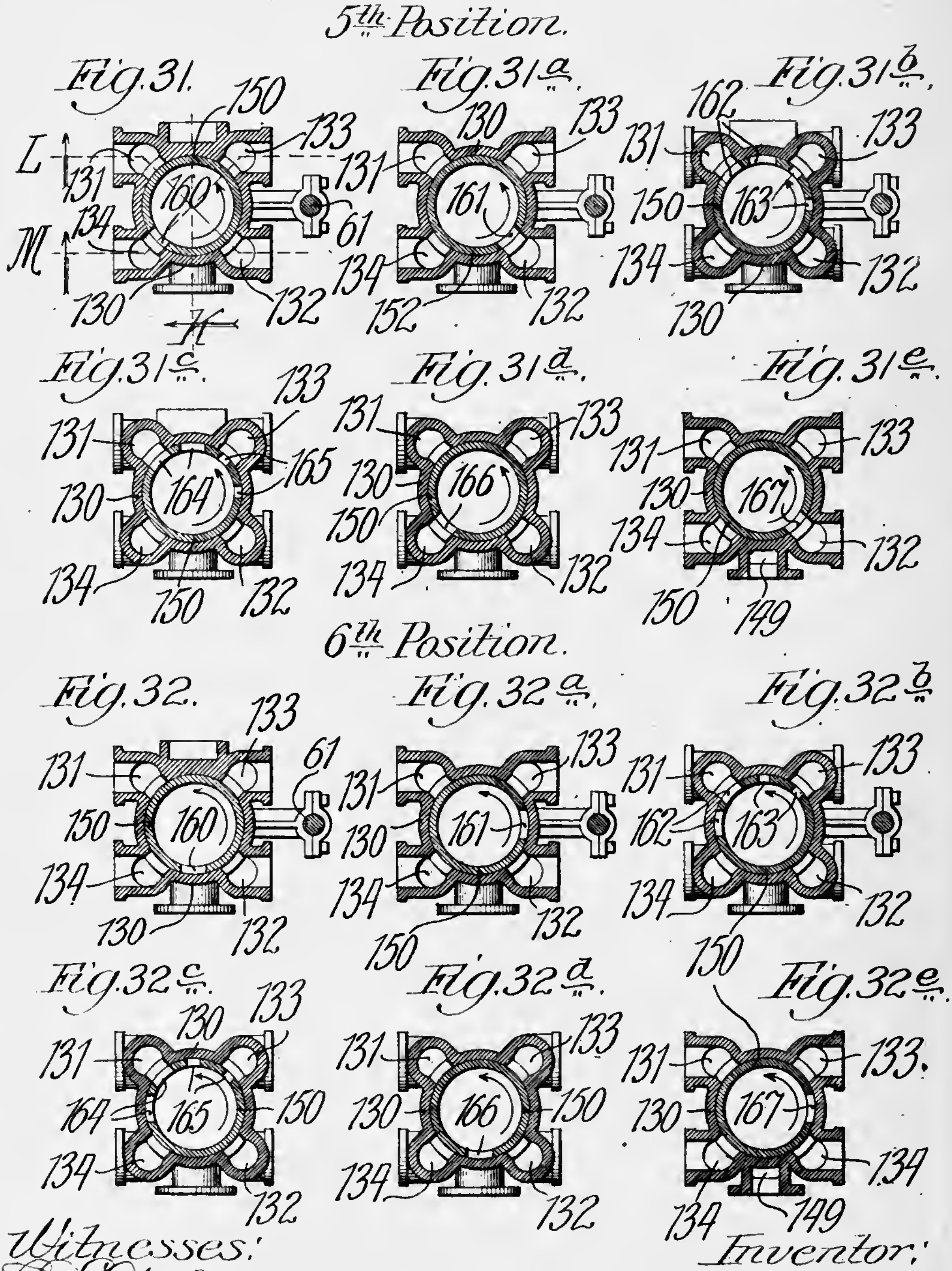
907,639. Patented Dec. 22, 1908.

11 SHEETS—SHEET 10.



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APPLICATION FILED MAR. 13, 1908

907,639.

Patented Dec. 22, 1908.

11 SHEETS—SHEET 11.

7th Position.

Fig. 33.

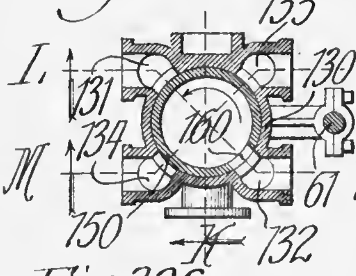


Fig. 33a.

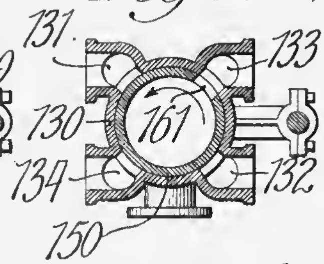


Fig. 33b.

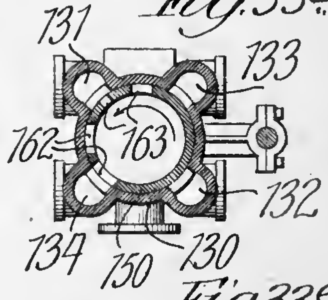


Fig. 33c.

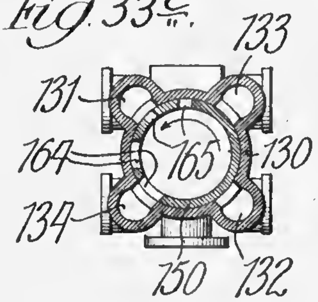


Fig. 33d.

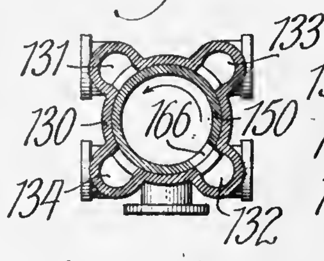
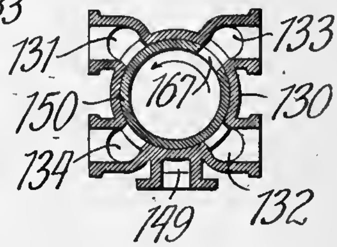


Fig. 33e.



8th Position.

Fig. 34.

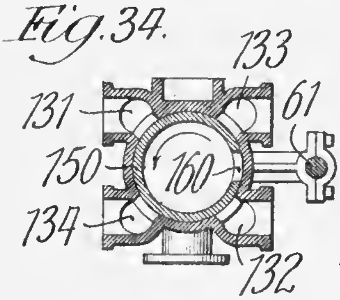


Fig. 34a.

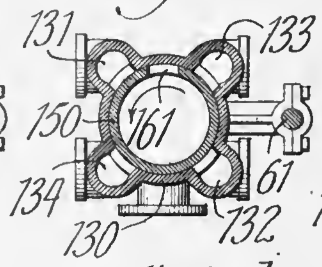


Fig. 34b.

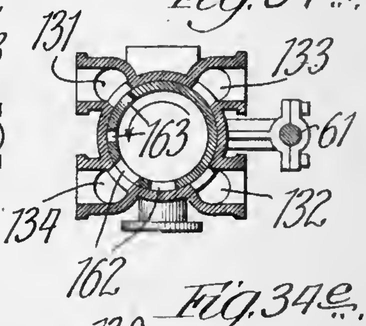


Fig. 34c.

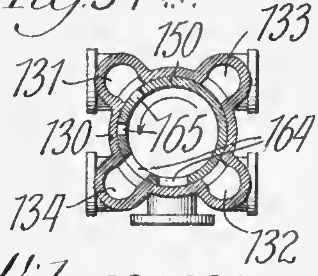


Fig. 34d.

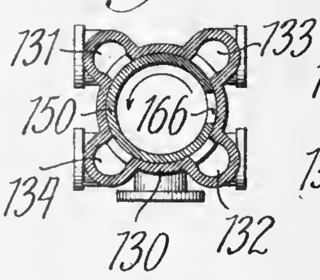
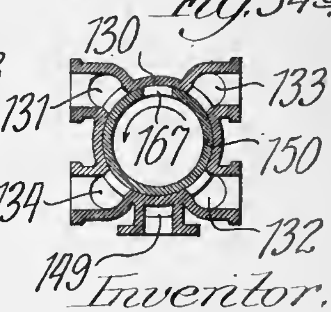


Fig. 34e.



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UNITED STATES PATENT OFFICE.

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PASTEURIZING APPARATUS.

No. 907,639. Specification of Letters Patent. Patented Dec. 22, 1908.

Application filed March 13, 1908. Serial No. 420,792.

To all whom it may concern:

Be it known that I, JOHN T. H. PAUL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Pasteurizing Apparatus, of which the following is a specification.

This invention relates to an improvement in the type of pasteurizing machine in which a plurality of tanks are employed for containing sterilizing water at different interchangeable temperatures, and into which is introduced the material to be treated (in bottles or other forms of packages), to be subjected in each compartment to the successive temperatures required in the practice of pasteurization.

The primary object of the invention is to render the machine, after it has once been started, thoroughly automatic throughout a complete run, so that no manipulation or attention shall be required on the part of the operator, except for introducing into and taking out of the tanks the material under treatment. This and other objects are accomplished by the mechanism illustrated in the accompanying drawings, in which

Figure 1 is a diagram of the entire machine; Fig. 2, an enlarged broken view showing the steam-jet device in section; Fig. 3, a similar view of the thermostat-device employed; Fig. 4, a similar view of the diaphragm-controlled valve-device coöperating with the thermostat for controlling the operation of the steam-jet device; Fig. 5, an enlarged broken view showing the magnet-controlled clutch-device in section, Fig. 6, a section on line A, Fig. 5, Fig. 7, a section on line B, Fig. 5, Fig. 8, a sectional view of a detail of the clutch, and Fig. 9, a view showing the two engaging members of the clutch-device in elevation; Fig. 10, an enlarged sectional view of the indicator-head on line C, Fig. 11, and Fig. 11, a broken plan section of the same with the hood removed; Fig. 12, a broken section of the alarm-gong on line D, Fig. 13; and Fig. 13, a section of the same on line E, Fig. 12; Fig. 14 is a broken section on line F, Fig. 1, showing the preferred tank-construction, and Fig. 15, a section on line G, Fig. 14; Fig. 16 is a broken view of a supplemental valve employed as an adjunct for supplying additional cooling water to the tanks, and Fig. 17, a section of the same on line H, Fig. 16; Fig. 18 an enlarged section of one of the shut-off valves in the filling-pipe for the tanks; Figs. 19 and 19ᵃ are views showing, respectively in side elevation and plan, the clock-controlled electric-contact mechanism for automatically operating the clutch-device; Fig. 20 is a plan view, with the surmounting gear-wheel removed, of the multiple-valve device through which the sterilizing operations in all the tanks are automatically controlled; Fig. 21, a view in elevation of the hollow valve-plug, and Fig. 22, a developed section on line I, Fig. 21; Fig. 23, a section on line J, Fig. 24; Figs. 24, 25 and 26 are sections respectively on lines K, L and M, Fig. 20; Figs. 27 to 27ᵉ, inclusive, are sectional views of the valve, in its "1st position," taken, respectively, on the lines N, O, P, Q, R and S, Fig. 25; Figs. 28 to 28ᵉ, inclusive, are similar views on the same lines, showing the valve in its "2nd position," the "3rd position" thereof being shown in Figs. 29 to 29ᵉ, inclusive, the "4th position," in Figs. 30 to 30ᵉ inclusive, the "5th position" in Figs. 31 to 31ᵉ, inclusive, the "6th position," in Figs. 32 to 32ᵉ, inclusive, the "7th position," in Figs. 33 to 33ᵉ, inclusive, and the "8th position" in Figs. 34 to 34ᵉ, inclusive, all by sections on the said lines on which the figures of said "1st position" are taken.

Four tanks are shown and are denoted as W, X, Y, Z, respectively, though the number employed is not material to the invention. The preferred construction of the tank is that illustrated in Figs. 14 and 15. It involves a continuous body 35, preferably of boiler-iron, for the entire series, bent to U-shape in cross-section, with end-heads flanged and riveted in place through the flanges to the sides and base of the body, in which the similar compartments are formed each by two partitions 36, 36 like the heads and similarly fastened in place in spaced relation to each other to form the overflow chamber 37 having openings 38 in the upper-end portions of the partitions. Each overflow-chamber contains a discharge-opening 39 in its base covered by a shield 40, and these shields are connected by pipe-sections forming the overflow-header 41 which leads to a sewer (not shown). A cold-water supply-pipe 42 containing a shut-off valve 43 connects at its discharge-end with the pipe 41 and communicates with the tanks, through their bases, by branches 44, each branch containing a shut-off valve 45;

and the pipe 42 contains a shut-off valve 46 near its discharge-end. The series of tanks is reinforced about its upper edge with angle-iron forming a seat along the sides for a track 47 on which to run a gauntree indicated at 48, Fig. 1, of any suitable construction, for raising out of and lowering into the tanks, racks 49 carrying crates (not shown) supporting the material to be treated, which, for the purposes of the present case, may be considered to be beer in bottles.

The gist of the invention consists in controlling the temperatures in the different tanks through the medium of a single valve-device of the preferred construction, hereinafter described, which is automatically set at required intervals for the various purposes by suitable mechanism, that shown for the purpose involving the following-described construction and combinations of parts: An electric motor, conventionally illustrated at 50 in Fig. 1, has its armature-shaft geared to a pump-shaft 51, common to three centrifugal pumps 54, 55, 56 of ordinary or any suitable construction. The pump-shaft drives, through the medium of a train of reducing-gears 57, a shaft 58 carrying on one end a miter 59 meshing with a similar miter 60 on the lower end of a vertical shaft 61 for operating the aforesaid valve-device. On the opposite end of the shaft 58 is provided an alarm-device 62 (Figs. 12 and 13), comprising a gong 63 supported on a stud 64 upon a bracket 65 through which the shaft 58 passes, the bracket being adapted to be secured to any convenient stable support; on the stud is rotatably mounted a gear-wheel 66 meshing with a pinion 67 on the shaft 58 and carrying a segmental ratchet 68, with the teeth of which engages a pawl 69 fulcrumed on the bracket and carrying on its free end a hammer 70 for sounding the gong during alternate rotations of the shaft by the tripping action of the ratchet upon the pawl.

The gear 58^a of the reducing-train which is carried by the shaft 58 is loose thereon to avoid rotation of the shaft except at predetermined intervals by engaging therewith said gear through the medium of a clutch-device 71, a suitable construction of which is illustrated in Figs. 5 to 9, inclusive. A solenoid-magnet 72 supported in a bracket 73 has suspended from the armature 74 on its cores 74^a a link 75 which has a releasable hook-connection at 76 with a spring-pressed, vertically movable tripping-pin 77 working in bearings on the bracket, on one of which bearings is fulcrumed a lever 78 having a link-connection 79 with the hook-link for a purpose hereinafter described; the tripping-pin carrying on its lower end a cam-shoe 80. On one face of the gear in the train 57 which is loosely mounted on the shaft 58 is provided a disk 81 having confined in it at one end of a circular recess 82 concentric with the disk, a transverse stationary clutch-pin 83 terminating in a stepped head 84 to engage with a similar head 85 on a spring-pressed pin 86 forming the other clutch-member reciprocably confined in a transverse bearing in a head 87 about a hub 88 rigidly secured upon the shaft, the pin 86 containing a notch 89, rounded at its outer side and lying in the path of the shoe 80, which normally bears against an annular flange 90 provided about the head 87 concentrically with its hub. To energize the solenoid, it is contained in a branch 91 of the motor-circuit 92. This branch also contains an electric switch 93 and a clock 94 carrying on its hour-arbor 95 (Figs. 19 and 19^a) a disk 96 provided about its periphery with irregularly spaced cam-surfaces, the three shorter ones 97 of which correspond in length and terminate in shoulders 98 and alternate with the longer cam-surfaces 99, which correspond in length and terminate in shoulders 100. A spring-pressed pivotal contact-finger 101 bears against the periphery of the disk, and a relatively shorter spring-pressed pivotal contact-finger 102, included with the other in said branch-circuit, also bears against the said periphery and is curved at its free-end, where it carries a laterally-projecting stud 103 extending into the path of the finger 101. With the switch 93 closed, the clock, in running, turns the disk 96, whereby each time the shorter finger 102 clears a shoulder its stud 103 contacts with the longer finger 101, just before the latter clears the same shoulder, to close the circuit, the closure being maintained only momentarily until the longer finger clears that shoulder, when its spring retracts it from the stud 103 to open the circuit. Each circuit-closure energizes the solenoid to raise the pin 77 and permit the clutch-member 86 to engage with the companion-member 83 and thus cause the continuously rotating motor 50 to rotate the shaft 58 to the extent of a complete revolution. At the beginning of this revolution the circuit is opened at the disk 96 to deenergize the solenoid and permit the spring-pressed shoe 80 to bear against the flange 90 until, in the rotation of the gear 57 the pin 86 is brought to the position wherein its notch 89 registers with the cam-shoe 80, whereupon the engagement of the notch with the shoe forces the clutch-member 86 away and disengages it from the member 83 to unclutch the shaft 58 at the end of the complete rotation thereof.

The steam-supply for heating the water in circulating from each tank back to the same tank is introduced through a pipe indicated at 104 in Fig. 1 and containing a shut-off valve 105 and a steam-gage 106, the steam entering at 107 and performing its function in a suitable water-heater, the preferred type of which is that of a jet-pump device 108

(Fig. 2), having its valve-stem 109 carried by a spring-supported diaphragm 110. The jet-pump coöperates with the centrifugal pumps for circulating the water. As means for depressing the diaphragm 110 to close the valve of the jet-pump, an air-pressure controlling-device is provided, indicated at 111 in Fig. 1 and shown in detail in Fig. 4. It comprises a casing containing a vent-opening 112 and a standard 113 containing a central fluid-passage 114 having its upper end covered by a diaphragm 115, and a pipe 116 leading from its opposite end: on this standard is fulcrumed between its ends a lever 117 to bear at one end against the diaphragm, and in the opposite end of which works a set-screw 118 carrying above the casing a pointer 119 movable over a dial (not shown) in a glass-covered box 120 on the casing; this set-screw, which is accessible for adjustment, on removal of the box-cover, for regulating the bearing-pressure of the lever 117 against the diaphragm, bears against the upper end of a vertically-reciprocable rod 121 working in a valve-chamber 122 in the casing, the rod being confined against a ball-valve 123 supported against its seat from underneath by a spring 124 supplemented by air-pressure from any suitable source (not shown) admitted through a pipe 125 leading into the base of the valve-chamber, from one side of which near its upper end it communicates through a pipe 126 with the casing of the diaphragm 110. The pipe 116 connects the fluid-passage 114 with a thermostat-device 127 (Fig. 3), containing alcohol or other suitable fluid expansible and contractible under variations in temperature to actuate the diaphragm 115 to work the ball-valve 123 to regulate the admission of air pressure through the pipes 125 and 126 against the diaphragm 110 and thereby cause the valve of the jet-pump to regulate the flow of steam through it in accordance with the requirement in heating the circulating water, to which the thermostat is exposed in its position on the main valve-device, being secured to the casing thereof by a T-coupling 128 in which the thermostat extends.

The main valve-device 129, as illustrated in detail in Figs. 20 to 26, inclusive, involves the following construction: The valve-casing 130, which is best formed in the general cylindrical shape illustrated, and is closed by a cap 130^a at the bottom and by a gland 130^b at the top forming a stuffing-box, has formed upon it at equal distances apart about its circumference vertical passages 131, 132, 133 and 134, each divided by a transverse partition 135 midway between its ends into an upper and a lower section. Four of these passages are shown, one for each tank, but the number thereof required to be provided will, in each instance, correspond with the number of tanks employed in the apparatus.

An opening 136 is provided in the upper section of the passage 131, its lower section containing a similar opening 137; the passage 132 contains the similar openings 138 and 139, respectively, in its upper and lower sections, similar openings 140 and 141 are provided, respectively, in the upper and lower sections in the passage 133, and similar openings 142 and 143 are provided in the upper and lower sections, respectively, of the passage 134. In a vertical series along the casing between the chambers 132 and 134 are provided the six openings numbered, in their order from top to bottom, 144 to 149, both inclusive. Fig. 23 may properly be regarded as a section taken through any one of these six openings. The hollow valve-plug 150, which fits rotatably in the casing and is closed at both ends, carries on a stem projecting from its upper end a gear-wheel 151, with which meshes a pinion 152 on the upper end of the shaft 61 to cause the plug to be rotated by the shaft 58. The last-named pinion and gear are so relatively proportioned for the purposes of the apparatus as it is shown to be constructed, as to cause each complete rotation of the shaft to turn the plug through one-eighth of its complete rotation. The valve-plug is divided at uniform intervals by horizontal partitions into a vertical series of six chambers numbered from 153 to 158, both inclusive. Each of these chambers contains a circumferential series of ports 159, those in each chamber occupying a plane coincident with that of an opening in the vertical series thereof in the casing, so that in every position of the plug each chamber therein communicates with the respective casing-opening. As shown in Figs. 25 and 26, each vertical passage on the casing-wall has formed in the latter a vertical series of six ports, each registering with an adjacent chamber in the valve-plug. The chamber 153 contains a port 160 in the plane of the uppermost ports in the inner walls of said passages; the chamber 154 contains a port 161 in the plane of the next lower ports in said inner walls; the chamber 155 contains two similar adjacent ports 162, and also, adjacent to each other, two similar by-pass ports 163, in the plane of the next lower ports in said inner walls; the chamber 156 contains ports 164 and by-pass ports 165, like those in the chamber 155 but occupying the plane of the next lower ports in the inner walls of said vertical passages; and the chambers 157 and 158 contain, respectively, ports 166 and 167 in planes corresponding with those of the next lower and lowermost ports in said inner walls.

In Fig. 21 and in Figs. 24—26, inclusive, the valve-plug is shown to be provided about its ends and about its wall between each pair of chambers in the plug with circumferential grooves 150^a to receive packing, the material preferably used for the packing purpose being a heavy grease that will resist melting under the temperature in the valve, a suitable compound being what is known as a graphite-mixture.

The pipe-connections with the valve-device 129 are, for the sake of simplicity and to avoid confusion, indicated by dotted representation in Fig. 1. Each tank is provided in one side with an upper port 168 and a lower port 169. A pipe 170 leads from the upper port in tank W to the opening 138 in the casing of the valve-device; a pipe 171 leads from the upper port in tank X to the opening 140; a pipe 172 leads from the corresponding port in the tank Y to the valve-device opening 136, and similarly a pipe 173 connects the port 168 with the opening 142 of the valve-device. A pipe-connection 174 leads from the lower port 169 in the tank W to the opening 139 in the valve-device, and the corresponding ports in the tanks X, Y and Z are respectively connected by pipes 175, 176 and 177 with the openings 141, 137 and 143 in the lower part of the valve-device.

Of the vertical series of six openings in the valve-casing 130, the second one from the top, namely 145, is connected by a pipe 178 with the suction-side of the pump 54, the discharge-side of which is connected by a pipe 179 with the uppermost opening 144; the third opening 146 in the series is connected by a pipe 180 with the suction-side of the pump 55, the discharge-side of which is connected by a pipe 181 with the jet-pump 108, and the latter is connected from its lower discharge-end by a pipe 182 with the fourth opening, 147, in the series; a pipe 183 leads from the fifth opening, 148, to the suction-side of the pump 56, and a pipe 184 connects the discharge-side of this pump with the lowermost opening 149. A supplemental valve-device 185, the construction of which is shown in Figs. 16 and 17, is connected at the inlet in its lower end by a pipe 186, containing a shut-off valve 187, with the water-supply pipe 42; and a branch-pipe 188 connects this supplemental valve from its discharge-side with the opening 149. The stem of the valve 185 carries a pinion 189 meshing with the gear 151 and bearing thereto the relation of 1 to 2. The purpose of the valve 185 may best be explained in this connection to be that of supplying cold-water to the circulation when needed to reduce excessive temperature therein, this supply being controllable through the shut-off valve 187.

The stem on the upper end of the valve-plug 150 carries an indicator 190, the preferred construction of which is illustrated in Figs. 10 and 11: An upright drum 191, secured to the stem, contains a circumferential series of glass-covered openings 192 at uniform distances apart and is inclosed in a stationary shell 193 containing a display-opening 194 and having a bracket 195 extending from it by which to fasten it to any stable support. The shell is surmounted by a removable hood 196 carrying an incandescent electric lamp, as indicated, to depend centrally in the indicator-drum, and adapted to be connected with a source of electric current (not shown). Thus the drum rotates with the valve-plug 150 to display at each quarter-revolution thereof at the point 194 a different character provided on the glass of the respective opening 192 indicating the one of the series of tanks in which the pasteurizing operation has been completed and requiring to be emptied of and refilled with beer to be treated.

The operation is as follows, starting with the valve in the "1st position": The four tanks being filled with cold water admitted through the pipe 42 and its branches, with the valve 46 closed (being only opened with the valve 43 closed when it is desired to empty the tanks into the sewer), the motor 50 is started to work the centrifugal pumps continuously and drive the shaft 58 intermittently; the steam having meantime been turned on by opening the valve 105. For starting, the switch 93 is left open and the magnet 72 is tripped by hand to operate the valve-device 129 the first three times for preparing the tanks by heating the water in one to the pasteurizing temperature of about 48° R., and that of another to a lower temperature of, say, about 20° R., leaving the water in the other two tanks at the natural temperature of 10° to 15° R. at which it is adapted for receiving beer in bottles, with which one of these tanks is the first to be supplied. With the valve in the "1st position" (Figs. 27—27[e]) the circulation, indicated by arrows in Fig. 1, is as follows: from the top of tank W through pipe 170 to the valve-opening 138 and into the upper section of the passage 132 (Fig. 25), whence it enters the plug-chamber 155 and passes out through a port 159 of that chamber by way of the opening 146 (Fig. 24) into the pipe 180 under the suction-action of the pump 55 (Fig. 1), which discharges it through the pipe 181 into the jet-pump 108 where it is heated and whence it passes by way of the pipe 182 to the valve-opening 147 leading to the plug-chamber 156 (Fig. 24); thence it flows into the lower section of the passage 132 (Fig. 25) and out at the opening 139 through pipe 174 back into the tank W at its port 169. At the same time the pipe 173 leading from the upper port in the tank Z to the opening 142 conducts water from that tank into the upper section of the passage 134 (Fig. 26), whence it enters the plug-chamber 155 through a by-pass port 163 and passes out through a port 159 to the opening 146 (Fig. 24), from which the pipe 180 connects with the suction-side of the pump 55, which also forces that water through the pipe

181 into the jet-pump to flow therefrom through the pipe 182, with the water from tank W, into the plug-chamber 156, whence a by-pass port 165 (Fig. 24) conducts the same quantity of water that was taken from the tank Z, in heated condition back to the same tank through the lower section of the passage 134 (Fig. 26) and through the pipe 177 leading from that chamber to the port 169 in tank Z. Under the hand-operation of the magnet 72 the described circulation may be maintained for any length of time (say about 30 to 45 minutes) required to heat the water in tank W to about 30° R. and that in tank Z to about 20° R.

While the described circulation is taking place, water is being transferred (incidentally in the starting operation) from the top of tank Y to the top of tank Z and from the bottom of tank X to the bottom of tank Y: through pipe 172 and opening 136 into the upper section of passage 131 (Fig. 25), thence into plug-chamber 154 and out through a port 159 and opening 145 by way of pipe 178 to the suction-side of the pump 54, which discharges through pipe 179 into plug-chamber 153 at the opening 144 (Fig. 24), and from this chamber the flow enters the upper section of the passage 133 (Fig. 26) and continues therefrom through the opening 140 and pipe 171 into the top of tank X. The pipe 175 takes water from the bottom of tank X to the valve-opening 141 and introduces it into the lower section of the passage 133 (Fig. 26), whence it enters the plug-chamber 157 to discharge therefrom through a port 159 and opening 148 to the suction-side of pump 56 through pipe 183, and the pump discharges through the pipe 184 into the plug-chamber 158 at 149 (Fig. 24), whence the flow continues through the port 167 into the lower section of the passage 131 and through opening 137 (Fig. 25) and pipe 176 to the port 169 in tank Y. The operator then trips the clutch by hand to permit the shaft 58 to rotate the valve-plug through one-eighth of a revolution, thereby bringing the valve-device to the "2nd position" (Figs. 28—28^e), in which the circulation takes place as follows to raise the water in tank W to the sterilizing temperature of about 48° R. and that in tank Z to about 35° R: The course of the water to and from tank W and to and from tank Z remains the same as described, with the valve-device in the first position, except that its transfer-ports are closed in the "2nd position". While the valve occupies this second position, which is maintained until the aforesaid temperatures are reached, the gauntree 48 is run on the track to extend over the tank Y, containing cold water, there to raise a bottle-rack stored therein into position for loading it with baskets containing bottled beer to be pasteurized; and the rack is thereupon lowered by the gauntree into the tank. The operator, now, again trips the clutch by hand, thereby causing the shaft 58 to rotate the valve-plug through the second eighth of a revolution to the "3rd position" (Figs. 29—29^e), and thereby cause the circulation to ensue as follows, to raise the temperature of the water in tank X to about 20° R. and through the by-pass maintain that in tank W at 48° R: through pipe 171 and opening 140 into the upper section of passage 133, thence into chamber 155, from which it continues to the suction-side of the pump 55 through opening 146 and pipe 180 and its discharge through pipe 181, the jet-pump, and pipe 182 through opening 147 into plug-chamber 156, thence to the lower section of passage 133 through opening 141 and pipe 175 back to tank X. To maintain the temperature in tank W through the by-pass, the flow is through pipe 170 and opening 138 into the upper section of the passage 132, thence into plug-chamber 155, continuing through the pipe 180 from the opening 146 to the suction-side of the pump 55, thence through pipe 181, the jet-pump and the pipe 182 to the opening 147 and chamber 156 opening into the lower section of the passage 132 from the opening 139, in which it continues through the pipe 174 back to tank W. With the valve in this "3rd position", transfer of water is taking place from the top of tank Z to the top of tank Y to raise the temperature in the latter to about 25° R. for warming the beer therein, this transfer occurring through pipe 173 and opening 142 into the upper section of passage 134, thence into chamber 154, from the latter by way of opening 145 and pipe 178 to the suction-side of pump 54, thence through pipe 179 and opening 144 into plug-chamber 153 and into the upper section of passage 131, and through the opening 136 and pipe 172 back to tank Y. Transfer is also then taking place from the bottom of tank Y to the bottom of tank Z to lower the temperature in the latter to about 20° R. for preparing it to receive bottles, this transfer being effected through pipe 176 to opening 137 in the lower section of passage 131, thence into chamber 157, through opening 148 and pipe 183 to the suction-side of pump 56 thence through pipe 184, opening 149 and chamber 158 into the lower section of passage 134, and through pipe 177 leading from opening 143 back to tank Z. The clutch is again tripped, for the third and last time by hand, to permit the shaft 58 to turn the valve-plug through the third eighth of its rotation and set the valve at its "4th position", in which beer is placed in tank Z, wherein the water is at about 20° R.; and in this position the water in tank X is still being heated to raise it to the absolute temperature of 48° R. while the water in tank W is being held, through the medium of the by-pass, at 48° R. This circulation is the same as that described as taking place to maintain the temperature in tank W and raise it in tank X, the transfer-ports in the valve-device, however, being then closed; so that that description need not be repeated in the present connection.

Thenceforth the operation of the apparatus throughout an entire run is automatic, except as to introducing the beer into and removing it from tanks, and as to turning the valve 187 to introduce cooling water into and shut it off from the circulation. The disk 96 on the clock arbor 95 has its cam-surfaces 99 arranged each to maintain the contact-fingers out of engagement for a period of twelve minutes and its cam-surfaces 97 each to maintain them out of such engagement for a period of eight minutes, so that the circuit is kept open for alternate periods of eight minutes during each of which to maintain the valve-device set for initially heating one tank, by-passing heat into another tank and transferring from one to the other of the other tanks; and it is kept open for intermediate periods of twelve minutes, during each of which to maintain the valve-device set for maintaining by the by-pass the pasteurizing temperature in one tank and raising the other tank to the pasteurizing temperature. This automatic action ensues upon closure of the switch 93 to cause the clock-movement to energize the magnet 72 momentarily each time the shorter finger 102 clears the shouldered end of a cam on the disk 96, the resultant energizing of the magnet freeing the clutch member 86 to permit it to engage with the companion-member 83 and thus cause the constantly rotating motor-shaft to turn the shaft 58 through one complete revolution, whereby its gear-connection with the valve-plug 150 turns the latter through one-eighth of its complete rotation to bring the ports into the eight different positions required for handling the four tanks. To avoid confusion on the part of the attendant, the clock should be set for each run of the apparatus before closing the switch, to begin the automatic operation with the hands pointing to the full hour or either twenty or forty minute divisions of the hour, since the circuit-closure occurs at intervals of eight and twelve minutes and the attendant is thus the better enabled to time the intervals when away from the apparatus and is not obliged to depend upon the sounding of the alarm by ringing of the gong 62. The gong is only sounded by alternate revolutions of the shaft 58, since during its intermediate revolutions the segmental rack 68 is out of engagement with the pawl 69, the gearing between the shaft 58 and gear 66 being 1 to 2; and the sounding of the gong begins with each twelve-minutes interval to notify the attendant of the condition of the apparatus requiring a supply of beer to be introduced into a tank for treatment, or that the beer treated in a tank is ready to be removed and supplanted by a fresh charge. In this connection the indicator 190 coöperates to display at the opening 194, during the sounding of the alarm, the particular tank ready to be emptied and recharged.

As will be understood, the provision in the course of circulation of the thermostat-device for controlling the admission of air-pressure upon the diaphragm 110, and the adjustment afforded by the set-screw 118, enable accurate regulation of the valve of the jet-pump to introduce more or less steam into the circulating water according to undue rise or fall in the temperature thereof. The valve-device having remained at the "4th position" for the desired period will, upon the adjustment of the switch and setting of the clock as hereinbefore described, thereafter be turned automatically at intervals of eight and twelve minutes throughout the run, to set it to its different positions. At the end of the "4th position" period, therefore, the valve-plug will be turned to the "5th position", (Figs. 31—31^a), to remain for eight minutes. In that period the tank Y is heated to the sterilizing temperature, at which the tank X is maintained through the by-pass, water is transferred from the top of tank W to the top of tank Z for warming the contents of the latter to about 30° R., and water is transferred from the bottom of tank Z to that of tank W for reducing the temperature of the latter to about 28° R. The course of circulation then is the following: through pipe 172 to opening 136 into the upper section of passage 131, thence into plug-chamber 155 through opening 146, by pipe 180 to the suction-side of the pump 55, through pipe 181, the jet-pump, pipe 182 and opening 147 into chamber 156; thence into the lower section of passage 131, and through opening 137 and pipe 176 to tank Y to raise the temperature therein to about 38° R. for further heating the beer. For holding the temperature at 48° R. in the tank X the circulation is through pipe 171, opening 140, upper section of passage 133, chamber 155, opening 146 and pipe 180 to the suction-side of the pump 55, thence through pipe 181, the jet-pump, pipe 182, opening 147, plug-chamber 156, lower section of passage 133, opening 141 and pipe 175 back to the tank X. For transferring water from the top of tank W to the top of tank Z the course is through pipe 170, opening 138, upper section of passage 132, chamber 154, opening 145 and pipe 178 to the suction-side of pump 54; thence through pipe 179, opening 144, plug-chamber

153, upper section of passage 134, opening 142 and pipe 173 to tank Z for raising the temperature therein to about 30° R. For transferring water from the bottom of tank Z to the bottom of tank W, to reduce the temperature in the latter to about 28° R., the course is through pipe 177, opening 143, lower section of passage 134, chamber 157, opening 148 and pipe 183 to the suction-side of pump 56; thence through pipe 184, opening 149, plug-chamber 158, lower section of passage 132, opening 139 and pipe 174 to tank W. At the end of this eight-minutes period of the valve, the rotation of shaft 58 turns it to the "6th position", (Figs. 32—32^e), in which tank Y is raised to the pasteurizing temperature of 48° R. and tank X is held at that temperature through the by-pass flow. In this period beer is placed in tank W by the use of the gauntree, the temperature of this tank being, as aforesaid, about 28° R. The circulation for these purposes is precisely the same as that described in relation to the "5th position" of the valve and may, therefore, be readily traced with the aid of that description, bearing in mind, however, that no transfer takes place between tanks in this position of the valve, wherein it closes the transfer ports.

At the end of the twelve-minutes period of the last-described position of the valve, its operating shaft turns it to the "7th position" (Figs. 33–33^e), for raising the temperature of tank Z to about 38° R., maintaining tank Y at the pasteurizing temperature through the by-pass, transferring water from the top of tank X to the top of tank W to raise the temperature in the latter to about 35° R., and for transferring water from the bottom of tank W to the bottom of tank X to lower the latter to about 28° R. For the first-named purpose the course is through pipe 173, opening 142, upper section of passage 134, chamber 155, opening 146 and pipe 180 to the suction-side of pump 55; thence through pipe 181, the jet-pump, pipe 182, opening 147, chamber 156, lower section of passage 134, opening 143 and pipe 177 to tank Z. The by-pass flow from tank Y is through pipe 172, opening 136, upper section of passage 131, chamber 155, opening 146 and pipe 180 to the suction-side of pump 55; thence through pipe 181, the jet-pump, pipe 182, opening 147, chamber 156, lower section of passage 131, opening 137 and pipe 176 back to tank Y. The course of the transfer from the top of tank X to that of tank W is through pipe 171, opening 140, upper section of passage 133, chamber 154, opening 145, and pipe 178 to the suction-side of pump 54; thence through pipe 179, opening 144, chamber 153, upper section of passage 132, opening 138 and pipe 170 to tank W. The course of the transfer from the bottom of tank W to the corresponding part of tank X is through pipe 174, opening 139, lower section of passage 132, chamber 157, opening 148 and pipe 183 to the suction-side of pump 56; thence through pipe 184, opening 149, chamber 158, lower section of passage 133, opening 141 and pipe 175 to tank X.

At the end of the last-described eight-minutes period, the valve-plug is turned to the eighth and last position (Figs. 34–34^e) for raising tank Z to the pasteurizing temperature and maintaining through the by-pass that temperature in tank Y. Aside from there being no transfer between tanks in this position, the circulation is the same as that in the "7th position" and may be traced by the description thereof with the aid of the drawings. In this period, tank X is supplied by the use of the gauntree with beer to be pasteurized.

As will be understood, the succeeding first, second, third and fourth positions of the valve-device, as also the remaining positions, will be attained successively by the automatic action of the mechanism provided for the purpose, throughout the remainder of the run of the apparatus, one tank, during each twelve-minutes period, being emptied of its contained supply of sterilized beer and refilled with a fresh supply of the bottled article to be sterilized.

There still remains to be explained the purpose of the lever 78 (Fig. 6): The wheel in the train 57 which immediately coöperates with the clutch-mechanism, when rotating very rapidly, is liable to be too quick for the action of the solenoid when deënergized, because of residual magnetism. To insure the prompt release, then, of the pin 77, the clutch-member 86, in the rotation of the hub 88, encounters the lever 78 and turns it, against the resistance of its returning spring 278, to disconnect the hook of the link 75 from the stud 76 to release the pin 77 and permit it to be depressed by its controlling spring to effect the unclutching operation. When the member 86 has cleared the lever, the spring 278 actuates the latter to again engage the hook with the stud 76 then in position to be so engaged by deënergizing of the magnet.

What I claim as new and desire to secure by Letters Patent is—

1. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device with which said pipes communicate constructed and arranged to direct, in its various positions, the circulation for the different steps in the sterilizing operation in said tanks, and means for automatically setting the valve-device at predetermined intervals to it sdifferent positions.

2. In a pasteurizing apparatus, the com-

bination of a plurality of sterilizing tanks, each provided with an overflow-opening leading to an overflow-chamber formed in said tanks and provided with an outlet, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device with which said pipes communicate constructed and arranged to direct, in its various positions, the circulation for the different steps in the sterilizing operation in said tanks, and means for automatically setting the valve-device at predetermined intervals to its different positions.

3. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks formed of a continuous shell provided with end-heads and containing partitions having overflow-openings, dividing said shell into tanks and forming overflow-chambers between them provided with outlets, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device with which said pipes communicate constructed and arranged to direct, in its various positions, the circulation for the different steps in the sterilizing operation in said tanks, and means for automatically setting the valve-device at predetermined intervals to its different positions.

4. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks, water-circulating pipes communicating with said tanks, pumping mechanism included in the circulation, and a heater included therein provided with means for automatically regulating its heating function, a multiple-valve device with which said pipes communicate constructed and arranged to direct, in its various positions, the circulation for the different steps in the sterilizing operation in said tanks, and means for automatically setting the valve-device at predetermined intervals to its different positions.

5. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device with which said pipes communicate constructed and arranged to direct, in its various positions, the circulation for the different steps in the sterilizing operation in said tanks, a motor geared to the valve-plug of said device, and an electrically-operated timed clutch-device coöperating with the gearing to turn the valve-plug to its different positions at predetermined intervals.

6. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device with which said pipes communicate constructed and arranged to direct, in its various positions, the circulation for the different steps in the sterilizing operation in said tanks, a drive-shaft for said device geared to the valve-plug thereof, a motor geared to said shaft, a clutch-device coöperating with the gears, an electromagnet operatively connected with the clutch-device, an electric circuit containing the electromagnet, and automatic means for closing said circuit at predetermined intervals to energize said magnet, for the purpose set forth.

7. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device with which said pipes communicate constructed and arranged to direct, in its various positions, the circulation for the different steps in the sterilizing operation in said tanks, a drive-shaft for said device geared to the valve-plug thereof, a motor geared to said shaft, a clutch-device coöperating with the gears, an electromagnet operatively connected with the clutch-device, an electric circuit containing the electromagnet, a clock carrying on an arbor thereof a cam-disk, and electric contact-fingers included in said circuit and coöperating with the cams on said disk to close the magnet-circuit at predetermined intervals, for the purpose set forth.

8. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device with which said pipes communicate constructed and arranged to direct, in its various positions, the circulation for the different steps in the sterilizing operation in said tanks, a drive-shaft for said device geared to the valve-plug thereof, a motor geared to said shaft, a clutch-device coöperating with the gears, an electromagnet operatively connected with the clutch-device, an electric circuit containing the electromagnet, a clock, a disk on an arbor of the clock having formed upon it two series of relatively longer and shorter cams, the members of each series alternating with those of the other series, and a pair of spring-pressed electric contact-fingers, one longer than the other, engaging said cams, for the purpose set forth.

9. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device with which said pipes communicate constructed and arranged to direct, in its various positions, the circulation for the different steps in the sterilizing operation in

said tanks, a drive-shaft for said device geared to the valve-plug thereof, a motor geared to said shaft, a clutch-device coöperating with the gears, an electromagnet releasably connected with the clutch-device, an electric circuit containing the electromagnet, automatic means for closing said circuit at predetermined intervals to energize said magnet and release the clutch, and a spring-pressed lever-device forming supplemental means for disconnecting said magnet from the clutch.

10. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device with which said pipes communicate constructed and arranged to direct, in its various positions, the circulation for the different steps in the sterilizing operation in said tanks, means for automatically setting the valve-device at predetermined intervals to its different positions, a water-supply pipe having valved connections with said tanks, and a supplemental valve geared to said valve-device and having a valved pipe-connection with said supply-pipe, for the purpose set forth.

11. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks each provided with upper and lower ports, a pipe leading from each upper port and a pipe leading to each lower port, a multiple-valve device having an upper circumferential series of openings in its casing each connected with one of the first-named pipes and a similar series of lower openings with each of which one of said last-named pipes connects, and a vertical series of openings in the casing, a thermostat-controlled jet-pump, a motor having a clutch-controlled gear-connection with the valve-plug, a series of pumps operatively connected with the motor-shaft and each having a circulating-pipe connection with two of the openings in said vertical series, the circulating-pipe connection of one of said pumps containing said jet-pump, and means for automatically setting the plug of the valve-device at predetermined intervals to its different positions, for the purpose set forth.

12. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks each provided with upper and lower ports, a pipe leading from each upper port and a pipe leading to each lower port, a multiple-valve device having an upper circumferential series of openings in its casing each connected with one of the first-named pipes and a similar series of lower openings with each of which one of said last-named pipes connects, and a vertical series of openings in the casing, a jet-pump device provided with a diaphragm-supported valve, a fluid-pressure valve-device connected with said diaphragm, a thermostat controlling the valve in said fluid-pressure device, a motor having a clutch-controlled gear-connection with the plug of the multiple-valve device, a series of pumps operatively connected with the motor-shaft and each having a circulating-pipe connection with two of the openings in said vertical series, the circulating connection with one of said pumps containing said jet-pump, and means for automatically setting said plug at predetermined intervals to its different positions, for the purpose set forth.

13. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks each provided with upper and lower ports, a pipe leading from each upper port and a pipe leading to each lower port, a motor, a multiple-valve device having its rotary plug geared to said motor and provided with an indicator, with an electrically-operated timed clutch-device coöperating with the gearing to turn the valve-plug to its different positions at predetermined intervals, a circumferential series of openings in the upper part of the valve-casing each connected with one of the first-named pipes and a similar series of lower openings therein with each of which one of said last-named pipes connects, and a vertical series of openings in the casing, a series of pumps on the motor-shaft each having a circulating-pipe connection with two of the openings in said vertical series, and a jet-pump contained in said pipe-connection of one of said pumps, for the purpose set forth.

14. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device comprising a shell having an external series of passages divided into upper and lower sections having openings and provided with ports in the casing-wall, and a longitudinal series of openings, with which said various openings said circulating pipes connect, and a hollow plug rotatably confined in the casing and divided into a series of chambers having ports, including by-pass ports in certain chambers, constructed and arranged to direct, in the various positions of the plug, the circulation for the different steps in the sterilizing operation in said tanks, and means for automatically setting the plug at predetermined intervals to its different positions.

15. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device comprising a shell having an external series of passages divided into upper and lower sections, having open-

ings and provided with ports in the casing-wall, and a longitudinal series of openings, with which said various openings said circulating pipes connect, and a hollow plug rotatably confined in the casing, having circumferential packing-confining grooves in its wall and divided into a series of chambers having ports, including by-pass ports in certain chambers, constructed and arranged to direct, in the various positions of the plug, the circulation for the different steps in the sterilizing operation in said tanks, and means for automatically setting the plug at predetermined intervals to its different positions.

16. In a pasteurizing apparatus, the combination of a plurality of sterilizing tanks, water-circulating pipes communicating with said tanks with a heater and pumping mechanism included in the circulation, a multiple-valve device comprising a shell having an external series of passages divided into upper and lower sections with an opening in each section and ports in the inner wall thereof, and a longitudinal series of openings between a pair of said passages, with which said various openings said circulating pipes connect, a hollow plug rotatably confined in the casing and divided into a circumferential series of chambers each having a series of ports, each of the first, second, fifth and sixth chambers containing an additional port in a different plane from that containing the series thereof and the third and fourth chambers containing such additional ports and also by-pass ports, said ports being constructed and arranged to direct, in the various positions of the plug, the circulation for the different steps in the sterilizing operation in said tanks, and means for automatically setting the plug at predetermined intervals to its different positions.

JOHN T. H. PAUL.

In presence of—
RALPH SCHAEFER,
W. T. JONES.

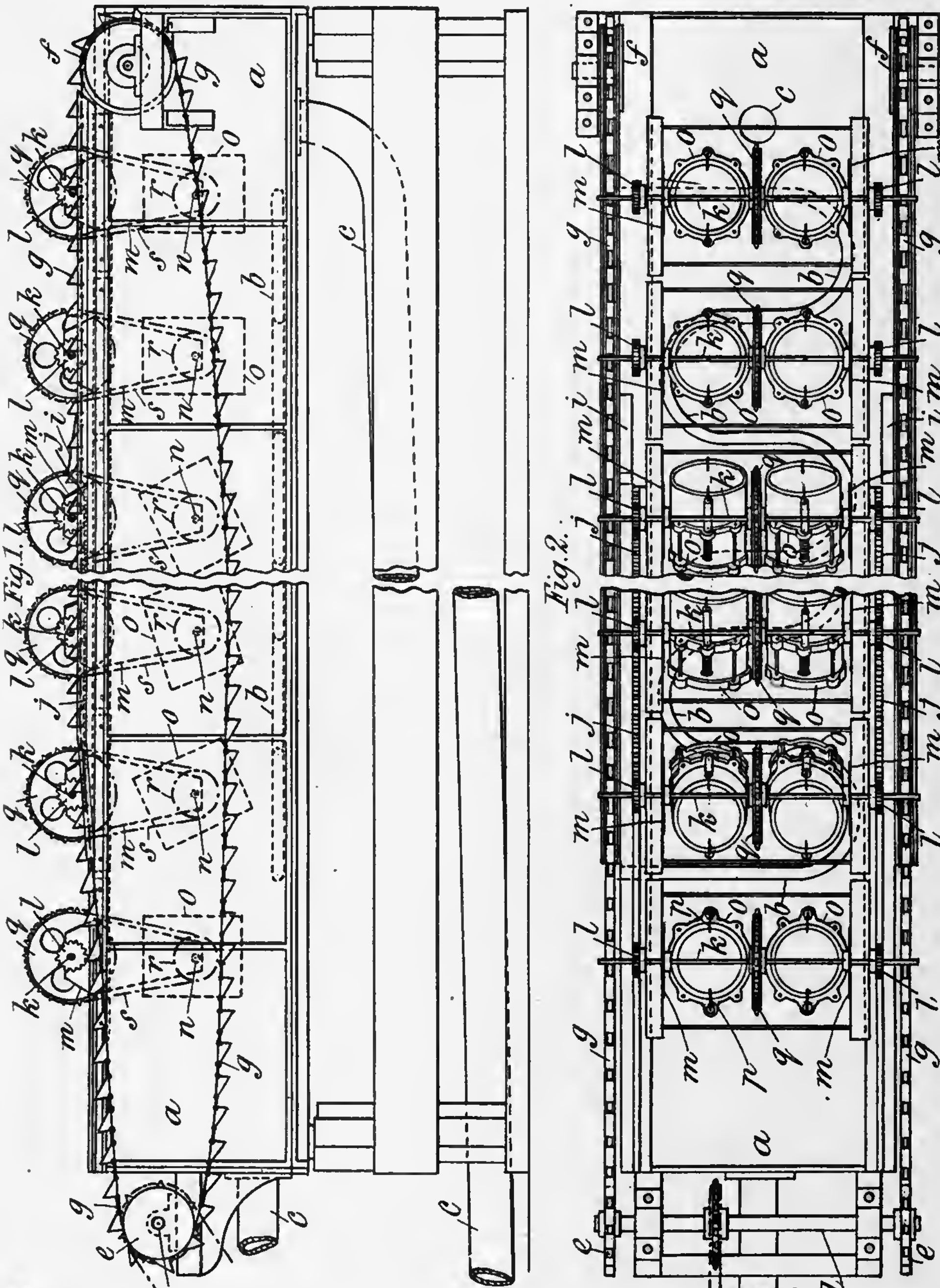
J. C. L. CAMPBELL.

PROCESS OF TREATING FRUIT.

APPLICATION FILED NOV. 4, 1907.

909,542. Patented Jan. 12, 1909.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig.3.

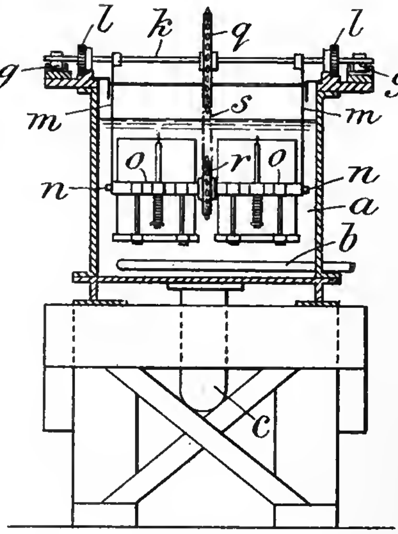


Fig.4.

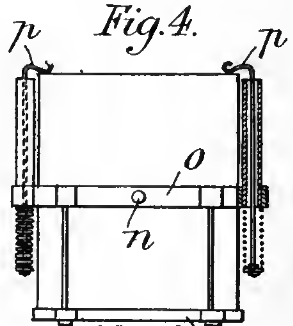
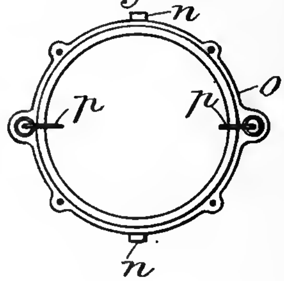


Fig.5.



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UNITED STATES PATENT OFFICE.

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PROCESS OF TREATING FRUIT.

No. 909,542. **Specification of Letters Patent.** **Patented Jan. 12, 1909.**

Application filed November 4, 1907. Serial No. 400,608.

To all whom it may concern:

Be it known that I, JOHN COLIN LIVINGTON CAMPBELL, late lieutenant-colonel Royal Engineers and brevet colonel, a subject of the King of Great Britain, residing at Achalader, Blairgowrie, Perthshire, North Britain, have invented new and useful Improvements in Processes of Treating Fruit, of which the following is a specification.

Fruit to be sterilized is usually put into tins which are placed in a bath heated to the proper temperature, for about two hours. I have discovered that if the tins containing the fruit are rotated preferably about a transverse axis, while being heated, the temperature in the center of the tin reaches the sterilizing point earlier, thus shortening the process and cooking the fruit on the outside less and allowing bigger tins to be used.

The drawings illustrate apparatus suitable for use in carrying out my invention.

Figure 1 is a side elevation, Fig. 2 a plan, and Fig. 3 a transverse section. Fig. 4 is a side elevation and Fig. 5 a plan of one of the frames to a larger scale.

a is a trough in which is a steam pipe *b* for increasing the temperature as required.

c are pipes through which water is supplied and returned to a boiler situated in any convenient position.

At one end of the trough *a* is a driven shaft *d* carrying two sprocket wheels *e e* and at the other end are two other sprocket wheels *f f* and endless conveyer chains *g g* pass over these sprocket wheels. At the end of the trough at which the carriages are inserted inclines *i i* are provided at each side of the trough and beyond the inclines *i i* racks *j j* extend along both sides of the trough.

In the trough are carriages, on each carriage is a shaft *k* having on it two toothed wheels *l l* which gear with the racks *j j*, each end of the shaft *k* being prolonged so as to engage with the teeth of the conveyer chains *g g*. Depending from this shaft are plates *m m* supporting the trunnions *n n* of the frames *o o* in which the vessels containing the fruit are held by means of spring catches *p p*. Fast to the shaft *k* and the frame *o* are sprocket wheels *q* and *r* connected together by a chain *s*.

The process may be carried out as follows:—The fruit is placed in the tins or vessels which are closed except for a small blow hole and the tins are placed in the frames *o* and secured therein by the spring catches *p p*. The carriages carrying the frames are placed in and traversed along the trough by means of the endless chains *g g* but the frames are not at first rotated as the racks *j j* do not extend the whole length of the trough. After the tins have been a few minutes in the trough the carriages come to rest being raised by the inclines *i i* out of contact with the chains and the frames are given one quick rotation by hand and the blow holes are soldered up. The carriages then proceed and as they have reached the racks *j j* the frames are kept in rotation. When the end of the trough is reached the carriages are removed and may with advantage be placed in a similar trough containing cold water or the tins may be removed and allowed to cool in the air.

In most cases I have found that the bath should be heated to a temperature of 180° to 195° F.

The apparatus herein shown and described is claimed in my application for Patent No. 421,215, filed March 14, 1908.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:—

1. The process for treating fruit by heating the vessels containing the fruit in a bath, turning and then closing the vessels, and then repeatedly turning the vessels as they traverse the bath, substantially as described.

2. The process for treating fruit by heating the vessels containing the fruit in a bath, turning and then closing the vessels, and then repeatedly turning the vessels about their transverse axes as they traverse the bath substantially as described.

3. The process of treating fruit by heating the vessels containing the fruit in a bath, the vessels being provided with a small hole; rapidly turning the vessels; raising the vessels out of the bath and closing the hole in the vessels; and then repeatedly turning the vessels about their transverse axes as they traverse the bath.

JOHN COLIN LIVINGTON CAMPBELL.

Witnesses:
GEORGE HUTTON,
J. T. HUTTON.

A. A. PINDSTOFTE.

PASTEURIZING APPARATUS.

APPLICATION FILED OCT. 1, 1907.

913,559. Patented Feb. 23, 1909.

Fig. 1

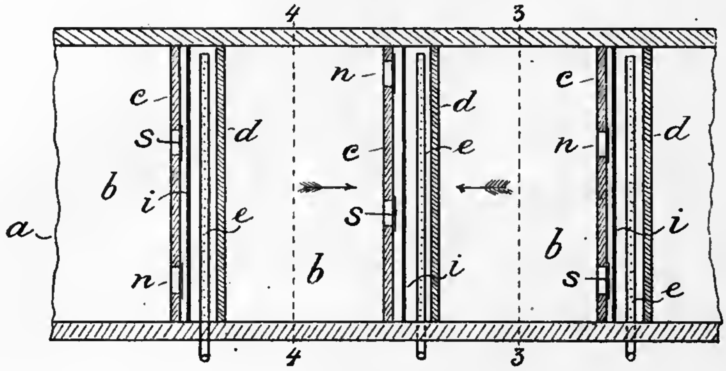


Fig. 2

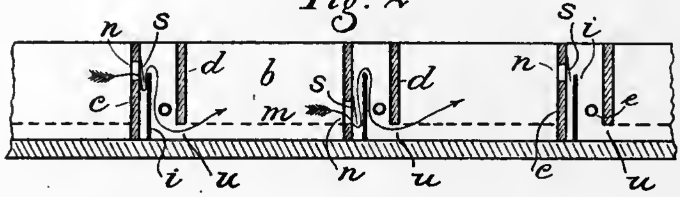


Fig. 3

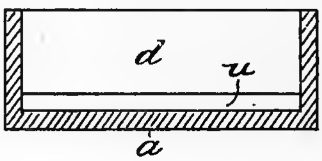
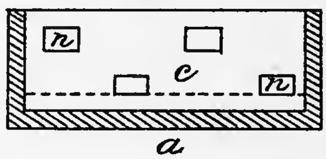


Fig. 4



Witnesses

Inventor

Anders A. Pindstofte

per

Attorneys

UNITED STATES PATENT OFFICE.

ANDERS ANDERSEN PINDSTOFTE, OF FREDERIKSBERG, NEAR COPENHAGEN, DENMARK.

PASTEURIZING APPARATUS.

No. 913,559. **Specification of Letters Patent.** **Patented Feb. 23, 1909.**

Application filed October 1, 1907. Serial No. 395,391.

To all whom it may concern:

Be it known that I, Anders Andersen Pindstofte, subject of Denmark, residing at No. 62 Frederiksberg Alle, in the city of Frederiksberg, near Copenhagen, Kingdom of Denmark, have invented new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

The invention relates to improvements in pasteurizing-apparatus, consisting of a reservoir divided into compartments through which the pasteurizing fluid is caused to circulate during the use of the apparatus, which circulation always takes place in a certain direction through the apparatus. In order to insure that the upper and lower portions of the pasteurizing fluid are mixed together during the passage of said fluid from one of the compartments to the next, it has been customary or usual to provide the partitions between the compartments with channels alternately having inlet at the top, outlet at the bottom, an inlet at the bottom, outlet at the top, thereby causing the pasteurizing fluid when it, during the use of the apparatus, is brought to circulate to flow out from the several compartments as well at the bottom as at the neck of the bottles inserted in the compartments and to be thoroughly mixed when it leaves the said channels before it flows into the next compartment. Such channels, however, render the cleaning of the apparatus difficult, and, therefore, the present invention has for its object to dispense with such channels, which are replaced by an arrangement, by means of which the different layers of the pasteurizing fluid are mixed at least as well or still better as in apparatus provided with the above stated channels.

In the improved apparatus the front wall of each of the compartments (*i. e.* the end wall of the compartment which is situated in the direction of movement of the pasteurizing fluid) is provided with openings closed by self-acting valves, such openings being arranged alternately at the bottom and at the top in line with the neck of the bottles inserted in the compartment. The openings are so arranged and of such dimensions that a simultaneous flow corresponding to the size of the apparatus takes place through all the openings every time when the pasteurizing fluid during the use of the apparatus is caused to circulate through the compartments. When the bottles are placed in stories in the compartments the number of ranks of openings in the front-walls is augmented proportional to the number of stories, so that thereby the distribution of the fluid-current between the bottles is rendered as equal as possible. Between each of said front walls and the rear wall of the next compartment is arranged a transversely placed partition of such a height, that the several parts of the pasteurizing fluid which flow out through the openings in the front wall are thoroughly mixed in the rear of such partition, after which the mixed fluid passing over the upper edge of the partition can flow into the next compartment. In front of the partition between it and the rear wall of the next compartment a perforated tube or the like may be arranged, through which tube steam or cooling water can be introduced into the pasteurizing fluid during its movement, thereby heating or cooling said fluid in a homogeneous manner before it flows into the next compartment.

I will now proceed to describe my invention with reference to the accompanying drawing, in which like reference letters refer to like parts throughout, and in which—

Figure 1 is a horizontal section through a part of a pasteurizing apparatus, Fig. 2 is a vertical longitudinal section through said apparatus, Fig. 3 is a vertical section on line 3—3 of Fig. 1, and Fig. 4 is a vertical section on line 4—4 of Fig. 1. Figs. 3 and 4 are seen in the direction of the arrows placed at the section-lines.

The pasteurizing-apparatus *a* is divided into a number of compartments *b* by means of walls *c*, *d*. The walls *c* which are designated "the front-walls" because they lie in the direction of movement of the pasteurizing fluid, are provided with openings *n* closed by self-acting valves *s*, which openings are situated alternately at a level with the bottom and the neck of the bottles placed in the compartments. The walls *d* are provided at the bottom with a transverse opening *u*, through which the pasteurizing-fluid from one compartment can pass into the next compartment and upwards between the bottles, which are placed upon the perforated bottom *m* of the compartment, or in a basket having a perforated bottom and placed upon the bottom *m*. In order, however, that the pasteurizing fluid flowing out of the openings n shall be thoroughly mixed before it passes into the next compartment, a transverse partition i is arranged in front of each of the front-walls c. Behind these transverse partitions the several layers of the outflowing fluid are thoroughly mixed before the fluid passing over the upper edge of said partitions i can pass through the opening u at the bottom of the partitions d and upwards between the bottles placed in the next compartment.

Between each of the partitions i and the end walls d may be arranged a perforated tube e an injeetor or the like, through which steam or cooling water can be introduced into the passing pasteurizing fluid. By such means the fluid may be heated or cooled to the desired extent and in a homogeneous manner during its passage from one compartment to the next. The perforated tubes e may suitably be branched to a common pipe arranged outside the apparatus.

I claim:

1. In a pasteurizing apparatus, the combination of transverse partitions dividing the apparatus into compartments through which the pasteurizing fluid is caused to circulate during the use of the apparatus and forming the front and rear walls of said compartments, with openings arranged at different levels in said front-walls and closed by self-acting valves, opening or openings in the rear-walls, and intermediate transverse partitions of suitable height placed one in front of each of the front-walls; substantially as described and for the purpose set forth.

2. In a pasteurizing apparatus, the combination of transverse partitions dividing the apparatus into compartments through which the pasteurizing fluid is caused to circulate during the use of the apparatus and forming the front and rear walls of said compartments, with two rows of openings arranged at different levels in said front-walls and closed by self-acting non-return valves, which open in the direction of the flow, a transverse opening at the bottom of each rear-wall, and intermediate transverse partitions of suitable height placed one in front of each of the front-walls; substantially as described and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANDERS ANDERSEN PINDSTOFTE.

Witnesses:

MARCUS ULOLLER,

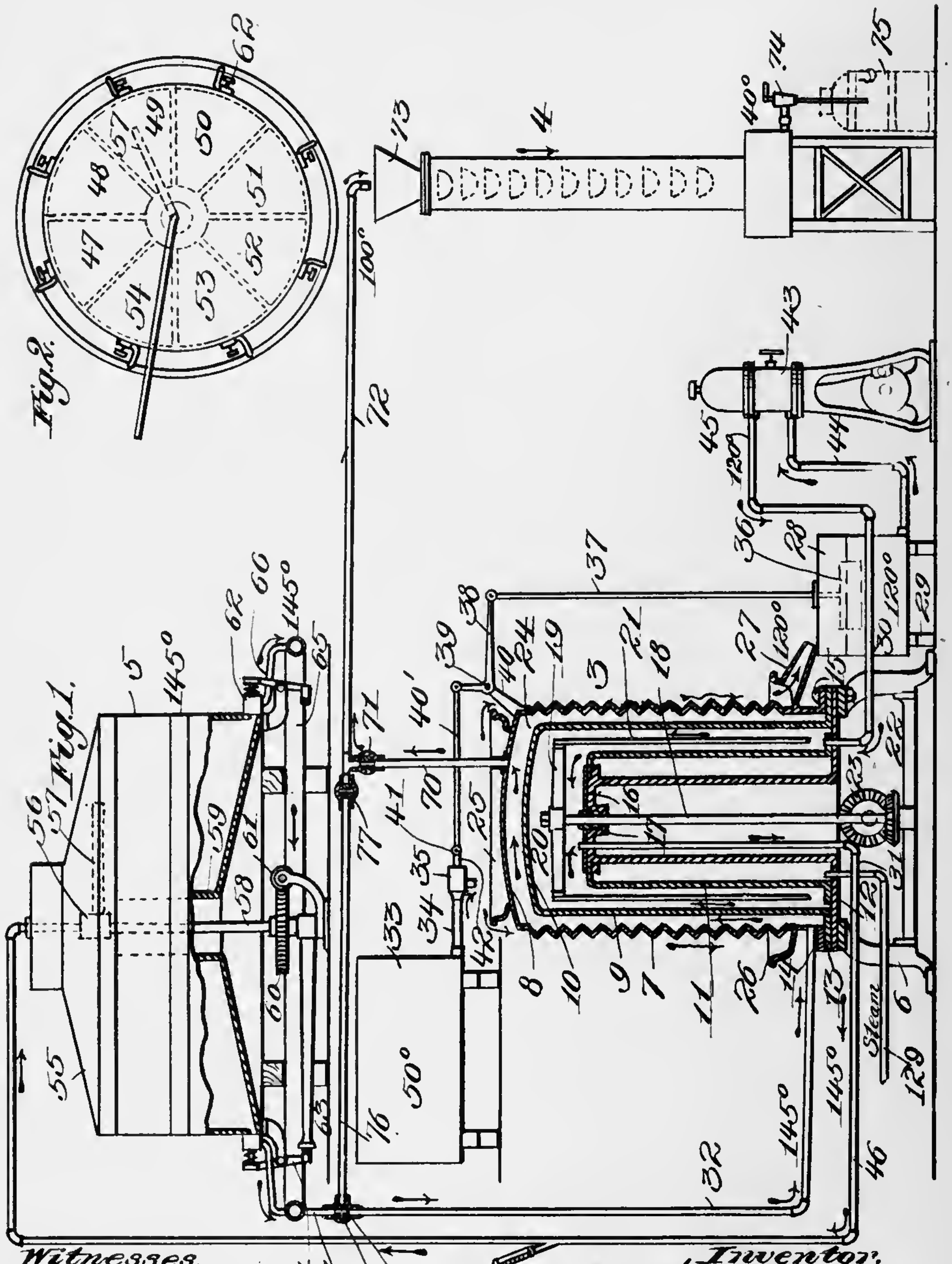
T. RATKJUR.

J. WILLMANN.

PROCESS OF PASTEURIZING MILK.

APPLICATION FILED MAY 25, 1908.

913,600. Patented Feb. 23, 1909.



Witnesses.
Robert Everett.
[illegible]

Inventor.
Joseph Willmann.
By James L. Norris,
Atty.

UNITED STATES PATENT OFFICE.

JOSEPH WILLMANN, OF SHELTON, CONNECTICUT.

PROCESS OF PASTEURIZING MILK.

No. 913,600. Specification of Letters Patent. Patented Feb. 23, 1909.

Application filed May 25, 1908. Serial No. 434,947.

To all whom it may concern:

Be it known that I, JOSEPH WILLMANN, a subject of the Emperor of Germany, residing at Shelton, in the county of Fairfield and State of Connecticut, have invented new and useful Improvements in Processes of Pasteurizing Milk, of which the following is a specification.

This invention relates to a process of pasteurizing milk, and the object thereof is to provide a process in a manner as hereinafter set forth whereby the milk is perfectly pasteurized in a continuous manner and without the intermittent discontinuing of the heating of the milk to a pasteurizing temperature.

The primary object of the process in accordance with this invention is to entirely eliminate the pathogenic bacteria, at the same time preserving the cream line and rendering the milk thoroughly digestive, whereby an absolutely safe and harmless product is set up.

Briefly described the process consists of the following steps:—The milk is heated to a temperature of from 140 to 152° F. in a suitable vessel, after which the hot steady stream enters a suitable holding device, where it is kept automatically from twenty to thirty minutes at such temperature and after which it is discharged in a steady flow either through the regenerative department of a pasteurizer or over or through a cooler into a can or bottle filler. The holding of the milk for a predetermined time at a predetermined temperature destroys all of the bacteria contained in the milk, at the same time preserving the cream line and does not render the albumen hard to digest. The method as herein set forth not only destroys the germ life in the milk, but at the same time the characteristics of the milk are preserved, so that the milk will not only be pure and wholesome, but will keep for much longer periods of time than if not pasteurized in accordance with the process set forth herein.

As showing one form of an apparatus capable of carrying out the method, reference is had to the accompanying drawings, in which:—

Figure 1 is a sectional elevation of a pasteurizing apparatus by which the process can be carried out, and Fig. 2 is a plan of a container.

Referring to the drawings in detail, 3 denotes generally a pasteurizer, 4 a cooler and 5 a container. The pasteurizer embodies a base 6, a corrugated outer section 7 closed at its top as at 8, an intermediate section 9 closed at its top as at 10, and a chambered inner section 11 the bottom wall 12 of which is extended and mounted upon the base 6. The section 9 is flanged as at 13 and rests upon the extended portion of the inner section and the corrugated outer section is flanged as at 14 and rests upon the flange 13. The extension 12 as well as the flanges 13 and 14 are secured together by the hold-fast devices 15. The top 16 of the inner section 11 is provided with a stuffing box 17 through which projects a vertically extending shaft 18 which on its upper end has secured thereto a supporting arm 19 positioned in a chamber 20 formed between the inner section 11 and the intermediate section 9. The arm 19 has depending therefrom the agitators 21 which when the shaft 18 is rotated revolve within the chamber 20. The lower end of the shaft 18 has connected therewith a bevel gear 22 meshing with the crown gear 23, the latter being operated from any suitable source of power. The pasteurizer 3 further embodies a chamber 24 formed by the intermediate section 9 and the outer section 7. Mounted upon the latter is a receiving tray 25 for the milk to be pasteurized and surrounding the section 7 near the lower end thereof is a collecting trough 26 having an outlet 27 which opens into a tank 28 mounted upon the supports 29. The chamber formed by the inner section 11 of the pasteurizer has communicating therewith a steam supply pipe 129, the chamber 20 has a milk supply pipe 30 and a milk discharge pipe 31, and the chamber 24 has communicating therewith a milk supply pipe 32.

The reference character 33 denotes a reservoir having an outlet 34 controlled by an automatically operable shut-off 35. The milk as it leaves the reservoir 33 is supplied to the tray 25 and over-flows the edge of the tray and travels down the corrugated outer section 7 and is collected in the trough 26. The milk when collected in the trough 26 owing to its travel over the outer section 7 has been heated to a temperature of 120°. The milk stored in the reservoir 33 is of a temperature of 50°. The milk is discharged from the trough 26 at a temperature of 120° into the tank 28. Within the tank 28 is a float 36 connected by a rod 37 with a bell crank 38 which is pivoted as at 39 to an arm 40 formed integral with the outer section 7 of the pasteurizer. To the bell crank 38 is pivotally connected a shifting rod 40′ which is also pivotally connected as at 41 to the stem 42 of the automatically controlled cut-off. By such an arrangement it is evident that the supply of milk from the reservoir 33 can be controlled by the quantity of milk within the tank 28. This is evident, as when the float 36 rises it will tend to close the cut-off, but when the float lowers the cut-off will be operated in an opposite direction, whereby an increased quantity of milk can be supplied from the reservoir 33.

The reference character 43 denotes a pump which communicates by the suction pipe 44 with the bottom of the tank 28 and the function of the pump 43 is to withdraw the heated milk from the tank 28 and force the same back into the pasteurizer 3, the milk entering the chamber 20 at the bottom thereof where it transmits most of its heat to the incoming cold milk. While the milk is being heated in the chamber 20, it is agitated through the medium of the agitators 21. The pump 43 communicates with the chamber 20 through the medium of the supply pipe 45. The milk as it leaves the tank 28 is of a temperature of 120° and is forced back into the chamber 20 at such temperature. The heating of the milk in the chamber 20 as well as when it flows over the outer section 7 is had through the medium of the steam jacket formed by the inner section 11. After the milk has been brought to a temperature of 145° without discontinuing the flow of the milk through the pasteurizer, it is discharged from the chamber 20 through the medium of the discharge pipe 46 which has one end thereof opening into the chamber 20 near the top of the latter. The milk is conducted through the medium of the pipe 46 at for instance a temperature of 145° into the container where the milk is held a predetermined length of time at said temperature of 145° and without discontinuing the operation of the pasteurizer.

The container 5 is constructed in such manner as to maintain the temperature of the milk at for example 145° for a predetermined length of time, say from twenty to thirty minutes, the loss of heat being usually negligible, perhaps one-half a degree such action killing the pathogenic germs, but without eventually changing the cream line of the milk or causing the albumen to be hard to digest. By way of example the container 5 is shown consisting of a cylindrical receptacle divided into a series of compartments 47, 48, 49, 50, 51, 52, 53, 54. The number of compartments is shown by way of example, the number being increased or diminished according to the quantity of milk desired to be treated. A cover 55 is provided for the receptacle, through which extends the pipe 46, the latter depending into the container and opening into a receiver 56 which is provided with a spout 57 for discharging the heated milk successively into the various compartments of the container. The receiver 56 is mounted upon the upper end of a revolving shaft 58 which extends up through a sleeve 59 arranged centrally of the container and by such an arrangement it is evident that when the shaft 58 rotates the receiver 56 is carried therewith and causes the spout to be positioned successively over the various compartments of the container and successively fill them. The shaft 58 carries a worm wheel 60 meshing with a worm 61 driven by suitable means not shown. Each of the compartments 47 to 54 is provided with an automatically operable outlet valve 62, each of the valves 62 being operated at predetermined intervals so as to cause the compartments to successively empty. The shaft 58 revolves at a predetermined rate of speed and in this connection it will be stated that during the supply of milk to the compartments of the container 5, the shaft 58 is adapted to be revolved at such a rate of speed as to enable the milk to be held a predetermined time at the temperature at which the milk is delivered into the container. If this time, is, for instance, say fifteen minutes, the speed of the shaft will be such as to make one revolution in every twenty-four minutes, as it would be necessary to keep the milk in the compartments for a period of fifteen minutes and it will have to eventually cause the filling of all the compartments.

It will be assumed that compartments 54, 53, 52, 51 and 50 are filled, compartment 49 filling, compartment 48 empty and compartment 47 emptying. After compartment 49 has been filled and the spout is moved over compartment 48 the exhaust valve will be closed to compartment 47, as this compartment will have been emptied by this time. The actuating device for the exhaust valve mechanism to be hereinafter referred to will then have to be moved to a position to open the outlet of compartment 54. Afte the filling of compartment 48, the spout is then moved over compartment 47 to cause the filling thereof and the tripping device will close the exhaust valve mechanism of compartment 54 which has been emptied by this time and the tripping device will move on to open the outlet to compartment 53 so that said compartment can be emptied. This operation is had without discontinuing or cutting off the flow of milk through the pipe 56 from the pasteurizer 3 and is also continued until all the milk has been exhausted from the pasteurizer 3. The tripping device or actuating means for each of the exhaust valve mechanisms 62 consists of an elongated arm 63 carried by the shaft 58 and adapted to engage a shifting lever 64 which actuates the exhaust valve mechanism. Arranged below the container 5 is a common receiving pipe 65 to all of the compartments in the container and communication is had between said pipe 65 and each of the exhaust valve mechanisms 62 by a branch pipe 66.

In some instances it has been found advantageous to again pass the milk through the pasteurizer 3 after it has been held a predetermined period within the container and for such purpose a branch pipe 67 is provided which communicates at one end with a pipe 65 and at its other end with a two-way valve casing 68, the valve being indicated by the reference character 69. The pipe 32 communicates at one end with the casing 68 and at its other end with the chamber 24. If the valve 69 is in the position shown in Fig. 1, the milk is discharged from the pipe 65 into the chamber 24 and is again heated, after which it is discharged from the chamber 24 into the cooler 4 and for such purpose a branch pipe 70 provided with a cut-off 71 communicates with a chamber 24 and with the conducting pipe 72 which opens into a funnel 73, the latter constituting the entrance for the cooler 4. The milk as it enters the regenerative chamber 24 has a temperature of say 145° but is discharged into the cooler at a temperature of 100°. The milk leaves the cooler through the discharge spout 74 at a temperature of 40° and is received in a vessel 75 or other suitable means. The milk can be conducted from the container 5 directly to the cooler and for such purpose a branch conducting pipe 76 is provided which has a cut-off 77. The pipe 76 communicates with a valve casing 68 and with the conducting pipe 72. When it is desired to conduct the milk at 145° from the container 5 to the cooler 4, the valve 68 is shifted so as to establish communication between the pipes 67 and 76 and the valve 77 shifted so as to establish communication between the pipes 76 and 72. The cut-off 71 and the pipe 70 are closed.

Fahrenheit temperatures have been given in the preceding specification, and in each case, it will be obvious that the pasteurizing temperature at which the milk is heated and held is considerably below the boiling point so that while the dangerous bacilli are destroyed or rendered harmless, the properties of the liquid will not be injured. In the drawing and specification, it is stated that the milk may be heated to a temperature of 145° Fahrenheit, but it will be understood of course that this temperature is given merely as an example and that this temperature may vary one way or another within a range of temperature which will insure the pasteurization of the bacilli without coagulating the albumen in the milk, it being possible to vary the temperature, say, between 140° and 152° Fahrenheit.

What I claim is:—

1. A process of pasteurizing milk which consists in heating the milk to a pasteurizing temperature while the milk flows continuously, and then maintaining the milk at such pasteurizing temperature and for such a period of time as will suffice to kill or render harmless the bacteria without coagulating the albumen in the milk and without discontinuing the flow of milk while being heated.

2. A process of pasteurizing milk which consists in heating the milk to a pasteurizing temperature while the milk flows continuously, then maintaining the milk at such pasteurizing temperature and for such a period of time as will suffice to kill or render harmless the bacteria without coagulating the albumen therein and without discontinuing the flow of milk while being heated, and then cooling the milk.

3. A method of pasteurizing milk which consists in heating a continuously flowing body of milk to a temperature of from 140° to 152° Fahrenheit, and then maintaining the milk for such a predetermined time at said temperature as will suffice to kill the bacteria without coagulating the albumen contained in the milk and while the milk flows continuously.

4. A method of pasteurizing milk comprising the heating of a continuously flowing body of milk to a temperature of from 140° to 152° Fahrenheit, then maintaining the milk for such a predetermined time at said temperature as will suffice to kill the bacteria contained in the milk without coagulating the albumen therein and without discontinuing the flow of the milk while being heated to the temperature set forth, and then cooling the milk.

5. A method of pasteurizing liquids which consists in heating a continuously flowing liquid to a pasteurizing temperature, and then uniformly holding every portion of the liquid at such pasteurizing temperature while the liquid continues to flow and for a period of time sufficient to kill or render harmless the bacteria without coagulating the albumen therein.

6. A method of pasteurizing liquids which consists in heating a flowing body of liquid to a temperature of from 140 to 152° Fahrenheit, then holding the liquid at such temperature for a period of time sufficient to destroy or render harmless the bacteria contained therein without coagulating albuminous matter and while the liquid continues to flow during the heating thereof.

7. A method of pasteurizing liquids which consists in heating a continuously flowing liquid to a temperature ranging between 140 and 152° Fahrenheit, then maintaining such liquid at such temperature for a period suffi-

cient to destroy or render harmless the bacteria therein without destroying albuminous matter and while the said liquid is continuously discharging.

8. A method of pasteurizing milk which consists in heating a continuously flowing body of milk to a pasteurizing temperature insufficient to coagulate the albumen therein, and then holding the milk thus heated for a period of time sufficient to kill the pathogenic organisms therein without coagulating the albumen or destroying the cream line and while the said body of milk flows continuously.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOSEPH WILLMANN.

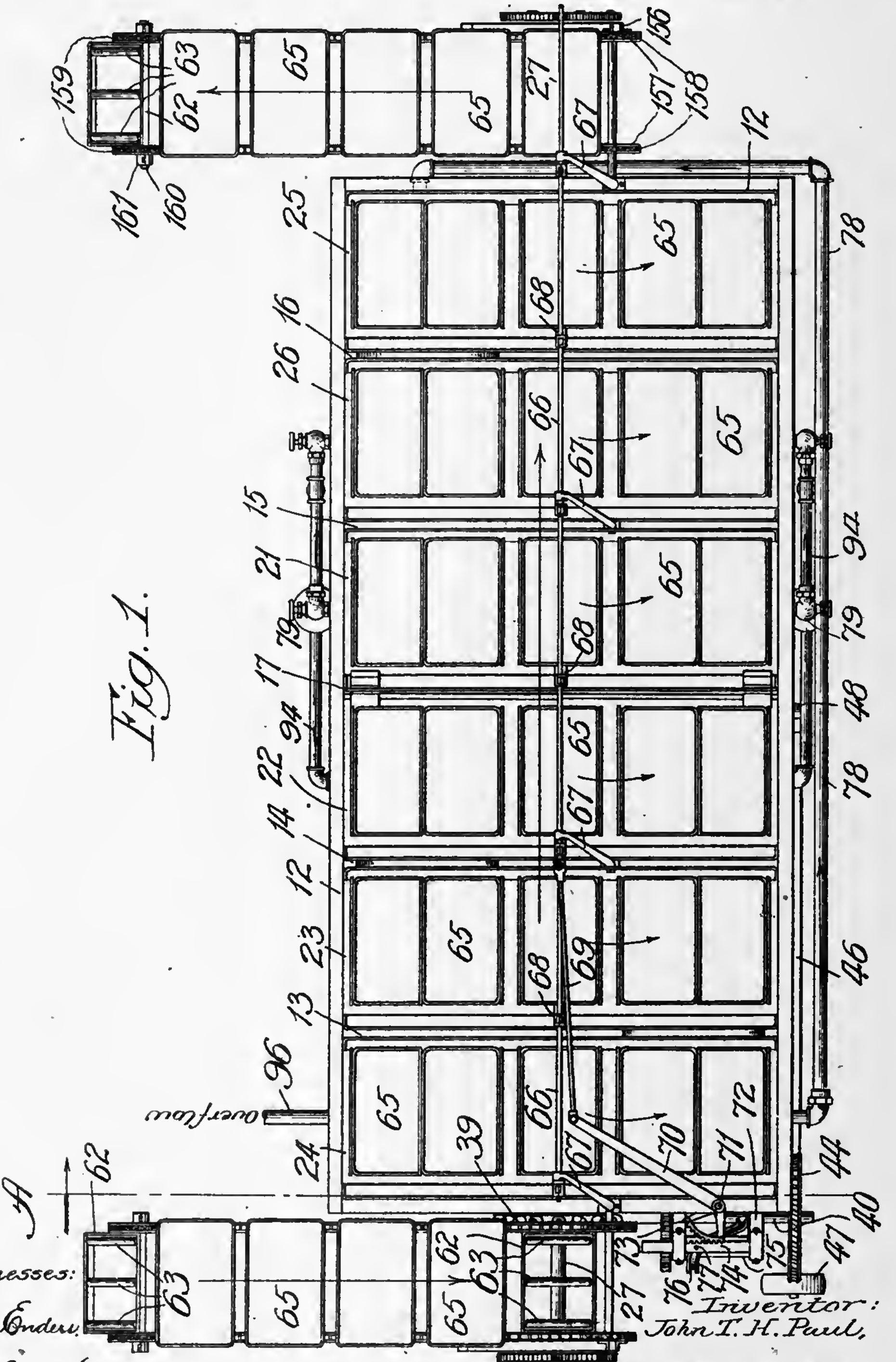
Witnesses:
MURIEL I. DAVIS,
HOWARD B. PECK.

5 a
Mch 1909

913,910.

J. T. H. PAUL.
PASTEURIZING APPARATUS.
APPLICATION FILED MAY 28, 1908.

Patented Mar. 2, 1909.
7 SHEETS—SHEET 1.



Witnesses:
John Enders.
Chas. H. Buell.

Inventor:
John T. H. Paul,
By Dyrenforth, Lee, Chritton & Wiles
Attys.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED MAY 28, 1908.

913,910. Patented Mar. 2, 1909.

7 SHEETS—SHEET 2.

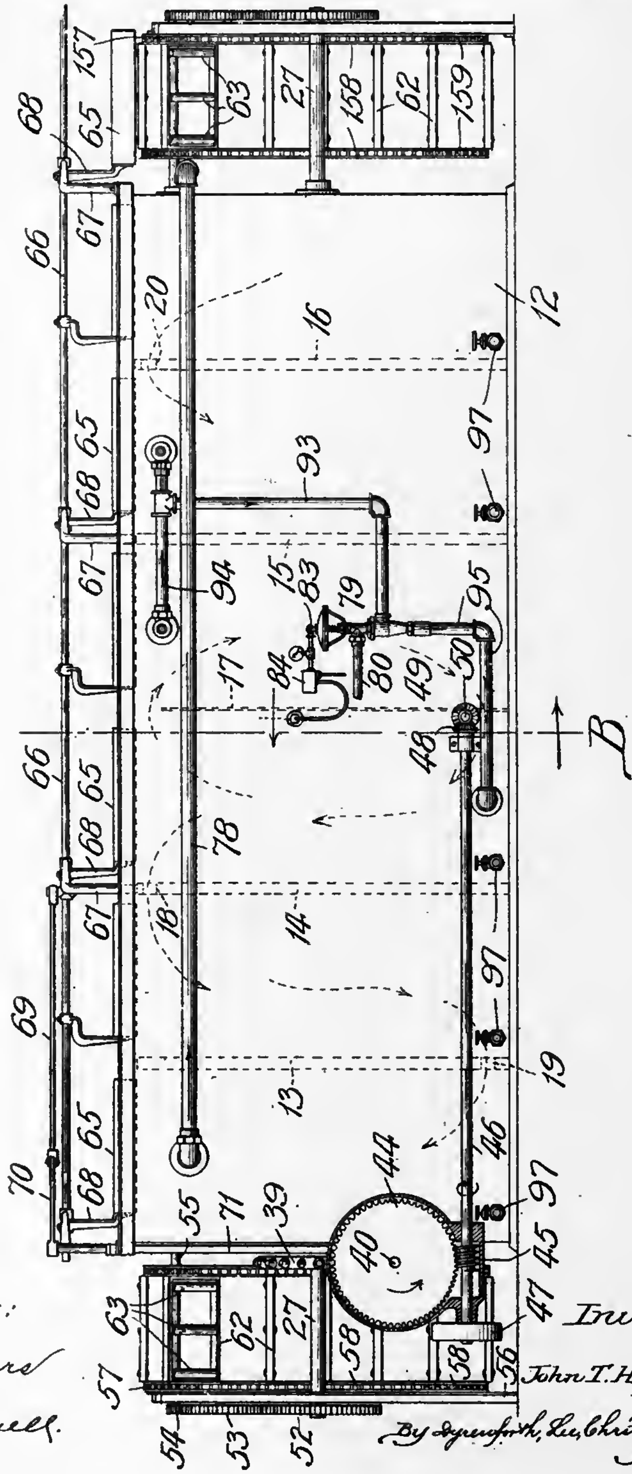


Fig. 2.

Witnesses:

John Enders

Chas. H. Buell.

Inventor:

John T. H. Paul,

By Dyrenforth, Lee, Chritton & Wiles

Attys.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

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7 SHEETS—SHEET 3.

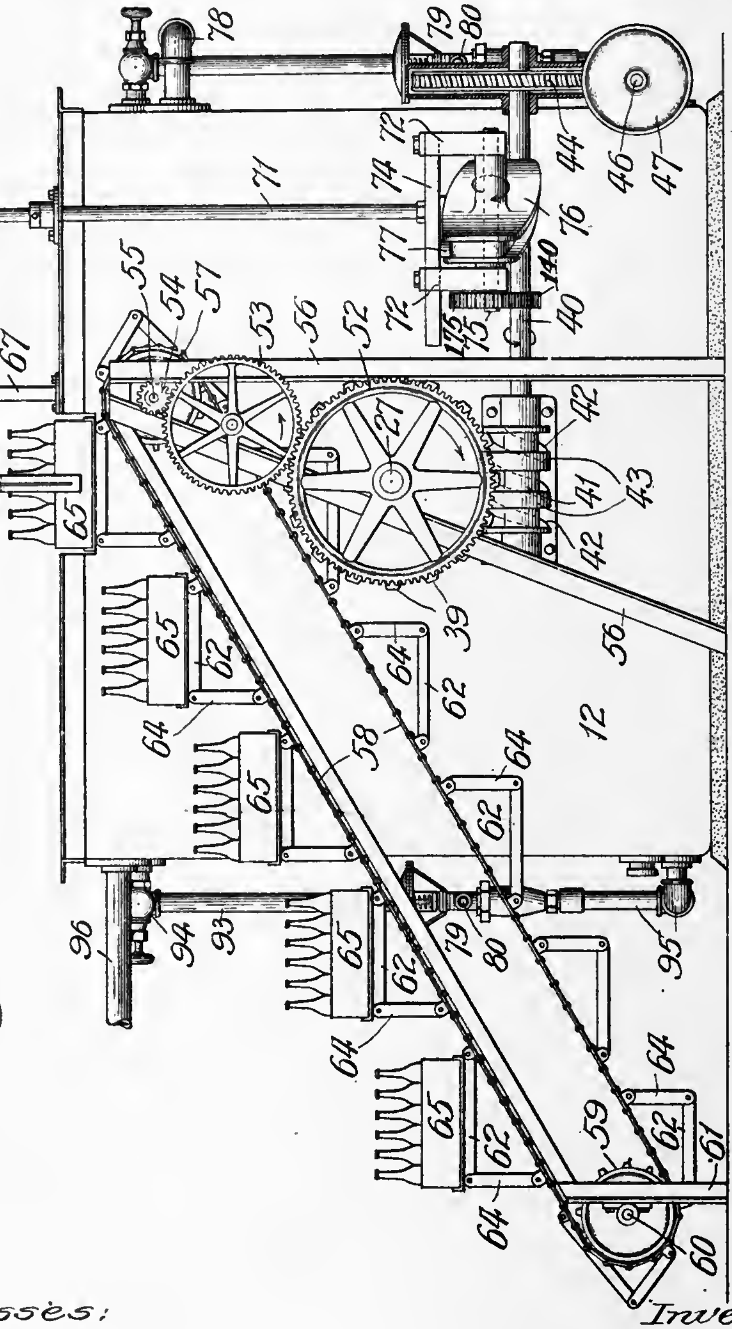


Fig. 3.

Witnesses:

John Enders

Chas. H. Bull

Inventor:

John T. H. Paul,

By Dyrenforth, Lee, Chritton & Wiles

Attys.

J. T. H. PAUL.
PASTEURIZING APPARATUS.
APPLICATION FILED MAY 28, 1908.

913,910. Patented Mar. 2, 1909.

7 SHEETS—SHEET 4.

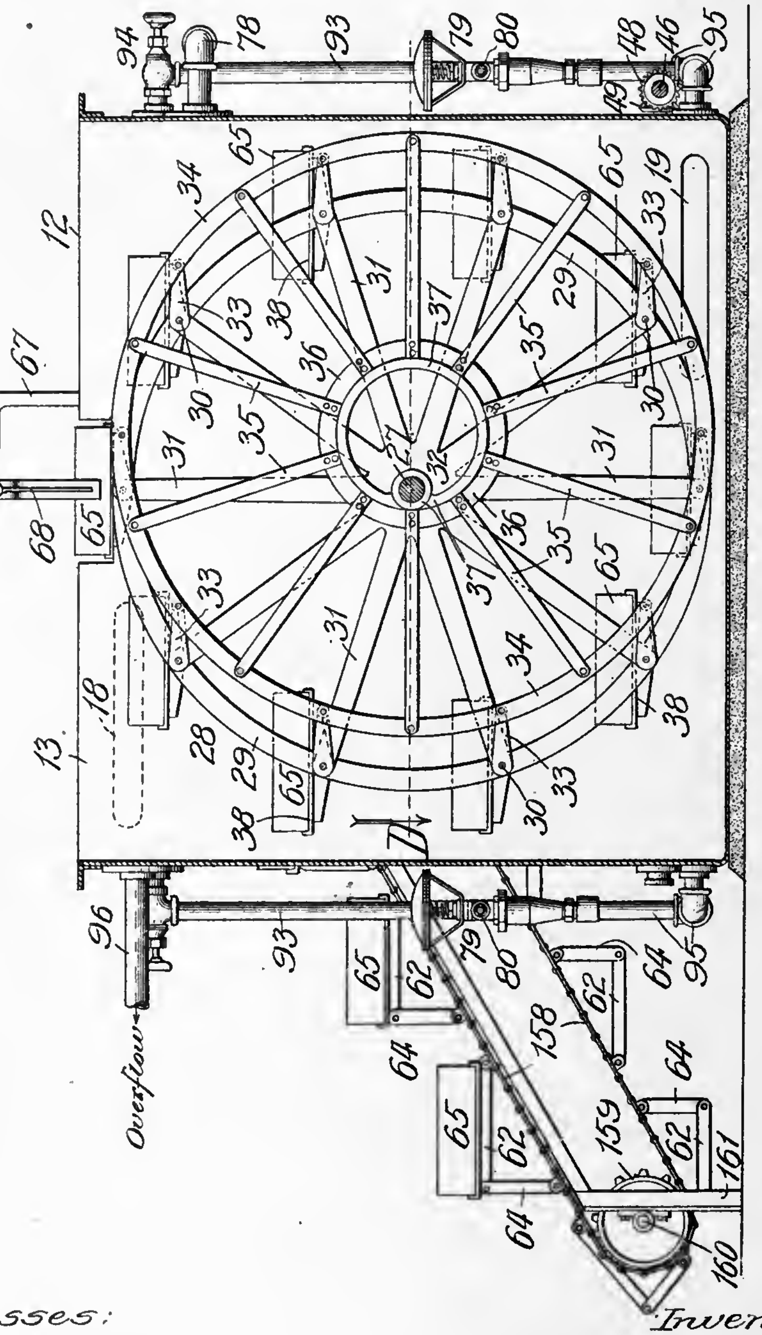


Fig. 4.

Witnesses:
John Endere
Chas. H. Buell

Inventor:
John T. H. Paul,
By Dyrenforth, Lee, Chritton & Wiles
Attys.

J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED MAY 28, 1908.

913,910. Patented Mar. 2, 1909.

7 SHEETS—SHEET 5.

Fig. 5.

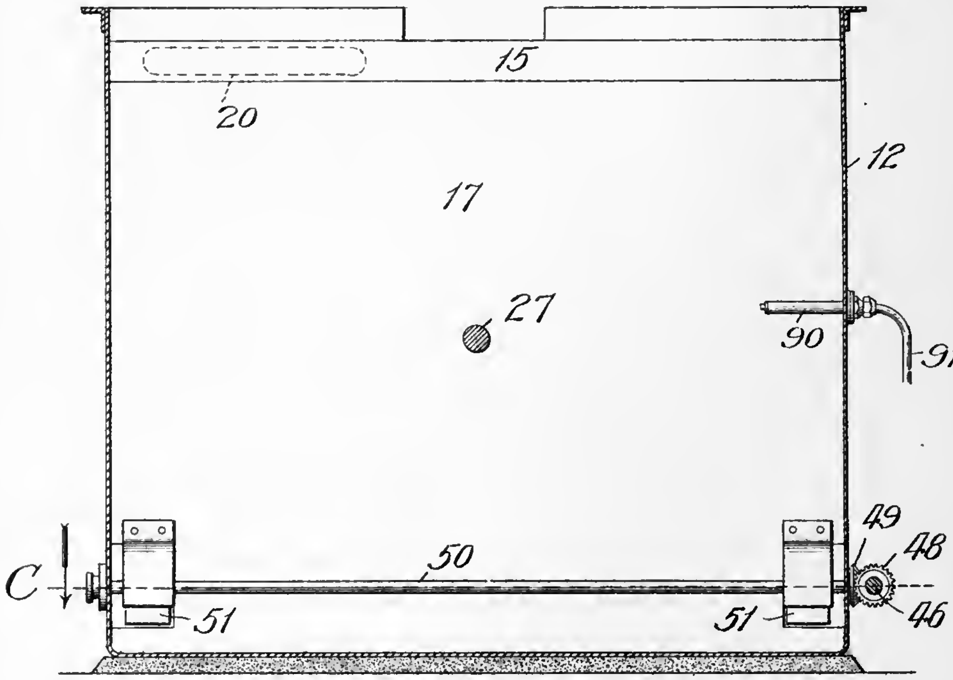
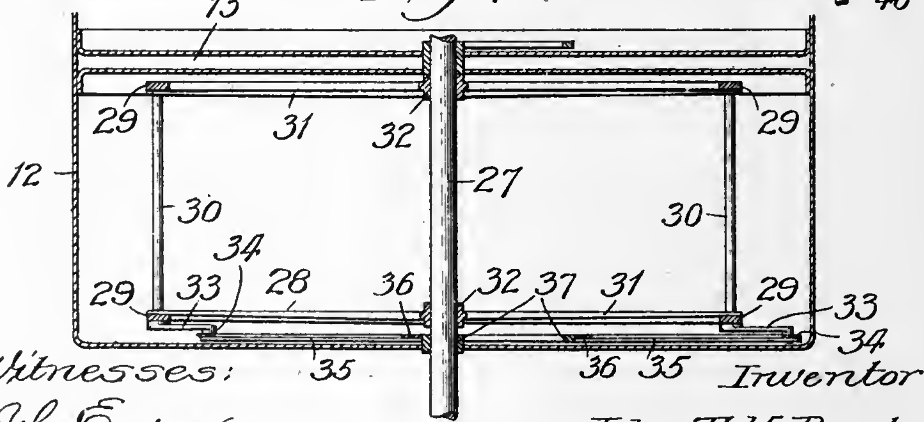


Fig. 6.

Fig. 7.



Witnesses:

John Enders

Chas. H. Bull.

Inventor:

John T. H. Paul.

By Dyrenforth, Lee, Chritton & Wiles Attys.

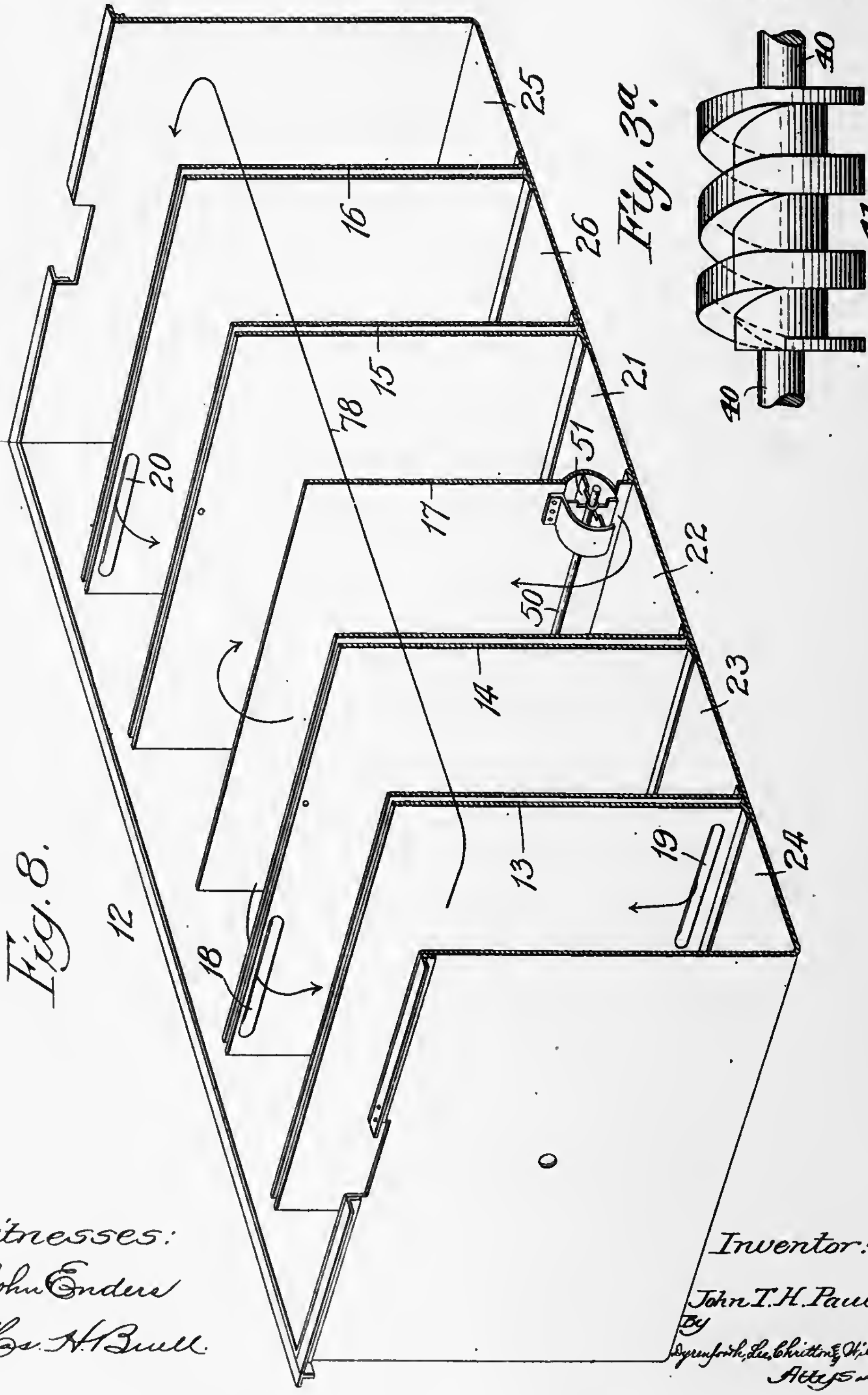
J. T. H. PAUL.

PASTEURIZING APPARATUS.

APPLICATION FILED MAY 28, 1908.

913,910. Patented Mar. 2, 1909.

7 SHEETS—SHEET 6.



Witnesses:
John Enders
Chas. H. Buell

Inventor:
John T. H. Paul,
By Dyrenforth, Lee, Chritton & Wiles
Attys.

J. T. H. PAUL.
PASTEURIZING APPARATUS.
APPLICATION FILED MAY 28, 1908.

913,910. Patented Mar. 2, 1909.

7 SHEETS—SHEET 7.

Fig. 9.

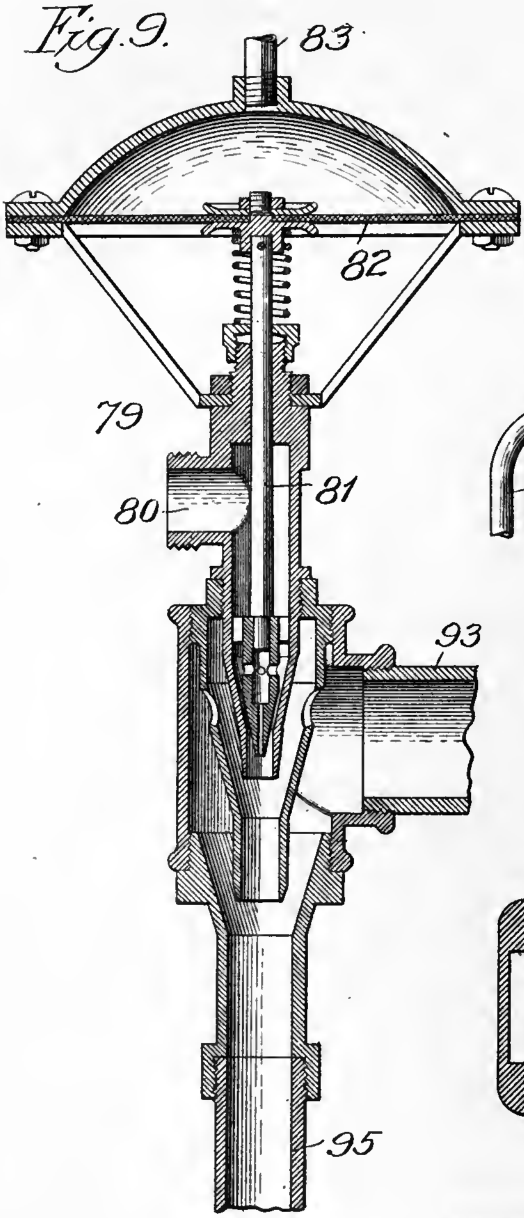


Fig. 10.

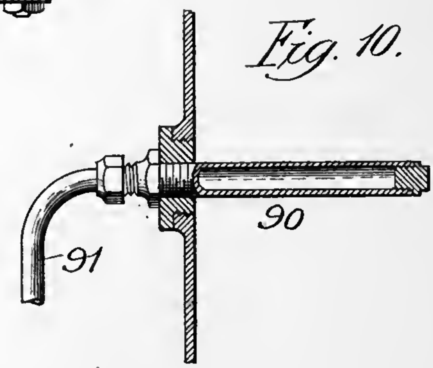
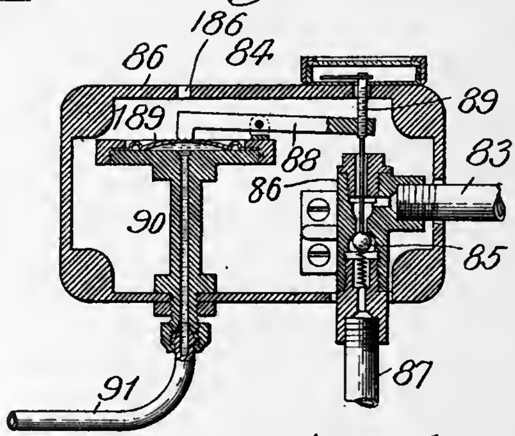


Fig. 11.



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THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN T. H. PAUL, OF CHICAGO, ILLINOIS, ASSIGNOR TO E. GOLDMAN & CO., INC., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PASTEURIZING APPARATUS.

No. 913,910. Specification of Letters Patent. Patented March 2, 1909.

Application filed May 28, 1908. Serial No. 435,443.

To all whom it may concern:

Be it known that I, JOHN T. H. PAUL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Pasteurizing Apparatus, of which the following is a specification.

My invention relates to improvements in the class of pasteurizers in which the material to be pasteurized, contained in packages—as liquids in bottles—is caused to travel slowly and intermittently through a series of compartments containing water at successive temperatures increasing to that required for effecting pasteurization and thereafter decreasing, the packages being intercepted in each compartment and carried about therein, by intermittent motion, or rotary carriers.

In the accompanying drawings, Figure 1 is a plan view of the apparatus; Fig. 2 is a view of the same in side elevation, and Fig. 3, an end view; Fig. 3ª is a broken view in front elevation of the mutilated driving member of the intermittent-motion device; Fig. 4 is an enlarged section on line A, Fig. 1, and Fig. 5, a similar section on line B, Fig. 2; Fig. 6 is a section on line C, Fig. 5, and Fig. 7, a section on line D, Fig. 4; Fig. 8 is a perspective view of the tank in longitudinal section, showing its division into compartments which are, for the most part, intercommunicating; Fig. 9 shows a steam-jet device in longitudinal section for heating and circulating the water in the pasteurizing compartments, and Figs. 10 and 11 are sectional views respectively of a thermostat-device and an air-pressure valve-device for controlling the operation of the steam-jet device.

For the purpose of the following description, the material to be treated may be considered to be beer in bottles.

The tank 12 is shown of oblong rectangular form and is divided into compartments, of which six are shown (Fig. 8) by similar vertical double partitions 13, 14, 15 and 16, each forming between its sections an insulating air-space, and a single central partition 17 extending to a lesser height in the tank than the others. A port 18 in the upper part of the partition 14 connects the compartments 22 and 23 and the latter communicates with the compartment 24 through a port 19 in the lower part of the partition 13; the compartments 25 and 26 communicate through a port 20 in the upper part of the partition 16, but the compartments 26 and 21 do not intercommunicate directly and the compartments 21 and 22, which form the pasteurizing compartment, communicate over the upper edge of the relatively lower partition 17 and through the bottom of the latter near its opposite ends. It would, of course, be possible to construct the tank in sections joined together and forming the compartments.

A shaft 27 extends lengthwise and centrally through the tank, being journaled in the ends thereof and in the partitions. Rotary basket or receptacle carriers 28 are secured on the shaft to turn with it, one in each compartment, and are all of the preferred wheel-construction best illustrated of the one represented in Figs. 4 and 7: A pair of similar annular rims 29, 29 are connected by rock-shafts 30 journaled at uniform intervals apart in and extending between the rims which are rigidly connected by spokes 31 with the central hub 32 secured on the shaft 27. The rock-shafts carry on corresponding ends cranks 33 which are fastened to an annular rim 34 connected by spokes 35 with a ring 36 supported concentrically of the rim 34 by rotatably surrounding an annular hub 37, which is fastened eccentrically upon the shaft 27 to rotate with it. The rim 34 thus rotates with the shaft and affords an eccentric connection therewith of the cranks for turning them as and for the purpose hereinafter described. On each rock-shaft is secured to turn with it a basket-holder 38.

To drive the shaft 27 it carries on one end a gear-wheel 39 to be engaged by an intermittent drive of the preferred construction illustrated, comprising a rotary shaft 40 journaled in suitable bearings and carrying on one end a mutilated gear 41 consisting of worm-sections 42 extending part way about the shaft and straight teeth 43 extending about the remaining portion of the shaft's circumference and joining the ends of successive worm-sections. On the opposite end of the shaft 40 is a worm-wheel 44 meshing with a worm 45 on the drive-shaft 46, which is journaled in suitable bearings and carries on one end a belt-pulley 47 and on its opposite end a beveled pinion 48 meshing with a similar pinion 49 on a shaft 50 journaled in bearings on the base of the partition 17.

The shaft 50 carries on each end a shielded agitator 51 in an opening in the base of the partition to act upon the water in both compartments 21 and 22, as and for the purpose hereinafter explained.

A gear-wheel 52 on the end of the shaft 27 carrying the gear 39 meshes with an idler 53, which in turn meshes with a pinion 54 on a shaft 55 journaled, like the idler 53 and shaft 27, in bearings in a frame 56 at the adjacent receiving end of the tank and carrying a pair of sprockets 57 connected by inclined chains 58 with similar sprockets 59 on a shaft 60 journaled in bearings on a lower frame 61. At the opposite, delivery end of the tank is provided a frame 156 like the frame 56 and having journaled in it a shaft 155 carrying sprockets 157 connected by inclined chains 158 with similar sprockets 159 on a shaft 160 journaled in a lower frame 161, all as at the receiving end of the tank, except that the chains 158, forming a conveyer, must travel in the direction opposite that in which the conveyer-chains 58 travel, and to that end are suitably geared to the shaft 27, as indicated in Fig. 1, by the interposition in the gear-train of an additional idler. On each pair of the chains 58 and 158 are fastened at uniform intervals apart platforms 62, each consisting, as its preferred construction, of a rectangular frame (Fig. 1) in which rollers 63 are journaled, with one end of the frame pivotally connected with the pair of chains and the other end connected therewith by links 64, whereby the roller platforms are rendered flexible to adapt them to pass freely about the sprockets and always occupy a horizontal position in their travel along the inclined way of the conveyer to properly support baskets 65 filled with bottles containing the beer to be received into and delivered from the tank. The platform-rollers facilitate imposing the boxes on and removing them from the platforms.

As will be hereinafter more fully explained, the operation of the machine involves intermittent rotation of the shaft 27 to bring a longitudinal series of the holders 38 on successive carriers 28 in horizontal alinement with the feed and discharge positions of the baskets 65, so that each alternate time that the carriers are arrested a fresh box may be introduced into place upon the first carrier, and the baskets ahead of it advanced upon successive carriers, while the alining basket on the final carrier is advanced out of the tank upon the delivery-carrier. To effect the automatic advancement of the baskets upon successive holders 38 a rod 66 is supported to adapt it to be reciprocated longitudinally in bearings provided on the horizontal ends of arms 67 of inverted-L shape rising at intervals from the tank-ends and partitions between them to extend the rod-bearings along the longitudinal center of the tank, and pusher-fingers 68 depend at proper intervals rigidly from the rod to engage the rear ends of the baskets. For reciprocating this rod it has a link-connection 69 with a horizontal crank-arm 70 on the upper end of a vertical rock-shaft 71 (Fig. 3) journaled in bearings respectively in the flange on the upper edge of the tank and in a frame 72, and this vertical shaft carries on its lower end a segmental pinion 73 meshing with a rack 74 supported for longitudinally reciprocable movement in the frame 72. In this frame is also journaled a shaft 75 provided with a toothed wheel 175 which meshes with a pinion 140 on a shaft 40, the shaft 75 carrying a cam 76 of the construction shown, adapting it by engagement with it of a stud 77 depending from the rack to reciprocate the latter by a partial rotation of the shaft 40.

An important feature of the present invention is that of the circulation of the water in the tank, to maintain that in each end-compartment 24 and 25 at practically the same temperature (about 25° R. for beer), that in each intermediate compartment 23 and 26 at practically the same temperature of 40° R. (for beer) and that in each central compartment 21 and 22 at the pasteurizing temperature, which is about 48° R. for beer; and the course of circulation is that, as indicated by arrows (Figs. 2 and 8), from the compartments 21 and 22 through the upper port 18 into the attemperating-compartment 23, thence through the lower port 19 into the receiving-compartment 24, thence through a pipe 78 (only indicated in Fig. 8) into the delivery-compartment 25, and from the latter through the upper port 20 into the attemperating-compartment 26. For producing the circulation and heating the water for the pasteurizing action the jet-pump device 79 is provided which is most clearly illustrated in Fig. 9, with a steam-supply pipe 80 leading into its casing and its valve-stem 81 connected for automatic control of the device with a spring-retracted diaphragm 82 actuated by air-pressure directed against it through a pipe 83. The flow of air under pressure to the diaphragm is automatically controlled by the valve-device 84 most clearly illustrated in Fig. 11 and involving the adjustable spring-supported ball-valve 85 interposed, in a vented casing 86, between the air-pressure supply-pipe 87 and the pipe 83, the control of the valve being effected by a lever 88 engaging at one end with the stem 89 for setting the valve 85 and at its opposite end with the diaphragm 189 of a thermostat-device 90, the part of which outside the casing 86 is shown in Fig. 10 and is connected with the part thereof within said casing by a tube 91. The hole 186 shown to be provided in the casing 86 renders it open to the atmosphere to expose thereto the diaphragm 189.

The mechanism shown in Figs. 9 to 11, inclusive, and which is used by preference in connection with the present invention, is fully shown and described in my United States Letters Patent No. 886,012, dated April 28, 1908, and need not, therefore, be more elaborately described herein. This mechanism is duplicated on opposite sides of the tank, with a flow-pipe 93 leading into the casing of the steam-jet pump from a pipe 94 which connects the two compartments 21 and 26 near their upper ends outside the tank, and a discharge-pipe 95 leading from the pump into the lower part of the compartment 22. The tank is provided with an overflow-pipe 96 (Fig. 1) leading preferably to a sewer (not shown), and draw-off cocks 97 are shown on the lower parts of the compartments.

To start with, the tank is filled with cold water, which may be introduced in any desired manner, as through its open top by means of a hose. The jet-pump, by its operation, draws water through it from the upper parts of the compartments 26 and 21, heats it and discharges it in the heated condition into the bottom part of the compartment 22, and the water so heated circulates in the two compartments 21 and 22 over and under the partition 17, under the action of the agitators 51, to eventually raise the water therein and maintain it at the pasteurizing temperature. From the compartment 22 the circulation proceeds in the manner hereinbefore described to heat and maintain the water in each compartment 23 and 26 at the required temperature for preparing the bottles to enter the pasteurizing central compartments (which form practically a single compartment), and to heat and maintain the water in the end-compartments at the required temperature to adapt them, respectively, to receive the cold bottles without danger of fracturing them and deliver the same to the atmosphere with like lack of danger.

With the circulation thus proceeding, the operation of the machine is as follows: Rotation of the shaft 46, which maintains the agitators 51 in constant motion, slowly drives the shaft 40 continuously to cause the mutilated-gear device 41 to turn the carrier-shaft 27 through part of a rotation by the action of the worm-sections 42 and then, by engagement of the tooth-sections 43 with the gear 39, arrest the rotation of the carrier-shaft until the worm-sections again engage said gear. The arrangement is such as to cause each engagement of the worm-sections 42 with the gear to turn each of the carriers 28 one-half the distance between successive holders 38, so that with each carrier provided with ten holders, as shown, it requires two actions of said worm-sections to bring a longitudinal series of the holders into registration with the receiving and delivery points on the tank-ends, one of such actions serving to remove the holders out of that registration and out of the return-path of the pusher-fingers for the purpose hereinafter explained. This rotating shaft 27 furthermore drives the conveyers at corresponding speed, that at the receiving-end of the tank being supplied with baskets 65 containing the beer-bottles by an attendant who places such a basket on each lowermost patform 62 as it arrives in position to receive the same. The movements of the parts are so timed that with a basket conveyed to the receiving-point on the tank the carriers 28 will be arrested to aline a longitudinal series of holders 38 with that point, and the shaft 40, in rotating, turns the cam 76 to move the rack 74 in the direction to so turn the shaft 71 as to cause it to move the rod 66 in the direction toward the delivery-end of the tank, thereby engaging with the aforesaid basket a pusher-finger 68 then behind it, to advance that basket upon the holder 38 in position to receive it on the first rotary carrier 28. The next partial turn of the series of carriers takes the basket out of the return-path of the fingers 68, permitting the cam to return them to normal position, wherein the first finger will be behind the next basket brought by the conveyer into the receiving position. The next partial turn of the carriers brings the next succeeding holder on the first carrier into position to receive the basket then in place to be advanced by the first pusher-finger. In this way all the carriers become filled with the baskets, and each is intermittently rotated in each compartment to subject the bottles for the proper prolonged period to the temperature in that compartment, and at the end of each period of such subjection baskets in proper position are transferred to the successive compartments to be preliminarily heated in the compartment 23 after being warmed in the compartment 24 and thus prepared to enter the compartments 22 and 21 to be pasteurized therein, whence they enter the compartment 26 for preliminary reduction therein of their temperature and then attain the compartment 25 for successive delivery from the top thereof at about atmosphere temperature to the conveyer at that end of the tank, from the discharge end of which an attendant removes them in succession.

As will be observed, by the crank-connection 33 between the eccentric rim 34 and each rock-shaft 30 of the respective carrier 28, correspondingly with which the rim rotates, the holders on each carrier are maintained at all times in required horizontal position to support in that position the baskets 65.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a pasteurizing-apparatus, the combination of a tank for the liquid containing a series of compartments forming in succession intercommunicating receiving, attemperating and pasteurizing compartments, a second attemperating-compartment non-communicating with the pasteurizing-compartment and a delivery-compartment communicating with said second attemperating-compartment, a pipe-connection between the end-compartments, a heater and pump for circulating back and forth the liquid in said pasteurizing-compartment and heating it in circulation, and means for conveying material to be pasteurized successively through the compartments from the receiving end of the tank.

2. In a pasteurizing-apparatus, the combination of a tank for the liquid containing a series of compartments forming in succession intercommunicating receiving, attemperating and pasteurizing compartments, a second attemperating compartment non-communicating with the pasteurizing-compartment and a delivery-compartment communicating with second attemperating-compartment, a pipe-connection between the end-compartments, a heater and pump connected with said pasteurizing and second attemperating compartments at their upper parts to take liquid from both and heat it in circulation and discharging into the lower part of the pasteurizing-compartment, and means for conveying material to be pasteurized successively through the compartments from the receiving-end of the tank.

3. In a pasteurizing-apparatus, the combination of a tank for the liquid containing partitions forming in series a receiving and an attemperating compartment with a lower port in the interposed partition, a pasteurizing compartment with an upper port in the next partition, a second attemperating-compartment having no direct conmunication with said pasteurizing-compartment and a delivery-compartment with an upper port in its forming-partition, a pipe-connection between the end-compartments, a heater and pump connected with said pasteurizing and second attemperating compartments at their upper parts to take liquid from both and heat it in circulation and discharging into the lower part of the pasteurizing-compartment, and means for conveying material to be pasteurized successively through the compartments from the receiving-end of the tank.

4. In a pasteurizing-apparatus, the combination of a tank for the liquid containing insulating partitions forming in series a receiving and an attemperating compartment with a lower port in the interposed partition, a pasteurizing compartment with an upper port in the next partition, a second attemperating-compartment having no direct communication with said pasteurizing-compartment and a delivery-compartment with an upper port in its forming-partition, a pipe-connection between the end-compartments, a partition, in the pasteurizing-compartment dividing it into sections intercommunicating at the top and bottom of said partition, an agitator-device in the communication between said sections provided with means for driving it, a heater and pump connected with said pasteurizing and second attemperating compartments at their upper parts to take liquid from both and heat it in circulation and discharging into the lower part of the pasteurizing-compartment, and means for conveying material to be pasteurized successively through the compartments from the receiving-end of the tank.

5. In a pasteurizing-apparatus, the combination of a tank containing a series of compartments for the liquid at different temperatures, a rotary carrier in each compartment, holders supported at uniform intervals about the carriers, intermittent driving means for the carriers operating to partially turn them at intervals to aline, by one partial turn, a longitudinal series of the holders with the feed and delivery ends of the tank and by the next-succeeding partial turn to take said series out of such alinement and thereby leave unobstructed by holders the path between said ends, and reciprocating pushing-devices on the tank for positively engaging baskets imposed on said alining holders to advance them, for the purpose set forth.

6. In a pasteurizing-apparatus, the combination of a tank containing a series of compartments for the liquid at different temperatures, a rotatable shaft extending lengthwise through the tank, a carrier in each compartment on said shaft consisting of a wheel provided with rock-shafts at intervals about its peripheral portion, a ring rotatably supported on said shaft eccentrically of the wheel and cranks connecting said rock-shafts and ring, holders on the rock-shafts and intermittent driving-means for said shaft, for the purpose set forth.

7. In a pasteurizing-apparatus, the combination of a tank containing a series of compartments for the liquid at different temperatures, a rotary carrier in each compartment, holders supported at uniform intervals about the carriers, intermittent driving-means for the carriers operating to partially turn them at intervals to aline, by one partial turn, a longitudinal series of the holders with the feed and delivery ends of the tank and by the next-succeeding partial turn to take said series out of such alinement and thereby leave unobstructed by holders the path between said ends, a rod supported in bearings on said tank to be reciprocated lengthwise, pusher-fingers depending at in-

tervals from said rod into the path of baskets on said alining holders, and a cam-actuated connection between said rod and driving-means for moving the rod with each partial turn of said carriers, for the purpose set forth.

8. In a pasteurizing-apparatus, the combination of a tank containing a series of compartments for the liquid at different temperatures, a rotatable shaft extending lengthwise through the tank, a carrier in each compartment on said shaft, holders supported at uniform intervals about the carriers, intermittent driving-means for said shaft operating to partially turn the carriers at intervals to aline longitudinal series of the holders with the feed and delivery-ends of the tank, a rod supported in bearings on said tank to be reciprocated lengthwise, pusher-fingers depending at intervals from said rod into the path of boxes on said alining holders, a vertical rock-shaft having a crank-connection with said rod, a rack-and-pinion drive for said rock-shaft, and a rotatably supported cam engaging with the rack and geared to said driving-means, for the purpose set forth.

9. In a pasteurizing-apparatus, the combination of a tank containing a series of compartments for the liquid at different temperatures, a rotatable shaft extending lengthwise through the tank, a carrier in each compartment on said shaft, holders supported at uniform intervals about the carriers, intermittent driving-means for said shaft operating to partially turn the carriers at intervals to aline longitudinal series of the holders with the feed and delivery ends of the tank, and a conveyer geared to said shaft at an end of the tank and consisting of sprockets with endless chains connecting them and platforms at intervals on said chains on flexible supports thereon normally maintaining the platforms in horizontal position.

10. In a pasteurizing-apparatus, the combination of a tank containing a series of compartments for the liquid at different temperatures, a rotatable shaft extending lengthwise through the tank, a carrier in each compartment on said shaft, holders supported at uniform intervals about the carriers, intermittent driving means for said shaft operating to partially turn the carriers at intervals to aline longitudinal series of the holders with the feed and delivery ends of the tank, and a conveyer geared to said shaft at an end of the tank and consisting of sprockets with endless chains connecting them, platforms hinged at their advance-ends to said chains and legs pivotally connecting the opposite ends of the platforms to said chains, for the purpose set forth.

11. In a pasteurizing-apparatus, the combination of a tank containing a series of compartments for the liquid at different temperatures, a rotatable shaft extending lengthwise through the tank, a carrier in each compartment on said shaft, holders supported at uniform intervals about the carriers, intermittent driving-means for said shaft operating to partially turn the carriers at intervals to aline longitudinal series of the holders with the feed and delivery ends of the tank, a conveyer geared to said shaft at the receiving end of the tank to carry packages to said end and consisting of sprockets with endless chains connecting them and platforms at intervals on said chains on flexible supports thereon normally maintaining the platforms in horizontal position, and a similar conveyer geared to said shaft at the delivery end of the tank to carry packages away from said end, for the purpose set forth.

12. In a pasteurizing-apparatus, the combination of a tank containing a series of compartments for the liquid at different temperatures, a rotatable shaft extending lengthwise through the tank, a carrier in each compartment on said shaft, holders supported at uniform intervals about the carriers, intermittent driving-means for said shaft operating to partially turn the carriers at intervals to aline, by one partial turn, a longitudinal series of said holders with the receiving and delivery ends of the tank, and by the next-succeeding partial turn to take said series out of such alinement and thereby leave unobstructed by such holders the path between said ends, endless-chain conveyers geared to opposite ends of said shaft respectively to carry packages toward said receiving-end and from said delivery-end, and provided with platforms at intervals, and reciprocating pushing devices on the tank operatively connected with said driving means to positively engage baskets imposed on said alining holders and platforms alining therewith to advance said baskets, for the purpose set forth.

JOHN T. H. PAUL.

In presence of—
W. T. Jones,
R. A. Schaefer.

H. M. A. HARDERS.

PASTEURIZING APPARATUS.

APPLICATION FILED NOV. 16, 1907.

915,765. Patented Mar. 23, 1909.

7 SHEETS—SHEET 1.

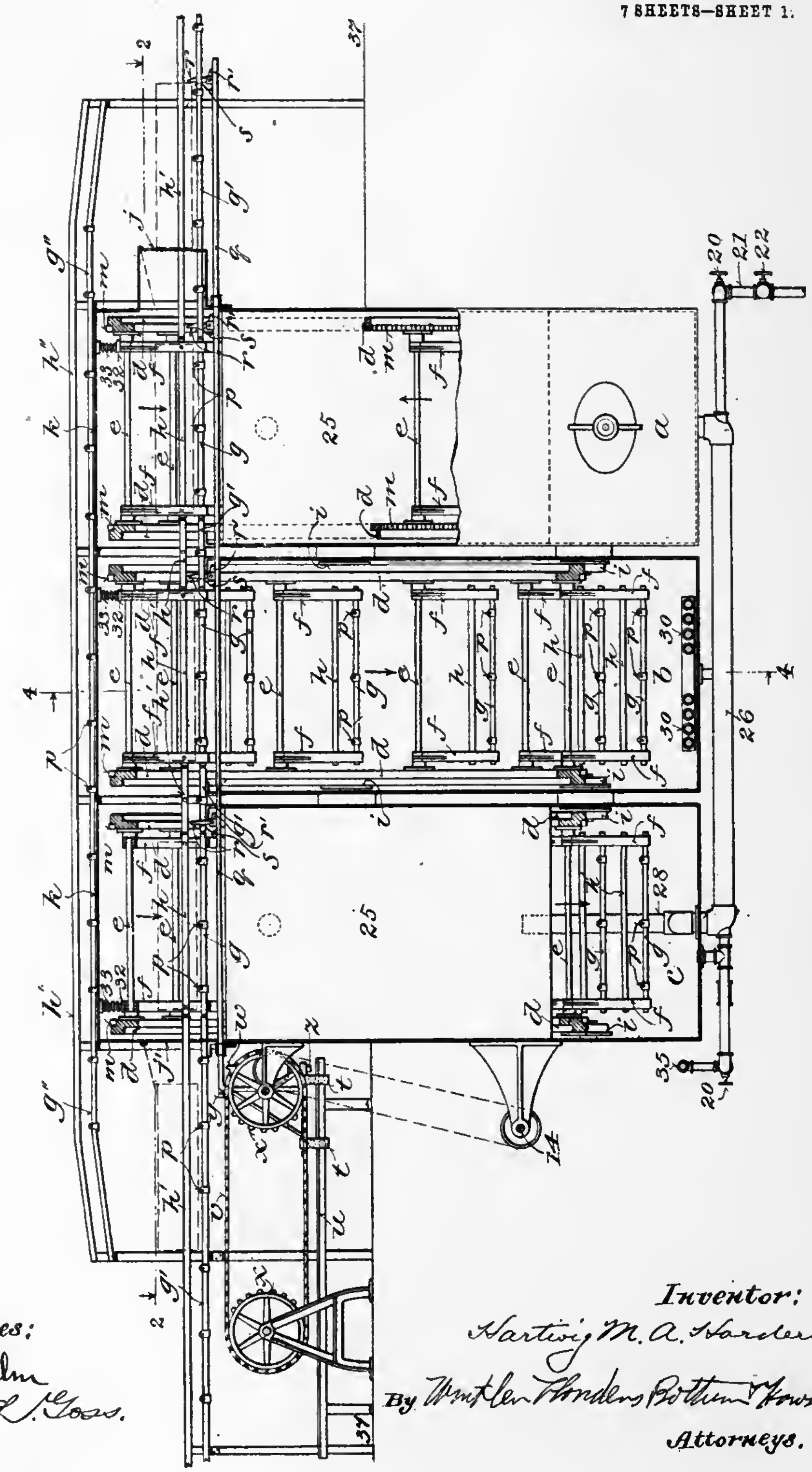

Fig. 1.

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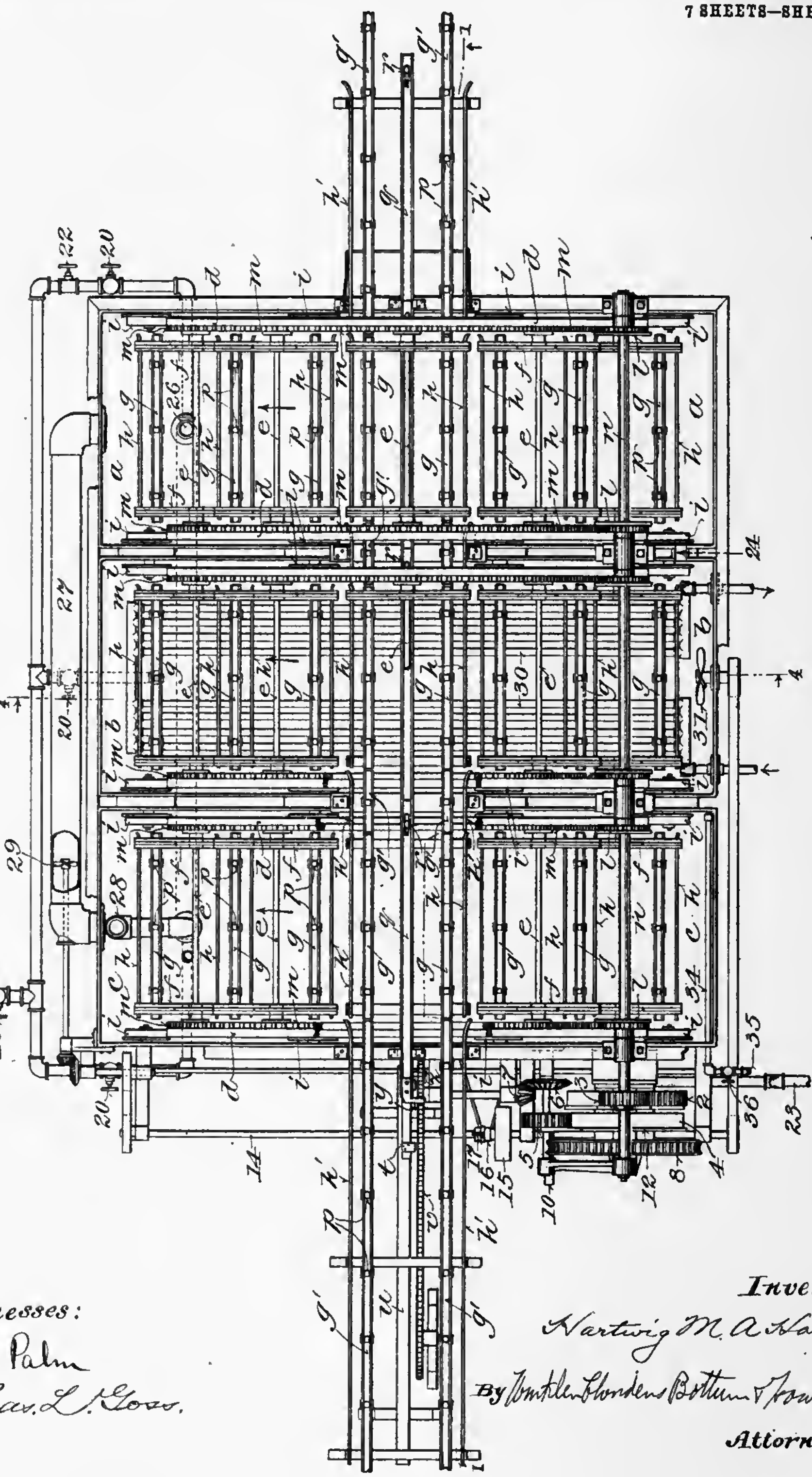
7 SHEETS—SHEET 2.

Fig. 2.



Witnesses:

Fred Palm

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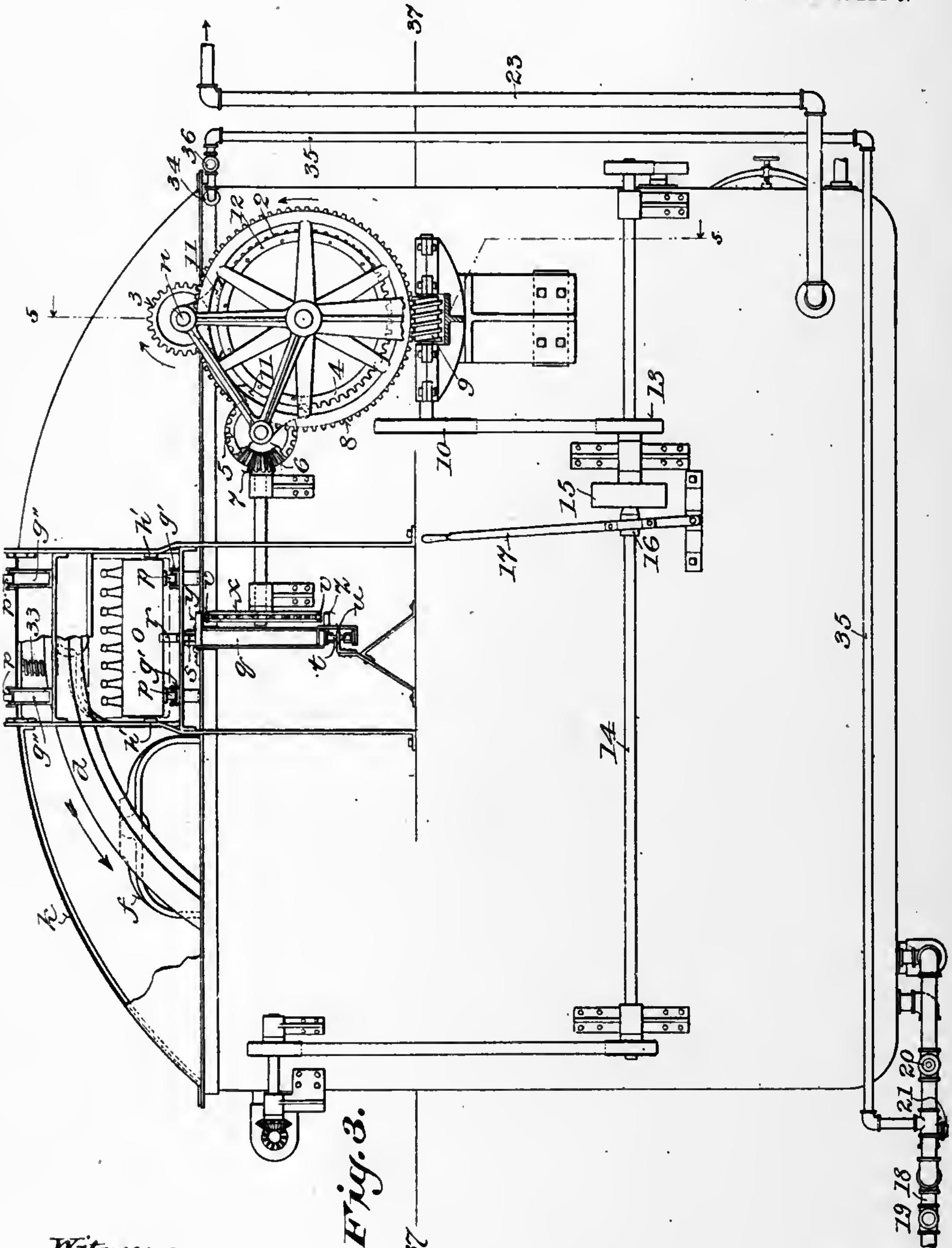

Fig. 3.

Witnesses:

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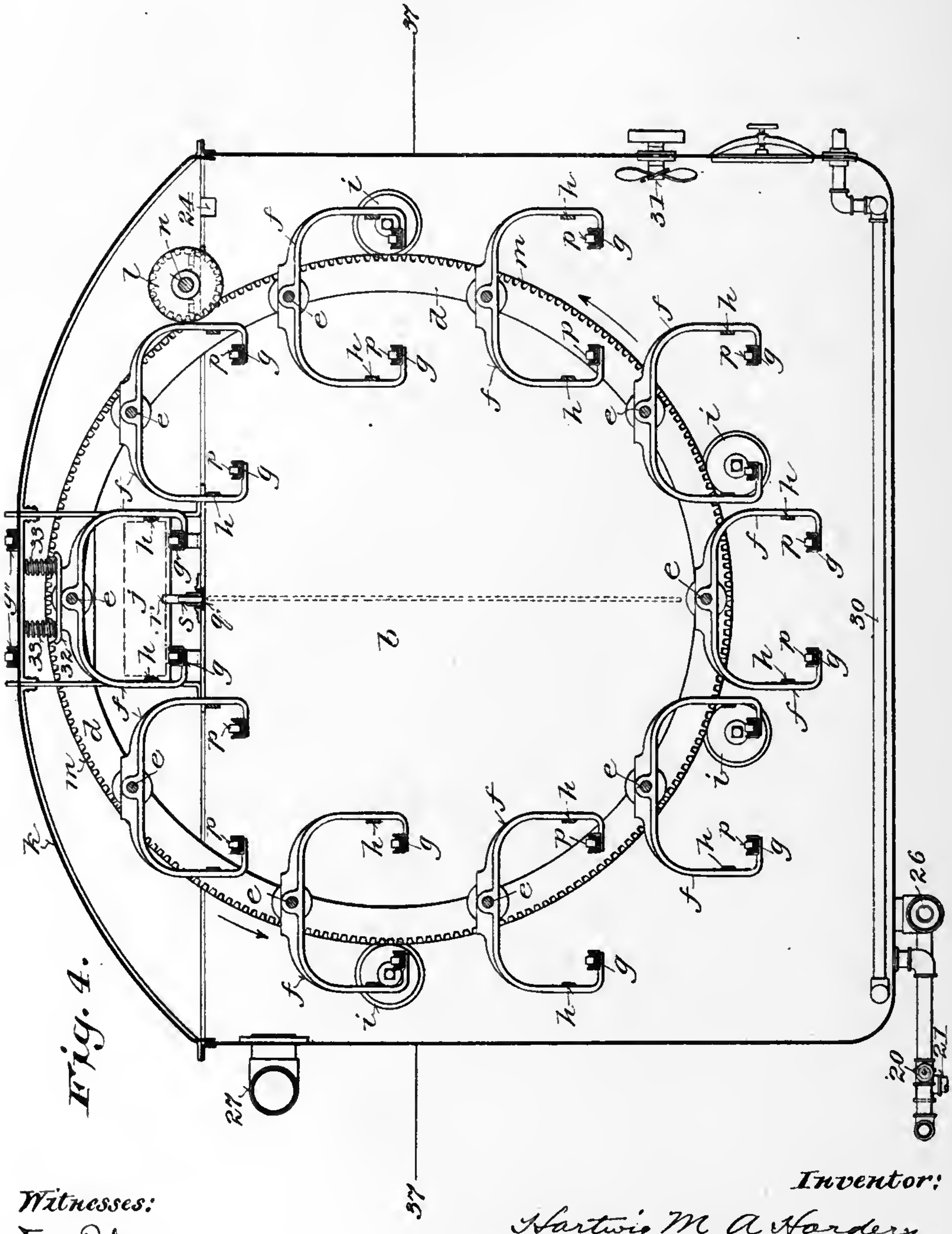

Fig. 4.

Witnesses:

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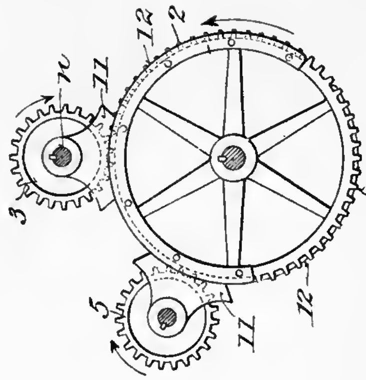

Fig. 6.

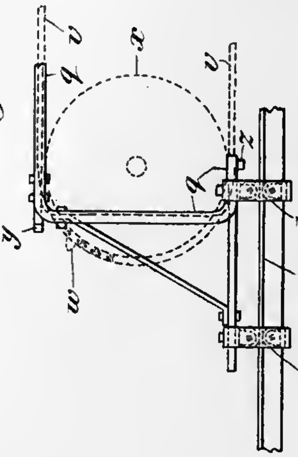

Fig. 9.

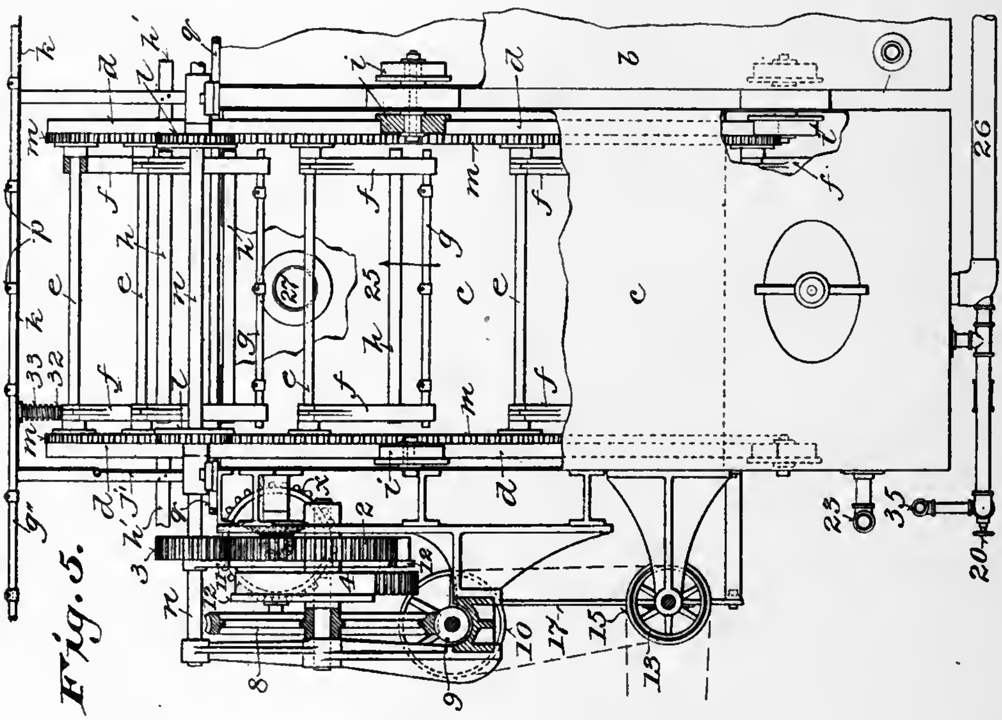

Fig. 5.

Witnesses:
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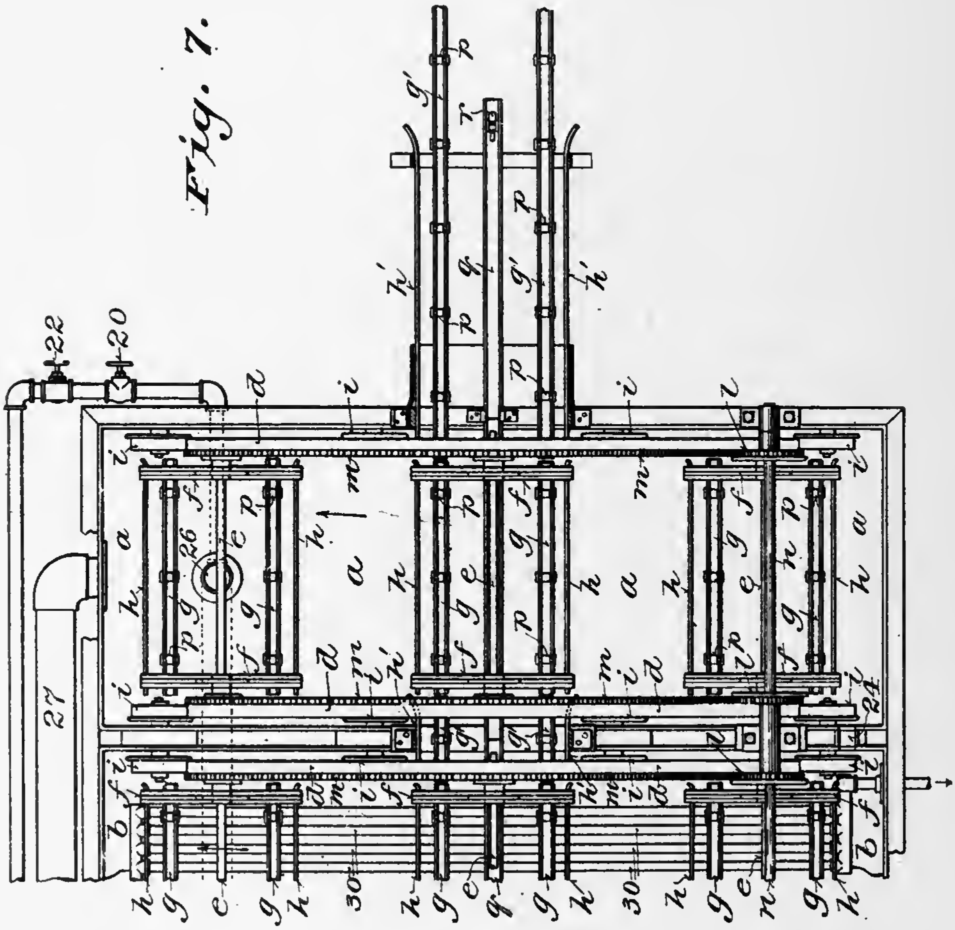
7 SHEETS—SHEET 8.

Fig. 7.



Witnesses:

Fred Palm

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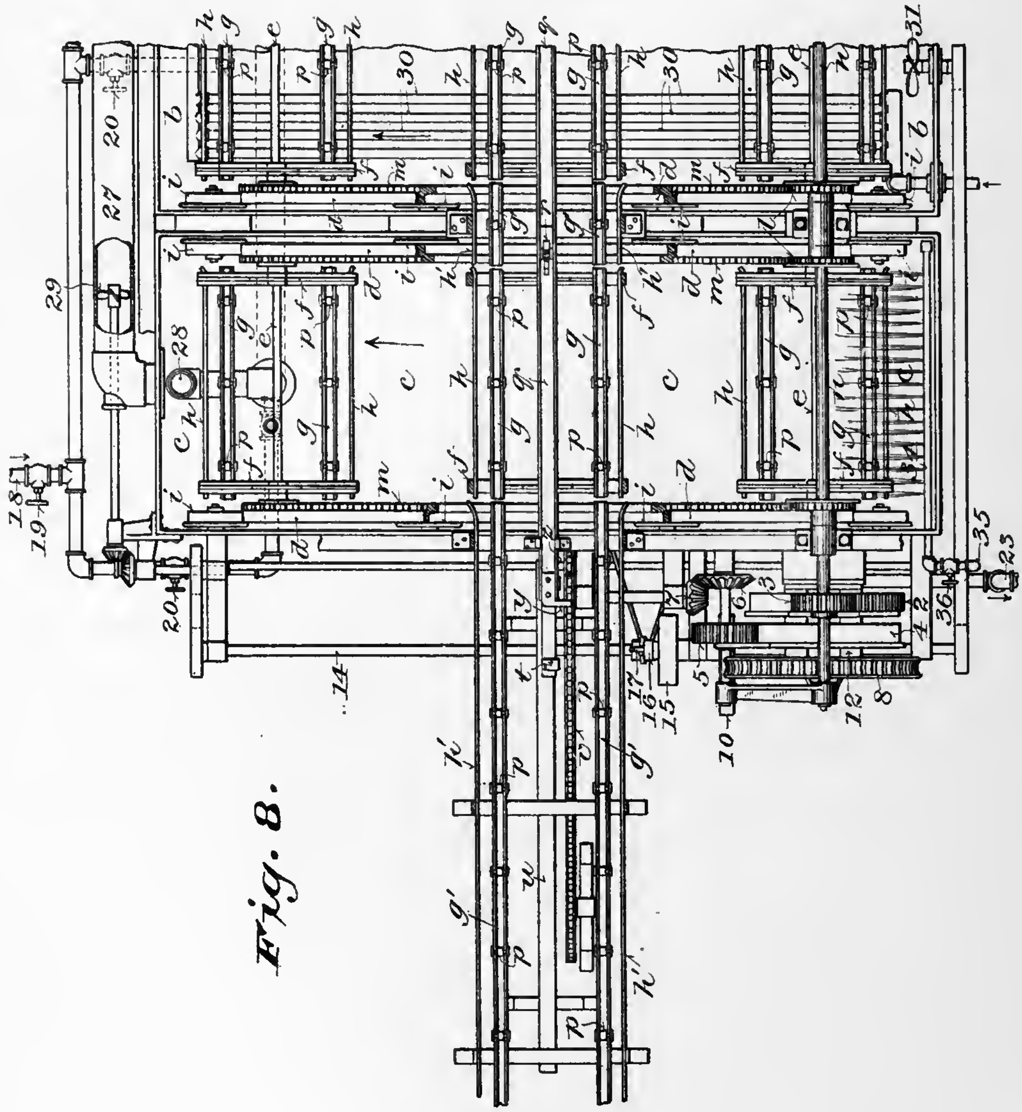

Fig. 8.

Witnesses:
Fred Palm
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UNITED STATES PATENT OFFICE.

HARTWIG M. A. HARDERS, OF MILWAUKEE, WISCONSIN, ASSIGNOR OF ONE-HALF TO GUSTAV C. BECHERER, OF MILWAUKEE, WISCONSIN.

PASTEURIZING APPARATUS.

No. 915,765. **Specification of Letters Patent.** **Patented March 23, 1909.**

Application filed November 16, 1907. Serial No. 402,435.

To all whom it may concern:

Be it known that I, HARTWIG M. A. HARDERS, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates more particularly to apparatus for successively subjecting bottled beverages and the like, such as beer, to a pasteurizing bath. Its main objects are to facilitate and expedite the operations of handling and pasteurizing bottled beverages such as beer, in such a manner that they may be conveniently delivered from a bottle filling machine directly to the pasteurizing apparatus, and in turn delivered directly from the pasteurizing apparatus to a labeling machine; to gradually raise the bottles and their contents to a pasteurizing temperature, then hold them at that temperature for the requisite period to secure the desired result, and finally reduce their temperature gradually before they are delivered from the apparatus; to perform the pasteurizing operations automatically without special care on the part of operators or attendants; and generally to improve the construction and operation of apparatus of this class.

It consists in certain novel features of construction and in the peculiar arrangement and combinations of parts as hereinafter particularly described and pointed out in the claims.

In the accompanying drawing like characters designate the same parts in the several figures.

Figure 1 is a vertical longitudinal section on the line 1 1, Fig. 2, of apparatus embodying the invention; Fig. 2 is a plan view and partial horizontal section on the line 2 2, Fig. 1 of the apparatus, the cover or top of the tanks or casing being removed; Fig. 3 is an end elevation on an enlarged scale as viewed from the left relative to Figs. 1 and 2; Fig. 4 is an enlarged vertical cross section through the pasteurizing compartment or tank, on the line 4 4, Figs. 1 and 2; Fig. 5 is an enlarged side elevation and vertical longitudinal section on the line 5 5, Fig. 3, showing the driving mechanism and the delivery or cooling compartment or tank; Fig. 6 is a detail view of a part of the driving gearing; Figs. 7 and 8 are plan views on an enlarged scale of the right and left portions respectively of the machine as shown in Fig. 2, certain parts being omitted for the sake of greater clearness and Fig. 9 is a side elevation showing in detail a portion of the feed bar and its guides at the delivery end of the apparatus.

The apparatus comprises three tanks or compartments, *a*, *b* and *c*, in the present case, three separate tanks made of boiler plate or heavy sheet metal and arranged side by side with spaces between them. Each tank or compartment is provided with a rotary carrier comprising a pair of spokeless wheels *d* connected by cross rods *e* and having open-ended racks or frames pivotally suspended on said rods. Each rack or frame consists of two yokes or end pieces *f*, a pair of parallel track rails *g* secured to the inwardly bent lower ends of the yokes or end pieces *f*, and guides *h* attached to the sides of said yokes above and parallel with the rails *g*. The wheels *d* of each carrier run upon and are supported by flanged rollers *i*, which are mounted on the sides of the associated tank or compartment. The several carriers extend above the tops of the tanks so that the rails *g* of the uppermost row of racks will be above the sides of the tanks in position to receive bottle crates or trays and discharge the same through openings at the ends of the apparatus. The tanks are closed at the top over the carriers by a cover or hood which has openings in the ends normally closed by swinging doors *j* and *j'*, and is preferably made with removable sections *k* over the several tanks. The carriers are turned simultaneously and their racks are held in line by pinions *l* meshing with racks *m* on the wheels *d* and mounted on a common driving shaft *n* running lengthwise of the apparatus through the several tanks or compartments.

At the ends of the apparatus and between the tanks, stationary track rails *g'* and guides *h'* are arranged to aline respectively with the rails *g* and guides *h* of each row of racks as they are brought opposite the doors *j* and *j'*.

The bottles containing the beverage to be pasteurized are placed in trays or racks *o*, as shown in Fig. 3, and these trays or crates are placed one after another on the rails b' next to the feed door j over the tank a.

To return empty trays or crates from the delivery end to the receiving end of the apparatus, track rails g'' and guides h'' are provided above the hood or cover, as shown in Figs. 1, 3 and 4, the ends of these return rails and guides being preferably inclined downwardly as shown in Fig. 1. The track rails are provided at intervals with rollers p to facilitate the movement of the bottle trays or crates thereon.

To automatically feed the loaded trays or crates into the apparatus, to transfer them from one carrier to the next, and to discharge them from the last carrier at the proper times, a reciprocating feed bar q passes lengthwise through the apparatus between, parallel with and a little below the track rails g'. This bar is provided at intervals with pivoted dogs r, which fold or swing from an upright position toward the delivery end of the apparatus, and are held normally in an upright position against their lateral tail pieces r' by springs s. At the delivery end of the machine the bar q is bent downwardly and provided at its lower end with roller guides t, which run on a horizontal guide rail u parallel with said bar, as shown in detail in Fig. 9. For intermittently moving the bar q back and forth the distance required to carry the bottle trays or crates into the apparatus, transfer them from one carrier to another, and finally discharge them at the delivery end of the apparatus, a link belt v provided with a tooth w, is mounted on sprocket wheels x, parallel with said bar, which is provided with lugs y and z in the path of the tooth w.

The rotary bottle carriers are intermittently turned a distance corresponding with the distance between adjacent rows of racks, by a mutilated gear 2, which meshes with a pinion 3 on the shaft n, and the link belt v is intermittently turned the distance of one complete circuit while the rotary carriers are at rest by a similar mutilated gear 4, which meshes with a pinion 5 on a shaft connected by bevel gears 6 and 7, as shown in Figs. 2, 3, and 8, with the shaft of one of the sprocket wheels x. The gears 2 and 4 are fixed on a shaft parallel with the shaft n and provided with a worm gear 8 meshing with a worm 9 on a transverse shaft which is provided with a pulley 10, as shown in Figs. 3 and 5. As shown in Figs. 2, 3, 5, 6, 7 and 8, each of the pinions 3 and 5 is associated with a shoe 11, having a fixed relation thereto and adapted after each complete revolution to engage with the periphery of a flange 12 on the driving gear and to prevent the pinion from turning when it is not engaged by the teeth of the driving gear. The toothed portions of the two driving gears 2 and 4 are so arranged that while one pinion is being turned, the other is held stationary.

The pulley 10 on the worm shaft may be driven from any convenient source of power. As shown in Figs. 3 and 5, it is belted to a pulley 13 on a shaft 14, extending across the delivery end of the apparatus, and provided with a driving pulley 15 and a clutch 16, operated by a lever 17, for starting and stopping the mechanism.

A water supply pipe 18, provided with a valve 19, is connected with the several tanks a, b and c at the bottom by branches which are provided with valves 20. A drain pipe 21 provided with a valve 22, as shown in Fig. 1, connects with one of the branches in such a way that either the tanks a and c or the tank b can be drained when the valve 19 is closed, by opening the proper valves 20 and the valve 22.

The tank c is provided with an overflow pipe 23, which prevents the water from rising above the desired level in any of the tanks, the tanks a and c being connected with each other as hereinafter explained, and the middle tank b having an overflow connection 24 into the tank a, as shown in Figs. 2, 4, and 7.

Each of the tanks a and c is partially divided by a central vertical partition 25, parallel with the axis of the rotary bottle carriers, into two subdivisions, in which the water may be maintained at different temperatures. The subdivisions on the descending side of the carriers are connected by circulating pipes 26 and 27. The pipe 26 opens directly into the bottom of the tank a, but has an extension 28 leading upwardly into the tank c and terminating therein above the lower edge of the partition 25. The pipe 27 opens at its ends into the upper parts of said tanks. A constant circulation of water through the subdivisions of the tanks a and c with which the pipes 26 and 27 directly communicate, is maintained while the apparatus is in operation, by a small propeller wheel 29 in the pipe 27. This wheel may be driven from the main shaft 14 by connections substantially as shown in Figs. 2, 3, and 8. By this means substantially the same temperature is maintained in these subdivisions of the tanks a and c. The middle tank b is provided as shown in Figs. 1, 2, 7 and 8, with steam pipes or coils 30, for heating the water therein, and the water is agitated so as to keep it at approximately the same temperature throughout the tank by a propeller wheel 31, which may be connected with and driven from the main shaft 14, as shown in Figs. 2 and 8.

To prevent the pivotally suspended racks from swinging, and to hold their track rails g in line with the stationary track rails g', vertically movable shoes or plates 32 are connected with the hood or cover, as shown in Figs. 1, 4 and 5, and are pressed downwardly by springs 33 against the horizontal faces on the upper sides of the yokes *f* at one or both ends of said racks as they are brought into line with the doors *j* and *j'*.

A perforated pipe 34 is arranged across the upper part of the tank *c* in position to direct a spray or stream of water against the bottles on the ascending side of the carrier in said tank, as indicated in Fig. 8 and is connected by a pipe 35 with a branch of the supply pipe 18, said pipe 35 being provided with a valve 36.

The greater portion of the tanks *a*, *b* and *c* may be located below the operating floor, which is indicated in Figs. 1, 3 and 4 by the lines 37.

In the operation of the apparatus the water in the middle tank or compartment *b* is heated to and maintained at a pasteurizing temperature of about 140° F. by the steam pipes or coils 30. The water in the subdivisions of the tanks or compartments *a* and *c* on the descending side of the carriers (indicated by arrows) is maintained at about 110° F., while the water in the remaining subdivision of the tank *a* is maintained at about 140° F., and the water in the remaining subdivision of the tank *c* is maintained at about 88° F. Although the temperatures in the different parts of the apparatus may be varied somewhat without materially affecting the results attained, those above stated have been found in practice suitable for the purpose. The driving mechanism being set in motion, the rotary carriers are intermittently turned together in the direction indicated by arrows, bringing one row of racks after another into line with the doors *j* and *j'*. The bottles containing the beverage to be pasteurized are taken from the filling machine and placed in trays or crates *o* on the stationary track rails *g'* next to the receiving tank *a*, the first tray or crate being placed so that the dog *r* at the adjacent end of the feed bar *q* will stand up behind it, as indicated in Fig. 1, when said bar is in its normal position. While the rotary carriers stand at rest with a row of racks in line with the doors *j* and *j'*, the feed bar *q* is advanced by the engagement of the tooth *w* on the link belt *v* with the lug *y* on feed bar *q*, said belt being driven intermittently by the mutilated gear 4 hereinbefore described, so that the tooth *w* makes a complete circuit at each movement, starting from about the point where it is shown in Fig. 1, clearing said lug *y* at the limit of the advance movement of said bar and leaving the lug *z*, as shown in Fig. 9, in the path of the return movement of said tooth on the under side of the belt. By this advance movement of the bar *q*, the first tray or crate is carried into the uppermost rack of the carrier in the tank *a*, opening the door *j*, which closes behind it. The tooth *w* passing back on the under side of the belt *v*, engages with the lug *z* and moves the bar *q* back to its original position, the dog *r* at its opposite end being turned back against the tension of its spring *s* so as to pass under the tray or crate just deposited in the adjacent carrier. Trays or crates filled with bottles are placed one after another in position to be fed into the apparatus, as the foregoing operations are repeated. After making a complete circuit through the receiving and warming tank *a*, each tray or crate of bottles which has been gradually raised to or approximately to a pasteurizing temperature, is transferred automatically by the feed bar *q* into the second carrier, wherein it makes a complete circuit through the pasteurizing tank *b* and is held for a certain period at the pasteurizing temperature. From this carrier each tray or crate of bottles is transferred in like manner by the action of the feed bar *q* into the last carrier, wherein it makes a complete circuit through the tank *c*, its temperature being gradually lowered till it is in proper condition for delivery from the apparatus. From the last carrier each tray or crate of bottles is discharged upon the stationary track rails *g'*, opening the door *j'* which closes behind it at that end of the apparatus. Here the bottles are removed from the trays or crates, and may be conveniently passed directly to a labeling machine, thereby avoiding, as in the feeding of the pasteurizing apparatus directly from the bottling machine, unnecessary handling. The empty trays or crates are returned to the feeding operator upon the elevated track rails *g''*. As the trays or crates are transferred from one carrier to another, and discharged from the last carrier, their places are taken by other trays or crates, which are fed into the apparatus, advanced from one carrier to the next, and finally discharged from the last carrier by the action of the feed bar *q* and its dogs *r* during every stop of the carriers. If crates or trays of freshly filled bottles are supplied by the feeding operator so that a tray or crate will be fed into the apparatus every time the carriers stop, the apparatus will be kept filled, and a tray or crate will be delivered from the apparatus at each stop of the carriers. As the heated bottles received into the last carrier from the pasteurizing tank *b* descend in the tank *c*, they are gradually cooled, imparting their heat to the water in that subdivision of the tank. Water thus heated and tending to rise, is forced by the propeller 29 through the pipe 27 into the upper part of the corresponding subdivision in tank *a*, where it is utilized to gradually warm the cool bottles and their contents as they descend in that tank. The water being thus cooled and tending to descend in this subdivision of the apparatus, is conveyed back through the pipe 26 and its extension 28 into the corresponding subdivision of tank *c*, where it again serves to cool the bottles and their contents as they descend therein.

By extending the return pipe 26 upward in the tank *c* above the lower edge of the partition 25 on the side next to that with which the pipe 27 is connected, the water in the subdivision on the opposite side of said partition is kept cooler. As the bottles ascend in tank *c*, they are subjected to sprays or jets of fresh cool water from the pipe 34, the supply of such water being regulated by the valve 36, so that the bottles and their contents as they are delivered from the apparatus, will have the desired temperature.

The apparatus as herein shown and described may be used to advantage for soaking, cleansing and sterilizing bottles or the like and sterilizing the contents of bottles, or the like, as well as for pasteurizing. Various modifications in the details of construction and arrangement of parts of the apparatus may be made without materially affecting its mode of operation and without departing from the principle and scope of the invention.

I claim:

1. In a pasteurizing apparatus, the combination of a tank, an open-center rotary carrier mounted in said tank and provided with ways parallel with its axis, stationary ways arranged to aline with the ways on the upper side of the carrier at opposite ends thereof, a reciprocating feed bar passing through said carrier parallel with its ways and provided with dogs which are adapted to engage with bottle-trays or crates and move them on said ways into and out of the carrier, and means for intermittently turning said carrier, substantially as described.

2. In a pasteurizing apparatus, the combination of a plurality of tanks or compartments, open-center rotary carriers mounted coaxilly in said tanks or compartments and provided with ways parallel with the axis of the carriers, stationary ways arranged to aline with the ways on the upper side of the carriers at opposite ends thereof, a reciprocating feed bar passing through the several carriers parallel with their axes and provided at intervals with dogs for moving bottle-crates on said ways into and out of the apparatus and from one carrier into another, and means for intermittently turning said carriers, substantially as described.

3. In pasteurizing apparatus, the combination of a tank, rollers mounted on opposite sides of said tank, an open-center rotary carrier mounted on said rollers, ways pivotally hung on said carrier parallel with its axis, means for intermittently turning said carrier, stationary ways arranged to aline with the ways on the upper side of the carrier at opposite ends thereof, and a reciprocating bar passing through said carrier, parallel with said ways and provided with means for moving bottle-trays or crates on said ways into and out of the carrier, substantially as described.

4. In pasteurizing apparatus, the combination of a plurality of tanks or compartments arranged side by side, rollers mounted on opposite sides of said tanks or compartments, open-center rotary carriers mounted coaxially in the several tanks or compartments on said rollers, ways pivotally hung on each of said carriers parallel with its axis, stationary ways arranged to aline with the ways on the upper side of the carriers between them and at the ends of the apparatus, means for intermittently turning said carriers together, and a reciprocating bar passing through the several carriers parallel with said ways and provided with means for engaging and moving bottle-trays or crates on said ways into and out of the apparatus and from one carrier into another, substantially as described.

5. In pasteurizing apparatus, the combination of a tank, a carrier rotatably mounted therein, open-ended frames pivotally suspended on said carrier and provided with ways parallel with its axis, stationary ways arranged to aline with the ways on the upper side of the carrier at opposite ends thereof, said carrier being open at the ends between the stationary ways and the ends of said frames, means for holding each frame on the upper side of the carrier motionless with its ways in alinement with the stationary ways, means for intermittently turning said carrier, and means for automatically moving bottle trays or crates upon said ways into and out of the first and last carriers and from one carrier into another, substantially as described.

6. In pasteurizing apparatus, the combination of a tank, an open-center carrier rotatably mounted therein, frames pivotally suspended on said carrier and provided with ways parallel with its axis, stationary ways arranged to aline with the ways on the upper side of the carrier at opposite ends thereof, a reciprocating bar passing through said carrier parallel with said ways and provided with means for moving bottle-trays or crates upon said ways into and out of said carrier, and mechanism for intermittently turning said carrier and alternately moving said bar back and forth, comprising a pair of mutilated gears, pinions meshing therewith and locking shoes connected with the pinions and fitting curved rims or flanges on the toothless portions of the gears, said gears being arranged to turn said pinions alternately, substantially as described.

7. In pasteurizing apparatus, the combination of a tank, an open-center carrier rotatably mounted therein and provided

with ways parallel with its axis, stationary ways arranged to aline with the ways in the upper part of the carrier at opposite ends thereof, means for intermittently turning said carrier, a reciprocating bar passing through said carrier parallel with said ways and provided with means for moving bottle-trays or crates on said ways into and out of the carrier, sprocket wheels, a link belt mounted on said sprocket wheels parallel with said bar and provided with a tooth adapted by engagement with lugs on said bar to move the same back and forth, and means for intermittently turning said sprocket wheels, substantially as described.

8. In pasteurizing apparatus, the combination of a tank provided on opposite sides with rollers, a carrier comprising spokeless wheels mounted on said rollers and connected by cross rods, frames pivotally suspended from said cross rods and having ways parallel therewith, one of said wheels having a circular rack or gear, a driving shaft parallel with the axis of said carrier and provided with a pinion meshing with said gear, means for intermittently turning said shaft, and stationary ways arranged to aline with the ways of said frames in the upper part of the carrier at opposite ends thereof, substantially as described.

9. In pasteurizing apparatus, the combination of a plurality of tanks or compartments having rollers mounted on opposite sides thereof and coaxial rotary carriers mounted on said rollers and each comprising a pair of spokeless wheels connected by cross rods, and a circular rack or gear, a driving shaft provided with pinions meshing with said racks or gears, means for turning said shaft intermittently, frames pivotally suspended from said cross rods and having ways parallel therewith, stationary ways arranged to aline with the ways of said frames in the upper part of the carriers at opposite ends thereof, and means for moving bottle trays or crates on said ways into and out of the first and last carriers and from one carrier into another, substantially as described.

10. In pasteurizing apparatus, the combination of a tank, a rotary carrier mounted therein, stationary ways arranged above and at the ends of said tank parallel with the axis of the carrier, stationary guides arranged at the sides of, above and parallel with said ways, racks pivotally suspended in said carrier and having ways and guides parallel with its axis and arranged to be brought on the upper side of the carrier into alinement with the stationary ways and guides, the ends of the racks and the ends of the carrier being open and means for intermittently turning said carrier, substantially as described.

11. In pasteurizing apparatus, the combination of a plurality of tanks, coaxial open-center carriers rotatably mounted in said tanks, stationway ways and side guides arranged between and at the outer ends of said tanks parallel with the axis of the carriers, frames pivotally suspended in said carriers and having ways and side guides parallel with their axis and arranged to be brought into alinement on the upper side of the carriers with the stationary ways and guides, means for intermittently turning said carriers, and means for automatically moving bottle trays or crates on said ways into and out of the first and last carriers and from one carrier into another, substantially as described.

12. In pasteurizing apparatus, the combination of a plurality of tanks, coaxial open-center carriers rotatably mounted therein, stationary ways located above and at the ends of the tanks parallel with the axis of the carriers, frames pivotally suspended in the carriers and having ways arranged to be brought on the upper side of the carriers into line with the stationary ways, return ways extending over the carriers from one end of the apparatus to the other, means for intermittently turning said carriers, and a reciprocating bar passing through the carriers and provided with means for moving bottle trays or crates on said ways into and out of the apparatus and from one carrier into another, substantially as described.

13. In pasteurizing apparatus, the combination of three tanks arranged side by side, open-center carriers rotatably mounted in said tanks, vertical partitions extending through the carriers in the two outer tanks, circulating pipes connecting the outer tanks on one side of said partitions, means for heating liquid contained in the middle tank, stationary ways located above and at the ends of the tanks parallel with the axis of the carriers, frames suspended on the carriers and having ways arranged to be brought on the upper side of the carrier into line with the stationary ways, means for intermittently turning said carriers, and a reciprocating bar passing through the several carriers parallel with said ways and provided with means for moving bottle trays or crates thereon into and out of the apparatus and from one carrier into another, substantially as described.

14. In pasteurizing apparatus, the combination of three tanks arranged side by side, rotary carriers mounted in said tanks and provided with supporting frames for bottle trays or crates, the carriers in the two outer tanks being open through the center, means for turning said carriers, vertical partitions extending through the carriers in the two outer tanks, circulating pipes connecting said outer tanks on one side of said partitions, one of said pipes communicating with the upper parts of said tanks and the other

pipe leading from the lower part of the first tank and opening into the other tank above the lower edge of the partition therein, and means for heating liquid contained in the middle tank, substantially as described.

15. In pasteurizing apparatus, the combination of a number of tanks arranged side by side, rotary carriers mounted in said tanks and provided with supporting frames for bottle trays or crates, the carriers in the two outer tanks being open through the center, means for turning said carriers, vertical partitions extending through the carriers in the two outer tanks, circulating pipes connecting said outer tanks on one side of said partitions, one of said pipes communicating with the upper parts of said tanks and the other pipe leading from the lower part of the first tank into the other tank, means for heating liquid contained in the middle tank, a spray or jet pipe arranged in the upper part of the last tank to direct cool water toward the ascending side of the carrier therein and an overflow connection leading out of one of the outer tanks, substantially as described.

16. In pasteurizing apparatus, the combination of a number of tanks, rotary carriers mounted in said tanks and provided with supporting frames for bottle trays or crates, the two outer carriers being open through the center, means for turning said carriers, vertical partitions extending through the carriers in the two outer tanks, circulating pipes connecting said outer tanks on one side of said partitions, means for heating liquid contained in the middle tank, a spray or jet pipe arranged in the upper part of the last tank to direct cool water toward the ascending side of the carrier therein, and an overflow from said tank, substantially as described.

17. In pasteurizing apparatus, the combination of a number of tanks arranged side by side, rotary carriers mounted therein and provided with supporting frames for bottle-trays or crates, the two outer carriers being open through the center, means for turning said carriers, vertical partitions extending through the carriers in the two outer tanks, circulating pipes connecting said outer tanks on one side of said partitions, means for heating liquid contained in the middle tank, and a water supply pipe and a drain pipe having valve controlled branch connections with the lower parts of said tanks, substantially as described.

18. In pasteurizing apparatus, the combination of a number of tanks arranged side by side, endless carriers rotatably mounted in said tanks and having supports for bottle trays or crates, the two outer carriers being open through the center, a vertical partition extending through the carrier in each outer tank and forming subdivisions which communicate with each other at the bottom, circulating connections between said subdivisions on the descending side of the carriers, means for heating liquid contained in the middle tank, means for turning said carriers, and means for feeding bottle trays or crates into and discharging them from the apparatus, substantially as described.

19. In pasteurizing apparatus, the combination of a number of tanks arranged side by side, endless bottle carriers movably mounted in said tanks and provided with supports for bottle trays or crates, a partition extending through the carrier in each outer tank and forming subdivisions which communicate with each other at the bottom, circulating connections between said subdivisions on the descending side of the carriers, means for heating liquid contained in the middle tank, a cool water supply connection leading into the upper part of the subdivision of the last tank on the ascending side of the carriers, an overflow leading out of the lower part of the last tank, means for turning said carriers, and means for feeding bottle trays or crates into and discharging them from the apparatus, substantially as described.

20. The combination of a tank, an open center endless carrier mounted in said tank and provided with transverse horizontal ways, stationary ways arranged to aline with the ways in the upper part of the carrier at the ends thereof, a reciprocating feed bar passing through said carrier parallel with its ways and provided with a dog adapted to move bottle trays or crates on said ways into and out of the carrier, and means for intermittently turning said carrier, substantially as described.

21. The combination of a tank, an open center rotary carrier, open-ended frames pivotally suspended in said carrier parallel with its axis, and stationary ways arranged to aline with said frames in the upper part of the carrier at opposite ends thereof, substantially as described.

22. The combination of a tank, an endless carrier mounted therein and open at the ends, open-ended transverse frames pivotally suspended in said carrier, stationary ways arranged to aline with said frames in the upper part of the carrier at opposite ends thereof, a reciprocating bar passing through said carrier parallel with said ways and provided with a dog for moving bottle trays or crates on said ways into and out of the frames in said carrier, and means for intermittently turning said carrier, substantially as described.

In witness whereof I hereto affix my signature in presence of two witnesses.

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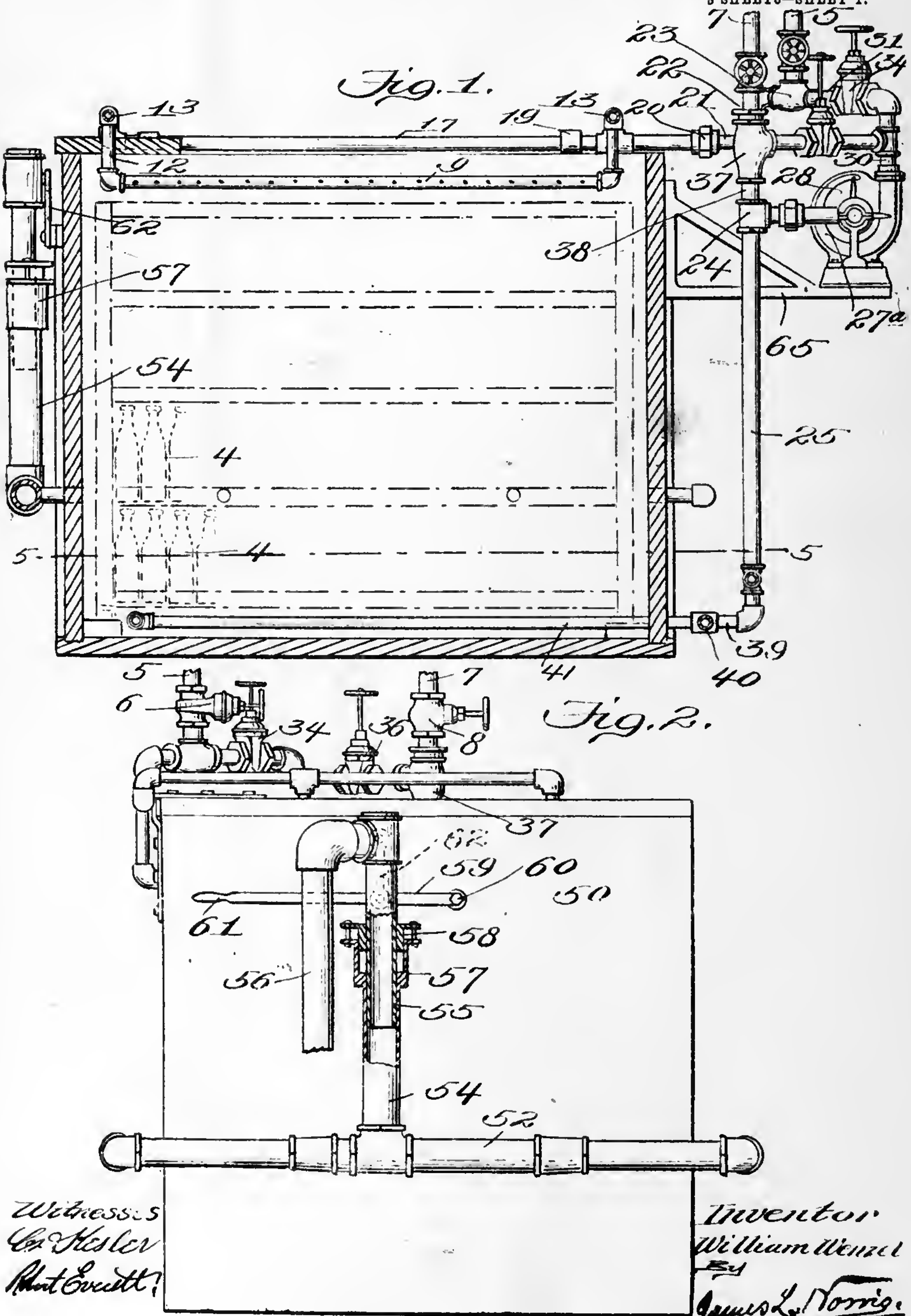
APPARATUS FOR PASTEURIZING AND COOLING BEER.

APPLICATION FILED JULY 8, 1908.

934,377. Patented Sept. 14, 1909.

3 SHEETS—SHEET 1.



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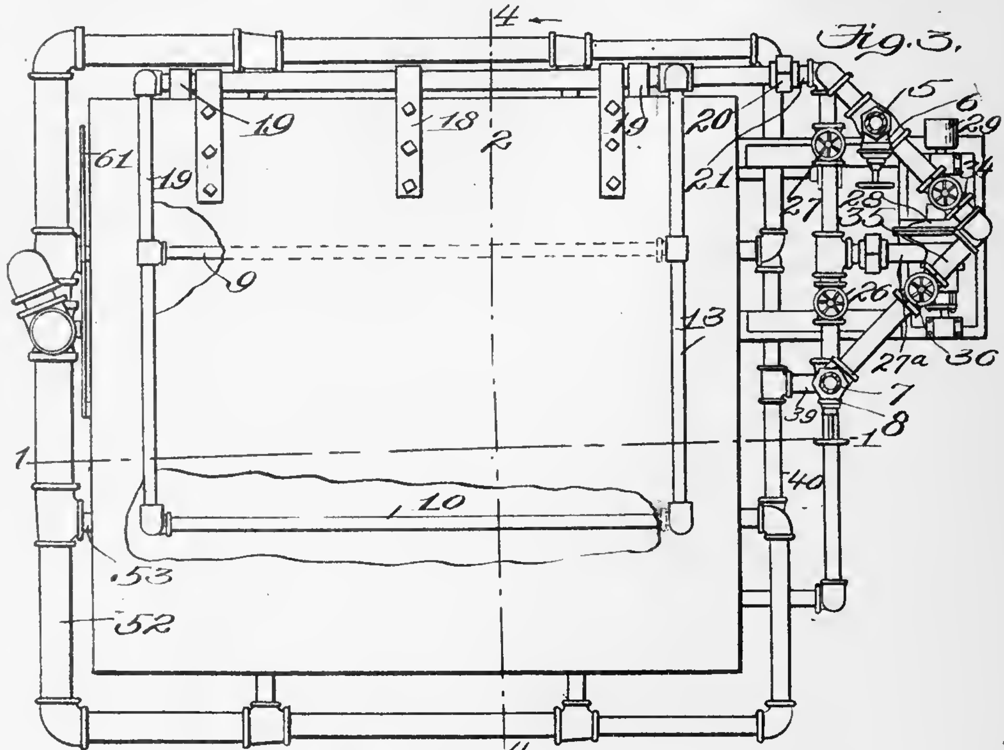

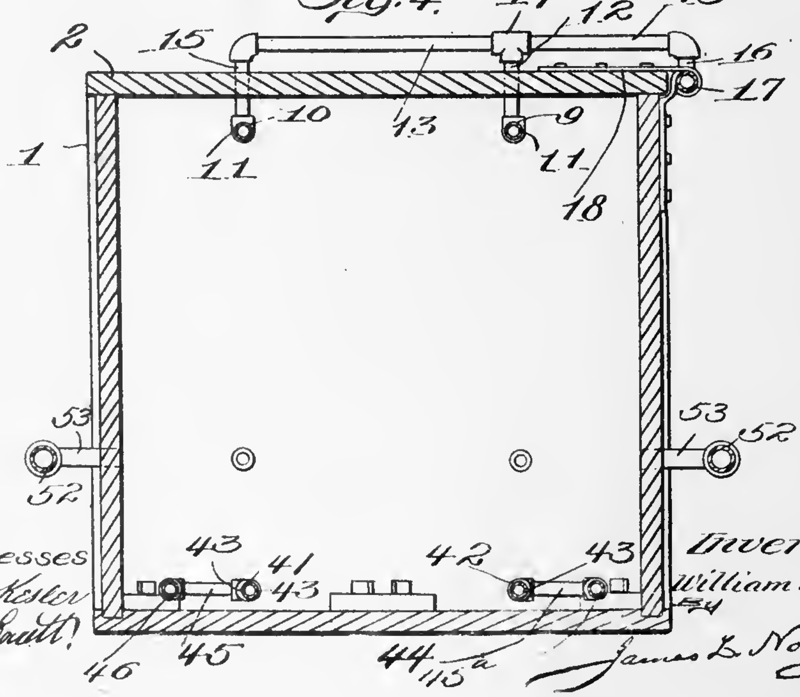

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3 SHEETS—SHEET 3.

Fig. 5.

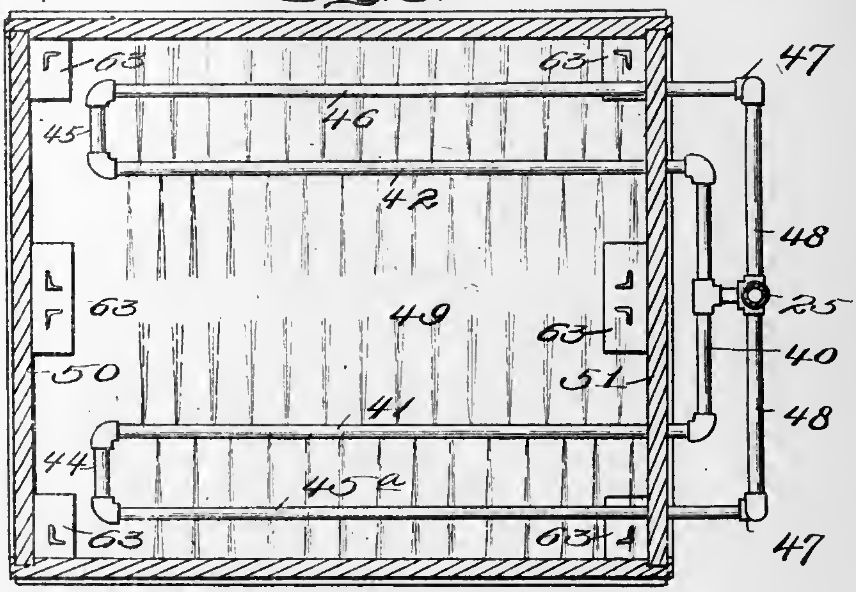


Fig. 6.

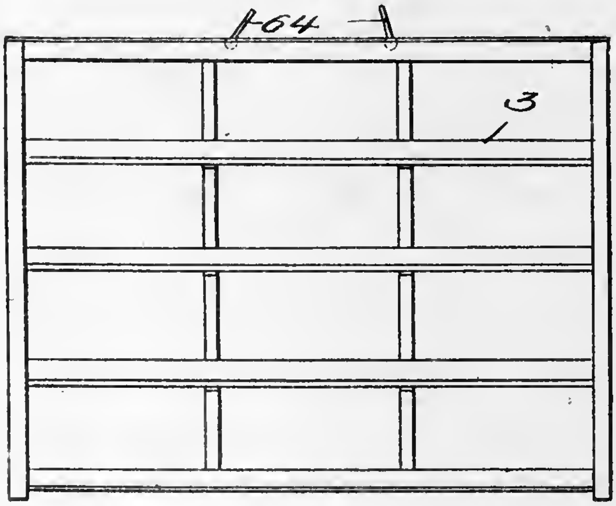
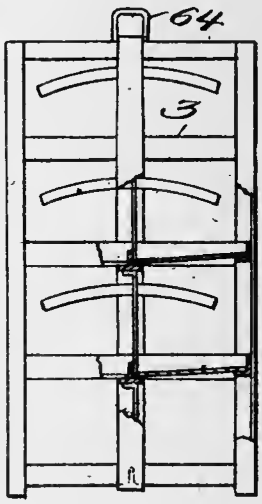


Fig. 7.



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APPARATUS FOR PASTEURIZING AND COOLING BEER.

934,377. Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed July 8, 1908. Serial No. 442,480.

To all whom it may concern:

Be it known that I, William Wenzel, a citizen of the United States, residing at Appleton, in the county of Outagamie and State of Wisconsin, have invented new and useful Improvements in Apparatus for Pasteurizing and Cooling Beer, of which the following is a specification.

This invention relates to an apparatus for pasteurizing and cooling beer in bottles and aims to provide an apparatus of such class with means in a manner as hereinafter set forth whereby the beer in the bottles will be subjected to a circulating medium of progressively increasing temperature until the desired temperature is reached, then maintaining such circulating medium at such temperature a predetermined period of time until the pasteurization is completed, after which the pasteurized beer is cooled by subjecting it to a circulating medium of gradually decreasing temperature until the cooling step is completed.

Further objects of the invention are to provide an apparatus of the class referred to which shall be simple in its construction, strong, durable, efficient in its use, conveniently operated, readily set up, and comparatively inexpensive to manufacture.

With the foregoing and other objects in view the invention consists of the novel construction, combination and arrangement of parts hereinafter more specifically described and illustrated in the accompanying drawings wherein is shown the preferred embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which come within the scope of the claims hereunto appended.

In the drawings:—Figure 1 is a longitudinal sectional view of a pasteurizing apparatus in accordance with this invention, the section being taken on the line 1—1 of Fig. 3. Fig. 2 is an end view in elevation. Fig. 3 is a plan broken away. Fig. 4 is a transverse section on the line 4—4 of Fig. 3. Fig. 5 is a sectional plan on the line 5—5 of Fig. 1, and Figs. 6 and 7 are respectively a side elevation and an end view partly in section of a convenient form of crate or basket for supporting the bottles containing the beer within the apparatus.

Referring to the drawings by reference characters, 1 denotes a tank having a hinged top 2 and in which is adapted to be mounted a basket 3 carrying bottles 4 containing the liquid to be pasteurized. The pasteurizing medium is water having the temperature thereof progressively increasing, while the cooling medium is water having the temperature thereof gradually decreasing. The reference character 5 denotes a water feed pipe communicating with a water supply and provided with a cut-off 6. The reference character 7 denotes a steam feed pipe communicating with the steam supply and formed with a cut-off 8. Arranged within the tank 1 at the top thereof is a plurality of combined water supply and draw-off pipes 9, 10 each of which is formed with a series of orifices 11 for supplying or withdrawing the water from the top of the tank. The pipe 9 at each end is bent in a vertical manner as at 12 and the up-turned ends 12 of the said pipe 9 are connected to the transversely extending branch pipes 13 by the T-couplings 14. The branch pipes 13 at one end each depend downwardly as at 15 and the said depending ends 15 terminate in a pipe 10. The other end of each of the pipes 13 is bent downwardly as at 16 and terminates in a longitudinally extending conducting pipe 17. The latter is connected to the straps 18 which are fixed to the cover 2 and constitutes the pivot for the cover 2. Stops or collars 19 are carried by the cover 2 in which the pipe 17 pivots and the pipe 17 is swivelly connected as at 20 to a branch pipe 21 and by such an arrangement the raising and lowering of the cover 2 can be had when occasion so requires. The depending portions 15 of the pipe 13 extend through the cover 2 and the upwardly extending portions 12 of the pipe 9 project through the cover 2. By such an arrangement when the cover 2 is raised the pipes 9, 10 and 13 are carried therewith and a like action is had when the cover 2 is lowered. The branch pipe 21 communicates with a coupling pipe 22. The latter opens at one end into a coupling 23 which communicates with the water feed pipe 5 and at its other end opens into a coupling 24 which communicates with a vertically extending conducting pipe 25. The pipe 22 embodies a vertically extending portion and an upper and a lower angularly disposed portion, the upper portion extending at an angle with respect to the lower portion and said lower portion is of greater length than said upper portion and is provided with the cut-offs 26, 27. Intermediate the lower portion of the pipe 22 a suction pipe 27ᵃ communicates therewith and with a pump 28 driven by a pulley 29 connected with the prime mover, not shown.

The outlet pipe for the pump 28 is indicated by the reference character 30 which communicates with a branch pipe 31 projecting from the coupling 23 and having a cut-off 34. A branch pipe 35 having a cut-off 36 communicates at one end with the outlet pipe 30 and with a coupling 37 in which opens the feed steam pipe. A branch pipe 38 opens at one end into the coupling 37 and at its upper end in the coupling 24. The conducting pipe 25 which communicates with the coupling 24 has its lower end as at 39 bent in an angular manner and opens into a transversely extending branch pipe 40 which terminates at each end in a longitudinally extending combined water supply and draw-off pipe. These pipes are indicated by the reference characters 41 and 42 and each provided with a series of orifices 43. Each of the pipes 41, 42 terminates at its inner end in a transversely extending branch pipe. These branch pipes are indicated by the reference characters 44, 45, each of which opens into a longitudinally extending combined water supply and draw-off pipe. These latter pipes are indicated by the reference characters 45ᵃ, 46 and are positioned in parallelism with respect to the pipes 41, 42. The pipes 45ᵃ, 46 at their outer ends are bent outwardly as at 47 and each of said bent ends 47 opens into a branch pipe 48 and these pipes 48 communicate with the conducting pipe 25.

The pipes 41, 42 and 45ᵃ, 46 are arranged in close proximity to the bottom 49 of the tank 1, and terminate at one end at a point removed from the side wall 50 of the tank 1 and at their other ends extend through the side wall 51 of the tank 1. The branch pipes 40, 48 are arranged exteriorly of the wall 51 and the same is true of the conducting pipe 25.

Surrounding the tank 1 exteriorly thereof is a conducting pipe 52 for the over-flow and which communicates with the interior of the tank 1 through the medium of a series of outlet pipes 53, these latter extending and opening into the tank 1 at a point below the center thereof. The pipe 52 is common to all the outlet pipes 53 and opens into a stand pipe formed of a stationary section 54 and a shiftable section 55. The latter has communicating with the top thereof a discharge pipe 56. The section 54 of the stand pipe is provided with a packing box 57 in which is arranged a gland 58. Through the latter extends the section 55. The section 55 is vertically adjusted through the medium of the lever 59 pivoted to the wall 50 as at 60 provided with a handle 61 and connected to the section 55 by the link 62. By providing an adjustable stand pipe it is evident that the depth of the body of water within the tank 1 can be regulated. The stand pipe and its connections constitute what may be termed a water gage.

The crates, racks or receptacles 3 are mounted upon the supports 63 and provided with a bail 64 whereby the crate, rack or receptacle can be removed and positioned in the tank 1 when occasion so requires. The pump 28 is mounted upon a laterally extending bracket 65 which projects from and is secured to the wall 51.

The pipes 9, 10 are positioned the desired distance apart so that the water will be drawn from or discharged at different points at the top of the tank and the same is true of the pipes 41, 42. This arrangement of perforated pipes facilitates the circulation of the pasteurizing medium which by way of example is heated water and the cooling medium which by way of example is water gradually decreasing in temperature.

The operation of the apparatus is as follows:—It will be stated that after the crates or receptacles containing the bottles filled with beer are positioned in the tank, the tank is completely filled with water of suitable temperature through the medium of the pipes 5, 22, 17 and 13 and 9 and 10. During the filling of the tank with water, the cut-offs 27 and 34 are closed. It will be assumed that the tank has been filled with water, the cut-off 6 is then closed, the cut-off 27 opened, the cut-off 34 remaining closed, the cut-off 36 opened and the cut-off 8 opened, whereby steam is admitted to the conducting pipe 25. The pump 28 is operated and by such action water is drawn from the top of the body of water within the tank 1. The water passes from the tank 1 out through the pipes 9, 10, 13, 17, 21, 27ᵃ, through the pump, pipes 30, 35, into the branch pipe 38. At this point the steam entering the branch 38 will increase the temperature of the water. The heated water is conducted through the pipe 25 and discharged into the bottom of the tank through the medium of the pipes 41, 42, and the connections between said pipes and the conducting pipe 25. This forced mechanical circulation, *i. e.* drawing the water from the top and reëntering it into the tank at the bottom will cause the water to have the temperature progressively increased, owing to the supply of steam to the branch 38. After the water has been heated to a desired temperature, it is maintained at such a temperature for a predetermined period to complete the pasteurization of the beer and when it has been determined that the pasteurization has been completed, or at any time as may be desired the steam supply is shut off by closing the cut-off 8. The cut-offs 27 and 36 are also closed and the cut-offs 26, 34 and 6 opened, the operation of the pump is reversed and the water is drawn from the bottom of the tank and reëntered into the tank at the top, the water passing out through the pipes 41, 42, and the connections therebetween and the conducting pipe 25. From there the water passes through the lower portion of the pipe 22 and into the pump, then up through the pipe 30 into the branch 31 where it is admixed with the cold water entering through the pipe 5, consequently decreasing the temperature of the water drawn from the bottom of the tank 1. From the branch 31, the water passes into the vertical portion of the pipe 22, thence into the pipe 17, from there into the pipes 13, and discharged in the tank through the perforated pipes 9, 10. This action is continued until the cooling operation has been completed. The circulation of water in the manner as stated will cause the water to assume a gradually decreasing temperature on its way from the bottom to the top of the tank, owing to the admixing with the water of the cold water entering through the pipe 5. The overflow is discharged through the outlets 53, common conducting pipe 52, the stand pipe which communicates with the pipe 52 and the discharge pipe 56. After the cooling operation has been completed, the crate or receptable with the battles of beer which have been operated on are removed in a known manner from the tank and another lot of bottles containing beer placed in the tank to be pasteurized and cooled.

The overflow of the cooling medium and heating medium is provided for by the manner in which the outlet pipes 53 communicate with the interior of the tank and also with the common conducting pipe 52, the latter opening into the stand pipe. The level of the water within the tank can be regulated owing to the adjustability of the stand pipe, as will be evident, or in other words the adjustability of the stand pipe provides for regulation of the discharge from the tank.

By setting up the apparatus in the manner as hereinbefore described, it will be evident that the suction of the pump through the perforated pipes taking the water from all parts of the tank and after heating it forcing it into the bottom embodies several distinct principles, first, circulation by suction at the top, thereby also lifting the entering heated water from the bottom, second, the natural circulation caused by the rising of the heated water, and third the circulation by forcing the heated water into the tank by the pump which is aided by the rising of the heated water and the lifting of the heated water by suction. In reference to the cooling, it will be said that the hot water is drawn from all parts of the bottom of the tank and forced into the top of the tank through the perforated pipes, the heated water prior to its entering the top of the tank being mixed with cold water and as the cold water is heavier than the hot water, it naturally gravitates to the bottom. By the arrangement of perforated pipes, each is supplied from both ends, giving an equal distribution of water throughout the tank and also drawing from all parts of the tank. In causing the over-flow water to waste at the sides of the tank at or near the center lines of the sides and ends, three distinct means of circulation during the cooling process are obtained, first, circulation caused by the natural gravitation of the cold water to the bottom of the tank, second, circulation caused by wasting the over-flow water at the sides and ends which aids in the gravitation of the cold water to the bottom of the tank, and third, circulation caused by suction at the bottom of the tank, all of which tends to cause a rapid, uniform, thorough and complete gradual cooling of the water in all parts of the tank.

By setting up the apparatus in the manner as hereinbefore set forth a uniform circulation of the water into which the bottles containing the beer are submerged is obtained, whereby the beer will be subjected to uniform temperatures gradually increasing when pasteurizing and gradually decreasing when cooling, thereby giving each bottle containing beer no matter where placed the same treatment.

What I claim is:—

1. An apparatus for pasteurizing and cooling beer comprising a tank adapted to contain a body of water in which bottles containing beer are immersed, means whereby the water can be drawn from the top and forced into the bottom of the tank and withdrawn from the bottom and forced into the top of the tank, means for admixing a heating medium with the water to gradually increase its temperature during its travel from the top to the bottom of the tank, and means for admixing a cooling medium with the water during its travel from the bottom to the top of the tank.

2. An apparatus for pasteurizing and cooling beer comprising a tank adapted to contain a body of water in which bottles containing beer are immersed, means whereby the water can be drawn from the top and forced into the bottom of the tank and withdrawn from the bottom and forced into the top of the tank, means for admixing a heating medium with the water to gradually increase its temperature during its travel from the top to the bottom of the tank, means for admixing a cooling medium with the water during its travel from the bottom to the top of the tank, and means for discharging the surplus water from the tank.

3. An apparatus for pasteurizing and cooling beer comprising a tank adapted to contain a body of water in which bottles con-

taining beer are immersed, means whereby the water can be drawn from the top and forced into the bottom of the tank and withdrawn from the bottom and forced into the top of the tank, means for admixing a heating medium with the water to gradually increase its temperature during its travel from the top to the bottom of the tank, means for admixing a cooling medium with the water during its travel from the bottom to the top of the tank, and a regulatable means for discharging the surplus water from the tank.

4. An apparatus for pasteurizing and cooling beer comprising a tank adapted to contain a body of water in which bottles containing beer are immersed, means whereby the water can be drawn from the top and forced into the bottom of the tank and withdrawn from the bottom and forced into the top of the tank, means for admixing a heating medium with the water to gradually increase its temperature during its travel from the top to the bottom of the tank, means for admixing a cooling medium with the water during its travel from the bottom to the top of the tank, and means opening into the tank at the sides thereof at a point between the center and the bottom of the tank for discharging the surplus water.

5. An apparatus for pasteurizing and cooling beer comprising a tank adapted to contain a body of water in which bottles containing beer are immersed, means whereby the water can be drawn from the top and forced into the bottom of the tank and withdrawn from the bottom and forced into the top of the tank, means for admixing a heating medium with the water to gradually increase its temperature during its travel from the top to the bottom of the tank, means for admixing a cooling medium with the water during its travel from the bottom to the top of the tank, and regulatable means opening into the tank at the sides thereof at a point between the center and the bottom of the tank for discharging the surplus water.

6. An apparatus for pasteurizing and cooling beer in bottles comprising a tank adapted to contain a body of water in which the bottles containing the beer are submerged, a plurality of combined perforated supply and draw-off pipes arranged in said tank in proximity to the bottom thereof, a plurality of combined perforated supply and draw-off pipes arranged in said tank in proximity to the top thereof, means communicating with said pipes for drawing off the water at the top and reëntering it at the bottom of the tank whereby a circulation of the water is had in one direction and for drawing off the water at the bottom and reëntering it at the top whereby the circulation of the water is had in the opposite direction, means for admixing a heating medium with the water while circulating in one direction whereby the temperature of the water is progressively increased, and means for admixing a cooling medium with the water as it is circulating in the opposite direction whereby the temperature of the water is gradually decreased.

7. An apparatus for pasteurizing and cooling beer in bottles comprising a tank adapted to contain a body of water in which the bottles containing the beer are submerged, a plurality of combined perforated supply and draw-off pipes arranged in said tank in proximity to the bottom thereof, a plurality of combined perforated supply and draw-off pipes arranged in said tank in proximity to the top thereof, means communicating with said pipes for drawing off the water at the top and reëntering it at the bottom of the tank whereby a circulation of the water is had in one direction and for drawing off the water at the bottom and reëntering it at the top whereby the circulation of the water is had in the opposite direction, means for admixing a heating medium with the water while circulating in one direction whereby the temperature of the water is progressively increased, means for admixing a cooling medium with the water as it is circulating in the opposite direction whereby the temperature of the water is gradually decreased, and means at the sides and ends of the tank for drawing off the surplus water.

8. An apparatus for pasteurizing and cooling beer in bottles comprising a tank adapted to contain a body of water in which the bottles containing the beer are submerged, a plurality of combined perforated supply and draw-off pipes arranged in said tank in proximity to the bottom thereof, a plurality of combined perforated supply and draw-off pipes arranged in said tank in proximity to the top thereof, means communicating with said pipes for drawing off the water at the top and reëntering it at the bottom of the tank whereby a circulation of the water is had in one direction and for drawing off the water at the bottom and reëntering it at the top whereby the circulation of the water is had in the opposite direction, means for admixing a heating medium with the water while circulating in one direction whereby the temperature of the water is progressively increased, means for admixing a cooling medium with the water as it is circulating in the opposite direction whereby the temperature of the water is gradually decreased, and regulatable means at the sides and ends of the tank for drawing off the surplus water.

9. An apparatus for pasteurizing and cooling beer, comprising a tank adapted to contain a body of water in which bottles con-

taining beer are adapted to be submerged, a plurality of combined perforated supply and draw-off pipes arranged in said tank in close proximity to the bottom thereof, a cover for the tank, a plurality of perforated combined supply and draw-off pipes carried by and depending from the cover, a swiveled conducting pipe attached to the cover and constituting a pivot therefor, means for establishing communication between the conducting pipe and said last mentioned perforated pipes, a conducting pipe communicating with the perforated pipes at the bottom of the tank, means communicating with said conducting pipes for drawing the water off at the top of the tank and reëntering the same at the bottom whereby a circulation of water will be had in one direction and for drawing off the water at the bottom of the tank and reëntering it at the top whereby a circulation of the water will be had in the opposite direction, means for admixing a heating medium with the water while circulating in one direction whereby the temperature of the water is progressively increased, and means for admixing a cooling medium with the water as it circulates in the opposite direction whereby the temperature of the water is gradually decreased.

10. An apparatus for pasteurizing and cooling beer, comprising a tank adapted to contain a body of water in which bottles containing beer are adapted to be submerged, a plurality of combined perforated supply and draw-off pipes arranged in said tank in close proximity to the bottom thereof, a cover for the tank, a plurality of perforated combined supply and draw-off pipes carried by and depending from the cover, a swiveled conducting pipe attached to the cover and constituting a pivot therefor, means for establishing communication between the conducting pipe and said last mentioned perforated pipes, a conducting pipe communicating with the perforated pipes at the bottom of the tank, means communicating with said conducting pipes for drawing the water off at the top of the tank and reëntering the same at the bottom whereby a circulation of water will be had in one direction and for drawing off the water at the bottom of the tank and reëntering it at the top whereby a circulation of the water will be had in the opposite direction, means for admixing a heating medium with the water while circulating in one direction whereby the temperature of the water is progressively increased, means for admixing a cooling medium with the water as it circulates in the opposite direction whereby the temperature of the water is gradually decreased, and means communicating with the sides and ends of the tank at a point below the center thereof for discharging the surplus water.

11. An apparatus for pasteurizing and cooling beer, comprising a tank adapted to contain a body of water in which bottles containing beer are adapted to be submerged, a plurality of combined perforated supply and draw-off pipes arranged in said tank in close proximity to the bottom thereof, a cover for the tank, a plurality of perforated combined supply and draw-off pipes carried by and depending from the cover; a swiveled conducting pipe attached to the cover and constituting a pivot therefor, means for establishing communication between the conducting pipe and said last-mentioned perforated pipes, a conducting pipe communicating with the perforated pipes at the bottom of the tank, means communicating with said conducting pipes for drawing the water off at the top of the tank and reëntering the same at the bottom whereby a circulation of water will be had in one direction and for drawing off the water at the bottom of the tank and reëntering it at the top whereby a circulation of the water will be had in the opposite direction, means for admixing a heating medium with the water while circulating in one direction whereby the temperature of the water is progressively increased, means for admixing a cooling medium with the water as it circulates in the opposite direction whereby the temperature of the water is gradually decreased, and regulatable means communicating with the sides and ends of the tank at a point below the center thereof for discharging the surplus water.

12. An apparatus for pasteurizing and cooling beer, comprising a tank adapted to contain a body of water in which bottles containing beer are adapted to be submerged, a plurality of combined perforated supply and draw-off pipes arranged in said tank in close proximity to the bottom thereof, a cover for the tank, a plurality of perforated combined supply and draw-off pipes carried by and depending from the cover, a swiveled conducting pipe attached to the cover and constituting the pivot therefor, means for establishing communication between the conducting pipe and said last mentioned perforated pipes, a conducting pipe communicating with the perforated pipes at the bottom of the tank, means communicating with said conducting pipes for drawing the water off at the top of the tank and reëntering the same at the bottom whereby a circulation of water will be had in one direction and for drawing off the water at the bottom of the tank and reëntering it at the top whereby a circulation of the water will be had in the opposite direction, means for admixing a heating medium with the water while circulating in one direction whereby the temperature of the water is progressively increased, means for admixing a cooling medium with the water as it circulates in the

opposite direction whereby the temperature of the water is gradually decreased, a conducting pipe communicating with the sides and ends of the tank below the center thereof causing a discharge of the surplus water, and a regulatable stand pipe communicating with said conducting pipe for controlling the discharge from the tank of the surplus water.

13. A pasteurizing apparatus of the class described comprising a tank, a cover mounted pivotally thereon, circulating pipes depending from said cover and into the water contained in the tank, and a conducting pipe communicating with the circulating pipes carried by said cover and arranged coaxially with the latter.

14. An apparatus for pasteurizing and cooling beer comprising a tank adapted to contain a body of water in which the bottles are to be submerged, a cover mounted pivotally on the tank, circulating pipes carried by and depending from the cover into the water contained in the tank, and a conducting pipe communicating with said circulating pipes and serving as a pivot about which said cover may turn.

15. An apparatus for pasteurizing and cooling beer in bottles comprising a tank adapted to contain a body of water in which the bottles are to be submerged, a plurality of perforated pipes depending into the upper portion of the tank, perforated distributing pipes arranged in the bottom of the tank, means for supplying heated water to the perforated pipes in the bottom of the tank and withdrawing water through the perforated pipes in the top of the tank, means for supplying a cooling medium to the perforated pipes in the top of the tank and for withdrawing water through the perforated pipes in the bottom of the tank.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM WENZEL.

Witnesses:
B. J. Zuehlke,
Lu Pauly.

Pa
Mar 1909

339,162

A. A. PINDSTOFTE.

PASTEURIZING APPARATUS.

APPLICATION FILED JUNE 22, 1909.

939,162. Patented Nov. 2, 1909.

Fig. 1

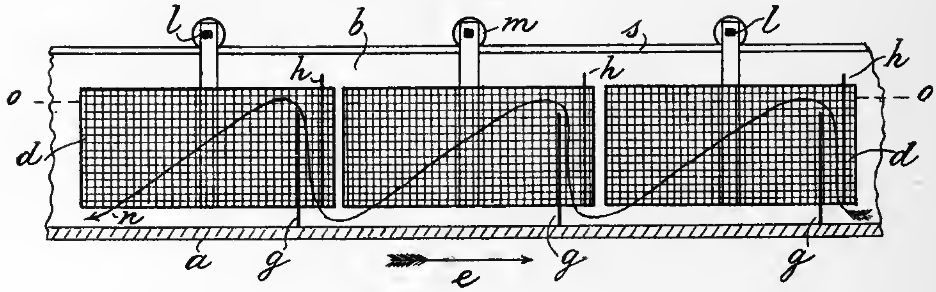
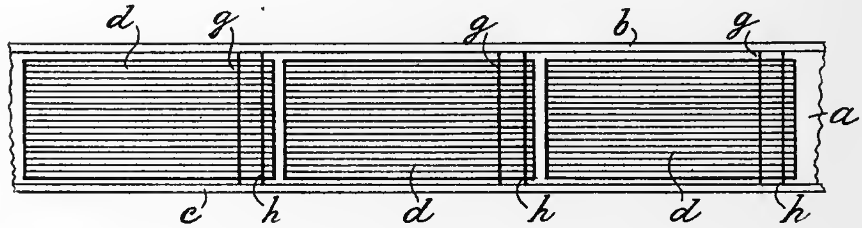


Fig. 2



Witnesses

Clara Hohenstein

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UNITED STATES PATENT OFFICE.

ANDERS ANDERSEN PINDSTOFTE, OF FREDERIKSBERG, NEAR COPENHAGEN, DENMARK.

PASTEURIZING APPARATUS.

939,162. Specification of Letters Patent. **Patented Nov. 2, 1909.**

Original application filed October 1, 1907, Serial No. 395,390. Divided and this application filed June 22, 1909. Serial No. 503,682.

To all whom it may concern:

Be it known that I, Anders Andersen Pindstofte, a subject of the King of Denmark, residing at Frederiksberg, near Copenhagen, Denmark, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

The present application is a division of my application Serial No. 395,390, filed October 1, 1907, for improvements in pasteurizing apparatus.

The present invention relates to improvements in pasteurizing apparatus of the kind in which the bottles are placed in baskets moving through a water reservoir of suitable dimensions, the bottles being gradually heated in this reservoir to pasteurizing temperature. The water is maintained at pasteurizing temperature as long as required by means of heat supplied to the water by suitable devices, the bottles afterward being cooled by means of a cooling medium supplied to the water near the place where the bottles are removed from the apparatus. In such apparatus the pasteurizing fluid is, of course, put in motion when the baskets are pulled or pushed through it, but this motion is not sufficient to cause the warmer water at the top to mix with the colder water at the bottom, and therefore the temperature of the upper water and that of the lower water present so great differences that a pasteurizing process safe and free of breakage cannot be effected in such apparatus. These drawbacks are obviated by the present invention, which has for its object to combine the baskets with means which will produce a perfect mixing of the upper and lower layer of water during the motion of the baskets, so that the temperature is practically uniform from top to bottom of the different parts of the apparatus.

The invention is illustrated in the accompanying drawing, in which—

Figure 1 is a vertical longitudinal section through a part of the improved apparatus. Fig. 2 is a plan view of parts of the apparatus; the suspension means of the baskets being omitted.

Referring to the figures, *a* is the bottom of the water reservoir, and *b*, *c* the side walls of said reservoir. The bottles (not shown) are placed in baskets *d*, which can be made of wire-grating, plait-work, frame-work or the like, permitting the pasteurizing fluid to pass through the baskets. The baskets *d* are suspended on transverse shafts *l* (Fig. 1), provided with rollers *m* running upon rails *s* on the top of the side-walls of the water reservoir so that the baskets can be moved through the water reservoir in the direction indicated by the arrow *e*. In the interior of each of the baskets *d* is arranged a channel, which consists of two plates *g* and *h* placed transversely to the side-walls *b* and *c* of the water reservoir. The length of the plates *g* and *h* corresponds to the distance between said side-walls. The plate *g* extends from the bottom of the water reservoir to some distance below the upper edge of the basket *d*, and the plate *h* extends from the bottom of the basket *d* to some distance above the water level *o*—*o* (Fig. 1) in the water reservoir.

The operation of the apparatus is as follows: The baskets containing the bottles are inserted in the water reservoir and moved through it in the direction of the arrow *e*. The motion of the baskets and the channels formed by the plates *g* and *h* causes the pasteurizing fluid to move in the opposite direction so that the fluid-current always passes up through the channels and down between the bottles placed in the baskets, as indicated by the arrow *n* (Fig. 1), thereby mixing the water in such a manner that the temperature is practically uniform from top to bottom at all parts of the apparatus.

What I claim is:

In a pasteurizing apparatus, the combination with a water reservoir, of a number of open bottle-baskets having their bottom some distance above the bottom of the reservoir, means which permit of the moving of said bottle-baskets through said reservoir, and a number of channels placed one in the interior of each of the bottle baskets and separating the bottle-supporting parts, each of said channels consisting of two spaced parallel plates placed transversely to the side-walls of the water reservoir and having a length corresponding to the distance between said side-walls, one of said plates *g* extending from the bottom of the water reservoir to some distance below the upper edge of the bottle-baskets, while the other of said plates *h* extends from the bottom of the bottle-baskets to some distance above the water level in the water reservoir; substantially as and for the purpose set forth.

ANDERS ANDERSEN PINDSTOFTE.

Witnesses:
HAROLD FROST,
J. ROTKJAR.

A. A. PINDSTOFTE.

PASTEURIZING APPARATUS.

APPLICATION FILED OCT. 1, 1907.

946,397. Patented Jan. 11, 1910.

Fig. 2.

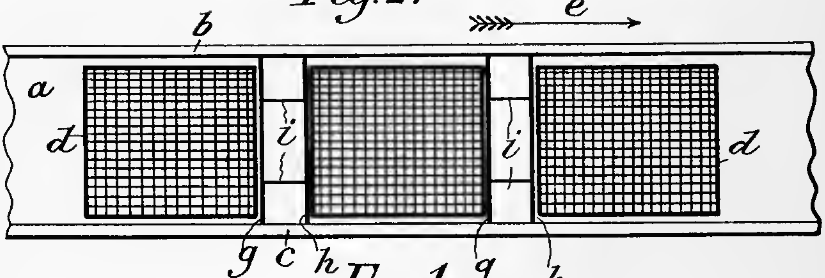


Fig. 1

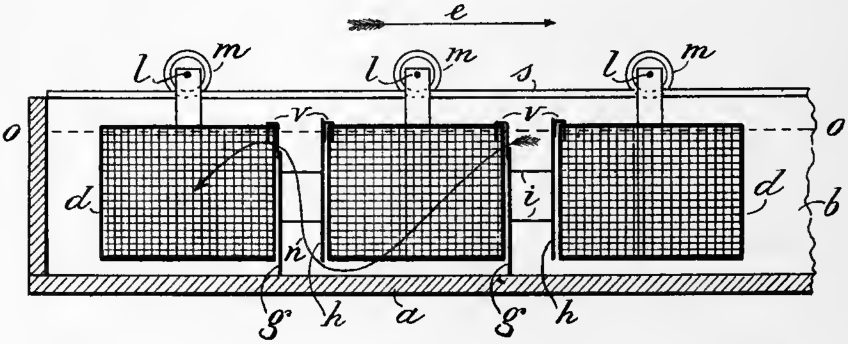


Fig. 1a

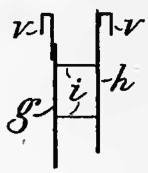
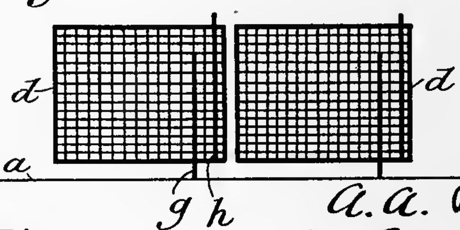


Fig. 3.



Witnesses

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UNITED STATES PATENT OFFICE.

ANDERS ANDERSEN PINDSTOFTE, OF FREDERIKSBERG, NEAR COPENHAGEN, DENMARK.

PASTEURIZING APPARATUS.

946,397. Specification of Letters Patent. **Patented Jan. 11, 1910.**

Application filed October 1, 1907. Serial No. 395,390.

To all whom it may concern:

Be it known that I, Anders Andersen Pindstofte, subject of Denmark, residing at No. 62 Frederiksberg Alle, in the city of Frederiksberg, near Copenhagen, Kingdom of Denmark, have invented new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

The present invention relates to improvements in pasteurizing apparatus of the kind in which the bottles are placed in baskets moving through a water reservoir of suitable dimensions, the bottles being gradually heated in this reservoir to pasteurizing temperature. The water is maintained at pasteurizing temperature as long as required by means of heat supplied to the water by suitable devices, the bottles afterward being cooled by means of a cooling medium supplied to the water near the place, where the bottles are removed from the apparatus. In such apparatus the pasteurizing fluid is, of course, put in motion when the baskets are pulled or pushed through it, but this motion is not sufficient to cause the warmer water at the top to mix with the colder water at the bottom, and therefore the temperature of the upper water and that of the lower water present so great differences that a pasteurizing process safe and free of breakage cannot be effected in such apparatus. These drawbacks are obviated by the present invention, which has for its object to combine the baskets with means which will produce a perfect mixing of the upper and lower layers of water during the motion of the baskets, so that the temperature is practically uniform from top to bottom at the different parts of the apparatus.

The invention is illustrated in the accompanying drawing, in which—Figure 1 is a vertical longitudinal section through a part of the improved apparatus. Fig. 1ª is a vertical section through one of the channels referred to in the following specification. Fig. 2 is a plan view of parts of the apparatus; the suspension means of the baskets being omitted. Fig. 3 is a side view of two adjacent baskets and shows a modification of the invention.

Referring to Figs. 1, 1ª and 2, *a* is the bottom of the water reservoir, and *b*, *c* the side walls of said reservoir. The bottles (not shown) are placed in baskets *d*, which can be made of wire-grating, plait-work, frame-work or the like, permitting the pasteurizing fluid to pass through the baskets. The baskets *d* are suspended on transverse shafts 1 (Fig. 1), provided with rollers *m* running upon rails *s* on the top of the side-walls of the water-reservoir so that the baskets can be moved through the water reservoir in the direction indicated by the arrows *e*. Between each two of the baskets *d* is inserted a channel having form of a flat frame, which consists of two plates *g* and *h* placed transversely to the side walls *b* and *c* of the water reservoir and connected together by means of plates parallel to the side walls *b* and *c*, or by means of cross-stays *i*, or by other suitable means. The length of the plates *g* and *h* corresponds to the distance between the side-walls *b* and *c*. The plate *g* extends from the bottom of the water reservoir to some distance below the upper edge of the basket *d*, and the plate *h* extends from the bottom of the basket *d* to some distance above the water level *o—o* (Fig. 1) in the water reservoir. The channels formed by the plates *g* and *h* are suspended upon the baskets by means of hooks *v* (Figs. 1 and 1ª) or the like or they may be suspended by any other suitable means which will permit said plates to follow the movements of the baskets.

The operation of the apparatus is as follows: The baskets containing the bottles are inserted in the water reservoir and moved through it in the direction of the arrows *e*. The motion of the baskets and of the channels formed by the plates *g* and *h* placed between each two baskets causes the pasteurizing fluid to move in the opposite direction so that the fluid-current always passes up between the baskets and down between the bottles placed in the baskets, as indicated by the arrow *n* (Fig. 1), thereby mixing the water in such a manner that the temperature is practically uniform from top to bottom at all parts of the apparatus.

Fig. 3 shows a modification, in which the channels *g*, *h* are placed in the interior of the baskets *d*, so that the distance between the baskets can be reduced to a minimum. It will be obvious that such an arrangement will give the same result as the arrangement first described. This modified form of the apparatus is the subject of a divisional application filed by me June 22nd, 1909, Ser. No. 503,682.

I claim:

1. In a pasteurizing apparatus, the combination with a water-reservoir, of a number of open bottle-baskets supported therein with their bottoms some distance above the bottom of the reservoir, means permitting the moving of said bottle-baskets through said reservoir, and a number of channels moving with the bottle-baskets and separating the bottle-supporting parts, each of said channels consisting of two spaced parallel plates placed transversely to the side walls of the water-reservoir and having a length corresponding to the distance between said side walls, one of said plates *g* extending from the bottom of the water-reservoir to some distance below the upper edge of the bottle-baskets, while the other of said plates *h* extends from the bottom of the bottle-baskets to some distance above the water level in the water-reservoir; substantially as and for the purpose set forth.

2. In a pasteurizing apparatus, the combination with a water-reservoir, of a number of open bottle-baskets supported therein with their bottoms some distance above the bottom of the reservoir, means permitting the moving of said bottle-baskets through said reservoir, and a number of channels suspended between each two of such baskets and moving with the baskets and separating the bottle-supporting parts, each of said channels consisting of two spaced parallel plates connected together and placed transversely of the side walls of the water-reservoir and having a length corresponding to the distance between said side walls, one of said plates *g* extending from the bottom of the water-reservoir to some distance below the upper edge of the bottle-baskets, while the other of said plates *h* extends from the bottom of the bottle-baskets to some distance above the water level in the water-reservoir; substantially as and for the purpose set forth.

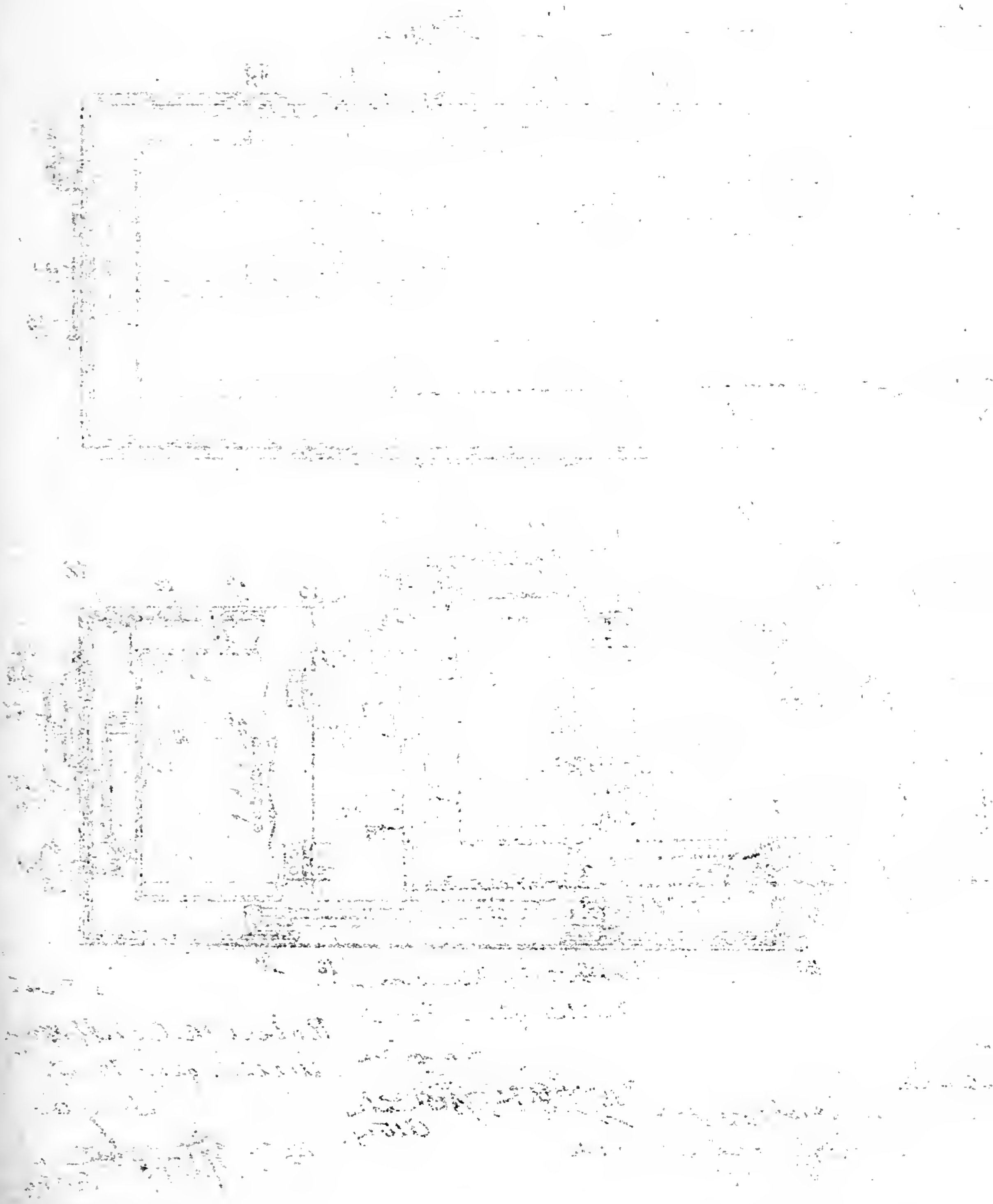
In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANDERS ANDERSEN PINDSTOFTE.

Witnesses:
MARCUS MÖLLER,
S. KÓTKJAR.

948,443

Pa
Feb, 1910



R. M. CAUFFMAN & W. BEST.

PASTEURIZING APPARATUS.

APPLICATION FILED FEB. 24, 1908.

948,443. Patented Feb. 8, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

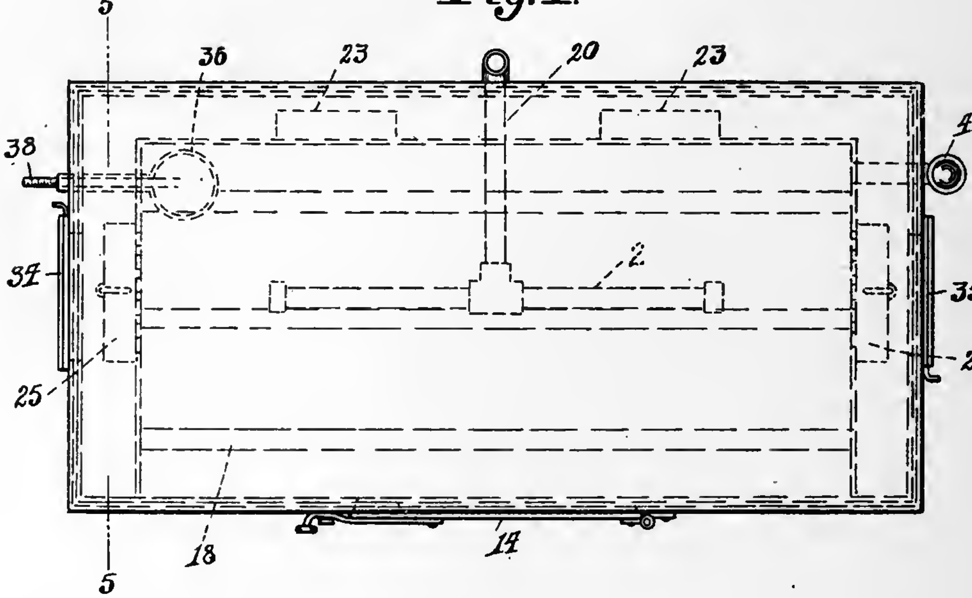
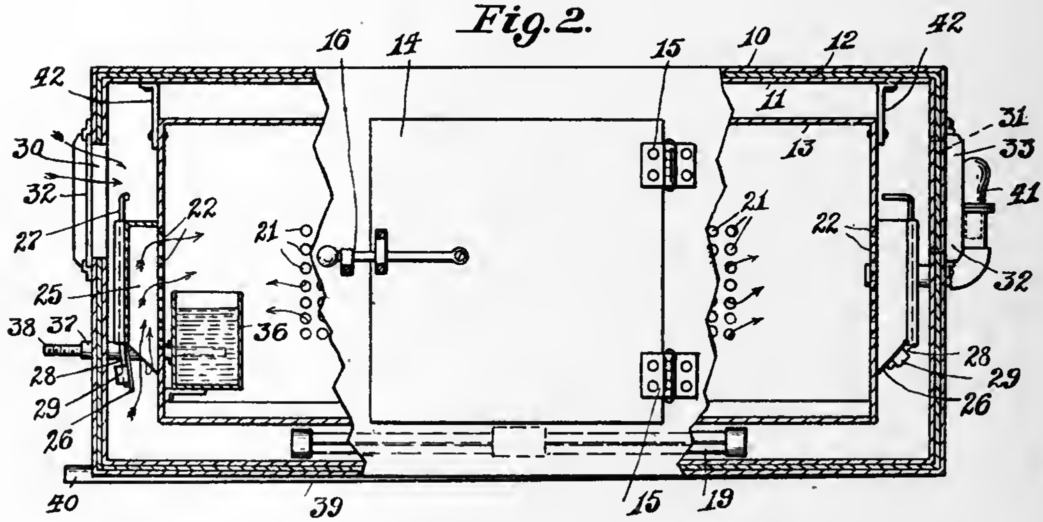


Fig. 2.



Witnesses:

George Oltsch

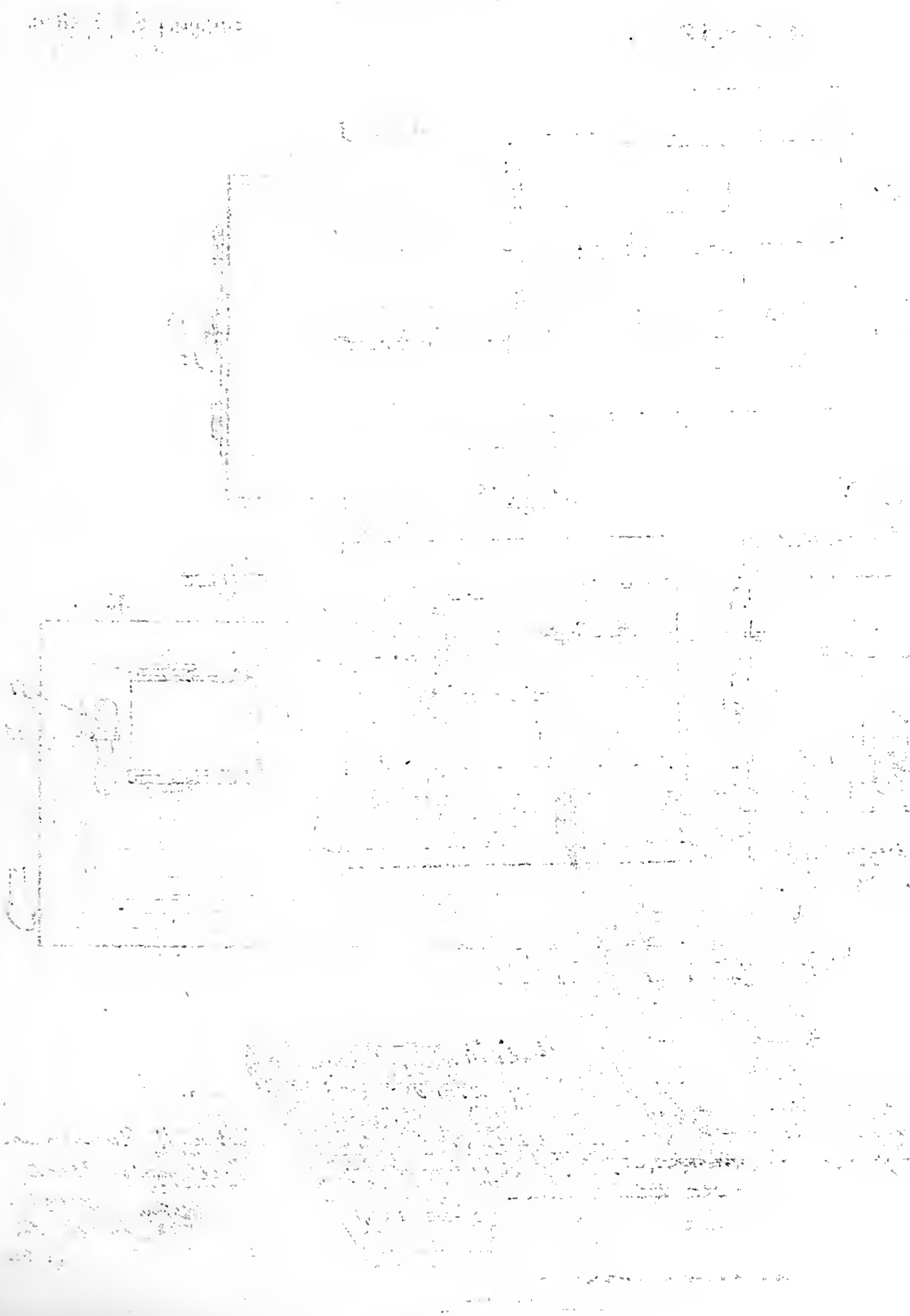
G. M. Cole.

Robert M. Cauffman.

Wellington Best.

Inventors.

By [illegible] Attny.



R. M. CAUFFMAN & W. BEST.
PASTEURIZING APPARATUS.
APPLICATION FILED FEB. 24, 1908.

948,443. Patented Feb. 8, 1910.

2 SHEETS—SHEET 2.

Fig. 3.

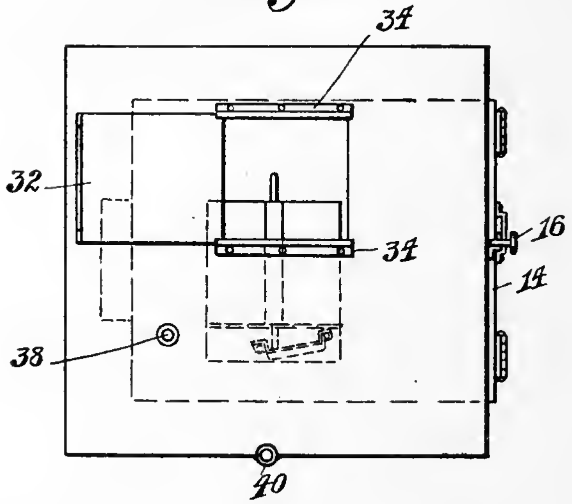


Fig. 5.

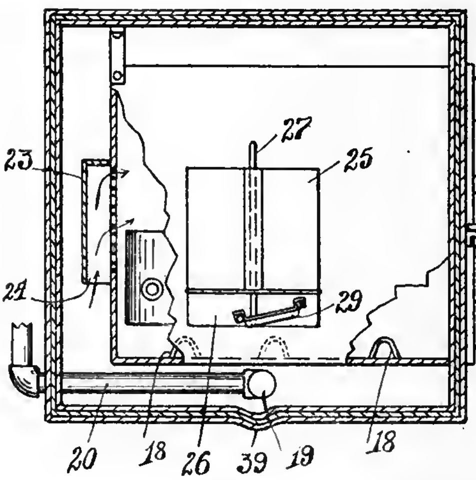


Fig. 4.

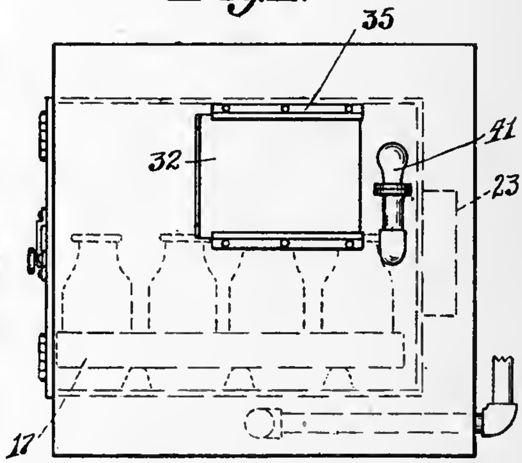
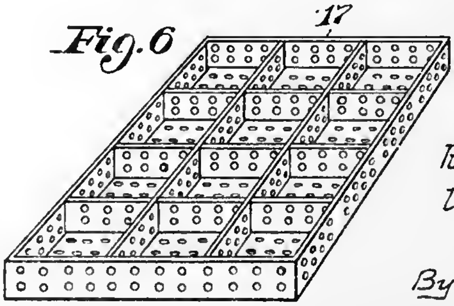


Fig. 6



Witnesses:
George Oltsch
G. M. Cole.

Robert M. Cauffman.
Wellington Best.
Inventors.
By [signature]
Atty.

UNITED STATES PATENT OFFICE.

ROBERT M. CAUFFMAN AND WELLINGTON BEST, OF CENTERVILLE, MICHIGAN; SAID BEST ASSIGNOR TO SAID CAUFFMAN.

PASTEURIZING APPARATUS.

948,443. Specification of Letters Patent. **Patented Feb. 8, 1910.**

Application filed February 24, 1908. Serial No. 417,489.

To all whom it may concern:

Be it known that we, Robert M. Cauffman and Wellington Best, citizens of the United States, residing at Centerville, in the county of St. Joseph and State of Michigan, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

This invention relates to improvements in apparatus for treating milk and other articles of food for the purpose of pasteurizing the same, and has for one of its objects to improve the construction and increase the efficiency and utility of devices of this character.

Another object of the invention is to provide a simply constructed apparatus whereby the heating medium may be applied with greater uniformity and regularity to the food products or compounds, and without danger of over heating or under heating the same.

Another object of the invention is to provide a simply constructed apparatus whereby the temperature may be readily controlled and increased or decreased as desired, and wherein the degree of temperature may be known to the attendant at all times.

With these and other objects in view the invention, consists in certain novel features of construction, as hereinafter shown and described and specifically pointed out in the claims.

In the drawings is shown the preferred form of the embodiment of the invention, and in the drawings thus employed Figure 1 is a plan view of the improved apparatus. Fig. 2 is a side elevation from the front partly in section. Fig. 3 is an elevation from one end of the apparatus. Fig. 4 is an end elevation from the opposite end of the apparatus. Fig. 5 is a transverse section on the line 5—5 of Fig. 1. Fig. 6 is a perspective view of one of the trays for supporting the food products or compounds within the apparatus.

The improved apparatus comprises an outer casing, preferably of two or more thicknesses 10—11 of sheet metal preferably galvanized iron, and spaced apart with one or more layers of non-conductive material, such as asbestos, represented at 12, between the walls of the casing.

Disposed within the outer casing is an inner casing 13 of suitable sheet metal and spaced upon all sides except the front from the outer casing, the front of the inner casing bearing against the inner face of the front of the outer casing, as shown in Figs. 3, 4 and 5, the outer casing having a door 14 providing access to the inner casing. The door 14 is hinged as at 15 to the inner casing and provided at its free edges with a suitable latch device 16, the door being large enough to permit of the insertion and removal of the articles of food which are preferably disposed in perforated trays, one of which is illustrated at 17 in Fig. 6.

The lower side of the inner casing is formed with longitudinal ribs 18 upon which the trays 17 rest, and thus supported from the floor of the inner casing so that the heating medium will pass around all sides of the tray and of the food products supported thereby.

The heating medium will be supplied to the space between the inner and outer casings and will preferably be live steam, and to supply this live steam a perforated pipe section is disposed within the space between the bottom of the inner and outer casings, this pipe being represented at 19 and provided with a branch 20 leading through the outer casing, as shown. Any suitable steam supplying means may be employed, but as the steam generator is not a portion of the present invention it is not illustrated.

The inner casing 13 is provided at suitable points in its rear wall with transverse perforations 21, and with similar perforations 22 in the end walls, the perforations 21 being covered by hoods 23 open at their lower sides, as represented at 24 in Fig. 5, while the end perforations 22 are covered by similar hoods 25, the latter open at the lower sides and provided with closing valves 26 adapted to cover the openings. Suitable operating devices will be employed to control the valves 26, and for the purpose of illustration rods 27 are mounted for rotation upon the hoods 25, with the lower ends bent at an angle to the longitudinal plane of the rods, as shown at 28, the bent portions operating in diagonal guide strips 29 attached to the valves. By this arrangement it will be obvious that when the rods 27 are rotated the bent ends 28 acting within the guide strips 29 will open and close the valves 26, the extent of the opening being easily controlled by the extent to which the rods are operated.

The outer casing of the apparatus is provided at the ends with relatively large openings 30—31, the openings provided with closures 32—33, preferably slidable in guide ways 34—35, so that the openings may be uncovered to any required extent to admit any given quantity of cold air into the space between the outer and inner casings. The hoods 25 being located opposite the openings 30—31, the valve rods 27 are easily accessible through the openings, so that the valves 26 may be readily set to any desired extent by simply opening the closures 32—33, as will be obvious.

Located within the inner casing, preferably at one corner is a tank 36 for holding water, the tank provided with a tubular connection 37 leading out through both casings, and within this tubular connection is arranged a suitable thermometer device 38, readable from the exterior of the outer casing, so that the temperature of the water in the tank 36 may be ascertained at all times. It will be understood that it is not the object to ascertain the temperature of the inner casing, but that on the other hand it is the object to ascertain the temperature of the milk in the bottles in order to determine when the temperature has reached a point to properly pasteurize the milk. Thus the temperature of the milk within the bottles is ascertained approximately by the temperature of the water in the tank 36, in which one end of the thermometer is submerged, as one liquid will be substantially the same in temperature as the other, both being subjected to the same heating medium. The thermometer device employed consists simply of an ordinary tube thermometer within a tubular casing 37, which serves to protect the thermometer from the heat of the steam.

Within the bottom of the outer casing is arranged a longitudinal depression 39 inclined toward one end of the casing and provided with a discharge pipe 40 at its lower end to provide suitable drainings for the water of condensation. A suitable safety valve indicated at 41 is also connected to the apparatus, to prevent danger from undue pressure of steam in the apparatus.

The inner casing 13 is preferably suspended by hangers 42 from the inner casing, as shown in Fig. 2.

By this simple arrangement it will be obvious that when steam is admitted into the distributing pipe 19 it will pass around all sides of the inner casing except the front, and likewise pass through the perforations 21—22 into the interior of the inner casing, and thus come into direct contact with the receptacles of the food products supported in the tray, or otherwise disposed within the inner casing. The steam thus freely circulates around the exterior and, within the interior of the inner casing, and subjects the food products both to the direct and indirect influence or action of the steam, thereby utilizing to the fullest extent the best accurate properties of the steam.

The air intakes 30—31 are an important feature of the invention and permit the proper mixing of air and steam by which any sudden heating of the bottles or other vessels containing the food products is prevented and thus also preventing loss of bottles or other fragile receptacles by breaking them. The cold air apertures are also utilized to prevent a sudden rise in temperature which would be liable to fracture the bottles. By this arrangement a comparatively small amount of steam only is required to produce a relatively high temperature which may be uniformly maintained at any required degree by manipulating the closures 32—33 and the valves 26, as before described, the degree of temperature being readily ascertained by consulting the thermometer device 38.

When the milk is to be treated in the apparatus it is first passed through a centrifugal machine which clarifies the milk and the milk and cream aerated and cooled and thoroughly mixed and strained in the sterilized bottles which are then placed on the trays 17 and inserted through the door 14 into the inner casing as before described and supported upon the ribs 18. The milk is thus in condition and position to be pasteurized at a temperature of 180° to 200° for thirty minutes more or less, after which the bottles are instantly sealed.

The apparatus may also be employed in cheese factories and in creameries to enable the cheese makers and butter makers to supply milk admirably adapted for starter making.

The improved apparatus may be manufactured in any required size or capacity, and may be manufactured for farmers having a limited supply of milk or employed upon the larger dairy farms, creameries, or cheese factories, as above stated.

The thermometer device 38 projecting into the water in the tank 36, and the temperature of the water being always slightly greater than the milk, or other food products within the inner casing, the temperature is readily ascertainable and by a little practice the operator may be able to maintain the temperature of the milk or other products at any degree required. The operator is thus in position to intelligently manipulate the cold air supply and the valve 26, as will be obvious.

What is claimed is—

1. In an apparatus of the class described, an outer and an inner casing spaced apart,

means for supplying heat to the space between the casings, a tank within the inner casing and adapted to contain liquid, a thermometer device connected to said tank and extending to the exterior of the casings to determine the temperature of the liquid in said tank and thereby determine approximately the temperature of the milk being pasteurized within the bottles disposed in the apparatus, said inner casing having perforations providing communication between the inner casing and the space between the casings, and means in the interspace for controlling the flow of the heating medium through the apertures.

2. In an apparatus of the class described, an outer and inner casing spaced apart, means for supplying heat to the space between the casings, said inner casing having apertures providing communication between the inner casing and the space between the casings, hoods disposed over said apertures and open at their lower sides, valves operating to control the flow of heat to said hoods, and means for adjusting said valves.

3. In an apparatus of the class described, an outer and an inner casing spaced apart, said outer casing having air apertures, adjustable closures for said air apertures, means for supplying heat to the space between the casings, said inner casing having apertures providing communication between the inner casing and the space between the casings, and hoods over said apertures and open at their lower sides.

4. In an apparatus of the class described, an outer and an inner casing spaced apart, the outer casing having air apertures leading therethrough, adjustable closures for said apertures, means for supplying heat to the space between the casings, said inner casing having apertures providing communication between the inner casing and the space between the casings, hoods over said apertures and open at their lower sides, valves operating to control the heat passing through said hoods and means for adjusting the said valves.

5. In an apparatus of the class described, an outer and an inner casing spaced apart, the outer casing having air apertures communicating with the space between the casings, adjustable closures for said air apertures, means for supplying heat to the space between said casings, said inner casing having apertures in its ends providing communication with the space between the casings, and hoods disposed over said apertures and open at the lower sides.

6. In an apparatus of the class described, an outer and an inner casing spaced apart, the outer casing having air apertures communicating with the space between the casings, adjustable closures for said air apertures, means for supplying heat to the space between said casings, the inner casing having apertures in its ends communicating with the space between the casings, hoods disposed over said latter apertures and open at the lower side, valves operating to control the passage of heat through said hoods, and means for controlling said valves and disposed in a position to be accessible through said air apertures.

7. In an apparatus of the class described, an outer and an inner casing spaced apart, said inner casing having transverse apertures providing communication with the space between the casings, and said outer casing having air apertures communicating with the space between the casings, adjustable closures for said air apertures, hoods disposed over the apertures of the inner casing and open at the lower side, means for supplying heat to the space between the casings, valves operating to control the flow of heat through the hoods, means for controlling said valves and accessible through said apertures, a tank for holding liquid disposed within said inner casing, and a thermometer device connected into said tank and extending through said casing to determine the temperature of the liquid in said tank and thereby determine approximately the temperature of the milk being pasteurized within the bottles disposed in the apparatus.

8. In an apparatus of the class described, an outer casing and an inner casing, means for supplying heat to the space between the casings, said inner casing having communication with the space between the casings, means for controlling the flow of the heating medium through the communication between the inner casing and said space, said outer casing having an air opening, and a closure for said air opening.

9. In an apparatus of the class described, an outer and inner casing spaced apart, means for supplying heat to the space between the casings, said inner casing having apertures providing communication between the inner casing and the space between the casings, hoods disposed over said apertures and open at their lower sides, valves operating to control the flow of heat to said hoods.

In testimony whereof we affix our signatures, in presence of two witnesses.

ROBERT M. CAUFFMAN.
WELLINGTON BEST.

Witnesses:
GEORGE OLTSCH,
G. M. COLE.

1a

July 1910

J. W. HEIZER.

PASTEURIZING APPARATUS.

APPLICATION FILED APR. 23, 1909.

964,777. Patented July 19, 1910.

Fig. I

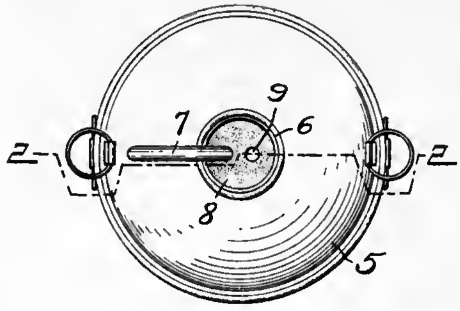


Fig. 3

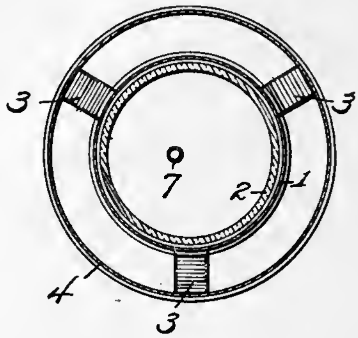


Fig. 2

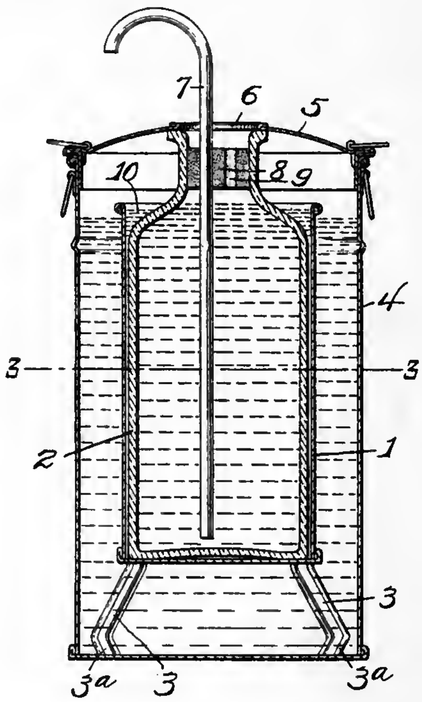
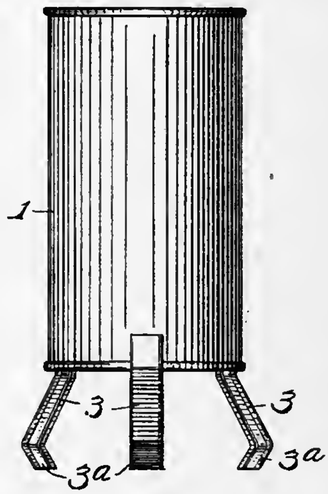


Fig. 4



WITNESSES:

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Alfred C. Paul

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James W. Heizer

BY H. E. Dunlap

ATTORNEY.

THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JAMES W. HEIZER, OF WHEELING, WEST VIRGINIA, ASSIGNOR TO THE LACTOMODE COMPANY, OF WHEELING, WEST VIRGINIA, A CORPORATION.

PASTEURIZING APPARATUS.

964,777. Specification of Letters Patent. **Patented July 19, 1910.**

Application filed April 23, 1909. Serial No. 491,716.

To all whom it may concern:

Be it known that I, JAMES W. HEIZER, a citizen of the United States of America, and resident of Wheeling, county of Ohio, and State of West Virginia, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

This invention relates to improvements in pasteurizing apparatus, and it has for its primary object to provide an extremely simple and inexpensive device whereby the contents of glass bottles or jars may be pasteurized or sterilized without subjecting such bottles or jars to the danger of breakage.

A further object of the invention is to provide an apparatus of the character mentioned which is particularly adapted for pasteurizing the contents of milk-modifying bottles and whereby said contents may be accurately heated to the required temperature.

A still further object of the invention is to provide a pasteurizing apparatus the construction or arrangement of which is such that a thermometer or other temperature-testing instrument may be directly applied to the contents of the bottle or jar without its first being passed through a heated zone where it would be unduly influenced.

With these and other objects in view, the invention finally consists in the particular construction, arrangement and combination of parts which will hereinafter be fully described, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a top plan view of the invention; Fig. 2 is a vertical section of the same on the line 2—2, Fig. 1; Fig. 3 is a horizontal section on the line 3—3, Fig. 2; and—Fig. 4 is a side elevation of the jar-holding receptacle, removed.

Referring to said drawings, in which like reference numerals designate like parts throughout the several views—1 indicates a cylindrical receptacle adapted for receiving a bottle or jar 2 containing milk, fruit, cereals, or other matter to be pasteurized or sterilized, the diameter of said receptacle being just enough greater than that of said bottle or jar 2 to admit of convenient or ready insertion and removal of the latter. Legs 3 carried by the lower end of said receptacle 1 serve to support the latter, as shown, said legs being inclined outward to a point where they are just receivable in an outer cylindrical receptacle 4 in which the receptacle 1 is seated and being adapted to center the receptacle 1 with relation to the receptacle 4. The lower ends of said legs have inturned terminals 3^a which facilitate the insertion of the inner receptacle in the outer receptacle. The height of the inner receptacle 1 is preferably such that it stands slightly above the straight body-portion of the bottle or jar to be received therein, as shown. The outer receptacle 4 is made of such a height with relation to the inner receptacle and to the bottle or jar to be contained therein that its removable cover 5, when properly seated, will rest upon or closely overlie the top of the neck of said bottle or jar. Said cover has a central orifice 6 therein whose diameter is substantially that of the mouth of the bottle or jar 2, with which mouth it registers, said orifice being adapted not only to allow the usual discharge tube 7 of a milk-modifying bottle to project outward therethrough, but also to admit of the application of a thermometer, or other temperature-testing instrument, to the contents of the bottle without removing the cover, said instrument being inserted into the contents through an aperture in the bottle-stopper 8, which aperture may be either that through which the tube 7 is projected or the aperture 9 in which a blowpipe (not shown) may be seated.

In practice, the receptacle 1 is first seated within the receptacle 4 and the bottle 2 containing the fluid to be acted upon is placed within said receptacle 1, after which the latter is filled up with cold water. The receptacle 4 is then filled with boiling water, after which the cover 5 is immediately seated in place. The cold water which finds its way about the sides of the bottle serves to prevent the sudden heating of the bottle which would otherwise result from the filling of the outer receptacle with hot water; that is to say, the heating of the bottle is thereby caused to be gradual, and consequently the danger of the bottle breaking through being subjected to a sudden change of temperature is removed or eliminated.

Since it is desirable in pasteurizing to effect the heating of the fluid acted upon to not more than a certain degree of temperature, this may be regulated more or less, as desired, by increasing or diminishing the quantity of cold water placed in the receptacle 1, the purpose had in view in making said receptacle slightly higher than the body-portion of the bottle to be received therein being to provide a water-holding area 10 which may, or may not, be occupied by water.

It will be noted that to test the temperature of the contents of the bottle, the testing instruments may be passed directly into the bottle without removing the cover 5 and without said instrument passing through a heated instrument-influencing area in reaching said contents, and that, consequently, an accurate test is readily obtained.

As is well understood, when the water in the outer receptacle begins to cool, a circulation is created which carries the cooler water to the bottom of the receptacle. The legs 3 are therefore provided on the inner receptacle for the double purpose of centering the latter with respect to the outer receptacle and of supporting it above the bottom of said outer receptacle where it will be subjected to the greatest heat of the water.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A pasteurizing apparatus comprising separable outer and inner receptacles, means whereby the latter is centered with respect to the former, a glass bottle seated within the inner receptacle with its neck projecting outward therefrom, an apertured stopper in said bottle, and a centrally apertured cover seated in the outer receptacle and closely overlying the top of the neck of the bottle with its aperture in register with the mouth of the bottle.

2. A pasteurizing apparatus comprising separable outer and inner receptacles, means whereby the latter is centered with respect to the former, a glass bottle seated within the inner receptacle with its neck projecting outward therefrom, the inner diameter of the inner receptacle being slightly greater than the outer diameter of the bottle body, adapting the former for containing a thin sheet of water about the bottle body, and a cover seated in the top of said outer receptacle and closely overlying the top of the neck of the bottle, said cover having an orifice therein in register with the mouth of the bottle.

In testimony whereof I affix my signature in presence of two subscribing witnesses.

JAMES W. HEIZER.

Witnesses:

O. P. Stephan,

W. C. Adams.

966,872

Aug 191

A. TIESSE.

PASTEURIZING APPARATUS.

APPLICATION FILED JAN. 18, 1910.

966,872. Patented Aug. 9, 1910.

4 SHEETS—SHEET 1.

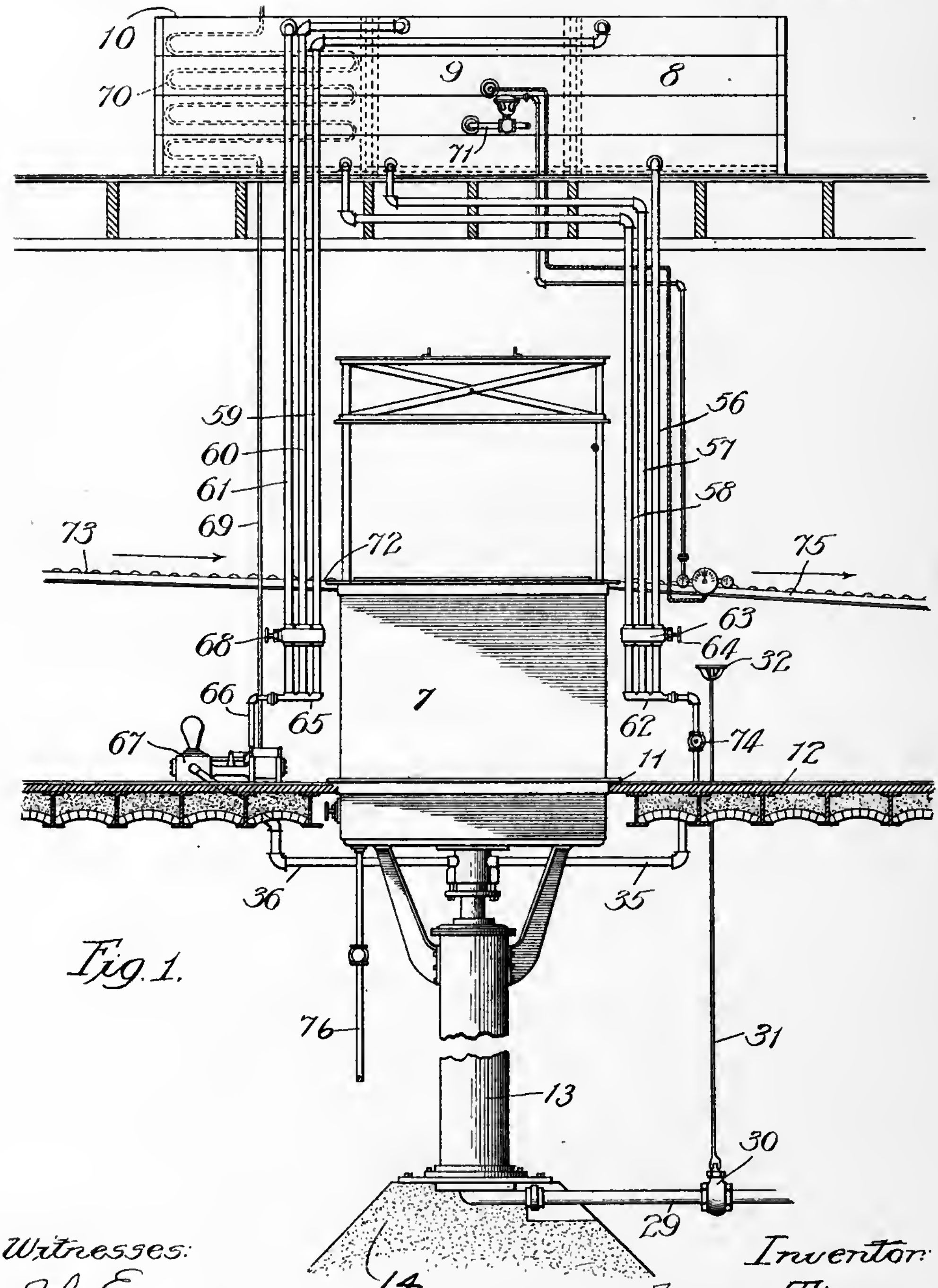

Fig. 1.

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Attys.

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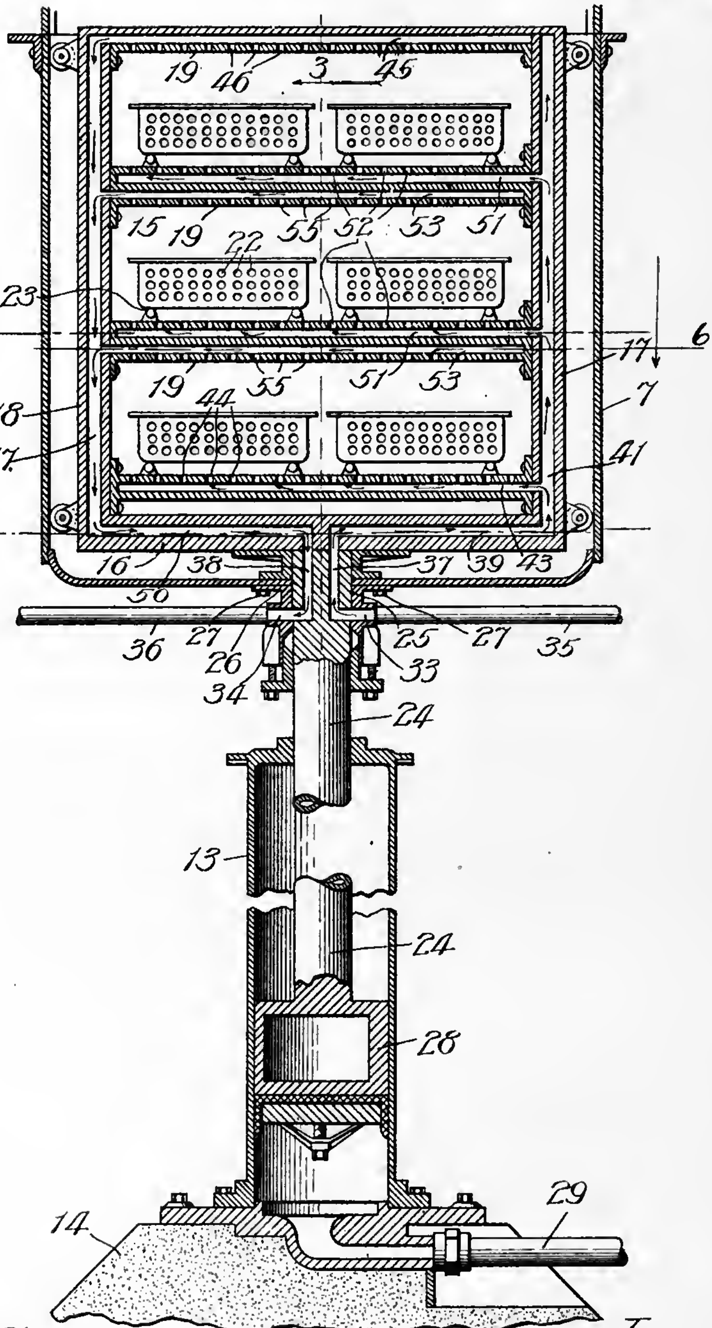
PASTEURIZING APPARATUS.

APPLICATION FILED JAN. 19, 1910.

966,872. Patented Aug. 9, 1910.

4 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
John Enders
Chas. H. Bull

Inventor:
August Tiesse.
By Dyrenforth, Lee, Chritton & Wiles
Attys.

A. TIESSE.

PASTEURIZING APPARATUS.

APPLICATION FILED JAN. 18, 1910.

966,872.

Patented Aug. 9, 1910.

4 SHEETS—SHEET 3.

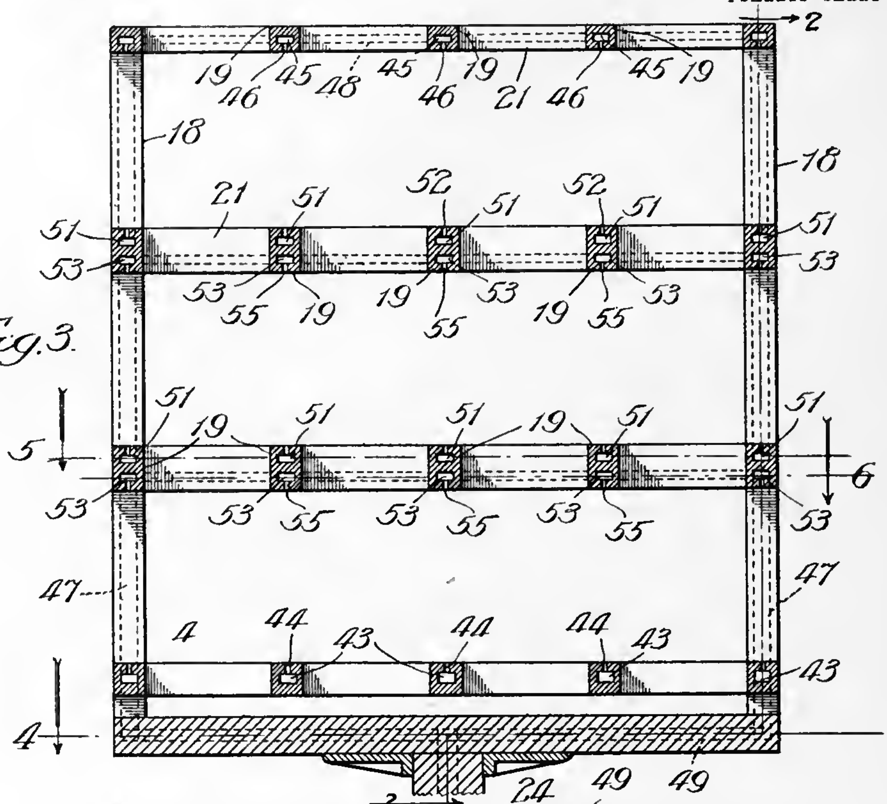


Fig. 3.

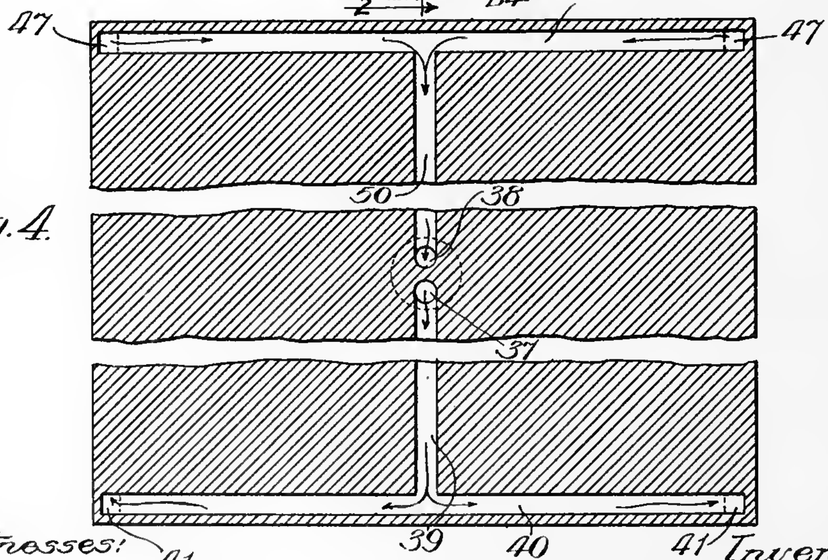


Fig. 4.

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4 SHEETS—SHEET 4.

Fig. 5.

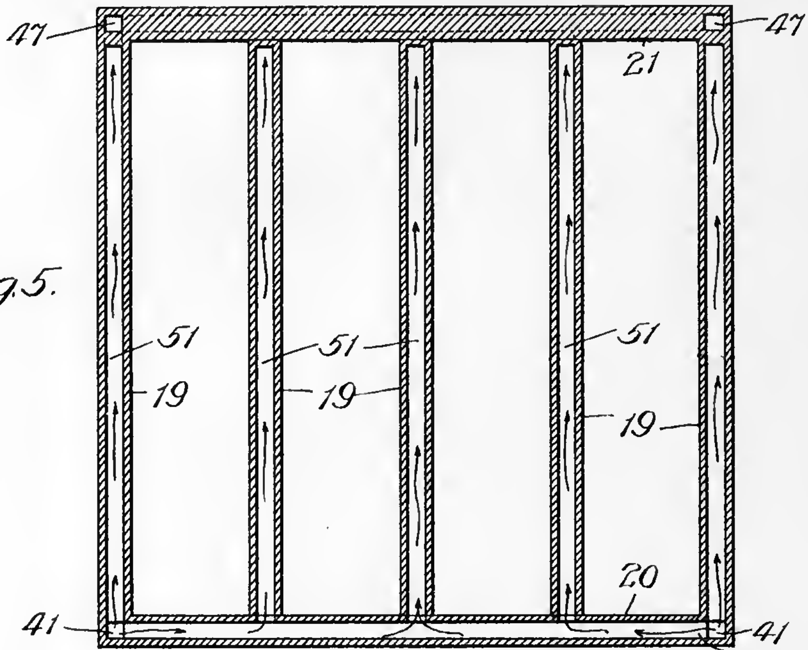
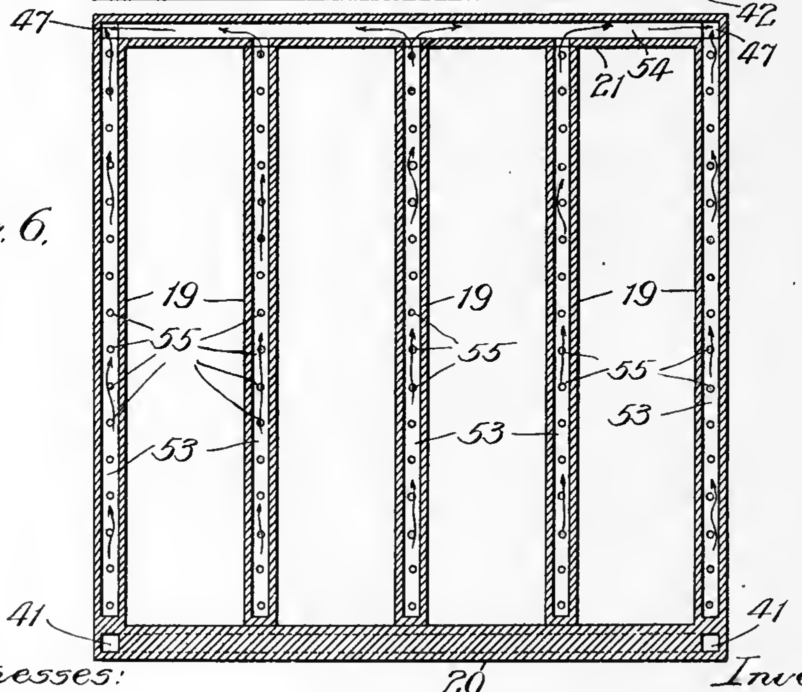


Fig. 6.



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UNITED STATES PATENT OFFICE.

AUGUST TIESSE, OF CHICAGO, ILLINOIS.

PASTEURIZING APPARATUS.

966,872. Specification of Letters Patent. Patented Aug. 9, 1910.

Application filed January 19, 1910. Serial No. 538,918.

To all whom it may concern:

Be it known that I, August Tiesse, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Pasteurizing Apparatus, of which the following is a specification.

My objects, generally stated, are to provide improvements in pasteurizing apparatus to the end of effecting uniform pasteurization; of conducting the pasteurizing operation with economy of heat and water; and augmenting the circulation of water in the pasteurizing tank without interfering with the introduction therein, and the removal therefrom, of the supports for the trays or crates for the receptacles containing the material to be pasteurized.

Referring to the accompanying drawings—Figure 1 shows by a view in elevation pasteurizing apparatus constructed in accordance with my invention. Fig. 2 is a broken view in sectional elevation of the pasteurizing tank and carrier therein and means for operating the carrier, the section being taken at the irregular line 2 on Fig. 3 and viewed in the direction of the arrow, the section through the base of the carrier and those parts below said base being in central elevation, and those parts above said base being taken through one side thereof, namely at the rear of the carrier. Fig. 3 is an enlarged section taken at the line 3 on Fig. 2 and viewed in the direction of the arrow with the surrounding tank omitted. Fig. 4 is a broken section taken at the line 4 on Fig. 3 and the line 4 on Fig. 2 and viewed in the direction of the arrows. Fig. 5 is a section taken at the line 5 on Fig. 3 and the line 5 on Fig. 2 and viewed in the direction of the arrows; and Fig. 6, a section taken at the line 6 on Fig. 3 and the line 6 on Fig. 2 and viewed in the direction of the arrows.

In the construction in which I have chosen to illustrate my invention, I employ a single tank represented at 7 in which the pasteurizing operations are performed, this tank cooperating with three water-storage tanks 8, 9 and 10 in a manner hereinafter described, for circulating through the tank 7 the water for pre-heating, pasteurizing and cooling the material to be pasteurized.

The tank 7 is represented as supported in an opening 11 in a floor 12 on a vertically-disposed cylinder 13 resting on a foundation 14. The tank 7, which, in the construction shown, is of rectangular shape in cross-section, contains a carrier 15 for trays, crates or other form of supports for bottles, or the like, carrying the material to be pasteurized, this carrier being of rectangular shape and preferably formed of a platform, or base, 16, upright members 17 and 18 rising from the corners thereof and located, respectively, on the right and left-hand side of the carrier as viewed in Fig. 2, a plurality of superposed series of cross-beams, said series being spaced apart vertically and the beams of each series being spaced apart horizontally as represented in Figs. 2 and 5, the beams 19 being connected with the uprights 17 and 18 and with beams 20 and 21 arranged on the right and left-hand sides respectively of the carrier as viewed in Fig. 2, the beams 20 and 21 being connected at their opposite ends with the uprights 17 and 18 and disposed at right-angles to the cross-beams 19 as most clearly represented of the beams 21 in Fig. 3. The cross-beams 19 of each series form spaced supports for trays, crates, platforms, baskets, or any other suitable device, preferably perforated or of open-work construction, as for instance those represented at 22, for carrying the receptacles containing the material to be pasteurized and insertible into the carrier through its open sides, rollers 23 being provided on the cross-members 19 for facilitating the introduction into and the removal from the carrier of the trays, and preventing obstruction to the circulation of water in the tank produced as hereinafter described.

The carrier 15, by preference, is carried on the end of a piston-rod 24, which extends through an opening 25 in the bottom of the tank and is reciprocally confined in a bearing 26 secured to the tank 7, as by bolts 27, this rod being connected with a piston 28 in the cylinder 13. The cylinder 13 is connected at its lower end with a pipe 29 which is equipped with a three-way valve 30 of common construction controllable through the medium of a rod 31 provided with a hand-valve 32 for operating it, the pipe 29 communicating with a water-supply (not shown) under pressure for operating the piston by hydraulic power for raising and lowering the carrier 15 in the tank 7, as hereinafter more fully explained.

The bearing 26 contains in its opposite sides non-communicating passages 33 and 34 which communicate at their outer ends with pipes 35 and 36 respectively, and, when the piston 24 and carrier 13 are in the positions illustrated in Fig. 2, communicate at their inner ends with non-communicating passages, or conduits, 37 and 38, respectively, in the upper end of the piston-rod 24. The conduit 37 communicates with a horizontal conduit 39 in the base 16 of the carrier, the latter conduit extending to the right in Fig. 2 and opening into the center of a cross-conduit 40 in the base 16. The cross-conduit 40 opens at its ends into vertical conduits 41 formed in the uprights 17, these vertical conduits opening into horizontal conduits 42 in the beams 20 arranged as described at different levels and at the right-hand side of Fig. 2. Each cross-member 19 of the lowermost series thereof contains a horizontal conduit 43 closed at one end as represented in Fig. 2, wherein it is shown closed at its left-hand end and opening into the conduits 41 and 42 as represented of one of the beams 19 in Fig. 2, the upper wall of the conduits 43 of each series of beams 19 being perforated as indicated at 44, whereby water introduced into the conduits in the frame-members of the carrier 15, as hereinafter described, flows upwardly from these perforations into the tank 7. The cross-members 19 of the uppermost series thereof each contain a horizontally and longitudinally extending conduit 45 having its bottom wall perforated as indicated at 46 in Fig. 2, each of said conduits being closed at one end as indicated in Fig. 2 of the one therein illustrated, and opening into vertical conduits 47 in the two uprights 18 at the left-hand side of the carrier in Fig. 2, and into a conduit 48 in the uppermost one of the beams 21, the upright conduits 47 communicating with a horizontal conduit 49 in the base 16, this latter conduit opening into a conduit 50 in the base at right-angles to the conduit 49 and communicating with the conduits 38 in the piston-rod 24.

The cross-beams 19 of the intermediate series thereof each contain a horizontally-extending conduit 51 opening into the conduits 41 in the uprights 17 and the conduits 42 in the adjacent beams 20, the upper walls of the conduits 51 being perforated as indicated at 52. The cross-beams 19 of each intermediate series thereof, in addition to containing the conduits 51, contain conduits 53 which open into the vertical conduits 47 and into conduits 54 formed in the beams 21 disposed opposite to the intermediate series of beams 19, the conduits 54 opening into the vertical conduits 47, and the lower walls of the conduits 53 being perforated as indicated at 55.

In the operation of the apparatus, it is intended that water at the desired temperatures for effecting the pasteurization of the material be circulated through the various conduits in the piston-rod 24, in the carrier 15 as described, and through the tank 7, the water being introduced into this system of conduits through the pipe 35 and withdrawn therefrom through the pipe 36. As an economical way of supplying the water to the tank for pasteurization, I provide the following described apparatus, which contemplates the use of the storage tanks 8, 9 and 10 for water at different temperatures, the flow of water from these tanks through the tank 7 being controllable.

In the particular apparatus illustrated, the tanks 8, 9 and 10 are connected at their lower ends with pipes 56, 57 and 58, respectively, and at their upper ends with pipes 59, 60 and 61, respectively. The pipes 56, 57 and 58 open into a header 62 which is connected with the pipe 35, the pipes 56, 57 and 58 being valve-controlled for permitting any one of these pipes to be brought into communication with the pipe 35, as by the valve illustrated at 63, this valve being the common three-plug variety formed with a single operating wheel 64, whereby communication of any one of the various pipes controlled thereby with the pipe 35 may be established. The pipes 59, 60 and 61 open into a header 65, which, in the particular arrangement illustrated, is connected by means of a pipe 66 with the outlet-end of a force pump illustrated at 67 and driven in any suitable manner, the pump communicating at its inlet-end with the pipe 36. Communication of the pipes 59, 60 and 61 with the header 65 is controlled by any suitable means as by the valve-mechanism represented at 68, these valve-means being of the same variety as those indicated at 63 and operating, when actuated, to cause any one of the pipes 59, 60 and 61 to be brought into communication with the pipe 66, and consequently with the pipe 36.

The operation of the apparatus is as follows: Water is supplied to tanks 7 and 8 at about normal temperature, say 65° F., and water maintained in the tanks 10 and 9 at about 212° F. and pasteurizing temperature, respectively, the latter varying with the material to be pasteurized, some materials requiring a greater temperature than others for pasteurization. The water in the tanks 9 and 10 is maintained at the desired temperatures in any suitable manner, as by exhaust steam or live steam, in the apparatus illustrated the tank 10 being heated by the exhaust from the engine 67 which discharges through a pipe 69 terminating in a coil 70 in the tank 10, and the tank 9 by live steam introduced therein through a pipe 71. Assuming the carrier 15 and the hydraulic mechanism therefor to be in the position illustrated in Fig. 2, the operator to load the carrier, assuming it to be empty, turns the valve 32 to permit water, under pressure, to flow into the cylinder 13 below the piston 28, thus forcing the carrier 15 upward in the tank to a position in which its lowermost series of cross-bars 19 register with the discharge-end 72 of a platform 73, shown as a rotary conveyer, from which the trays, crates or platforms 22 supporting the receptacles, such as bottles containing the material to be pasteurized, are discharged into the lowermost compartment of the carrier upon the rollers 23 supported on the bars 19.

After the lowermost compartment of the carrier, bounded by the lowermost series of cross-beams 19 and the series thereof immediately above them, is filled, the operator by again operating the valve to permit a portion of the water to exhaust from the cylinder through the exhaust of the three-way valve, causes the carrier to descend into the tank to a position in which the next to the lowermost series of cross-beams 19 alines with the conveyer 73, whereupon the compartment of the carrier of which these beams form the open floor is filled, the alternate operations of lowering the carrier in the tank and charging it at different levels with the trays 22 continuing until the carrier is filled with the material to be pasteurized, whereupon the carrier is allowed to assume the position represented in Fig. 2 in which all of the crates 22 are lowered into the tank. The operator then turns the valves 62 and 68 to cause the pipes 56 and 59 to communicate with the pipes 35 and 36, respectively, whereupon the water from the tank 8 flows through the pipes 56 and 35, conduits 33 and 37, the conduit 39, the vertical conduits 41, and conduits 42 from which it flows into the conduits 43 and 51 in the cross-beams 19 and out through the perforations 44 and 52 into the tank 7 at different levels therein. Under the action of the pump 67, suction is produced in the pipe 36, rod-conduit 38, platform-conduit 50, conduits 49 and 47, the conduits 54 in the beams 21, and in the conduits 45 and 53 in the cross-beams 19, with the result of drawing water from the tank 7 through the perforations 46 and 55, respectively, at different levels, thus causing the water to circulate through tanks 7 and 8. Where beer is being pasteurized, communication of the tank 7 with tank 8 is maintained as described until the temperature of the water in these tanks is equalized, which may be ascertained in any desired manner, as is well understood in the art. The beer being introduced into the tank at about 40° to 50° F. is thus warmed by the operation described, and the water in the tanks 7 and 8 cooled to equal temperatures. After the receptacles in the crates 22 have been pre-heated as described, the operator again manipulates the valves 63 and 68 to disconnect the pipes 56 and 59 and open the pipes 58 and 61 to the pipes 35 and 36, respectively, thus placing tank 10 in circuit with tank 7. The water in tank 10, which is hotter than that at which pasteurization takes place, is caused to circulate through tank 7 as described of the first operation, until the water in tank 7 has reached the desired pasteurizing temperature, which may be determined by any suitable way, as is well understood in the art, whereupon the operator again manipulates these valves to disconnect the tank 10 from the tank 7 and open the pipes 57 and 60 to the pipes 35 and 36, respectively, for circulating water through tank 7 at the desired pasteurizing temperature. The last referred to operation continues until the pasteurization of the material in the receptacles carried by the trays 22 is completed, whereupon the tank 7 is again brought into communication with the tank 8 by manipulating the valves 63 and 68 for cooling the receptacles and their contents before removing them from the pasteurizing tanks. The water in tank 8 having been cooled by the action of subjecting it to the cold beer when first treated to water in tank 7, cools the receptacles and their contents, and as soon as the temperature of the water in tanks 7 and 8 is equalized the operator turns a valve 74 in the pipe 35 for closing it to prevent further flow of water to the tank 37. The trays 22 are now ready to be removed from the carrier 15, this being effected by raising the piston 28 hydraulically as described, to cause the floors of the various compartments of the carrier formed by the conduit-equipped beams 19, to be successively brought into alinement with the receiving end of a discharge-conveyer 75 upon which the crates 22 are discharged.

The series of operations described, namely those of successively charging the carrier with the trays of receptacles containing the material to be pasteurized, lowering the carrier into the tank and therein subjecting the material to water at different temperatures, and finally raising the carrier to permit of the discharge therefrom of the material pasteurized, are repeated with each separate batch of material to be pasteurized. It will be noted that where the material to be pasteurized is introduced into the carrier 15 at a relatively lower temperature, as in the case of beer, the water in tank 8 in the operation of pre-heating the material is cooled, and thus after this pre-heating operation this water is in cooled condition for cooling the material after subjection to pasteurizing heat, as described; and that in such cooling operation the water in this tank is heated, placing it in a highly satisfactory condition for pre-heating the material introduced in cold condition into the carrier, these operations of heating and cooling the water in tank 8 being performed in a cycle, whereby the heating and cooling power of the material being pasteurized is utilized to a full degree.

From the foregoing description, it will be noted that the water is both introduced and withdrawn from the tank 7 at different levels, and as this tank is filled at all times with water, the effect of thus introducing and withdrawing the water is to produce highly effective circulation thereof throughout the tank. Furthermore, by introducing the water into the tank at different levels and below the crates or trays 22, the receptacles in each crate 22 are subjected to water at the same degree of temperature, and thus there is uniformity of pasteurization with respect to all of the material being operated on.

In the construction illustrated, the rod 24 in coöperating with the bearing 26 forms, in effect, a pair of valves, which in the position illustrated in Fig. 2 are open to cause the conduits 33 and 34 to have free communication with the conduits 37 and 38, respectively, but when moved from such position to elevate the carrier in the tank, are operated to automatically shut off the flow of water into and out of tank 7. It is desirable that the tank 7 be provided with a drain-pipe, such as that represented at 76 for draining the tank when desired.

By providing a single tank in which the pasteurizing operations are performed, and providing a series of tanks for storing water at different temperatures for introduction into the pasteurizing tank, the pasteurizing operation may be carried on without the loss of water and without wasting heat, as the water at the various temperatures may be used over and over again.

The feature of forming the carrier of conduit-equipped members, whereby water is both introduced and withdrawn from the pasteurizing tank at different levels, is of great advantage, as it permits of the maximum utilization of the space afforded in the tank, as the water-distributing conduits are movable with the carrier.

While I prefer to embody my invention in the apparatus illustrated, it will be understood that the construction may be variously modified and varied without departing from the spirit of my invention, and furthermore my invention may be embodied in a carrier used in connection with any system for supplying water to the tank with which it cooperates, instead of using the system of tanks hereinbefore described. It will also be manifest that while my improved system of water-supply is particularly useful in connection with my improved carrier as the combined advantages of these features afford a highly practical and commercial machine, the water system described is useful in connection with any other forms of carriers, where it is desirable that economy be practiced in the amount of water and heat used for performing the pasteurizing operations. It will furthermore be understood that when the receptacles containing the material to be pasteurized are of such a character that pre-heating and cooling thereof before and after subjection to the pasteurizing temperature, respectively, is unnecessary, the tanks 8 and 10 may be dispensed with and tank 9 alone employed, the employment of my improved carrier in connection with either a single or a plurality of water-supply tanks, as hereinbefore referred to, being within the spirit of my invention, and therefore no undue limitations are to be placed upon the illustration and description of a particular construction.

It will be manifest that in so far as the feature of providing the carrier with water-conduits is concerned, such conduits need not be formed in the frame-members of the carrier, but may be provided in any other suitable manner.

What I claim as new, and desire to secure by Letters Patent, is—

1. A pasteurizing apparatus comprising, in combination, a tank, means in the tank for supporting receptacles containing the material to be pasteurized, means for introducing water for pasteurization into said tank, and means for simultaneously and continuously withdrawing the water therefrom at different levels, for the purpose set forth.

2. A pasteurizing apparatus comprising, in combination, a tank, means in the tank for supporting receptacles containing the material to be pasteurized, means for introducing water for pasteurization into said tank, and means located above said receptacles for simultaneously and continuously withdrawing the water from the tank at different levels therein, for the purpose set forth.

3. A pasteurizing apparatus comprising, in combination, a tank, means in the tank for supporting receptacles containing the material to be pasteurized, means for simultaneously introducing the water for pasteurization into the tank at different levels, and means for withdrawing the water therefrom at different levels, for the purpose set forth.

4. A pasteurizing apparatus comprising, in combination, a tank, means in the tank for supporting receptacles containing the material to be pasteurized, means for introducing water for pasteurization into said tank at different levels therein below said receptacles, and means for withdrawing the water therefrom at different levels in the tank above said receptacles, for the purpose set forth.

5. A pasteurizing apparatus comprising, in combination, a tank, means in the tank

for supporting receptacles containing the material to be pasteurized in superposed condition, means for introducing water for pasteurization into said tank below each horizontal series of receptacles, and means for withdrawing the water therefrom above each series of receptacles, for the purpose set forth.

6. A pasteurizing apparatus comprising, in combination, a tank, means in the tank for supporting receptacles containing the material to be pasteurized in superposed condition, means for introducing water for pasteurization into said tank at different levels and intermediate adjacent series of receptacles, and means for simultaneously withdrawing the water from said tank intermediate adjacent series of receptacles.

7. A pasteurizing apparatus comprising, in combination, a tank, means in the tank for supporting receptacles containing the material to be pasteurized in superposed condition, a water-inlet pipe in said tank below each series of receptacles, and a water-outlet pipe in said tank above each series of receptacles, for the purpose set forth.

8. A pasteurizing apparatus comprising, in combination, a tank, a vertically-movable support in the tank for receptacles containing the material to be pasteurized, said support being equipped with conduits for introducing the water into the tank, and means for withdrawing the water therefrom, said conduits being adapted to be connected with a source of water-supply, for the purpose set forth.

9. A pasteurizing apparatus comprising, in combination, a tank, a support in the tank constructed and arranged to support receptacles containing the material to be pasteurized in superposed condition, said support being equipped with conduits for introducing the water into the tank at different levels therein, and means for withdrawing the water from the tank, said conduits being adapted to be connected with a source of water-supply, for the purpose set forth.

10. A pasteurizing apparatus comprising, in combination, a tank, a support in the tank for receptacles containing the material to be pasteurized, said support being equipped with outlet-pipes through which the water in the tank is withdrawn, and means for introducing water into the tank, for the purpose set forth.

11. A pasteurizing apparatus comprising, in combination, a tank, and a support in the tank for receptacles containing the material to be pasteurized, said support being equipped with conduits for introducing the water into the tank and withdrawing it therefrom, said conduits being adapted to be connected with a source of water-supply, for the purpose set forth.

12. A pasteurizing apparatus comprising, in combination, a tank, and a support in the tank for receptacles containing the material to be pasteurized, said support being equipped with conduits for introducing the water into the tank and withdrawing it therefrom, and said conduits being adapted to be connected in circuit with a source of water-supply, for the purpose set forth.

13. A pasteurizing apparatus comprising, in combination, a tank, and a support in the tank constructed and arranged to support receptacles containing the material to be pasteurized in superposed condition, said support being equipped with conduits above and below each series of receptacles for introducing the water into the tank and withdrawing it therefrom, said inlet-conduits being adapted to be connected with a source of water-supply, for the purpose set forth.

14. A pasteurizing apparatus comprising in combination a tank, and a carrier vertically movable in said tank for supporting receptacles containing the material to be pasteurized, said carrier being equipped with conduits for introducing the water into said tank and withdrawing it therefrom, and said inlet-conduits being adapted to be connected with a source of water-supply, for the purpose set forth.

15. A pasteurizing apparatus comprising, in combination, a tank, and a carrier vertically movable in said tank for supporting receptacles for the material to be pasteurized in superposed condition, said carrier being equipped with conduits for introducing the water into the tank and withdrawing it therefrom below and above said superposed receptacles, said inlet-conduits being adapted to be connected with a source of water-supply, for the purpose set forth.

16. A pasteurizing apparatus comprising, in combination, a tank, and a support in said tank for supporting receptacles containing the material to be pasteurized in superposed condition, said support being equipped with conduits for introducing water into the tank and withdrawing it therefrom at different levels in the tank, said inlet-conduits being adapted to be connected with a source of water-supply and opening upwardly, and said outlet-conduits opening downwardly, for the purpose set forth.

17. A carrier, for the purpose set forth, formed with a vertical series of skeleton supports for receptacles containing the material to be pasteurized, said carrier being equipped with a conduit adapted to be connected with a source of water-supply.

18. A carrier, for the purpose set forth, formed with a skeleton support for receptacles containing the material to be pasteurized, said carrier being equipped with inlet and outlet conduits above and below said receptacles, for the purpose set forth.

19. A carrier, for the purpose set forth,

provided with a vertical series of supports for receptacles containing the material to be pasteurized, formed of spaced cross-members equipped with conduits, for the purpose set forth.

20. A carrier, for the purpose set forth, provided with a vertical series of supports for receptacles containing material to be pasteurized, formed of spaced members equipped with inlet-conduits below the receptacles of each series and with outlet conduits above each series of receptacles, for the purpose set forth.

21. A carrier, for the purpose set forth, formed with uprights and with spaced members connected with said uprights in a vertical series and affording supports for receptacles containing the material to be pasteurized, said uprights and said spaced members being equipped with conduits, certain of the conduits in said spaced members being connected with the conduits in certain of the uprights, and the other of the conduits in said spaced members being connected with the conduits in the other of said uprights, for the purpose set forth.

22. A carrier, for the purpose set forth, formed with skeleton supports for receptacles containing the material to be pasteurized, said carrier being equipped with vertically-disposed inlet and outlet-conduits and said supports being provided with inlet and outlet conduits arranged at different levels and communicating with said vertical conduits, for the purpose set forth.

23. A carrier, for the purpose set forth, provided at different levels with spaced beams affording supports for receptacles containing the material to be pasteurized, uprights, and beams connecting said uprights, said spaced beams, uprights and said last-named beams being connected together and provided with conduits, the conduits in certain of said uprights, spaced-beams and said last-named beams being connected together to afford inlet-conduits, and the conduits of the other of said uprights, spaced-beams and said last-named beams communicating with each other and forming outlet-conduits, for the purpose set forth.

24. A pasteurizing apparatus comprising, in combination, a tank, a vertically movable carrier in said tank for supporting receptacles containing the material to be pasteurized, a bearing on the tank, a vertically reciprocable member slidable in said bearing and coöperating with the carrier to raise and lower the latter when said member is actuated, said carrier being equipped with conduits for introducing water into said tank and withdrawing it therefrom communicating with conduits in said member, and said bearing containing inlet and outlet conduits constructed and arranged to register with conduits in said member when the latter is in one position and to be out of registration therewith when said member is moved out of such position, for the purpose set forth.

25. A pasteurizing apparatus comprising, in combination, a tank, a vertically movable carrier in the tank for supporting receptacles containing the material to be pasteurized, a bearing on the tank, and a vertically movable member reciprocable in said bearing and coöperating with said carrier to raise and lower the latter when said member is actuated, said carrier containing conduits for introducing water into the tank and withdrawing it therefrom, and said bearing containing inlet and outlet conduits, said member being constructed and arranged to open communication between the conduits of said carrier and the conduits in said bearing when in one position and close said communication when in another position, for the purpose set forth.

26. A pasteurizing apparatus comprising, in combination, a tank, a vertically movable carrier in said tank for supporting receptacles containing the material to be pasteurized, a bearing on said tank, a vertically movable member reciprocable in said bearing and coöperating with said carrier to raise and lower the latter when said member is actuated and provided near its upper end with non-communicating conduits, said bearing containing inlet and outlet conduits adapted, when said member is in one position, to register respectively with the conduits in said member, and said carrier being equipped with non-communicating conduits registering respectively with the conduits in said member, and further provided with upright conduits and horizontal conduits opening into said tank at different levels therein and constructed and arranged to circulate in the tank the water introduced therein, for the purpose set forth.

27. A pasteurizing apparatus comprising, in combination, a tank containing means for supporting receptacles containing the material to be pasteurized, a plurality of water-storage tanks containing water at different temperatures, and means for controlling the flow of water from said storage-tanks into said first-named tank, for the purpose set forth.

28. A pasteurizing apparatus comprising, in combination, a tank, a vertically movable carrier in said tank for supporting receptacles containing the material to be pasteurized, and a plurality of water-storage tanks in which water is adapted to be maintained at different temperatures coöperating with said first-named tank, for the purpose set forth.

29. In pasteurizing apparatus, the combination of a tank containing means for supporting receptacles containing the material

to be pasteurized, a plurality of water-storage tanks containing water at different temperatures provided near their bottom-portions with outlets and near their upper ends with inlets, pipes connecting said inlets and outlets with said first-named tank, and means for controlling the flow of water from said plurality of tanks to said first-named tank, to cause the water in any one of said plurality of tanks to enter said first-named tank, for the purpose set forth.

30. A pasteurizing apparatus comprising, in combination, a tank containing means for supporting receptacles containing material to be pasteurized, a plurality of water-storage tanks containing water at different temperatures and each provided with an inlet and an outlet, pipes connecting said inlets and outlets with said first-named tank, means for controlling the flow of water from said plurality of tanks to said first-named tank, to cause any one of said plurality of tanks to be placed in circuit with said first-named tank, and means for producing circulation of the water from any one of said water-storage tanks through said first-named tank when in communication therewith, for the purpose set forth.

31. A pasteurizing apparatus comprising, in combination, a tank containing means for supporting receptacles containing material to be pasteurized, a plurality of water-storage tanks containing water at different temperatures and each provided with an inlet and an outlet pipe, a pair of single pipes connected with said first-named tank and forming the inlets and outlets thereof, one of said pair of pipes being connected with the outlet pipes of said plurality of tanks, and the other of said pair of pipes being connected with the inlet-pipes of said plurality of tanks, and valve-mechanisms in the inlet and outlet pipes of said plurality of tanks for controlling the communication thereof with said pair of pipes to cause water to circulate through said first-named tank and any one of said plurality of tanks, for the purpose set forth.

32. In pasteurizing apparatus, the combination of a tank, a vertically movable carrier in the tank for supporting receptacles containing the material to be pasteurized, means for moving said carrier in the tank, and means for introducing water into the tank controllable automatically by the raising and lowering of said carrier, for the purpose set forth.

33. In pasteurizing apparatus, the combination of a tank, a vertically movable carrier in the tank for supporting receptacles containing material to be pasteurized, means for moving said carrier in the tank, and means for introducing water into the tank and withdrawing it therefrom controllable automatically by the movement of said carrier-moving means.

34. In pasteurizing apparatus, the combination of a tank, a vertically movable carrier in the tank for supporting receptacles containing the material to be pasteurized, a bearing on the tank, a vertical reciprocable member slidable in said bearing and coöperating with the carrier to raise and lower the latter when said member is actuated, said carrier being equipped with a conduit for introducing water into said tank communicating with a conduit in said member, and said bearing containing an inlet-conduit constructed and arranged to register with the conduit in said member when the latter is in one position and to be out of registration therewith when said member is moved out of such position, for the purpose set forth.

AUGUST TIESSE.

In presence of—
M. A. Nyman,
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Pasteurizer
Dec. 1910

979,796

B. D. PINKNEY.

PASTEURIZER.

APPLICATION FILED OCT. 19, 1908.

979,796. **Patented Dec. 27, 1910.**

2 SHEETS—SHEET 1.

Fig. 1

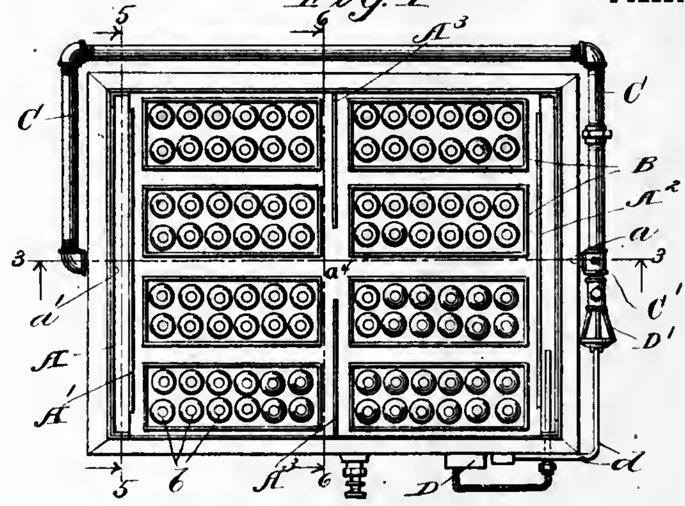


Fig. 2

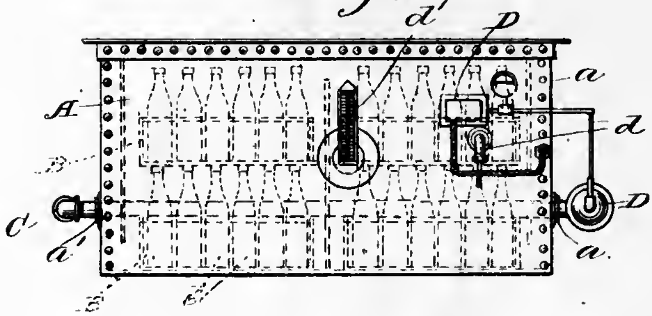
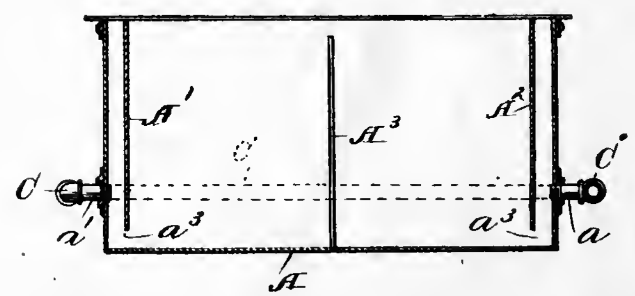


Fig. 3



WITNESSES:

J. C. Turner

Jno. F. Oberlin

INVENTOR

Bryan D. Pinkney

BY

J. B. Fay

ATTORNEY

B. D. PINKNEY.

PASTEURIZER.

APPLICATION FILED OCT. 19, 1908.

979,796. Patented Dec. 27, 1910.

2 SHEETS—SHEET 2.

Fig. 4

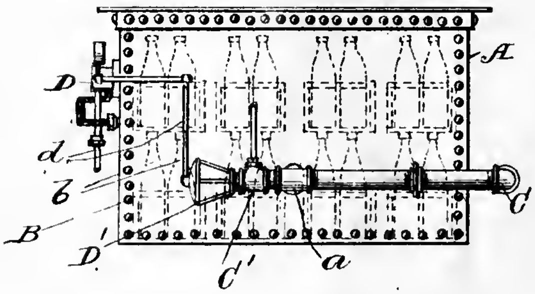


Fig. 5

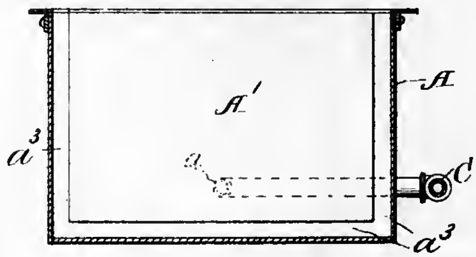
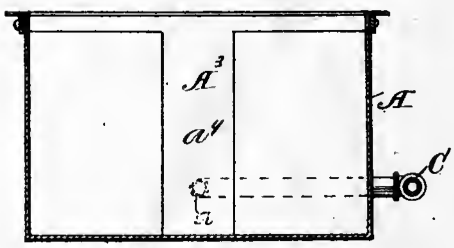


Fig. 6



WITNESSES:

J. C. Turner

Jno. F. Oberlin

INVENTOR

Bryan D. Pinkney

BY J. B. Fay

ATTORNEY

UNITED STATES PATENT OFFICE.

BRYAN D. PINKNEY, OF CLEVELAND, OHIO, ASSIGNOR TO THE LOEW MANUFACTURING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

PASTEURIZER.

979,796. Specification of Letters Patent. Patented Dec. 27, 1910.

Application filed October 19, 1908. Serial No. 458,544.

To all whom it may concern:

Be it known that I, BRYAN D. PINKNEY, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Pasteurizers, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

It is to pasteurizers of the tank, or "chainless," type in contradistinction to the continuous pasteurizer that the present invention belongs, this classification of pasteurizers being that generally adopted in dealing with those intended for use in beer-bottling establishments and the like. As is well understood, the process of pasteurization in this connection consists in heating the beer in the bottles to a certain temperature, holding this temperature constant for a determined length of time, and finally cooling such bottles to nearly ordinary atmospheric temperature.

The object of the present invention is the provision of a pasteurizer of the tank type, wherein this change in temperature may be conveniently effected under suitable conditions of control, and wherein the uniform heating of all parts of the tank's contents is assured, such uniform heating being a prerequisite to a sound condition of the goods, and the absence of such heating in present pasteurizing operations being the cause of no small amount of trouble to the bottler and dissatisfaction on the part of the consumer.

To the accomplishment of the above and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings Figure 1, is a plan view of a pasteurizer embodying my several improvements; Fig. 2, is a front elevation of such pasteurizer; Fig. 3 is a section thereof taken on the line 3—3, Fig. 1; Fig. 4 is an end elevation of the same; Fig. 5, is a transverse cross-section on the line 5—5, Fig. 1; and Fig. 6 is a similar section on the line 6—6 of said Fig. 1.

The pasteurizing chamber comprises as usual in apparatus of this kind, simply a tank like receptacle A that is preferably rectangular in form, so as to conveniently accommodate the crates or trays B, in which the bottles *b* are placed for steaming, as the pasteurizing process is frequently called. The dimensions of such receptacle A are chosen so as to permit of the placing therein, and the entire submergence when so placed, of the desired number of crates, whether of pint or quart bottles, constituting the capacity of the pasteurizer. Connected with opposite ends of the tank or receptacle, and on a level below the middle, is a pipe or conduit C lying wholly without said receptacle. Connected with such exterior conduit or pipe near one of the points where it is joined to the tank, is a steam injector C′ of well known construction, and hence not requiring detailed description here. By means of such injector, a circulation of water through the receptacle and pipe can be maintained, the water being drawn from the receptacle at the end *a* adjacent to such injector, and returned thereto at the opposite end *a′*. As will be readily understood, such injector serves at the same time to heat the water, thus put into circulation, so as to raise the same from the initial temperature, which is generally relatively low, in order to avoid making the transition in temperature too great when the bottles are first placed therein, to the proper pasteurizing temperature. That such temperature may be automatically maintained when it has been finally reached, a thermostat D, likewise of familiar construction, is employed, such thermostat being mounted laterally of the tank, and near the same end from which the water has been seen to be withdrawn by the injector. The thermostat is adapted by means of suitable air pressure connections *d* and a diaphragm valve D′ to appropriately operate the injector whenever the temperature at the point of attachment of the thermostat falls below, or rises above the predetermined temperature. For observation purposes a thermometer *d′* is likewise mounted in the same side wall of the tank or the receptacle as such thermostat.

From the foregoing description, it will

be seen that the heating of the liquid contents of the receptacle is effected by means located wholly exterior of the receptacle. While the circulation of the receptacle's contents, effected at the same time, will serve to render more or less uniform the temperature througnout the tank, the presence of the crates or trays of bottles will more or less hinder such circulation, and render its effects at least uncertain. With a view accordingly of assuring the penetration of the inflowing stream of warmer liquid to all parts of the receptacle, as it passes therethrough, I employ a series of baffle plates A′, A^2 A^3, of the form clearly appearing from Figs. 5 and 6. In other words, at each end adjacent to the inlet and discharge openings *a a′* of the tank, is provided an imperforate plate A′ or A^2 suspended from above, so as to leave in effect, an open space a^3 between its bottom and lateral edges, and the tank walls. Any tendency, accordingly, at the inlet opening for the warmer water to rise to the surface and there remain, is effectually overcome, while similarly it is the cooler liquid near the bottom of the other end of the tank that is withdrawn. The third plate A^3 is located midway between the two ends of the tank, being disposed so as to contact with the side and bottom of the tank, but is so formed as to leave a vertically disposed opening a^4 centrally of the tank, so that the divergent streams passing around the baffle plate A′ at the inlet end of the tank, are obliged to again unite before they can pass on into the other portion of the tank. Here they are again obliged to diffuse themselves throughout such tank portion, before they can escape around the lateral and bottom edges of the remaining baffle plate A^2.

From the foregoing description of my improved pasteurizer, it will be obvious that the heating of the contents of such pasteurizer cannot only be conveniently and quickly effected, but automatically as well, since the effect of the thermostatic control will be to admit steam to the injector until the pasteurizing temperature has been reached. At the same time, by reason of the presence and particular disposition of the baffle plates, the heating effect is uniform throughout the tank, and all portions will be brought up to such pasteurizing temperature at the same time, and likewise maintained at such temperature together, so that the reversal of the heating process may be begun with assurance that no part of the receptacle's contents has been either over or under-heated.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. A pasteurizer of the tank type comprising a receptacle, means exterior of the same for effecting a circulation of liquid therethrough and simultaneously heating the liquid, and transverse baffle plates within said receptacle comprising one at each end spaced from the bottom and side walls of the receptacle and a centrally located plate in contact with such walls but formed with an opening midway between the side walls, whereby the entering warmer liquid is spread throughout the tank.

2. A pasteurizer of the tank type comprising a receptacle, a conduit exterior of said receptacle and connecting opposite ends of the same, an injector connected with said condnit adapted to effect a circulation of said receptacle's contents and simultaneously heat the same, and transverse baffle plates within said receptacle comprising one at each end spaced from the bottom and side walls of the receptacle and a centrally located plate in contact with such walls but formed with an opening midway between the side walls, whereby the entering warmer liquid is spread throughout the tank.

Signed by me this 15th day of October, 1908.

BRYAN D. PINKNEY.

Attested by—
CHRISTINE E. ARNS,
JNO. F. OBERLIN.

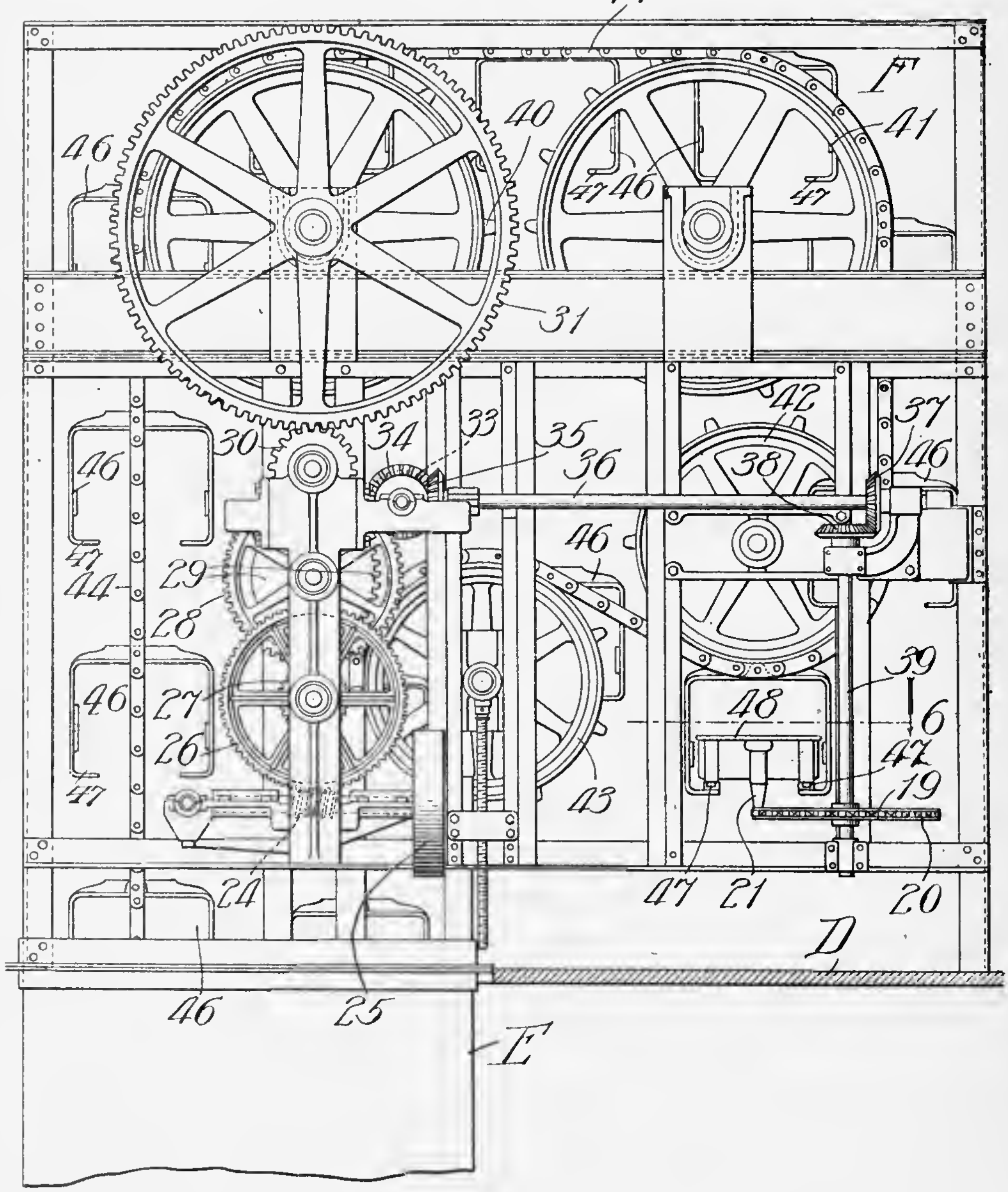
J. T. H. PAUL.
PASTEURIZER EQUIPMENT.
APPLICATION FILED APR. 21, 1910.

981,303.

Patented Jan. 10, 1911.

6 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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Chas. H. Bull.

Inventor:
John T. H. Paul
By Dyrenforth, Lee, Chritton & Wiles,
Attys.

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PASTEURIZER EQUIPMENT.
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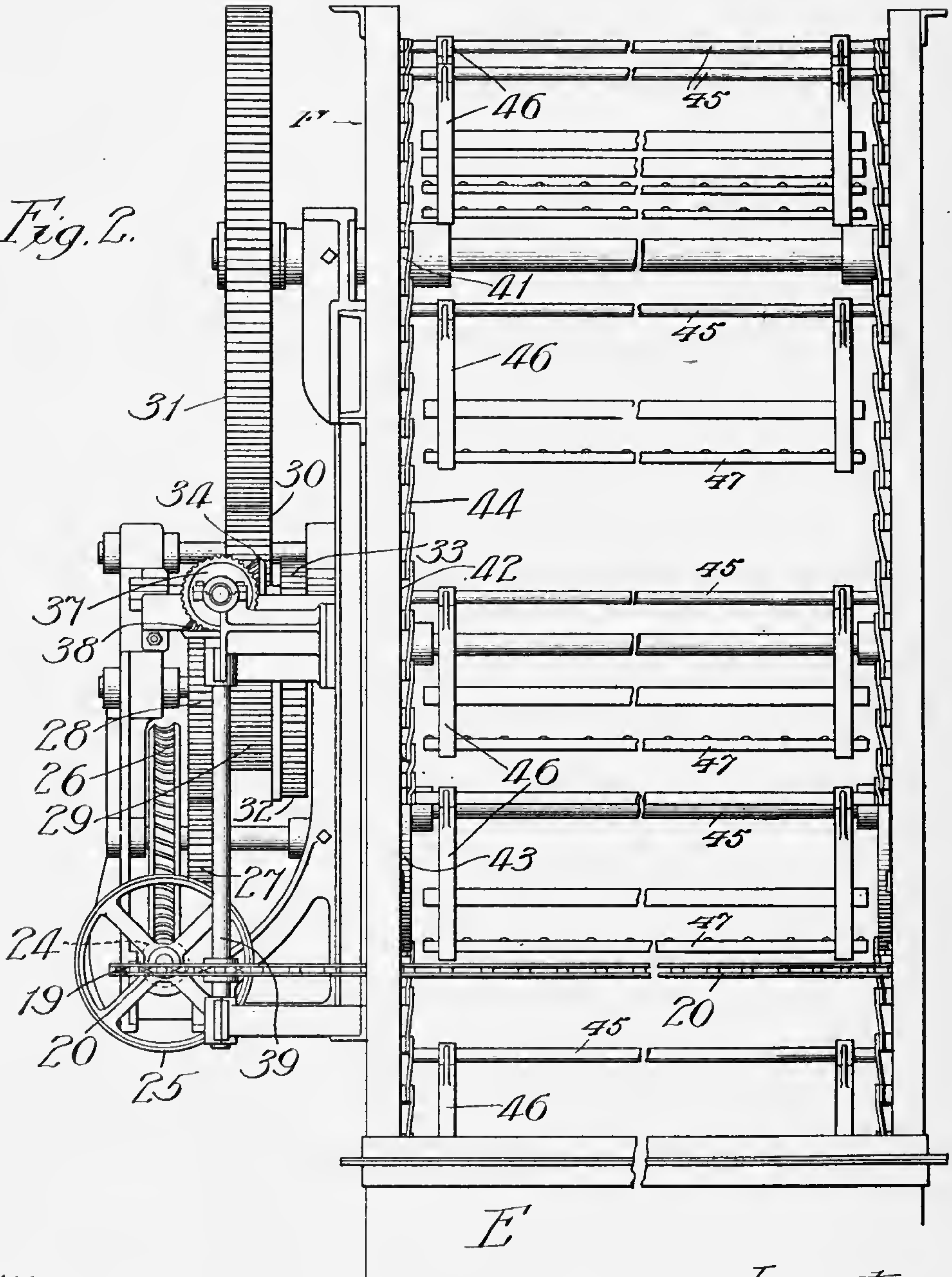
6 SHEETS—SHEET 2.

Fig. 2.



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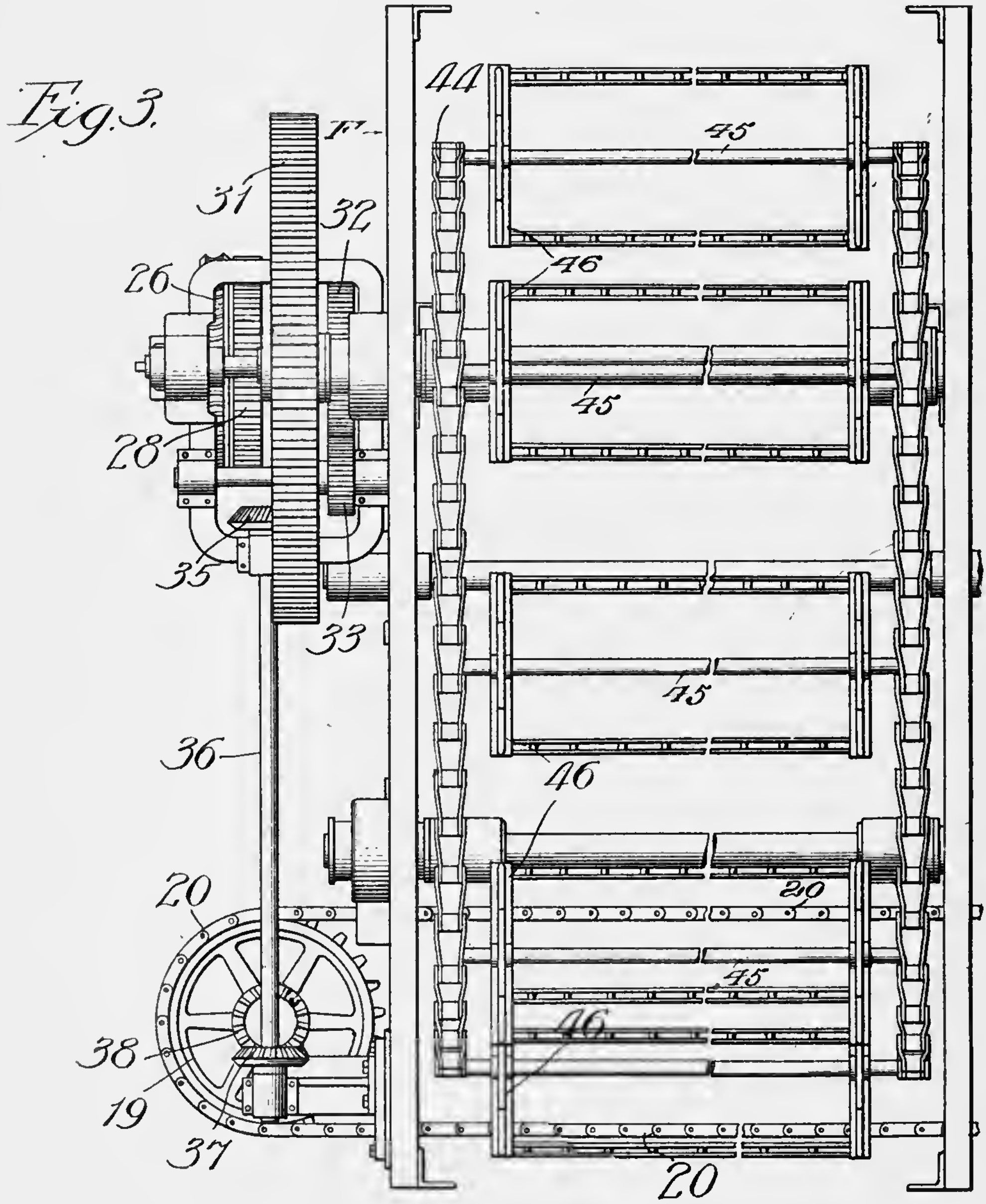
8 SHEETS—SHEET 3.



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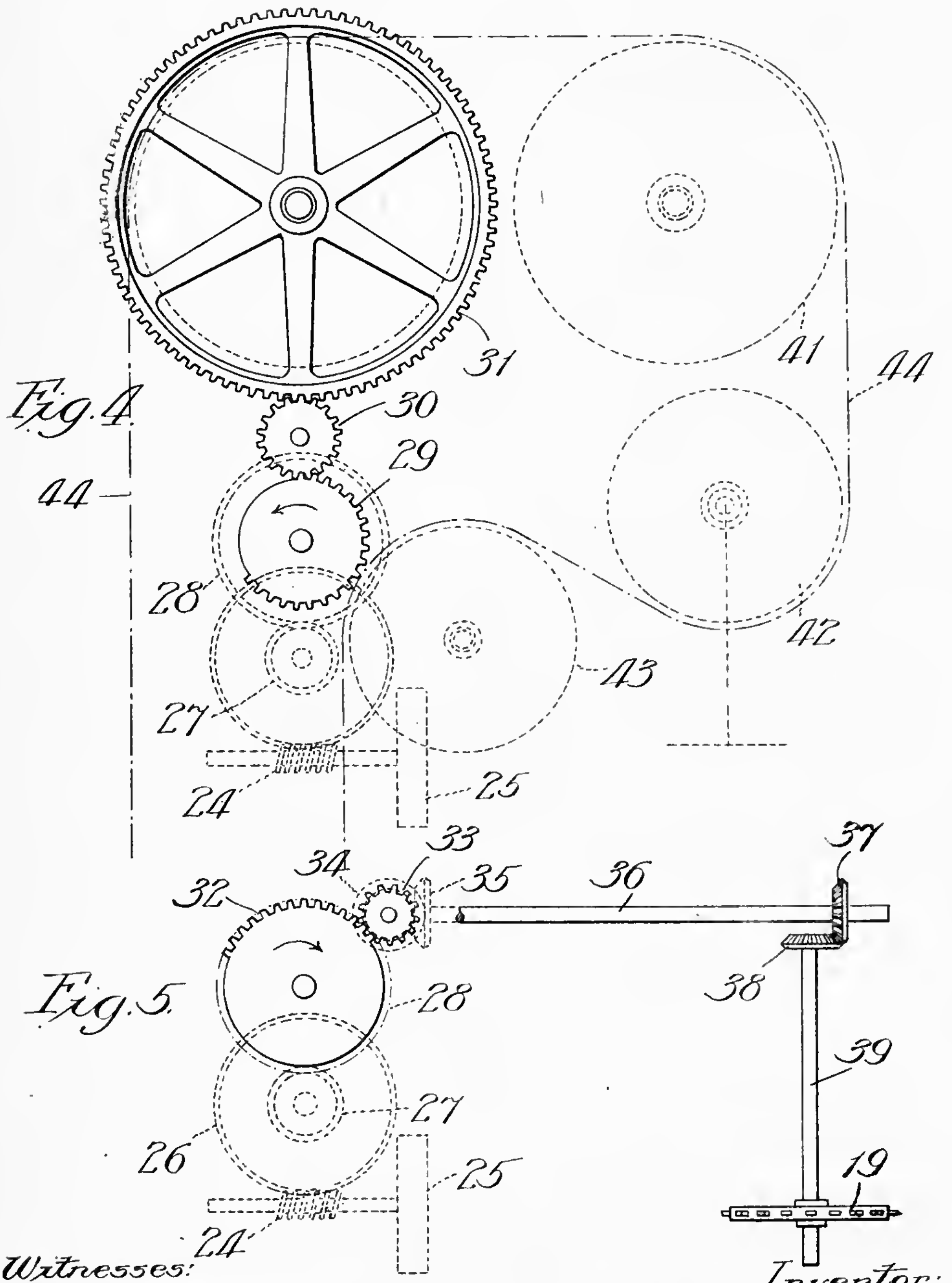
6 SHEETS—SHEET 4.



Witnesses:

[signature] Gaylord,

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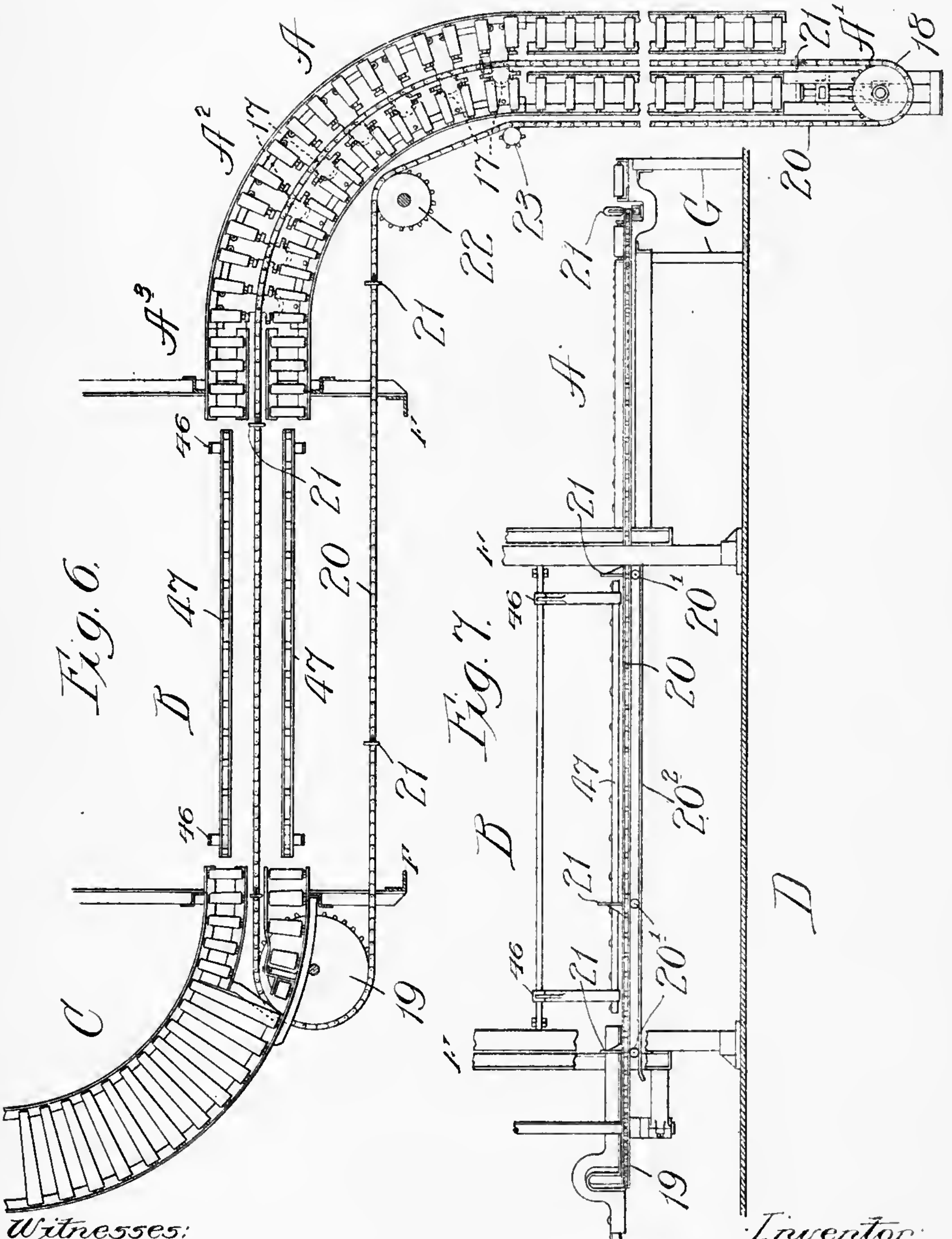
APPLICATION FILED APR. 21, 1910.

981,303. Patented Jan. 10, 1911.

6 SHEETS—SHEET 5.



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J. T. H. PAUL.
PASTEURIZER EQUIPMENT.
APPLICATION FILED APR. 21, 1910.

981,303.

Patented Jan. 10, 1911.

6 SHEETS—SHEET 6.

Fig. 8.

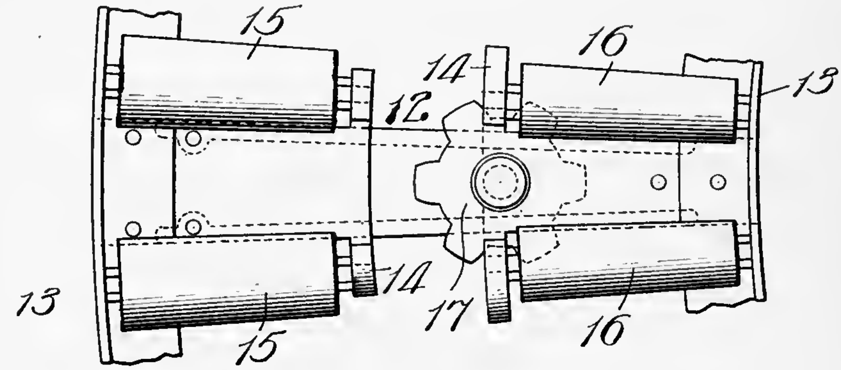


Fig. 9.

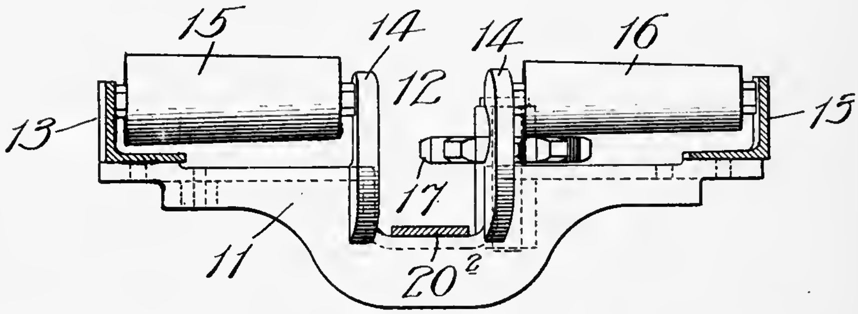
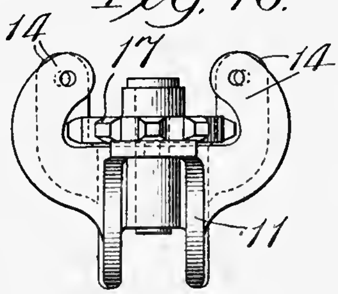


Fig. 10.



Witnesses:
Chas. E. Gaylord.
Chas. H. Buell.

Inventor:
John T. H. Paul
By Dyrenforth, Lee, Chritton & Wiles,
Attys.

UNITED STATES PATENT OFFICE.

JOHN T. H. PAUL, OF CHICAGO, ILLINOIS, ASSIGNOR TO E. GOLDMAN & CO., INC., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PASTEURIZER EQUIPMENT.

981,303. Specification of Letters Patent. Patented Jan. 10, 1911.

Application filed April 21, 1910. Serial No. 556,899.

To all whom it may concern:

Be it known that I, JOHN T. H. PAUL, a citizen of the United States, residing at 3900 Union avenue, Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Pasteurizer Equipments, of which the following is a specification.

My invention relates to an improved equipment for pasteurizing apparatus of the class involving a tank for containing the pasteurizing liquid through which receptacles containing the material to be pasteurized are caused to travel intermittently on a carrier; and it relates, more particularly, to means for conveying the receptacles, in baskets or holders, to the tank for treatment therein, and means for delivering them from the tank after the pasteurizing, and to so timing the conveying and delivery operations relative to the intermittent travel through the tank as to render the operation of the apparatus regular and reliably continuous.

Referring to the accompanying drawings:—Figure 1 is a view in side elevation, partly sectional, showing the upper-end portion of a pasteurizer-tank surmounted by the frame-work which supports the mechanism for intermittently carrying the material to be pasteurized through the tank. Fig. 2 is a broken view presenting the showing of Fig. 1 as regarded from the receiving end of the apparatus, and Fig. 3 is a plan view of the same. Fig. 4 is a diagrammatic view illustrating the intermittent operation of the mechanism for carrying the receptacles through the tank, and Fig. 5 is a similar view illustrating the intermittent operation of the mechanism for feeding the receptacles to the said carrying means. Fig. 6 is a broken sectional plan view of the feeding and delivering conveyers with interposed carrier, the section being taken at line 6, Fig. 1, and Fig. 7 is a view of the same in elevation showing the platform in section. Figs. 8, 9 and 10 are, respectively, plan, side and end views of one of the similar roller sections of which the curved portion of the feed-conveyer is composed, the rollers being removed in Fig. 10.

To facilitate understanding the plan of construction and operation of the entire apparatus the same may be generally described as follows, with more particular reference to Figs. 6 and 7 and to pasteurizing bottled beer, or the like, in crates, baskets, or other suitable forms of holders: The bottle-filled holders are loaded upon a conveyer A, which is caused to move intermittently at regular intervals and feed the holders to an endless carrier, denoted B, as a whole, which travels vertically in the pasteurizer-tank and intermittently like the feed-conveyer A but in alternation therewith. Thus, each time a holder-receiving member of the carrier is brought into registration with the discharge-end of the feed-conveyer, the carrier is arrested and the conveyer is set in motion to advance a holder, or set of holders, upon such registering member, whereupon the conveyer is arrested and the carrier is set in motion upon its course through the tank. Whenever a holder-laden member of the carrier, in traveling through its course, reaches the position of registering with the feed, the holder advanced by it upon such member supplants the holder on the latter by shoving it off upon a delivery-conveyer, represented at C, which is preferably of the well-known gravity variety and thus downwardly inclined to adapt the holders that are delivered to it to travel upon its rollers to the ultimate point of delivery.

An object of the present improvement is to render the entire apparatus compact, so as to occupy the minimum space and simplify the mechanism, which is all supported on a floor or platform D and the upper end of the pasteurizer-tank E surrounded by such floor or platform, the tank rising from a lower support (not shown), and the supporting medium for the driving mechanism being an upright rectangular frame, denoted as whole at F in Fig. 1, surmounting the tank and platform and built substantially of structural-metal bars.

The conveyer A, supported on the platform D, comprises straight end-portions A^1 and A^3 and an intermediate curved portion A^2, the conveyer terminating at the tank; and it is built as a roller-track, of a plurality of sections, those forming the curved portion A^2 being each like that illustrated in Figs. 8, 9 and 10 and involving the following described construction: A transversely extending yoke 11 forms a depression or conduit 12 between its ends to admit a traveling conveyer-chain, hereinafter described. On the opposite ends of the yoke are provided bearings 13, 13, which are angle-irons extending continuously throughout the entire length of the conveyer, and bearings 14, 14, for each section are formed at opposite sides of the conduit as integral parts of the yoke. In these bearings are journaled the tapering rollers 15, 15 and 16, 16; and a sprocket-wheel 17 is journaled in horizontal position on the yoke to one side of the conduit to extend into the path through the latter. The sections forming the straight portions of the track are each of the described construction of those for the curved portion thereof except that the rollers are cylindrical and that the sections are devoid of sprocket-wheels. The double track thus formed to accommodate the outer length of the conveyer-chain is supported on and fastened to frame-work indicated at G in Fig. 7. A sprocket-wheel 18 is journaled at the receiving end of the track, and a relatively larger sprocket-wheel 19 is journaled on the frame F adjacent to the receiving end of the gravity-conveyer C; and an endless chain 20, carrying flights 21 at uniform intervals, passes about these sprocket-wheels to travel through the conduit formed by the yoke-depressions 12, wherein it engages the series of sprockets 17, and along the inner side of the conveyer where it is guided by sprockets at 22 and 23. To prevent the chain from sagging under its load, it is caused to ride on rollers 20^1 on a bed-plate 20^2 extending along the conduit 12 and throughout the length of the conveyer-chain.

The driving mechanism, or "movement," supported on the frame F is the following: A worm-shaft 24, to which the power is applied at a pulley 25, meshes with a worm-wheel 26 carrying a pinion 27 which meshes with a gear 28 having on its shaft a mutilated gear 29 to mesh with a pinion 30 engaging a large gear 31. The shaft which carries the mutilated gear 29 also carries a mutilated gear 32 to mesh with a pinion 33, the shaft of which also carries a beveled pinion 34 meshing with a similar pinion 35 on one end of a horizontal shaft 36 carrying a beveled pinion 37 in mesh with a similar pinion 38 on the upper end of the vertical shaft 39 of the sprocket 19. A pair of sprockets 40 is provided on the shaft of the gear 31, and sprockets 41, 42 and 43 are provided in pairs on their respective shafts journaled in the frame F, as represented, for passage about them of the endless chains 44 of the carrier B. At uniform intervals the chains 44 are connected by rods 45, on each of which, near its ends, are pivotally suspended, to always maintain a vertically depending position, members of a pair of hangers 46 of general rectangular or yoke shape with parallel roller-tracks 47, formed with channel-irons, connecting the members of each pair. These roller-tracks are, by preference, sufficiently long to seat a series, as three, bottle-holders 48 (Fig. 1), and correspond in length with that of the interval between flights 21 on the chain 20 to adapt each flight to advance, in each intermittent movement of the chain, a plurality of the holders upon the carrier B to the number thereof which a pair of the track-connected hangers 46 is adapted to hold, and to advance that number in each operation upon the delivery-conveyer.

The operation is as follows: The mutilated gears 29 and 32 are so relatively disposed as to cause the teeth upon them to mesh alternately with the pinions they respectively engage. In starting the machine, a pair of the hanger-tracks 47 may be presumed to be in registration with the discharge-end of the feed-conveyer A, then laden with a series of holders 48, with a flight 21 abutting against the rearmost holder; and the gear 32 may be presumed to be in initial engagement with the pinion 33. With the worm-shaft 24 then in motion, the mutilated gear 32 will turn the shafts 36 and 39 to drive the sprocket 19 until the teeth of that gear clear the pinion 33, which is just sufficient to drive the chain 20 to the extent of causing the respective flight 21 to advance the holders 48 ahead of it upon the hanger-tracks 47 then in position to receive the holder-series, which, in so advancing, will shove any holders in their path on the track off the latter upon the conveyer C for delivery. Upon cessation of the movement of the chain 20, the teeth of the mutilated gear 29 are in initial engagement with the pinion 30, causing the latter to drive the gear 31 and chains 44, by actuating the sprockets 40, until the teeth of that gear clear the pinion 30 when the teeth of the mutilated gear 32 will again be in initial engagement with those of the pinion 33, ready to repeat the intermittent movement of the chain 20. The intermittent movement of the chains 44 of the carri B lowers the holder-laden tracks into the tank to remain in a stratum of the pasteurizing-liquid therein until the next movement of the chain 20 loads upon the next-succeeding pair of carrier-tracks thus brought into position, another series of holders, in the meantime placed upon the conveyer A. The continuous operation of the apparatus involves the repeated alternate movements of the chain 20 and carrier B, to intermittently advance each series of bottle-holders downwardly and upwardly through the tank E and bring the endless series of track-pairs successively into registration with the discharge-end of the feed-conveyer and to intermittently ride series of the bottle-holders upon the carrier-tracks, thereby effecting the removal of those on the latter, after pasteurization of their contents, to the delivery-conveyer C.

The type of pasteurizing apparatus to which my present improvement particularly relates is exemplified by the apparatus which forms the subject of United States Letters Patent No. 913,910, granted to me March 2, 1909. In that type of apparatus the carrier in the pasteurizer tank is a wheel-like body rotatable about its axis and carrying holders; and the carrier is rotated intermittently to alternate with the intermittent movements of a feed-conveyer, whereby packages containing the material to be pasteurized are conveyed upon the holders on the carrier, as they are arrested, at intervals, to register with the discharge-end of the conveyer, and the packages which have been passed through the tank are removed from their holders. The primary purpose of my improvement is to adapt the same principle of operation to the endless-chain form of carrier in a pasteurizing apparatus, thereby to attain the advantages peculiar to that form, including simplicity, compactness and comparatively moderate cost of construction, all of which are secured by the apparatus herein illustrated and described.

What I claim as new and desire to secure by Letters Patent is:—

1. In a pasteurizing-apparatus equipment, the combination of a tank for holding the pasteurizing medium, a frame rising above the tank, sprockets journaled in said frame, an endless-chain carrier working on sprockets in said frame to travel in the tank, hangers pivotally supported at intervals on the carrier-chains, an endless-chain roller-conveyer including a sprocket in said frame provided on the chain with flights spaced to correspond with the spaces between said hangers, said endless-chain roller-conveyer being so positioned relative to the endless-chain carrier as to convey thereto and remove therefrom the receptacles containing the material to be pasteurized, and a train of driving-gears on said frame, including a pair of mutilated gears for driving said carrier and conveyer intermittently in alternation with each other, for the purpose set forth.

2. In a pasteurizing-apparatus equipment, the combination of a tank for holding the pasteurizing medium, an endless-chain carrier traveling in said tank and having members of pairs of hangers pivotally supported at intervals on its relatively opposite chains, with roller-tracks connecting the members of each pair, a conveyer for carrying to said hangers holders containing material to be pasteurized, and driving mechanism for said carrier and conveyer operating to actuate them intermittently in alternation with each other, for the purpose set forth.

3. In a pasteurizing-apparatus equipment, the combination of a tank for holding the pasteurizing medium, a frame rising above said tank, sprockets journaled in said frame, an endless-chain carrier working on sprockets in said frame to travel in the tank and having members of pairs of hangers pivotally supported at intervals on its relatively-opposite chains, with roller-tracks connecting the members of each pair, an endless-chain roller-conveyer including a sprocket in said frame and provided on the chain with flights at intervals corresponding with those between said hangers, said endless-chain roller-conveyer being so positioned relative to the endless-chain carrier as to convey thereto and remove therefrom the receptacles containing the material to be pasteurized, and a train of driving gears on the frame, including a pair of mutilated gears for driving said carrier and conveyer intermittently in alternation with each other, for the purpose set forth.

JOHN T. H. PAUL.

In presence of—
L. Heislar,
R. Schaefer.

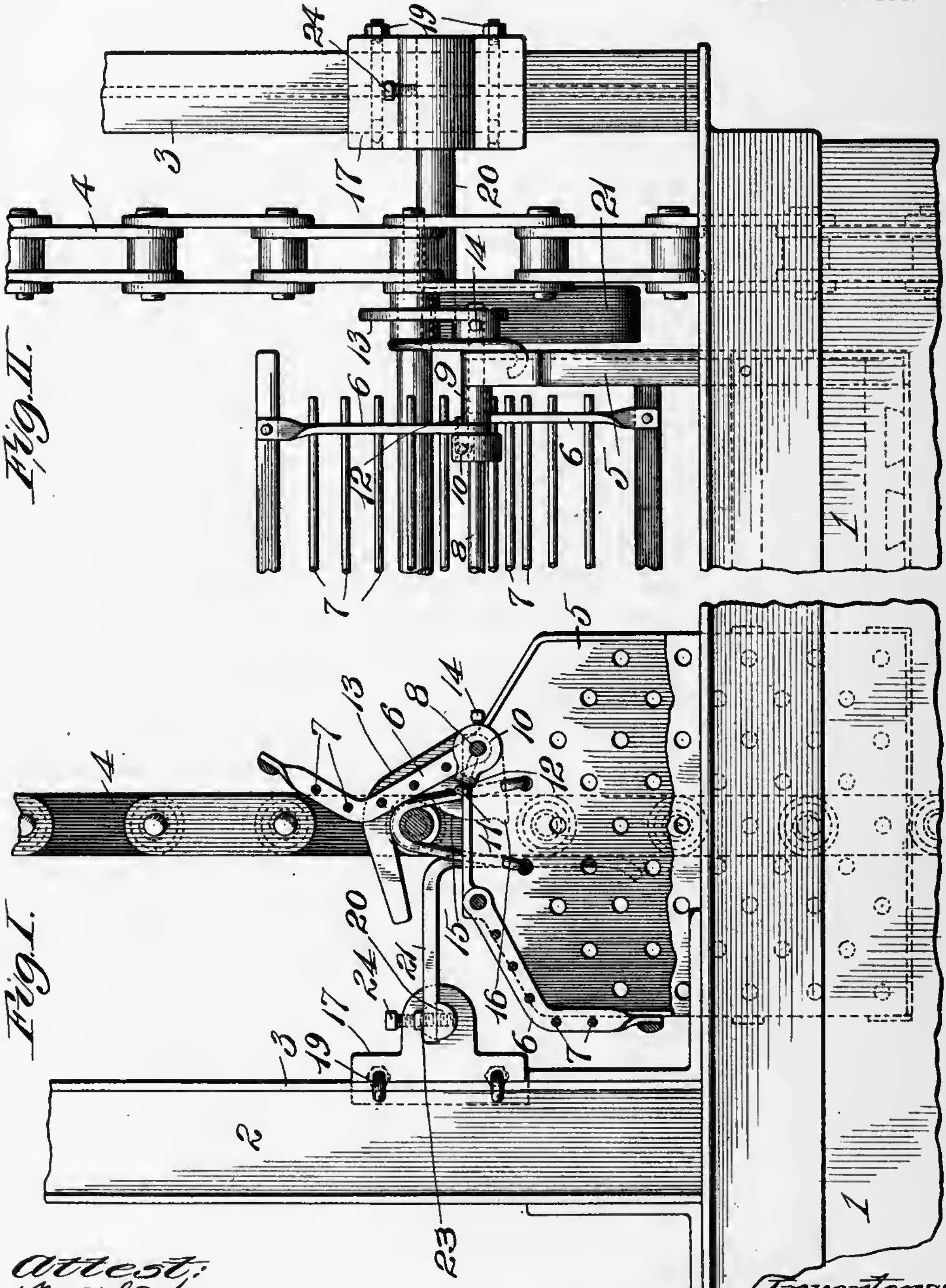
A. H. WEHMILLER & J. W. DAWSON.

MECHANISM FOR CLOSING COVERS OF PASTEURIZER BASKETS.

APPLICATION FILED MAR. 10, 1910.

981,961. Patented Jan. 17, 1911.

2 SHEETS—SHEET 1.



Attest:
Wm. H. Scott
H. S. Cook

Inventors:
A. H Wehmiller and J. W. Dawson.
by E. S. Knight atty.

THE NORRIS PETERS CO., WASHINGTON, D. C.

A. H. WEHMILLER & J. W. DAWSON.
MECHANISM FOR CLOSING COVERS OF PASTEURIZER BASKETS.
APPLICATION FILED MAR. 10, 1910.

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2 SHEETS—SHEET 2.

Fig. III.

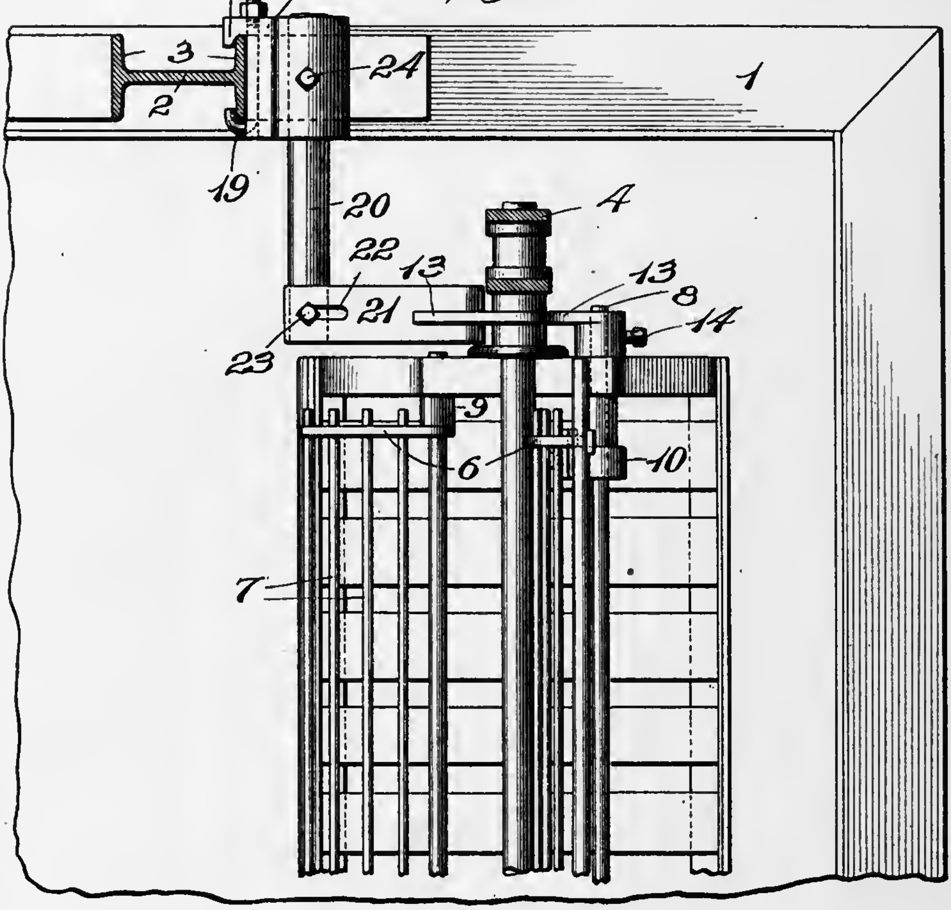


Fig. IV.

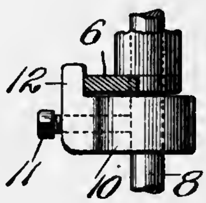
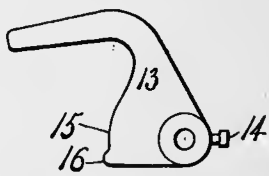


Fig. V.



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Wm H. Scott.
H. G. Cook

Inventors:
A. H. WEHMILLER.
J. W. DAWSON.
by E. S. Knight
Atty.

UNITED STATES PATENT OFFICE.

ALFRED H. WEHMILLER AND JOSEPH W. DAWSON, OF ST. LOUIS, MISSOURI, ASSIGNORS TO BARRY-WEHMILLER MACHINERY COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION.

MECHANISM FOR CLOSING COVERS OF PASTEURIZER-BASKETS.

981,961. Specification of Letters Patent. **Patented Jan. 17, 1911.**

Application filed March 10, 1910. Serial No. 548,405.

To all whom it may concern:

Be it known that we, Alfred H. Wehmiller and Joseph W. Dawson, citizens of the United States, residing in the city of St. Louis and State of Missouri, have invented certain new and useful Improvements in Mechanisms for Closing Covers of Pasteurizer-Baskets, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

Our invention relates to a mechanism for automatically closing the covers of baskets used in pasteurizers in which bottles of beer are subjected to a pasteurizing treatment.

The invention is in the nature of an improvement upon that class of pasteurizers of which an example is to be found in Letters Patent of the United States No. 755,108, issued March 22, 1904, and in which there is employed a bottle carrier having baskets provided with covers hinged to the baskets and adapted to be opened to permit access into the baskets and closed to prevent escape of contents from the basket. In the use of a pasteurizer containing carrier baskets of the description referred to, it is essential that the covers of the baskets be closed before the baskets pass through the pasteurizer after bottles have been placed therein in order that fragments of the bottles, which are frequently broken, may not be permitted to escape from the baskets by floating in the water in the pasteurizer. It not infrequently happens that in the use of the pasteurizers the workmen engaged in filling the baskets neglect to close the covers after the baskets have been filled and our invention has for its object the production of means whereby the covers are automatically moved to closed positions with the result of avoiding any possibility of fragments of broken bottles becoming discharged from the baskets.

Figure I is a side elevation of a portion of a pasteurizer including fragments of the tank, the carrier and our door closing means. Fig. II is a front elevation of the parts shown in Fig. I. Fig. III is a top or plan view of the parts shown in Fig. I. Fig. IV is a view partly in plan and partly in horizontal section of a fragment of the rock shaft by which a cover of each carrier basket is supported, a fragment of one of the end members of the cover and the dog carried by the rock shaft and adapted to actuate the cover. Fig. V is a detail view of the trip lever.

In the accompanying drawings: 1 designates the tank of the pasteurizer and 2 is an upright or post surmounting said tank. This upright is preferably of I-beam shape or of any other suitable shape that will provide side flanges 3 which receive parts to be hereinafter mentioned.

4 designates one of the endless chains of a carrier that supports baskets 5, the baskets being preferably provided with hanger stirrups that are mounted on cross rods of the carrier as in the construction illustrated in the patent hereinbefore mentioned. The top of the carrier basket is at least in part closed by a cover that preferably consists of end bars 6 and cross rods 7. This cover, as shown in the drawings, is composed of two sections loosely mounted upon a rock shaft 8 that extends through the end bars of the cover sections and is journaled in the end walls of the carrier basket so that it may rotate freely in said end walls when it is actuated through means to be hereinafter set forth. The cover end bars 6 are spaced apart from the end walls of the basket by distance sleeves 9. A sectional cover for a basket is unimportant in so far as our present invention is concerned, and therefore, when the word cover is hereinafter used, it is to be understood as referring to one section of the cover shown that has means associated with it for mechanical operation of it.

10 designates a dog fixed to the rock shaft 8 adjacent to one of the cover end bars by suitable means, such as a set screw 11. This dog is provided with a laterally projecting lip 12, see Fig. IV, that occupies a position back of the adjacent cover end bar 6 and is adapted to operate against said end bar for the purpose of swinging the basket cover to a closed position when the rock shaft 8 is rotated by the means to be next described.

13 designates a trip lever that is fixed to the rock shaft 8 by suitable means, such as a set screw 14. This trip lever is located at one of the outer ends of the rock shaft 8 and preferably exteriorly of the carrier basket 5. The trip lever 13 is preferably of curved shape, as seen in Fig. I, in order that it may extend through the carrier chain

4 above the basket to so position its free end as to cause it to strike against a member to be hereinafter mentioned, and which is supported by the upright 2. The trip lever is provided at its lower side with a rearwardly projecting extension 15 which is provided at its lower end with a toe or stop 16 that is adapted to come into contact with one of the pivot members in the carrier chain when the trip lever is tripped to close the basket cover, thereby limiting the degree of movement of said trip lever.

17 designates a bracket seated against the upright 2. This bracket is vertically adjustable upon said upright in order that its elevation may be altered and it is preferably provided at one side with a hook 18 that engages one of the flanges 3 of the upright and the bracket contains hook bolts 19, the hooks of which are adapted to engage the other of said flanges, whereby the bracket may be securely held to the upright at any desired location.

20 is an arm mounted in the bracket 17 and extending inwardly toward the path of travel of the carrier baskets 5.

21 is a trip arm that is supported by the arm 20 and is adjustable transversely of said arm 20, the trip arm being provided with a slot 22 that receives a set screw 23 seated in the arm 20. The trip arm 21 is preferably of L-shape and it extends into the path of travel of the free end of the trip lever 13 in order that it will be engaged by said trip lever and the trip arm is adjustably mounted upon the arm 20 in order that it may be shifted laterally relative to the path of travel of the free end of the trip arm, thereby providing for only the proper degree of engagement between said members. The supporting arm 20 is adjustably mounted in the bracket 17 in order that it may be turned to lower or elevate the trip arm 21 supported thereby to provide for further adjustment of the trip arm relative to the path of travel of the trip lever, and said supporting arm is normally held in a fixed position by suitable means, such as a set screw 24.

In the practical use of a pasteurizer equipped with our door closing cover, the carrier of the pasteurizer operates in the usual manner and as each basket of the carrier moves into proximity with the trip arm 21, the trip lever 13 carried by the basket engages said trip arm with the result of causing the trip lever to be moved upwardly and forwardly relative to the trip arm and impart rotation to the rock shaft 8. The rock shaft in its rotation, carries with it the dog 10 and the lip 12 of said dog, and said lip by engaging the adjacent end bar loosely mounted upon the rock shaft, acts to move said cover in a forward or outward direction in order that it will fall to a closed position over the open upper end of the basket.

We claim:

1. In a pasteurizer, the combination of a pasteurizing tank, bottle receptacles provided with covers, a carrier for moving said receptacles into the pasteurizing tank, and means for automatically closing said covers before the entry of said receptacles within said tank.

2. The combination in a pasteurizer, of a carrier comprising a receptacle provided with a cover, a rock shaft associated with said receptacle and by which said cover is loosely supported, a member carried by said rock shaft arranged to engage said cover, a trip lever carried by said rock shaft, and an adjustably supported trip arm arranged in the path of movement of said lever and by which the lever is moved to rotate said shaft and close said cover, substantially as set forth.

3. The combination in a pasteurizer, of a carrier comprising a receptacle provided with a cover, a rock shaft associated with said receptacle and by which said cover is loosely supported, a dog fixed to said rock shaft arranged to engage said cover, a trip lever fixed to said rock shaft, and a trip arm arranged in the path of movement of said lever and by which the lever is moved to cause it to rotate said shaft to close said cover, substantially as set forth.

ALFRED H. WEHMILLER.
JOSEPH W. DAWSON.

In presence of—
HOWARD G. COOK,
EDNA B. LINN.

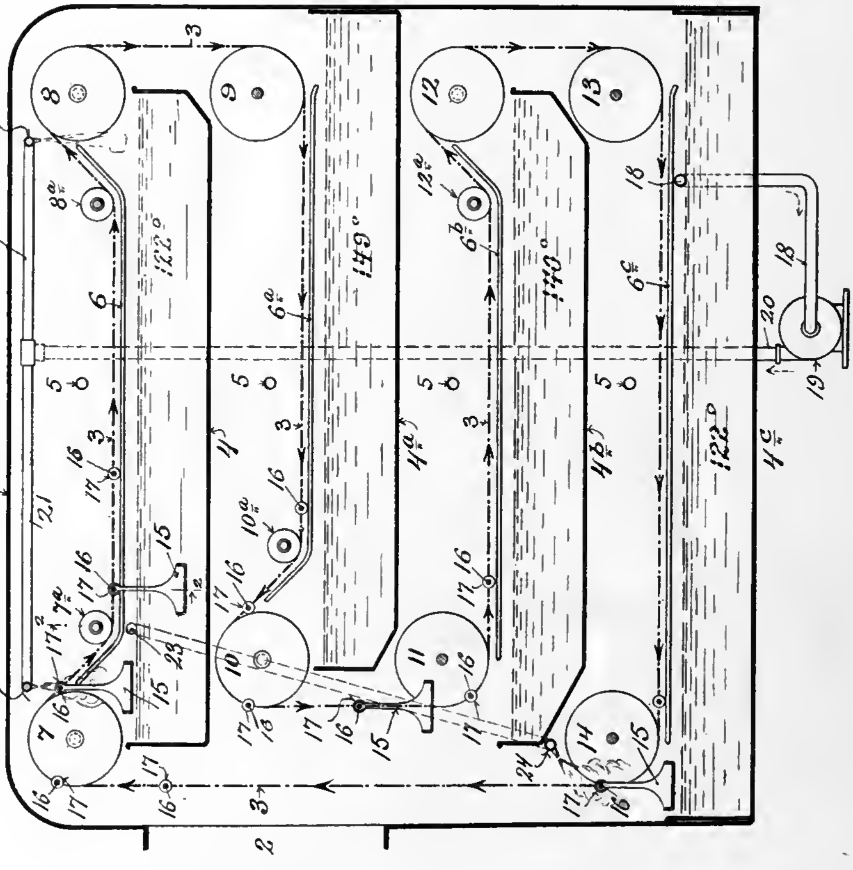
F. GETTELMAN.

PASTEURIZING APPARATUS.

APPLICATION FILED MAY 10, 1909.

989,141. Patented Apr. 11, 1911.

Fig. 1.

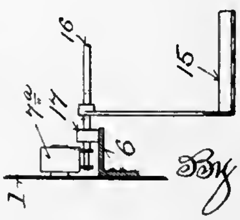


Witnesses:

George G. Felber

Thos. J. DeLattre

Fig. 2.



Inventor

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By Olyphant & Young

Attorneys.

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UNITED STATES PATENT OFFICE.

FREDERICK GETTELMAN, OF MILWAUKEE, WISCONSIN.

PASTEURIZING APPARATUS.

989,141. Specification of Letters Patent. **Patented Apr. 11, 1911.**

Application filed May 10, 1909. Serial No. 495,177.

To all whom it may concern:

Be it known that I, FREDERICK GETTELMAN, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Pasteurizing Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof.

The object of my invention is to provide a simple, efficient and economical apparatus for pasteurizing, the construction and arrangement of the apparatus being such that pasteurization is effected by subjecting the bottled product to successive interrupted immersions in water contained in separate vats, the water in each vat being at initial predetermined temperature, whereby said product is gradually brought to the exact pasteurizing temperature desired, at which temperature it is sustained for a period of time and thereafter gradually lowered in temperature preparatory to being removed from the pasteurizing apparatus. Thus it will be understood that by dividing the heated water into separate compartments accuracy in temperatures may be more readily mintained, than in cases where a single vat of heated water is used and the laws of specific gravity depended upon for such temperatures, in which case the product is arranged to pass through the body of water at different elevations therein. In the last named method of sterilizing, the conveyer or chains which carry the bottled product through the sterilizing machine are necessarily subjected to moisture and consequently rust and deteriorate, while with my apparatus the chain or conveyer is supported above the water-line at all times, being dry and susceptible to lubrication, whereby smooth running and durability are maintained.

The invention therefore consists in certain peculiarities of construction and combination of parts as hereinafter fully set forth with reference to the accompanying drawings and subsequently claimed.

In the drawings: Figure 1 is a diagrammatic view of a pasteurizing apparatus embodying the features of my invention, and Fig. 2, a detail cross-section as indicated by line 2—2 of Fig. 1, showing the conveyer-chain and its supporting means.

Referring by characters to the drawings, 1 indicates a housing forming a chamber having an opening 2 therein, that communicates with a vertically disposed well in the forward end of the chamber through which opening access is had to an endless chain conveyer 3, the conveyer being driven and supported by a series of pulleys mounted upon suitable bearings in connection with the housing walls. Suitably supported within the chamber are a series of vats 4, 4^a, 4^b, 4^c, located in their respective order one below the other, the vats being filled to a predetermined height with heated water from supply-pipes 5. Track-rails 6, 6^a, 6^b, 6^c, are disposed above the water-line of the series of vats, which rails serve as longitudinal supporting guides for the chain-conveyer 3. This chain-conveyer is arranged to pass over a pulley 7 located above the forward end of the first vat 4, from which point it is deflected downwardly by a guide-pulley 7^a, being also supported by an upwardly inclined end of the guide-rail 6, and from the guide-pulley said conveyer travels in the direction of the arrows upon said guide-rail to a second guide-pulley 8^a and from thence upward and over a pulley 8, the aforesaid guide-rail being also inclined at this end to form a support for the conveyer intermediate of the last named pulleys, as shown. From pulley 8 the conveyer passes downward to the rear end of the vat 4 over a pulley 9 and lengthwise of the second vat 4^a, being supported by guide-rails 6^a at the forward end of the vat 4^a, said conveyer passes up an inclined portion of the guide-rail from a guide-pulley 10^a to a pulley 10, from which pulley it takes a vertical drop to a pulley 11 disposed over the forward end of the third vat 4^b. The conveyer passes above this vat in a similar manner to that just described in connection with vat 4^a, except that it travels in the opposite direction, being passed under a guide-pulley 12^a and over a pulley 12 to a pulley 13 above the rear end of the last vat 4^c. It then travels across the latter, being guided by the rail 6^c to a forward pulley 14 and from thence up through the well portion of the chamber to the first pulley 7, this last vertical stretch between the aforesaid pulleys is sufficiently offset from the vertical stretch between the pulleys 10 and 11 to permit all clearance required.

From the foregoing it will be seen that the endless chain-conveyer thus passes in a zigzag manner back and forth over the series of vats being alternately dropped and elevated as it enters and leaves each vat in order to immerse the bottled product in the vat water, which bottled product is carried by a series of trays 15 that are pivotally suspended from rods 16 carried by said chain-conveyer, the rods being provided with anti-friction rollers 17 arranged to contact with the guide-rails. By the above described construction, the several stretches of the aforesaid chain-conveyer are relieved of sagging strain to which they would otherwise be subjected and thus friction being reduced to a minimum a proportionate less amount of power is required to operate the apparatus. The conveyer being set in motion, it is apparent that the trays containing the bottled product will retain their vertical position throughout the entire travel of the conveyer, being immersed in each tank, starting from the first and returning to the starting-point, where said bottled product is removed through the opening of the housing in a perfect state of sterilization.

An overflow-pipe 18 taps the water-line at the rear end of the last vat 4^c of the series, which pipe is connected to a pump 19, the pump being provided with a discharge-pipe 20 connecting a branch-pipe 21 disposed lengthwise of and above the first vat. The branch-pipe terminates with transverse spray-nozzles 22 adapted to discharge their contents at the opposite ends of said first vat 4, whereby the overflow from the last vat 4^c is circulated, there being a gravity overflow pipe-connection 23 leading from the water-line at the forward end of the first vat to a point adjacent to the forward end of the last vat where it terminates in a transverse spray-nozzle 24 arranged to discharge water at a low temperature upon the bottled product as it is lifted from the last sterilizing vat preparatory to being removed from the chamber to be labeled for shipment or consumption.

Assuming the temperature of the water in the first and fourth vats 4, 4^c, to be 122°, the second and third vats 4, 4^b, being 149° and 140° respectively. The bottled product, which is at the surrounding atmospheric temperature, just prior to entering the first vat will pass under and be subjected to a spray from the overflow water pumped from the rear end of the last vat, thus increasing the temperature of the product just before the same is submerged. The bottled product is thereafter drawn through the water of the first vat, whereby it is further heated to approximately 113° by the time it is withdrawn therefrom. Thus it will be seen that the water temperature in the first vat will have been materially lowered at its forward end, due to absorption of heat at this point by the lower temperatured bottled product. The water in the rear end of said first vat however will remain at the approximate initial temperature being supplemented by water fed from the rear end of the fourth vat. The product is now passed through the second vat 4^a, being raised thereby to a temperature approximating 140°, and from this vat said product is submerged into the water of the third vat 4^b, and thereby held at approximately the same temperature (140°) for a period of time sufficient to effect perfect sterilization. The product is then introduced into the rear end of the fourth vat 4^c where its temperature is gradually lowered, the water in the rear end of said vat being raised in temperature from its initial 122° due to the equalization between the higher temperature of the bottled product. Hence the overflow water taken from this end of vat 4^c, by the pump is delivered to the first vat above the initial temperature of the water therein, and as the finished sterilized product is lifted from the last tank, lowered in temperature, it is further cooled by the spray bath from nozzle 24, the water from which nozzle is fed from the overflow discharged from the cooled forward end of vat 4.

Thus it will be seen that the sterilizing process consists in a step-by-step gradual rise of the temperature of the product, the rise of temperature being interrupted at intervals until the maximum temperature is reached, at which temperature it is held for a predetermined interval, and thereafter said bottled product is gradually cooled in a reverse step-by-step series of interrupted baths at decreasing temperatures, and by utilizing a series of vats, the temperatures of water therein may be fixed at any degree of heat to produce the most effective results, a condition not attainable wherein a single vat is used and the bottled product raised or lowered therein to effect a sterilization by the temperature of the water at different elevations. Furthermore by interrupting the sterilization of the bottled product in passing from one vat to the other, the sudden shock due to variation in temperature tends more quickly and effectually to render such organisms as sacc. cerevisiae, pediococcus, etc., as are found in fermented beverages incapable, it being understood that the apparatus herein described is especially applicable to the sterilization of such beverages.

I claim:

A pasteurizing apparatus comprising a housing having a series of four vats arranged therein one above the other adapted to contain water at progressively higher temperatures from the first vat to the second vat of the series, the third and fourth vats being adapted to contain water at progressively lower temperatures, the water in the first and last vats of the series being approximately at even temperatures, guide sheaves disposed at the ends of each vat, a well at the forward end of the housing communicating with the lower vat, an endless conveyer arranged to pass over sheaves of the first vat under the rear sheave of the second vat and over the forward sheave thereof, under the forward and over the rear sheave of the third vat and under the sheaves of the fourth vat and from thence completing its circuit to the forward sheave of the first vat through the housing well.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee, in the county of Milwaukee and State of Wisconsin in the presence of two witnesses.

FREDERICK GETTELMAN.

Witnesses:

GEORGE G. FELBER,

N. E. OLIPHANT.

Pa

May 1911

991,808

A. TIESSE.
PASTEURIZING APPARATUS.
APPLICATION FILED MAR. 16, 1910.

991,808. Patented May 9, 1911.

5 SHEETS—SHEET 1.

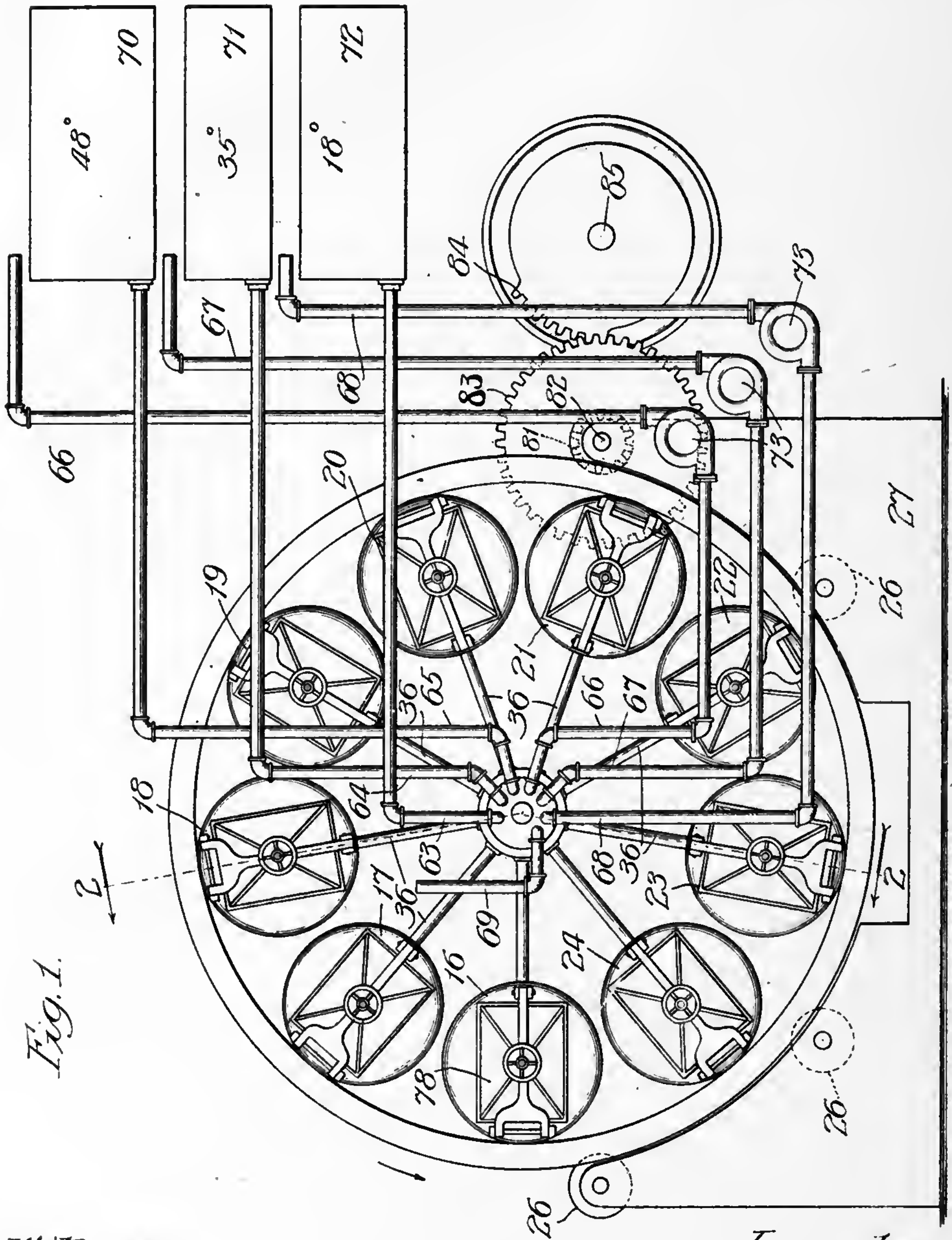

Fig. 1.

Witnesses:
John Enders
Chas. H. Buell

Inventor:
August Tiesse,
By Dyrenforth, Lee, Chritton & Wiles.
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A. TIESSE.

PASTEURIZING APPARATUS.

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5 SHEETS—SHEET 2.

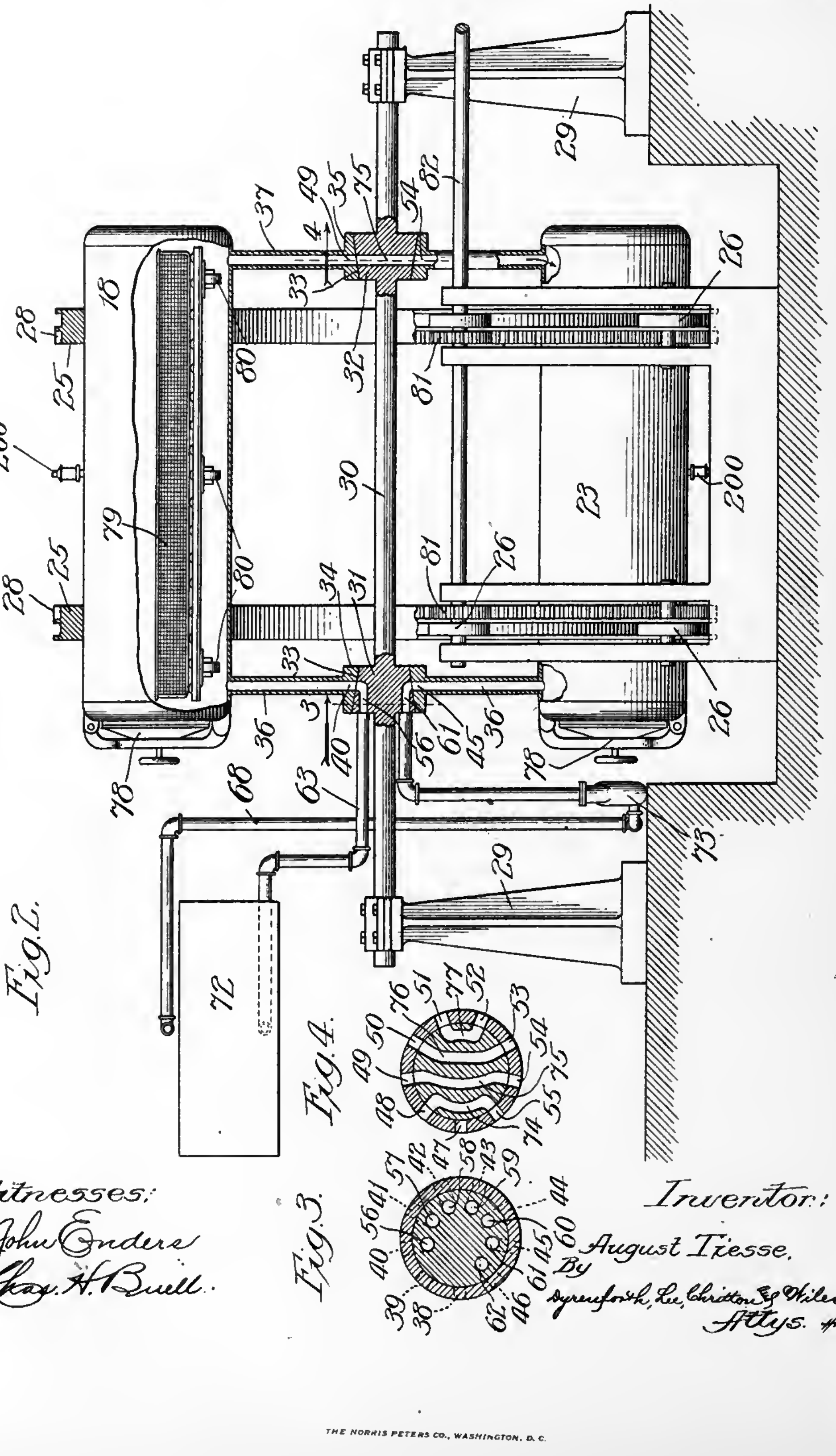

Fig. 2.

Fig. 4.

Fig. 3.

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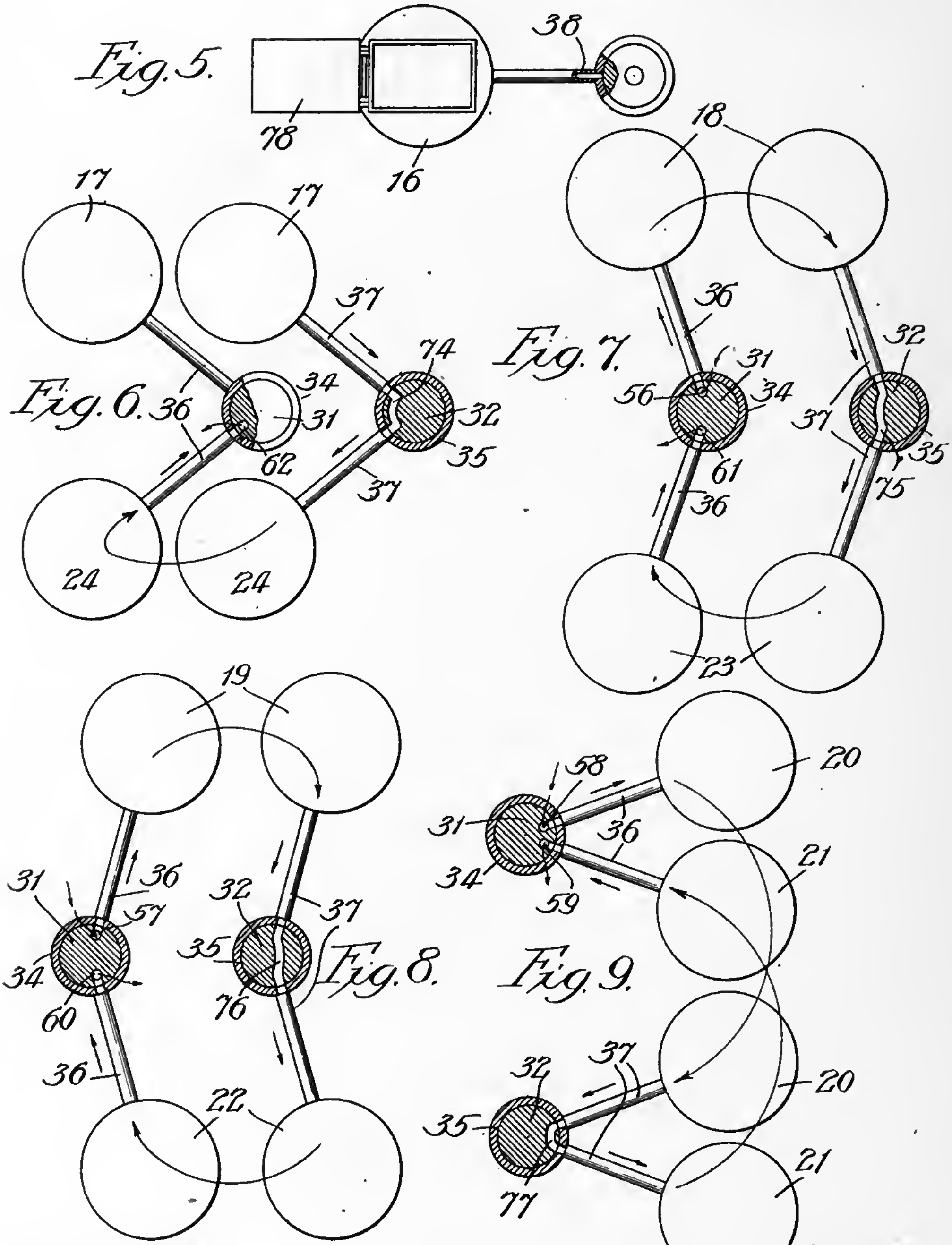
5 SHEETS—SHEET 3.



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5 SHEETS—SHEET 4.

Fig. 11.

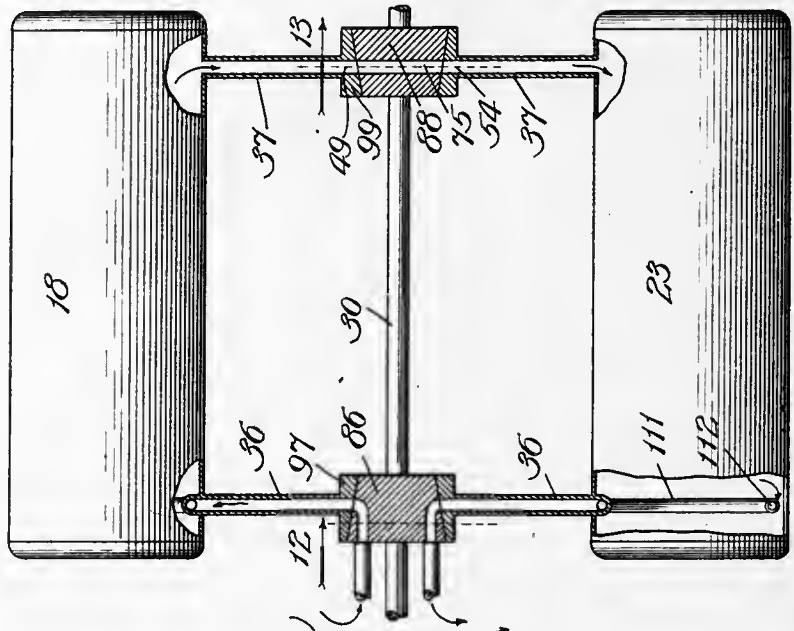
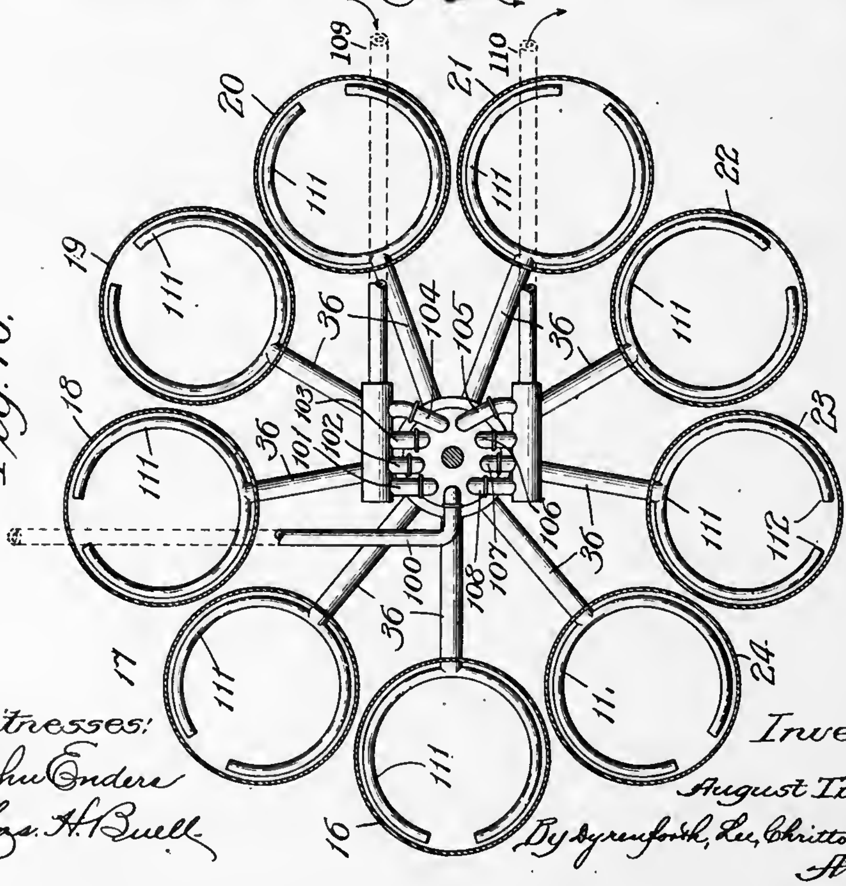


Fig. 10.



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PASTEURIZING APPARATUS.

APPLICATION FILED MAR. 16, 1910.

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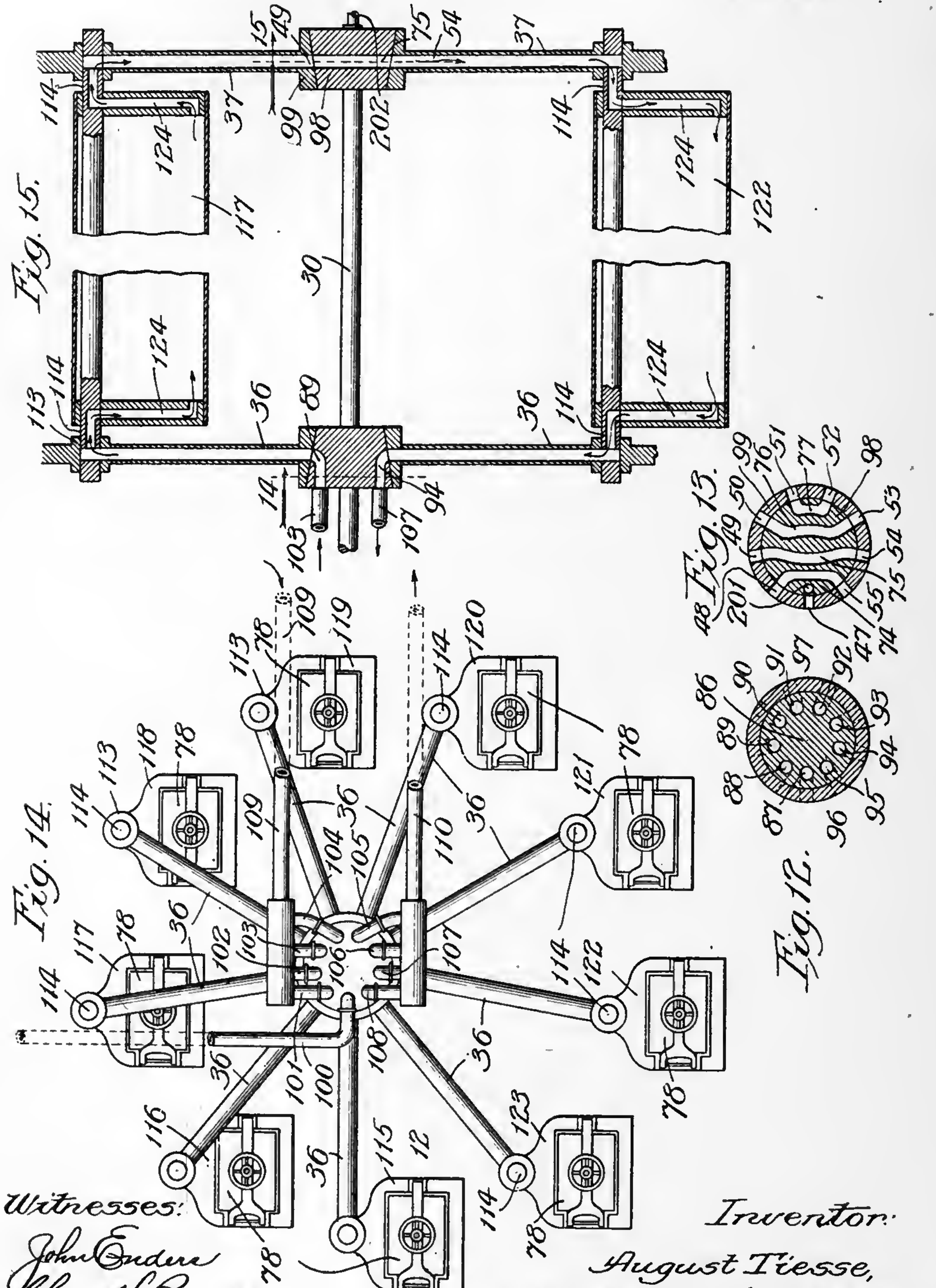
5 SHEETS—SHEET 5.



Witnesses:
John Enders
Chas. H. Buell

Inventor:
August Tiesse,
By Dyrenforth, Lee, Chritton & Wiles,
Attys.

UNITED STATES PATENT OFFICE.

AUGUST TIESSE, OF CHICAGO, ILLINOIS.

PASTEURIZING APPARATUS.

991,808. Specification of Letters Patent. Patented May 9, 1911.

Application filed March 16, 1910. Serial No. 549,789.

To all whom it may concern:

Be it known that I, August Tiesse, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Pasteurizing Apparatus, of which the following is a specification.

My object is to provide a construction of pasteurizer by which the pasteurizing operation may be carried on continuously, and under pressure when desired, whether the pasteurizing agent be steam or water, and by which pasteurization of the material to be treated may be effected expeditiously and uniformly.

Referring to the accompanying drawings—Figure 1 shows by a view in elevation a pasteurizing apparatus constructed in accordance with my invention, the apparatus illustrated in this figure being designed for use with water as the pasteurizing agent. Fig. 2 is a view in elevation of the pasteurizing apparatus showing portions thereof in section, this view being taken from the right-hand side of Fig. 1 and at right-angles thereto and the section being taken at line 2 on Fig. 1 and viewed in the direction of the arrow. Fig. 3 is a section taken at the line 3 on Fig. 2 and viewed in the direction of the arrow, this section being taken through one of the two valve-constructions employed. Fig. 4 is a section taken at the line 4 on Fig. 2 and viewed in the direction of the arrow, this view being taken through the other of the valve-constructions of the pasteurizer. Fig. 5 is a diagrammatic view in side elevation of one of the closed receptacles for receiving the material to be pasteurized, this view illustrating the manner of preventing the pasteurizing agent from entering the receptacles when they are in position for being emptied of the pasteurized material and filled with raw material to be pasteurized. Fig. 6 is a diagrammatic view in elevation and partly in section of the receptacles adjacent to the one illustrated in Fig. 5 and arranged above and below it, together with the connections between these receptacles at their opposite ends. Fig. 7 is a similar view of the two receptacles adjacent to those shown in Fig. 6, together with their inlet and outlet connections. Fig. 8 is a similar view of the two receptacles next to those shown in Fig. 7, together with their inlet and outlet connections; and Fig. 9, a similar view of the two remaining receptacles and their inlet and outlet connections, Figs. 5 to 9 inclusive showing, respectively, only those portions of the controlling valves which operate in conjunction with the respective receptacles shown in the figures, for clearness of illustration. Fig. 10 is a view in end elevation of my improved pasteurizing apparatus adapted for use with steam as the pasteurizing fluid. Fig. 11 is a view in elevation of the construction shown in Fig. 10, but taken at a right-angle thereto, with certain parts of the apparatus shown in section. Fig. 12 is a section taken at the line 12 on Fig. 11 and viewed in the direction of the arrow. Fig. 13 is a section taken at the line 13 on Fig. 11 and viewed in the direction of the arrow. Fig. 14 is a view like that of Fig. 10 showing a modification of the receptacles for receiving the material to be pasteurized; and Fig. 15, a view in vertical sectional elevation of the apparatus illustrated in Fig. 14.

Referring particularly to Figs. 1 to 9 inclusive, 16 to 24 inclusive denote a plurality of closed receptacles shown as of cylindrical form and secured equi-distant from each other to the inner surfaces of a pair of spaced parallel rings 25, the rings 25 resting at their outer peripheries upon rollers 26 journaled in a base 27, a portion of the periphery of each ring being in the form of a gear as represented at 28 for a purpose hereinafter set forth. Extending through the center of the rings 25 and journaled in bearings 29. is a shaft 30 which carries two spaced heads 31 and 32, respectively, of frusto-conical form tapering inwardly as represented at 33 in Fig. 2, and journaled on these heads are internally tapered sleeves 34 and 35, respectively, which are provided with radially extending arms 36 and 37, respectively, connecting with the opposite ends of the receptacles 16 to 24 inclusive as illustrated of those shown in Fig. 2. The sleeve 34 and arms 36 contain conduits 38 to 46 inclusive, which are spaced equidistant from each other and communicate, respectively, with the interior of the receptacles 16 to 24, inclusive, at their left-hand ends in Fig. 2, when these receptacles are in the positions illustrated in Fig. 1, and the sleeve 35 and arms 37 contain conduits 47 to 55 inclusive which are likewise spaced equidistant from each other and communicate, respectively, with the interior of the receptacles 16 to 24 inclusive at their right-hand ends in Fig. 2, when the receptacles are in the positions illustrated in Fig. 1.

In the particular construction illustrated, the head 31 contains seven angle-shaped conduits 56 to 62 inclusive which open through its periphery and its outer face as represented of those conduits illustrated in Fig. 2, the conduits 56 to 62 inclusive being so arranged that when the receptacles occupy the positions represented in Fig. 2 they will communicate with the conduits 40 to 46 inclusive, respectively. The conduits 56 to 62 inclusive communicate with pipes 63 to 68 inclusive and an exhaust-pipe 69, respectively, the pipes 63, 64 and 65 leading into the lower ends of tanks 72, 71 and 70, respectively, and the pipes 66, 67 and 68 containing pumps 73 are adapted to discharge into the tanks 70, 71 and 72 respectively, these tanks being designed to receive water for circulation through the receptacles 16 to 24 inclusive as hereinafter described, and maintain it at different degrees of temperature for producing gradual heating of the material to be pasteurized, pasteurization of the same and subsequent cooling thereof, as for instance the water in tank 72 may be maintained at 18° R., that in tank 71 at 35° R. and that in tank 70 at 48° R., though it will be understood from the following description of the operation of the apparatus that the temperature of the water in the different tanks may be varied as conditions require. The head 32 contains four passages 74, 75, 76 and 77, which are so disposed as to cause the conduits 48, 49, 50 and 51 to communicate with the conduits 55, 54, 53 and 52, respectively, when the receptacles occupy the positions illustrated in Fig. 2 for effecting circulation therethrough of the pasteurizing water as hereinafter described. It will be noted from the foregoing that the stationary heads 31 and 32 form with their coöperating sleeves 34 and 35, respectively, valves for the conduits at the opposite ends of the receptacles for controlling the flow of water from the several tanks into and out of the latter when the rings 25 are intermittently rotated and the receptacles carried thereby move in a circular path.

Each receptacle 16 to 24 inclusive is provided at its opposite end with a swinging door 78, which, when closed, renders the receptacle fluid-tight. The supports for the bottles, cans or the like, containing the material to be pasteurized are represented at 79, these supports preferably being made of wire fabric in the form of baskets provided on their under sides with rollers 80 which rest on the inner surfaces of the receptacles and by which the supports are always maintained in upright condition therein, regardless of the positions occupied by the receptacles during the operation of the apparatus as hereinafter described.

In the operation of the apparatus, the rings 25 are caused to be intermittently rotated and the receptacles 16 to 24, inclusive, moved in a circular path to advance the receptacles step by step to permit of the withdrawal of the pasteurized material, their recharging with new material and subjecting the material charged into the receptacles to the pasteurizing agent circulated through these receptacles from the tanks. This intermittent movement may be effected in any desired manner, convenient means for accomplishing this purpose being those represented, a description of which is as follows: The gears 28 mesh with pinions 81 rigid on a shaft 82, the latter carrying a gear 83 adapted to mesh with a mutilated gear 84 carried on a shaft 85 driven in any suitable manner. The effect of driving the gear 83 from the mutilated gear 84 is that of causing the rings 25 and receptacles 16 to 24 inclusive to be rotated throughout a portion only of the rotation of the shaft 85, the gears being so proportioned that the receptacles are moved a predetermined distance with each engagement of the gear 84 with the gear 83 and are caused to remain at rest for a predetermined length of time, as for instance in the construction illustrated the receptacles would be at rest for a period five times as long as the period during which they move, and each time the gear 84 engages with the gear 83 the rings and receptacles would travel one-ninth of a complete revolution for the purpose hereinafter explained.

The operation of the apparatus is as follows: The receptacles 16 to 24 inclusive are charged with the supports 79 carrying the material to be pasteurized by inserting them through their open, door-controlled ends, when the receptacles are successively moved into the position represented of receptacle 16 in Fig. 1. Assuming that the receptacles occupy the positions represented in Fig. 1 and that the pumps 73 are operating, the receptacle 16 is empty and in loading position, the inner ends of its conduits 38 and 47 being closed, as represented in Figs. 3 and 4, by the heads 31 and 32; the conduit 39 of casing 17 is closed and its conduit 48 is in communication with the conduit 55 of casing 24 through the medium of the passage 74 in the head 32, the outlet-conduit 46 of receptacle 24 being open to the exhaust-pipe 69, all as represented in Figs. 1, 3, 4 and 6; the conduit 40 of casing 18 is open to the pipe 63 leading from tank 72 through the medium of the conduit 56 in the head 31, and the other conduit 49 of receptacle 18 communicates with the conduit 54 of receptacle 23 through the medium of the passage 75 in the head 32 as represented in Figs. 1, 3, 4 and 7, the conduit 45 of casing 23 communicating through the passage 75 in the head 32 with the return pipe 68; the conduit 41 of receptacle 19 is open to the pipe 64 through the conduit 57 in the head 31, and the conduit 50 thereof communicates through the passage 76 in the head 32 with the conduit 53 in receptacle 22, the other conduit 44 of receptacle 22 communicating through the conduit 60 with the return pipe 67 leading to tank 71; and the conduit 42 of receptacle 20 communicates with the pipe 65 through the conduit 58 in the head 31, and its conduit 51 communicates with the conduit 52 in the receptacle 21 through the passage 77 in the head 32, the other conduit 43 of receptacle 21 communicating through the conduit 59 in the head 31 with the return-pipe 66 to tank 70. Thus when the receptacles are in the positions illustrated in Fig. 1, the water in receptacle 17 will flow into receptacle 24, receptacle 24 having been previously emptied when it occupied the position occupied by receptacle 17 in Fig. 1, the air in receptacle 24 venting through the pipe 69; the water from tank 72 will flow through receptacles 18 and 23; the water from tank 71 will circulate through receptacles 19 and 22; and the water from tank 70 will circulate through receptacles 20 and 21, with the effect of causing material in the receptacles 18 to 23 inclusive to be subjected to water circulated through these receptacles from the respective tanks. When the gear 84 in its rotation meshes with the gear 83 the receptacles are caused to travel in a circular path to the left in Fig. 1 a distance equal to one-ninth of the circumference of the circle in which they lie, to cause all of the receptacles to be moved one-ninth of a revolution in the direction indicated by the arrow in Fig. 1. The effect of thus operating the apparatus is to cause receptacle 17 to be moved into the position occupied by receptacle 16 in Fig. 1 and advance each of the other receptacles to the positions formerly occupied by the next receptacle in advance of it. As the heads 31 and 32 are stationary and the sleeves 34 and 35 rotate with the receptacles, the operation of the latter as described destroys the communications between the receptacles described when in the positions illustrated in Fig. 1 and establishes new communications between the several receptacles as is manifest from the drawings. The receptacle 17 having been emptied of the water contained therein by draining it into the receptacle 16, it is now in a position to permit of the removal of the pasteurizing material and the introduction therein of raw material to be pasteurized, the water in receptacle 18 draining during this operation into receptacle 16. It will be noted that by the time the receptacles have made a complete rotation by the intermittent action referred to, the material therein will have been first subjected to water at increasing temperatures and then to water at the pasteurizing temperature, the material thereafter being subjected to water at decreasing temperatures for cooling it.

From the foregoing description, it will be understood that while the operation of withdrawing the pasteurized material, and substituting for it raw material, is being performed in the receptacles as they successively occupy the position represented of casing 16 in Fig. 1, the material in the other receptacles is being subjected to the water from the tanks 70, 71 and 72, and thus the operation of the pasteurizer is rendered continuous. The parts of the drive mechanisms for the receptacles may be so proportioned as to provide as long periods of rest, during which the pasteurizing fluid is acting upon the material, as desired.

To insure the discharge of the water from the several receptacles as they successively occupy the position represented of receptacle 17 in Fig. 1, I provide on each receptacle a vacuum valve 200 which operates in a well known manner to permit air to enter the receptacles when the internal pressure is less than that of the atmosphere.

While I prefer to employ a plurality of tanks for furnishing water to the receptacles at different temperatures and to provide nine of the receptacles for the material to be pasteurized, I do not wish to be understood as intending to limit my invention to this feature of the construction, as the number of receptacles may be increased or diminished as desired, and likewise the number of tanks, in some cases the use of water at pasteurizing temperature only being desirable.

In Figs. 10 to 13 inclusive, I have illustrated my invention as applicable to the use of steam as the pasteurizing fluid. In this construction, in which the parts corresponding to those shown in the preceding figures are designated by the same numerals, the head 86, which corresponds to the head 31 of the preceding figures, differs therefrom in the particular of having nine right-angled conduits 87 to 96 inclusive instead of the seven provided in the head 31, the sleeve 97 coöperating therewith and corresponding to the sleeve 34, and the head 98 and sleeve 99 corresponding to the head 32 and sleeve 35, respectively, being of the same construction and provided with the same conduits and passages as illustrated and described of the similar parts 34, 32 and 35, respectively, of the preceding figures, excepting that the head 98 contains a port 201 which registers with the passage 47 when the receptacles occupy the positions represented in Fig. 10 and is adapted to register successively with the passages 48 to 55 inclusive as the receptacles are advanced in their circular path of movement, as hereinafter described. In this construction, the conduits 87 to 96 inclusive communicate with pipes 100 to 108 inclusive, respectively, the pipes 101 to 104 inclusive communicating with a steam-supply pipe 109; the pipes 105 to 108 inclusive communicating with a return steam-pipe 110, and the pipe 100 serving as an exhaust, the pipes 109 and 110 being connected with any suitable source of steam-supply for introducing steam into the pipes 101 to 104 inclusive, thence through the conduits 88 to 91 inclusive and through the conduits 39 to 42 inclusive, thence through the receptacles 17 to 20 inclusive, and from these receptacles through the receptacles 21 to 24 inclusive communicating therewith through the medium of the valve formed of the parts 98 and 99 as described of the construction illustrated in the preceding figures. Steam courses through the various receptacles containing the material to be pasteurized at all times, excepting when such receptacles successively occupy the position occupied by receptacle 16 in Fig. 10, in which position its steam-conduits are closed to the steam-supply and communication is made between it and the exhaust-pipe 100 which enables the steam to escape from the receptacle to place it in a condition in which its pasteurized contents may be removed and raw material for pasteurization may be substituted. It is preferred that the conduits for each receptacle leading into the valve formed of the parts 96 and 87 open into a pipe terminating in a hollow ring-shaped pipe 111, having a section thereof broken away to afford oppositely directed openings 112 which, when the receptacles are at the lowermost point reached by them in their movement in a circular path, extend close to the bottom of the receptacles and serve to permit of the withdrawal, under the pressure of the outgoing steam of the water of condensation collected therein.

The receptacles of this construction may be driven as described of the receptacles in the preceding figures, to cause them to successively assume the position represented of receptacle 16 in Fig. 10 to permit of the removal therefrom of the pasteurized material and the substitution therefor of material to be pasteurized. The port 201 communicates with a pipe 202 which leads to any suitable source of compressed air supply whereby when the receptacles successively assume the position represented of receptacle 16 in Fig. 10, the steam will be forced therefrom through the exhaust-pipe 100.

A modification of the receptacles of the construction shown in Figs. 1 to 11 inclusive is represented in Figs. 14 and 15. In this case, the receptacles instead of remaining in fixed position and inverting as they move through a circular path, are pivotally supported to cause them to remain upright at all times, a description of the particular construction illustrated being as follows: The arms 36 and 37 are provided toward their outer ends with transversely-extending bearings 113 in which tubular extensions 114 carried by receptacles 115 to 123 inclusive are journaled, these tubular extensions communicating with downwardly-extending conduits 124 in the receptacles, and these conduits opening into the interior of the latter. The receptacles 115 to 123 inclusive are door-controlled at their ends as described of the preceding constructions, to permit of the introduction therein and withdrawal therefrom of supports carrying the material to be pasteurized. The details of the construction for supplying steam to the various receptacles and withdrawing it therefrom are the same as those illustrated and described of the construction in Figs. 10 to 13 inclusive.

It will be noted that in all of the constructions illustrated the pasteurizing operation may be continuously carried on and that uniform pasteurization may be effected. It will furthermore be noted that by providing a plurality of receptacles adapted to be maintained, during the pasteurizing operation in air-tight condition, the pasteurizing medium may be circulated or passed therethrough under any pressure desired, which is of especial advantage in the case of pasteurization of beer in bottles, in which case the increased pressure exerted by the gases formed in the bottles may be compensated for to equalize the strain on the latter and thus prevent breakage from this cause.

What I claim as new, and desire to secure by Letters Patent, is

1. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to rotate in a circular path and adapted to receive the material to be pasteurized, and valve-mechanism for directing pasteurizing fluid through the receptacles said valve-mechanism being formed of relatively movable parts communicating respectively with a source of pasteurizing fluid and with said receptacles, one of said parts moving with said receptacles and the other of said parts being stationary.

2. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in a circular path and adapted to receive the material to be pasteurized, and a pair of valves arranged centrally with said receptacles and each formed with a stationary member and a coöperating member movable with said receptacles, the parts of said valves containing conduits communicating with said receptacles and a source of pasteurizing fluid, and

adapted to be moved into and out of registration with each other for introducing pasteurizing fluid into said receptacles, for the purpose set forth.

3. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, and valve-mechanism, arranged centrally of said receptacles and operating automatically to effect the introduction into and the discharge from said receptacles of the pasteurizing fluid, formed of relatively movable parts communicating respectively with the source of pasteurizing fluid and with said receptacles, one of said parts moving with said receptacles.

4. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in a circular path and adapted to receive the material to be pasteurized, and valves arranged centrally of said receptacles, the parts of said valves containing conduits communicating with said receptacles and a source of pasteurizing fluid, respectively, and adapted to be moved into and out of registration with each other upon advancing said receptacles in a circular path for introducing pasteurizing fluid into said receptacles, for the purpose set forth.

5. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, and valve-mechanism for directing pasteurizing fluid through said receptacles when the latter occupy predetermined positions, said valve-mechanism being formed of relatively movable parts communicating, respectively, with a source of pasteurizing fluid and with said receptacles, one of said parts being movable with said receptacles.

6. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, and valve-mechanism formed of relatively movable parts communicating, respectively, with a source of pasteurizing fluid and with said receptacles, one of said parts moving with said receptacles, said valve-mechanism being constructed and arranged to cause the fluid to pass through said receptacles excepting when they occupy certain predetermined positions for recharging with the material to be pasteurized.

7. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, and valve-mechanism formed of relatively movable parts communicating, respectively, with a source of pasteurizing fluid and with said receptacles, one of said parts being movable with said receptacles, said valve-mechanism being constructed and arranged to cause the fluid to pass through the receptacles when in certain positions and to vent the same successively of their contained fluid as the receptacles are advanced in a curved path of movement, for the purpose set forth.

8. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path, and adapted to receive the material to be pasteurized, and valve-mechanism disposed centrally of said receptacles and formed of relatively movable parts communicating, respectively, with a source of pasteurizing fluid and with said receptacles, one of said parts moving with said receptacles, said valve-mechanism being constructed and arranged to cause the fluid to pass through said receptacles and to vent the latter successively of their contained fluid as they are advanced in their circular path of movement.

9. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path, and adapted to receive the material to be pasteurized, and valve-mechanism formed of relatively movable parts communicating, respectively, with a source of pasteurizing fluid and with said receptacles, one of said parts moving with said receptacles, said valve-mechanism being constructed and arranged to pass the fluid through the receptacles when the latter occupy certain predetermined positions, to vent the same when they occupy another position and permit them to be filled when they occupy still another position, for the purpose set forth.

10. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, sources of supply of fluid at different temperatures, and valve-mechanism formed of relatively movable parts communicating, respectively, with said sources of supply and with said receptacles, one of said parts moving with the receptacles, said valve-mechanism being constructed and arranged to permit the fluid to pass from said sources successively through said receptacles when the latter are advanced in their path of movement, for the purpose set forth.

11. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, sources of supply of fluid at different temperatures, and valve-mechanism formed of relatively movable parts communicating, respectively, with said sources of supply and with said receptacles,

one of said parts moving with said receptacles, said valve-mechanism being constructed and arranged to permit the fluid from said sources to pass successively through said receptacles when the latter are advanced in their path of movement and occupy certain predetermined positions, and to vent said receptacles successively of their contained fluid when moved into other predetermined positions.

12. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path, sources of supply of fluid at different temperatures, and valve-mechanism formed of relatively movable parts communicating, respectively, with said sources of supply and with said receptacles, one of said parts moving with said receptacles, said valve-mechanism being constructed and arranged to permit the fluid to pass from said sources successively through said receptacles when the latter are advanced in their path of movement and occupy certain predetermined positions, to vent said receptacles successively of their contained fluid when moved into other predetermined positions, and to cause said receptacles to be cut off from said sources of supply of fluid when in another predetermined position.

13. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, a plurality of tanks containing fluid at different temperatures, valve-mechanism communicating with said receptacles, and conduits communicating with said valve-mechanism and leading to and from said tanks, respectively, said valve-mechanism being constructed and arranged to pass the fluid from said tanks successively through said receptacles when the latter are advanced in their path of movement and occupy certain predetermined positions, to vent said receptacles successively of their contained fluid when moved into other predetermined positions, and return the fluid to the respective tanks from which it was drawn, for the purpose set forth.

14. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path, a plurality of tanks containing fluid at different temperatures, valve-mechanism communicating with said receptacles, and conduits communicating with said valve-mechanism and leading to and from said tanks respectively, said valve-mechanism being constructed and arranged to pass the fluid from said tanks successively through said receptacles when the latter are advanced in their path of movement and occupy certain predetermined positions, to vent said receptacles successively of their contained fluid when moved into other predetermined positions, to cause said receptacles to be cut off from said tanks when in another predetermined position, and to return the fluid to the respective tanks from which it was drawn.

15. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, a plurality of tanks containing fluid at different temperatures, valve-mechanism communicating with said receptacles, and conduits communicating with said valve-mechanism and leading to and from said tanks respectively, said valve-mechanism being constructed and arranged to pass the fluid from said tanks successively through said receptacles as they are advanced in the path of their movement and return the fluid to the respective tanks from which it was drawn, for the purpose set forth.

16. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in a circular path and adapted to receive the material to be pasteurized, and valve-mechanisms, one of which communicates with a source of pasteurizing fluid and with one end of each receptacle, and the other of which affords communication between predetermined sets of receptacles at their other ends, said valves operating to pass fluid into certain predetermined receptacles and discharge the same through the other receptacles of the predetermined sets thereof successively, for the purpose set forth.

17. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in a circular path and adapted to receive the material to be pasteurized, and valve-mechanisms formed of relatively movable parts containing ports, one part of each valve moving with said receptacles and the other parts thereof being stationary, said movable parts communicating, respectively, with the receptacles at their opposite ends, the ports of one of said stationary parts being connected with a source of pasteurizing fluid, and the ports of the other of said stationary parts affording communication between predetermined sets of receptacles, said valves operating, when the receptacles are intermittently advanced, to pass the fluid therethrough, for the purpose set forth.

18. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to rotate in a circular path and adapted to receive the material to be pasteurized, and a pair of valves one of which communicates with a source of pasteurizing fluid and with said receptacles at one end, and the other of which affords

communication between predetermined sets of said receptacles for effecting circulation of the pasteurizing fluid through the receptacles, for the purpose set forth.

19. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in a circular path and adapted to receive the material to be pasteurized, and a pair of valves one of which is connected with a source of pasteurizing fluid and with said receptacles at one end and forms means for controlling the supply of fluid to the receptacles, and the other of which affords communication at the other ends of the receptacles between predetermined sets thereof, said fluid-inlet-controlling valve operating to cut off the supply of fluid to said receptacles when they successively occupy a predetermined position, for the purpose set forth.

20. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in a circular path and adapted to receive the material to be pasteurized, and a pair of valves one of which is connected with a source of pasteurizing fluid and with said receptacles at one end and forms means for controlling the supply of fluid to the receptacles, and the other of which affords communication at the other ends of the receptacles between predetermined sets thereof, said fluid-inlet-controlling valve operating to cut off the supply of fluid to said receptacles and to vent said receptacles of their contained pasteurizing fluid when they occupy certain predetermined positions.

21. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, and valve-mechanism formed of relatively movable parts communicating, respectively, with a source of pasteurizing fluid and with said receptacles, one of said parts moving with the receptacles, said valve-mechanism being constructed and arranged to cause the fluid to pass from said source into said receptacles when the latter are intermittently advanced in their path of movement, excepting when they successively occupy a certain predetermined position for recharging with material to be pasteurized.

22. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, means for intermittently operating said receptacles, and valve-mechanism formed of relatively movable parts communicating, respectively, with a source of pasteurizing fluid and with said receptacles, one of said parts moving with the receptacles, said valve-mechanism being constructed and arranged to pass fluid from said source into said receptacles when the latter occupy predetermined positions in their path of movement.

23. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, means for intermittently operating said receptacles, and valve-mechanism formed of relatively movable parts communicating, respectively, with a source of pasteurizing fluid and with said receptacles, one of said parts moving with the receptacles, said valve-mechanism being constructed and arranged to pass fluid from said source into said receptacles when the latter occupy predetermined positions in their path of movement, and vent the same when they occupy other positions, for the purpose set forth.

24. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in an endless path and adapted to receive the material to be pasteurized, and valve-mechanism formed of relatively movable parts communicating, respectively, with a source of pasteurizing fluid and with said receptacles, one of said parts moving with the receptacles, said valve-mechanism being constructed and arranged to pass the fluid from said source into said receptacles throughout a portion of the travel of the latter and to vent the same at another point in their travel for placing them in position for recharging with material to be pasteurized.

25. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in a circular path and adapted to receive the material to be pasteurized, and a pair of valves each formed of a stationary part and a coöperating rotatable part, said rotatable part being provided with conduits communicating with said receptacles, the said stationary part of one of said valves containing conduits adapted to be brought into registration successively with the conduits in the coöperating movable part of the valve when said receptacles are intermittently advanced in their path of movement, and the stationary part of the other of said valves being provided with ports communicating with a source of pasteurizing fluid and of a less number than the conduits in its coöperating movable part and adapted to register successively with said last referred to conduits when said receptacles are advanced, for the purpose set forth.

26. A pasteurizing apparatus comprising, in combination, a plurality of closed receptacles supported to move in a circular path and adapted to receive the material to be pasteurized, and a pair of spaced valves lo-

cated centrally of said receptacles and each formed of a stationary part and a part rotatable thereon, the said rotatable parts of the valves being connected by conduits with said receptacles at their opposite ends and spaced in said rotatable parts equidistantly in a circular series, the stationary part of one of said valves containing cross-conduits adapted to afford communication between diametrically-disposed receptacles, and the stationary part of the other of said valves containing ports communicating with a source of pasteurizing fluid, said last referred to ports being of less number than the conduits coöperating therewith and adapted to successively register with the latter, for the purpose set forth.

AUGUST TIESSE.

In presence of—
F. L. BROWNE,
GEO. H. SNYDER.

Pasteurizer
Je 1911

B. D. PINKNEY.

PASTEURIZER.

APPLICATION FILED OCT. 19, 1908.

994,192. Patented June 6, 1911.

2 SHEETS—SHEET 1.

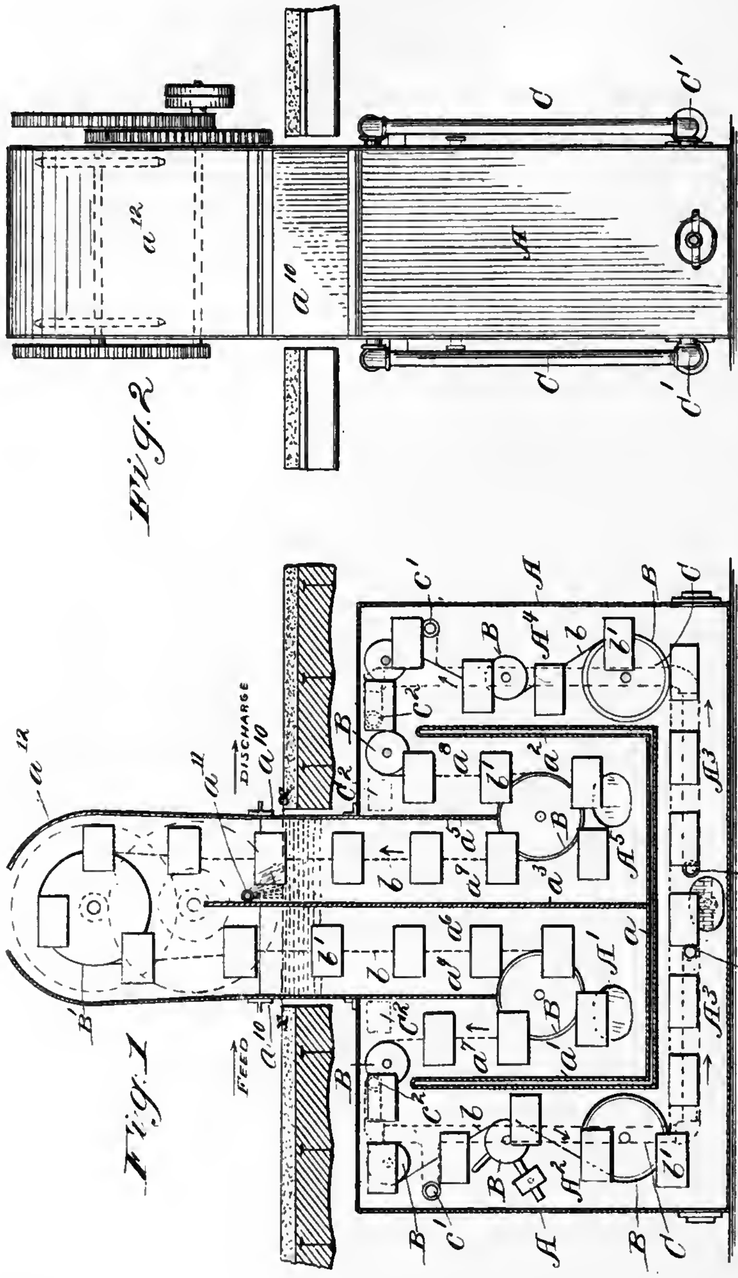


Fig. 2

Fig. 1

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2 SHEETS—SHEET 2.

Fig. 3

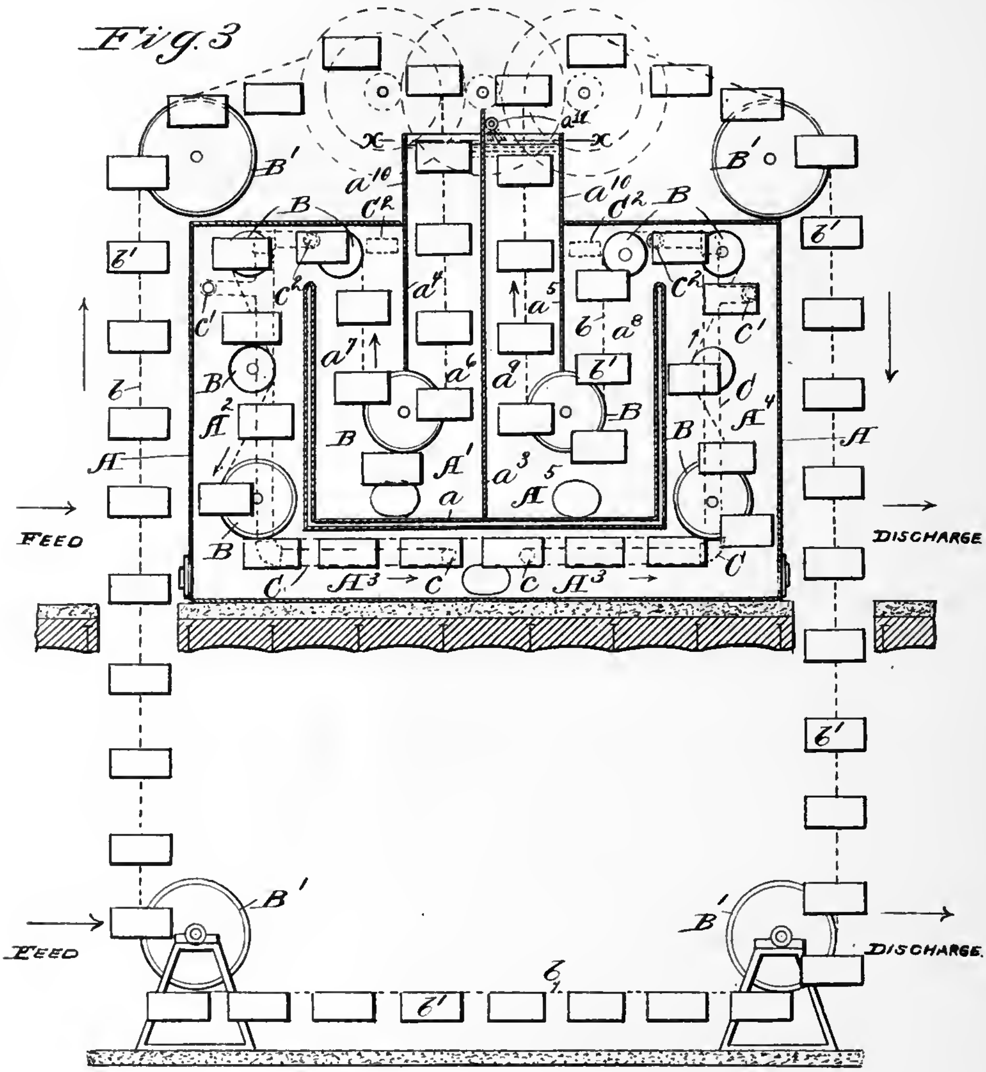


Fig. 4

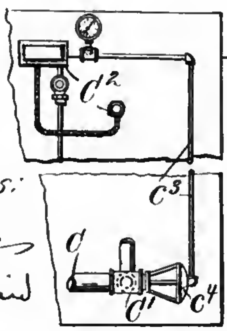
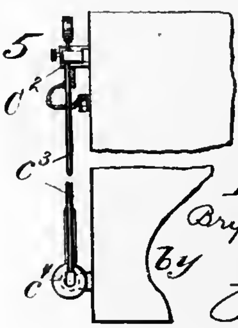


Fig. 5



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UNITED STATES PATENT OFFICE.

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PASTEURIZER.

994,192. Specification of Letters Patent. **Patented June 6, 1911.**

Application filed October 19, 1908. Serial No. 458,543.

To all whom it may concern:

Be it known that I, BRYAN D. PINKNEY, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Pasteurizers, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The present invention relates to improvements in pasteurizers as indicated; its more particular relation, however, is to pasteurizers of the continuous type, such as are used in beer-bottling establishments and the like.

The object of the invention is the provision of continuous pasteurizing apparatus whereby increased thoroughness and economy of pasteurization is accomplished, while at the same time, by suitable balance and symmetrical disposition of moving parts, operative losses are reduced to a minimum.

To the accomplishment of the above and related ends, said invention, then, consists of the means hereinafter fully described, and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings: Figure 1 is a diagrammatic sectional view of my improved pasteurizer as adapted for use either in a one storied bottling house with the tank in a pit, or in a two storied bottling house with the tank in the basement; Fig. 2, is a side elevation of such pasteurizer; Fig. 3, is a view similar to Fig. 1, but illustrating the adaptation of the apparatus for use in a two story bottling house with the tank on the second floor; Fig. 4, is a side elevational view of one of the thermostatic control-devices employed in connection with my pasteurizer; and Fig. 5 is an end elevational view of the same.

The main feature of the apparatus in each of its several modified forms of construction, is a tank A suitably supported either in a pit or basement or on a floor of the bottling house, as occasion may demand. Such tank is of rectangular form, and is separated into four alined vertical chambers, A' A^2 A^4 A^5, by transverse partitions, a' a^2 a^3, rising from a horizontal partition, a, whereby the horizontal chamber or passage A^3 is provided beneath the two innermost, A' A^5, of said alined chambers which horizontal chamber, as will be obvious, serves to connect the lower portion of the two remaining or outermost chambers, A^2 A^4. Said two innermost chambers are further separated by partitions, a^4 a^5, depending from above into two compartments, a^6 a^7, a^8 a^9, respectively. The outer walls a^{10} and outer separating wall a^3 of the two adjacent compartments, a^6 a^9, are designed to rise above the level $x—x$ of the water in the main chamber or tank, which chamber or tank is otherwise closed, so that the two other compartments, a^7 a^8, together with the outermost chambers A^2 A^4, are entirely submerged.

At suitable points within the several chambers of the main tank are mounted sheaves or drums, B, by means of which an endless conveyer b is guided through the chambers in such fashion as to suitably carry the trays or other carriers b' in which the bottles or like articles to be pasteurized are placed. Outside of the pasteurizing tank A, such endless conveyer may obviously be conducted as suits the convenience of each individual installation, either terminating just above the open tops of the compartments as shown in Fig. 1, or else being carried over other sheaves B' without the pasteurizer to any desired point or points in the plant, (Fig. 3) for the purpose of loading and unloading the carriers. In the arrangement of conveyer b indicated in Fig. 1, a hood a^{12} serves to house the portion thereof lying outside of the main pasteurizer tank, so that the whole of the apparatus is inclosed. As indicated (Figs. 1 and 2) the direction of movement of the conveyer is downwardly through one inner compartment a^6, thence up through the adjacent outer compartment a^7, down the corresponding outermost chamber, A^2, across the horizontal chamber A^3, up the other outermost chamber A^4, and finally down and up the two remaining compartments a^8 a^9, and thence without the pasteurizer.

As is well understood in pasteurizing processes, or methods, the beer when received in the apparatus, is considerably below the pasteurizing temperature, the latter being about 48 degrees R., whereas the bottling operation is carried on just a little above freezing point perhaps three or four degrees R. It accordingly becomes necessary to preliminarily heat or attemperate the beer before subjecting it to the pasteurizing temperature. So too, incidentally to removing the beer from the pasteurizing chamber, its temperature should be gradually lowered, so that upon removal from the apparatus, it will be restored to the normal temperature at which it is maintained for purposes of storage or shipment, all without being subjected at any time to the shock of a sudden change in temperature. The arrangement of chambers and compartments within the tank of my improved pasteurizer, has hence been designed with a view to facilitate the maintenance of the proper temperature of the body of water contained within said tank or chamber, to which end the following additional means are provided. On the exterior of the tank, and laterally of the same there are provided at each end two pipes or conduits, C, the lower ends of which are connected with the horizontal chamber or space A^3 at points c near its center, the upper ends of which branch and open into the upper portion of the respective outermost vertical chambers, either A^2 or A^4. By means of a steam injector C' of familiar construction, and hence not requiring detailed description in this connection, a circulation of water may be maintained from such lower point c of connection of each pipe C to the points c' c^2 where its branched upper end is connected with the outer pasteurizing chambers, thence downwardly through each outermost chamber to the lower end of the pipe again. As will be readily understood, such injector serves at the same time to maintain the water, thus put in circulation, at the proper pasteurizing temperature, and that such temperature may be automatically maintained when the apparatus is in operation, thermostats C^2, likewise of familiar construction, are employed in conjunction with each of the circulating pipes, C. These thermostats are mounted laterally of the corresponding tank portion near the upper end of the circulating pipe, and are adapted by means of suitable pressure-air connections c^3 and a diaphragm valve c^4 to appropriately operate the corresponding injector, whenever the temperature at the point of attachment of the thermostat to the tank falls below, or rises above the pre-determined temperature.

While by the means just described, the body of the water throughout the connected series of chambers A^2 A^3 A^4, will be uniformly heated to the pasteurizing temperature and so maintained the water in chamber A' will tend to lose, and that in chamber A^5 to gain heat, since the cold bottles are passed through the former and the heated bottles are passed through the latter. For the purpose, hence, of overcoming these effects and more or less equalizing the temperatures in the two chambers just named, I provide a cold spray above the water line in compartment a^9 whereby the tendency of the body of water in such compartment to become unduly heated is overcome; the spray, falling as it does directly on the bottles as they emerge, serves to finally cool the latter. In the case of the other compartment a^6, I have found that by reason of the particular arrangement of partitions, the water therein will be properly attemperated by conduction from the space A^2, through the compartment a^7.

From the foregoing description of the construction of my improved pasteurizing apparatus, it will be seen, as has already been remarked, that by reason of the symmetrical disposition of the chambers, and consequently of the corresponding portions of the conveyer passing therethrough, an even pull is at all times secured, so far as mechanical operation of the apparatus is concerned. Moreover, the feed and discharge points of the apparatus are brought closely together, thus permitting the remainder of the more or less cumbersome tank to be disposed out of the way, a feature frequently permitting considerable saving of room. All this is obtained without sacrificing the extent of the passage, or series of connected chambers, wherein the actual pasteurization is effected. At the same time in maintaining the necessary temperature in this portion of the tank, I obtain a unique, and much more effective control by the arrangement and connection of the several circulating and heating devices, than has heretofore been possible, since not only is each end of the chamber (regarding the same as a whole) separately regulated in the matter of temperature, but such independent regulation exists in the case of the two sides of each end. This is a matter of no small importance, for the crates or trays are of a considerable length (such that in fact the tank of the pasteurizer requires to be six or more feet in width), as result of which one side of the pasteurizer may be at the proper temperature, and the other side too cold. This has particularly been apt heretofore to be the case where partially filled trays are put through the pasteurizer, but no such difficulty can arise with the present arrangement.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. A pasteurizer, comprising a tank separated into four vertical chambers, depending partitions separating the two adjacent chambers into two compartments, a horizontal chamber connecting the two outermost chambers but out of direct communication with said adjacent chambers, means for circulating heated water through said chambers, and means for conveying the material to be pasteurized through said chambers.

2. A pasteurizer, comprising a tank separated into four vertical chambers by partitions, depending partitions separating the two adjacent chambers into two compartments, a horizontal chamber lying under, but out of direct communication with, said two adjacent chambers and connecting the lower portions of the two outermost chambers, means for circulating heated water through said chambers, and means for conveying the material to be pasteurized through said chambers.

3. A pasteurizer, comprising a tank separated into four alined vertical chambers by partitions, depending partitions separating the two adjacent chambers into two compartments, the walls of the two adjacent compartments rising above the level of the water in the tank, the remainder of the tank being closed and wholly submerged, a horizontal chamber connecting the lower portions of the two outermost chambers, but out of direct communication with said adjacent chambers, means for circulating heated water through said chambers, and means for conveying the material to be pasteurized to said chambers.

4. A pasteurizer, comprising a tank separated into four alined vertical chambers by partitions, depending partitions separating the two innermost of said chambers into two compartments, a horizontal chamber connecting the lower portions of the outermost chambers but out of direct communication with said innermost chambers, means for circulating heated water downwardly through the outermost chambers, and means for conveying the material to be pasteurized through said chambers.

5. A pasteurizer, comprising a tank separated into four alined vertical chambers by partitions, depending partitions separating the two innnermost of said chambers into two compartments, a horizontal chamber connecting the lower portions of the two outermost chambers but out of direct communication with said innermost chambers, means for circulating heated water downwardly through the outermost chambers and thence across the horizontal chamber, and means for conveying material to be pasteurized through said chambers.

6. A pasteurizer, comprising a tank separated into four alined vertical chambers by partitions, depending partitions separating the two innermost chambers into two compartments, a horizontal chamber lying under, but out of direct communication with, the two innermost chambers and connecting the lower portions of the outermost chambers, injector means for withdrawing, and heating, water from substantially the center of the horizontal chamber and transferring the same to the outer upper portions of the outermost chambers.

7. A pasteurizer, comprising a tank separated into four alined vertical chambers by partitions, depending partitions separating the two innermost chambers into two compartments the outer walls of the two adjacent compartments rising above the level of the water in the tank and the remainder of the tank being closed and wholly submerged, a horizontal chamber lying under, but out of direct communication with, said innermost chambers and connecting the lower portions of the outermost chambers, means for attemperating the contents of the two adjacent compartments, and means for withdrawing, and heating, water from substantially the center of the horizontal chamber and transferring the same to the upper portions of the outermost chambers, and means for conveying the material to be pasteurized through said chambers.

8. A pasteurizer, comprising a tank separated into four alined vertical chambers by partitions, depending partitions separating the two innermost chambers into two compartments, the outer walls of the adjacent compartments rising above the level of the water in the tank and the remainder of the tank being closed and wholly submerged, a horizontal chamber lying under, but out of direct communication with, the innermost

chambers and connecting the lower portions of the outermost chambers, means for circulating heated water through said chambers, means for conveying the material to be pasteurized through said chambers, means for spraying cooler water into the compartment from which the pasteurized product is discharged, and the construction of the compartment through which the product is admitted being such as to permit water therein to be heated by conduction of the outermost chambers.

Signed by me this 17th day of October, 1908.

BRYAN D. PINKNEY.

Attested by—
Adolph Henry Boehler,
Daniel Loew.

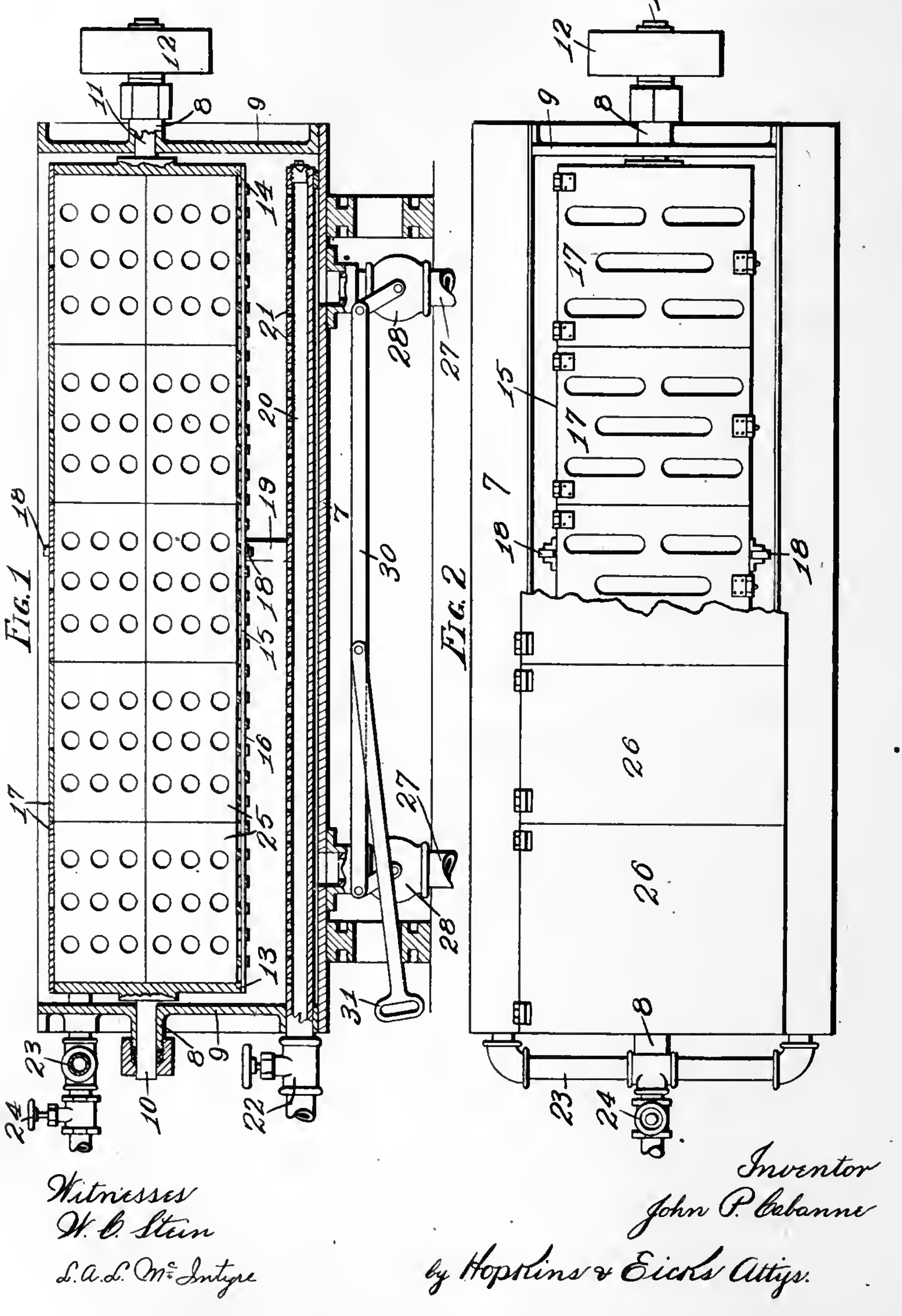
J. P. CABANNE.

METHOD OF PASTEURIZING LIQUID FOOD AND DRINK PRODUCTS IN GLASS CONTAINERS.

APPLICATION FILED APR. 8, 1910. RENEWED MAR. 20, 1911.

996,209. Patented June 27, 1911.

2 SHEETS—SHEET 1.



J. P. CABANNE.

METHOD OF PASTEURIZING LIQUID FOOD AND DRINK PRODUCTS IN GLASS CONTAINERS.

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2 SHEETS—SHEET 2.

FIG. 3

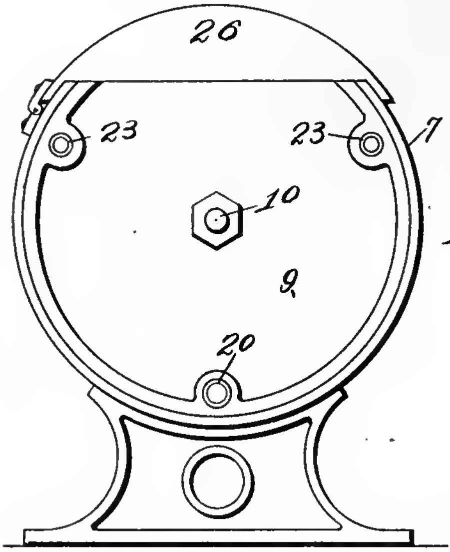


FIG. 4

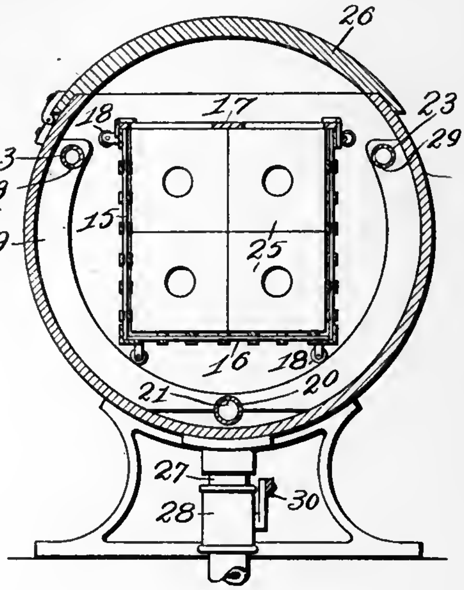


FIG. 5

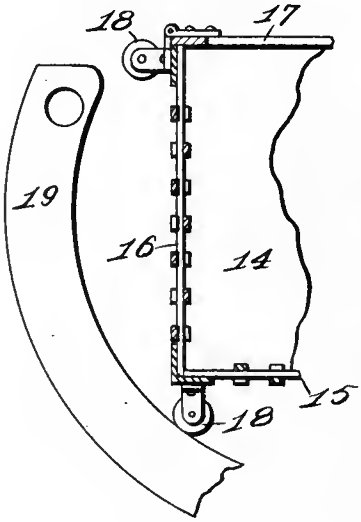
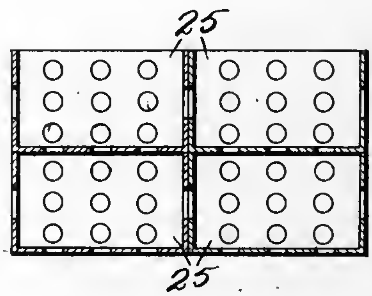


FIG. 6



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L. A. L. McIntyre

Inventor
John P. Cabanne
by Hopkins & Eicks Attys.

UNITED STATES PATENT OFFICE.

JOHN P. CABANNE, OF ST. LOUIS, MISSOURI.

METHOD OF PASTEURIZING LIQUID FOOD AND DRINK PRODUCTS IN GLASS CONTAINERS.

996,209. Specification of Letters Patent. **Patented June 27, 1911.**

Application filed April 8, 1910, Serial No. 554,289. Renewed March 20, 1911. Serial No. 615,656.

To all whom it may concern:

Be it known that I, JOHN P. CABANNE, a citizen of the United States, and resident of St. Louis, Missouri, have invented a certain new and useful Improved Method of Pasteurizing Liquid Food and Drink Products in Glass Containers, of which the following is a specification.

My invention relates to an improved method of sterilizing and pasteurizing liquid food and drink products in glass containers, and has for its object to provide a method whereby food and drink products in small glass containers may be sterilized and pasteurized in the containers in which they are to be delivered to the consumer.

In the drawings—Figure 1 is a longitudinal vertical view in mid-section of a device suitable to be employed in practicing my invention. Fig. 2 is a top plan view of the same. Fig. 3 is an end view of the same. Fig. 4 is a transverse vertical view in mid-section of the same. Fig. 5 is an enlarged sectional detail view of the same, showing the bearings with which the revolving sterilizing receptacle is provided. Fig. 6 is an end plan view of the boxes wherein the food products are held in their containers.

With reference to the apparatus illustrated in the drawings, my method may be described as follows:

I provide an outer shell 7 provided with journal boxes 8—8 in the heads 9. In these journal boxes 8 are mounted the trunnions 10 and 11, the trunnion 11 being provided at its outer extremity with the pulley-wheel 12. The trunnions 10 and 11 are mounted respectively in the heads 13 and 14 of the revolving receptacle 15. The receptacle 15 is provided with perforate walls 16 and a perforated hinged sectional cover 17. Midway its length the receptacle 15 is provided at its corners with the bearing wheels 18 adapted to travel on the circular track or band 19 which is mounted in the interior of the outer shell 7. The shell 7 is provided at its bottom with the steam-pipe 20 having perforations 21, to which the admission of steam is controlled by means of the valve 22. Water is fed to the interior of the shell 7 by means of the pipes 23 provided with a valve 24. The revolving receptacle 15 is rectangular in section and is of such dimensions as to receive and hold a predetermined number of rectangular boxes 25, which boxes are provided with perforate sides and bottoms and are open at their tops; the boxes 25 being superimposed upon each other in layers as indicated in Fig. 1, the bottoms of the boxes 25 above the lower layer of said boxes serving as tops for the boxes immediately beneath them, while the cover 17 with which the revolving receptacle 15 is provided serves as a cover for the topmost layer of the boxes 25. Within the boxes 25 are to be seated packages of milk or other food or drink products to be sterilized.

The cover 17 being secured in place by any suitable means, the receptacle 15 is revolved by means of the pulley-wheel 12. The outer shell 7 is provided with the sectional hinged cover 26 whose sections correspond with the sections of the cover 17. Water being admitted to the shell 7 by means of the pipe 23, the valve 22 is opened admitting steam to the water for the purpose of raising the temperature of the water. The desired temperature being thus secured, the receptacle 15 is revolved rapidly upon the trunnions 10 and 11 by means of the pulley-wheel 12, so that the contents of the boxes 25 shall be uniformly heated to a point which will partially pasteurize their contents.

As my method relates to the treatment of liquid food and drink products in which it is desirable to maintain the original flavor and characteristics of the product, I have found that such flavor and characteristics can best be preserved by discontinuous heating; that is to say, by a series of heatings and coolings which will quite as effectually eliminate all bacteria and spore, as well as the maintenance of the product at a high temperature for a considerable length of time. I have found that such continued high temperature has a tendency to deteriorate the product in taste, smell and flavor, and my method is devised to overcome that objection. I therefore immerse the glass containers in the heating fluid at a temperature below 100° Fahrenheit, raise the temperature of the fluid to a point between 140° F. and 190° F., hold the temperature of the fluid at that point until the contents of the revolving glass containers have been brought to the same temperature as that of the fluid in which they are immersed, with the effect of partial or fractional pasteurization. During the entire process the revolution of the containers is continuous. As the temperature of the heating fluid rises in advance of the temperature of the contents of the glass containers, the gradual heating of the glass effects annealing and avoids bursting of the bottles as well.

The first heating has the effect of destroying the bulk of the active bacteria, and I then reduce the heating fluid to a point below 100° F. and maintain it at its low temperature until the contents of the glass containers has descended to the same temperature. The spore remaining in the food or drink product then becomes active and I repeat the former operation of raising the temperature, first of the heating fluid and then of the contents of the glass containers, as another step in the fractional or partial pasteurization of the food or drink product.

The lowering of the temperature of the heating fluid is accomplished by closing the valve 22 and discharging the contents of the shell 7 through the discharge pipes 27, which are opened by means of the valves 28 controlled by the levers 30 and 31; re-opening the valve 24 and discharging cold water within the interior of the shell 7 through the pipes 23 to cool the contents of the boxes 25.

By means of providing the receptacle 15 with the sectional cover 17 and providing the shell 7 with the sectional cover 26, the sections of these covers registering with each other, I am enabled to determine by actual test at any given stage of the perfect pasteurization of the food or drink product, the degree to which pasteurization has been accomplished. This is done by the removal of one or more of the glass containers and the microscopic examination of the food or drink product. Having once determined by such microscopic test the number of successive heatings required for the particular product, which number will be determined by the perfect elimination of all of the spore and bacteria recognizable through the microscope, I have established a record which will be followed in subsequent pasteurization of the same food or drink product.

After the glass containers have been originally immersed in the heating fluid at any temperature below 100° F., and above 32° F., the subsequent coolings are made to a temperature between 70° F. and 90° F.

The pipes 23 extend along the length of the interior of the shell 7, as indicated in Fig. 2, and are perforated as indicated by the numeral 29; the perforations 29 being of such number and so arranged as to permit the interior of the shell 7 to be speedily filled with water to the desired height.

By means of the described method, I provide means whereby commodities, such as milk, may be uniformly sterilized and pasteurized without danger of coagulation or irregular heating; the contents of each of the packages contained in the boxes 25 being agitated during the process of heating and cooling and caused to pass rapidly through the mass of heating fluid contained in the shell 7, thus securing exact uniformity of temperature throughout the mass of the material to be sterilized.

Having thus fully described my invention, what I claim as new and desire to have secured to me by the grant of Letters Patent, is:

The improved method of pasteurizing liquid food and drink products in glass containers, consisting in subjecting the glass containers carrying said product to continuous revolution within a body of heating fluid, in which fluid they are immersed at a temperature below 100° Fahrenheit, and the temperature of which fluid is alternately raised to a pasteurizing temperature of 140° F. to 190° F., and again lowered to a temperature between 70° F. and 90° F. until all spore and bacteria existing in the product have been destroyed.

In testimony whereof, I have signed my name to this specification, in presence of two subscribing witnesses.

JOHN P. CABANNE.

Witnesses:
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WALTER C. STEIN.

O. EICK.

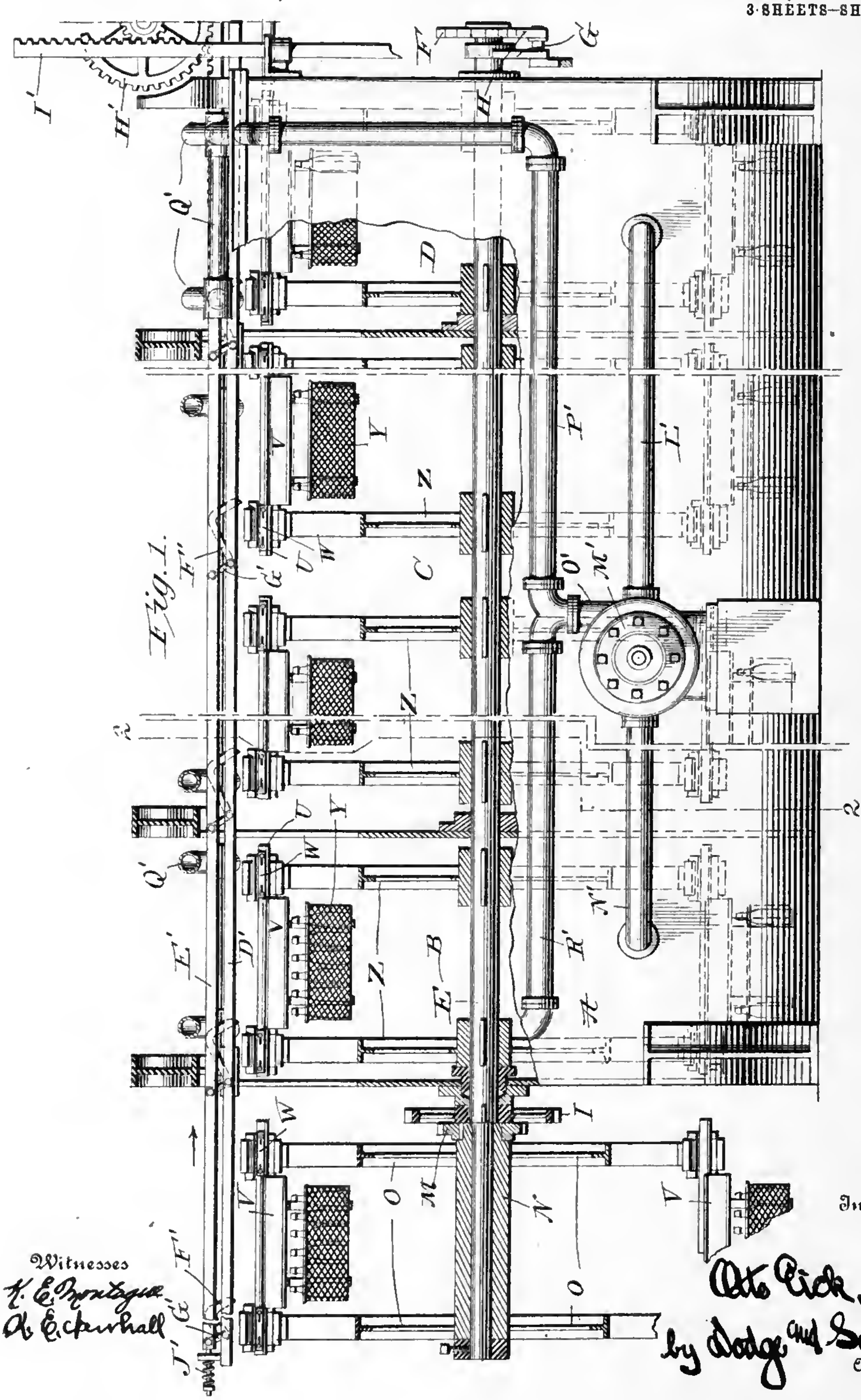
APPARATUS FOR HANDLING BOTTLES OR LIKE CONTAINERS.

APPLICATION FILED DEC. 19, 1907.

999,553.

Patented Aug. 1, 1911.

3 SHEETS—SHEET 1.



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A. E. Eckerhall

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Attorneys

O. EICK.

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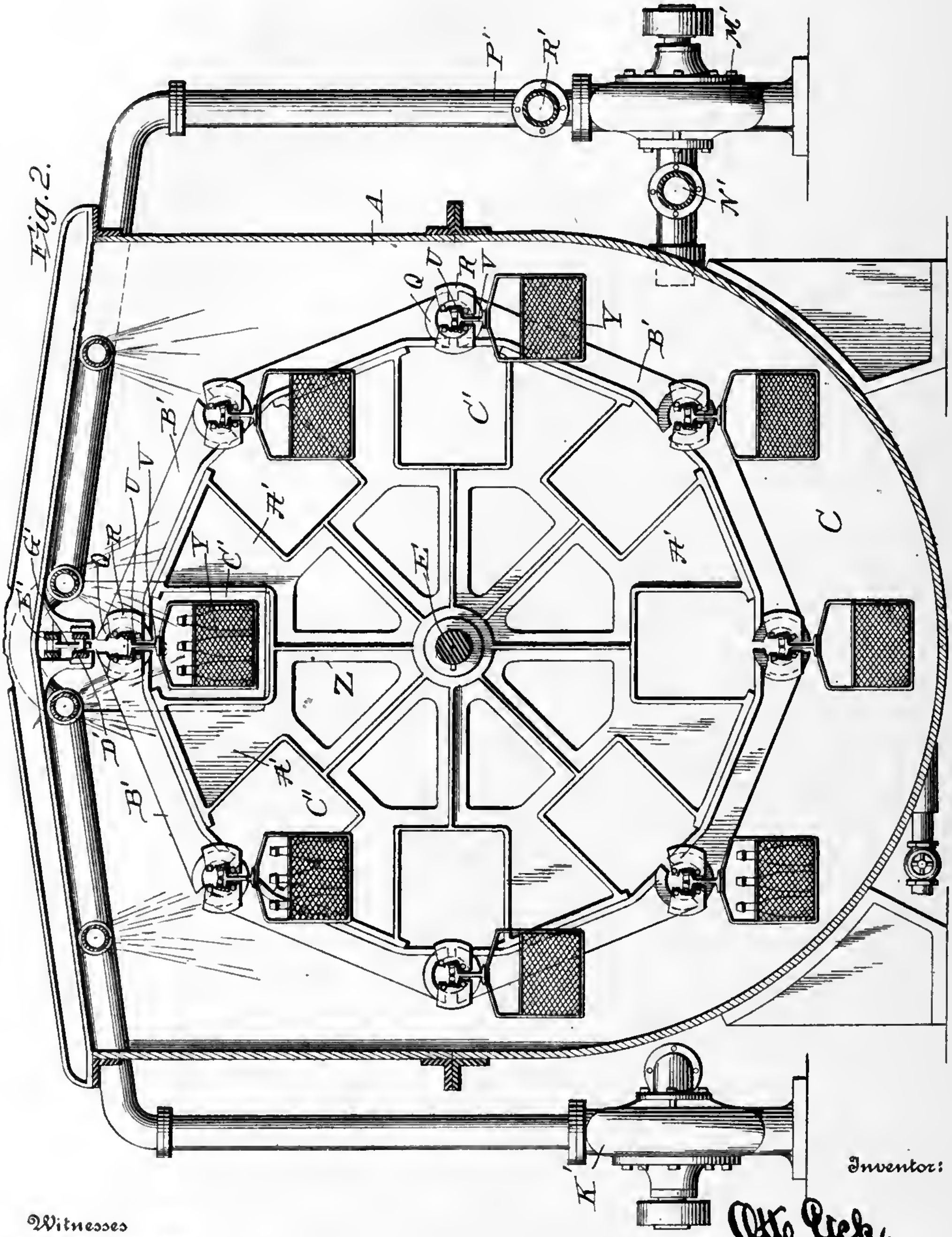

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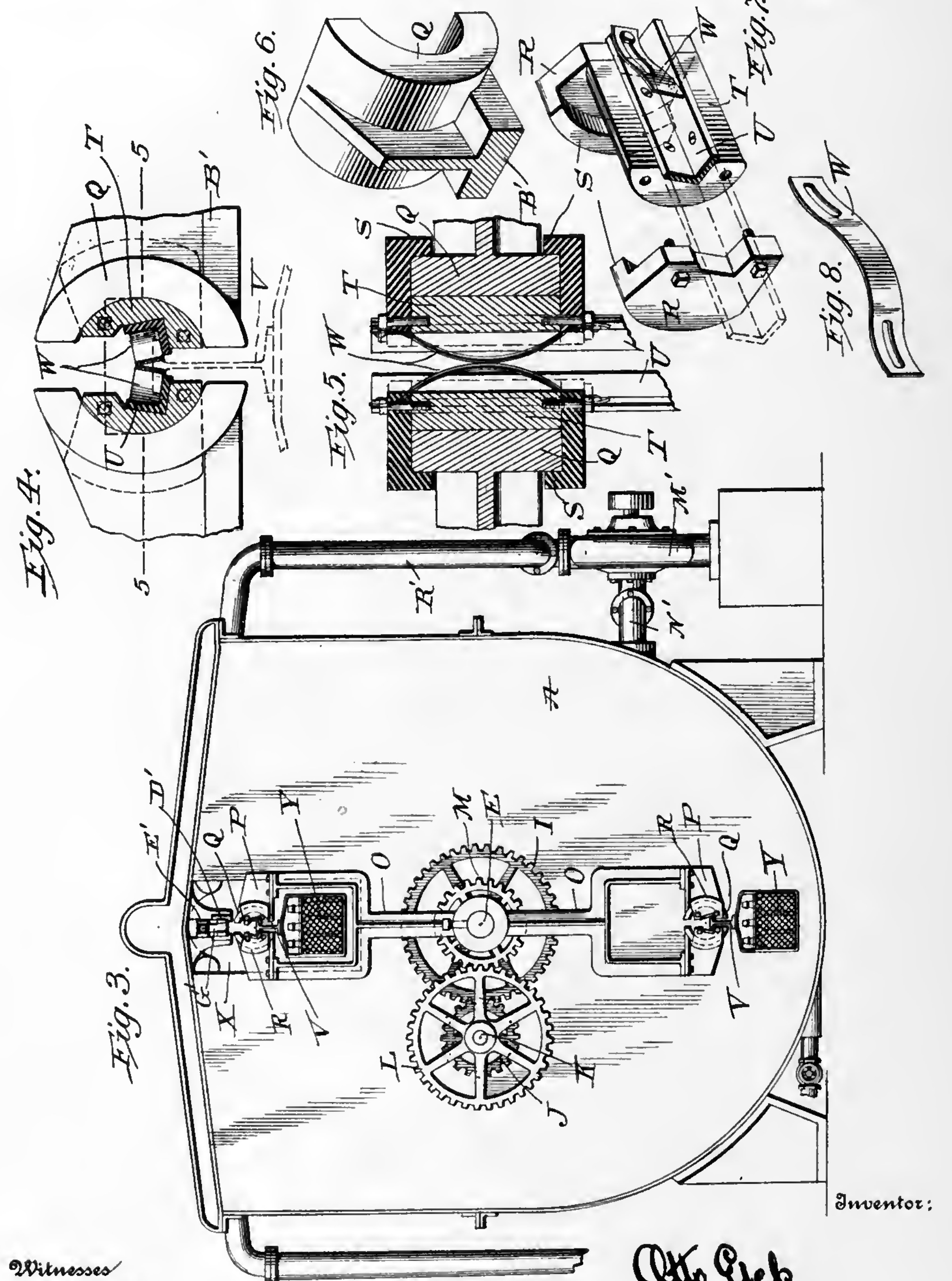
APPARATUS FOR HANDLING BOTTLES OR LIKE CONTAINERS.

APPLICATION FILED DEC. 19, 1907.

999,553. Patented Aug. 1, 1911.

3 SHEETS—SHEET 3.



Inventor:

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K. E. Stenhall

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By

Dodge and Sons,

Attorneys.

UNITED STATES PATENT OFFICE.

OTTO EICK, OF BALTIMORE, MARYLAND.

APPARATUS FOR HANDLING BOTTLES OR LIKE CONTAINERS.

999,553. Specification of Letters Patent. Patented Aug. 1, 1911.

Application filed December 19, 1907. Serial No. 407,212.

To all whom it may concern:

Be it known that I, Otto Eick, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Apparatus for Handling Bottles or Like Containers, of which the following is a specification.

My present invention pertains to improvements in apparatus for handling bottles or like containers, the construction and advantages of which will be hereinafter set forth, reference being had to the annexed drawings, wherein:

Figure 1 is a side elevation of the apparatus, the upper portion thereof being shown in section; Fig. 2 a transverse vertical sectional view, on the line 2—2 of Fig. 1; Fig. 3 an end elevation of the forward or in-feeding end of the apparatus; Fig. 4 a sectional elevation of the track and track-supporting means; Fig. 5 a horizontal sectional view, taken on the line 5—5 of Fig. 4; Fig. 6 a perspective view of the end of one of the supporting arms or brackets; Fig. 7 a similar view of one of the rotary track-supports, portions thereof being shown as separated; and Fig. 8 a perspective view of one of the springs employed to maintain the tracks and track-supporting members in their proper relations so as to always be in position to receive the basket or carrier.

The main object of my invention is to provide a simple and efficient machine, in which baskets or the like holding bottles or other containers may be passed successively through the apparatus from one end to the other and subjected to fluids for the purpose of cleaning the bottles, or fluids at different temperatures for the purpose of pasteurizing the contents of the bottles or containers.

A further object of the invention is to provide means whereby the heat absorbed by the bottles as they pass from the compartment wherein they are subjected to the hot fluid may be utilized to heat the water or other fluid which is sprayed initially upon the bottles as they enter the machine.

With these and other objects in view, which will appear from the specification, a description of the invention will be given.

The apparatus comprises a tank divided into a series of compartments, primarily that into which the bottles are introduced and given their initial heating; a middle compartment (or series of compartments) wherein the bottles are subjected to a fluid having a higher temperature; and a discharge compartment wherein the bottles or other containers are treated by a spray which cools the bottles before they leave the machine. The water which is sprayed upon the bottles in the discharge compartment is heated by the bottles and utilized to secure the initial heating thereof in the first compartment.

Mounted within the various compartments is a series of frames carrying swiveled supports, each adapted and designed to hold a basket, in which are placed a series of bottles, the frames being mounted upon a common shaft and rotated therewith, so that the baskets are moved around in the tank and subjected to the fluid contained in the lower portion thereof. The shaft is brought to rest periodically, and means are provided for shifting the baskets from one compartment to another, and finally discharging the same from the tank.

Where the apparatus is not employed to pasteurize the material contained within the bottles, the bottles may be subjected to various cleansing fluids, either hot or cold, and as they are lowered into the first compartment of the tank they will become filled with liquid and so remain until they pass out of the tank.

In the drawings A denotes the tank, which is divided into three compartments, B, C and D. A shaft E passes through the end walls of the tank and the partitions between the compartments, the shaft at the discharge end of the machine being provided with a ratchet-wheel F. A pawl-carrier G is swiveled upon the shaft and a pawl H operates in conjunction with the ratchet-wheel, and by reciprocating the pawl-carrier a step-by-step rotation may be imparted to the shaft. Any means may be employed for effecting this action.

A gear I is splined to the shaft at the intake or feeding end of the machine, said gear meshing with a smaller gear J mounted upon a stub-axle K, said axle also carrying a large gear L which in turn meshes with a smaller gear M, secured to a sleeve N journaled upon the outer reduced end of the shaft E. Said sleeve carries two frames or castings both being alike in form. Each frame comprises two oppositely-disposed arms O, forked at their outer ends and carrying brackets P, the inner ends of which are of the form shown in Fig. 6; that is to say, each extremity is provided with a semi-cylindrical hub or bearing Q, the outer portions of which project beyond the wall of the bracket, as clearly indicated in Figs. 5 and 6. The bearing members of the brackets stand directly opposite each other and the edges thereof are separated to a slight extent to permit the passage of the basket-supporting member, hereinafter referred to, between them.

Mounted upon each of the half-hubs or bearings Q is a track-supporting member, comprising end plates R, having inwardly-projecting ribs S which latter pass in rear of and engage the back faces of the bearings Q, see Fig. 5. The end plates are connected by a track-sustaining member or block T, one face of which is curved and fits closely against the inner curved face of the half-hub or bearing. The track-supporting member T upon the opposite face is so formed as to receive an L-shaped track U which is bolted thereto. The tracks and the supporting members to which they are attached are duplicated and arranged in pairs, and the tracks extend from one pair, carried by one of the arms O, to the opposite pair, mounted upon the second arm O.

In order to maintain the tracks in their separated position and thus hold them so that the basket-sustaining angle-bar V may freely pass between the same, I provide a pair of oppositely-disposed springs W, the springs being forced back against the tracks, thus permitting the ready entrance of the head of the basket-sustaining member. As the head passes out of contact with the springs, they will resume the positions shown in Fig. 5 and thus hold the parts in the positions indicated in Fig. 4.

With the gears arranged as shown in Fig. 3, the arms O will be alternately brought into line with an opening X in one end of the tank, in order that the sustaining member V and the basket Y carried thereby may be passed into the tank and onto the tracks U carried by the frames Z mounted upon the shaft within the first compartment B. These tracks are arranged in the same manner as those just described. The frames, however, are slightly different and are shown in detail in Fig. 2. Each frame is provided with a series of outwardly-extending arms A′, to which are secured bracket-pieces or arms B′ which are, to all intents and purposes, the mechanical equivalent of the brackets P, except that they are elongated and a hub or bearing member is formed at each end thereof. The construction of the hubs or bearing members is exactly similar to that shown in Fig. 6. Openings C′ are formed between the arms A′, so that the baskets and their sustaining members may be moved along from one pair of frames to the next succeeding pair, and from one compartment to the other when the shaft E is at rest and the parts are in the positions shown in the drawings.

To advance the baskets from the presenting devices (comprising the arms O) into the tank and onto the tracks within the first compartment, and to thereafter advance them successively from one compartment to another, and finally from the machine, I may employ any structure which will periodically engage the basket-sustaining members and move the same forwardly one step, or between one pair of supporting arms or frames to the track carried by the next pair of supporting arms or frames.

In the drawings I have shown a pair of bars D′ and E′, the upper bar having an initial endwise movement independent of the bar D′, after which both bars move forwardly together. Hooks F′ are pivotally connected to the lower bar, and arms G′ connected to the hooks are likewise pivotally connected at their upper ends to the bar E′. It will thus be seen that when the bar E′ is moved in the direction of the arrow, Fig. 1, independently of the bar D′, the hooks will be rocked upon their pivots and thrown downwardly into position to engage the rear end of the basket-sustaining members V. Further movement of the sector gear H′ by the rack I′ will advance both of the bars together and move the baskets forwardly one step. A reverse movement of the rack I′ will cause the disengagement of the hooks, the upper bar E′ being moved rearward independently of the bar D′ through the action of a spring J′, after which both bars will move backwardly together, with the hooks in an elevated position, until they come to the point shown in Fig. 1. It is conceivable, of course, that any means may be employed for advancing the bottle-sustaining baskets. If the machine be used as a pasteurizer, a pump K′ (Fig. 2) will be employed to spray water of the required temperature upon the bottles as they pass into and through the central compartment or compartments C.

In order to abstract the heat from the bottles as they pass through the compartment D, I connect a pipe L′ with the lower portion of said compartment, the pipe leading to a pump M′, which is also in communication with the lower portion of the compartment B through a pipe N′. The pump M′ is provided with a single outlet O′, from which a branch P′ extends to a pipe, or series of pipes, Q′, located in the upper portion of the compartment D, so that the water passing from the pump is sprayed over the bottles as they pass into and out of said compartment D. A pipe R′ also leads from the outlet O′, said pipe connecting with a spray pipe, or series of pipes, located in the upper portion of the compartment B. It will thus be seen that the water which is drawn from the lower portions of the compartments B and D is commingled or mixed in the pump M′ and water relatively warmer than that drawn from the compartment B will be sprayed upon the bottles passing into said compartment, while water relatively colder than that drawn from the compartment D will be sprayed onto the bottles passing into said compartment. Thus the latent heat of the bottles passing from compartment C into compartment D is utilized to heat the water which is sprayed upon the bottles passing into the compartment B, and the bottles are initially heated before passing into the compartment or compartments C where they are subjected to the highest temperature. This arrangement will also be utilized when the bottles are being merely washed or cleaned, as it will gradually bring the bottles up to the temperature of the hottest water or cleaning solution, and likewise temper the bottles before they pass out of the tank.

Having thus described my invention, what I claim is:

1. In an apparatus for the purpose described, the combination of a tank, a rotatable shaft extending through the tank; fixed bearings for the shaft; a frame mounted on the shaft; a series of rotary track-supports carried by the frame and rotatable with reference thereto; and tracks mounted upon said supports and adapted to receive and sustain a receptacle for bottles or the like.

2. In combination with a rotary frame; a pair of oppositely-disposed track-supports journaled therein; and tracks extending from one support to the other and adapted to receive and sustain a receptacle for bottles or the like.

3. In combination with a rotary frame; a pair of oppositely-disposed track-supports journaled therein; means for holding said supports against endwise movement; and a pair of oppositely-disposed tracks secured to said supports.

4. In combination with a tank; a shaft extending therethrough; a series of frames mounted upon the shaft and rotatable therewith; a series of track-supports journaled in each of said frames; and tracks carried by the supports and adapted to move therewith.

5. In an apparatus of the character specified, the combination of a shaft; a pair of frames carried thereby; a pair of bearing members swiveled upon each frame; and oppositely-disposed tracks carried by said bearing members, the edges of the tracks being separated and adapted to receive a sustaining device for a basket or the like.

6. In an apparatus of the character specified, the combination of a shaft; a pair of frames carried thereby, said frames being separated from each other; a series of swiveled bearings mounted in each of said frames, the bearings being arranged in line with pockets formed in the frames; and a pair of tracks extending from each pair of bearings carried by one frame to the oppositely-disposed bearings carried by the other frame, the lower edges of the tracks being separated and adapted and designed to receive a sustaining member for a basket or like receptacle.

7. In combination with a shaft; a pair of frames secured thereto; brackets carried by the outer portions of the frames, the adjacent ends of the brackets being separated and formed with a semi-cylindrical hub or bearing; a pair of retaining members provided with shoulders engaging the outer faces of the hubs; a filling block formed with a rounded face adapted to fit against the inner face of each bearing, said block being connected to the retaining members; an L-shaped track secured to said bearing member, said track extending from said member to the like member carried by the connecting block or member upon the opposite bearing; and means for maintaining the tracks in their proper relation to each other.

8. In combination with a shaft; a pair of frames mounted thereon, each of said frames being provided with pockets adjacent to its outer portion; brackets secured to the outer portion of said frame, the ends of the brackets extending out from the pockets and being separated from each other; a semi-cylindrical hub or bearing formed upon the end of each bracket; retaining members mounted upon the ends of the hub and provided with inwardly-projecting flanges which engage the outer face of the hub; a block provided with a rounding face fitting the inner surface of the hub and connected to the retaining members; L-shaped tracks connected to said block and to the corresponding block upon the oppositely-disposed frame; and springs secured to the opposite tracks, said springs normally contacting with each other and serving to keep the lower, inwardly-projecting portions of the track in a separated position.

9. In combination with a tank provided with a series of compartments; means for sustaining bottles in said compartments; means for advancing the bottles from one compartment to the next and finally from the tank; a pump; pipe connections leading from the lower portion of the first and last compartments in the tank to said pump; and connections leading from the pump and serving to force water into the upper portion of the first and last compartments of the tank.

10. In an apparatus of the character speci-

fied, the combination of a tank provided with a series of compartments; means contained in said tank for sustaining a series of bottles therein; a pump serving to withdraw the water from the first and last compartments; and a single outlet passing from the pump and serving to distribute the water into the upper portion of said first and last compartments.

11. In combination with a tank having a series of compartments; means for sustaining a series of bottles therein; means for subjecting the bottles in the intermediate compartment to fluid having a relatively high temperature; a pump serving to draw the fluid from the lower portion of the first and last compartments; and pipes leading from the outlet of the pump and serving to spray the fluid withdrawn from the first and last compartments into the upper portion of said compartments.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

OTTO EICK.

Witnesses:
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JACOB F. MURBACH.

Pasteurizer
Aug. 1911

1,001,517

O. EICK.

PASTEURIZING APPARATUS.

APPLICATION FILED DEC. 16, 1908.

1,001,517. Patented Aug. 22, 1911.

5 SHEETS—SHEET 1.

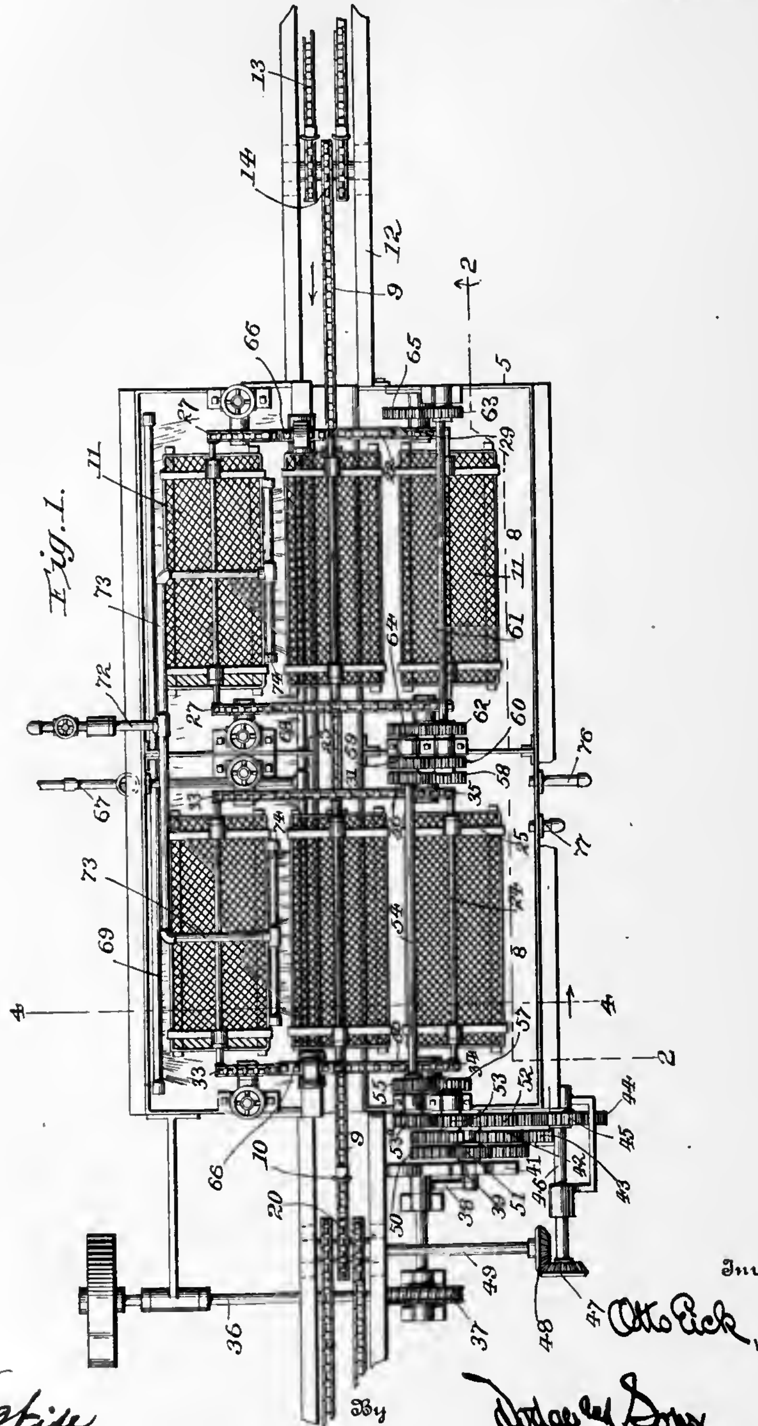

Fig. 1.

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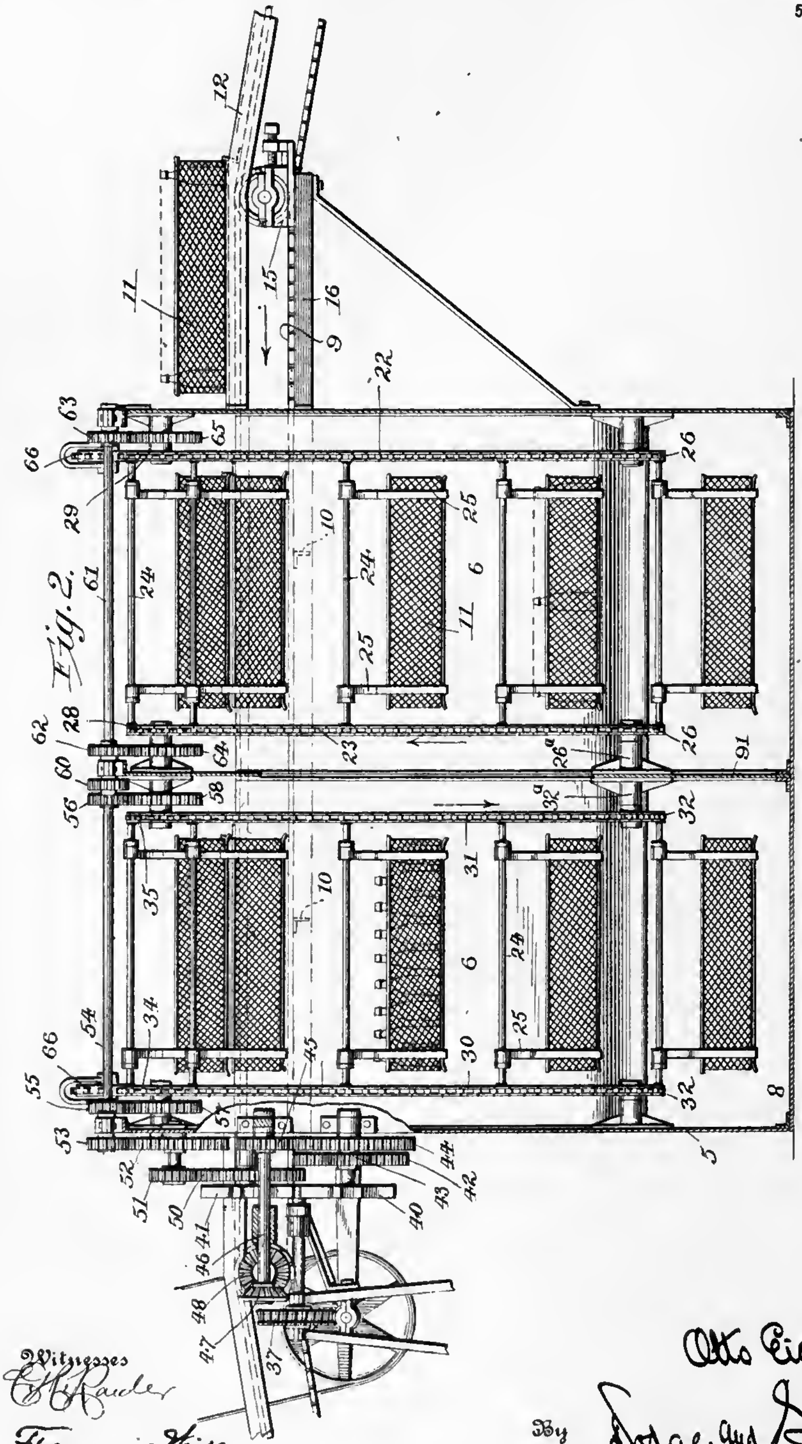

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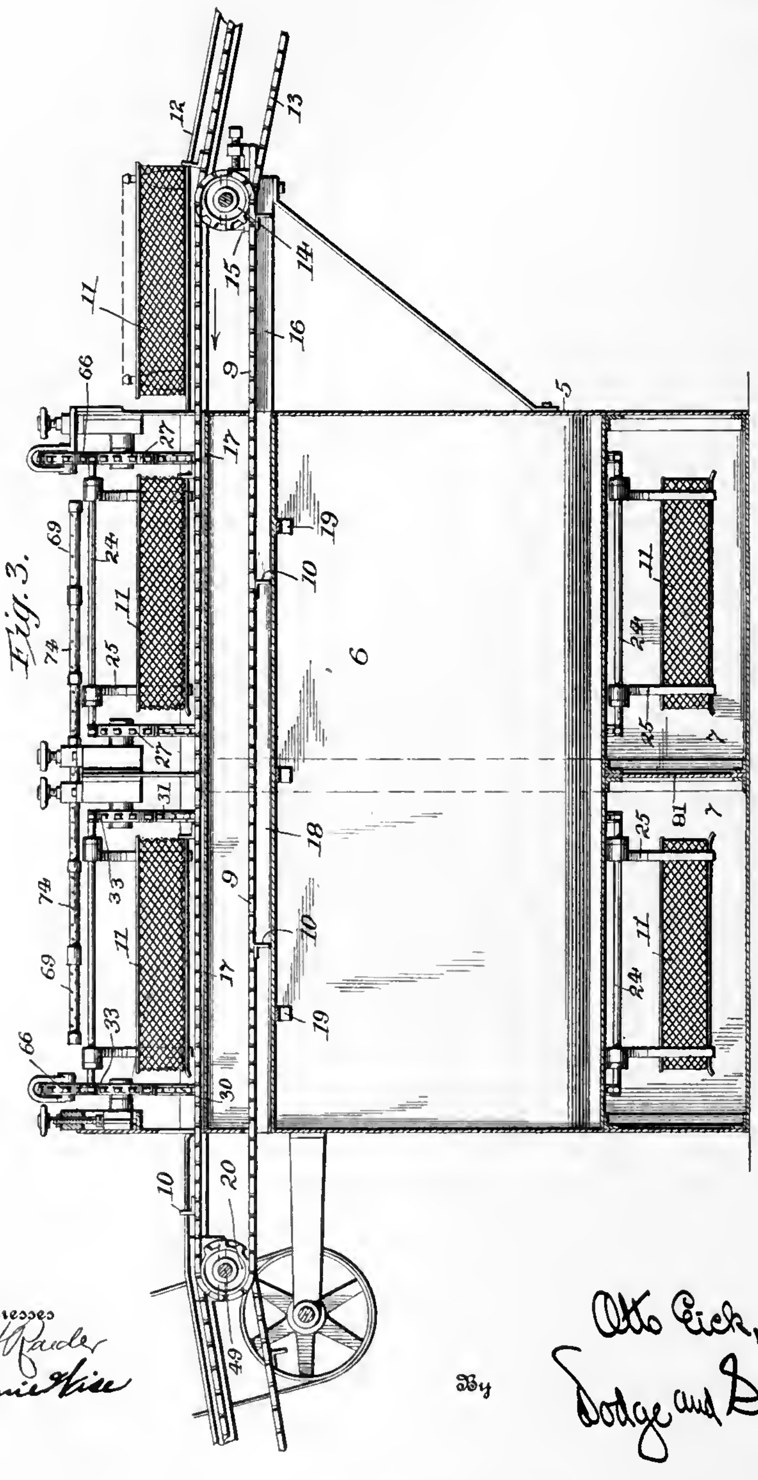
5 SHEETS—SHEET 3.



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APPLICATION FILED DEC. 16, 1909.

1,001,517. **Patented Aug. 22, 1911.**

5 SHEETS—SHEET 4.

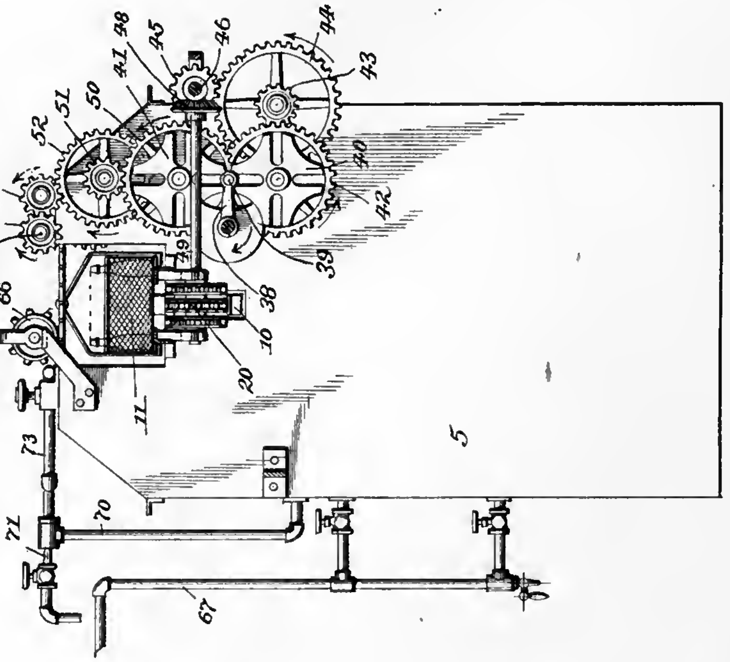

Fig. 5.

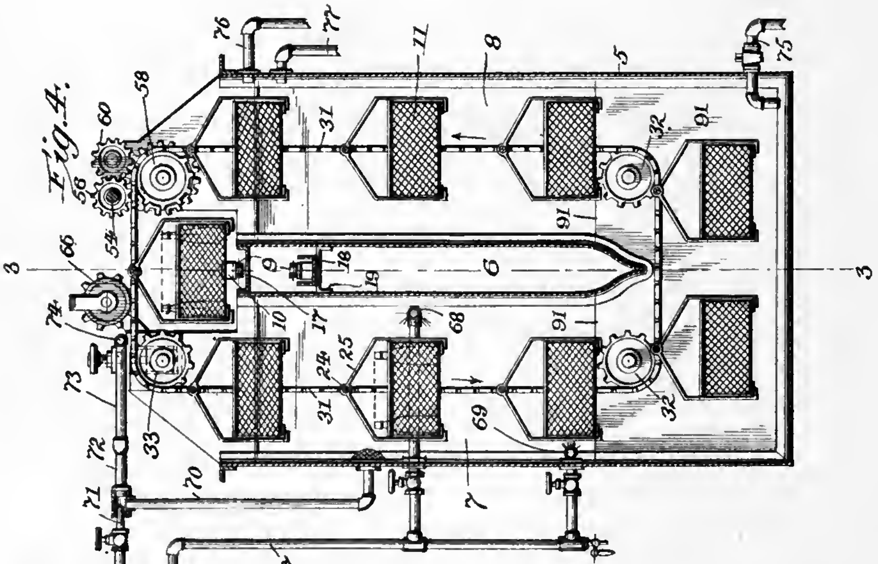

Fig. 4.

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APPLICATION FILED DEC. 16, 1908.

1,001,517. Patented Aug. 22, 1911.

5 SHEETS—SHEET 5.

Fig. 6.

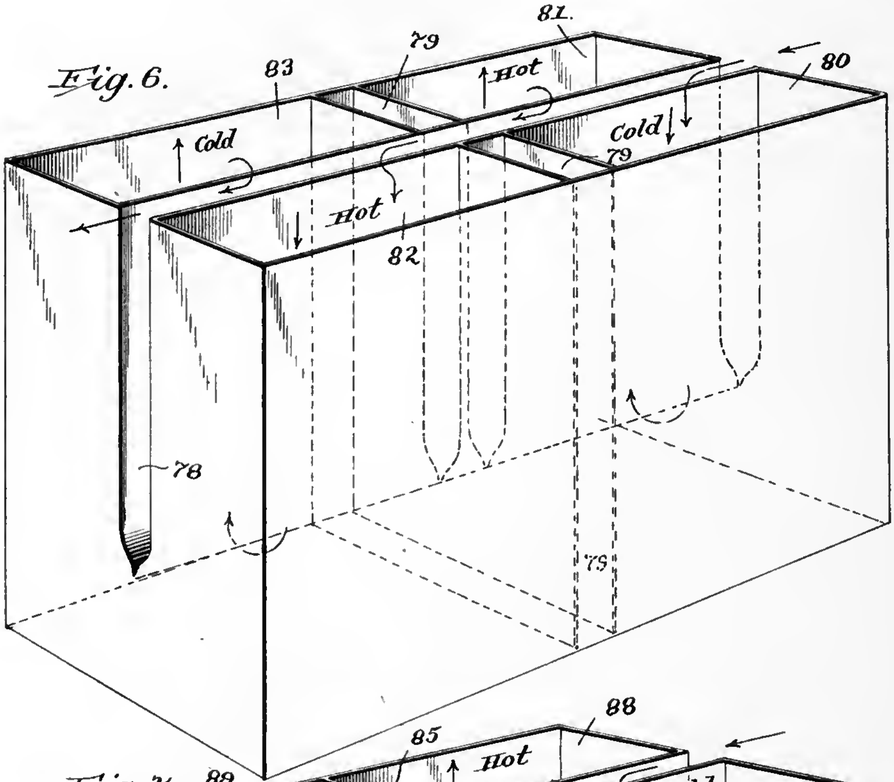
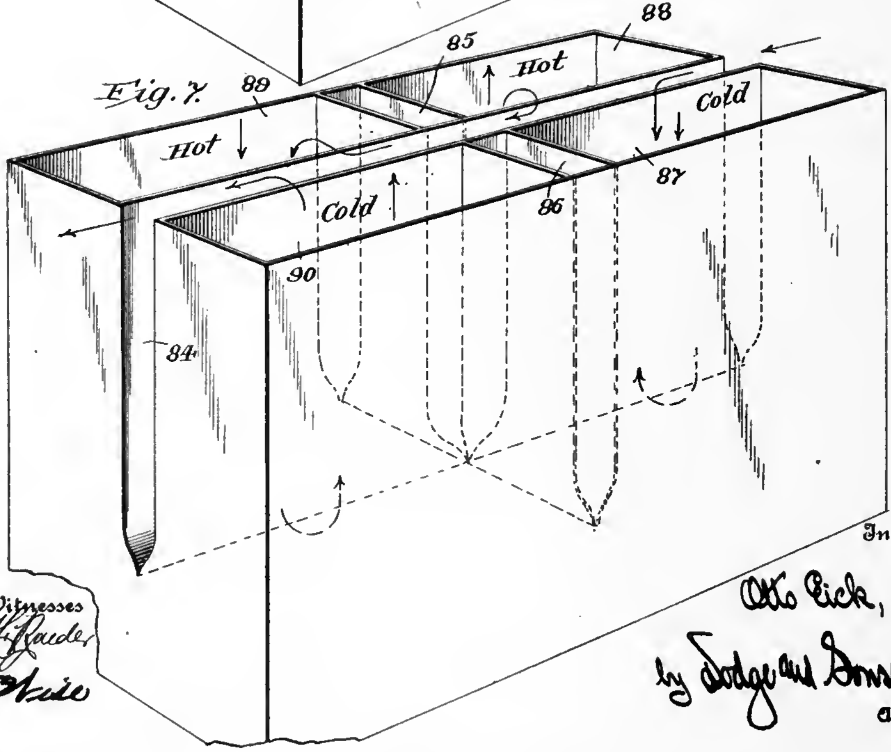


Fig. 7.



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PASTEURIZING APPARATUS.

1,001,517. Specification of Letters Patent. Patented Aug. 22, 1911.

Application filed December 16, 1908. Serial No. 467,886.

To all whom it may concern:

Be it known that I, OTTO EICK, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

My present invention pertains to improvements in pasteurizing apparatus, the construction and advantages of which will be hereinafter set forth, reference being had to the annexed drawings, wherein:

Figure 1 is a top plan view of the apparatus; Fig. 2 a vertical longitudinal sectional view, taken on the line 2—2 of Fig. 1; Fig. 3 a similar view, taken on the line 3—3 of Fig. 4; Fig. 4 a transverse vertical sectional view, taken on the line 4—4 of Fig. 1; Fig. 5 an elevation of the discharge end of the apparatus, the main driving shaft and its supporting members being broken away; Figs. 6 and 7, perspective views of the tank, with varying arrangements of partitions, and designed to give different paths of travel to the containers.

The main object of the present invention is to provide a simple and efficient apparatus for pasteurizing material in bottles or other containers, in which relatively few parts are employed, so that the apparatus is not liable to breakage and disarrangement.

A further object of the invention is to provide a construction in which the bottles are first passed down through a body of water which has been slightly heated, and then into a body of warmer or hot water, through which body they are traversed twice the distance they passed through the initial cold or partially warmed water, and finally, after the contents of the bottles have been pasteurized, the bottles are passed through the cold water and thereby gradually restored to their normal temperature. In passing through the cold water, the bottles tend to impart their heat to the water and to bring it to the desired temperature.

The apparatus in a broad sense may be said to consist of a single tank, divided into two compartments, one containing hot water and the second cooler water, said compartments communicating with each other at their lower ends, combined with means for first traversing the bottles down through the cold water compartment, thence upward through the hot water compartment, thence downward through the hot water compartment, and finally up through the cold water compartment to the point of discharge. The construction of the apparatus is such that all parts are readily accessible, and the use of long chains, so common in modern pasteurizing apparatus, is rendered unnecessary, relatively short chains or belts being employed in their stead.

In the drawings, 5 denotes the tank, preferably oblong in form and provided with a central hollow partition 6, which as will be seen upon reference to Fig. 4, extends from the upper portion of the tank to a point short of the bottom thereof, so as to divide the tank into two compartments, designated by 7 and 8, 7 denoting the hot water compartment and 8 the cold or warm water compartment.

An endless chain or carrier 9, provided with a series of push-plates or lugs 10 extends throughout the length of the tank and beyond the ends thereof, as clearly seen in Fig. 1, the upper stretch of the chain standing slightly above the upper edge of the tank, see Fig. 4, so that the lugs or push plates 10 may come into contact with the lower portion of baskets or crates 11, which are primarily placed upon a way 12, located at the forward or in-feed end of the tank.

Any suitable means may be employed for placing the baskets in position upon the way, an endless chain 13 being shown for the purpose of illustration.

The chain 9 passes around an idler 14 at the intake end of the apparatus, which idler is mounted upon a shaft carried in bearings 15 adjustably connected to a bracket 16, Figs. 2 and 3. The upper stretch of the chain is supported upon a cross plate 17 (see Figs. 3 and 4) secured in the upper portion of the hollow partition 6, while the lower stretch runs in a trough or channel 18, mounted upon suitable cross pieces or brackets 19 secured to the inner walls of the partition. At the discharge end of the machine the chain 9 passes about a sprocket 20 mounted upon a shaft to which motion is imparted through suitable gearing, as will be hereinafter set forth.

A pair of chains 22, 23, connected to each other by a series of cross-bars 24 from which are suspended open-ended basket-carrying frames 25, pass about idlers 26 located near the bottom of the tank, so that the lower stretch of the chains passes beneath the lower portion of the hollow partition 6. Said chains likewise pass over idlers 27, located in the upper portion of the tank, and about sprocket-wheels 28, 29, see Fig. 1. A second pair of chains, 30 and 31, provided with cross-bars and depending basket-carrying frames, the same as the other chains, pass about idlers 32, located adjacent to the bottom of the tank, so that the lower stretch of the chain will pass beneath the hollow partition 6, the same as the other chains, the chains also passing over idlers 33 located in the upper portion of the tank and over driven sprockets 34 and 35.

As will be seen upon reference to Figs. 2 and 4, the sprockets 26 and 32 are, respectively, carried by brackets 26^a and 32^a secured to a cross plate 91, said plate extending across the bottom of the tank and upwardly to a point slightly above the lower end of the partition to which it is secured. This plate serves merely as a supporting plate and leaves the compartments 7 and 8 substantially free throughout their length.

Mechanism is provided to drive one carrier, composed of chains, bars and baskets, and the other carrier composed of the other chains, bars and baskets, in opposite directions (in all the forms except the modified form illustrated in Fig. 6); that is to say, the forward carrier, or that at the in-take end, will pass downwardly into the cold-water compartment, thence beneath the partition up through the hot-water compartment, while the other carrier passes down through the hot-water compartment and up through the cold-water compartment. This driving mechanism acts intermittently, and while the carriers are at rest the chain 9 comes into action and serves to transfer one crate or basket from the first carrier to the second carrier, and to remove a crate from the second carrier to the point of discharge, a new crate likewise being introduced into the first carrier. It will thus be seen that after a basket or crate has been traversed by the first carrier through the cold-water compartment, thence upward through the hot-water compartment, it is transferred to the second carrier and moved downwardly through the hot water compartment and finally up through the cold-water compartment, when it is discharged from the machine. To effect this operation, the gearing shown, or its equivalent, may be employed.

36 designates the driving shaft, carrying a worm which meshes with a worm-wheel 37, upon whose shaft is mounted an arm 38 carrying an inwardly-projecting stud or roller 39, which coacts with the Geneva stops 40 and 41, acting alternately upon said stops. The lower member 40 imparts motion to a gear 42, which meshing with a pinion 43 imparts rotation to a gear 44 which in turn imparts motion to a pinion 45, carried upon a shaft 46. Said shaft has secured to its opposite end a bevel gear 47 which meshing with a corresponding gear 48 imparts motion to a shaft 49, upon which the sprocket 20, hereinbefore referred to, is secured. This gearing, as will be seen, will impart an intermittent step-by-step motion to the feed chain or conveyer 9. While it is in operation the Geneva stop 41 is at rest. Said stop 41 has secured to it a gear 50, which meshes with a pinion 51, mounted upon an axle with a gear 52, said gear 52 in turn meshing with a pinion 53 secured to a stub-axle. Said pinion 53 meshes with a pinion 53^a, mounted upon a shaft 54, which shaft carries pinions 55 and 56, which are in mesh, respectively, with gears 57 and 58 secured to stub-axles which carry the sprockets 34 and 35, thus imparting motion to the sprockets and consequently to the chains or carriers which pass over the sprockets. The shaft 54 has likewise secured to it a pinion 59 which meshes with a pinion 60 mounted upon a shaft 61, which shaft carries pinions 62 and 63, which mesh, respectively, with gears 64 and 65, which latter gears are secured to the stub-axles upon which the driving sprockets 28 and 29 are mounted. This arrangement of gearing will cause one of the carriers to move in a direction the reverse of the other. It is to be noted, however, that any suitable gearing for effecting this purpose may be used.

An idler 66 will preferably be located over the chain 22, in order that the frame 25 which is then uppermost may be held in its proper position before the introduction of a basket or crate into the same.

A steam pipe 67 will preferably be located at one side of the tank, adjacent to the outer face of the compartment 7, and spray pipes 68 and 69 will be placed in the tank in line with the frames 25 when they come to rest, or while the carriers are standing still and the chain 9 is being moved to introduce, transfer and discharge the crates. The steam will tend to heat the water and also to throw said hot water directly onto the baskets or crates in which the bottles or other containers are mounted.

A draw-off pipe 70, having its opening into the tank and located at a point below the upper end of the tank works in conjunction with a steam nozzle 71, steam issuing from the nozzle serving to draw the water upward through the pipe and force it through a pipe 72, with branches 73, and spray pipe 74 located above the basket-carrying chains and spray the bottles as they pass downward into the hot-water compartment. All of the water drawn up through the pipe 70 will be more or less heated by the steam jet. A drain pipe 75 is located at the lower portion of the tank, and an overflow pipe 76 will likewise be provided so as to maintain the proper level of water in the tank. A filling pipe 77 will also be employed.

It is possible, and in some cases may be desirable, to subdivide the tank to a greater extent than is indicated in Figs. 1 to 5 inclusive and as set forth in the above description. Thus in Fig. 6 I have shown a tank which is provided with a longitudinal, centrally-disposed partition 78 which extends downwardly toward the bottom of the tank and terminates at a sufficient height therefrom to permit the passage of the conveyer chains and the baskets or crates thereunder. The chambers formed upon each side of this partition are subdivided by a cross-partition 79, which is preferably hollow and extends from the bottom of the tank to the top thereof, as is clearly indicated in the drawings, thus forming four compartments 80, 81, 82 and 83.

The gearing is so arranged that the baskets are carried downwardly by the chains in the direction indicated by the arrow, that is, through compartment 80 which is filled with cold or relatively cold water or other fluid, thence up through the compartment 81 containing hot water, to the advancing mechanism which transfers the basket to the carriers working in the compartment 82 which is filled with hot water, the basket passing down through said compartment, beneath partition 78, and up through compartment 83, which is filled with cool or cold water. At this point it is discharged from the apparatus.

In Fig. 7 the tank is shown as divided by a longitudinal centrally-disposed partition 84 and cross-partitions 85 and 86, said partitions terminating at a point above the bottom of the tank and forming four compartments 87, 88, 89 and 90. The gearing will be so arranged that the carriers will cause the baskets to be traversed in the direction indicated by the arrows, to wit, down through the chamber or compartment 87, up through compartment 88, down through compartment 89, and up through compartment 90, where they will be discharged from the machine.

When cross-partitions are used it is found that the water or other liquid in the several compartments will not intermix to so great an extent as is the case where such partitions are not employed.

Having thus described my invention, what I claim is:

1. In a pasteurizing apparatus, the combination of a tank divided into two compartments which communicate with each other at their lower ends said compartments being adapted to hold a pasteurizing agent; a pair of carriers passing through each of said compartments and moving in opposite directions; and means for transferring the articles to be pasteurized from one carrier to the other.

2. In a pasteurizing apparatus, the combination of a tank divided into two vertically-disposed compartments in open communication at their lower ends, said compartments being adapted to contain a pasteurizing agent, means for passing the articles to be treated downwardly through one compartment and upwardly through the other; means for traversing the articles to be pasteurized through the compartments in a reverse direction; and means for transferring the articles from one traversing means to the other traversing means.

3. In a pasteurizing apparatus, the combination of a tank divided into two vertically-disposed compartments communicating with each other at their lower ends said compartments being adapted to contain a pasteurizing agent; a pair of endless carriers passing through each of said compartments; means for moving said carriers in opposite directions; and means for transferring the articles to be pasteurized from one carrier to the other, whereby the articles will be moved downward and upward through one compartment, and thence downward and upward through the other compartment.

4. In a pasteurizing apparatus, the combination of a tank divided into two vertically-disposed intercommunicating compartments adapted to hold a pasteurizing agent; an endless carrier mounted adjacent to one end of the tank, moving downward through one compartment and upward through the other; a second endless carrier moving through the compartments in a direction opposite to that of the first carrier; and means for transferring the holders for the articles to be pasteurized from one carrier to the other.

5. In a pasteurizing apparatus, the combination of a tank formed with two vertically-disposed compartments communicating with each other at their lower ends and adapted to hold a pasteurizing agent; a pair of endless carriers mounted in said tank and moving through each of the compartments the movement thereof being in opposite directions; means for transferring the crates or holders for the articles to be pasteurized from one carrier to the other; and means for heating the water in one of said compartments.

6. In a pasteurizing apparatus, the combination of a tank formed with two vertically-disposed compartments communicating with each other at their lower ends and

adapted to contain a pasteurizing agent; a pair of endless carriers mounted in said tank and moving through each of the compartments and in opposite directions; and means for heating the water in one of said compartments.

7. In a pasteurizing apparatus, the combination of a tank provided with two vertically-disposed compartments communicating with each other at their lower ends and adapted to contain a pasteurizing agent; a pair of endless carriers mounted in the tank and moving through each of the compartments and in opposite directions; means for imparting an intermittent step-by-step motion to said carriers; and means for introducing crates or the like holding the articles to be pasteurized into one carrier and transferring the previously-positioned crate from the first carrier onto the second carrier while the two carriers are at rest.

8. In a pasteurizing apparatus, the combination of a tank provided with two vertically-disposed compartments communicating with each other at their lower ends and adapted to contain a pasteurizing agent; a pair of endless carriers mounted in said tank and passing through each of the compartments and in opposite directions; means for imparting a step-by-step movement to said carriers; a conveyer located at the upper portion of the tank and acting to introduce the article-containing crates or the like into the first carrier, transfer said crates from the first to the second carrier, and discharge the same therefrom; and means for actuating said conveyer while the endless carriers are at rest.

9. In a pasteurizing apparatus, the combination of a tank provided with two vertically-disposed compartments communicating with each other at their lower end and adapted to hold a pasteurizing agent; a pair of endless carriers mounted in said tank and each adapted to pass through both compartments, each of said carriers comprising a pair of endless chains, cross-bars and carrying frames suspended from said cross-bars; means for imparting a step-by-step intermittent rotation to said carriers, one carrier moving in one direction and the other in a direction opposite thereto; a conveyer for introducing crates or like holders for the articles to be pasteurized into the first carrier, transferring the crates previously positioned from said first carrier to the second carrier and discharging the crates from the last-named carrier; and means for imparting motion to said conveyer while the carriers are at rest.

10. In a pasteurizing apparatus, the combination of a tank; a hollow wall or partition extending lengthwise thereof and terminating short of the bottom of the tank, whereby two vertically-disposed compartments will be formed, adapted to contain a pasteurizing agent; means for heating the water in one of said compartments; a pair of endless carriers passing through both of said compartments and beneath the partition; and means for traversing said carriers in opposite directions.

11. In a pasteurizing apparatus, the combination of a tank; a partition extending lengthwise thereof, terminating short of the bottom of the tank, whereby two vertically-disposed compartments will be formed, said compartments being adapted to contain a pasteurizing agent; a cross-partition subdividing the compartments transversely; a pair of endless carriers each passing through both of the compartments, arranged upon opposite sides of said lengthwise-extending partition; means for traversing said carriers; and means for heating the pasteurizing agent in those compartments where a relatively high temperature is to be maintained.

12. In a pasteurizing apparatus, the combination of a tank; a hollow wall or partition extending longitudinally thereof, terminating short of the bottom of the tank and forming longitudinally-disposed compartments; a cross-partition or partitions dividing the longitudinally-disposed compartments into a series of shorter compartments, each of said compartments being adapted to contain a pasteurizing agent; an endless carrier working in each of said pairs of compartments which are oppositely disposed to each other; means for traversing said carriers; and means for heating the pasteurizing agent in those compartments where a relatively high temperature is to be maintained.

13. In a pasteurizing apparatus, the combination of a tank; a hollow partition extending downwardly into the tank; a second hollow partition likewise extending downwardly into the tank, said partitions being arranged crosswise with relation to each other and subdividing the tank into a series of compartments intercommunicating with each other below the partitions, said compartments being adapted to contain a pasteurizing agent; and means for traversing the bottles or like containers which are to be pasteurized through the various compartments.

14. In a pasteurizing apparatus, the combination of a tank; a plurality of hollow partitions extending downwardly into said tank, said partitions being arranged crosswise with relation to each other and to the tank thereby forming a series of compartments separated from each other by air-spaces or chambers said compartments being arranged to contain a pasteurizing agent; endless carriers passing through said compartments; and means attached to said car-

riers for holding a basket or like support for bottles or similar containers which are to be pasteurized.

15. In a pasteurizing apparatus, the combination of a tank provided with a plurality of intercommunicating liquid-containing compartments; a plurality of endless carriers, each carrier extending through at least two of such compartments; and means for transferring the containers for the material being treated from one carrier to the next, whereby relatively short carriers may be employed and easy access had to the various portions of the apparatus.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

OTTO EICK.

Witnesses:
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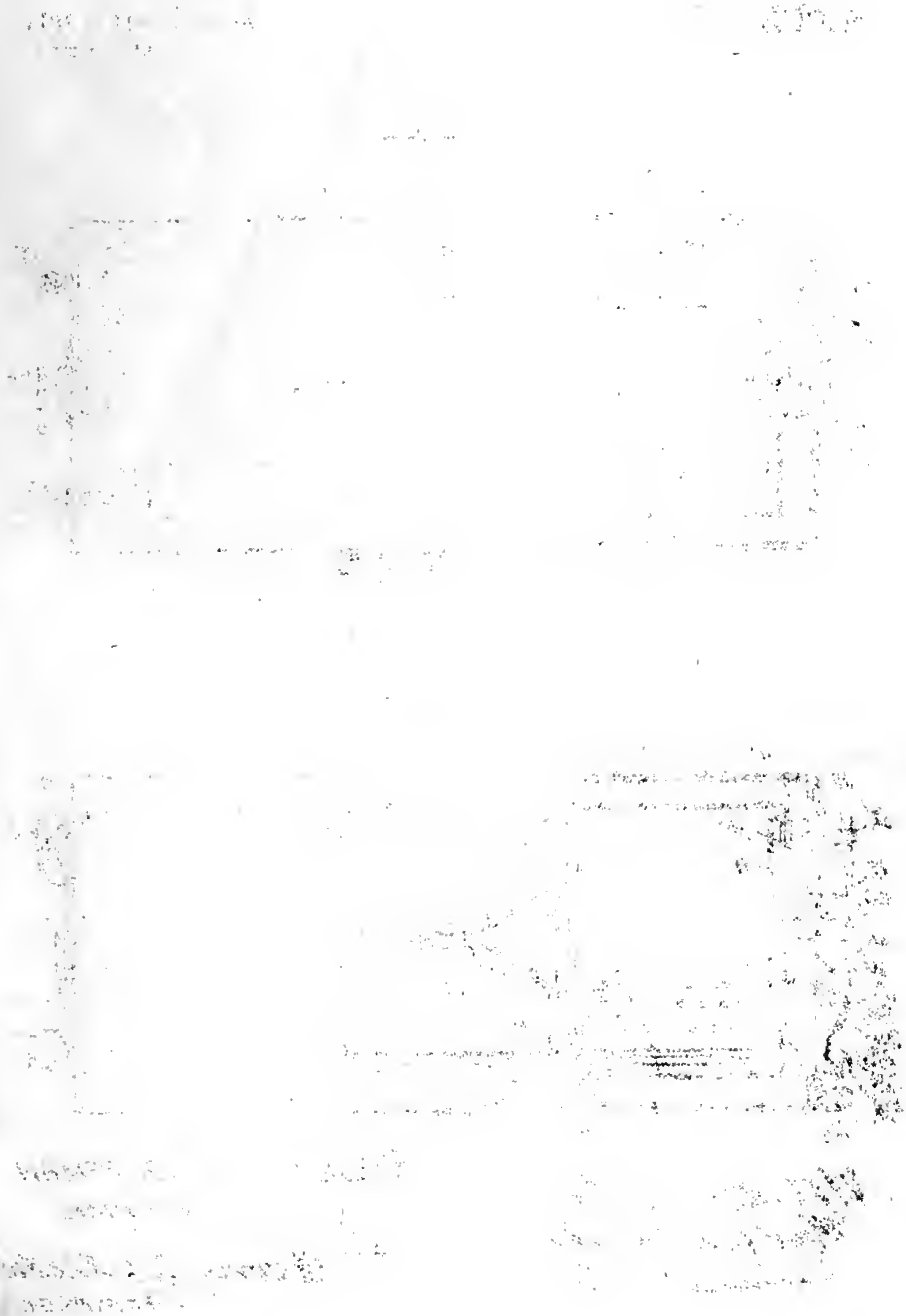
C. C. SAMPSON.

Pa

Sept, 1911

1,002,432



R. M. CAUFFMAN.
PASTEURIZING APPARATUS.
APPLICATION FILED OCT. 19, 1910.

1,002,499. Patented Sept. 5, 1911.

2 SHEETS—SHEET 1.

Fig.1.

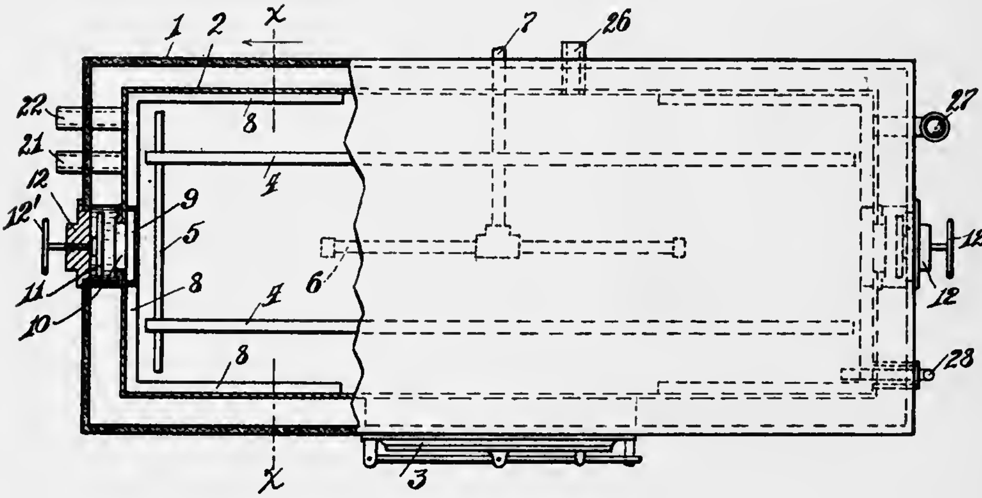
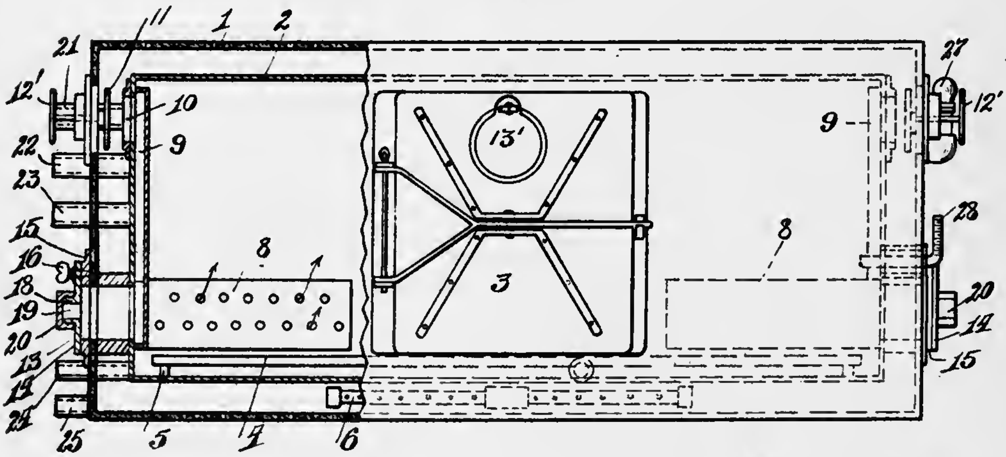


Fig.2.



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PASTEURIZING APPARATUS.

APPLICATION FILED OCT. 19, 1910.

1,002,499. Patented Sept. 5, 1911.

2 SHEETS—SHEET 2.

Fig. 3.

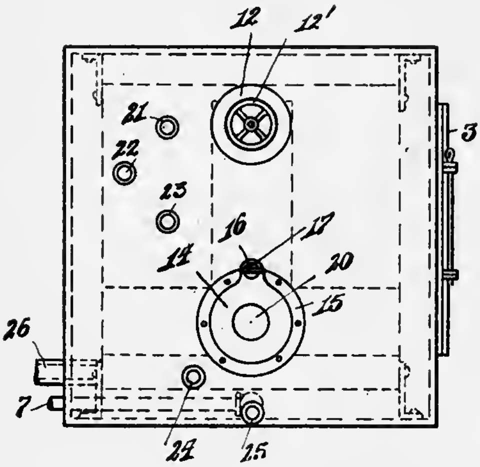


Fig. 4.

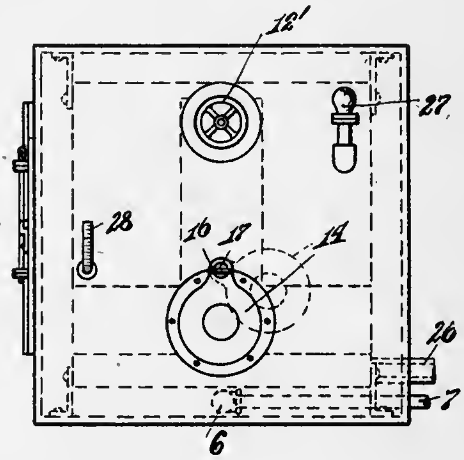
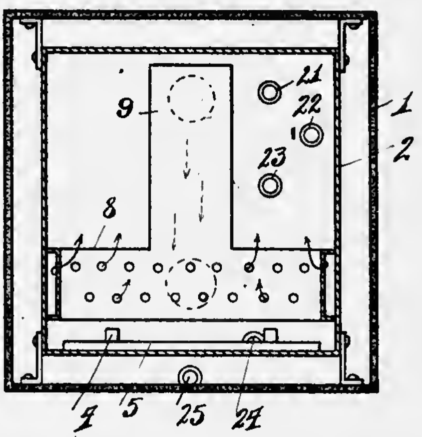


Fig. 5.



WITNESSES:

Madge Smith

Frances Rush

ROBERT M. CAUFFMAN.

INVENTOR.

By George J. Oltsch.

ATTORNEY.

UNITED STATES PATENT OFFICE.

ROBERT M. CAUFFMAN, OF CENTERVILLE, MICHIGAN.

PASTEURIZING APPARATUS.

1,002,499. Specification of Letters Patent. Patented Sept. 5, 1911.

Application filed October 19, 1910. Serial No. 587,791.

To all whom it may concern:

Be it known that I, ROBERT M. CAUFFMAN, a citizen of the United States, residing at Centerville, in the county of St. Joseph and State of Michigan, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

My invention relates to improvements in apparatus for pasteurizing milk, and has for its object the improvement of the construction and efficiency of devices of this character.

Another object of the invention resides in the provision of improved means for controlling and regulating the induction of the heating medium into the pasteurizing chamber, in order to obtain a more uniform distribution thereof throughout the chamber, and subject the bottled milk stored therein to practically the same temperature at one and the same time.

Another object of the invention resides in the provision of means for cooling the milk by the admission of water into the pasteurizing chamber, and partially submerging the milk bottles, and so regulating the admission of water as to raise its temperature by the heat of the walls of the chamber as it first flows thereinto, and before coming in contact with the highly heated bottles, and gradually reducing the temperature by continuing the flow of water into and out of the chamber.

With these and other objects in view, the invention consists of certain novel features of construction, as hereinafter shown and described, and specifically pointed out in the claims.

In the drawings employed for illustrating the preferred embodiment of the invention—Figure 1 is a plan view of the improved apparatus, partly in section. Fig. 2 is a front side elevation, partly in section. Fig. 3 is an end elevation of one end of the apparatus. Fig. 4 is an end eelvation of the opposite end thereof. Fig. 5 is a transverse section on the line x—x of Fig. 1.

The apparatus comprises an outer casing 1, the walls of which are preferably of two thicknesses of sheet metal, with a non-conducting material, as asbestos, between the walls. An inner casing 2 of sheet metal, is disposed within the outer casing, and spaced therefrom on all sides, except at that portion adjoining the door 3, through which access is had to the inner casing, the intervening space between the outer and inner casings being walled up around the door opening and corresponding opening in the inner casing. The door 3 is preferably hinged, as shown, and provided with a suitable latch device, and of a sufficient size to permit trays containing the bottled milk to be handily inserted into and removed from the inner casing or pasteurizing chamber. Bars 4 are disposed longitudinally of the inner chamber and upon cross bars 5 resting upon the bottom of said chamber, to serve as a rest or support for the trays containing the bottled milk, and hold the same elevated so that the heating as well as the cooling medium may pass around all sides of the trays.

Live steam is preferably used as a heating medium, and is supplied to the space between the outer and inner casing by a pipe 6, disposed between the bottom of the inner and outer casing, said pipe being perforated to permit the discharge and proper diffusion of the steam, and having a branch 7 extending through the outer casing, with which connection may be made with any suitable source of steam supply. Mounted within the inner casing and at each end thereof, are perforated ducts 8, which extend across the ends and along the sides of the casing, as shown. A branch 9 extends upwardly from each duct, and a valve opening 10 communicates with the upper end of each branch, so that when steam is admitted to the space between the outer and inner casing, it will enter through said valved openings into the ducts and out into the inner casing through the perforations, the discharge of the steam into the inner casing being thus widely distributed and subjecting all of the bottled milk stored therein to practically the same temperature at one and the same time, thus making for uniformity of treatment and obviating the necessity of over-treating a part of the milk in order to subject the remainder to the proper treatment to effect pasteurization. The steam thus freely circulates around the exterior and within the inner casing, thus subjecting the bottled milk to the direct action of the steam, the envelop of steam around the exterior heating the space between the casings and thereby indirectly imparting heat to the inner casing, as well as preventing the rapid radiation of the heat contained within the inner casing. After a sufficient quantity of steam has been admitted to the apparatus as may be necessary to bring the milk up to the proper temperature for pasteurization, the openings 10 are closed by means of the disk-valves 11, the stems of which are screw-threaded for engagement with screw-threaded apertures in the head members 12, which latter are in turn in screw-threaded engagement with openings in the outer casing, so that the valves may be easily and quickly removed for cleansing or repair. The valve stems are provided with hand-wheels 12′ for manipulating the same.

In order to control the temperature of the inner casing, so as to prevent breakage of bottles by a too sudden raising of, or by maintaining too high a temperature, air ducts 13 are provided which afford direct communication with the perforated ducts 8 near the bottom of the casing, through which cold air may be admitted to mix with the steam within the inner casing. The closures for the air ducts consist each of a disk 14, which has a smooth inner surface for contact with the flanges 15, and is clamped thereto by a thumb-screw 16, the shank of which passes through the disk near the upper edge thereof and is screw-threaded for engagement with a similarly threaded tap in the flange rim. The thumb-screw is provided with a head 17, so that upon tightening the screw the head will bear against and force the disk into tight contact with the flange. The door 3 is also provided with an inlet opening and a disk closure 13′ of the same type as above described. The thumb-screws also serve as a pivot for the disk closures, whereby any or all of the disks may be swung sidewise on their pivots so as to obtain the desired size of opening to permit the proper quantity of air to enter, the same being held in any adjusted position by simply tightening the thumb-screws. The disk closures at the ends of the apparatus are provided with coupling members 18, with an opening 19 therethrough, and a screw-cap 20 for closing the opening while steam is being admitted to the apparatus.

In order to effect a rapid cooling of the milk as well as the trays in which the bottles are placed, so as to permit same to be readily handled, and for their removal from the apparatus, water is injected into the inner casing by removing the screw-cap 20, and coupling a hose leading from a water supply to the coupling member 18. The hose may be attached at either end of the apparatus, whichever may be the most convenient, and the same results attained. In order to prevent breakage of the heated bottles, which would result by the cold water suddenly coming in contact therewith, the water is turned on gradually, so that the initial flow will have time to be warmed by the heat of the ducts and walls of the inner casing before rising to a height sufficient to contact with the bottom of the bottles, for which purpose the trays containing the bottles are elevated from the bottom of the casing, which would first fill with water before coming in contact with the bottles. As the water continues to flow into the casing the temperature of the water is gradually reduced, having absorbed all the heat of the ducts and casing walls, and the cooling of the milk effected without danger of fracturing the bottles. In order to prevent the water from rising above the upper ends of the bottles and mixing with the milk, where the same are not previously corked, or where ordinary paper disk stoppers, which are not always water tight, are used, overflow pipes 21, 22 and 23 are provided, which are located at different heights corresponding to the height of the bottles used, as half-pint, pint and quart bottles. The overflow pipes as well as the drain pipes 24, 25 and 26, are provided with suitable valves, (not shown) so as to permit same to be opened or closed, as occasion may require, during the admission of steam or water, or for draining the inner or outer casings.

The apparatus is provided with a suitable safety-valve 27, which has connection with the inner casing, so as to prevent excess steam pressure therein. A thermometer 28, readable from the exterior of the apparatus, is arranged within a tubular connection extending through the outer into the inner casing. The operator may thus readily ascertain the temperature within the inner casing, and manipulate the valves and closures controlling the admission of steam, air and water, so as to obtain the required temperature necessary for the pasteurization of the milk, and for the cooling of the same.

Having thus described my invention, what is claimed is—

1. In an apparatus of the class described, an outer and inner casing spaced apart, means for supplying a heating medium to the space between the casings, means having communication with said space for conducting and distributing the heating medium at divers points within the inner casing, a valve controlling said point of communication and operable from without the outer casing, an air duct leading from without the outer casing into direct communication with the means for distributing the heating medium within the inner casing, and an adjustable closure for the duct.

2. In an apparatus of the class described, an outer and inner casing spaced apart, means for supplying a heating medium to the space between the casings, perforated

ducts having communication with said space and arranged within and along the end and side walls of the inner casing, inlet openings extending from without the outer casing into said ducts, a closure for said openings comprising a disk, a combined pivot and clamping screw extending through said disk near the edge thereof, a coupling member formed integral with the disk having a bore extending through the disk, and a removable cap for the disk.

In testimony whereof I affix my signature, in presence of two witnesses.

ROBERT M. CAUFFMAN.

Witnesses:
THOMAS W. MORRISON,
ETHEL CROTHERS.

Pa

Oct. 1911

1,004,885

C. H. LOEW.

PROCESS OF PASTEURIZATION.

APPLICATION FILED DEC. 8, 1909.

1,004,885. Patented Oct. 3, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

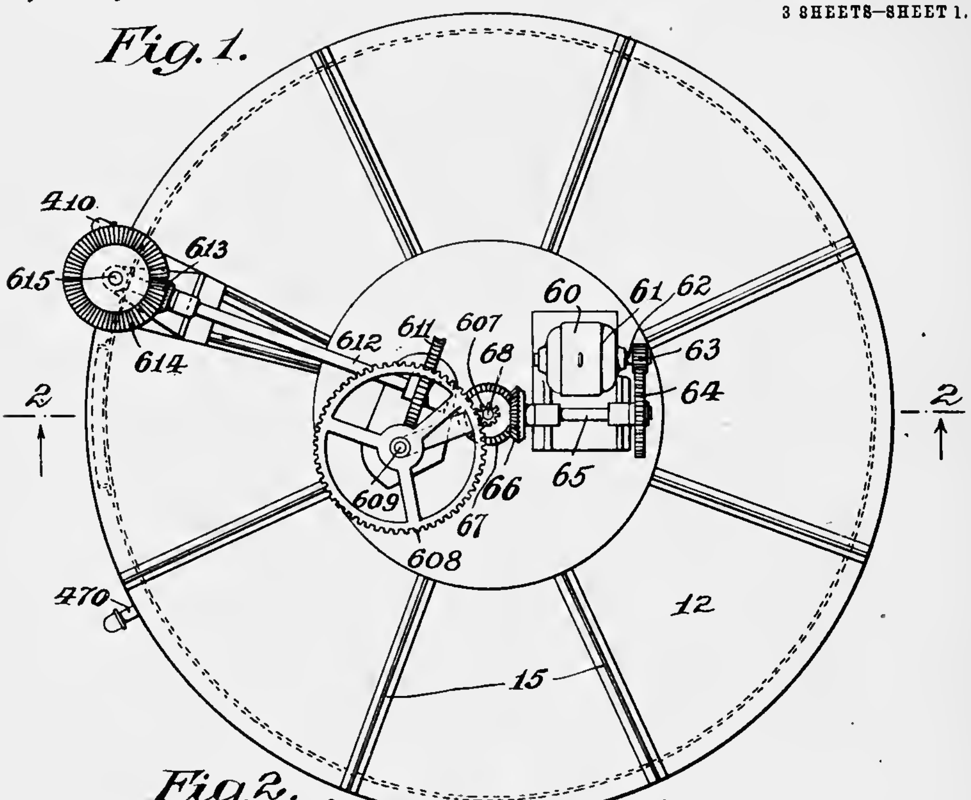
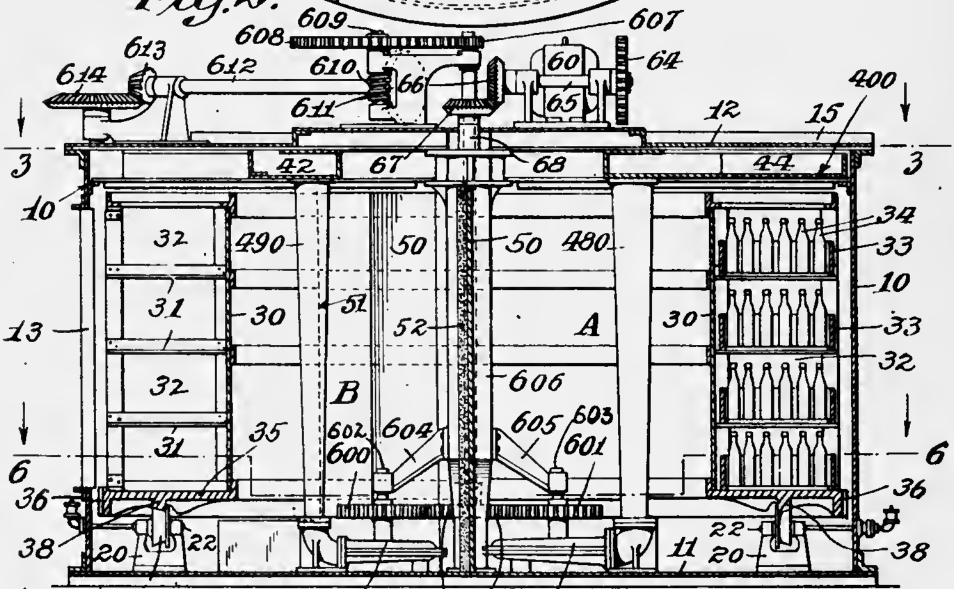


Fig. 2.



Attest:

Daisy Westervelt

Alan C. McDonnell

Inventor:

Charles H. Loew

by William R. Baird

his Atty.

C. H. LOEW.

PROCESS OF PASTEURIZATION.

APPLICATION FILED DEC. 8, 1909.

1,004,885.

Patented Oct. 3, 1911.

3 SHEETS—SHEET 2.

Fig. 3.

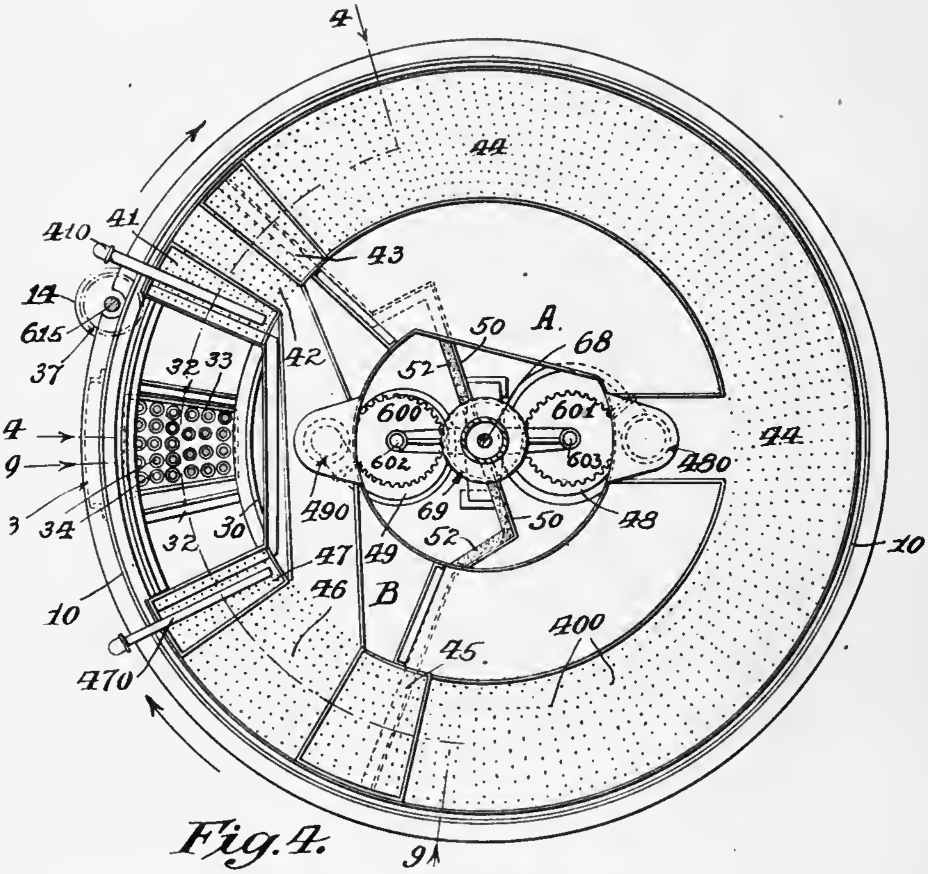


Fig. 4.

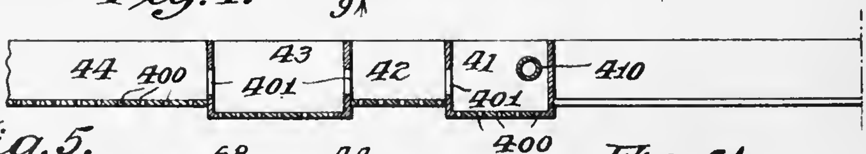


Fig. 5.

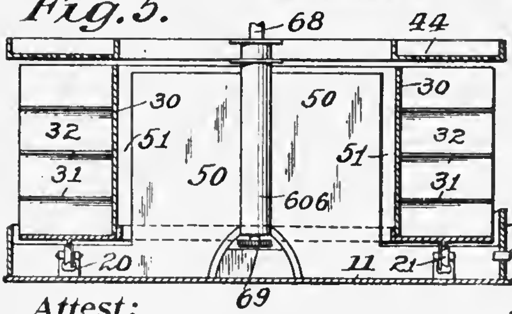
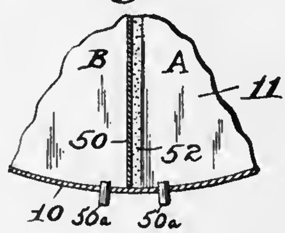


Fig. 5★.



Attest:

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his Atty.

C. H. LOEW.

PROCESS OF PASTEURIZATION.

APPLICATION FILED DEC. 8, 1909.

1,004,885. Patented Oct. 3, 1911.

3 SHEETS—SHEET 3.

Fig. 6.

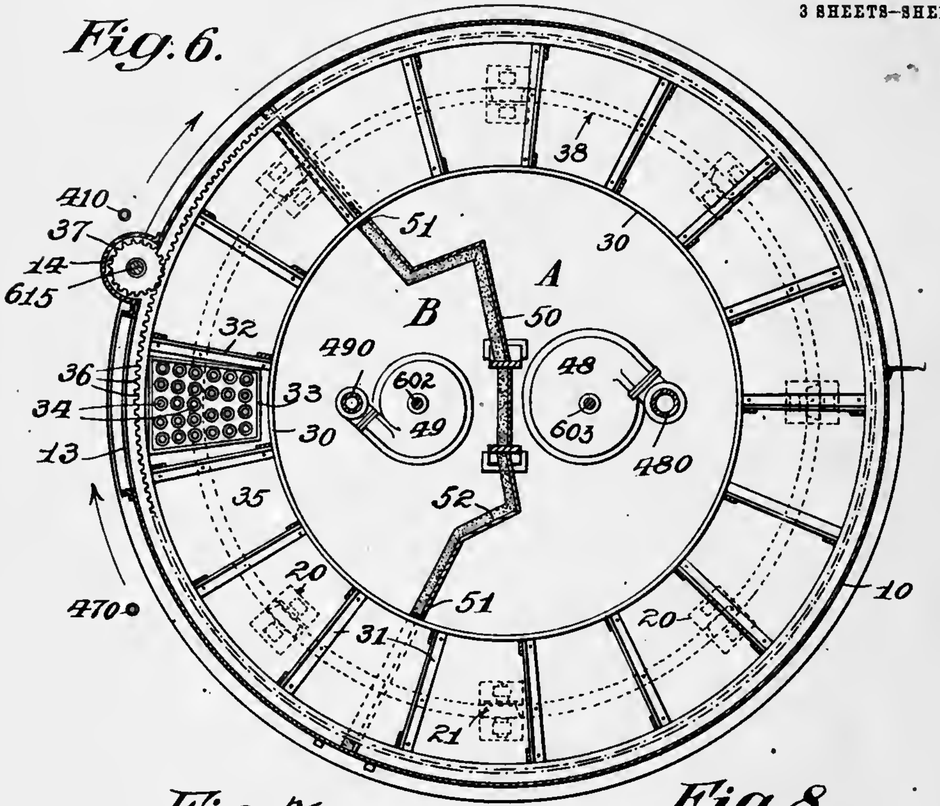


Fig. 7.

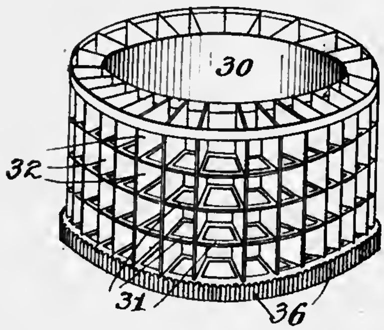


Fig. 8.

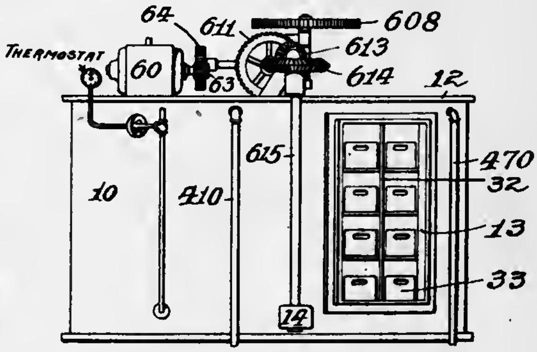
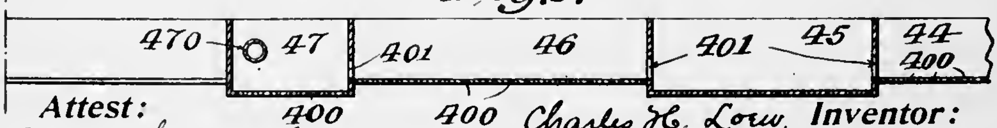


Fig. 9.



Attest:

Daisy Westervelt.

Alan C. McDonnell.

Charles H. Loew, Inventor:

by William R. Baird

his Atty.

UNITED STATES PATENT OFFICE.

CHARLES H. LOEW, OF LAKEWOOD, OHIO.

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 vertical 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.

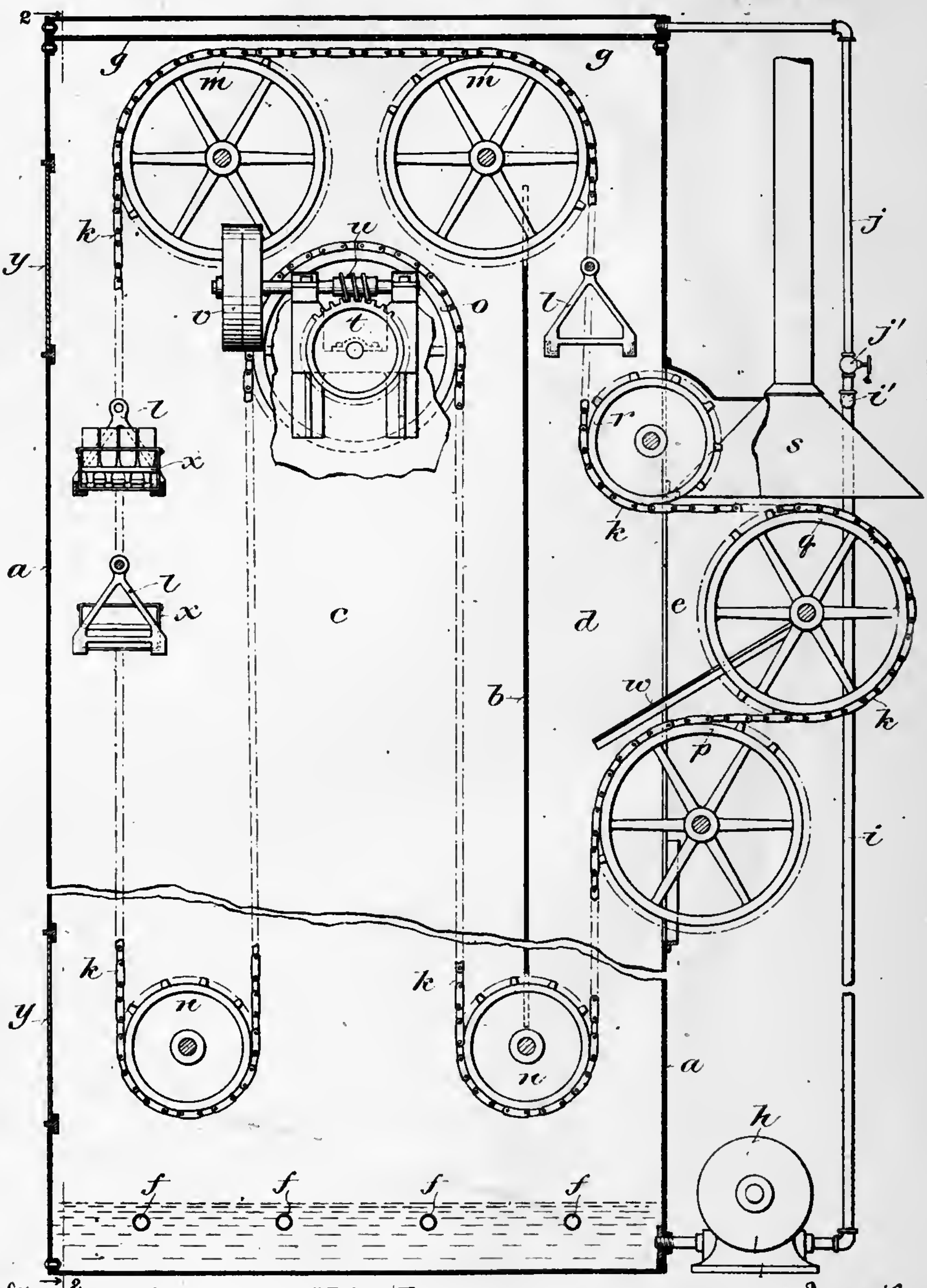
A. S. LINDEMANN & H. F. STOCK.

PROCESS OF PASTEURIZING BOTTLE BEVERAGES.

APPLICATION FILED JUNE 6, 1906.

1,005,854. Patented Oct. 17, 1911

3 SHEETS—SHEET 1.



Witnesses:
Fred Palm.
Chas. L. Goss.

Fig. 1.

Inventors.
August S. Lindemann
Henry F. Stock
By Wheeler, Anders, Smith, Whitney & Prevost
Attorneys

A. S. LINDEMANN & H. F. STOCK.
PROCESS OF PASTEURIZING BOTTLE BEVERAGES.
APPLICATION FILED JUNE 8, 1906.

1,005,854.

Patented Oct. 17, 1911.

3 SHEETS—SHEET 2.

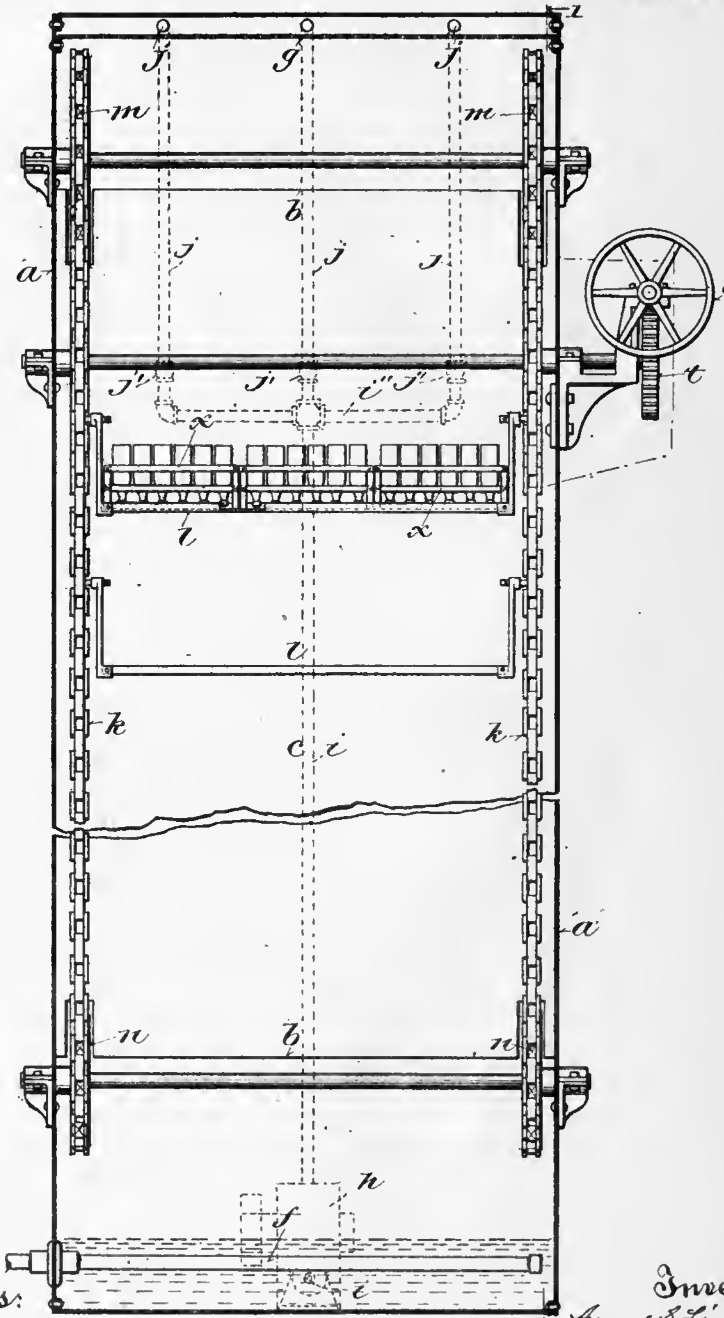


Fig. 2.

Witnesses:
Fred Palm.
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Inventors:
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Henry F. Stock
By Winkler Flanders Smith Bottum & Vilas
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3 SHEETS—SHEET 3.

Fig. 3

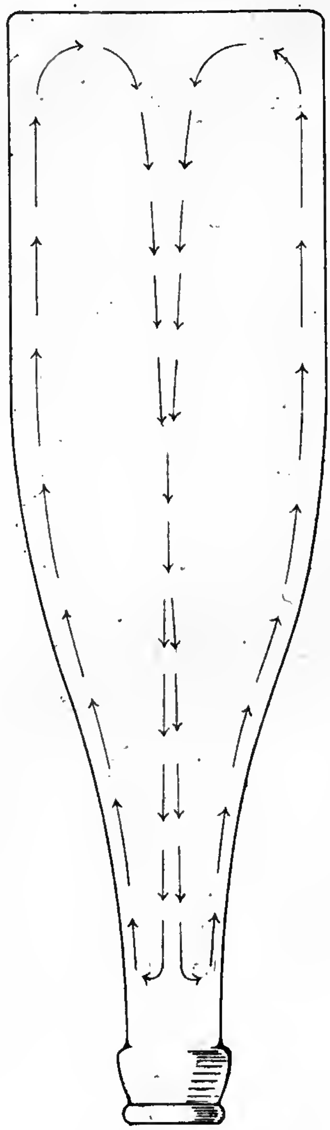
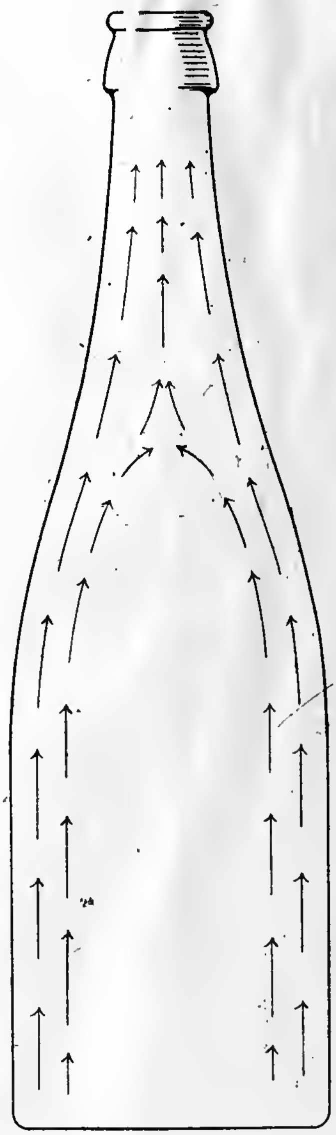


Fig. 4



Witnesses:
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Bernard C. Roloff.

Inventors:
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Attorneys.

UNITED STATES PATENT OFFICE.

AUGUST S. LINDEMANN, OF MILWAUKEE, AND HENRY F. STOCK, OF WAUKESHA, WISCONSIN, ASSIGNORS TO MILWAUKEE-WAUKESHA BREWING COMPANY, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

PROCESS OF PASTEURIZING BOTTLE BEVERAGES.

1,005,854. Specification of Letters Patent. Patented Oct. 17, 1911.

Application filed June 8, 1906. Serial No. 320,690.

To all whom it may concern:

Be it known that we, AUGUST S. LINDEMANN and HENRY F. STOCK, citizens of the United States, residing at Milwaukee, in the county of Milwaukee, and at Waukesha, in the county of Waukesha, respectively, in the State of Wisconsin, have invented certain new and useful Improvements in Processes of Pasteurizing Bottle Beverages, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

The main objects of this invention are to heat the liquid quickly and uniformly to the desired temperature, thus saving time and energy or heat and avoiding injury to the product by keeping it too long at a high pasteurizing temperature; to prevent or reduce loss by breakage of bottles due to uneven heating and unequal expansion thereof; and generally to improve processes of this class.

It consists in certain novel features in the manner of performing the operations which constitute the process as hereinafter particularly described and pointed out in the claims.

In the accompanying drawing, showing suitable apparatus for carrying out the process, like characters designate the same parts in the several figures.

Figure 1 is a side elevation and vertical section on the line 1 1, Fig. 2, of the apparatus; Fig. 2 is a vertical section of the same on the line 2 2, Fig. 1; and Figs. 3 and 4 are diagrams on an enlarged scale illustrating the difference in the effect upon the contents of a bottle when subjected in an inverted position to an external heating medium, from that produced when the bottle is held in an upright position.

Referring to Figs. 1 and 2, *a* designates a casing which may be conveniently constructed of sheet metal. It is partially divided by a vertical partition *b* into two compartments *c* and *d*, which may be called respectively the pasteurizing compartment and the warming and cooling compartment, and is provided in the side next to the compartment *d* with a feed and delivery opening *e*. The lower part of the casing is made to hold a pasteurizing liquid and is provided with suitable means such as a steam coil or pipes *f* for heating such liquid. The upper part of the casing is provided with a sprinkler chamber or head which may be conveniently formed by a perforated horizontal plate *g* secured at its edges to the side walls of the casing. A pump *h* connected on the suction side with the lower part of the casing and on the discharge side with the sprinkler chamber, is provided for elevating the pasteurizing liquid from the lower part of the casing into said chamber. The discharge pipe *i* connects with a header i^1 from which a number of branch pipes *j*, each provided with a valve j^1, lead into the sprinkler chamber or head for distributing and regulating the supply of liquid delivered thereto. An endless conveyer consisting of link belts *k* and bottle carriers *l* pivotally connected therewith at intervals, is supported and guided within the casing by sprocket wheels *m*, *n*, and *o*. Adjacent to the opening *e*, sprocket wheels *p* *q* and *r* are arranged to form a horizontal loop in the conveyer and to carry the link belts in and out through said opening for convenience in loading and unloading the carriers. Above the opening *e* outside of the casing a hood *s* communicating at the top with an escape pipe or flue is provided to catch and conduct off the steam issuing from said opening. The conveyer supporting and guiding wheels are arranged to conduct the belts *k*, with the bottle carriers *l* suspended therefrom, upwardly from the opening *e*, through the upper part of the compartment *d* over the upper wheels *m*, across the upper part of the chamber inclosed by the casing below the sprinkler plate *g*, thence down through the compartment *c* around one set of wheels *n*, thence up over the wheels *o*, thence down again around the other set of wheels *n* at the lower end of the partition *b*, thence up through the lower part of the compartment *d* around the wheels *p*, thence outward through the opening *e* around the wheels *q*, thence backward through said opening around the wheels *r*. The conveyer is driven by any suitable connection or connections with one or more sets of the sprocket wheels above mentioned. For this purpose the shaft of the wheels *o* may be provided at one end outside of the casing, as shown, with a worm gear *t* meshing with a worm *u* on a transverse shaft which is provided with loose and tight pulleys v for connecting it by a belt with a suitably located driving pulley (not shown). An inclined deflecting plate w, extending downwardly from a line adjacent to the axis of the wheels q through the opening e is provided to catch and conduct the spray falling through the upper part of the compartment b upon the bottles ascending through the lower part of said compartment. Open crates or bottle receptacles x removably fitted in the carriers l are provided for holding bottles in an inverted position, and to facilitate loading them upon and removing them from the carriers l as they pass out and in through the opening e. The back of the casing a is provided adjacent to the upper and lower sprocket wheels m and n, with doors or removable sections y for affording easy access to the interior of the apparatus.

In carrying out our process the apparatus hereinbefore described operates as follows: The water or other liquid pasteurizing medium contained in the lower part of the casing being heated by the steam coil or pipes f, and maintained at the required temperature, and the conveyer being set in motion, bottles containing the beverage to be pasteurized are loaded in crates or receptacles x upon the carriers l as they pass outside of the casing through the opening e around the wheels q. The ingoing bottles during their ascent through the upper part of the compartment d, are sprayed or sprinkled with the hot liquid issuing from the perforations in the plate g over said compartment, and are thus gradually heated so that they will not be broken by being suddenly subjected to the bath or spray of hot liquid as it issues directly from the sprinkler head or chamber. The hot liquid flowing down over the bottles in successive carriers in imparting its heat thereto is cooled and utilized, as hereinafter explained, to gradually cool the outgoing bottles ascending through the lower part of said compartment d. In their passage across the upper part of the apparatus and down and up through the compartment c, the bottles are subjected to the descending spray of hot liquid from the sprinkler head or chamber, and they and their contents are rapidly brought to a pasteurizing temperature and kept at that temperature a sufficient length of time to destroy yeast germs.

The bottles being held with their necks downward in their entire circuit through the apparatus, the comparatively small volume of liquid contained in their necks being heated sooner than the much larger volume in their bodies, rises and produces a circulation within the bodies of the bottles, as indicated by arrows on Fig. 3. By reason of this free circulation the liquid contents of the inverted bottles are quickly and uniformly heated to the required temperature, thereby materially shortening the time required for pasteurizing. In this way a saving is effected not only in time but also in heat, or in the fuel or energy required to produce it. A better product is also obtained, particularly in the treatment of beverages such as fermented malt liquors which are detrimentally affected by being subjected to a high temperature for a longer period than is absolutely necessary to destroy yeast germs.

According to the usual method of pasteurizing bottle beverages the bottles are held in an upright position, as shown in Fig. 4, and their contents next to the glass being first heated, rises into their necks, as indicated by arrows. The rising currents being congested and arrested in the bottle necks, the hotter portion of the liquid is confined therein, while the greater and cooler portion remains at or near the bottoms or in the bodies of the bottles. It will thus be seen that a very sluggish circulation of the contents of the bottles when they are held in an upright position is produced by the heating medium to which they are exposed on the outside. The contents of the bottles being thus slowly and unevenly heated, a much longer time is required to produce the desired effect and much greater breakage of the bottles will result on account of the concentration of heat in their necks and the consequent unequal expansion of the glass. On the other hand, when the bottles are subjected to the heating medium in an inverted position according to the present invention, their contents next to the glass being first heated rises into the larger parts of the bottles where ample room is afforded for the rising currents to turn and descend, as shown in Fig. 3. This results in a free and rapid circulation throughout the contents of the bottles and a consequent acceleration of the pasteurizing process. The liquid contained in the bottles is uniformly and quickly heated, uneven expansion and breakage of the bottles are avoided, and a better product is obtained.

As the bottles ascend through the lower part of the compartment d they are sprayed or flowed with the water which has been cooled by the ingoing bottles and are thus gradually cooled as they approach the opening e, the temperature of the liquid flowing over the outgoing bottles being again raised before it reaches the bottom of said compartment to repeat its circuit through the apparatus as above explained.

By sprinkling, spraying or flowing the hot liquid over the bottles as they are moved with the conveyer through a closed chamber, it has been found that the liquid can be heated to a higher initial temperature and that the contents of the bottles can be raised to a pasteurizing temperature in a shorter time than by moving the bottles through or immersing them in a hot liquid bath according to the usual method. Furthermore, with the present method of pasteurizing by sprinkling or spraying the bottles with the hot liquid, there is less liability of overheating and injuring their contents in case of break-down or stoppage of the apparatus, since the supply of hot liquid to the sprinkler chamber or head can be instantly shut off, whereas, on the other hand, considerable time would be required to draw off the hot bath with which the pasteurizing tank or chamber is supplied according to the usual practice. Although sprinkling, spraying or flowing the bottles containing the beverage to be pasteurized is the only method described of subjecting a bottled beverage to a pasteurizing medium, the advantages obtained by subjecting the bottles containing the beverage to the pasteurizing medium with the necks of the bottles downward, may be obtained with the pasteurizing medium in different conditions, such as a spray, vapor or liquid bath, or with different mediums.

We claim:

1. The process of pasteurizing bottled beverages consisting in subjecting the bottles with their necks downward to a heating medium till their entire contents are brought to a pasteurizing temperature, substantially as described.

2. The process of pasteurizing bottled beverages consisting in moving the bottles with their necks downward through a heating medium till their contents are heated to a pasteurizing temperature, substantially as described.

3. The process of pasteurizing bottled beverages consisting in sprinkling the bottles while held necks downward with a hot liquid till their contents are heated to a pasteurizing temperature, substantially as described.

4. The process of pasteurizing bottled beverages consisting in moving the bottles with their necks downward through a spray of hot liquid till their contents are brought to a pasteurizing temperature, substantially as described.

5. The process of pasteurizing bottled beverages consisting in moving the bottles with their necks downward vertically through a falling spray of hot liquid till their contents are brought to pasteurizing temperature, substantially as described.

In witness whereof we hereto affix our signatures in presence of two witnesses.

AUGUST S. LINDEMANN.
HENRY F. STOCK.

Witnesses:
CHAS. L. GOSS,
BERNARD C. ROLOFF.

F

Nov. 1911

1,009,686

W. H. PARK.
PASTEURIZING PROCESS.
APPLICATION FILED FEB. 1, 1911.

1,009,686. Patented Nov. 21, 1911.

Fig. 1.

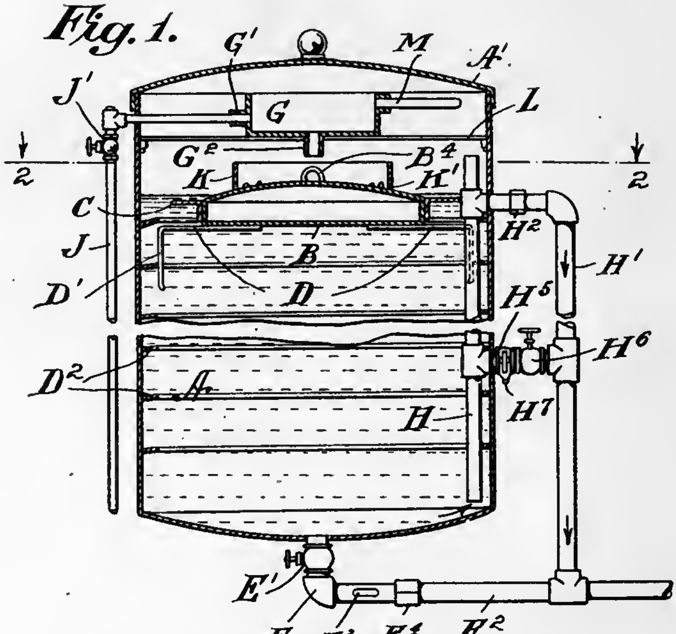
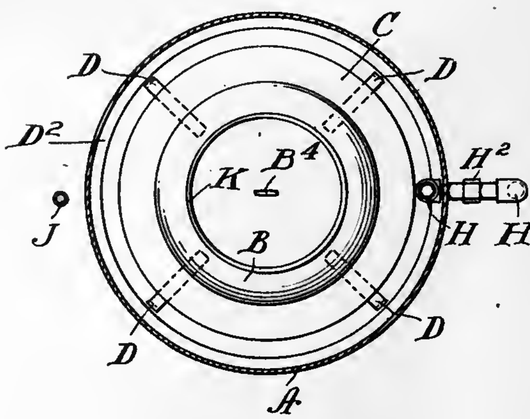


Fig. 2.



Attest:
Sara G. O'Rourke
Alan C. McDonnell

Wm. H. Park Inventor:

by S. J. Cox Att'y

UNITED STATES PATENT OFFICE.

WILLIAM H. PARK, OF NEW YORK, N. Y.

PASTEURIZING PROCESS.

1,009,686. Specification of Letters Patent. Patented Nov. 21, 1911.

Application filed February 1, 1911. Serial No. 605,903.

To all whom it may concern:

Be it known that I, William H. Park, a citizen of the United States, and a resident of the borough of Manhattan, in the county of New York, city and State of New York, have invented certain new and useful Improvements in Pasteurizing Processes, of which the following is a specification.

The invention relates to a process of pasteurizing milk and other liquids, and its objects are among others, to provide a process whereby the liquid, after being heated to a pasteurizing temperature may be maintained at that temperature for a sufficient period to insure the thorough elimination of bacteria while flowing continuously from the heating apparatus to the cooler or other receptacle, and to insure its operation against accidental or intentional interruption.

It will be understood that it is desirable to have the pasteurizing operation continuous and the flow of the liquid, into the apparatus, through the apparatus for maintaining it for a sufficient time at the proper temperature, through the cooler—if such a device is used—and to the receptacle in which it is to be transported, continuous, so that it is only necessary for the operators to feed the milk at one end of the apparatus and withdraw it from the other in order to secure its thorough pasteurization. All unnecessary delay is thus avoided, and the handling of the liquid intermediate the beginning and the end of the process is obviated. Owing to the fact, however, that the movements of liquid in passing through containers of considerable area cannot be controlled by ordinary mechanical means, and is affected in various ways by friction between it and the walls and other parts of the container, it has not hitherto been possible in an apparatus providing for the continuous flow of the liquid to prevent some of the said liquid from passing therethrough quicker than is desired; and this difficulty gives rise to uncertainty of a thorough pasteurization of all the liquid, rendering the process to a great extent ineffective and undependable.

In view of the fact that milk and other liquids intended for human consumption are often impregnated with germs of disease, the importance of providing a process which will insure that none of the liquid has escaped the pasteurization will be understood.

While the process herein described is of great value in an apparatus consisting of a heater and retaining holder and a cooler, it must not be understood that its use is limited to such an apparatus, since the process may be carried out in any suitable apparatus—whether provided with a heater or a cooler forming a part thereof, or not—and that the liquid may be heated in any desired manner, and caused to flow to any desired receptacle after being subjected to the action of this process.

In the accompanying drawings, I have illustrated an apparatus by which the process may be carried out, and in these drawings, Figure 1 is a vertical medial section of such an apparatus, and Fig. 2 is a horizontal cross section of the same on the line 2—2 of Fig. 1, looking in the direction indicated by the arrows.

In order to explain the process I will describe the action of the apparatus, shown in the drawings, in which A represents a cylindrical holder provided with annular horizontal flanges D^2 secured to the inner wall of the holder and projecting slightly upward. The purpose of these flanges is to prevent the liquid from gravitating toward the bottom of the holder along its walls. I have found by careful experiment that there is a tendency of the liquid in the holder to gravitate more rapidly along the walls than in the interior of the body of liquid therein. This is due to the fact that the cooling of the liquid begins at the walls and that as soon as the liquid near the walls is cooled it will start to gravitate toward the bottom of the holder for the reason that the lowering of its temperature increases its specific gravity relative to the liquid on the same level in the interior. The flanges D^2 will tend to prevent this action and give the cooling liquid at the walls an inward and slightly upward movement.

The supply pipe J is provided with a valve J′ by which the flow of liquid to the holder may be regulated so as to provide for the filling and emptying thereof at a rate that will insure proper pasteurization. By making the depending outlet tube of the receptacle G of the proper size and capacity, however, this result may be accomplished without the use of a valve, and in this case a more rapid flow of liquid than is desired cannot be caused.

The outlet is through the pipe H leading from the bottom of the holder to a point near the top thereof, and provided with a branch pipe H′ extending through the wall of the holder and adapted to be used for the filling of any suitable receptacle. In order that all siphoning action of this pipe may be avoided, its upper end extends above the outlet level and is open. It will be seen that when the liquid rises to the level of the branch pipe H′, it will begin to flow out from the bottom of the holder through this pipe and will continue to flow out as long as the liquid is supplied to the holder. When the supply ceases, the liquid remaining in the holder may be siphoned out by stopping the upper end of the pipe H, or discharged through the outlet E in the extreme bottom of the holder, which is ordinarily closed by the valve E′. This outlet is also useful in the operation of cleaning the holder and, where the contents are siphoned out, for draining the bottom thereof. The pipe H′ joins the pipe E^2 at its lower end, and this pipe may be provided with a sight glass E^3 in order that the operator or inspector, under whose supervision the pasteurization is carried on, may be sure that no liquid is being discharged through this pipe during the normal operation of the apparatus. The pipe E^2 is provided with a joint secured by a collar E^4 and the pipe H′ with a similar collar-secured joint H^2, in order that they may be removed for thorough cleansing and for transportation purposes.

The receptacle G is positioned and supported upon a cross-piece L secured to the walls of the holder and extending diametrically across the same. This receptacle is provided with an overflow pipe M, and this pipe may be used for the purpose of preventing an overflow from the said receptacle in case the operator fails to observe the influx of liquid and regulate it so that the pipe J will not supply liquid faster than it can escape through the neck G^2. This pipe M extends through the wall of the holder and may be arranged to discharge the liquid overflowing through it into any suitable receptacle or to convey it back to the holder or the source of supply.

At times, instead of subjecting the liquid to a moderate heat for a comparatively long period, it is desirable to subject it to a higher temperature for a shorter period. Thus, for instance, it is common practice to subject liquid to a temperature of 150 degrees for thirty minutes or to a temperature of 160 degrees or more for fifteen minutes, and the period will vary in an inverse ratio of the temperature within prescribed limits. In the case last mentioned it is, of course, desirable to have the holder so arranged that the liquid entering it will be discharged therefrom after a shorter period, and I have therefore provided the branch pipe H^5 made in two sections about half-way between the bottom of the holder and the upper outlet. This branch pipe extends through the wall of ~~the~~ holder and communicates with the outside discharge pipe H′. It is also controlled by a valve H^6, so that it can be closed when the upper outlet is used, and the outer portion of the pipe is made detachable by means of a joint secured by the collar H^7. Through the use of this valve-controlled branch pipe the liquid may be discharged below the normal outlet when desired.

It will be apparent that the apparatus above described is not essential to the carrying out of the process herein described and claimed, and that other apparatus may be employed, or some of the apparatus dispensed with, and its function manually performed. I prefer, however, to use the apparatus described and shown for the purpose of effectuating the process.

It is for the purpose of insuring the proper performance of the requirements hereinbefore stated automatically and without the possibility of accidental or intentional interference therewith that the process which forms the subject matter of this application is principally designed.

In the apparatus illustrated in the drawings, the liquid, after being heated to the desired temperature, is caused to pass into the cylindrical holder A through the pipe J which enters through the wall of the said holder below said cover A′ and has its discharge end connected with the pan G by means of a collar G′ in the side of said pan which receives it. The principal object of having the liquid received by the pan G on entering the holder is to prevent an oversupply and to avoid undue pressure on the spreader by the entering stream. The pan may be observed by removing the cover, or the cover may be made of transparent material, or entirely omitted in order that the depth of the liquid therein may be ascertained. From the pan G the liquid passes, through the depending outlet tube G^2 down to the float B, which in the usual operative condition of the apparatus is immediately below the said tube, since the level of liquid in the holder must be such as to raise it to this point before there can be any discharge.

When the holder is first filled the float rises from the bottom as the level of liquid rises, and in this operation the annular flange K concentrically arranged with respect to the float on the upper surface of said float receives the liquid discharged from the tube G′ and checks its tendency to splash against the sides of the holder by causing a pool to be formed. Small openings K′ are located at intervals along the lower edge of the flange K for the purpose of permitting all of the liquid therein to flow out.

The float is provided with a plurality of spacers D extending radially therefrom and preferably located 90 degrees apart, so as to space the said float from the walls of the holder and maintain its position in the center thereof. The extremities of the spacing arms D are drawn downwardly to form depending portions D′, and the lower ends of these depending portions are inwardly curved. The object of this provision is to prevent the spacers from catching over or under the annular flanges D^2. A sharp corner is also avoided in bending the parts D′ downward so that the angle will readily pass over the inner edges of the flanges. An annular horizontal flange or rim C is also provided at the outer edge of the upper surface of the float, and extends approximately half the distance from the said outer edge to the walls of the holder. The object and purpose of this flange is to give the liquid flowing from the medial part of the convex upper surface of the float a horizontal direction and provide a surface in addition to the upper surface of the float upon which it may spread and by which it will be caused to enter the body of liquid in a thin, slowly flowing body. It will be observed that this flange C is so formed and placed as to be normally slightly submerged, and the object of this provision is to still further check the outward flow of the liquid before it reaches the liquid body in the holder. By these means the liquid is received and caused to spread out gently upon the upper surface of the liquid body in the holder, without receiving any material vertical movement either through its initial movement on entering the holder or through contact with the walls or other parts thereof. The result is that the liquid entering the holder remains on the top of the liquid body and as it cools, and its specific gravity is thereby increased, settles toward the bottom, fresh and warmer liquid flowing in above it constantly. It is, therefore, only necessary to gage the flow of liquid into the holder so that it will fill and empty once in each half hour—or other predetermined time—in order to insure that each particle entering the holder shall remain therein substantially throughout the full period and be discharged therefrom only after it has been subjected to the desired temperature for the proper period of time. The float is provided with a loop B^4 by which it may be raised from the bottom of the holder and removed, if desired.

It will be observed that in the operation of this process variation in the specific gravity of the liquid due to slight difference in temperature is utilized to secure the gradual passage of each drop through the holder, and that in the apparatus shown this action is inaugurated by the deposition of the freshly heated liquid in such a manner that because of the inferior gravity it will spread out over the top of the liquid body. Auxiliary means, such as baffle plates and flanges, may be employed in carrying out the process to further protect the flow of liquid by its thermal gravity from being disturbed or interrupted.

What I claim is:

1. The herein-described process of sterilizing liquids which consists in first heating and then spreading the liquid upon the upper surface of a body of liquid having a mean lower temperature in such a manner as to prevent vertical movement thereof, and withdrawing the liquid from the lower part of said body at a rate not exceeding the rate of inflow, whereby each atom of the liquid is caused to gravitate gradually from the top to the point of withdrawal through the body by reason of its relative thermal specific gravity and is retained therein a period of time substantially equal to the time required for the entire body to be withdrawn.

2. The herein described process of sterilizing liquids which consists in first heating the liquid and then causing it to flow through a holder by gravity and to be detained therein for a given period determined by the period required for the discharge of substantially all the liquid in said holder, the relative time of discharge of said liquid with respect to that preceding and following it being determined by its relative specific gravity due to temperature.

3. The process of sterilizing liquids herein described which consists in maintaining a body of the liquid of predetermined volume in a container, said volume being determined by the period of time required for it to pass out of said container, and flowing heated liquid upon the upper surface of the said body in such a manner that it is spread out horizontally thereon, and withdrawing the liquid from the lower part of said container at the same rate as the rate of influx.

Witness my hand this 20th day of January, 1911, at the city of New York, in the county and State of New York.

WILLIAM H. PARK.

Witnesses:
E. W. SCHERR, Jr.,
ALAN C. McDONNELL.

Pasteurizer
Feb. 1912

1,017,777

C. H. LOEW & A. RUETSCHI.
PASTEURIZER.
APPLICATION FILED DEC. 30, 1909.

1,017,777. Patented Feb. 20, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

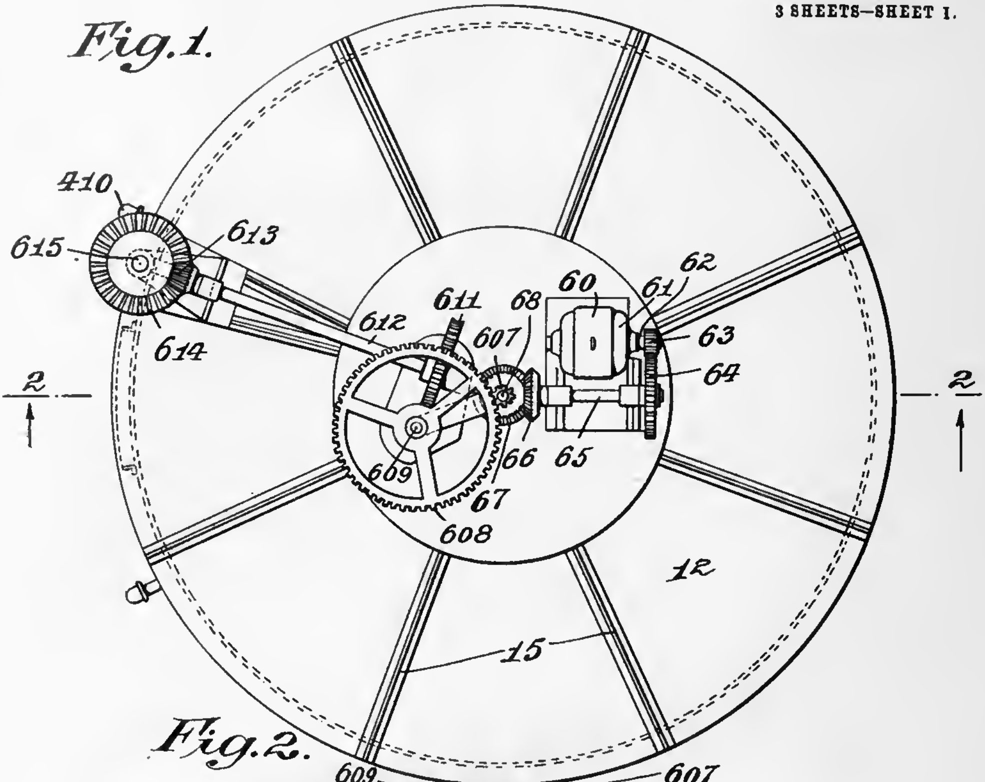
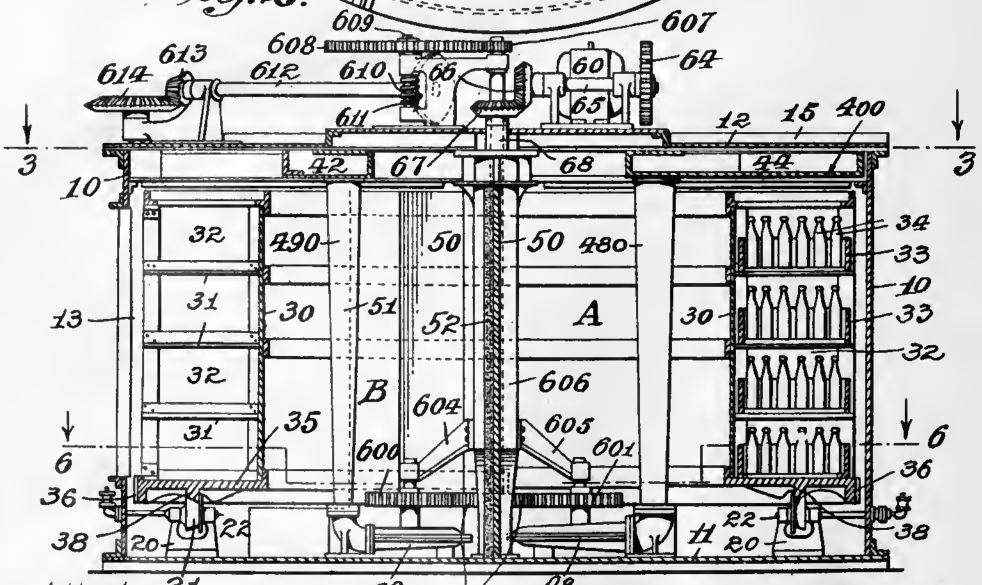


Fig. 2.



Attest:
Edna C. Moreland
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Charles H. Loew
and Arnold Ruetschi
Inventors
by William R. Baird
their Atty.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

C. H. LOEW & A. RUETSCHI.

PASTEURIZER.

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3 SHEETS—SHEET 2.

Fig. 3.

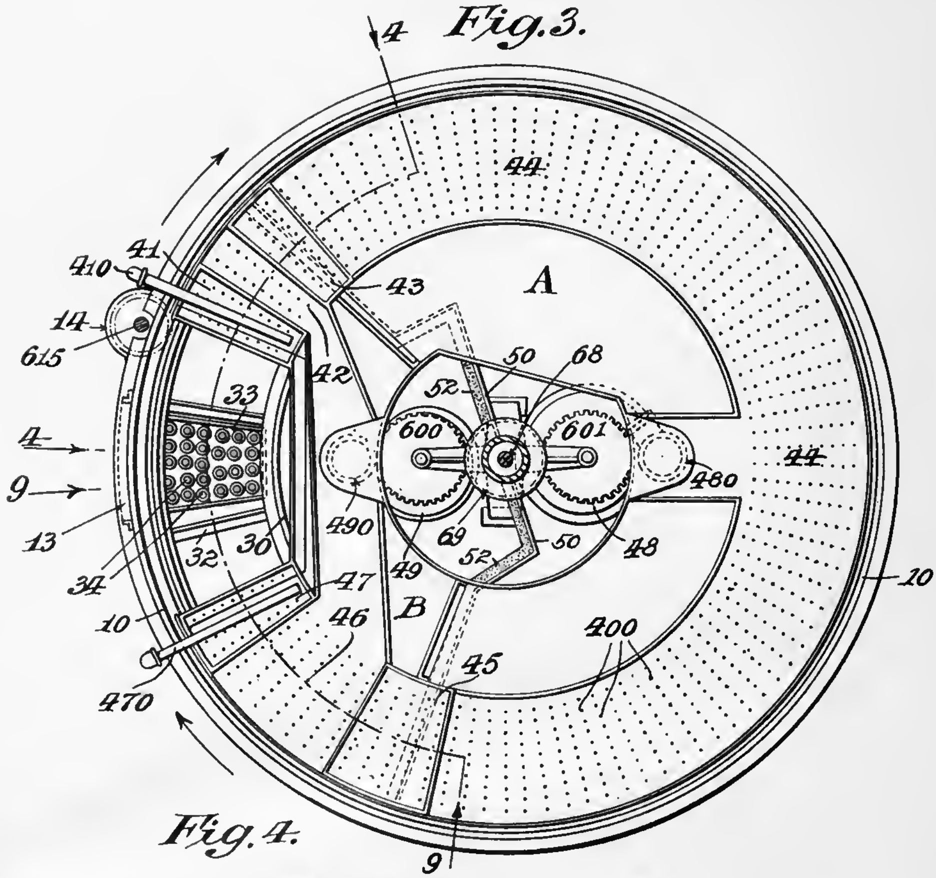


Fig. 4.

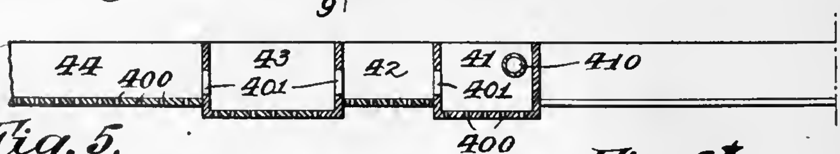


Fig. 5.

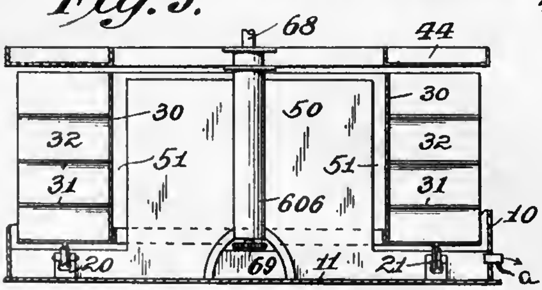
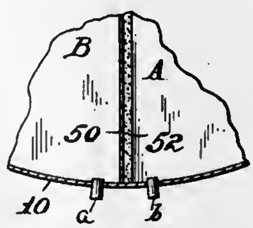


Fig. 5.*



Attest:
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3 SHEETS—SHEET 3.

Fig. 6.

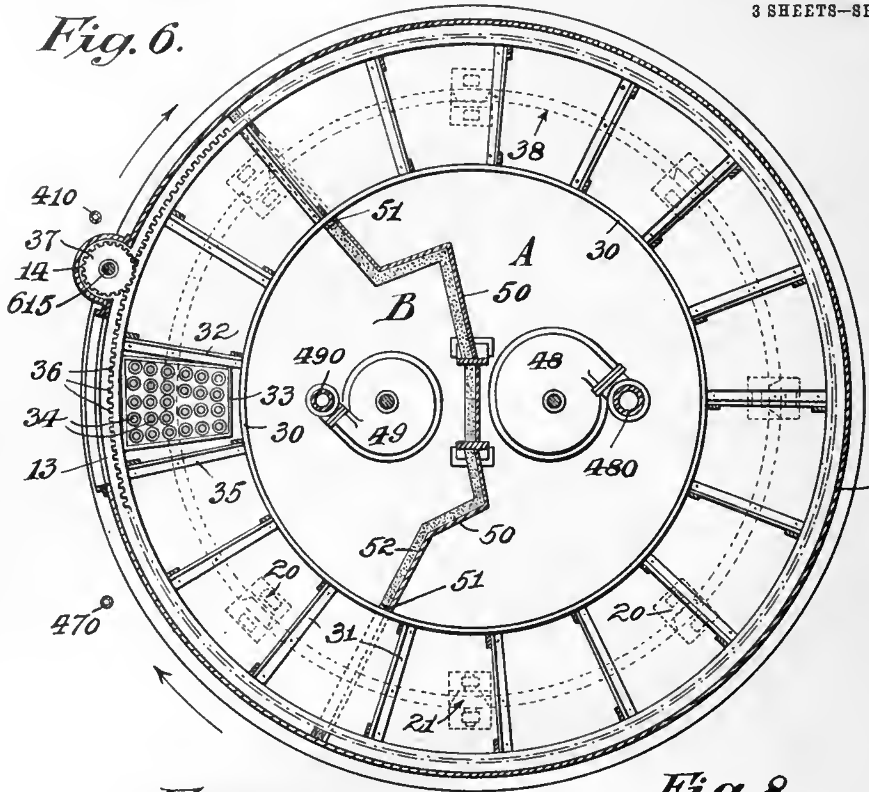


Fig. 7.

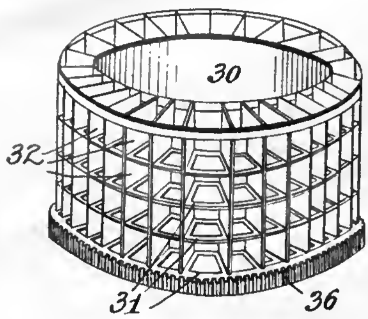


Fig. 8.

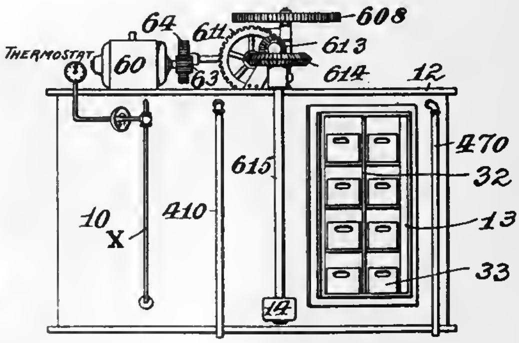
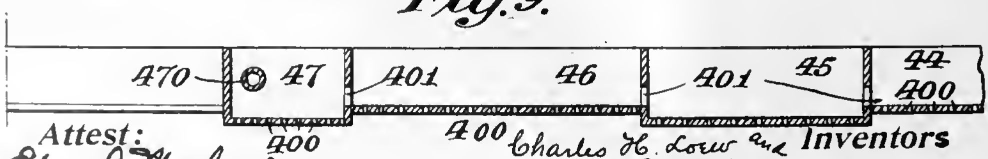


Fig. 9.



Attest:

Edna R. Moreland

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by William R. Baird
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COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHARLES H. LOEW, OF LAKEWOOD, AND ARNOLD RUETSCHI, OF CLEVELAND, OHIO, ASSIGNORS TO THE LOEW MANUFACTURING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

PASTEURIZER.

1,017,777. Specification of Letters Patent. **Patented Feb. 20, 1912.**

Application filed December 30, 1909. Serial No. 535,700.

To all whom it may concern:

Be it known that we, CHARLES H. LOEW and ARNOLD RUETSCHI, citizens of the United States, the said CHARLES H. LOEW residing at Lakewood, Cuyahoga county, Ohio, and the said ARNOLD RUETSCHI residing at Cleveland, Cuyahoga county, Ohio, have invented certain new and useful Improvements in Pasteurizers, of which the following is a specification.

This invention relates to apparatus intended primarily to be employed in the pasteurization of beer in bottles and its novelty consists in the construction and adaptation of the parts as will be more specifically hereinafter pointed out.

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 vertical section of adjacent parts; Fig. 5* is a detail sectional view showing the partition between the two compartments of the casing and the overflows from said compartments; 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 metal 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. T-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 pipe 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 nonconducting 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 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 suitably quantity and heated by steam supplied through a pipe passing into the same, as shown at x in Fig. 8. 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, and inasmuch as the supply of water to the pans 41, 44 and 47 is greater than the amount that will pass through the bottoms of said pans, it will be evident that the water will overflow into the pans 42, and 43, and consequently 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. Suitable overflows, as *a* and *b*, (see Fig. 5*) 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 Figs. 3 and 6, the workman places the bottles of beer in the 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 above 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.

The advantages of this system of pasteurization are considerable. In the first place it combines the spraying system with a continuous operation. The bottles are kept unmoved in substantially the same horizontal plane while passing through the successive zones of treatment and consequently there is no liability of breakage through movement or handling. The variation in temperature of the beer is so gradual that the bottles never break because of expansion or contraction. The apparatus is placed directly on the floor and requires no reconstruction of the floors or walls of the building in which it is operated. But one workman, who may be a boy, or an unskilled laborer, can readily handle all of the bottles and move and handle more than one at a time, usually twenty-seven in a tray so that much time and labor is saved. The water employed can be repeatedly used. The hot water has not lost much of its heat when it reaches the bottom of the apparatus and but little steam is required to restore its initial temperature. The division of the apparatus into two compartments also saves heat. The cost of the power to operate the mechanism is much less than that required for moving flexible carriers through large bodies of water. Moreover the operations being conducted inside of one casing there is little escape of heat through conductivity.

What we claim as new is:

1. In an apparatus of the class described an upright casing, a drum shaped carrier horizontally movable therein, the bottom of the carrier being arranged above the floor of the casing, a transverse partition dividing the space within the carrier drum and under the carrier into compartments, and means for supplying a pasteurizing agent at different temperatures to the different compartments and to the articles on the carrier as the same pass therethrough.

2. In an apparatus of the class described an upright casing, a drum shaped carrier horizontally movable therein, and a transverse partition whereby the casing is divided into two compartments in the space inside of the carrier drum and means for supplying water at different temperatures to the

different compartments and to the articles on the carrier as said carrier passes therethrough.

3. In an apparatus of the class described an upright casing, a drum shaped carrier horizontally movable therein, the bottom of the carrier being arranged above the floor of the casing, and a transverse partition dividing the space within the carrier drum and under the carrier into compartments and means for supplying water at different temperatures to the different compartments and to the articles on the carrier as said carrier passes therethrough.

4. In an apparatus of the character described, a series of water containers arranged in continuous series, means for discharging the contents of each container in the form of a spray, means for supplying hot water to the central container and cold water to one or more of the other containers and allowing it to overflow into the adjacent containers, and means for carrying articles to be treated through such spray.

5. In an apparatus of the character described, a series of water containers arranged in continuous series, means for discharging the contents of each container in the form of a spray, means for supplying hot water to the central container and cold water to the terminal containers, and means for carrying articles to be treated through such spray.

6. In an apparatus of the character described, a series of water containers arranged in continuous series, means for discharging the contents of each container in the form of a spray, means for supplying hot water to the central container and cold water to the terminal containers and water at an intermediate temperature to the intermediate set of containers, and means for carrying articles to be treated through such spray.

7. In an apparatus of the character described, a movable carrier and a system for supplying water in the form of a spray to the carrier comprising a series of water containers provided with perforated discharge openings, and means for supplying hot water to the middle one of the series, and cold water to the end ones of the series and allowing the hot and cold water so supplied to mix in the intermediate ones of the series.

8. In an apparatus of the character described, a movable carrier and a system for supplying water in the form of a spray to the carrier comprising a series of water containers provided with perforated discharge openings, and means for supplying hot water to the middle one of the series, and cold water to the end ones of the series and allowing the hot and cold water so supplied to mix in the intermediate ones of the series in combination with means for using the hot water over and over again.

9. In an apparatus of the character described, a movable carrier and a system for supplying water in the form of a spray to the carrier comprising a series of water containers provided with perforated discharge openings, and means for supplying hot water to the middle one of the series, and cold water to the end ones of the series and allowing the hot and cold water so supplied to mix in the intermediate ones of the series in combination with means for using the hot water over and over again consisting of a collector and means for renewing the initial heat of the hot water as it is returned to its container.

10. In an apparatus of the character described, a movable carrier and a system for supplying water in the form of a spray to the carrier comprising a series of water containers provided with perforated discharge openings, and means for supplying hot water to the middle one of the series, and cold water to the end ones of the series and allowing the hot and cold water so supplied to mix in the intermediate ones of the series in combination with means for using the hot water over and over again, and using the water mixed in the intermediate containers over and over again.

11. In an apparatus of the character described, a movable carrier and a system for supplying water in the form of a spray to the carrier comprising a series of water containers provided with perforated discharge openings, and means for supplying hot water to the middle one of the series, and cold water to the end ones of the series and allowing the hot and cold water so supplied to mix in the intermediate ones of the series in combination with means for using the hot water over and over again, and using the water mixed in the intermediate containers over and over again, the means in each instance consisting of collectors and pumps.

12. In an apparatus of the character described, a series of drip pans circularly arranged, means for supplying the pan centrally arranged with hot water, the pans on each side of it with water at a lower temperature, the pans on each side of those with water at yet a lower temperature and the terminal pans with cold water in combination with means for collecting the water from the central pan and returning it thereto after renewing its initial temperature, means for collecting the mixed water from all the other pans and returning it to two of such pans one on each side of the central pan and further means for preventing the mingling of the water falling from the hot water pan and the other pans consisting of a partition of non-conducting material arranged in a line with the boundaries of the hot water pan, and means for presenting

articles to be pasteurized successively to the falling water of different temperatures.

13. In an apparatus of the character described, a series of drip pans circularly arranged, means for supplying the pan centrally arranged with hot water, the pans on each side of it with water at a lower temperature, the pans on each side of those with water at yet a lower temperature and the terminal pans with cold water in combination with means for collecting the water from the central pan and returning it thereto after renewing its initial temperature and means for collecting the mixed water from all the other pans and returning it to two of such pans one on each side of the central pan, further means for preventing the mingling of the water falling from the hot water pan and the other pans consisting of a partition of non-conducting material arranged in a line with the boundaries of the hot water pan and an overflow device for each collector, and means for subjecting materials to be pasteurized successively to the falling water of different temperatures.

14. In an apparatus of the character described, a series of drip pans circularly arranged, means for supplying the pan centrally arranged with hot water, the pans on each side of it with water at a lower temperature, the pans on each side of those with water at yet a lower temperature and the terminal pans with cold water, the central pan being much longer circularly than the other pans, means for forming the water from the different pans into sprays of different temperatures, and means for subjecting material successively to the sprays of different temperature.

15. In an apparatus of the character described, a series of drip pans circularly arranged, means for supplying the pan centrally arranged with hot water, the pans on each side of it with water at a lower temperature, the pans on each side of those with water at yet a lower temperature and the terminal pans with cold water in combination with means for collecting the water falling from the central pan and separate means for collecting the water falling from the other pans, and means for subjecting articles to be pasteurized successively to the falling water from the different pans.

16. In an apparatus of the character described, a series of drip pans circularly arranged, means for supplying the pan centrally arranged with hot water, the pans on each side of it with water at a lower temperature, the pans on each of those with water at yet a lower temperature and the terminal pans with cold water in combination with means for collecting the water falling from the central pan and separate means for collecting the water falling from the other pans consisting of a water collecting chamber divided into two compartments along a line coincident with the lines of contact between the central pan and its adjacent pans, and means for subjecting articles to be pasteurized successively to the falling water from the different pans.

17. In apparatus of the character set forth, the combination with a carrier that rotates on a substantially vertical axis, of means for forming a spray having different temperatures and directing such spray at different temperatures along the path of travel of the carrier and upon said carrier.

18. In apparatus of the character set forth, the combination with a carrier that rotates on a substantially vertical axis, of means located above the carrier and conforming generally to its path of movement for spraying liquid at different temperatures along the path of travel of the carrier and downwardly upon said carrier.

19. In apparatus of the character set forth, the combination with means for causing two spaced streams of liquid of different temperatures to commingle, means for forming a body of spray therefrom having a gradually varied temperature from one portion of the body to another, and means for passing material through the body of spray thus formed.

20. In apparatus of the character set forth, the combination with spaced conduits, of perforated receptacles for receiving supplies from said conduits, means for supplying liquid through the conduits, means for raising the temperature of one supply above that of the other, perforated connections between the receptacles, in which the overflow from said receptacles intermingle, and means for passing material to be treated beneath the perforations and through the spray of varied temperature formed thereby.

21. In apparatus of the character set forth, the combination with a casing and a partition separating the same into two compartments, of means for delivering a spray at a pasteurizing temperature into one of the compartments, means for delivering a spray at a lower temperature into the other compartment, and means for transporting material to be pasteurized first into the compartment having the spray of lower temperature, thence into the compartment having the spray of the pasteurizing temperature, and afterward back into the first mentioned compartment.

22. In apparatus of the character set forth, the combination with an article carrier that is rotatable on a substantially vertical axis, of a curved spray-producing means located thereabove and discharging downwardly thereonto, means for delivering liquid at a comparatively high temperature to the central portion of the spray-producing means, and means for supplying liquid at a

lower temperature to the end portions of said spray-producing means, thereby providing a field of spray that is traversed by the article carrier and that has end portions cool and an intermediate portion hot.

23. In apparatus of the character set forth, the combination with an article carrier that is rotatable on a substantially vertical axis, of a curved spray-producing means located thereabove and discharging downwardly thereonto, means for delivering liquid at a comparatively high temperature to the central portion of the spray-producing means, and means for supplying liquid at a lower temperature to the end portion of said spray producing means, said spray-producing means including portions located between the liquid-supplying means of high and low temperature, in which portions said liquid supplies mingle to form a spray of an intermediate temperature.

24. In apparatus of the character set forth, the combination with an article carrier that is rotatable on a substantially vertical axis, of a curved spray-producing means located thereabove and discharging downwardly thereonto, means for delivering liquid at a comparatively high temperature to the central portion of the spray-producing means, means for supplying liquid at a lower temperature to the end portions of said spray-producing means, thereby providing a field of spray that is traversed by the article carrier and that has end portions cool and an intermediate portion hot, and a wall, forming compartments through which the article carrier passes, one of said compartments receiving the spray from both the colder ends of the field and the other compartment receiving the intermediate hotter spray.

25. In apparatus of the character set forth, the combination with an article carrier that is rotatable on a substantially vertical axis, of a curved spray-producing means located thereabove and discharging downwardly thereonto, means for delivering liquid at a comparatively high temperature to the central portion of the spray-producing means, means for supplying liquid at a lower temperature to the end portions of said spray-producing means, thereby providing a field of spray that is traversed by the article carrier and that has end portions cool and an intermediate portion hot, a wall, forming compartments through which the article carrier passes, one of said compartments receiving the spray from both the colder ends of the field and the other compartment receiving the intermediate hotter spray, and means for elevating the collected liquid from the compartments back to the respective portions of the spray-forming means.

26. In apparatus of the character set forth, the combination with a casing having an opening in one side, of an article carrier rotatably mounted in said casing on a substantially vertical axis, means located on opposite sides of the opening for spraying liquid at a relatively low temperature on the carrier on opposite sides of said opening, and means for spraying liquid at a higher temperature on the carrier between the points where the liquid of low temperature is sprayed.

27. In apparatus of the character set forth, the combination with a casing having an opening in one side, of an article carrier rotatably mounted in said casing on a substantially vertical axis, means located on opposite sides of the opening for spraying liquid at a relatively low temperature on the carrier on opposite sides of said opening, means for spraying liquid at a pasteurizing temperature on the carrier substantially midway between the points where liquid of low temperature is sprayed, and means for spraying liquid of gradually varied temperature between the spray of low temperature and that of the pasteurizing temperature.

Witness our hands this 23d day of December, 1909, at Cleveland, Ohio.

CHARLES H. LOEW.
ARNOLD RUETSCHI.

Witnesses:
ALBERT A. KAISER,
WILLIAM F. BIERMANN.

Pa

May 1912

1,027,894

A. A. PINDSTOFTE.
PASTEURIZING APPARATUS.
APPLICATION FILED OCT. 14, 1911.

1,027,894. Patented May 28, 1912.

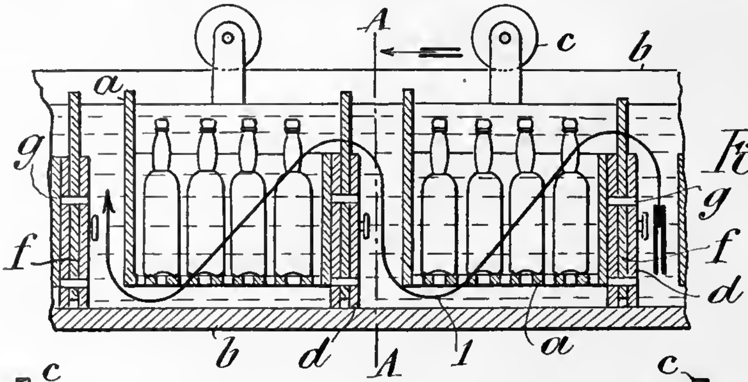

Fig 1.

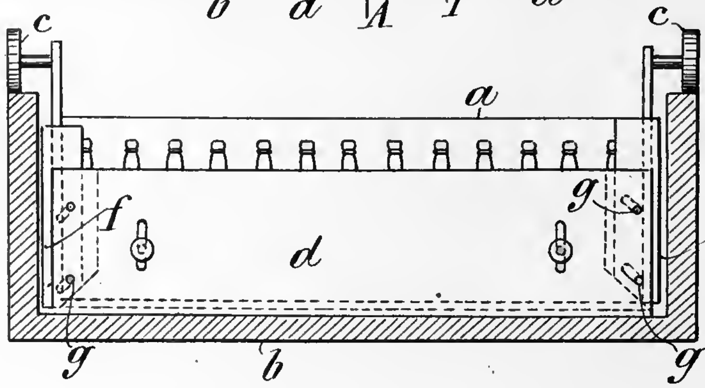

Fig 2

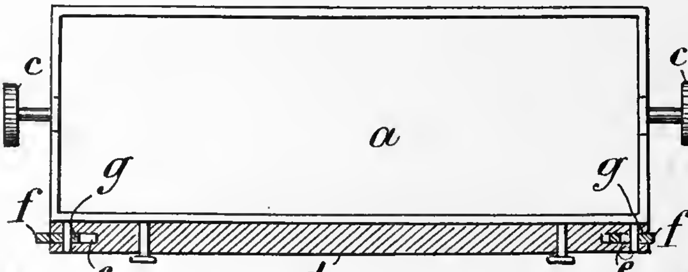

Fig 3.

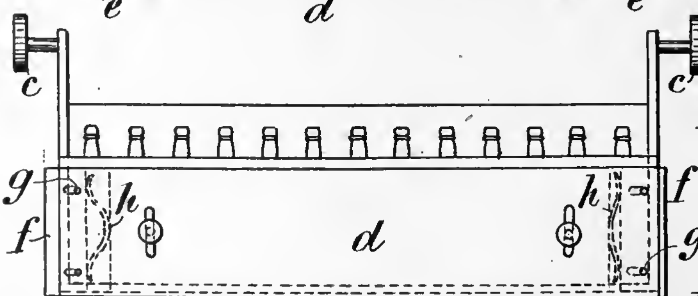

Fig 4.

Witnesses.

Inventor
Anders A. Pindstofte
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his attorneys.

UNITED STATES PATENT OFFICE.

ANDERS ANDERSEN PINDSTOFTE, OF COPENHAGEN, DENMARK.

PASTEURIZING APPARATUS.

1,027,894. Specification of Letters Patent. Patented May 28, 1912.

Application filed October 14, 1911. Serial No. 654,757.

To all whom it may concern:

Be it known that I, Anders Andersen Pindstofte, manufacturer, subject of the Kingdom of Denmark, residing at No. 62 Frederiksberg alle, in the city of Copenhagen, Denmark, have invented new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

The invention has for its object improvements in pasteurizing-apparatus of that kind by which the bottles are placed in bottle-baskets which are moved through a water-reservoir of suitable dimensions. On practical reasons it is necessary that the bottle-baskets in such apparatus are a little narrower than the water-reservoir. This however has the disadvantage that a part of the water passes outside the bottle-baskets along their outer side faces so that in large apparatus the heating or the cooling of the bottles which are moved through the reservoir is not equal. My invention overcomes these defects by employing at the sides of the bottle-baskets sliding-pieces, which can slide in a direction transverse to or oblique to the direction of movement and which, when the bottle-baskets are moved through the water-reservoir, slide outward and come in contact with the walls of the water-reservoir so that the water cannot pass along the outer side faces of the bottle-baskets but is caused to pass through said bottle-baskets.

Constructional forms for the invention are shown in the drawing.

Figure 1 is a longitudinal section through a part of a water-reservoir and bottle-baskets placed therein. Fig. 2 is a transverse section through the water-reservoir on line A—A Fig. 1 and seen in the direction of the arrow. Fig. 3 is a partial section of a bottle-basket seen from above. Fig. 4 is a front view of a modification of the bottle-basket.

The bottle-baskets *a* are moved through the water-reservoir *b* by means of rollers *c* running along rails on the upper edge of the side walls of the water-reservoir. The bottle-baskets are moved in the opposite direction of the curved arrow *l* shown in Fig. 1, which arrow indicates the direction in which the water is moved through the bottle-baskets.

In the ends of the front wall *d* of the bottle-baskets, which in a known manner can be movable up and down, and which slides on the bottom of the water-reservoir, are arranged notches *e* for sliding pieces *f*, which constitute shiftable closures, bolts *g* passing through inclined slots in said closures for permitting automatic shifting of the latter into yielding contact with the reservoir walls under the action of gravity. The sliding-pieces are forced into the notches *e* if during the insertion of the bottle-baskets into the water-reservoir any resistance is produced, but else they slide out of the notches and come in contact with the side walls of the water-reservoir (see left hand side of Fig. 2) so that the water cannot pass between the outer side faces of the bottle-baskets and the walls of the water-reservoir but is caused to pass through the baskets. The notches *e* have such a sloping that the sliding-pieces always tend to slide outward on account of their own weight.

In the modification shown in Fig. 4 the notches for the sliding-pieces are not sloping. The sliding-pieces are in such case pressed outward by means of springs *h* arranged in the rear of said sliding-pieces (see the left hand side of the figure).

Claims.

1. In a pasteurizing apparatus, the combination of a water-reservoir, bottle-baskets movable through said reservoir, closures shiftably mounted on said baskets for preventing passage of water between the sides of said reservoir and baskets, said closures being automatically maintained in contact with the walls of said reservoir.

2. In a pasteurizing apparatus, the combination of a water-reservoir, bottle-baskets movable through said reservoir, closures shiftably mounted on the front walls of said baskets, and means for yieldingly maintaining said closures in contact with the walls of said reservoir.

3. In a pasteurizing apparatus, the combination of a water-reservoir, bottle-baskets

movable through said reservoir, vertically movable front walls for said baskets, slides shiftably mounted at the ends of said front walls, and means for automatically shifting said slides into contact with the walls of said reservoir.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANDERS ANDERSEN PINDSTOFTE.

Witnesses:
OLAF SCHRÖDER,
CONSTANTINE EBERTS.

1,037,247

Pa

Sept, 1912

J. HAUK, Jr.

STERILIZING APPARATUS.

APPLICATION FILED FEB. 15, 1909. RENEWED JUNE 24, 1912.

1,037,247. Patented Sept. 3, 1912.

5 SHEETS—SHEET 1.

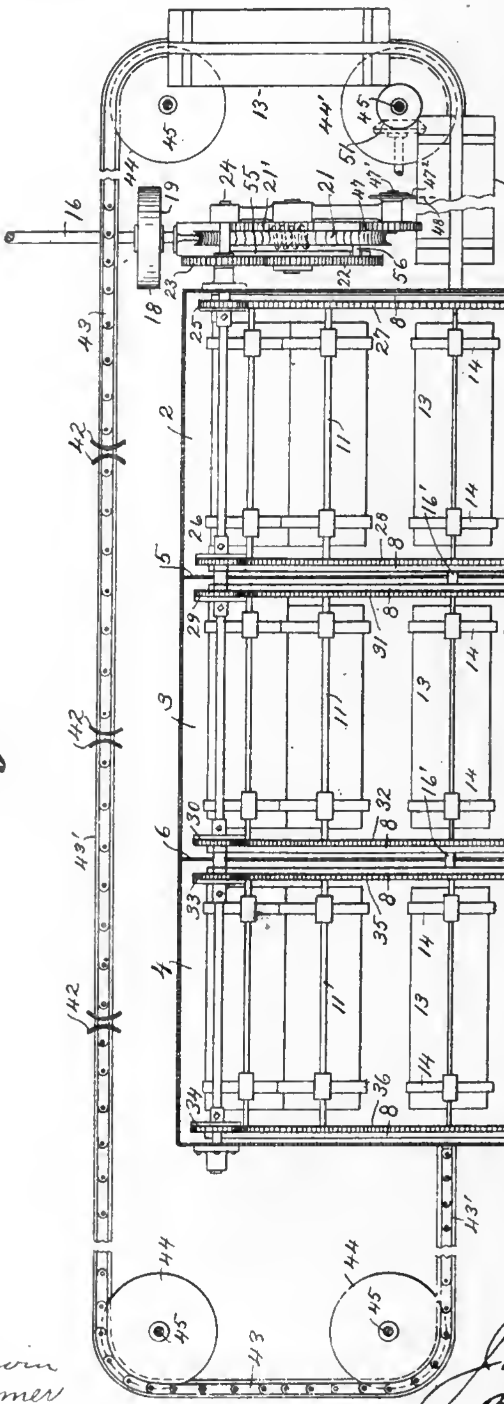


Fig. 1.

Witnesses

O R Erwin

I. D. Bremer

Inventor

Joseph Hauk Jr.

By Erwin & Wheeler

Attorneys.

J. HAUK, Jr.

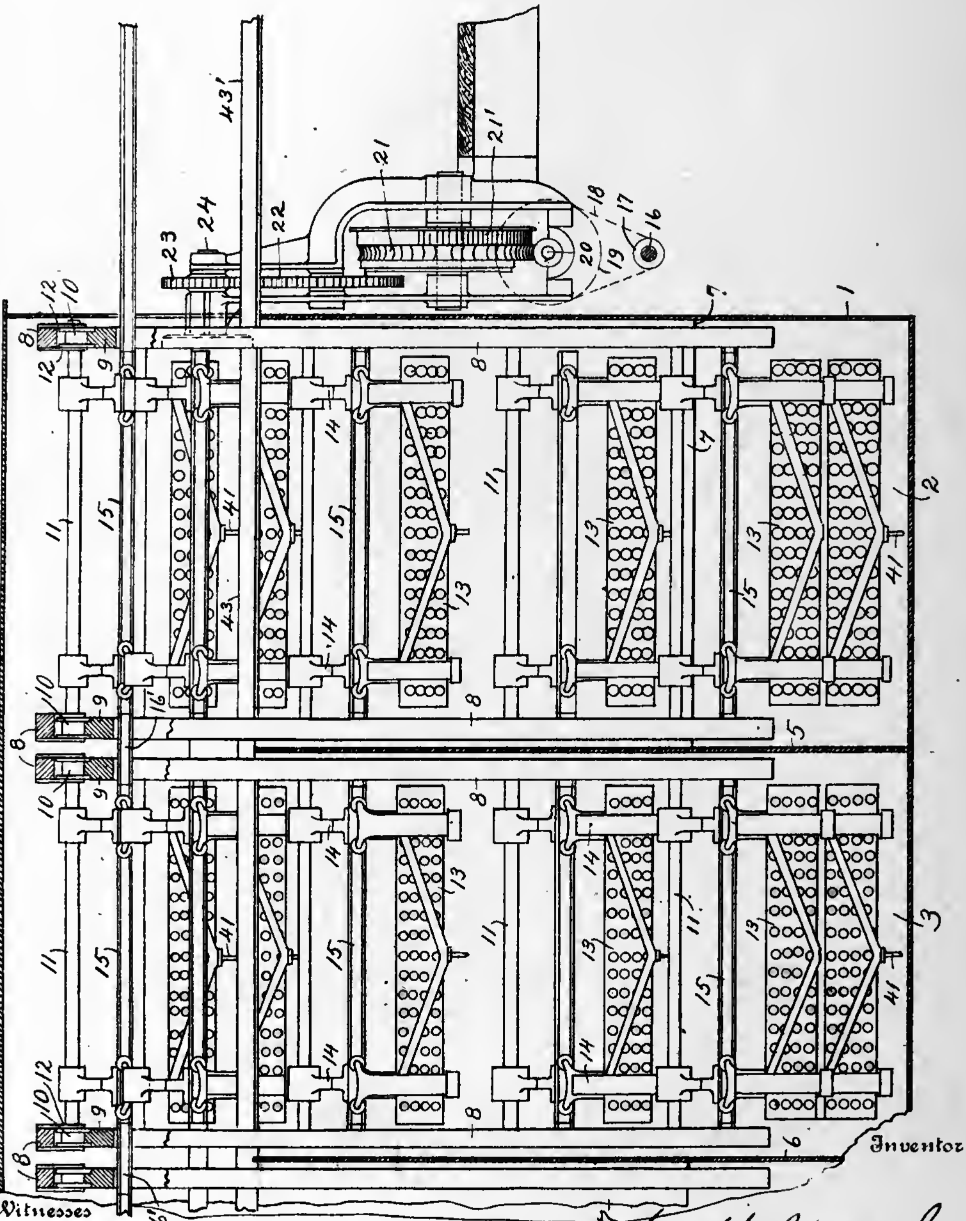
STERILIZING APPARATUS.

APPLICATION FILED FEB. 15, 1909. RENEWED JUNE 24, 1912.

1,037,247. **Patented Sept. 3, 1912.**

5 SHEETS—SHEET 2.

Fig. 2.



Inventor

Witnesses

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STERILIZING APPARATUS.

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5 SHEETS—SHEET 3.

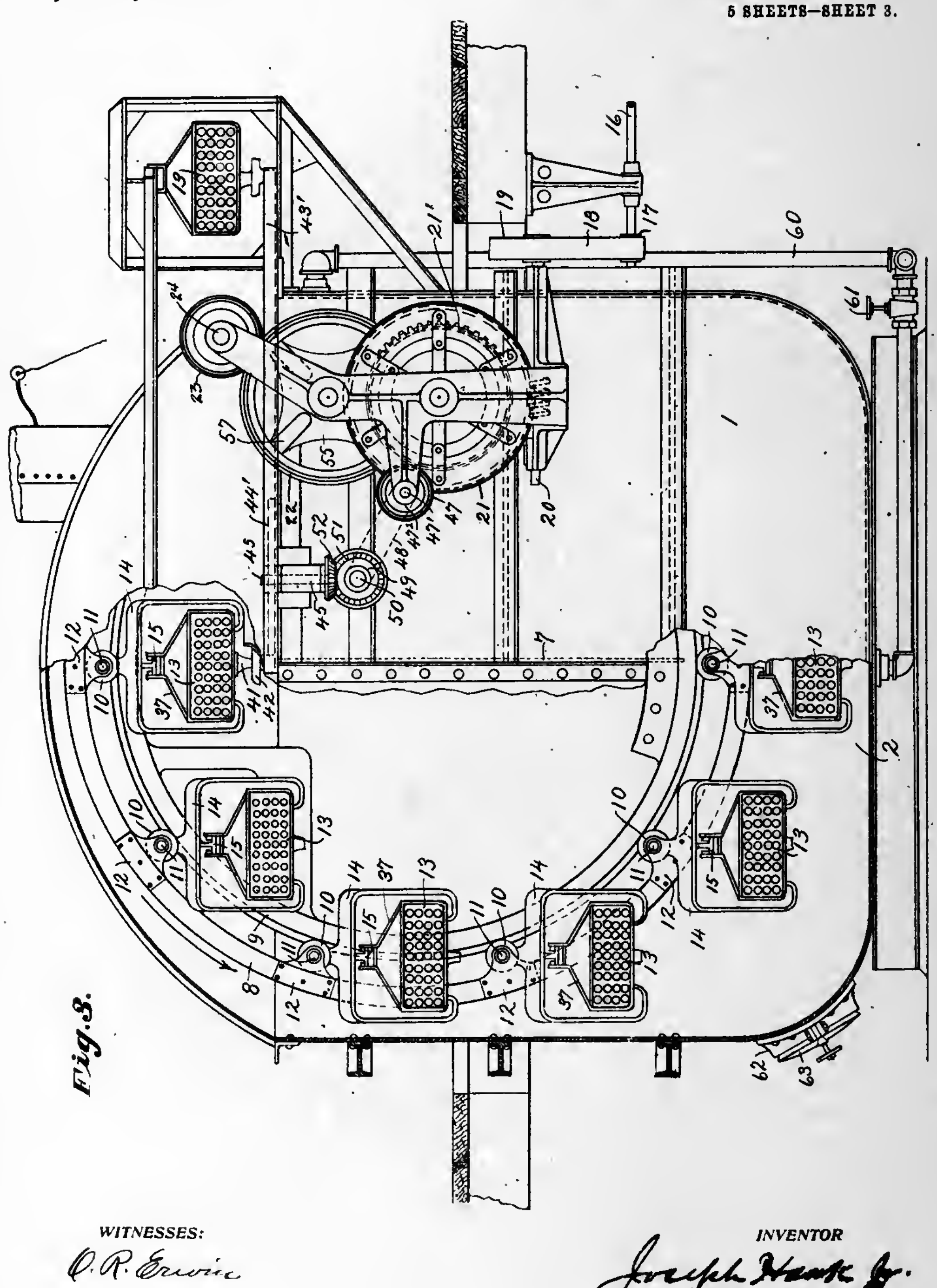

Fig. 3.

WITNESSES:

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STERILIZING APPARATUS.

APPLICATION FILED FEB. 15, 1909. RENEWED JUNE 24, 1912.

1,037,247. Patented Sept. 3, 1912.

5 SHEETS—SHEET 4.

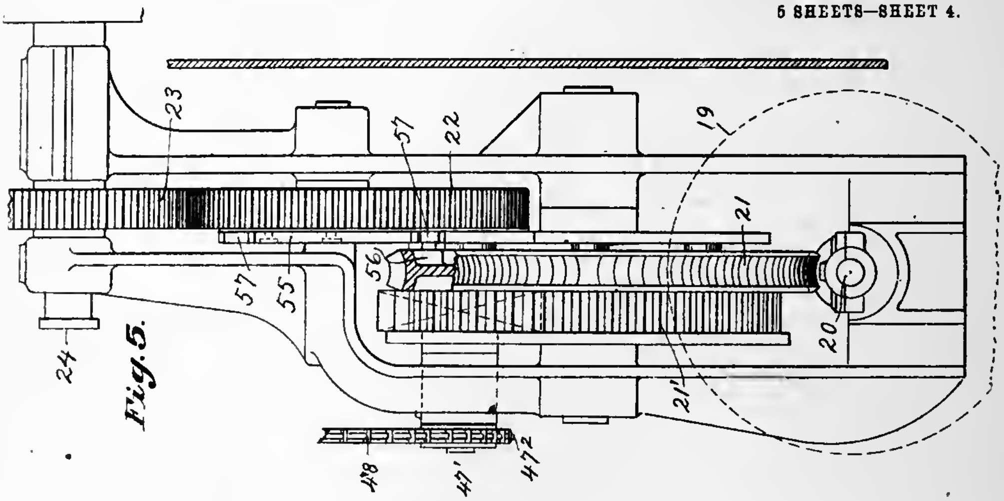

Fig. 5.

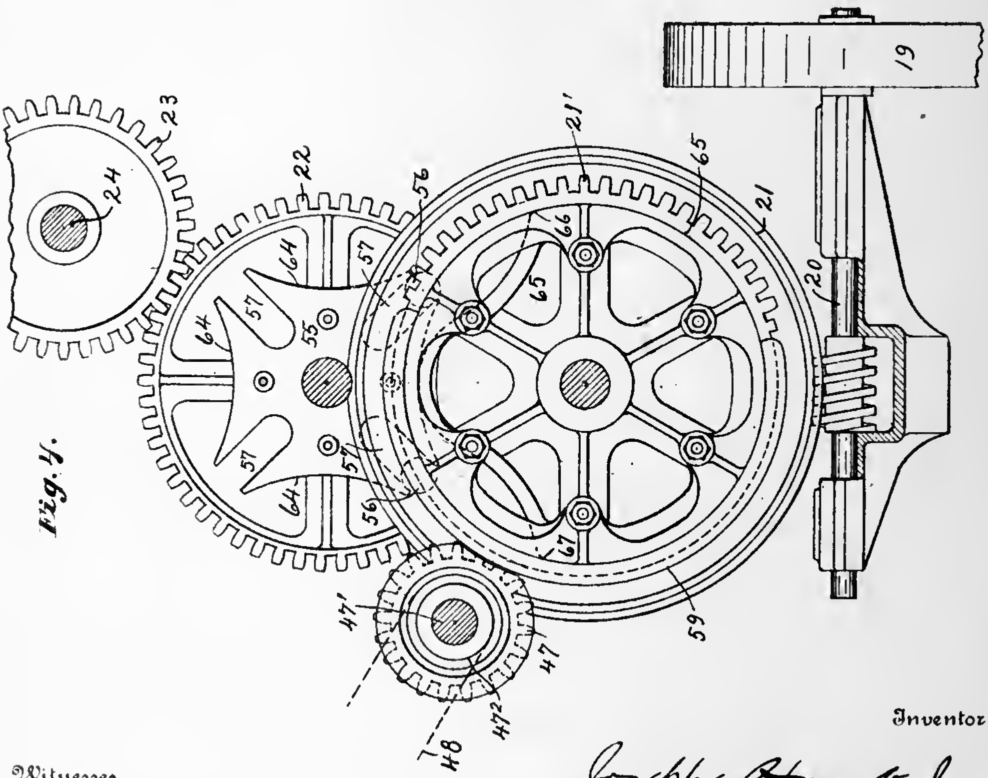

Fig. 4.

Witnesses

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STERILIZING APPARATUS.

APPLICATION FILED FEB. 15, 1909. RENEWED JUNE 24, 1912.

1,037,247.

Patented Sept. 3, 1912.

5 SHEETS—SHEET 5.

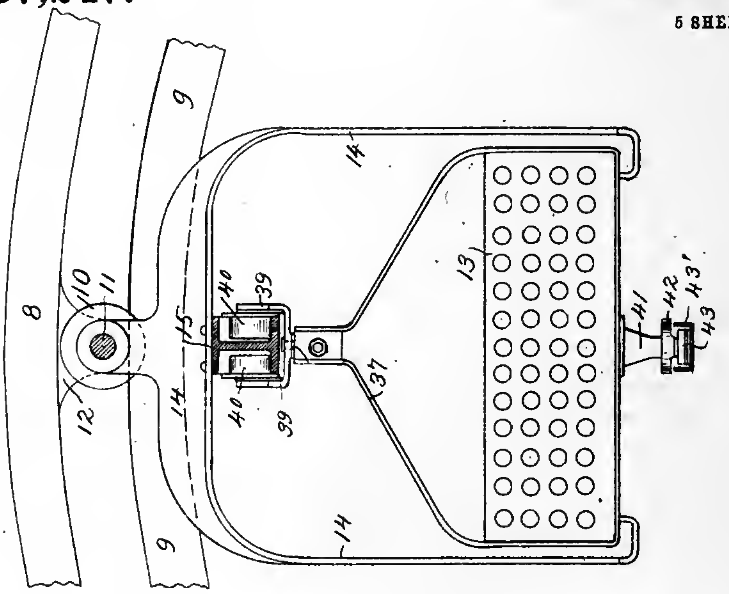

Fig. 7.

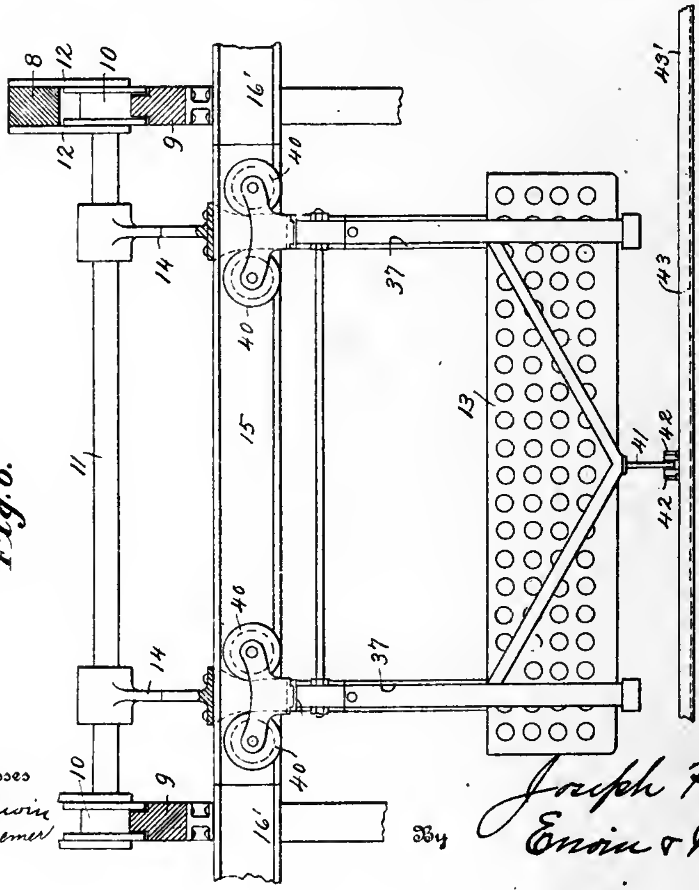

Fig. 6.

Witnesses

O. R. Erwin

J. D. Bremer

Inventor

Joseph Hauk Jr.

By Erwin & Wheeler

Attorneys.

UNITED STATES PATENT OFFICE.

JOSEPH HAUK, JR., OF MILWAUKEE, WISCONSIN, ASSIGNOR TO TWENTIETH CENTURY MACHINERY COMPANY, INCORPORATED, OF MILWAUKEE, WISCONSIN.

STERILIZING APPARATUS.

1,037,247. Specification of Letters Patent. Patented Sept. 3, 1912.

Application filed February 15, 1909, Serial No. 477,885. Renewed June 24, 1912. Serial No. 705,643.

To all whom it may concern:

Be it known that I, JOSEPH HAUK, Jr., a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Sterilizing Apparatus, of which the following is a specification.

My invention relates to improvements in apparatus for sterilizing milk, beer, and other liquid foods and beverages, and it pertains more especially, among other things, to the means employed for automatically conveying a large number of crated bottles in which the liquid is stored successively through a plurality of separate compartments, which are respectively supplied with water of successively higher and lower temperatures whereby the bottles and their contents will be gradually heated from a comparatively low to a high temperature and such contents sterilized, when the bottles are thereafter conveyed through the compartments in which the water is of successively lower temperature, whereby the liability of such bottles becoming broken by a too rapid change of temperature, is reduced to the minimum.

The construction of my invention is explained by reference to the accompanying drawings, in which—

Figure 1 is a plan view thereof. Fig. 2 is a vertical section of the central portion of the apparatus. Fig. 3 is an end view, part broken away to show the interior. Fig. 4 is a detail, showing an enlarged end view of the driving mechanism. Fig. 5 is a side view of the driving mechanism shown in Fig. 4. Fig. 6 is a side view; and Fig. 7 is an end view of one of the crate supporting conveyers showing the track from which the conveyers are suspended and the device for moving such crates longitudinally of said tracks.

Like parts are identified by the same reference figures troughout the several views.

1 is a water tank, which is divided into a plurality of separate compartments 2, 3 and 4, by the transverse partitions 5 and 6 and the compartments 2 and 4 are respectively divided by the central vertical partition 7 beneath and above which the crates are carried in their annular course through the tank 1, as more fully hereinafter described. Each of the compartments 2, 3 and 4, are provided with two annular carrying collars 8, which collars are in turn revolubly supported from the stationary collars 9 through a plurality of intermediate anti-friction rollers 10, roller supporting shafts 11 and roller supporting brackets 12, while the several bottle crates 13 of the series are connected with and temporarily suspended from said shafts 11, through the hangers 14, whereby it will be understood that when said collars 8 are revolved, all the crates in the annular series will be successively immersed beneath the water in the tank 1 and carried from thence back to the starting point above the longitudinal center of the tank.

It will be understood that the crate carrying collars, together with the operating mechanism, are revolved with an intermittent movement which is so timed that the crate carrying hangers are stopped as each one is successively brought to each starting point above the longitudinal center of the inclosing tank when each hanger of the series is supplied with a crate until all the hangers in such annular series has been thus supplied. It will be obvious that when all the hangers in the first series have been thus supplied, the first hanger will have completed its circuit in the first compartment, when the crate in such hanger is moved forward from such compartment into the hanger of the next succeeding compartment and its place supplied with another, and this step in the process is repeated until all the crates in the first annular series have been moved forward from the first compartment into the next succeeding compartment, and the process is again and continuously repeated until all the crates have passed through all the compartments of the tank. It will be understood that all the crates in being thus conveyed through the tank, will each successively pass in an annular course through each successive compartment and that when each compartment has been thus filled with crates, they will be successively withdrawn from the last compartment of the series as they have completed their annular course in such series and their places will be successively supplied with fresh crates from the exterior. The first compartment 2 of the series being provided, as stated, with a vertical partition 7 and the respective sides of the partition supplied with water of different temperatures, said partition has a tendency to keep the hot and cold water separate, whereby the crates, as they move in the direction indicated by the arrow in Fig. 3, are first conveyed downwardly through cold water and thence upwardly through warm water, whereby they are partially heated preparatory to entering the hot water, which is stored in the central compartment 3, the water in the central compartment being of the required temperature to properly sterilize the contents of the bottles. The compartment 4 is also divided centrally by a vertical partition, the same as compartment 2, and such third compartment is also in like manner supplied with water of two different temperatures, the warmer water being upon the left hand side of said vertical partition, reference being had to Fig. 3, and the cold water upon the right hand side, whereby said crates are first led into the warm water in the last compartment and from thence into the cooler water, and thereby gradually cooled before passing out of the sterilizing tank.

As a means of automatically conveying the crates through the several compartments of the tank, I have provided a supporting track formed of movable sections 15 and stationary sections 16′, from which track the crates are suspended through the rollers 40, 40, roller supporting arms 39, 39, and bails 37, 37. The several crates are provided with a fin or bracket 41, which is adapted to be engaged by the moving lugs 42, 42, of the endless chain 43, when said chain is moved, whereby said crates are carried forward in a continuous course through the several compartments of the tank, and from thence back to the starting point. The endless chain 43, which also passes through the tank and back to the starting point beneath the track, is supported in a channel 43′ and at the respective ends of the tank 1 by the several wheels 44, wheel 44′ and wheel supporting shafts 45. When the bottles have completed their course through the several compartments, they are manually removed from the crates and replaced with others at any intermediate point between the ends of the tank as found most convenient, whereby all the crates carried by the chain are continuously supplied with bottles. As the crates are thus successively conveyed into and out of the tank and from one compartment to the other, it becomes necessary to stop the annular movement of the carrying hangers that the crates may pass to and from them and it is also necessary to alternately start and stop the longitudinal movement of the endless chain 43 that the crates carried thereby may be emptied and refilled with bottles and the intermittent movement of such parts must be so timed as to alternate with each other.

An intermittent movement is communicated from the segmental gear 21′ to the endless chain 43, through the pinion 47, shaft 47′, sprocket wheel 47^2, sprocket chain 48, sprocket wheel 49, shaft 50, miter gears 51 and 52, shaft 45, and from thence to the wheel 44′ from which wheel motion is communicated direct to the endless chain 43. The wheel 44′ serves as the driver of the chain, while the other wheels 44 serve simply to support said chain as it is being driven. The intermittent movement of the chain and the parts connected therewith is effected by the action of the segmental gear 21′ upon the pinion 47. As the segmental gear 21′ revolves, it communicates movement to said pinion 47 during a part of its revolution only, while the teeth of said segmental gear are in contact with such pinion. When, however, the blank space 59 passes such pinion, the pinion is permitted to stop and the endless chain is thus caused to stop and start with each revolution of the segmental gear 21′ on its supporting shaft. As an intermittent movement is thus being communicated from the driving shaft to the endless chain, an intermittent movement is simultaneously communicated from the motor driven shaft 16 to the crate carrying mechanism through the pulley 17, belt 18, pulley 19, worm shaft 20, worm gear 21, laterally projecting pins 56, Geneva gear 64, gear 22, pinion 23, shaft 24, and from said shaft 24 to the several crate carrying collars 8, through the several pinions 25, 26, 29, 30, 33 and 34, which pinions respectively mesh in the annular series of gear teeth 27, 28, 31, 32, 35 and 36 formed upon the vertical edge of said carrying collars, the laterally projecting pins 56 operating in the slots 57 of the so-called Geneva gear 55 in such a manner that the annular movement of the crate carrying hangers is stopped and remains at rest while the crates are being conveyed into them, and when the crates have been thus moved by the endless chain, the movement of the chain is stopped, while the crate supporting hangers move far enough to bring the next succeeding hanger into position for the reception of the next succeeding crate, when such collar is stopped and the endless carrying chain again started, and the operation described is again and continuously repeated until all the crates have passed through the apparatus. The intermittent movement is thus communicated to the Geneva gear through the action of the laterally projecting pins 56 as they pass into and out of the recesses 57 and when said pins 56 are brought out of contact with said Geneva gear, the same will remain at rest until the gear carrying said pins 56 has completed its revolution.

60 is a duct through which hot water may be led from a boiler to the central compartment of the tank 1 and 61 is a valve for controlling its admission.

62 is a manhole, which is closed by the cover 63. The stationary track sections are supported at their respective ends from the stationary collars 9, while the movable track sections 15 are revolubly suspended at their respective ends from the movable collars 8, through the hangers 12 and shafts 11, whereby, when the crates are moved forward from one movable track section 15 to another, they pass over the intermediate stationary sections 16′. The position of the stationary track 16′ is such that the several sections 15 are successively brought into alinement with them as they reach the vertical above the longitudinal center of the tank. The Geneva gear 55 is provided with a plurality of concave bearing surfaces 64, which as the pins 56 are brought out of contact with the slots 57, are adapted to bear against the convex surface of the flange 65 carried by the gear 21, whereby said Geneva gear is prevented from turning, while all that part of the convex surface 65 between the points 66 and 67 are passing beneath such concave surface 64, and whereby such gear is retained in such position that the driving pins 56 will freely enter said slots 57, when said gear 22 has completed its annular movement.

While the mechanism for conveying the crates of bottled goods into and from the sterilizing tank and for carrying said crates in a circular course through each compartment of said tank, each comprise several coöperating parts, for brevity of description, such conveyers are respectively hereinafter referred to in the claims as horizontal and revoluble conveyers. It will be understood that the conveyer track comprising said stationary and movable sections, extends longitudinally through the several compartments of said tank and from thence around its exterior, whereby the crate carrying hangers and crates are thereby conveyed in a continuous course through and then around one side of said tank. The endless conveyer chain heretofore referred to is suspended centrally beneath said track throughout its entire length in such a manner that the brackets 42 connected with said chain, are adapted to engage the depending fin 41 connected with said crates, whereby when said chain is moved, the required movement will be communicated from said chain to said crates and said crates moved forward through the several compartments of the tank as previously described.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus of the described class, the combination of a sterlizing tank, a pair of annular stationary crate supporting collars mounted in said tank, a pair of annular revoluble collars each provided with a plurality of roller bearings surrounding and supported from said stationary collars, a plurality of sets of crate carrying hangers pivotally suspended from said revoluble collars, means for conveying bottle crates from the exterior of said tank into position to be carried by said hangers, means for communicating an intermittent movement to said revoluble collars, and means for moving the crates from the hangers of said tank after they have completed their annular course therein.

2. In an apparatus of the described class, the combination of a sterilizing tank divided by transverse partitions into a plurality of compartments, a pair of annular stationary crate supporting collars mounted in each of said compartments, a pair of annular revoluble collars provided with a plurality of roller bearings surrounding and supported from said stationary collars, a plurality of sets of crate carrying hangers pivotally suspended from said revoluble collars, means for conveying bottle crates from the exterior of said tank into position to be carried by said hangers, means for communicating an intermittent movement to said revoluble collars, means for moving the crates from the hangers in one compartment after they have completed their annular course therein to the hangers of the next compartment, and means for moving the crates from the last compartment.

3. In an apparatus of the described class, the combination of a sterilizing tank divided by transverse partitions into a plurality of compartments, a pair of annular stationary crate supporting collars mounted in each of said compartments, a pair of annular revoluble collars provided with a plurality of roller bearings surrounding and supported from said stationary collars, a plurality of sets of crate carrying hangers pivotally suspending form said revoluble collars, a movable track section for each set of crate carrying hangers located within and carried by said annular revoluble collars, a stationary track section supported above the longitudinal center of the tank in alinement with said movable track sections between and upon each side of the several compartments, means for communicating an intermittent movement to said revoluble collar and track sections carried thereby, and means for moving said crate carrying hangers from said stationary to said movable track sections, when the latter are at rest.

4. In an apparatus of the described class, the combination of a sterilizing tank divided by transverse partitions into a plurality of compartments, a pair of annular stationary crate supporting collars mounted in each of

said compartments, a pair of annular revoluble collars provided with a plurality of roller bearings surrounding and supported from said stationary collars, a plurality of sets of crate carrying hangers pivotally suspended from said revoluble collars, a movable track section for each set of crate carrying hangers located within and carried by said annular revoluble collars, a stationary track section supported above the longitudinal center of the tank in alinement with said movable track sections between and upon each side of the several compartments, means for communicating an intermittent movement to said revoluble collar and track sections carried thereby, a bottle crate carried by each of said hangers, an endless conveyer chain extending longitudinally from one end to the other through the several compartments and from thence to the starting point, returning upon the exterior of said compartments, means for communicating an intermittent movement to said endless chain, and from said endless chain to said bottle crates.

5. In an apparatus of the described class, the combination of a sterilizing tank divided by transverse partitions into a plurality of compartments, a pair of annular stationary crate supporting collars mounted in each of said compartments, a pair of annular revoluble collars provided with a plurality of collar bearings surrounding and supported from said stationary collars, a plurality of sets of crate carrying hangers pivotally suspended from said revoluble collars, a movable track section for each set of crate carrying hangers located within and carried by said annular revoluble collars, a stationary track section supported above the longitudinal center of the tank in alinement with said movable track sections upon each side of the several compartments, means for communicating an intermittent movement to said revoluble collar and track sections carried thereby, a bottle crate carried by each of said hangers, an endless chain extending longitudinally from one end to the other through the several compartments and from thence to the starting point, returning upon the exterior of said compartments, means for communicating an intermittent movement to said endless chain, and means for alternately connecting said chain to and releasing it from said crates as the latter are moved with said hangers from one of said track sections to the other through said compartments.

6. In a pasteurizing apparatus, the combination of a tank divided by transverse partitions into a plurality of compartments, annular stationary collars mounted in each of said compartments, annular revoluble collars supported from and around said stationary collars, crate carrying hangers pivotally suspended from said revoluble collars, bottle crates carried by said hangers, a fin connected with each of said crates, an endless conveyer chain extending longitudinally from one end to the other through the compartments of said tank, a plurality of lugs connected with said chain, said lugs being adapted, as said chain is revolved, to engage said fins and move said crates and to be automatically disengaged from said fins as said crates are moved laterally by said annular revoluble collars, and means for alternately moving and stopping said endless chain and revoluble collars.

7. In a pasteurizing apparatus, the combination of a tank divided by transverse partitions into a plurality of compartments, annular stationary collars mounted in each of said compartments, annular revoluble collars supported from and around said stationary collars, crate carrying hangers pivotally suspended from said revoluble collars, bottle crates carried by said hangers, a fin connected with each of said crates, an endless conveyer chain extending longitudinally from one end to the other through the compartments of said tank, a supporting channel for said carrier chain, a plurality of sets of lugs connected at short intervals apart to said carrying chain, each set comprising two outwardly diverging members between which is a space for the reception of the fin carried by each of said crates, whereby when said chain is at rest, the fins of said crates are caused by the movement of said revoluble collar, to enter such space and be engaged by said lugs, and when said collar is at rest, said crates will be disengaged from said lugs by the forward movement of said chain, all substantially as and for the purpose specified.

In testimony whereof I affix my signature in the presence of two witnesses.

JOSEPH HAUK, Jr.

Witnesses:
O. R. Erwin,
Jas. B. Erwin.

Pa
Oct. 1913

E. L. WESCOTT.

COMBINED RACK AND SEAL FOR SUBMERGED MILK CONTAINERS.

APPLICATION FILED JAN. 30, 1913.

1,076,852. Patented Oct. 28, 1913.

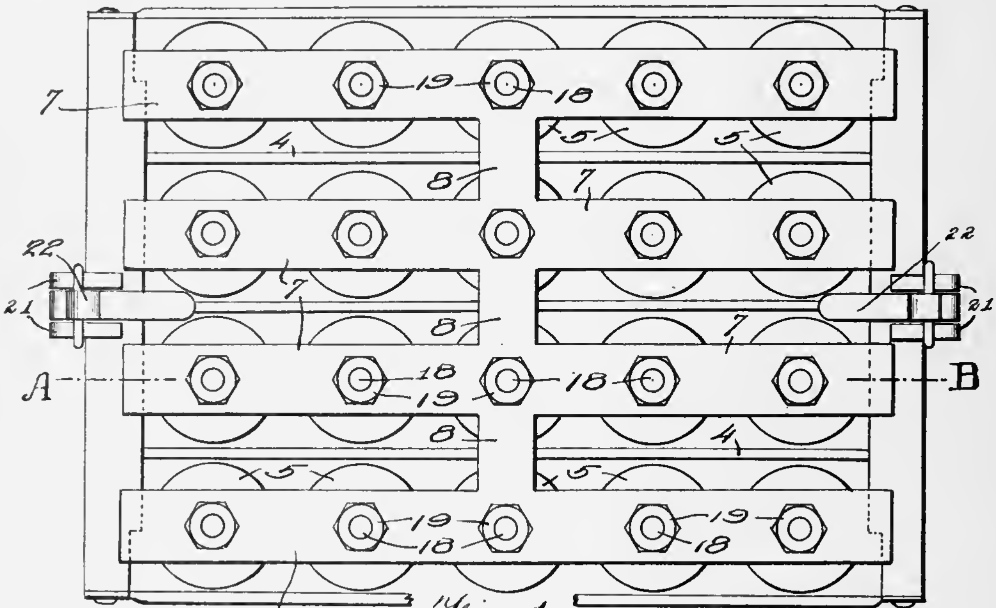

Fig. 1.

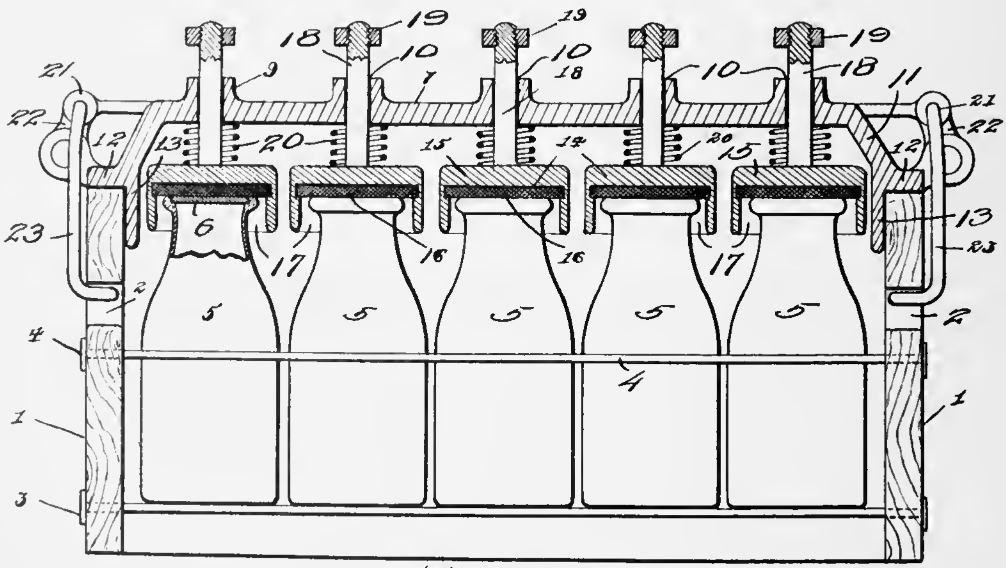

Fig. 2.

Inventor
E. L. Wescott

Witnesses
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W. G. Hammond

By E. J. Fetherstonhaugh

Attorney

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDMUND LANGWORTHY WESCOTT, OF TORONTO, ONTARIO, CANADA.

COMBINED RACK AND SEAL FOR SUBMERGED MILK-CONTAINERS.

1,076,852. Specification of Letters Patent. **Patented Oct. 28, 1913.**

Application filed January 30, 1913. Serial No. 745,114.

To all whom it may concern:

Be it known that I, EDMUND LANGWORTHY WESCOTT, resident of 152 Lee avenue, in the city of Toronto, county of York, Province of Ontario, in the Dominion of Canada, an American citizen, mechanical superintendent, have invented certain new and useful Improvements in Combined Racks and Seals for Submerged Milk-Containers, of which the following is a specification.

The invention relates to improvements in combined racks and seals for submerged milk containers, as described in the present specification and illustrated in the accompanying drawings that form part of the same.

The invention consists essentially in the novel construction and arrangement of parts, whereby in the treatment of milk in bottles the stopper is protected against contact with the outside fluid.

The objects of the invention are to effect economy in the matter of the stoppers employed as closures for the milk bottles, and in consequence use the ordinary paraffin pulp disk stoppers in place of a more expensive form and it is well known that the pulp stoppers are much more satisfactory, to devise a convenient form of rack, which will facilitate the process of pasteurizing milk and generally to provide a comparatively cheap and very durable rack for the purposes aforesaid.

In the drawings Figure 1 is a plan view of the top of the rack. Fig. 2 is a longitudinal sectional view of the complete rack on the line A—B in Fig. 1.

Like numerals of reference indicate corresponding parts in each figure.

Referring to the drawings, 1 are the ends of the rack formed of wood or any suitable material, that will not be materially effected by immersion in hot or cold fluids and having the hook holes 2 therethrough a short distance below the top and midway between the side edges of the said ends.

3 are bars suitably fastened in the ends 1 adjacent to the bottom thereof and forming milk bottle supports, in fact forming the grid bottom to the rack.

4 are rods suitably secured in the ends 1 intermediate of the height thereof extending between and outside of the rows of the milk bottles, and completing the frame.

5 are milk bottles standing on the grid bottom between the rods 4 and having the disk closures 6.

7 is a grid top preferably formed of four parallel bars joined by the cross bars 8 in the center thereof, said bars having the bosses 9 and the orifices 10 through said bosses and the downwardly offset ends 11, said ends terminating in the horizontal flanges 12 and the vertical flanges 13 and seated on the top edge faces of the ends 1, said flanges extending completely across the grid top, therefore the grid top 7 sits on the top of the ends 1 when in position, the orifices 10 being centrally arranged over the milk bottles 5.

14 are inverted cups having the flat bottoms 15 and the rubber disks 16 covering said bottoms, the said walls of said cups encircling the tops of said milk bottles 5, while the rubber disks rest on the rims of the bottles. The said cups are some what larger than the neck and head of the milk bottle, so that there is an annular space 17 forming an air seal between each of said cups and each of said bottles.

18 are stems rigidly and centrally secured to the outside bottoms 15 and extending upwardly through the orifices 10 and having threaded upper ends extending outwardly beyond the bosses 9, each of said threaded upper ends having a nut 19 mounted thereon.

20 are spiral springs encircling the stems 18 between the grid top 7 and the cups 14, thereby exerting a constant pressure on the tops of said cups and bringing the rubbers 16 in to close contact with the bottles, when the grid top 7 is fastened.

21 are lugs extending outwardly from the grid top 7 at each end thereof, each lug having a suitable pivot orifice therethrough.

22 are crank levers, each of said cranks being pivoted at the end of one of its sections in a lug 21 and having a downwardly hanging hook 23 pivotally secured at the angle thereof, the other section of said crank acting as a handle. It will be thus seen that on throwing the crank levers 22 outwardly the hooks 23 will hang loosely but on turning said cranks inwardly and slipping the hooks in the hook holes 2, the hooks will be drawn up tightly against the top walls of said hook holes and as the angle of each of said crank levers is slightly beyond the pivot center of the lug, the said hooks are locked firmly in place. This or any

other fastening will be quite suitable for the grid top, in fact many changes may be made in the construction of the device without departing from the spirit of the invention, so long as changes are kept within the scope of the claims for novelty following this description.

In the use of this rack the bottles are closed in the usual manner with disk stoppers and placed in the rack.

The grid top is placed in position, so that the inverted cups are over the tops of the bottles, the rubbers on the bottom coming into contact with said bottles, thus the bottles are held there firmly and the whole rack with the bottles can be immersed in the pasteurizing fluid without fear of the said fluid reaching the closures of said bottles, as the annular air spaces between the tops of the bottles and the side walls of the cups provide air seals, which prove a barrier to the passage of the outside liquid to the extreme tops of said bottles. The closures are further protected against moisture by the rubbers in the bottom of the cups, consequently the said disk closures will be kept perfectly dry during the pasteurizing treatment.

This description has been confined to the use of this rack for milk bottles, but it must be understood that it may be utilized otherwise.

What I claim is:—

1. In a device of the class described, a frame formed of ends and longitudinal bars, a grid top having bosses projecting upwardly therefrom and orifices through said bosses, a plurality of inverted cups having stems projecting upwardly through said orifices and means for fastening said grid top to said ends.

2. In a device of the class described, a frame formed of ends and longitudinal bars, a grid top having offsets at the end of its longitudinal bars terminating in horizontal and vertical flanges forming a seat on the tops of said ends, fasteners secured to said horizontal flanges and engaging the said ends, and a plurality of inverted cups suitably secured to said grid top and engaging the bottles therebelow.

3. In a device of the class described, a frame formed of ends and longitudinal bars, a grid top having bosses projecting upwardly therefrom and orifices through said bosses, a plurality of inverted cups having stems projecting upwardly through said orifices, and resilient means exerting a downward pressure on said cups, said cups being formed to provide an air chamber protecting the tops of the bottles they encircle and cover from contact with any liquid in which the frame may be immersed in a horizontal position, and means for fastening said grid top to said ends.

Signed at the city of Toronto, Ont., this 13th day of December, 1912.

EDMUND LANGWORTHY WESCOTT.

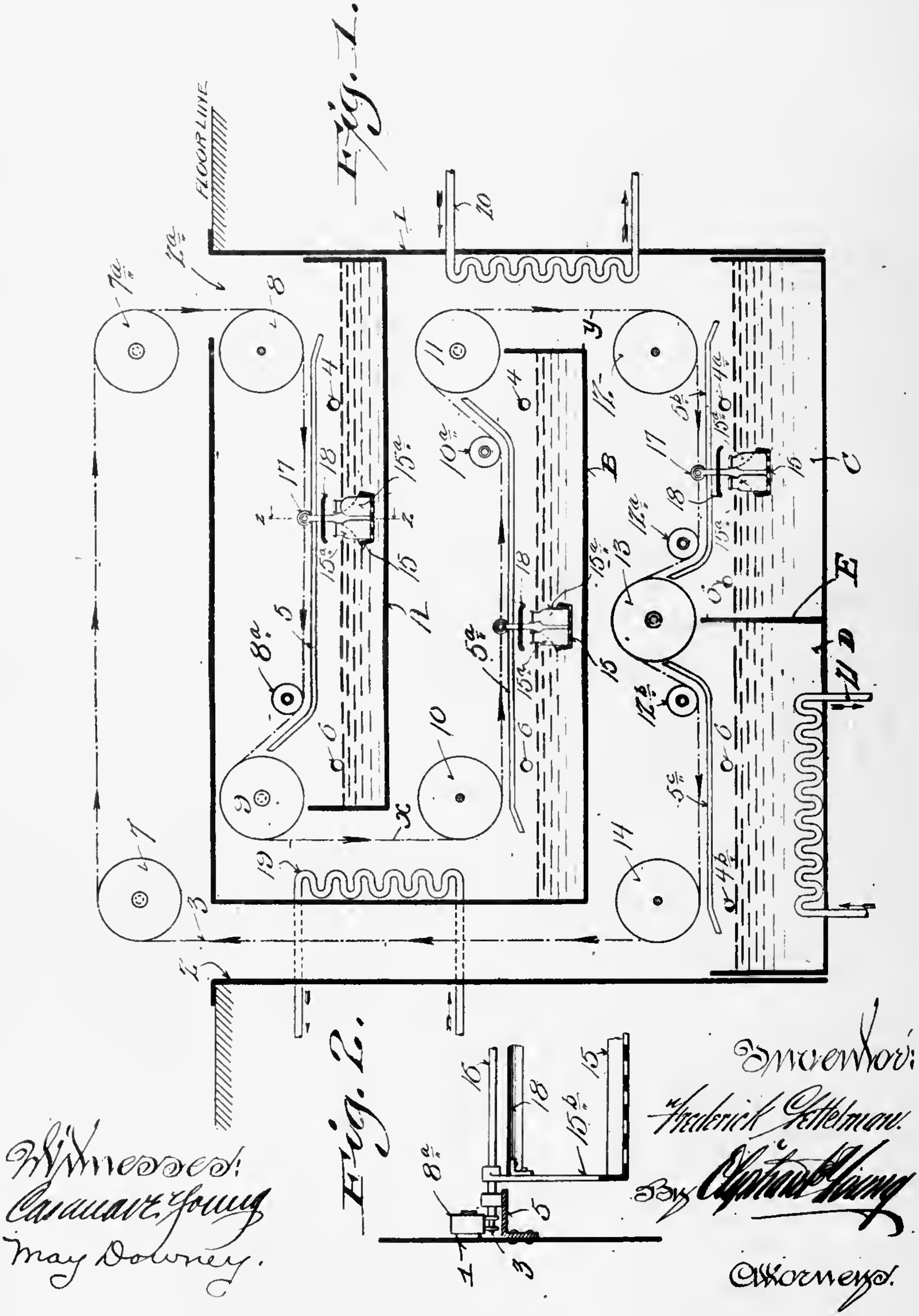
Witnesses:

W. G. HAMMOND,

M. S. NUECERT.

F. GETTELMAN.
PASTEURIZING.
APPLICATION FILED FEB. 6, 1912.

1,077,270. Patented Nov. 4, 1913.



UNITED STATES PATENT OFFICE.

FREDERICK GETTELMAN, OF MILWAUKEE, WISCONSIN.

PASTEURIZING.

1,077,270. Specification of Letters Patent. Patented Nov. 4, 1913.

Application filed February 6, 1912. Serial No. 675,853.

To all whom it may concern:

Be it known that I, FREDERICK GETTELMAN, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Pasteurizing; and I do hereby declare that the following is a full, clear, and exact description thereof.

The object of my invention is to provide a simple, effective and accurate method of pasteurizing, the same being accomplished through apparatus of the general character disclosed in the patent issued to me for pasteurizing apparatus, dated April 11, 1911, No. 989,141.

In general the method consists in subjecting the bottled product to successive interrupted immersions in water contained in separate vats, the water in each vat being at an initial predetermined temperature whereby said product is gradually brought to the exact pasteurizing temperature desired, at which temperature it is sustained for a period of time and thereafter gradually lowered in temperature preparatory to being removed from the pasteurizing apparatus.

This method is especially adapted to pasteurize milk, although it is apparent that any product may be treated with efficiency and that while I have particularly described the mouths of the vessels as being open that in some instances paper closures for the same may be utilized which would provide the necessary vent owing to such closures not forming a perfect seal.

With the above objects in view the invention consists in what is herein shown and described with reference to the accompanying illustrations and subsequently claimed.

In the drawings Figure 1 represents a diagram view of a pasteurizing apparatus embodying the features of my invention, and Fig. 2, a detail cross-section of a fragment of the conveyer chain and supporting means together with a portion of one of the carriers, the section being indicated by line 2—2 of Fig. 1.

Referring by characters to the drawings 1 indicates a housing forming a chamber having a vertical opening 2 therein that constitutes a well through which the pasteurized product is delivered to operators above the floor-line of the building upon which the housing is supported, the well being disposed at the forward end of the chamber and through which an endless chain conveyer 3 passes. The conveyer chain is driven and supported by a series of pulleys to be hereinafter particularly mentioned mounted within and exteriorly of the chamber. Suitably supported within the chamber are a series of vats A, B, C, D, the vats being filled to a predetermined height with water from supply-pipes 4, 4, 4^a, 4^b. Track-rails 5, 5^a, 5^b, and 5^c are disposed above the water-line of the series of vats and serve as longitudinal supporting guides for the chain conveyer. This chain conveyer is arranged to pass over a pulley 7 located above the top-wall of the chamber, the chain being thereafter passed over a pulley 7^a similarly located at the rear end of said chamber. From thence the chain passes down through an opening 2^a at the rear end of the chamber top over a pulley 8 located above the first vat A, from which point it is arranged to travel forwardly and over the guide-rail 5 under a guide-pulley 8^a and from thence said chain is inclined upwardly and is arranged to travel over a pulley 9, being also supported at its inclined portion by an upwardly inclined section of the guide-rail 5, which inclined section or stretch rises from pulley 8^a to pulley 9. The conveyer chain thereafter passes downwardly over a pulley 10 that is disposed above the vat B and from thence it travels parallel to the water-line in said vat and above the same to a guide-pulley 10^a, being upwardly inclined at the rear end of the vat B where it passes over a pulley 11. The conveyer chain is then directed downwardly at the rear end and under another pulley 12 that is disposed over vat C. From this pulley the chain travels forwardly under a guide-pulley 12^a and over a large pulley 13 which is disposed directly above the partition between vats D and C, which vats are in this instance shown arranged upon the same horizontal plane. The conveyer chain after passing over pulley 13 is deflected downwardly by a guide-pulley 12^b, a stretch being then directed parallel with vat D and over the same. The endless conveyer then passes under a pulley 14 from which it travels upwardly through the well 2 to the first pulley 7 whereby the cycle is completed.

From the foregoing it will be seen that the endless chain conveyers thus pass in zig-zag manner back and forth over the series of vats, being alternately dropped and elevated as it enters and leaves each vat in order to immerse the bottled product in the vat water. Each portion of the bottled product is contained in a vessel 15^a, groups of which are assembled in a series of carriers 15 that are pivotally suspended from rods 16, which rods are carried by the chain conveyer, the rods being provided with anti-friction rollers 17 arranged to contact with the guide-rails. By the above described construction the several stretches of the aforesaid chain conveyer are relieved of sagging strain to which they would otherwise be subjected and thus friction being reduced to a minimum a proportionately less amount of power is required to operate the apparatus. Furthermore it is apparent that owing to the arrangement of guide-rails which support the carriers 15 that the latter are always held in a position whereby they are submerged at a predetermined depth. By this arrangement the vessels or bottles 15^a containing the product can be submerged to the proper depth so that their necks are above the water-line and can thus be open to the atmosphere without danger of injury to the contents thereof incidental to travel through the sterilizing liquid.

Each bottle-carrier 15 has secured thereto a shield 18 that is connected to the supporting bails 15^b of the carrier and is disposed just above the open mouths of the vessels whereby they are protected and any water drippings or foreign matter that may drop upon the tray incidental to its travel is deflected from the vented vessels whereby their contents will not be polluted.

As clearly shown in the diagram a heat regulator in the form of a coiled pipe 19 is arranged in juxtaposition to the forward end of the first vat A, which coiled pipe parallels the vertical stretch x of the conveyer chain between said vat and the second vat B. A similar coil 20, which, in this instance, is adapted to receive a cooling medium, is mounted within the chamber in juxtaposition to the vertical stretch y of the conveyer chain that passes from the second vat B to the third vat C, the latter vat being provided with water which is designed as a cooling medium, being of slightly lower temperature than the water contained in vat B, which vat may be termed the sterilizing vat and, for example, contains water at a temperature of approximately 149°. The last vat D of the series may be termed a cooling vat and contains water which may, as shown, be held at a predetermined low temperature by a cooling medium that is introduced indirectly thereto through a coiled pipe 21.

From the foregoing it will be apparent that in carrying out my improved method of pasteurizing that the product on entering the chamber is approximately at atmospheric temperature and the vessels containing the product being open to atmosphere as previously mentioned, said vessels are first submerged in vat A, which contains water at a desired intermediate temperature whereby the product is raised in temperature gradually preparatory to being submerged in the pasteurizing vat B. Before entering said vat the product is pre-heated in its travel downwardly by indirect radiation from the heating coil 19 and thus in its travel from the first vat to the pasteurizing vat the temperature of the product is held constant or slightly pre-heated. Hence there is no sudden rise in the temperature of the product as it is submerged into the liquid containing vat B. Pasteurizing is effected as the carrier containing the product passes from the forward end to the rear end of vat B and thereafter it is desirable to gradually cool the pasteurized product. The initial pre-cooling is effected by indirect contact with the cooling medium introduced through coil 20. A further cooling of the product is effected as it travels through vat C, the final cooling being accomplished incidental to the travel of the carrier through vat D, the liquid in which, as shown, is maintained at a predetermined temperature by the cooling medium 21. The pasteurizing is now completed and the endless carrier raises the product up through the well 2 to the floor-line of the building where said product is unloaded in any desired manner.

While I have shown and described the chamber as being provided with four vats it is apparent that this number may be diminished or increased in accordance with the conditions required with reference to the product to be sterilized, particular attention being called to the fact that the product is pre-heated or pre-cooled by artificial means incidental to its travel from one vat to the other, whereby sudden variations in temperature are avoided in the interrupted steps of bringing the product to a pasteurizing temperature and thereafter gradually cooling the same, the said temperature regulating means being introduced in any desired form in the relative positions described and illustrated. It will also be observed that, as previously stated, the bottles or vessels containing the product are at no time totally submerged but are held in such a position relative to the water-line in the vats that the sterilized product is exposed to atmosphere.

I claim:

1. A pasteurizing method consisting in subjecting an atmospherically exposed product to a series of step by step water baths having progressively higher temperatures to effect sterilization, pre-heating the product by indirect radiation between the water baths of progressively higher temperatures,

and thereafter subjecting said product, step by step, to a series of water baths having progressively lower temperatures relative to the maximum temperature of the first named series, and pre-cooling the product between the cooling baths by subjecting said product to the influence of an indirect cooling medium.

2. A pasteurizing method consisting in subjecting the product to a series of step by step water baths having progressively higher temperatures to effect sterilization, pre-heating the product by indirect radiation between the water baths of progressively higher temperatures, and thereafter subjecting said product, step by step, to a series of water baths having progressively lower temperatures relative to the maximum temperature of the first named series, and pre-cooling the product between the cooling baths by subjecting said product to the influence of an indirect cooling medium.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee in the county of Milwaukee and State of Wisconsin in the presence of two witnesses.

FREDERICK GETTELMAN.

Witnesses:

GEO. W. YOUNG,

M. E. DOWNEY.

Pa

Dec. 1913

1,082,743

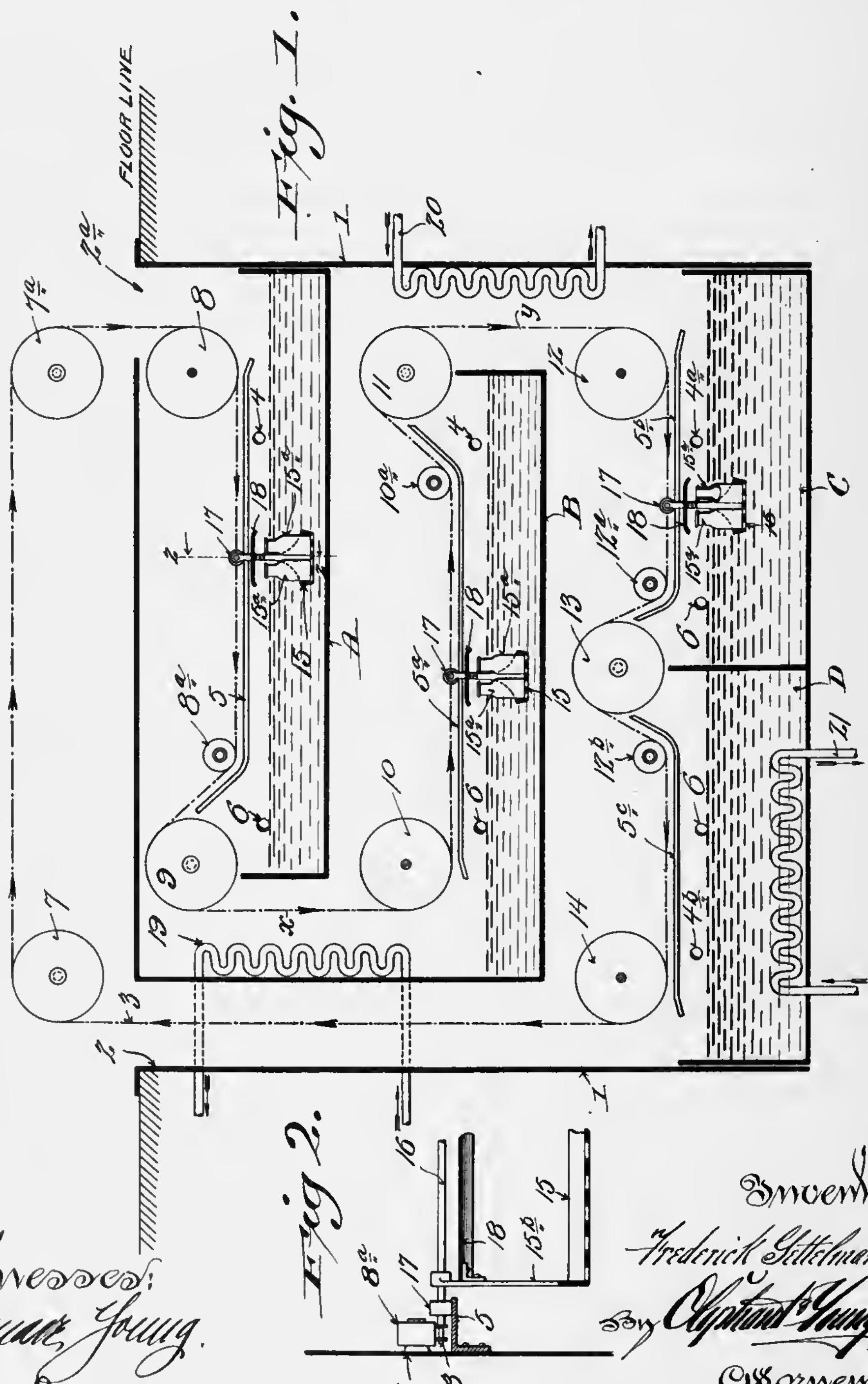
F. GETTELMAN.

PASTEURIZING.

APPLICATION FILED NOV. 28, 1911.

1,082,743.

Patented Dec. 30, 1913.



Witnesses:

Edward Young.

May Downey.

Inventor.

Frederick Gettelman

By Olephant & Young

Attorneys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FREDERICK GETTELMAN, OF MILWAUKEE, WISCONSIN.

PASTEURIZING.

1,082,743. Specification of Letters Patent. Patented Dec. 30, 1913.

Application filed November 28, 1911. Serial No. 662,871.

To all whom it may concern:

Be it known that I, FREDERICK GETTELMAN, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Pasteurizing; and I do hereby declare that the following is a full, clear, and exact description thereof.

The primary object of my invention is to increase the efficiency and scope of pasteurizing apparatus in general and particularly apparatus of that character such as described and claimed in a patent issued to me for pasteurizing apparatus dated April 11, 1911, No. 989,141.

In a general way my improved apparatus embodies in its construction and arrangement means for subjecting the bottled product to successive interrupted immersions in water contained in separate vats, the water in each vat being at an initial predetermined temperature whereby said product is gradually brought to the exact pasteurizing temperature desired, at which temperature it is sustained for a period of time and thereafter gradually lowered in temperature preparatory to being removed from the pasteurizing apparatus.

Specific objects of my invention are to provide means whereby open mouthed vessels containing the product to be pasteurized are maintained above the water-line in such position that only the body of the bottles will be submerged as they travel through the water, the product being thus vented during the process of sterilization; to provide protecting shields for the bottles whereby drippings of water or other foreign substance are shed from said open-mouthed bottles; to provide means for controlling the temperature of the product during its travel from one vat to the other, said means including indirect pre-heating and pre-cooling coils, provision being made for placing certain of the coils directly within the vats; to provide an endless conveyer chain having carriers, which chain is supported above the water-line at all times, the carriers being arranged with respect to the water-line in the various vats to submerge the body of the vessels containing the product to be sterilized, and to provide water supply pipes and overflows for the various vats whereby the water-level therein will remain constant.

With the above objects in view the invention consists in what is herein shown and described with reference to the accompanying illustrations and subsequently claimed.

In the drawings Figure 1 represents a diagram view of a pasteurizing apparatus embodying the features of my invention, and Fig. 2, a detail cross-section of a fragment of the conveyer chain and supporting means together with a portion of one of the carriers, the section being indicated by line 2—2 of Fig. 1.

Referring by characters to the drawings 1 indicates a housing forming a chamber having a vertical opening 2 therein that constitutes a well through which the pasteurized product is delivered to operators above the floor-line of the building upon which the housing is supported, the well being disposed at the forward end of the chamber and through which an endless chain conveyer 3 passes. The conveyer chain is driven and supported by a series of pulleys to be hereinafter particularly mentioned mounted within and exteriorly of the chamber.

Suitably supported within the chamber are a series of vats A, B, C, D, the vats being filled to a predetermined height with water from supply-pipes 4, 4, 4^a, 4^b, the height of the water being controlled by overflow pipes 6. Track-rails 5, 5^a, 5^b, and 5^c are disposed above the water-line of the series of vats and serve as longitudinal supporting guides for the chain conveyer. This chain conveyer is arranged to pass over a pulley 7 located above the top-wall of the chamber, the chain being thereafter passed over a pulley 7^a similarly located at the rear end of said chamber. From thence the chain passes down through an opening 2^a at the rear end of the chamber top over a pulley 8 located above the first vat A, from which point it is arranged to travel forwardly and over the guide-rail 5 under a guide-pulley 8^a and from thence said chain is inclined upwardly and is arranged to travel over a pulley 9, being also supported at its inclined section between the pulleys 8^a and 9, by an upwardly inclined section of the guide-rail 5, that parallels the inclined stretch of said chain. The conveyer chain thereafter passes downwardly over a pulley 10 that is disposed above the vat B and from thence it travels parallel to the water-line in said vat and above the same to a guide-pulley 10^a, being upwardly inclined at the rear end of the vat B where it passes over a pulley 11. The conveyer chain is then directed downwardly at the rear end and under another pulley 12 that is disposed over vat C. From this pulley the chain travels forwardly under a guide-pulley 12^a and over a large pulley 13 which is disposed directly above the partition between vats D and C, which vats are in this instance shown arranged upon the same horizontal plane. The conveyer chain after passing over pulley 13 is deflected downwardly by a guide-pulley 12^b, a stretch being then directed parallel with vat D and over the same. The endless conveyer then passes under a pulley 14 from which it travels upwardly through the well 2 to the first pulley 7 whereby the cycle is completed.

From the foregoing it will be seen that the endless chain conveyers thus pass in zig-zag manner back and forth over the series of vats, being alternately dropped and elevated as it enters and leaves each vat in order to immerse the bottled product in the vat water. Each portion of the bottled product is contained in a vessel 15^a, groups of which are assembled in a series of carriers 15 that are pivotally suspended from rods 16, which rods are carried by the chain conveyer, the rods being provided with anti-friction rollers 17 arranged to contact with the guide-rails.

By the above described construction the several stretches of the aforesaid chain conveyer are relieved of sagging strain to which they would otherwise be subjected and thus friction being reduced to a minimum a proportionately less amount of power is required to operate the apparatus. Furthermore it is apparent that owing to the arrangement of guide-rails which support the carriers 15 that the latter are always held in a position whereby they are submerged at a predetermined depth. By this arrangement the vessels or bottles 15^a containing the product can be submerged to the proper depth so that their necks are above the water-line and can thus be open to the atmosphere without danger of injury to the contents thereof incidental to travel through the sterilizing liquid.

Each bottle-carrier 15 has secured thereto a shield 18 that is connected to the supporting bails 15^b of the carrier and is disposed just above the open mouths of the vessels whereby they are protected and any water drippings or foreign matter that may drop upon the tray incidental to its travel is deflected from the vented vessels whereby their contents will not be polluted.

As clearly shown in the diagram a heat regulator in the form of a coiled pipe 19 is arranged in juxtaposition to the forward end of the first vat A, which coiled pipe parallels the vertical stretch x of the conveyer chain between said vat and the second vat B. A similar coil 20, which, in this instance, is adapted to receive a cooling medium, is mounted within the chamber in juxtaposition to the vertical stretch y of the conveyer chain that passes from the second vat B to the third vat C, the latter vat being provided with water which is designed as a cooling medium, being of slightly lower temperature than the water contained in vat B, which vat may be termed the sterilizing vat and, for example, contains water at a temperature of approximately 149°. The last vat D of the series may be termed a cooling vat and contains water which may, as shown, be held at a predetermined low temperature by a cooling medium that is introduced indirectly thereto through a coiled pipe 21.

From the foregoing it will be apparent that in carrying out my improved method of pasteurizing that the product on entering the chamber is approximately at atmospheric temperature and the vessels containing the product being open to atmosphere as previously mentioned, said vessels are first submerged in vat A, which contains water at a desired intermediate temperature whereby the product is raised in temperature gradually preparatory to being submerged in the pasteurizing vat B. Before entering said vat the product is pre-heated in its travel downwardly by indirect radiation from the heating coil 19 and thus in its travel from the first vat to the pasteurizing vat the temperature of the product is held constant or slightly pre-heated. Hence there is no sudden rise in the temperature of the product as it is submerged into the liquid containing vat B. Pasteurizing is effected as the carrier containing the product passes from the forward end to the rear end of vat B, and thereafter it is desirable to gradually cool the pasteurized product. The initial pre-cooling is effected by indirect contact with the cooling medium introduced through coil 20. A further cooling of the product is effected as it travels through vat C, the final cooling being accomplished incidental to the travel of the carrier through vat D, the liquid in which, as shown, is maintained at a predetermined temperature by the cooling medium 21. The pasteurizing is now completed and the endless carrier raises the product up through the well 2 to the floor-line of the building where said product is unloaded in any desired manner.

While I have shown and described the chamber as being provided with four vats it is apparent that this number may be diminished or increased in accordance with the conditions required with reference to the product to be sterilized, particular attention being called to the fact that the product is pre-heated or pre-cooled by artificial means incidental to its travel from one vat to the other, whereby sudden variations in temperature are avoided in the interrupted steps of bringing the product to a pasteurizing temperature and thereafter gradually cooling the same, the said temperature regulating means being introduced in any desired form in the relative positions described and illustrated.

It will also be observed that, as previously stated, the bottles or vessels containing the product are at no time totally submerged but are held in such a position relative to the water-line in the vats that the sterilized product is exposed to atmosphere.

I claim:

1. In a pasteurizing apparatus having a series of vats arranged one above the other adapted to contain water at progressively higher temperatures to an intermediate vat and progressively lower temperatures from said intermediate vat, an endless conveyer arranged to travel parallel with the water-line of the first vat and having a vertical stretch intermediate of the first and second vats, the conveyer being provided with a second stretch adapted to travel parallel with said second vat and provided with a second vertical stretch between said second and third vats, and vessel carriers in pivotal union with the conveyer; the combination of a heating coil arranged parallel with the first mentioned vertical belt stretch, and a cooling coil arranged parallel with the second vertical stretch of said belt.

2. In a pasteurizing apparatus having a series of vats arranged one above the other adapted to contain water at progressively higher temperatures to an intermediate vat and progressively lower temperatures from said intermediate vat, an endless conveyer arranged to travel parallel with the water-line of the first vat and having a vertical stretch intermediate of the first and second vats, the conveyer being provided with a second stretch adapted to travel parallel with said second vat and provided with a second vertical stretch between said second and third vats, and vessel carriers in pivotal union with the conveyer; the combination of an indirect heating means arranged parallel with the first mentioned vertical belt stretch, and an indirect cooling means arranged parallel with the second vertical stretch of said belt.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee in the county of Milwaukee and State of Wisconsin in the presence of two witnesses.

FREDERICK GETTELMAN.

Witnesses:

GEO. W. YOUNG,
MAY DOWNEY.

F. GETTELMAN.

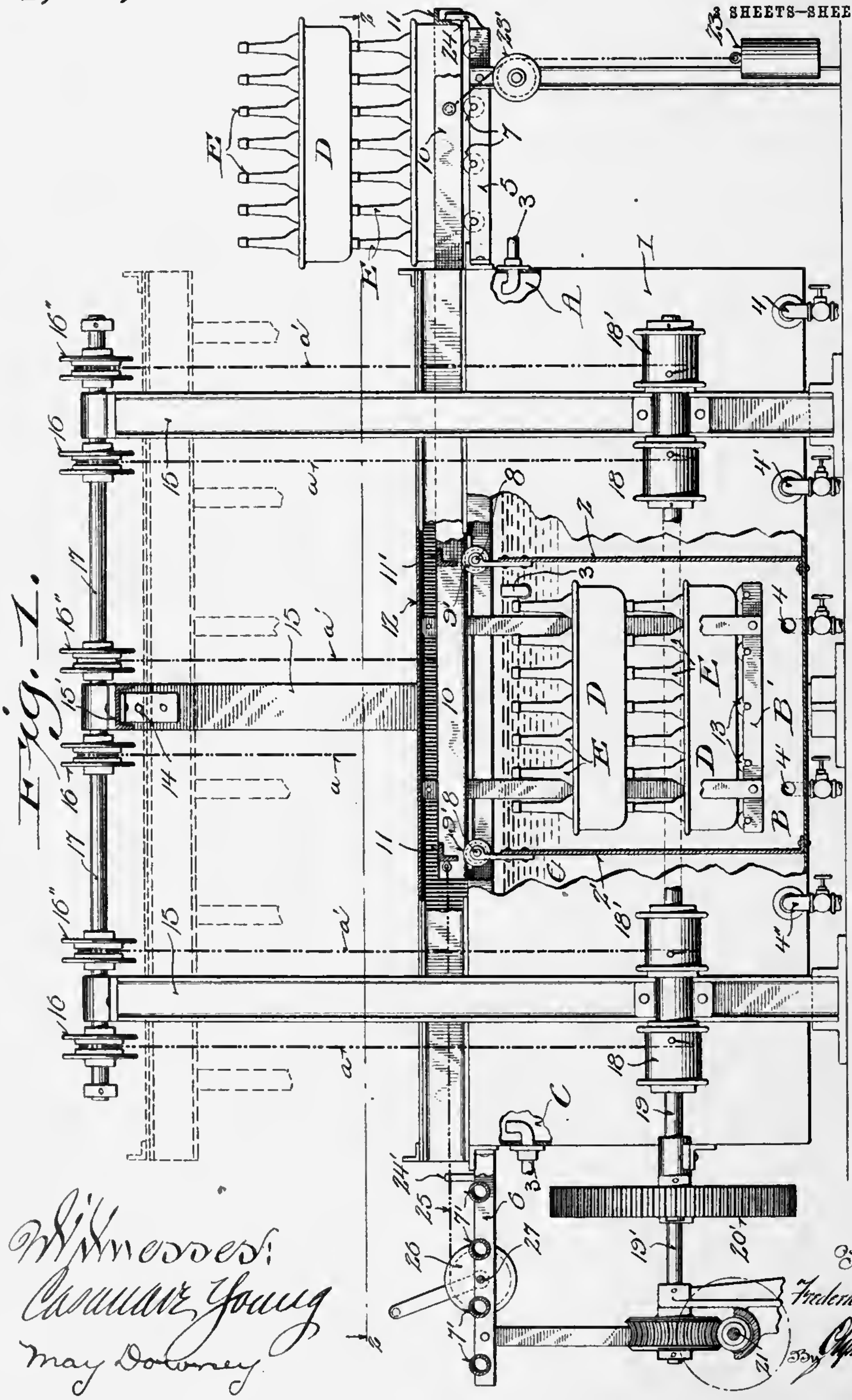
PASTEURIZING APPARATUS.

APPLICATION FILED MAR. 17, 1913.

1,085,901.

Patented Feb. 3, 1914.

3 SHEETS—SHEET 1.



Witnesses:

Casimair Young

May Downey

Inventor:

Frederick Gettelman

By Clifford Young

Attorneys

F. GETTELMAN.
PASTEURIZING APPARATUS.
APPLICATION FILED MAR. 17, 1913.

1,085,901. Patented Feb. 3, 1914.

3 SHEETS—SHEET 2.

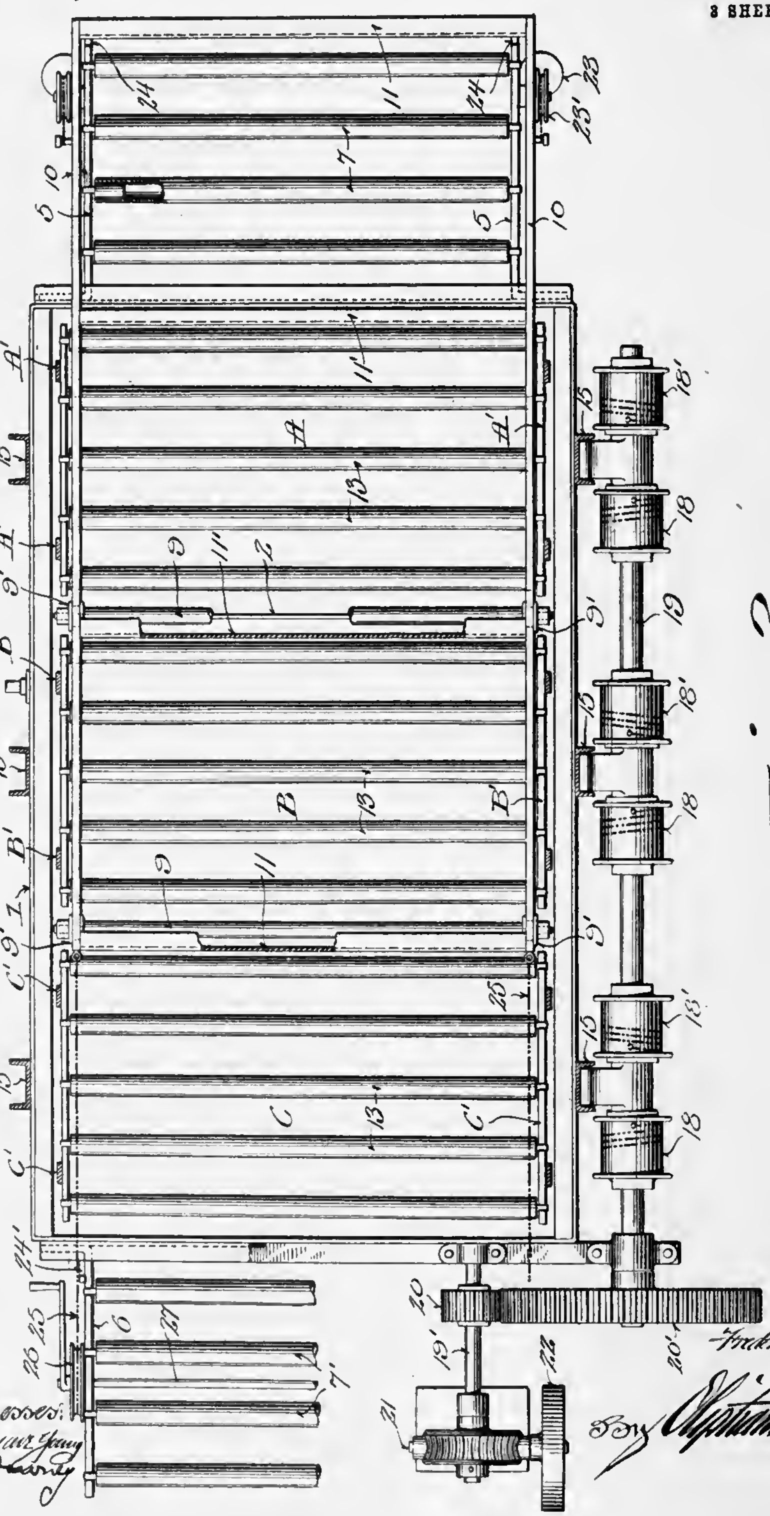


Fig. 2.

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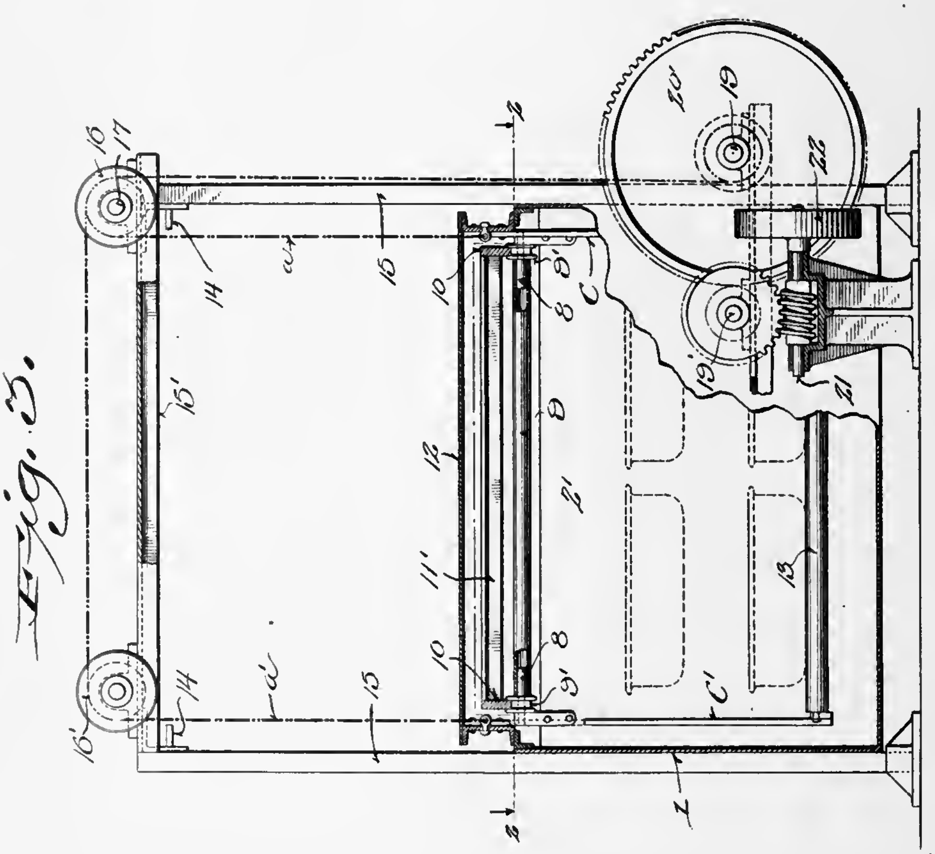
PASTEURIZING APPARATUS.

APPLICATION FILED MAR. 17, 1913.

1,085,901.

Patented Feb. 3, 1914.

3 SHEETS—SHEET 3.



Witnesses:

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May Downey.

Inventor:

Frederick Gettelman

By Olpham Young

Attorneys.

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UNITED STATES PATENT OFFICE.

FREDERICK GETTELMAN, OF MILWAUKEE, WISCONSIN.

PASTEURIZING APPARATUS.

1,085,901. Specification of Letters Patent. Patented Feb. 3, 1914.

Application filed March 17, 1913. Serial No. 754,796.

To all whom it may concern:

Be it known that I, Frederick Gettelman, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Pasteurizing Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention refers to pasteurizers, its object being to provide a simple, economical, effective and compact machine of the above mentioned character wherein a maximum pasteurizing capacity with minimum expenditure of labor will result, the said machine being capable of control by a single operator. In brief, the construction and arrangement is such that, after an initial operation, a series of tiers of separate tray units containing the product in the several stages of pasteurization are fed step by step over a series of pasteurizing vats, whereby the contents of one tier of the tray units with each movement is immersed, pasteurized and discharged. In the step by step process the several tiers of trays are simultaneously submerged into the vats through the medium of an elevator and after a predetermined interval of time the entire series are raised from the vats and moved forward one step, over the mouth of the succeeding vats, and so on until the pasteurization is completed, it being evident that with each elevation of the trays from the vats one tier is discharged completely pasteurized and a tier of trays containing raw material is supplied at the feed end of the machine through the reciprocative action of a conveyer, movements of which are correlated with those of the elevator.

With the above objects in view the invention consists in certain peculiarities of construction and combination of parts as set forth hereinafter with reference to the accompanying drawings and subsequently claimed.

In the drawings Figure 1 represents a side elevation with parts broken away and parts in section of a pasteurizing apparatus embodying the features of my invention; Fig. 2, a sectional plan view of the same with parts broken away, the section being indicated by line 2—2 of Fig. 1, and Fig. 3, an end elevation of the apparatus with parts broken away and in section, the view being taken looking toward the discharge end of the machine.

Referring by characters to the drawings, 1 represents a tank that is divided by transverse partition walls 2 and 2′ to form separate vats A, B, and C, and, for example, the first vat constitutes a pre-heating bath, the same containing water at approximately 35°. The second vat contains water at 45° to 50° and constitutes the pasteurizing vat, while the third vat C contains water at approximately 15° and constitutes the cooling vat. The pre-heating vat A and pasteurizing vat B are each provided with valve-controlled pipes 4 for supplying water, the said vats being also provided with valve-controlled steam supply pipes 4′, whereby the temperature of the water is maintained at a predetermined degree. The cooling vat C is provided with a valve-controlled water supply pipe 4″, and owing to the fact that the temperature of the water in said vat is maintained at approximately 15° the water supply thereto is delivered at the desired temperature through the pipe, the flow being continuous in order to maintain this low temperature. Each vat is provided with an overflow pipe 3 that extends therein and terminates at a point to maintain the desired water level.

Projecting rearwardly from the feed end of the tank 1 is a receiving table 5 and from the discharge end of said tank a similar delivery table 6 is extended. The receiving and delivery tables are provided with a transverse series of rollers 7, 7′, respectively, the same serving as supports for the bottom of one or more trays D, a series of which are in practice stacked one upon the other to form tiers of separable units for the reception of bottles E or analogous receptacles containing the product to be pasteurized. In practice the heads of the lower bottles serve as supports for the succeeding bottle tray, whereby several of such trays may be stacked one upon the other as shown, the bottom or lower tray being supported by the table rollers upon a slightly higher plane than the top edges of the series of partition walls to thus permit the tier of tray units with their contents to be carried forward and alined over the several vats of the series.

Secured to the upper edge of the partition walls 2 and 2′ are brackets having alined journal studs 8, upon which studs are loosely mounted conveyer rollers 9, the same being upon a plane common to the table rollers 7, 7′, referred to. These journal studs 8 also carry guide sheaves 9′ for the support of a reciprocative conveyer, which conveyer is in the form of a skeleton frame having side-bars 10 that are in sliding engagement with the guide-sheaves and the series of receiving table rollers 7, the engagement with the latter rollers being effected when said conveyer is moved into its extreme rearward position. The side-bars of the conveyer frame are of approximately the same length as the tank and are connected at their ends by transverse bars 11 and similar intermediate bars 11′, whereby said frame is divided into rectangular sections that approximately correspond to the mouth area of the vats with which they are arranged to register.

For the purpose of lowering and raising the several tiers of trays into and out of the vats, an elevator is provided, which elevator comprises frame sections A′, B′, C′, that are arranged to be submerged into and lifted from the respective vats A, B, C. These frame sections of the elevator are each suspended from a lid 12, and the bottom of the several frames is formed by sets of rollers 13 the same constituting a skeleton support, which rollers, when the elevator is lifted, are stopped upon a plane common to the receiving and delivery table rollers 7, 7′, and also the conveyer rolls 9. When the elevator is lowered, as shown in Figs. 1 and 2, the lid 12 rests upon side flanges of the tank 1, to thus form a closure for the entire series of vats. The vertical lift of the lid and elevator to the position indicated by dotted lines in Fig. 1, is checked by stop-pins 14 that project from sets of supporting columns 15, which columns extend upward from the tank sides and are connected by cross-girders 15′.

The elevator is raised and lowered by sets of cables *a*, *a*′. Ends of the cables *a* are connected to one side of the lid extending upward therefrom and over pulleys 16, which pulleys are secured to a shaft 17 that is journaled in bearings with which the cross-girders 15′ are provided. The said cables extend downward from the pulleys and have their opposite ends secured to drums 18, the same being mounted upon a positively driven shaft 19 that is journaled in boxes secured to the adjacent set of supporting columns. The other set of cables *a*′ have ends secured to the opposite sides of the lids 12, from which points they pass upwardly and over pulleys 16′ and from thence stretches of the cable extend across the machine and over other pulleys 16″ that are carried by the shaft 17 from which latter pulleys the said cables pass to sets of drums 18′ that are secured to the drive shaft 19. The drive-shaft 19 receives its motion from a counter-shaft 19′ through a pinion 20 carried thereby, which pinion meshes with a gear-wheel 20′ that is secured to said drive-shaft. The counter-shaft 19′ is, in turn, driven by an arbor 21 through a worm gear connection, the arbor being mounted in a suitable pillow-block and also carries a pulley 22, that is driven in either direction by a suitable belt connection from a source of power, not shown, and a suitable reversing mechanism, all of which gear transmission forms no part of my invention.

The receiving end of the conveyer frame is provided with weights 23 and suitable cable connections, which connections pass over guide-pulleys 23′ that are mounted upon the receiving table. This weight connection with the conveyer serves to normally hold the same in its extreme rearward position over the receiving table, as shown in Fig. 1, rearward movement of said conveyer-frame being limited by stops 24 that project from said table. The forward end of the conveyer frame is connected to cables 25, the opposite ends of which cables are wound about and secured to drums 26, the same being mounted upon a crank-shaft 27 that is suitably journaled in frame members of the delivery table 6.

Assuming that the parts are in the position shown in Fig. 1 and that each vat contains its quota of trays carrying the bottled product to be sterilized, it is apparent that the product contained in the first vat A will be pre-heated, while that contained in the vat B will be pasteurized and the product contained in the vat C in the meantime will be cooled. Hence after a predetermined interval, while the process of sterilization is taking place the operator places a tier of trays containing the raw product upon the receiving table 5, the lower tray of which tier is nested within the rear section of the conveyer. After the bottled products have been submerged for the proper interval of time the operator manipulates the power transmission mechanism, whereby drive shaft 19 is put into motion and the elevator, through its cable connections with the several drums upon said drive shaft, is lifted. In this position the bottom set of rollers of the various elevator sections are stopped in alinement with the receiving table rollers and rolls 9 or at a point where said elevator rolls will engage the lower face of the conveyer side bars 10. When the parts are in this position motion of the drive-shaft 19 is stopped and thereafter the operator will impart rotation to the drum sheaves 26 which are connected by cables to the conveyer. Owing to the cross-bar connections 11 and 11′ of the conveyer frame it is apparent that when this forward movement of said conveyer takes place that these cross-bars will engage the rear ends of the lower tray of each tier and hence that tier which is now resting upon the receiving table will be caused to travel forward upon the elevator rollers and over the pre-heating tank, while the tier which previously occupied the pre-heating tank will be moved forward to the pasteurizing tank. The tier of trays previously immersed in the pasteurizing vat will be then positioned over the cooling vat with the lower tray resting upon the rollers of that section of the elevator. Hence said trays will be pushed forward clear of the vat by the bar 11 upon the delivery table 6, their contents having passed through the complete pasteurizing process. The forward movement of the conveyer frame is limited by the engagement of its bar 11 with its stop 24′ which projects from the table 6, as best shown in Fig. 1, it being understood that this stop checks movement of the conveyer, whereby the discharged tray or series of trays is delivered upon the rollers 7′. This tier of trays is thereafter removed by the operator and when the parts again assume the position in Fig. 1 a fresh tray is supplied to the receiving table. Thus the process of pasteurization is continuously maintained in a series of successive steps which are controlled by the minimum expenditure of labor.

I claim:

1. A pasteurizing apparatus comprising a series of tanks, tables extending from each end tank, anti friction rollers mounted within the tables, a reciprocative conveyer adapted to travel over the rollers of the rear end tables, the conveyer comprising bars having cross-bar connections forming partitions that correspond in number to the vats, guides for the conveyer, a vertically reciprocative lid for the vats, frames suspended from the lid adapted to enter the vats and constitute elevators for material to be pasteurized, roller bottoms for the elevators adapted to be alined with the before mentioned roller-equipped tables, means for raising and lowering the lid and elevators, and means for imparting reciprocative motion to the conveyer.

2. A pasteurizing apparatus comprising a tank provided with partitions forming separate vats adapted to contain water at various predetermined degrees of temperature, a receiving table in connection with the first vat of the series and a delivery table in connection with the last vat of the series, anti-friction rollers mounted upon the tables, vessel-receiving trays arranged to be initially supported upon the receiving table, a reciprocative conveyer comprising side-bars connected by a series of transverse bars forming sections that correspond with the number of vats, the side-bars being adapted to travel over the rollers of the receiving table, guides for said side-bars, a vertically reciprocative lid arranged to rest upon the tank and form a closure for the entire series of vats, skeleton frames suspended from the lid constituting elevators for the trays, a series of rollers carried by the skeleton frames to form bottoms for the support of said trays, means for raising the lid and elevators whereby the bottom rollers are brought into horizontal alinement with the receiving and delivery table rollers, and means for moving the conveyer forward and backward a distance equal to the length of a vat.

3. A pasteurizing apparatus comprising a series of tanks, tables extending from each end tank, a reciprocative conveyer adapted to travel over the rear end table, the conveyer comprising bars having cross-bar connections forming partitions that correspond in number to the vats, guides for the conveyer, a vertically reciprocative lid for the vats, frames suspended from the lid adapted to enter the vats and constitute elevators for material to be pasteurized, skeleton bottoms for the elevators adapted to be alined with the before mentioned tables, means for raising and lowering the lid and elevators, and means for imparting reciprocative motion to the conveyer.

In testimony that I claim the foregoing I have hereunto set my hand at Milwaukee in the county of Milwaukee and State of Wisconsin in the presence of two witnesses.

FREDERICK GETTELMAN.

Witnesses:
W. A. Gettelman,
Chas. Mollenhauer.

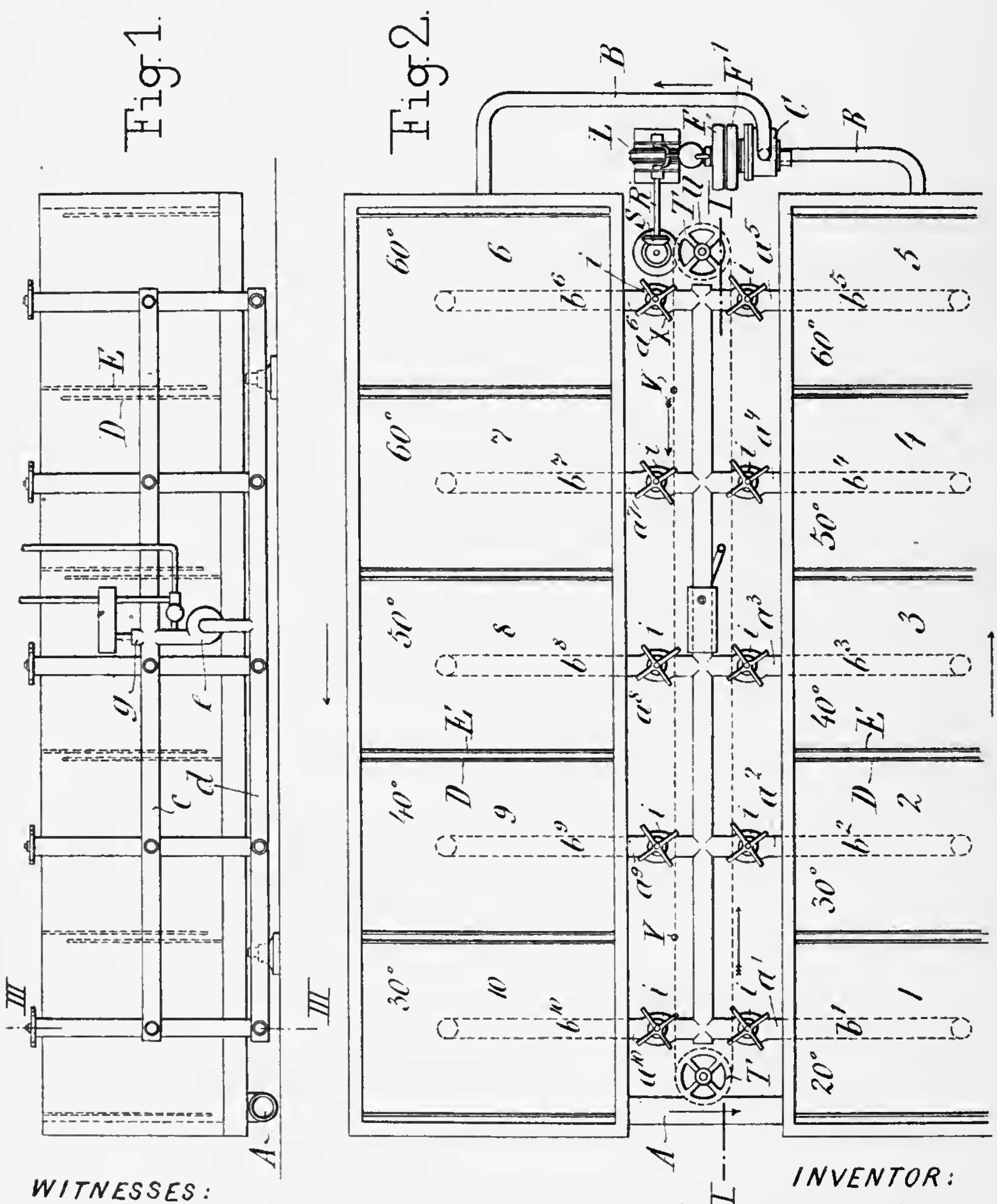
Pa

1, 088, 921 Mar 1914

N. F. NISSEN.
PASTEURIZING MACHINE.
APPLICATION FILED JUNE 30, 1909.

1,088,921. Patented Mar. 3, 1914.

5 SHEETS—SHEET 1.



WITNESSES:

Fred White

René Bruine

INVENTOR:

Niels Frederik Nissen,

By Attorneys,

Arthur C. Fraser & Usina

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

N. F. NISSEN.
PASTEURIZING MACHINE.
APPLICATION FILED JUNE 30, 1909.

1,088,921.

Patented Mar. 3, 1914.
5 SHEETS—SHEET 2.

Fig. 3.

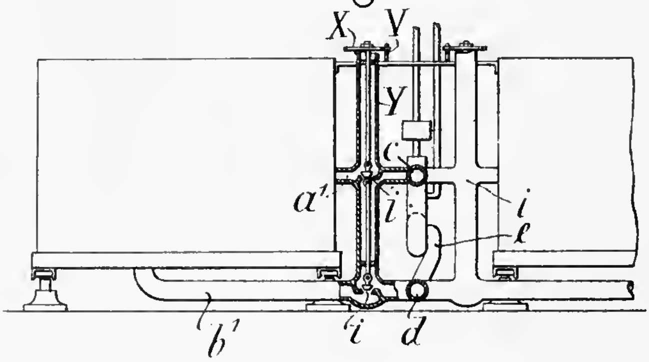


Fig. 4.

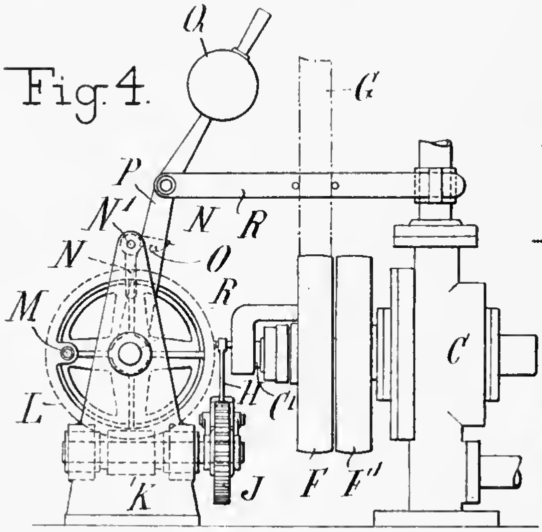
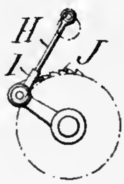


Fig. 5.



WITNESSES:
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Rene Bruine

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COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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PASTEURIZING MACHINE.

APPLICATION FILED JUNE 30, 1909.

1,088,921.

Patented Mar. 3, 1914.

5 SHEETS—SHEET 3.

Fig. 7.

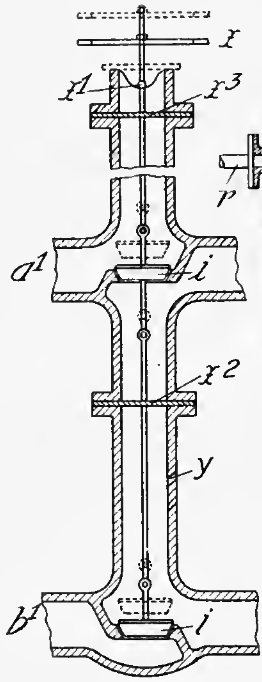


Fig. 12.

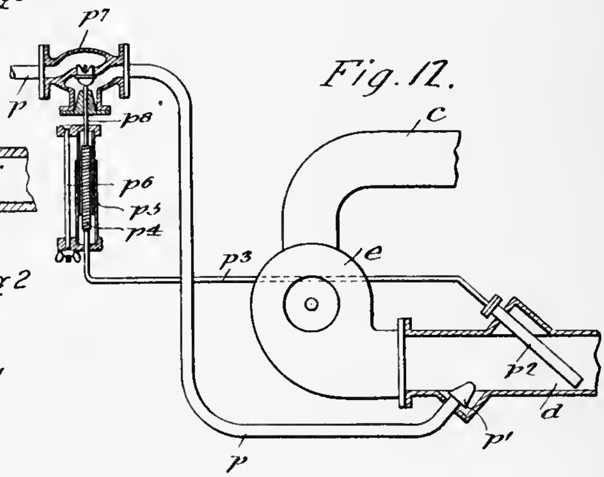


Fig. 6a.

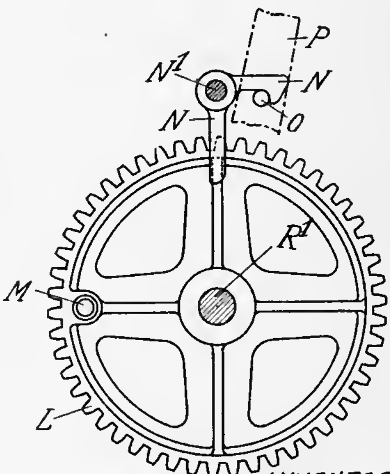
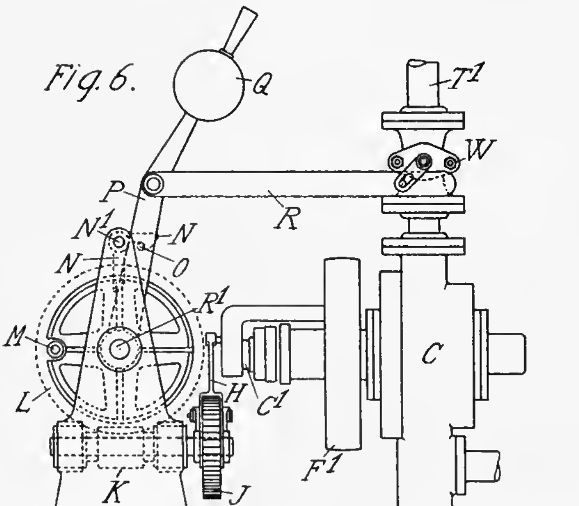


Fig. 6.



WITNESSES:

René Bruine

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PASTEURIZING MACHINE.

APPLICATION FILED JUNE 30, 1909.

1,088,921.

Patented Mar. 3, 1914.

5 SHEETS—SHEET 4.

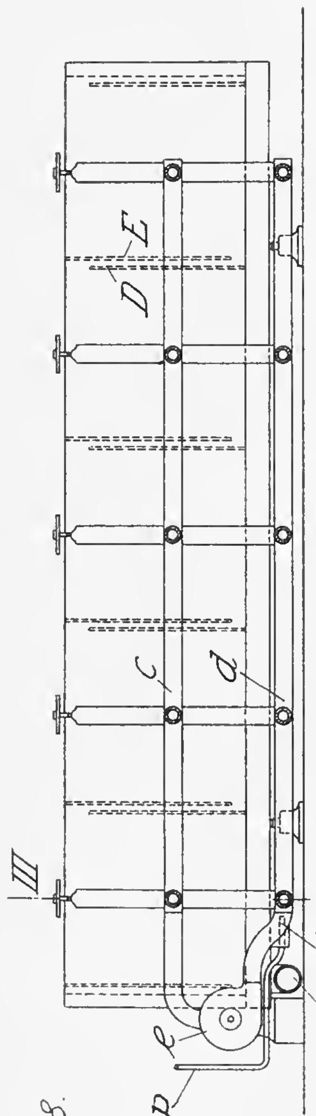

Fig. 8.

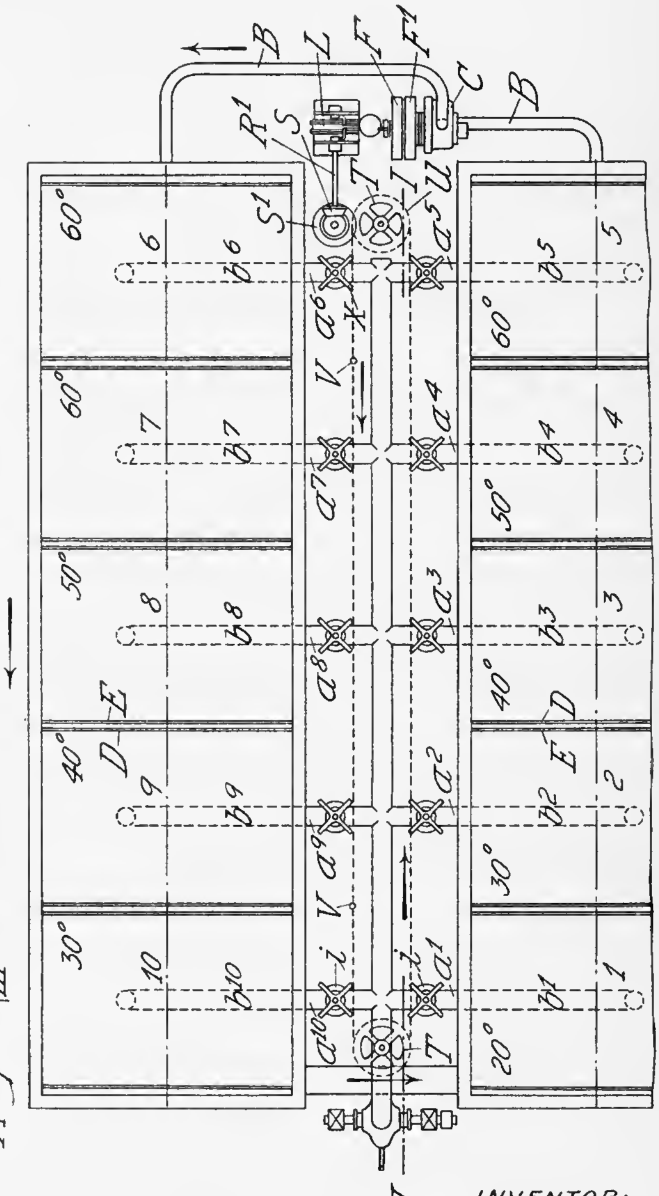

Fig. 9.

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PASTEURIZING MACHINE.

APPLICATION FILED JUNE 30, 1909.

1,088,921. Patented Mar. 3, 1914.

5 SHEETS—SHEET 5.

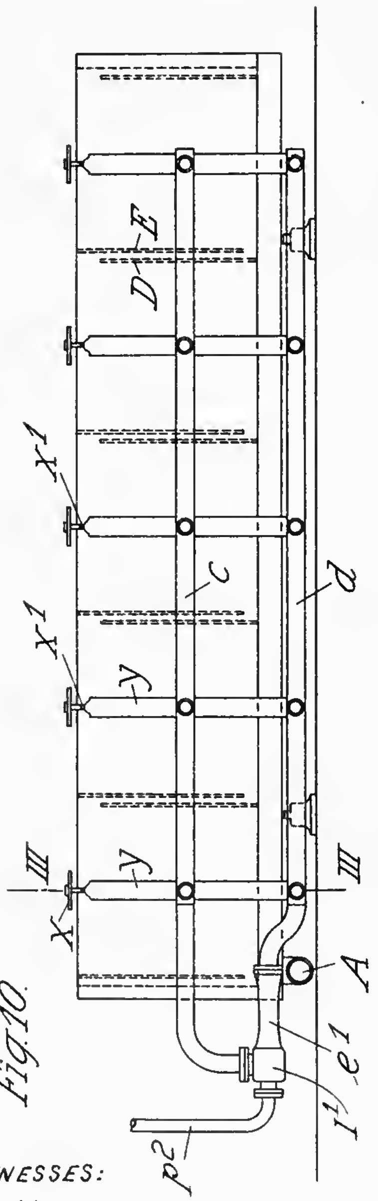

Fig. 10.

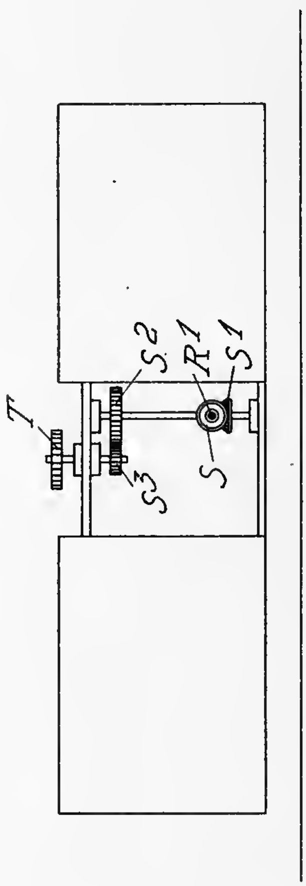

Fig. 11.

WITNESSES:

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Gustave R. Thompson

INVENTOR:

Niels Frederik Nissen

By Attorneys,

Arthur C. Fraser & Usina

UNITED STATES PATENT OFFICE.

NIELS FREDERIK NISSEN, OF COPENHAGEN, DENMARK, ASSIGNOR TO NYEBOE & NISSEN, OF COPENHAGEN, DENMARK, A FIRM.

PASTEURIZING-MACHINE.

1,088,921. Specification of Letters Patent. **Patented Mar. 3, 1914.**

Application filed June 30, 1909. Serial No. 505,296.

To all whom it may concern:

Be it known that I, NIELS FREDERIK NISSEN, engineer, residing at Raadhuspladsen 37, Copenhagen, Denmark, have invented new and useful Improvements in Pasteurizing-Machines, of which the following is a specification.

The object of the present invention is an improvement in the kind of pasteurizing apparatuses characterized in that the receptacles containing the goods to be pasteurized are submerged in liquid in a series of intercommunicating chambers, the temperature of the liquid in the several compartments being successively greater up to a predetermined maximum and then successively less down to a predetermined minimum. The liquid in the compartments is then circulated and the liquid of varying temperatures in the several compartments is transferred from one compartment to another, each compartment thereby having passed therethrough liquid of a temperature from the minimum to the maximum and again to the minimum. The receptacles to be pasteurized are successively placed in the chambers wherein is contained liquid of the lowest temperature, as the liquid is transferred from one chamber to the next, and the receptacles are left therein until the liquid of lowest temperature again reaches the successive chambers, when the receptacles are taken out and replaced by new receptacles to be pasteurized.

The invention consists in the provision of a device adapted to arrest automatically, at the proper moment, the circulation of the heat transmitting fluid, and to maintain, automatically, the proper thermic state of this fluid thereby that heat is supplied to the proper pasteurizing chambers. Hereby it is attained that the person operating the apparatus has no other duty than to exchange, at certain time intervals, the receptacles containing the goods, and thereafter to restart the fluid circulation, while all the other work is performed automatically by the machine itself. This is attained by providing means to arrest the circulation automatically, whenever the pump or other fluid moving device has caused the fluid contents of the chamber to advance one chamber, and by providing means for letting the necessary supply of heat to the hottest chambers be governed by the periodic action of the pump.

On the accompanying drawings Figure 1 represents a vertical section along line I—I of Fig. 2, Fig. 2 is a top-view of the apparatus, Fig. 3 a vertical section along the line III—III, Fig. 1, Fig. 4 the pump producing the circulation of the heat transmitting fluid, and Fig. 5 a detail belonging to the arresting mechanism of the pump. Fig. 6 shows an arrangement, which automatically closes the valve on the pressure pipe of the pump when the circulating pump has made the stipulated number of revolutions. Fig. 6^a represents a detail of the shifting device, shown in Figs. 4 and 6. Fig. 7 represents a detail in vertical section. Figs. 8 and 9 show the apparatus fitted with steampipe, pump and nozzle. Fig. 10 represents the apparatus fitted with an injector and a steampipe, and Fig. 11 is a detail. Fig. 12 is a detail illustration of the means for heating the fluid and its thermostatic controlling means.

The apparatus consists of two tanks, divided by double partitions D and E into ten chambers 1–10. The intercommunication between any two adjoining chambers is effected by one of the partitions D not quite reaching the top of the tank, while the other partition E not quite reaches the bottom of the tank. Besides the chambers 1 and 10 are connected by means of a pipe A, and the chambers 5 and 6 are connected by means of a pipe B and the pump C, so that a continuous circuit is provided through all the chambers and the pump C.

The heat transmitting medium in the various chambers is supposed to have, at a given moment, the temperatures indicated on the drawing. After the receptacles in the coldest chamber 1 have been exchanged, the fluid in a known manner is caused to circulate, in direction of the arrow, sufficiently to bring the inscribed temperatures one chamber forward. At the same time sufficient heat, from an exterior source, is added to the pasteurizing chambers proper 5, 6 and 7 in order to maintain them at the proper pasteurizing temperature, say 60°. After the receptacles in chamber 2 which is now at the lowest temperature 20°, are exchanged, the fluid is again advanced, by means of the pump, until the temperatures have again been transferred one chamber forward, etc., in other words the goods to be pasteurized are first exposed to increasing temperatures, then they are kept for some time at the actual pasteurizing temperature, and finally they are exposed to gradually decreasing temperatures.

The stoppage of the motion of the fluid, after it has made the proper advance, may be effected, for instance, by the pump being stopped after having made a certain number of revolutions or a certain number of strokes or by a valve or cock being caused to close. Fig. 6 represents, by way of example, a device to this effect. When the wheel L has been turned so far, that the projection M strikes against the lever N, then the latter will be raised so as to release the pin O, whereupon the counterweight Q will force the rod R to move to the right. This rod is connected to the cockplug, which is consequently turned.

In Fig. 4 is shown, by way of example, a rotary pump C driven by a belt G acting on a fixed pulley F and a loose pulley F′.

Eccentrically on the pump shaft C′ is journaled a fork-shaped connecting rod H (see Fig. 5) carrying a pawl I which engages a ratchet wheel J on whose shaft is keyed a worm K engaging a worm-wheel L fitted with a striking pin M. The gearing is such that when the pump has made a certain number of revolutions, corresponding to the proper volume of water to be moved forward, the wheel L will have finished one revolution. The pin M then strikes the lower part of the angular hook N, hanging on its pin N′, and thereby releases the stud O fastened on the disconnecting lever P. This latter now sinks down, by action of its counterweight Q, and moves the bar R which then shifts the belt G from the fixed pulley F to the loose pulley F′, thereby stopping the pump. The lever P, instead of moving the belt shifter might be used (as shown in Fig. 6) to operate a valve or cock shutting off the flow of water through the pump which latter would then run idle.

The parts of the ratchet mechanism H I J may be so proportioned as to allow the pump C to make a larger or smaller number of revolutions, before the circulation is stopped.

The adjustment of temperatures in the hottest chambers is effected by means of the device represented in Figs. 1, 2, 3, 8, 9 and 12. Each of the chambers communicates at top through a pipe a^1–a^{10} with a main pipe c, and at bottom through a pipe b^1–b^{10} with another main pipe d. The branch pipes a^1–a^{10} and b^1–b^{10} are fitted with puppet valves i (Fig. 3) connected in such a manner that the upper valve belonging to any one chamber opens and closes simultaneously with the opening and closing of the valve below it. The upper main pipe c and the lower main pipe d are connected by means of a pump e, into the outlet of which steam is introduced through a steam pipe p and a nozzle p^1. This pump may be of any known construction.

Fig. 8 further shows by way of example a rotary pump e fitted with a steam pipe p and nozzle p^1, while in Fig. 10 is represented an injector pump I^1 having an injector e^1 and a steam pipe p^2. Any injector of known construction will answer the purpose. The steam pipe may be provided with a heat regulating valve of known construction, which automatically breaks off the supply of steam, when the water circulating through the pump has reached a certain temperature, and opens for the steam when the temperature has sunk to a certain limit. An example of such a construction is illustrated in Fig. 12 wherein p^2 indicates a cylinder in which is contained a liquid and which is placed in an outlet pipe of the heating pump e. The cylinder p^2 is connected through pipe p^3 with a flexible tube, for instance of caoutchouc, and cased in a metal spring p^4 placed in a metal tube p^5 consisting of an upper and lower part; the last one placed telescopically around the first. By means of screw p^6 the casing p^5 of the flexible tube p^4 can be lengthened or shortened. p^7 is a steam valve provided with a rod p^8 which goes through the upper cover of p^5. When the fluid in p^2 is heated by the water passing through the outlet pipe of the pump e, the fluid of p^2 expands and lengthens the flexible casing p^4 until it reaches the lower end of the rod p^8 and closes the steam valve p^7. The inlet of steam in the outlet pipe of the pump e is then stopped and the rise in temperature is discontinued. By lengthening or shortening of the casing p^5 by means of the screw p^6 it is possible to stop the inlet of steam at any desired temperature of the water.

When the valves i of one or more chambers are opened, the water contained therein is constantly drawn through the pump e and back into the same chambers by way of the collecting pipes, and on its way the water is heated by the addition of steam as above described. The automatic opening and closing of the valves i is effected in the following way:—The shaft R^1 of the worm wheel L which is set in motion by the worm K, operated by the shaft of the circulating pump C is extended out and supports a beveled gear wheel S which transmits its motion to the beveled gear wheel S^1. On the same shaft as S^1 is fastened a common gear wheel S^2 which drives another gear wheel S^3 and on the shaft carrying the latter wheel S^3 is fastened a sprocket wheel T carrying a Gall's chain U. The ratio of gearings are chosen so that the chain advances a distance equal to the length of one of the chambers, during each period of the action of the pump. Two of the chain links are provided each with a projecting pin V striking the arms X of wheels fastened at the end of the spindles of the valves *i*. When one of the pins V passes an arm X the corresponding wheel is by this arrangement caused to make a revolution of 90° and, as the upper end of the pipe Y incasing the valves *i* is provided with two grooves placed diametrically opposite one another, while the valve stem is provided with a projection X^1 resting on the upper end of Y, a turn of 90° of the valve stem will either open or close the valve *i*.

Fig. 7 shows incasing pipe Y, turning wheel X and pin X^1, while X^2 is a plate having a hole for the passage of the valve stem but otherwise separating the upper and the lower water passages. X^3 is another plate serving as a guide for the valve stem. The full lines show the valves closed, while the dotted lines show the valves in their open position. When the first of the striking pins V strikes an arm of the wheel X belonging to a closed set of valves *i*, the said pin will turn the valve stem 90° thereby opening the set of valves, which will rest open until the wheel of this valve is hit by the second pin, the valve stem being thereby again turned 90° and the valves consequently closed.

Supposing the distance between the pins is equal to the width of one chamber, each chamber in succession will stay in connection with the pipe system during one acting period of the pump C, while all the other chambers are disconnected from the pipe system. If the distance between the pins equals the width of two or more chambers, a corresponding number of chambers will be in communication with the pipe system, and their contents of heating medium will be drawn through the pump *e* and their temperature kept up to the standard by action of the regulator *g*. This group of heated chambers, wherein is contained fluid of maximum temperature, will be advanced one chamber for each period of action of the pump, *i. e.*, each time the pump is put in operation it will operate to cause that portion of the heating medium which is of maximum temperature to be transferred from one chamber, or from the first of a group of chambers, to the next chamber.

It will be understood, that the devices just described and illustrated on the accompanying drawings by way of example, may be modified in numerous manners, without departing from the principle underlying this invention.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An apparatus for pasteurizing beer and other bottled liquids, comprising a number of fluid containing compartments connected together for circulation of their fluid contents through all of the chambers, a circulating pump for circulating the fluid therethrough *seriatim*, outlet and inlet pipes in connection with each compartment, valves in said pipes, and a pump adapted to circulate fluid through said pipes and the compartments in open communication therewith, whereby a secondary circulation independent of the first circulation can take place through a limited number of the compartments, means for heating the fluid circulated by said second-named pump, and means for automatically opening and closing said valves controlling said outlet and inlet pipes, through which said secondary circulation occurs, said means being controlled by said first named pump.

2. An apparatus for pasteurizing beer and other bottled liquids comprising a number of fluid-containing compartments connected together in series for circulation of their fluid contents, means for separately heating the fluid in each of said compartments, means for producing a circulation of the fluid contents of said compartments throughout the series, and means for automatically stopping the circulation of the water after a certain period of operation of said circulating means.

3. An apparatus for pasteurizing beer and other bottled liquids comprising a continuous series of intercommunicating chambers, through which a heat transmitting medium is adapted to be circulated, a pump inserted in the circuit for producing a circulation of said transmitting medium, valves for admitting an independent heating medium through each compartment, means for automatically opening and closing said valves, and means for automatically stopping the circulation of the heat transmitting medium after a certain pumping period.

4. An apparatus for pasteurizing beer and other bottled liquids comprising a continuous series of intercommunicating compartments, through which a heat transmitting medium is adapted to be circulated, a pump inserted in the circuit for producing a circulation of said transmitting medium, valves for admitting an independent heating medium through each compartment, and means for automatically opening and closing said valves under the influence of the said circulating pump.

5. An apparatus for pasteurizing beer or the like comprising a continuous series of intercommunicating compartments, through which a heat transmitting medium is adapted to be circulated, a pump inserted in the circuit for producing a circulation of said transmitting medium, valves for admitting an independent heating medium through each compartment, means for automatically opening and closing said valves, said means

being controlled by the circulating pump, and means for automatically starting the action of the heat source, when the temperature of the heat transmitting medium passing through the pipe system has sunk to a certain limit, and setting it out of action, when the temperature of this medium has reached a certain limit.

6. An apparatus for pasteurizing beer and other bottled liquids comprising a number of fluid-containing compartments connected together in series for circulation of their fluid contents, valves for separately controlling the admission of heating fluid to each of said compartments, means for producing a circulation of the fluid contents of said compartments throughout the series, and means for automatically opening and closing said valves, said means comprising a chain or the like, set in motion by the circulating means and effecting the opening and closing of the heating valves.

7. An apparatus for pasteurizing beer and other bottled liquids comprising a continuous series of intercommunicating chambers, through which a heat transmitting medium is adapted to be circulated, a pump inserted in the circuit for producing a circulation of said transmitting medium, valved means for admitting an independent heating medium through each compartment, means for automatically opening and closing said valves, and means for automatically stopping the circulation of the heat transmitting medium after a certain pumping period, said means comprising a chain or the like, set in motion by the circulating pump and effecting the opening and closing of the heating valves.

8. An apparatus for pasteurizing beer and other bottled liquids comprising a number of fluid-containing compartments connected together in series for circulation of their fluid contents, means for separately heating the fluid in each of said compartments, means for producing a circulation of the fluid contents of said compartments throughout the series, said means comprising a belt-driven pump, fast and loose pulleys, a driving belt and means for automatically shifting the said belt from the fixed pulley to the loose pulley thereby stopping the pump after a certain period of action.

9. An apparatus for pasteurizing beer and other bottled liquids comprising a continuous series of intercommunicating chambers, through which a heat transmitting medium is adapted to be circulated, means for setting said heat transmitting medium in motion, said means comprising a belt-driven pump, fast and loose pulleys, a driving belt, and means for automatically shifting said belt from the fixed pulley to the loose pulley, thereby stopping the pump after a certain period of action, valved heating means in said compartments, and means for automatically opening and closing the heating valves.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

NIELS FREDERIK NISSEN.

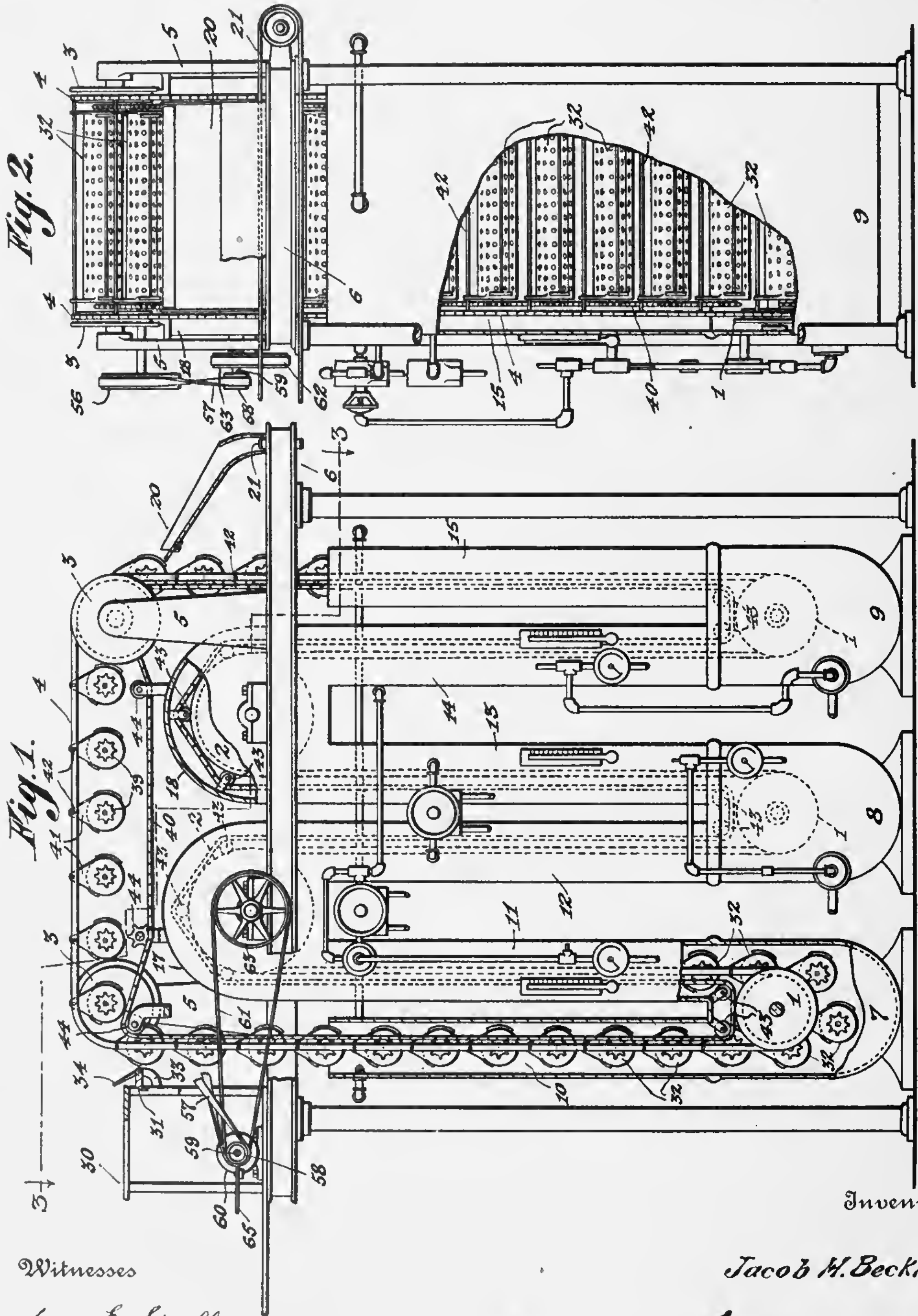
Witnesses:
JULIUS LEHMANN,
F. SODEMANN.

J. H. BECKMAN.
PASTEURIZING APPARATUS.
APPLICATION FILED FEB. 28, 1912.

1,098,551.

Patented June 2, 1914.

2 SHEETS—SHEET 1.



Inventor

Witnesses

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Arleta Adams

Jacob H. Beckman.

By

Adams & Brooks
Attorneys

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

J. H. BECKMAN.
PASTEURIZING APPARATUS.
APPLICATION FILED FEB. 28, 1912.

1,098,551.

Patented June 2, 1914.

2 SHEETS—SHEET 2.

Fig. 3.

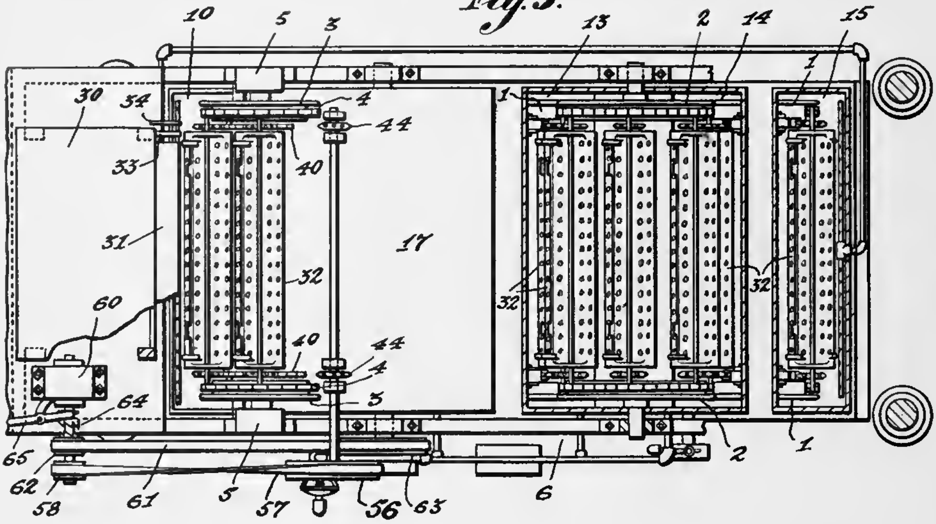


Fig. 4.

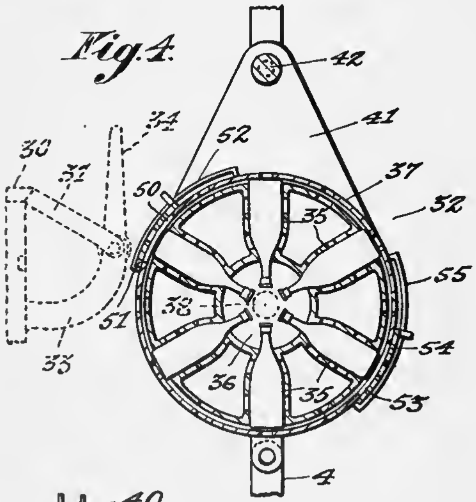
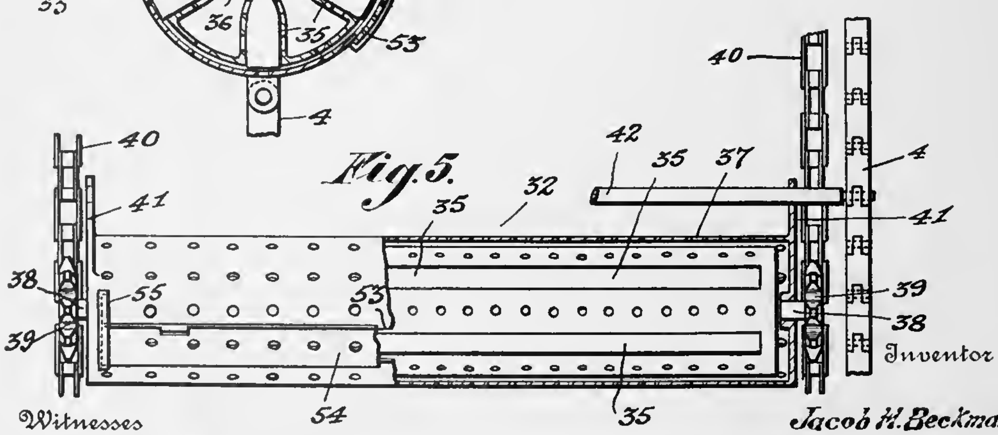


Fig. 5.



Witnesses
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Arleta Adams

Inventor
Jacob H. Beckman.

By
Adams & Brooks.
Attorneys.

UNITED STATES PATENT OFFICE.

JACOB H. BECKMAN, OF SEATTLE, WASHINGTON.

PASTEURIZING APPARATUS.

1,098,551. Specification of Letters Patent. Patented June 2, 1914.

Application filed February 28, 1912. Serial No. 680,534.

To all whom it may concern:

Be it known that I, JACOB H. BECKMAN, a citizen of the United States of America, and a resident of the city of Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

My invention relates to improvements in apparatus particularly adapted for pasteurizing or sterilizing beer and other liquid products which are to be preserved in bottles cans or other form of receptacles, whereby such products may be subjected to successive baths of different temperature, and has for one of its objects to provide apparatus of this character in which the products can be uniformly treated.

A further object resides in the provision of novel holding devices for the receptacles or bottles which are operated to cause the fluid to be agitated or to flow lengthwise of the receptacles.

A further object resides in the provision of mechanism conveying and operating the receptacle holders in a novel manner.

Referring to the accompanying drawings, wherein I have illustrated my apparatus adapted particularly for treating beer: Figure 1 is a view of my invention in side elevation with portions broken away. Fig. 2 is a view of the same in end elevation with portions broken away. Fig. 3 is a horizontal section on line 3—3 of Fig. 1, parts being broken away. Fig. 4 is a fragmentary section illustrating one of the holders in conjunction with the feeding device, and Fig. 5 is a detail of the holder partly in longitudinal section.

Referring to the drawings by numerals of reference 7, 8 and 9 indicate attemperating, pasteurizing and cooling tanks respectively, the same being adapted to hold water and being equipped with well known mechanism as shown in Patent No. 701,622 for creating and maintaining such fluid at the desired temperature to effect the heating of the products to be treated with a subsequent cooling thereof, prior to their delivery from tank 9, in a gradual manner. These tanks are substantially U-shaped, the several legs being designated by the numerals 10, 11, 12, 13, 14 and 15 respectively. The opposite legs of adjacent tanks are connected at their upper end portions by closed sections 17 and 18, thereby providing a continuous conduit between legs 10 and 15.

Reference numeral 4 indicates a conveyer comprising spaced endless chains having a portion of their lengths guided by direction wheels 1 and 2 in tanks 7, 8 and 9. Exteriorly of these tanks said conveyer takes over direction wheels 3 journaled in suitable stands 5 of main supporting frame 6, directly over the legs 10 and 15.

Reference numeral 20 indicates a delivery chute arranged above leg 15 at the upwardly moving side of conveyer 4 and extending to an endless conveyer 21, through the medium of which latter the treated receptacles can be removed to any desired point, as is well understood.

Above leg 10 I provide a feeding platform 30, at the forward end of which is an adjustable section 31 which in the operation of the machine is adapted to be adjusted to an inclined position, as shown in Fig. 4, so that the bottles can slide down the same by gravity into the holders 32 on conveyer 4.

Platform section 31 is pivoted in a bracket extension 33 of platform 30 and provided with a handle 34 with which it can be raised or lowered.

Holders 32 which are cylindrical in form and perforated so that the water can have free access to the contained bottles, are provided with longitudinal seats 35 whose inner end portions are contracted and communicate with a hollow hub part 36.

Holders 32 are rotatably mounted in perforated cylindrical supports 37, the same having shafts 38 journaled in and projecting through the end walls of the latter and provided with sprocket wheels 39, adapted for engagement with sprocket chains 40.

Reference numeral 41 indicates lugs provided on supports 37 and apertured to loosely receive rods 42, which rods extend between and are connected in a suitable manner with the spaced component chains of conveyer 4.

Chains 40 are guided, as by direction sheaves 43, within tanks 7, 8 and 9 at the side of the path of conveyer 4 for engagement with sprocket wheels 39 of holders 32 to rotate the latter and thereby so agitate the contents of the bottle as to obtain a more uniform and thorough subjection thereof to the submerging medium or agent. From legs 10 and 15 chains 40 extend upwardly to

Pa
July 1914.

1,102,486

C. E. FELT.
PASTEURIZING MACHINE.
APPLICATION FILED JAN. 11, 1908.

1,102,486.

Patented July 7, 1914.

4 SHEETS—SHEET 1.

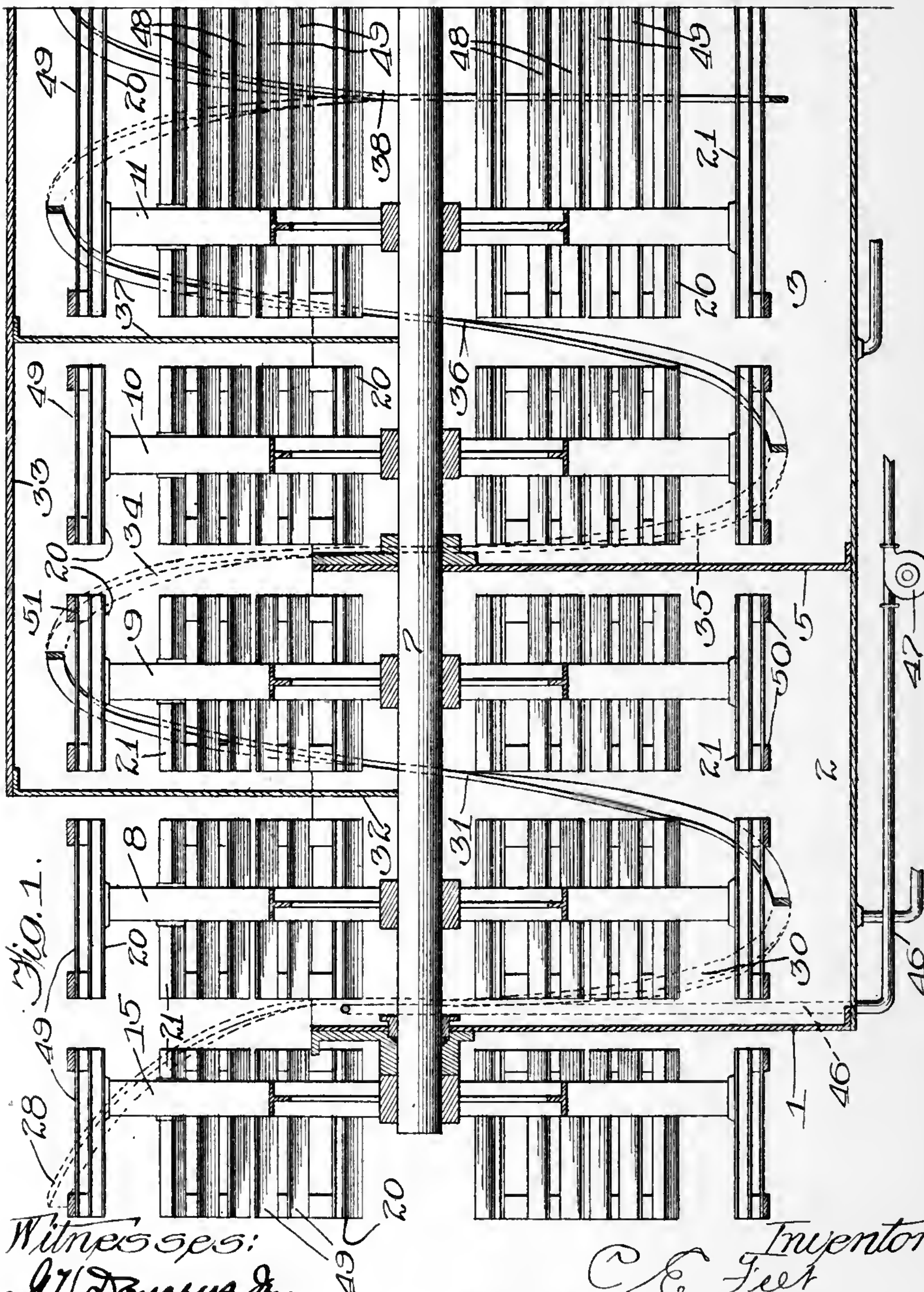

Fig. 1.

Witnesses:
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By Brown & Hopkins
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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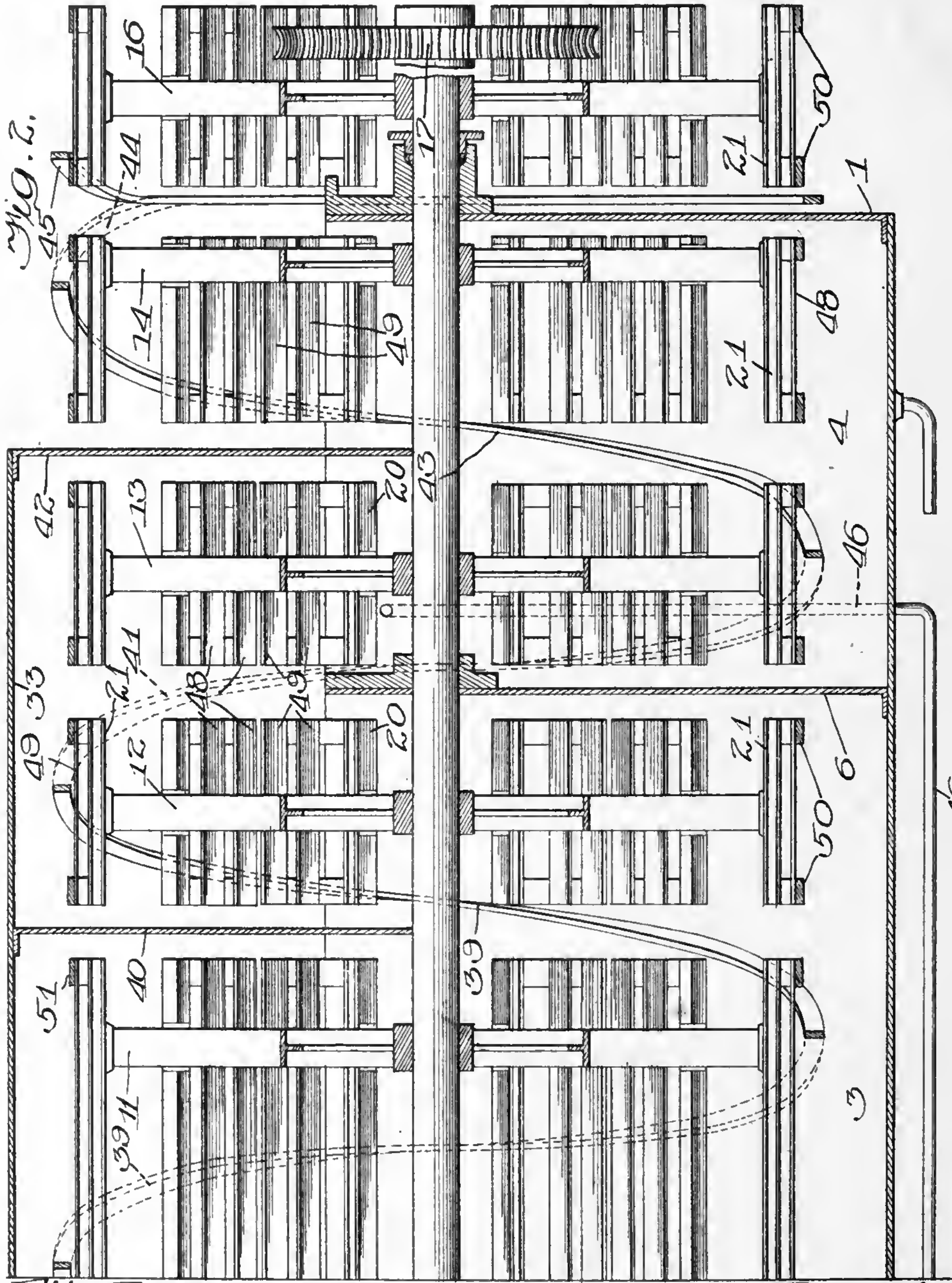
PASTEURIZING MACHINE.

APPLICATION FILED JAN. 11, 1908.

1,102,486. Patented July 7, 1914.

4 SHEETS—SHEET 2.

Fig. 2.



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PASTEURIZING MACHINE.

APPLICATION FILED JAN. 11, 1908.

1,102,486.

Patented July 7, 1914.

4 SHEETS—SHEET 3.

Fig. 3.

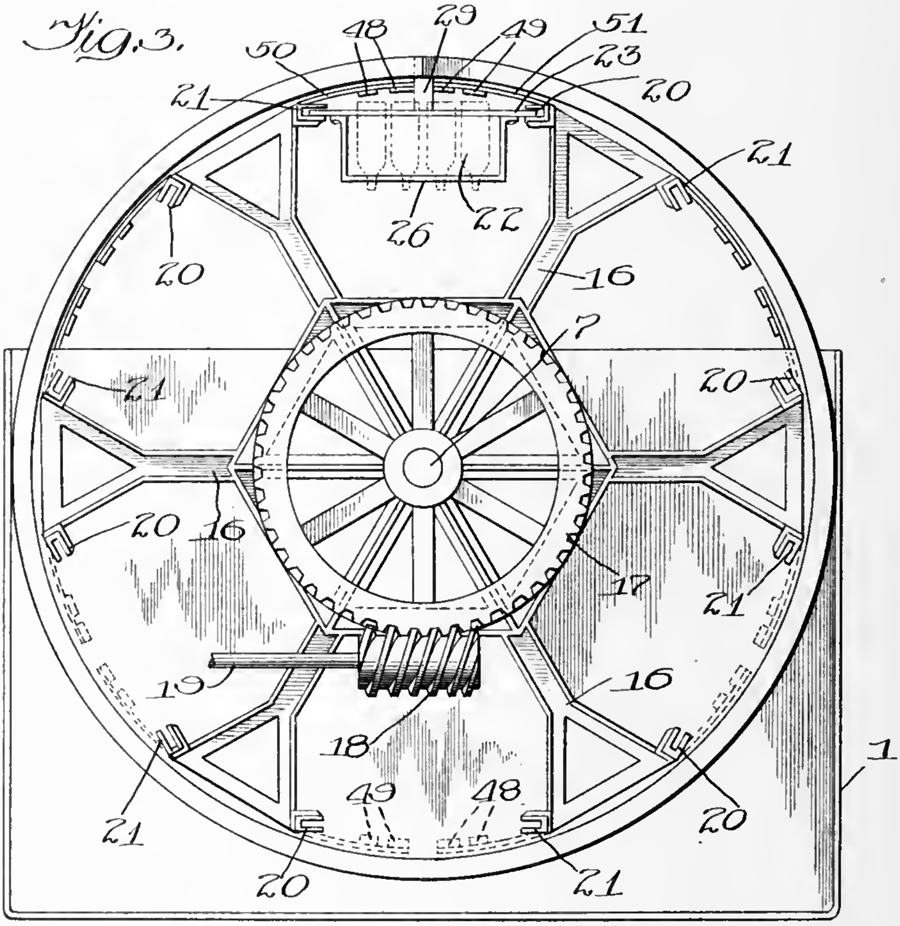


Fig. 4.

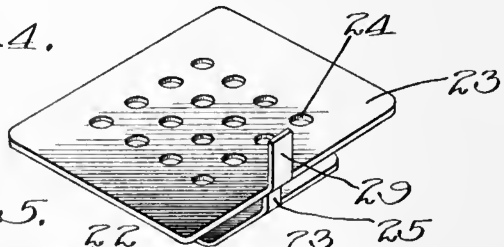
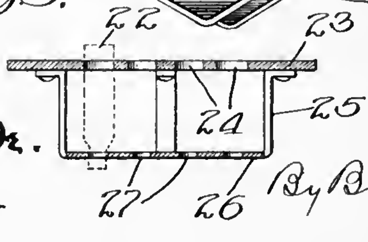


Fig. 5.



Witnesses:

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PASTEURIZING MACHINE.

APPLICATION FILED JAN. 11, 1908.

1,102,486.

Patented July 7, 1914.

4 SHEETS—SHEET 4.

Fig. 6.

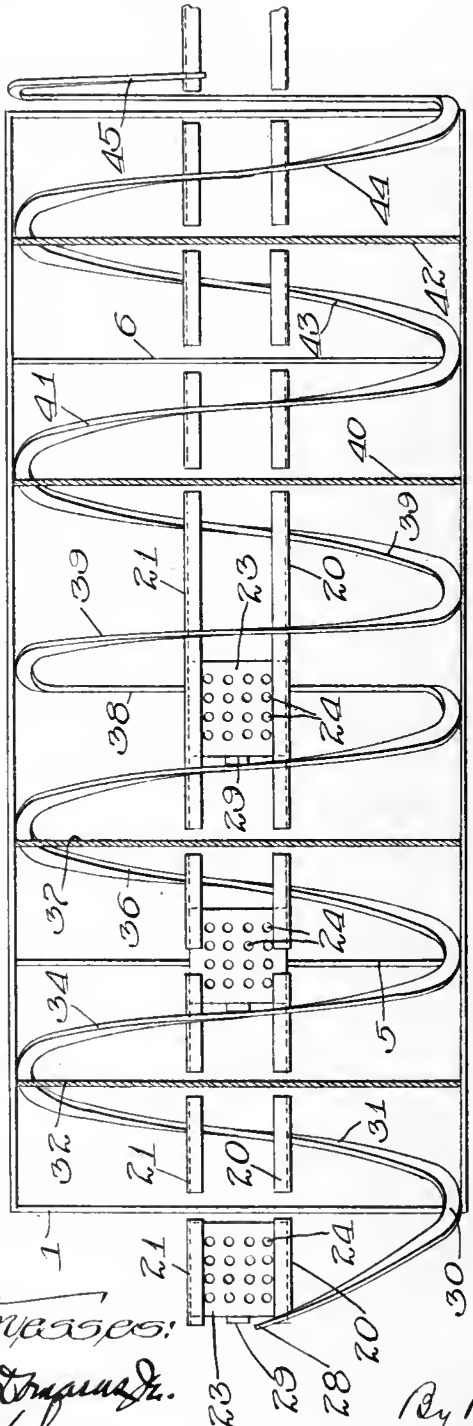


Fig. 8.

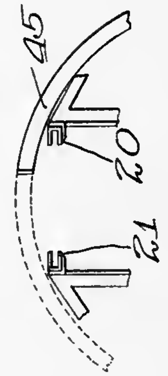
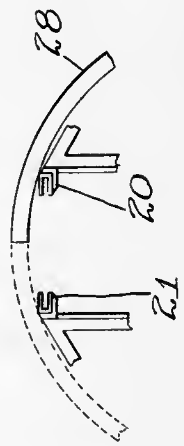


Fig. 7.



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UNITED STATES PATENT OFFICE.

CHARLES E. FELT, OF CHICAGO, ILLINOIS.

PASTEURIZING-MACHINE.

1,102,486. Specification of Letters Patent. **Patented July 7, 1914.**

Application filed January 11, 1908. Serial No. 410,354.

To all whom it may concern:

Be it known that I, CHARLES E. FELT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pasteurizing-Machines, of which the following is a full, clear, and exact specification.

This invention relates to machines for pasteurizing beer and other substances by submitting the same first to gradually increasing and then to gradually decreasing degrees of temperature, and the invention has for its primary object to provide an improved, simple and efficient form of machine for accomplishing this result.

Another object of the invention is to mechanically agitate the material being pasteurized during the pasteurizing operation so that a more perfect or uniform temperature throughout the contents of each bottle or receptacle will be maintained irrespective of the shape of the receptacle.

A still further object of the invention is to subject all bottles or other receptacles containing the material to be pasteurized, such as beer and other liquors or beverages that have been charged with gas, to successive inverting actions whereby the carbonic acid gas or other gas will be thoroughly commingled with the contents of the bottle during the pasteurizing process, and will be less liable to escape under the high temperature to which it is subjected.

With a view to the attainment of these ends and the accomplishment of certain other objects which will hereinafter appear, the invention consists in the features of novelty which will now be described, reference being had to the accompanying drawings showing a machine embodying the invention, and in which drawings—

Figure 1 is a vertical longitudinal sectional view of the inlet end of the machine; Fig. 2 is a similar view of the discharge end; Fig. 3 is an end elevation of the discharge end of the machine; Fig. 4 is a detail perspective view of one of the bottle crates; Fig. 5 is a cross-section thereof; Fig. 6 is a diagrammatic plan view of the machine, showing the crates passing through the machine; Fig. 7 is a diagrammatic end elevation of the inlet end of the spiral, showing its relation to one of the carriers; and Fig. 8 is a similar view of the discharge end of the spiral.

According to this invention, the bottle or other receptacle or object to be pasteurized is forced successively into a plurality of pasteurizing chambers which may contain a pasteurizing fluid graded in temperature, and when in each chamber is carried in a direction cross-wise of its general line of travel from the inlet to the outlet end of the machine. The particular means for accomplishing this prolonged travel embodies among other elements a series of inclined guides, and a series of ways on which the crates or receptacles for carrying the bottles slide, the ways and guides having a movement one relatively to the other. By this means a helical movement is imparted to the crates or carriers during their passage.

The numeral 1 indicates a tank which is divided transversely into a plurality of compartments, 2, 3 and 4, by means of a suitable number of partitions, 5—6, and these compartments may be supplied with a pasteurizing fluid, such as water, graded in temperature from cold to hot and hot to cold, commencing with the compartment 2, which may be regarded as the initial compartment, where the objects to be pasteurized are introduced. This tank is provided with a horizontal shaft 7, upon which is secured a number of spider arms, 8, 9, 10, 11, 12, 13 and 14, all arranged to revolve with the shaft 7, within the tank 1, and at the inlet end of the machine the shaft is provided with a spider 15 outside the tank, while at the outlet end it is provided with a spider 16 arranged outside the tank and having also at this end, if desired, suitable means of compelling its rotation, such for example as a worm wheel 17 which is engaged by a worm 18 on a driving shaft 19.

In Fig. 3 of the drawing is presented an end view of one of the spiders. It is, in fact, the outside spider 16, but as these spiders are counterparts of one another, this single view will suffice as an illustration for them all, and they will be seen to consist of a plurality of spokes radiating from a central hub secured to the shaft, and at the outer end of each spoke are mounted two horizontal guide rails in the form of channeled bars 20—21, the bar 20 on one spoke facing the bar 21 on the adjacent spoke so that the channeled bars on adjacent spokes constitute a guide way for supporting and guiding the edge of a crate which carries the bottles 22 containing the material to be pasteurized. The form of this crate is shown in Figs. 4 and 5 of the drawing, and while its particular construction is not material, it preferably consists of an apertured plate 23 having passages 24 of sufficient diameter to receive the body of the bottle, and below this plate 23 is suspended by hangers 25 a similar but smaller plate 26 having similar passages 27 for receiving the necks of the bottles, the projecting edges of the plate 23 being introduced into the channels of the bars 20—21, as shown in Fig. 3. All of the spiders being rigidly fixed on the shaft 7 with relation to each other and the guide-ways 20—21 carried by them, although separate and distinct from one another, as shown in Figs. 1 and 2, are nevertheless thus maintained in accurate alinement with one another, so that the crate may slide from the guide-ways on one spider into the guide-ways on the next, and so on from the inlet to the outlet of the machine, assuming that the crate is given a propelling force at a time when its transit from one spider to another would not bring it into collision with any of the various partitions of the tank or pasteurizing compartments. The crate is given this propelling force by the action of a spiral or series of inclines secured to the tank in conjunction with the rotary motion of the crate induced by its revolution with the shaft 7. These inclines are preferably in the form of a continuous spiral, one extremity 28 of which projects from the inlet end of the tank upwardly and over the circular line of travel of the various guide-ways 20—21 carried on the first outside spider 15, and its end is so positioned that when a crate is placed on one of these guide-ways and the spider rotated, a projection or lug 29 standing at the lower edge of the plate 23, or other suitable position on the crate, will come into engagement with the inner or forward face of this projecting end 28 of the spiral, and as better shown in Fig. 6, the spiral being so formed and curved in a downward and forward direction as to pass over the end wall and down into the compartment 2 of the tank, the crate will be forced along the first pair of ways 20—21 on the first spider 15, and will be eventually pushed on to the diametrically opposite ways 20—21 of the next spider 8, which, by its rotary action, will carry the crate in a direction crosswise of the general line of travel of the crate from inlet to outlet, and thereby prolong the stay of the crate within the first compartment. From the lower end of the protruding portion 28 of the spiral, the spiral continues as an Archimedean screw, always encompassing the circular line of travel of the ways 20—21, and varying its flights or degrees of incline according to whether it be desired to increase or decrease the speed of the forward travel of the crate with respect to its rotary or lateral travel. Thus it will be seen that where the spiral or incline first enters the end of the tank on the left, as shown at 30, its degree of inclination is very slight, so that after the crate is once over the end wall, its travel lengthwise on the guide-ways on the spider 8 will be very slight until it begins to rise out of the tank, when the spiral or incline increases its angle, as shown at 31, to carry the crate farther along and beyond the end wall 32, which is part of a hood 33 arranged over the tank 1 for confining the steam or vapors rising from the pasteurizing fluid and for maintaining the temperature of such fluid. From here on the spiral curves upwardly and then downwardly, as shown at 34, to carry the crate over and beyond the partition 5, whence the inclination of the spiral is again decreased, as shown at 35, to keep the crate within the tank or compartment 3 as long as possible, the incline from the lower end of 35 being increased as the spiral rises, as shown at 36, to pass beyond another partition 37, which is intended to separate the vapors and steam arising from the main body of the compartment 3 and the compartment 2, so that the required difference in temperatures between these two compartments may be maintained. From the compartment 3 the spiral passes into a plane at right angles to the axis of revolution of the crates as shown at 38, so that the duration of the stay of the crate in the compartment 3 may be prolonged as far as is necessary, and from the flight 38 the spiral again assumes proper degrees of inclination, as shown at 39 to carry the crate beyond another partition 40 depending from the head 33, near the end of the compartment 3, which is employed for the purpose of maintaining the required difference in temperature between the compartment 3 above the water, and that of the compartment 4 above the water.

The flight 39 of the spiral carries the crate within the reach of the guides mounted upon the spider 12, and the flight 41 carries it from the guides of the spider 12 over the end wall 6 and down into the compartment 4, between the end wall 6 and the end wall 42 of the hood 33, and from here a flight 43 carries the crate on to the guides of the end spider 14, whence it is delivered to the guide-ways of the final or delivery spider 16 by a flight 44, which, like the flight 38, is arranged in a plane substantially at right angles to the axis of revolution of the crates so as to avoid a sudden discharge of the crates from the guide ways of the final spider, this right angle flight 44 terminating at its upper end in an outward inclination 45, as better shown in Fig. 6, which is just sufficient to push the crates fairly upon the guide-ways of the spider 16, whence they may be removed by hand.

The water or pasteurizing fluid contained in the tank 1 may, of course, be heated by the usual or any suitable means not necessary to illustrate for maintaining the required difference in temperatures between the compartments 2, 3 and 4, or any other number of such compartments. The water or liquid in the compartment 4 should be cool for the purpose of cooling off the pasteurized material before leaving the machine, but this water necessarily becomes overheated by the hot material coming from the hottest compartment 3, and consequently, means must be provided for keeping its temperature down. On the other hand the water or pasteurizing fluid of the compartment 2, which is required to be warm, so as to give the material as it first enters its initial heating, necessarily becomes overchilled by contact with the beer or other material to be pasteurized, which usually enters the machine directly from the refrigerator. Hence provision must be made for compensating for this loss of heat in the compartment 2. In order that the surplus of heat occurring in the final compartment 4 may be utilized for counteracting the loss of heat in the compartment 2, and the loss of heat in the compartment 2 may be utilized for counteracting the increasing heat in the compartment 4, these two compartments are placed in communication by suitable circulating passages, the water being taken from the coldest part of the compartment 2 by means of a pipe 46 and conducted to the hottest part of the compartment 4, the ends of the pipe preferably entering both compartments at the upper part, entering the compartment 2 at the upper and outer end, but entering the compartment 4 at the upper and inner end, it being understood that the water in compartment 2 will be coldest where it first comes in contact with the refrigerated bottles. If desired, a circulating pump 47 may be introduced in the pipe 46 for inducing circulation. It is of course obvious that the bottles 22 thus resting freely in the apertures 24 would drop out of the carrier or crate when the latter is inverted in passing down into the pasteurizing compartments unless some special means be employed for holding them in. In order that the work of the attendant in removing the bottles may not have to be multiplied by having to release any special fastening devices for thus retaining the bottles, it is preferable to have the retaining means form a part of the pasteurizing machine itself as counterdistinct from the crate or carrier. To that end, a series of slats or grates 48—49 are mounted upon the spokes of the spiders in such a position that one of these slats or grates will be directly over each row of bottles, and all of the slats or grates for every pair of arms or spokes are in line, that is to say, the four slats or grates carried by one pair of arms or spokes are directly in line respectively with the four carried by the corresponding pair of arms or spokes of the next spider, and so on throughout the length of the machine. The two grates or slats 48 are carried by transversely extending arms or brackets 50 projecting from one of the guide-ways or channel-bars 20—21, while the other two slats or grates 49 are carried by a similar bracket 51 on the other one of the guide-ways or channel-bars 20—21.

With the machine thus constructed and operated, it will be seen that the bottles while passing through the machine and revolving with the various spiders, are repeatedly inverted and the contents thereof continually agitated while being pasteurized, while it is also thoroughly commingled with the carbonic acid or other gas with which the contents may be charged, and consequently the gas will be less liable to escape under the high temperature to which the contents is subjected in the pasteurizing operation, and by this constant agitation of the contents it will be seen that although the bottles may be of irregular shape and consequently more readily penetrated by the heat at one point than at another, thus making the contents at one point hotter than at another, the heating will nevertheless be uniform because of the continual stirring or changing of position of the contents in the bottles.

In order that the invention might be understood by those skilled in the art, the details of an exemplification thereof have been thus specifically described, but

What I claim as new and desire to secure by Letters Patent is:

1. In a machine of the class described, the combination of a receptacle with upwardly extending partitions forming a plurality of compartments, a hood with depending partitions disposed intermediate the other partitions forming compartments therein, said partitions extending below the upper edges of said other partitions to form a fluid seal for said compartments, a spiral guide extending lengthwise of the receptacle through the compartments, a carrier having means to engage said guide, and means to rotate said carrier.

2. In a pasteurizer the combination of a pasteurizing compartment, a cover therefor provided with depending partitions, a spiral arranged within said compartment, and extending between said partitions and the end walls of said compartment, a carrier for carrying the object to be pasteurized through

said compartment, having means for engagement with said spiral, a guide-way engaging said carrier extending lengthwise of the axis of the spiral, and means for moving said guide-way and carrier in a direction transverse to the axis of the spiral.

3. In a pasteurizer the combination of a pasteurizing compartment, a spiral arranged contiguous thereto, a cover for said compartment provided with partitions depending on either side of each end wall thereof, a series of guide-ways, a plurality of carriers for holding the objects to be pasteurized, said carriers being arranged on said guide-ways and provided with means for engagement with said spiral, and means for revolving said guide-ways in a plane transverse to the axis of the spiral.

4. In a pasteurizer the combination of the pasteurizer receptacle having a plurality of partitions forming a succession of pasteurizing compartments, a spiral arranged contiguous to said compartments, a cover for said pasteurizer provided with partitions depending therefrom on each side of each partition, a carrier having means for engagement with said spiral for carrying the object to be pasteurized, a guide-way for said carrier divided into a plurality of alined sections arranged in said compartments respectively, and means for moving the sections of said guide-way in a direction transverse to the axis of the spiral.

5. In a pasteurizer the combination of a succession of pasteurizing compartments having partition walls dividing them from each other, a spiral arranged in said succession of compartments and having its convolutions so disposed as to pass over said partitions at one or more points, the convolutions at other points being substantially without inclination lengthwise of the spiral, a cover for the pasteurizer having partitions depending therefrom adjacent the first said partitions, a carrier for the object to be pasteurized having means for engagement with said spiral, and means for moving the carrier in a direction transverse to the axis of the spiral.

6. In a pasteurizer the combination of a pasteurizing compartment provided with a cover for retaining the vapors therein, a spiral arranged contiguous thereto, a carrier movably engaging said spiral, means for moving said carrier in a direction transverse to the axis of the spiral whereby the carrier will be advanced lengthwise of the axis of the spiral, and means arranged contiguous to the line of movement of the carrier for holding the object to be pasteurized against dislodgment from the carrier.

7. In a pasteurizer the combination of a pasteurizing compartment provided with a vapor-retaining cover, a spiral arranged contiguous thereto, a carrier movably engaging said spiral, a guide-way also movably engaging said carrier, means for moving said guideway in a direction transverse to the axis of the spiral, and means extending lengthwise of the spiral but moving with said guide-way and arranged contiguous to the carrier for holding the object to be pasteurized against dislodgment from the carrier.

8. In a pasteurizer, the combination of a pasteurizing compartment having a hood, a spiral arranged contiguous thereto, a guideway movable with respect to said spiral in a direction transverse to the axis of the spiral, a carrier movably engaging said spiral and said guideway, means for moving said guideway, and a grate extending lengthwise of the spiral contiguous to the carrier and movable with said guideway for preventing the object to be pasteurized from falling out of the carrier.

9. In a pasteurizer the combination of a pasteurizing compartment, a vapor-holding hood therefor, a spiral arranged contiguous thereto, a guide-way revoluble within the spiral and compartment, and a carrier for the object to be pasteurized adapted to move on said guide-way and having means for engagement with said spiral whereby the revolving motion of the guide-way will cause the carrier to move lengthwise of the axis of the spiral.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 9th day of January, A. D. 1908.

CHARLES E. FELT.

Witnesses:
Charles H. Seem,
J. H. Jochum, Jr.

Pa
July 1934

1,104,716

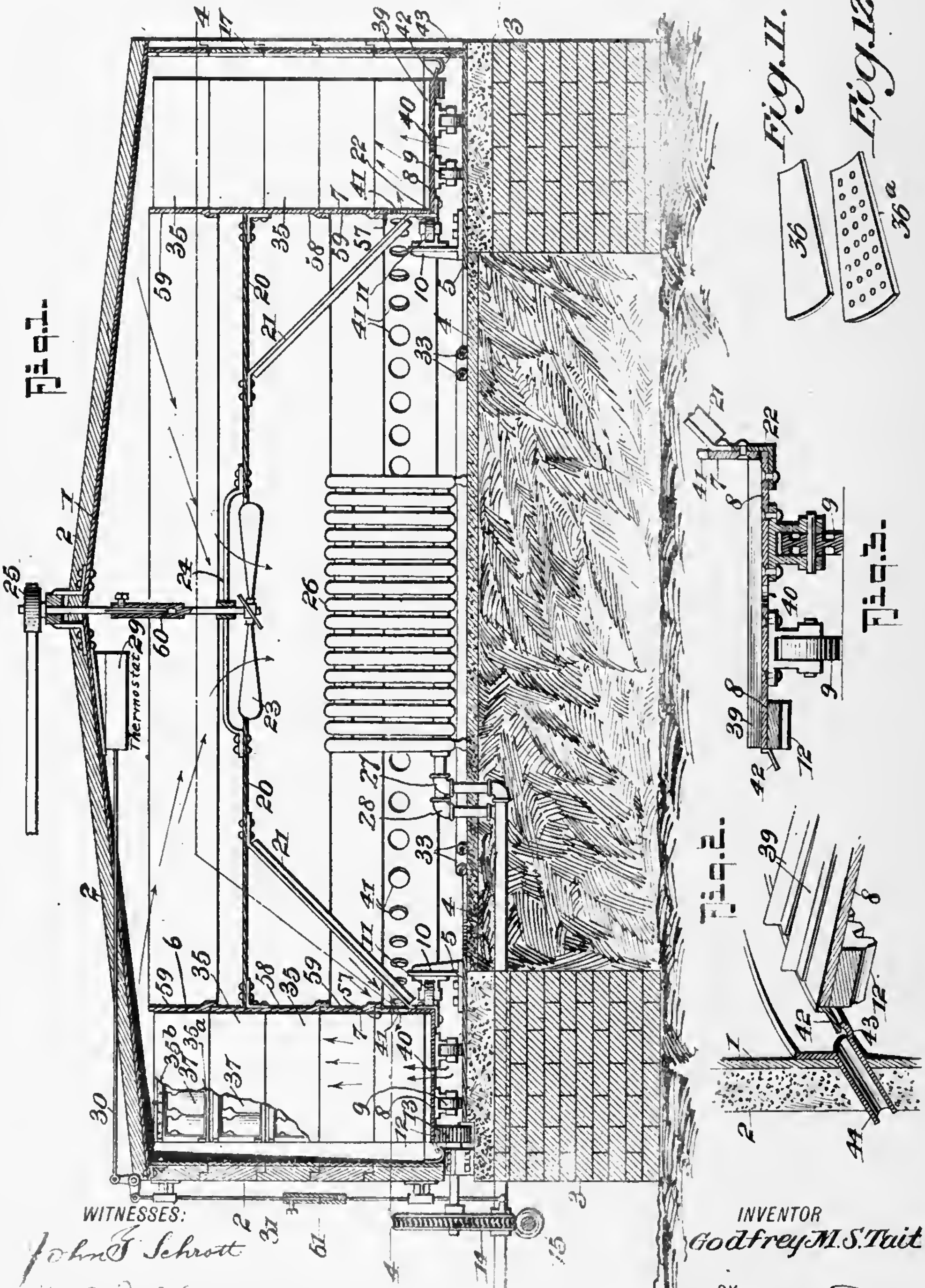
G. M. S. TAIT.

PASTEURIZING APPARATUS.

APPLICATION FILED MAR. 24, 1914.

1,104,716. Patented July 21, 1914.

3 SHEETS—SHEET 1.



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G. M. S. TAIT.
PASTEURIZING APPARATUS.
APPLICATION FILED MAR. 24, 1914.

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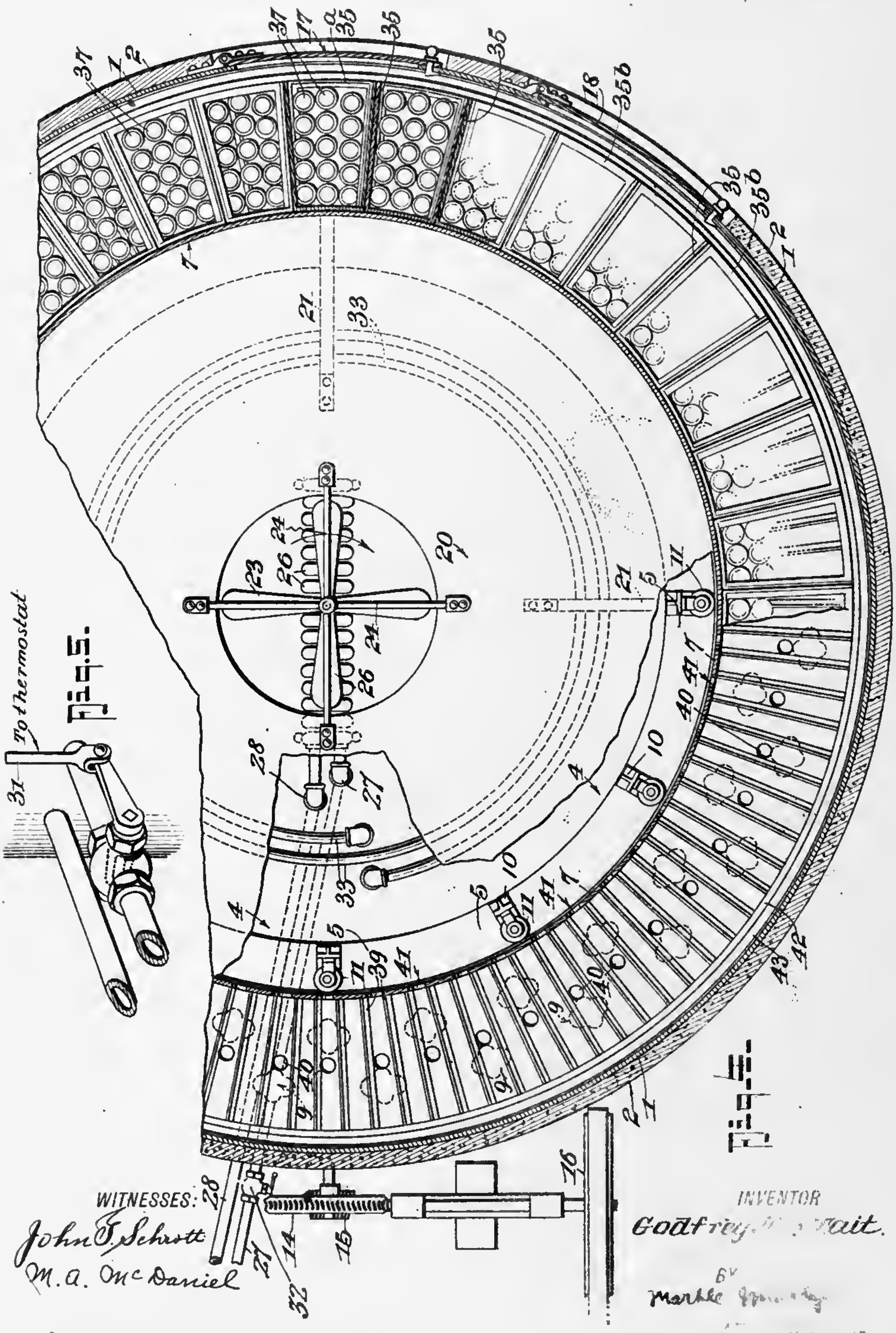
Patented July 21, 1914.
3 SHEETS—SHEET 2.



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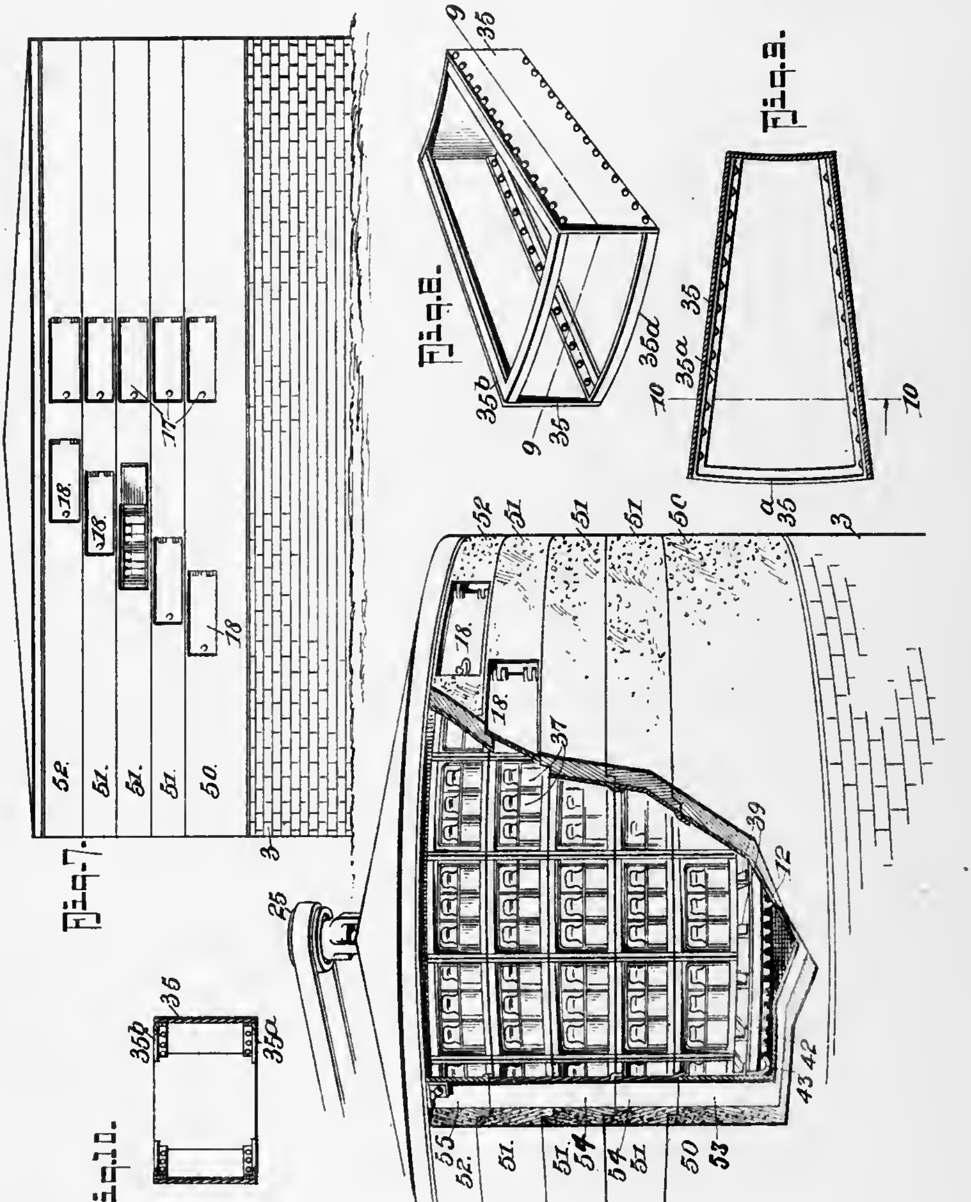
PASTEURIZING APPARATUS.

APPLICATION FILED MAR. 24, 1914.

1,104,716.

Patented July 21, 1914.

3 SHEETS—SHEET 3.



WITNESSES:

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INVENTOR

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ATTORNEYS

UNITED STATES PATENT OFFICE.

GODFREY M. S. TAIT, OF WASHINGTON, DISTRICT OF COLUMBIA.

PASTEURIZING APPARATUS.

1,104,716. Specification of Letters Patent. Patented July 21, 1914.

Application filed March 24, 1914. Serial No. 826,931.

To all whom it may concern:

Be it known that I, GODFREY M. S. TAIT, a subject of Great Britain, and a resident of Washington, in the District of Columbia, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

This invention relates to hot air insulated pasteurizing apparatus intended particularly for the pasteurization of bottled milk and other liquids; and it comprises such a pasteurizing apparatus having an outer casing of insulating material and having within said outer casing an annular carrier or conveyer together with means for moving said conveyer, and thermostatically controlled heating means for heating the air in said apparatus, and maintaining such air and the contents of the apparatus at the pasteurization temperature, said annular carrier having thereon bottle-receiving compartments open or perforate at their tops and bottoms and open at their outer ends but closed at their sides and inner ends and arranged so that said side walls form vertical partitions dividing the space above said annular carrier into a cellular structure having a plurality of vertical sections or divisions separated from each other, and said outer walls or casing of the apparatus having therein suitably arranged doors or openings for gaining access to the various layers of open ended compartments or receptacles; more specifically, and in its preferred form, the invention comprises such an apparatus in which the lower portion of the annular carrier is provided with perforations or otherwise constructed to permit circulation around or through the same; and the tops and bottoms of the open ended compartments of the cellular structure of the apparatus are also provided with perforations or cut away to permit circulation therethrough, means being provided for circulating air at the desired temperature through said carrier and compartments for maintaining the same at the desired pasteurization temperature; it also comprises, and more specifically, such an apparatus in which the compartments of the cellular structure are separate sections, each section comprising a separate receptacle having imperforate side and rear walls, but perforate or open or cut-away tops and bottoms, said sections being built up or superposed in tiers, and with said tiers being arranged to form a continuous sectional structure on said carrier, whereby the number of sections may be increased or decreased and individual sections replaced or removed as may be desired.

It further comprises a sectional pasteurizing apparatus built up of annular superposed sections which may be added to and the apparatus as a whole enlarged as desired; and it further comprises certain novel features of construction and arrangement of parts; all as more fully hereinafter set forth and as claimed.

In my prior application Serial No. 781633, filed July 28, 1913, I have described a process of pasteurizing milk and similar liquids which comprises preheating the raw or unpasteurized milk, bottling the preheated milk in bottles themselves also preheated, particularly the bottles which are still in a highly heated condition from the washing and scalding operation, and maintaining the bottled milk in its heated condition at the temperature necessary for pasteurization until the pasteurization process has been substantially completed, the heat necessary for pasteurization being supplied primarily by the heat of the bottles and of the preheated milk, and the bottled milk being maintained in a hot air insulated apparatus similar in nature to a fireless cooker so that the heat of the bottled milk is conserved, and the milk is kept from cooling by the heat insulating properties of the fireless cooker apparatus, a small amount of heat being supplied to this apparatus if necessary and thermostatically controlled in order to maintain the necessary temperature for pasteurization.

The apparatus of the present invention is intended primarily for the pasteurization of bottled milk in the manner just described, and more fully described in my prior application above referred to. It will be understood that this apparatus is adapted for other uses, and that other liquids than milk can be similarly pasteurized, but in describing the present invention, and the embodiments of it illustrated on the accompanying drawings, its use in the pasteurization of milk will be more particularly described.

The invention will now be described more in detail in connection with the accompanying drawings illustrative of certain embodiments thereof. It will be understood that the invention is illustrated by, but not limited to, these embodiments shown and described.

In the accompanying drawing, Figure 1 is a central vertical section of one embodiment of the invention; Fig. 2 is a detail view of a portion of the carrier and casing; Fig. 3 is a detail view of the carrier; Fig. 4 is a partial horizontal section taken on the line 4—4 of Fig. 1; Fig. 5 is a detail view showing the thermostatically controlled valve for controlling the supply of heating fluid; Fig. 6 is a perspective of the apparatus as a whole with part of the casing broken away; Fig. 7 is an elevation of the apparatus as a whole; Fig. 8 is a perspective of the sectional receptacles or compartments; Fig. 9 is a horizontal sectional view taken on the line 9—9, Fig. 8; Fig. 10 is a vertical sectional view taken on the line 10—10, Fig. 9. Fig. 11 shows a cover or shelf for the receptacles or compartments; and Fig. 12 shows a modified cover or shelf.

The apparatus illustrated in the accompanying drawings is made up of an outer sheet metal frame-work 1 covered both on its sides and top by heat insulating material 2 such as asbestos or other suitable material, the apparatus as a whole being supported on a suitable foundation 3 and having a floor 4 of cement or other suitable material. Inside the insulated casing is an annular plate 5 on which is mounted the rotating carrier 7 which as shown is made up of the inner cylindrical vertical wall 6 and the annular floor 8 supported by suitable trucks or rollers 9 on the annular plate 5. At the inner edge of the plate 5 are vertical angle braces 10 carrying guide trucks or rollers 11 for guiding the rotating carrier. At the outer edge of the carrier, and on the bottom of the annular plate 5 is shown an annular rack 12 engaged by a suitable gear wheel 13 by means of which the carrier is rotated. This gear wheel is in turn operated by suitable mechanism which as shown is made up of a worm gear 14 driven by a worm 15 which in turn is driven by a suitable pulley 16 or other source of power.

It will be understood that while I have illustrated and described one particular mechanism for rotating the carrier, yet different kinds of driving mechanism can be used for this purpose.

As shown in Figs. 1 and 2 a horizontal partition 20 divides the space within the cylindrical wall 6, this partition being further supported by the braces 21 attached by brackets 22 to the lower portion of the annular carrier. A fan 23 is mounted in a central opening in said partition and is guided by suitable spider supports 24 and driven by a pulley 25 or other suitable driving mechanism. Below the partition 20 and the fan 23 is shown a radiator 26 having suitable inlet and outlet pipes 27 and 28, and arranged to be automatically controlled by the thermostat 29 and its connecting rods 30 and 31 which operate the inlet valve 32, it being understood that the supply of heating fluid furnished to the radiator will be so controlled by the thermostat as to maintain the necessary temperature of the air and the other contents of the apparatus. It will be understood also that other suitable heating means can be used in a similar manner. A coil 33 through which may be circulated either a suitable heating or cooling fluid, but intended primarily for a cooling fluid, is shown on the floor of the apparatus.

On the annular carrier plate 5 are supported a plurality of horizontal rows or tiers of receptacles or compartments within which the bottled milk, or trays containing such bottled milk, is intended to be placed. These receptacles or compartments are somewhat wider at their outer than at their inner ends and are so proportioned that they form a continuous cellular structure open on the outside at the outer ends of the compartments. These compartments are each opened at their outer ends but closed at their sides and inner ends and arranged so that the side walls form vertical partitions dividing the space above said annular carrier into the cellular structure referred to. This cellular structure has its vertical walls dividing it into vertical sections or divisions separated from each other so that where the tops and bottoms, or the top and bottom walls, are perforated or open, these compartments are intercommunicating so that circulation may take place through them. In the specific and preferred embodiment of the invention illustrated this sectional structure is built up of individual sections which are interchangeable with each other and which are built up with the individual receptacles superposed in tiers with the different tiers arranged side by side around the carrier so that they form the continuous cellular structure referred to. The individual sections are interchangeable with each other and the sections of any vertical tier can be removed without removing any other section. In the specific embodiment of the invention illustrated, these sections are shown as made of imperforate sheet metal side walls and rear end, supported and reinforced by angle irons 35^a and 35^b extending across the sections at their bottoms and tops and along the sides of the sheet metal at their bottoms and tops, these angle irons stiffening and supporting the sides of the receptacles and forming a shelf or ledge around the sides and front of the sections to support the same and to furnish a support for the sections which are superposed upon them. The inside flange of the angle irons at the bottom of the section also furnishes a shelf for supporting the trays or crates of bottles which may be placed in the section and also for supporting separate and removable shelves, either perforate or imperforate, which may be placed within these sections. When the tops and bottoms of these receptacles are open or perforate, the receptacles of each tier communicate with each other so that air may circulate through the sections of each vertical tier, while circulation between the sections of different tiers is prevented.

In the structure shown in Figs. 1 and 2 the carrier plates 5 and 7 are shown as provided with suitable perforations or holes 40 and 41 to permit circulation of air therethrough. Suitable spacers or supports 39 may be placed upon the floor of the carrier to support the sections or receptacles. In order to provide for the removal of any condensate or other liquid from the carrier a drip flange 42 is provided and a trough 43 having a suitable outlet or outlets 44.

The outer casing of the apparatus is provided with suitable doors 17 and 18, as shown in Fig. 7, it being understood that these doors may be provided with suitable insulation and that one or more of these doors may be used as required. By means of the door 17 it is possible to gain access to the apparatus and to remove any particular tier of crates or the bottles in any particular tier; while by means of the doors 18 it is possible to remove the bottles from any particular horizontal row of receptacles or crates. These doors 18 are shown as off-set with respect to each other so that access may be had to different rows of crates at the same time by different operators. It will be understood that additional doors may be provided, and that the arrangement of these doors can be varied in order to provide for access to the open ended receptacles at any desired point.

In an apparatus such as that of the present invention it is frequently desirable to provide for increasing the capacity of a single apparatus where increased demands are placed upon it. Where an apparatus is built as a single unit, its capacity is not readily varied. If all of the apparatus is not utilized the remainder stays idle. It is one of the objects of the present invention to provide an apparatus which may be built up of sections so that its capacity can be increased to provide for increased demands. This object is effected by making the apparatus in horizontal sections which may be superposed one upon another. As illustrated in the accompanying drawings the outer casing is built up of the lower sections 50 of suitable insulating material provided with the inner metal lining 53, upon which are superposed the sections 51 provided with inner metal lining 54, these sections having suitable interlocking joints, and the joints of different sections being interchangeable with each other. Upon the upper section 51 is placed the top section 52 having the inner metal lining 55. The top of the apparatus may be suitably supported from this upper section. It will be seen that these sections 50, 51 and 52 form the outer side walls of the casing 2 while the inner linings 53, 54 and 55 form the inner metal lining 1 of the sides of the apparatus. The inner cylinder 6 is similarly shown as made up of the lower section 57 which is made integral with, or attached to, the bottom of the carrier, the central section 58 which supports the horizontal partition 20, and the interchangeable sections 59. It will be understood that the braces 21 are riveted or otherwise suitably secured in place and that by removing the rivets or fasteners the braces can be removed and longer or shorter braces used as may be necessary. In order that the fan support may be readily adjusted, a suitable telescoping connection is shown at 60, and a similar connection is shown at 61 in the thermostatically operated rod 31. It will be seen that by omitting one or more of the sections 59, and the corresponding outer sections of the casing, the apparatus will be made correspondingly smaller, while by adding one or more other sections 51, and the corresponding number of sectional receptacles or compartments, the apparatus can be increased in size. The heating apparatus, and the apparatus for moving the carrier and for insuring maintenance of the necessary temperature within the apparatus will remain the same, and only the interchangeable sections added or removed. Provision is thus made for building a small apparatus, and for adding one or more sections when occasion may arise and increased demands are placed upon the apparatus. It will be understood that with the addition of each section, an additional horizontal row of sectional compartments or receptacles may also be added, the operation of the apparatus remaining the same irrespective of the number of sections of which it is made up.

In the operation of the apparatus of the present invention it is intended that the bottled milk when inserted therein shall be at the pasteurization temperature or somewhat above this temperature. When the bottles are taken immediately after the washing and scalding operation they are at a temperature considerably higher than that necessary for pasteurization. If filled with preheated milk while still in this highly heated condition, the bottled milk will still be at or above the temperature necessary for pasteurization when inserted in the apparatus of the present invention. While the milk may be pasteurized after the covers have been placed on the bottles, yet the apparatus is equally adapted for use where the bottles have not been covered, in which case there may be free escape of occluded gases and odors from the bottles while in the pasteurizing apparatus. When the bottled milk is placed in this apparatus at a temperature somewhat above that of pasteurization it is necessary only that it be kept from cooling below the pasteurizing temperature until the pasteurizing process has been completed. The heat already contained in the preheated milk and in the heated bottles, if prevented from escape, furnishes the heat for the pasteurization. It is the primary object of the apparatus of the present invention to conserve this heat in much the same manner that heat is conserved by a fireless cooker. Sufficient heat only need be supplied to prevent cooling of the apparatus below the pasteurizing temperature; or, stated in other words, only sufficient heat need be furnished to maintain the apparatus as a whole at the temperature necessary for pasteurization. It will be understood that the thermostat, and the thermostatically controlled heating element, will be so constructed and proportioned as to enable this temperature to be maintained.

The bottled milk is placed in the compartments or receptacles in any suitable manner. Where the compartments are provided with suitable bottoms or shelves for supporting the bottles, the bottles may be placed in one at a time. For convenience of handling however, the bottles may be placed in trays of wire or other suitable construction and these trays placed in the separate compartments. By making these trays of the same size as the compartments, or slightly smaller, they may be placed in the compartments so that they will be supported by the flanges 35^a and 35^b at the front and sides of the compartments, and be held in place by the vertical flange at the front of each section. It will be understood that suitable shelves may first be placed in the separate sections or compartments to support the trays, or that the trays may be themselves supported by the flanges indicated. When all of the compartments have been filled, the speed of the driving mechanism is so controlled that the time necessary for one complete rotation of the carrier is sufficient to enable the pasteurizing process to be completed. About forty minutes is usually sufficient. Accordingly when the carrier has made one complete rotation the bottled milk has become pasteurized so that upon reaching the openings 18 the bottled milk can be removed and stoppers or covers applied to the bottles, in case the bottles have been uncovered during the process. At the same time that the pasteurized milk is being removed, the unpasteurized milk can be placed in the compartments thus vacated, it being thus possible for one operator to remove the pasteurized milk and to insert the unpasteurized milk through the same opening and from and into the same receptacle. The apparatus as a whole is entirely closed except for the doors or openings through which the bottled milk is inserted and removed. The construction of the receptacles however is such that there is no appreciable cooling of the apparatus through these openings or doors. The imperforate side walls of the compartments or sections 35 form vertical partitions separating the particular receptacle or receptacles in alinement with the openings 18 from those on either side so that only those receptacles or compartments in alinement with the openings 18 are exposed to the cooling action of the outside atmosphere. As soon as these receptacles have been moved past the openings in the outer casing, the heat of the bottles therein and of the apparatus as a whole raises the temperature to that at which the remainder of the apparatus is maintained so that the pasteurization process can proceed. It will be understood that the apparatus is filled with heated air at the pasteurization temperature and that it is necessary for sufficient heat only to be applied to the heating apparatus to maintain this air at this temperature and to prevent cooling of the already preheated bottled milk and bottles. In the embodiment of the invention illustrated, provision is made for circulating a current of air or other gas around the milk bottles in order to maintain the temperature uniform throughout the apparatus and to supply any heat that may be necessary to prevent the apparatus and the heated air and milk within from falling below the pasteurization temperature. The air heated by the radiator 26 is circulated by means of the fan 23 through the openings or perforations 40 and 41 in the frame of the rotating carrier and thence up through the different compartments of each vertical tier to the top of the apparatus. It is thus possible to maintain a slow circulation of the heated air for insuring that the temperature throughout the apparatus is uniform. The thermostat, which may be controlled by the air within the apparatus, itself controls the amount of heating fluid supplied to the radiator, and this control is so effected that the air within the apparatus and the apparatus as a whole is maintained at about 140 degrees, or slightly thereabove, to insure pasteurization. The slow circulation of air through the compartments and around the bottled milk has the further advantage of withdrawing odors and gases from the milk.

The air within the apparatus can be renewed whenever necessary, or suitably purified, should such purification for any reason be necessary. By placing an imperforate cover or shelf 36 (Fig. 11) at the top of any vertical tier or compartment, or at the top or bottom or both of any particular compartment, this compartment, and the vertical section of which it is a part, may be rendered inoperative so far as the circulation therethrough is concerned, while circulation between the outer end of the compartments and the outside casing may still be permitted. Similarly by using perforate shelves or covers 36ª (Fig. 12) for any particular vertical section of compartments, the circulation through such compartments may be modified or decreased. It is believed the use of such shelves will be sufficiently clear and obvious without further description or illustration.

When the outer walls of the apparatus are suitably constructed and insulated, so that the heated air within the apparatus cannot escape, the heat necessary to be supplied is very small, the main losses being those due to slight radiation and the slight cooling effect of the opening through which the trays of bottled milk are inserted and removed. By the circulation of heating fluid through the coil 33 an additional heating effect can be secured; but this coil is intended primarily for circulation of brine or other cooling medium in order to remove excessive moisture and dry air when it may become too moist, the moisture condensing on this coil and being removed at the bottom of the apparatus without cooling the air itself below the temperature of pasteurization. Any moisture or other liquid which may collect at the bottom of the compartments on the carrier is free to escape by means of the trough 43 and its outlets 44.

It will be understood that the size of the openings 40 and 41 in the carrier, as well as their number and relative location, can be varied as desired; and it will also be understood that the rapidity of the circulation can be varied as desired, although usually a slight circulation is all that is necessary.

While many of the advantages of the present invention may still be obtained by the use of compartments separated from each other by imperforate horizontal partitions which are maintained at the necessary temperature, yet the provision of circulation in the manner indicated has the advantage that the necessary uniformity of temperature is easily maintained and local variations avoided, the bottled milk being cooled if too hot, and vice versa, while the temperature may be more accurately controlled. Whatever the heating means may be, however, and irrespective of whether circulation of the heated air is effected within the apparatus, the apparatus as a whole is one which is filled with heated air at the necessary temperature, and which is provided with means for heating this air or maintaining it at this temperature. As already pointed out the heat supplied by the bottled milk tends to make up for any cooling through the opening in the outer casing, particularly when the bottled milk reaches the apparatus at a temperature of several degrees above that necessary for the pasteurization, so that the primary function of the apparatus as a whole is, as has been already pointed out, that of protecting and conserving this heat of the bottled milk and of the heated air within the apparatus and maintaining the apparatus as a whole at the desired constant or approximately constant temperature.

While the invention has been more particularly described as used for the pasteurization of bottled milk, yet it will be understood that other liquids or products can be treated in a similar manner. It will also be understood that variations and changes can be made in the construction and arrangement of the parts of the invention without departing from its spirit and scope. The particular temperature at which the apparatus is maintained can be varied to suit the requirements placed upon it. It is intended and understood that the invention is illustrated by, but not confined to, the embodiments thereof illustrated and described in the foregoing description and on the accompanying drawings.

I claim:

1. A hot air insulated pasteurizing apparatus comprising an outer casing of insulating material, an annular carrier within said casing having thereon bottle receiving compartments with open outer ends and imperforate sides and inner ends forming a cellular structure upon said annular carrier and dividing the space above the same by imperforate vertical partitions into a plurality of vertical sections separate from each other, means for rotating said annular carrier within said casing, and thermostatically controlled heating means for heating the air in said apparatus and maintaining said air and the contents of said apparatus at the pasteurization temperature, said casing having openings therein with which the outer ends of said compartments are arranged to be brought into alinement.

2. A hot air insulated pasteurizing apparatus comprising an outer casing of insulating material, an annular carrier within said casing having thereon a sectional cellular structure comprising a plurality of separate bottle receiving receptacles with open outer ends and imperforate side walls dividing the space above said carrier by imperforate vertical partitions into a plurality of vertical sections separate from each other, means for rotating said annular carrier within said casing, and thermostatically controlled heating means for heating the air in said apparatus and maintaining said air and the contents of said apparatus at the pasteurization temperature said casing having

openings therein with which the outer ends of said receptacles are arranged to be brought into alinement.

3. A hot air insulated pasteurizing apparatus comprising an outer casing of insulating material, an annular carrier within said casing having thereon bottle receiving compartments with open outer ends, imperforate sides and inner ends, and perforate tops and bottoms, forming a cellular structure upon said annular carrier and dividing the space above the same by imperforate vertical partitions into a plurality of vertical sections separate from each other but with the compartments of each vertical section in communication, means for rotating said annular carrier within said casing, means for circulating heated air through said vertical sections, and thermostatically controlled heating means for heating such air and maintaining the same and the contents of said apparatus at the pasteurization temperature, said casing having openings therein with which the outer ends of said compartments are arranged to be brought into alinement.

4. A hot air insulated pasteurizing apparatus comprising an outer casing of insulating material, an annular carrier within said casing having thereon a sectional cellular structure comprising a plurality of separate bottle receiving receptacles with open outer ends, imperforate sides and inner ends, and perforate tops and bottoms, forming a cellular structure upon said annular carrier and dividing the space above the same by imperforate vertical partitions into a plurality of vertical sections separate from each other but with the receptacles of each vertical section into communication, means for circulating heated air through said vertical sections, and thermostatically controlled heating means for heating such air and maintaining the same and the contents of said apparatus at the pasteurization temperature, said casing having openings therein with which the outer ends of said receptacles are arranged to be brought into alinement.

5. A hot air insulated pasteurizing apparatus comprising an outer casing of insulating material, an annular carrier within said casing having an inner cylindrical shell thereon and also having thereon around said shell bottle receiving compartments with open outer ends and imperforate sides and inner ends forming a cellular structure upon said annular carrier and dividing the space above the same by imperforate vertical partitions into a plurality of vertical sections separate from each other, but with the compartments of each section in communication, a horizontal partition within said cylindrical shell having a central opening therein, means for rotating said annular carrier and partition within said casing, means for circulating heated air through said vertical sections and the openings in said partition, and thermostatically controlled heating means for heating such air and maintaining the same and the contents of said apparatus at the pasteurization temperature, said casing having openings therein with which the outer ends of said compartments are arranged to be brought into alinement.

6. A pasteurizing apparatus comprising an outer casing built up of annular superposed sections, an annular carrier within said casing having thereon bottle receiving compartments with open outer ends and imperforate sides and inner ends arranged in superposed layers corresponding to the superposed sections of said casing, means for rotating said annular carrier within said casing, and means for regulating the temperature in said apparatus, the sections of said casing having openings therein with which the outer ends of the compartments of the corresponding levels are arranged to be brought into alinement.

7. A pasteurizing apparatus comprising an outer casing having its side walls built up of a lower base section, one or more superposed intermediate sections and a top section, an annular carrier within said casing constructed of a lower base section provided with means for rotatably supporting the same and having an inner cylindrical extension thereabove, and one or more superposed cylindrical sections corresponding to the superposed sections of said outer casing, open ended compartments arranged on said annular carrier in superposed layers corresponding to the superposed sections of said outer casing, means for rotating said carrier, and means for regulating the temperature in said apparatus, the sections of said casing having openings therein with which the outer ends of the compartments of the corresponding levels are arranged to be brought into alinement.

8. A hot air insulated pasteurizing apparatus comprising an outer casing built up of annular superposed sections of insulating material, an annular carrier within said casing having thereon bottle receiving compartments with open outer ends and imperforate sides and inner ends arranged in superposed layers corresponding to the superposed sections of said outer casing and forming a cellular structure upon said annular carrier and dividing the space above the same by imperforate vertical partitions into a plurality of vertical sections separate from each other, means for rotating said annular carrier within said casing, and thermostatically controlled heating means for heating the air in said apparatus and maintaining said air and the contents of said apparatus at the pasteurization temperature, the sections of

said casing having openings therein with which the outer ends of the compartments of the corresponding levels are arranged to be brought into alinement.

9. A hot air insulated pasteurizing apparatus comprising an outer casing built up of annular superposed sections of insulating material, an annular carrier within said casing having thereon a sectional cellular structure comprising a plurality of separate bottle receiving receptacles with open outer ends and imperforate side walls arranged in superposed layers corresponding to the superposed sections of said outer casing and dividing the space above said carrier by imperforate vertical partitions into a plurality of vertical sections separate from each other, means for rotating said annular carrier within said casing, and thermostatically controlled heating means for heating the air in said apparatus and maintaining said air and the contents of said apparatus at the pasteurization temperature, the sections of said casing having openings therein with which the outer ends of the receptacles of the corresponding levels are arranged to be brought into alinement.

10. A hot air insulated pasteurizing apparatus comprising an outer casing built up of annular superposed sections of insulating material, an annular carrier within said casing having thereon bottle receiving compartments with open outer ends, imperforate sides and inner ends, and perforate tops and bottoms, arranged in superposed layers corresponding to the superposed sections of said outer casing and forming a cellular structure upon said annular carrier and dividing the space above the same by imperforate vertical partitions into a plurality of vertical sections separate from each other but with the compartments of each vertical section in communication, means for rotating said annular carrier within said casing, means for circulating heated air through said vertical sections, and thermostatically controlled heating means for heating such air and maintaining the same and the contents of said apparatus at the pasteurization temperature, the sections of said casing having openings therein with which the outer ends of the compartments of the corresponding levels are arranged to be brought into alinement.

11. In a pasteurizing apparatus an annular carrier having thereon a sectional cellular structure comprising a plurality of separate bottle receiving receptacles with open outer ends and imperforate side walls dividing the space above said carrier by imperforate vertical partitions into a plurality of vertical sections separate from each other, said receptacles being superposed one upon another in tiers and the receptacles of each tier being separately removable.

12. In a pasteurizing apparatus an annular carrier, having thereon a sectional cellular structure comprising a plurality of separate bottle receiving receptacles with open outer ends, imperforate sides and inner ends, and perforate tops and bottoms, forming a cellular structure upon said annular carrier and dividing the space above the same by imperforate vertical partitions into a plurality of vertical sections separate from each other but with the receptacles of each vertical section into communication, said receptacles being superposed one upon another in tiers and the receptacles of each tier being separately removable.

13. A sectional receptacle for pasteurizing apparatus having imperforate side and rear walls, open front end and perforate top and bottom, and being tapered from front to back, said receptacle being suitably reinforced to support similar superposed receptacles thereon.

14. A section receptacle for pasteurizing apparatus having imperforate side and rear walls, open front end, and being tapered outwardly front to back, and angle iron reinforcement extending across the front and sides of said receptacle at its top and bottom and secured to said sides, and having inwardly extending flanges arranged to furnish suitable supports for superposed receptacles and for shelves or trays placed therein.

In testimony whereof I affix my signature in presence of two witnesses.

GODFREY M. S. TAIT.

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M. A. McDaniel.

O. EICK.

APPARATUS FOR HANDLING BOTTLES OR OTHER CONTAINERS.

APPLICATION FILED OCT. 5, 1905.

1,106,033. Patented Aug. 4, 1914.

4 SHEETS—SHEET 1.

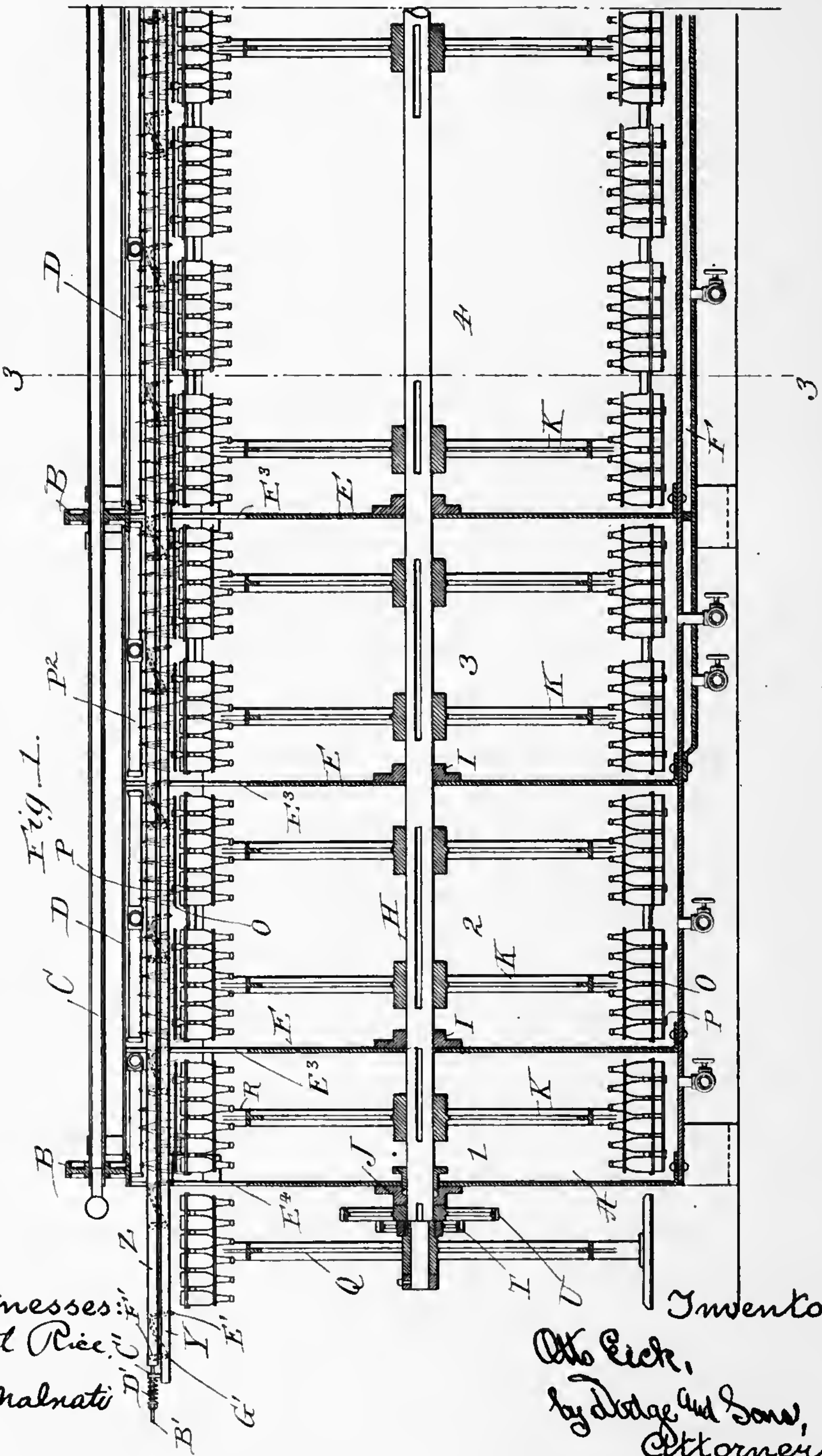

Fig. 1.

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4 SHEETS—SHEET 2.

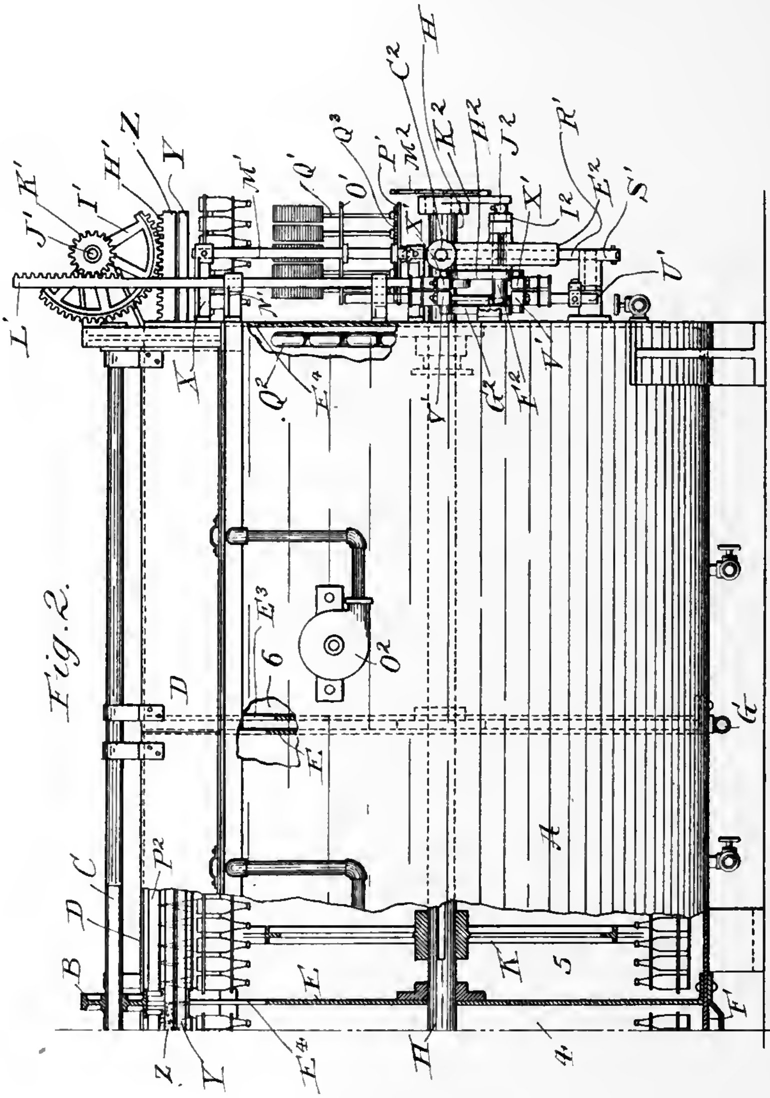

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 4.

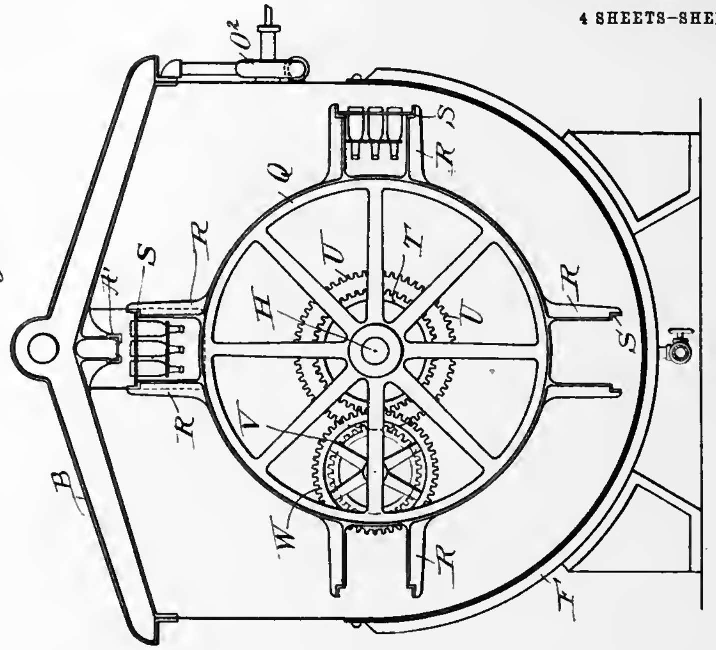
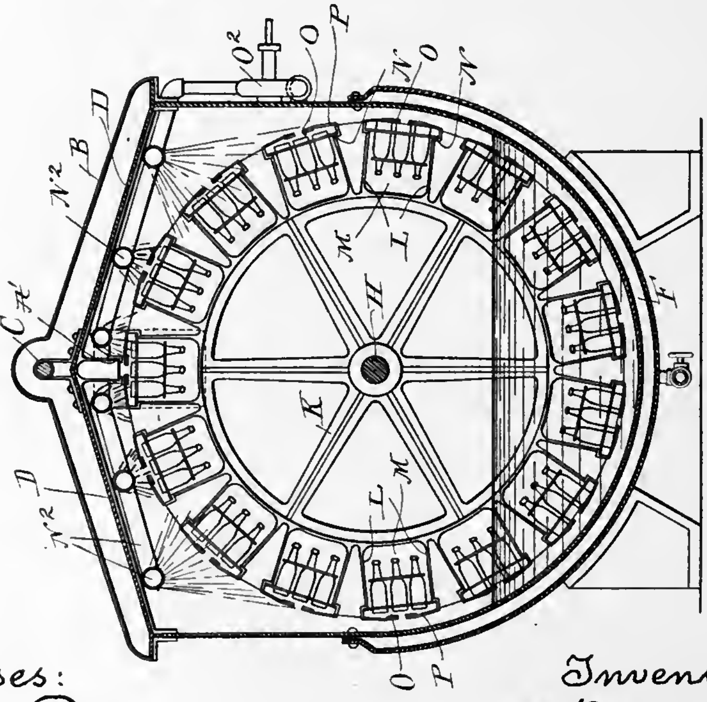


Fig. 3.



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APPLICATION FILED OCT. 5, 1905.

1,106,033. **Patented Aug. 4, 1914.**

4 SHEETS—SHEET 4.

Fig. 6.

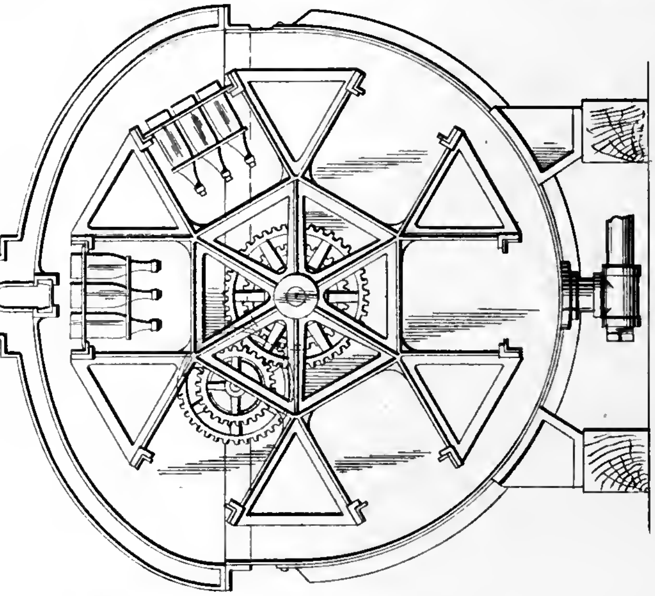
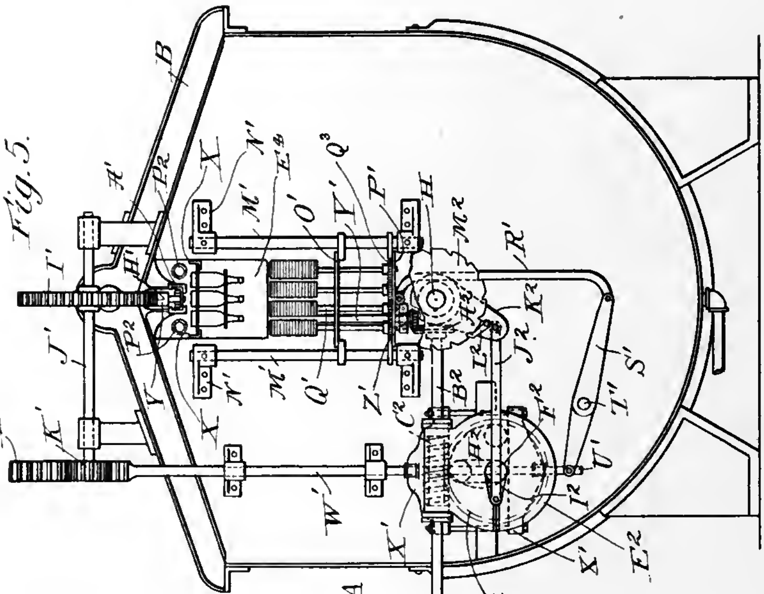


Fig. 5.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR HANDLING BOTTLES OR OTHER CONTAINERS.

1,106,033. Specification of Letters Patent. Patented Aug. 4, 1914.

Application filed October 5, 1905. Serial No. 281,520.

To all whom it may concern:

Be it known that I, OTTO EICK, a citizen of the United States, residing in Baltimore city, State of Maryland, have invented certain new and useful Improvements in Apparatus for Handling Bottles or other Containers, of which the following is a specification.

My present invention pertains to an improved apparatus for handling bottles or other containers, the apparatus being especially designed for use as a pasteurizer, though equally applicable to the washing and cleaning of bottles, either filled or empty.

The invention will be best understood upon reference to the annexed drawings, wherein: Figure 1 is a longitudinal vertical sectional view of the forward portion of the apparatus; Fig. 2 is a side elevation, partly in section, of the discharge end of the apparatus, said figure being a continuation of Fig. 1; Fig. 3 is a transverse vertical sectional view on the line 3—3 of Fig. 1; Fig. 4 is an end elevation of the forward or feed end of the machine, showing the feed-wheel and the driving-mechanism therefor; Fig. 5 is an end elevation of the discharge end of the machine; Fig. 6 is an elevation of a modified form of feeding or crate-presenting mechanism.

The main object of my invention is to produce a simple and efficient apparatus, which may be used as a pasteurizer, and in which access may be had to the bottles or other containers at any point in their travel through the machine.

A further object of the invention is to provide means for presenting the bottle-holders or crates to the means employed for advancing the crates through the machine.

A still further object is to provide means for cleaning the exterior of the bottles as they are discharged from the machine.

Referring to Figs. 1 to 5 inclusive, A designates a tank, substantially U-shaped in cross section, closed at each end, and mounted upon suitable supports. Cross-ties or frames B extend over the top of the tank, from side to side, said frames being securely fastened to the upper edges of the walls of the tank. A rod C passes through the central elevated portions of the frames B, and upon said rod are hinged the lids or covers D of the tank, said lids, when lowered, making a relatively close fit with the tank and with the lower portions or flanges of the cross-ties or frames B.

Tank A is divided into a number of chambers or compartments by a series of upright partitions E, three such partitions being shown in Fig. 1 and one in Fig. 2, in which latter figure there is also shown a double-wall compartment, making six chambers in all, which, for the sake of convenience, I have designated as 1, 2, 3, 4, 5 and 6. It is to be understood, however, that any number of chambers or compartments may be employed, the number being determined by the circumstances of each particular case. Chambers 3 and 4, or the lower portions thereof, are provided with a steam-jacket F, as, in the arrangement of the apparatus here shown, it is in said chambers that the greatest heat is maintained. The partition between chambers 5 and 6 is made hollow, as will be seen upon reference to Fig. 2, and a pipe G opens into the lower portion of said partition, for the introduction of cold water. The water, as it is heated by contact with the walls of the partition, which absorb heat from the water in chambers 5 and 6, will rise and overflow into one or the other of said chambers, accordingly as one or the other wall of said partition is made higher or lower. It is of course to be understood that a continuous supply of water is introduced through pipe G. Each of the upright partitions E is provided with a rectangular-shaped opening E^3 at its upper portion, centrally of the tank, as will be seen upon reference to Figs. 1, 2 and 3, and each end of the tank is also provided with an opening, E^4 which stands in line with the openings in the partitions. These openings permit the crates containing the bottles to be introduced into the machine and passed therethrough, or to be passed from one chamber to another, and discharged from the end of the machine.

A shaft H extends lengthwise of the machine, passing through each of the partitions, through suitable collars I mounted on said shaft, and through stuffing boxes J, mounted upon the end walls of the tank. Mounted upon shaft H, in each of the chambers, are wheels or carriers K, (one or more), each wheel being provided with a series of outwardly extending arms or members L, the adjacent side walls of which are substantially parallel, forming pockets or recesses M. Each member L is provided with a pair of horizontally-disposed ways or tracks N, of such length as to properly support a tray when the tracks are in alinement with the opening formed in the end of the tank. As the shaft H is rotated, and consequently the wheels are carried around in the tank, the bottles and tray will reach a point where the tracks will no longer support them. To prevent the bottles and tray from becoming disengaged from the wheel or carrier K, bars O are employed, which extend lengthwise of the opening M, and overlie the bottoms of the bottles within the crates, said bars being supported by arms P, which extend upwardly from the arms or members L, to which they are secured.

Where two wheels or carriers are employed in one chamber or compartment, as, for instance, in compartments 2 and 3, the ways or tracks N may be common to both wheels or carriers,—that is, they may be of a length sufficient to support two trays, as shown in Fig. 1. In chamber or compartment 4, the ways or tracks are extended to accommodate four trays in series. The outer end of shaft H, at the forward end of the machine, is reduced, and has a wheel or carrier Q loosely mounted thereon, said wheel, in the form shown in Fig. 4, being provided with four pairs of arms R, having tracks or ways S secured to or formed thereon, and designed to support and hold a bottle-holding rack with the bottles therein.

The trays are designed to be placed upon the tracks at the right-hand side of the machine, and to be carried up into line with the opening in the end of the tank, preparatory to being passed into the compartment or chamber 1.

The hub of wheel Q has splined to it a pinion T, motion being imparted to said pinion by a gear U splined to the main shaft H, said gear U serving to transmit its motion to pinion T through pinion V and gear W, the pinion V meshing with gear U, and the gear W meshing with the pinion T. The gears and pinions are so proportioned that wheel Q will make one-fourth of a revolution every time shaft H makes one-fifteenth of a complete revolution,—or, in other words, every time shaft H is moved to take one of its crates out of line with the opening in the end of the tank and to bring another one into line therewith. The proportioning of the gears of course depends upon the number of tracks or supports upon the wheel, and the number of tracks or supporting members upon the various carriers within the tank.

In Fig. 6, the outer wheel is shown as provided with six supporting tracks, and as a consequence the proportion of the gears is changed so as to impart a slower movement to the crate-presenting carrier. The tracks upon the wheel Q, and upon the various wheels or carriers mounted within the several chambers or compartments, must of course be brought into alinement when it becomes necessary to pass a new crate of bottles into the machine and to discharge a crate from the opposite end of the machine. In order to properly support the discharged crate, I provide a pair of tracks X (Fig. 5), said tracks standing in alinement with the tracks of the last carrier as they are brought into alinement therewith by the step-by-step movement of the carriers within the compartment.

In order to introduce the trays into the machine, to advance them through the compartments successively, and to discharge them from the last compartment onto the stationary tracks X, outside of the machine, I employ a pair of rods or bars Y, Z. Said bars extend throughout the length of the machine and overlie the uppermost series of trays supported by the wheel Q and the various carriers within the tank. The lower bar Y is supported by brackets or ways A′, see Figs. 3, 4 and 5. The upper bar Z, at the forward end of the machine, is provided with rod or stem B′, which extends freely through an arm C′, projecting upwardly from the lower bar Y. A coiled spring D′ surrounds the outer end of said rod, and is held against the outer face of arm C′ by a nut and washer mounted upon the rod. This permits the two rods to have a relative movement, and normally throws bar Z outwardly into the position shown in Fig. 1. A series of hooks or fingers E′ are pivotally connected to bars Y, Z, in the manner shown in said Fig. 1, that is to say, the hooks are pivotally connected to the rods at the points designated by F′ and G′. Normally the hooks are held in their elevated position by spring D′ withdrawing bar Z, and consequently throwing the pivotal points F′ and G′ out of alinement and thereby raising the depending ends of the hooks. When, however, the bar Z is moved by means which will presently be described, spring D′ is compressed and the ends of the hooks are thrown downward into a position in line with the ends of the crates. Upon further movement of bars Y and Z, the crates will be first engaged by the hooks and then moved forward a distance equal to the movement of the bars. To effect this longitudinal movement of the bars, bar Y is provided with a rack H′, which meshes with a segmental gear I′, mounted upon a shaft J′, carried in suitable bearings at the discharge end of the machine. Shaft J′ also carries a pinion K′, which in turn meshes with a vertically disposed rack L′. Reciprocating motion is imparted to rack L′, in a manner hereinafter set forth, and as a consequence, reciprocating motion is imparted to segmental gear I′, and through it to rack H′. As a rack H′ is moved toward the discharge end of the machine, the hooks carried by bar Z are thrown downward, in the manner above set forth. Upon a return movement of segmental gear I′, and consequently a return movement of rack H′, bar Z is moved independently of bar Y, and as a result the hooks are drawn upward, out of the path of the crates, and the bars Y, Z, are then moved toward the rear end of the machine, the hooks passing over the crates and their contained bottles, back into the position shown in Fig. 1, where they are again ready to be thrown downward to engage the crates and move them forward a step. When the bars are in the position shown in Fig. 1, the gear and rack will occupy the position shown in Fig. 2. This advancing mechanism for the crates is relatively simple and is brought into action automatically when the carriers come to a state of rest and another crate of bottles is brought into position by wheel Q, ready to be carried into the machine.

A pair of upright guide-rods or bars M′ is secured in a vertical position in brackets or arms N′, extending outwardly from the rear or discharge end of the machine. These rods serve to support and guide plates O′, P′, constituting the support for a series of rotating spindle-brushes Q′. The lower plate, which carries the gears Q^3, is moved up and down by an arm R′ pivotally connected to a lever S′, said lever being fulcrumed upon a fixed stud or axle T′, extending outwardly from the tank. The opposite end of lever S′ is connected to the lower end of a rod U′, which extends downwardly from a frame V′, to which reciprocating motion is imparted, in a manner about to be described. Rack L′ is formed upon the upper end of a rod W′, the lower end of said rod being connected to a frame X′, which is reciprocated when the brushes are in their lowest position and the carriers are at rest.

Motion is imparted to the gears of the brushes through a vertically disposed shaft Y′, (Fig. 5), said shaft carrying a gear slidably mounted thereon but splined thereto, so as to maintain its relation with the gears of the spindles yet permit the plates O′, P′ to be elevated. The lower end of shaft Y′ carries a beveled gear Z′, which meshes with a corresponding gear A^2, mounted upon a shaft B^2. Shaft B^2, which may be termed the power-shaft, carries a worm C^2, which meshes with a worm-gear D^2, inclosed in a suitable casing E^2 and mounted upon a shaft F^2. Said shaft carries cams G^2, H^2, which co-act with the frames V′, X′, to raise and lower the same, said cams being set quartering so as to move rod W′ while the arm U′ is at rest, and vice versa. Shaft F^2 is provided with a crank or arm I^2 (Fig. 5), to which is pivotally connected a link or pitman J^2, the opposite end of which is pivotally connected to a pawl-carrier K^2. A pawl L^2, mounted upon pawl-carrier K^2, coacts with a ratchet-wheel or toothed-disk M^2, mounted upon the outer end of the main shaft H.

The parts are so proportioned and arranged that shaft H is given the necessary step-by-step movement when the brushes are in their elevated position and the hooks E′ are elevated and out of the path of travel of the crates carried by the wheels or carriers. The movements and timing of the parts are controlled by shaft B^2, from which they are all driven.

A series of pipes N^2 are arranged in the upper portion of each of the chambers or compartments, and a pump O^2 is provided for each series of pipes, so that water at the proper degree of temperature may be forced through said pipes and sprayed into the upper portion of each chamber or compartment, and upon the bottles supported by the carriers. The temperature of the water will vary in each compartment, according to the temperature required within said compartment.

Assuming, for instance, that it be desired to maintain a temperature at substantially 35° Reaumur in chamber 1, 40° R. in chamber 2, 55° R. in chamber 3, 50° R. in chamber 4, 40° R. in chamber 5, and 35° R., or less, in chamber 6,—the temperature of the supply of water to each series of pipes will be regulated accordingly. In practice it will be found desirable to introduce the water at a temperature slightly higher than that at which the water is maintained in the lower portion of each chamber or compartment. By thus introducing the water, the bottles are heated to a temperature approximately that of the water contained within the compartment or chamber.

In Fig. 3 the water level is shown as comparatively low, but it may be varied and raised to any height, provided it does not reach the opening in the partition or diaphragm E, which divides the tank into chambers or compartments.

By varying the length of the compartments, the length of time to which the bottles may be subjected to a given temperature may be determined. Taking chambers 1 and 2, for example, it will be seen that the bottles will remain in chamber 2 twice the length of time that they remain in chamber 1, and that they will remain in chamber 4 four times as long as they would in chamber 1. With the temperatures above noted, the bottles are first raised to a degree of heat slightly above that of the atmosphere; they are then subjected to a slightly higher temperature, and finally to the highest temperature within the apparatus, namely, that within the third chamber. They are then transferred to chamber 4, where they are subjected to a temperature of 50° R., in which they are supposed to remain for a period of, say, twenty minutes. From said chamber they are passed to chamber 5, where the temperature is considerably lower. At this point. in order to gradually reduce the temperature, the temperature of the spray to which the bottles are subjected may be slightly lower than that of the water in which they are submerged. In this manner the bottles will be gradually cooled. The temperature in the sixth chamber is of course substantially that which obtains at the point of introduction of the bottles, and in order that they may be cooled quickly, the double partition is employed between chambers 5 and 6, to prevent transmission of the heat from chamber 5 to the water within chamber 6, the water in chamber 6 thereby remaining unaffected.

In order to effect a quick cooling of the liquid in chamber 6, and to maintain it in said condition, the cooling pipe or coil Q^2 is employed, said pipe being located within the chamber as shown in Fig. 2, and ice water or other cooling medium being passed therethrough. As the bottles pass out of chamber 6 onto the fixed tracks or ways X, they are subjected to a water spray from pipes P^2, located above the tracks. Said spray, acting in conjunction with the brushes, serves to thoroughly clean the bottles and prepare them for the labels, which may be affixed directly thereto, without further washing or cleaning of the bottles.

It has heretofore been a matter of considerable expense to clean the bottles after leaving the pasteurizing apparatus. The pasteurizing fluid is frequently made foul by breakage of the bottles in transit, and as a consequence the bottles emerge from the machine in a dirty condition and unfit for application of the labels. With the present invention, the bottles are automatically cleaned as they leave the pasteurizer, rendering re-handling for this purpose unnecessary.

It is of course conceivable that any number of chambers or compartments may be used, and that the length of any chamber or compartment may be varied according to requirements.

No claim is made herein *per se* to the rack-advancing mechanism, nor is any claim made broadly to the tray-presenting mechanism which carries the trays upwardly into a position where they may be advanced into the tank, as said structures are claimed in Letters Patent No. 947,151, granted to me under date of January 18, 1910; nor is any claim made herein specifically to the particular construction of the frames V′ and X′ and the coacting cams, as they are also fully set forth and claimed in my application No. 254,861, filed April 10, 1905.

It will be readily appreciated by those skilled in the art that the present apparatus may be used to advantage as a bottle-soaking and washing machine, the different compartments forming separate washing and rinsing chambers through which the bottles will be successively passed to the external cleaning brushes.

Having thus described my invention, what I claim is:

1. In an apparatus of the character specified, the combination of a tank provided with a series of chambers or compartments; means for supporting a series of bottle-racks in each of said compartments; means for periodically advancing the racks from one compartment to the next; means for spraying water into the upper portion of the various compartments; means for externally heating those compartments in which the highest temperature is to be maintained; and means for cooling the liquid in the last compartment of the series.

2. In an apparatus of the character specified, the combination of a tank provided with a series of chambers or compartments; rotatable means mounted in each of said chambers, for supporting a series of bottle-holding racks therein, said means at their uppermost portions standing above the level of the water in the compartments; and means for spraying water at the desired temperature upon the bottles as they enter and emerge from the water.

3. In an apparatus of the character specified, the combination of a tank; a hollow wall dividing said tank into a plurality of chambers, the upper end of the wall being open; and a water supply-pipe opening into said hollow wall.

4. In an apparatus of the character specified, the combination of a tank; a partition extending upwardly in said tank, said partition being formed by two walls spaced apart, with the upper edge of one wall lower than that of the other; and a water supply-pipe opening into the space between the walls.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

OTTO EICK.

Witnesses:
HOWARD E. CRUSE,
HARRY R. MILLER.

Pa Oct, 1914

1,115,173

R. M. CAUFFMAN.
PASTEURIZING APPARATUS.
APPLICATION FILED FEB. 16, 1914.

1,115,173.

Patented Oct. 27, 1914.

Fig. 1.

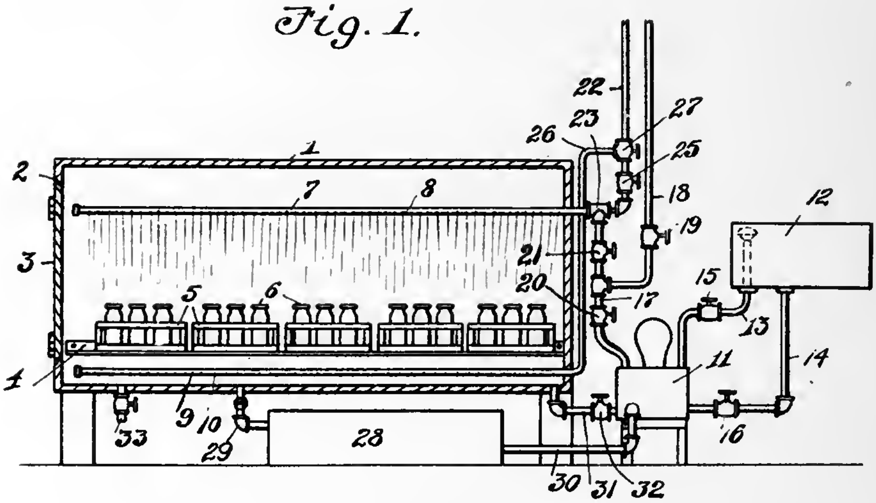
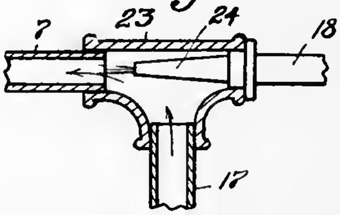


Fig. 2.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

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PASTEURIZING APPARATUS.

1,115,173. Specification of Letters Patent. Patented Oct. 27, 1914.

Application filed February 16, 1914. Serial No. 818,987.

To all whom it may concern:

Be it known that I, ROBERT M. CAUFFMAN, a citizen of the United States, residing at Three Rivers, in the county of St. Joseph and State of Michigan, have invented certain new and useful Improvements in Pasteurizing Apparatus, of which the following is a specification.

The invention relates to a pasteurizing apparatus designed particularly for the pasteurizing of milk, wherein the milk containing bottles are placed within the apparatus in considerable numbers and the contained fluid brought to the proper degree of heat.

The main object of the present invention is the provision of a pasteurizing device, wherein the pasteurizing agent is continually re-utilized, the construction contemplating its temporary storage in a manner to preserve to a considerable extent its heat or cold, as the case may be, whereby from such conservation a material saving in time and economy in operation may be gained.

The invention in the preferred form of details will be described in the following specification, reference being had particularly to the accompanying drawings, in which:—

Figure 1 is a view in section partly in elevation, illustrating the apparatus. Fig. 2 is an enlarged sectional view illustrating the medium for bringing the water to the proper degree of heat.

Referring particularly to the accompanying drawings, the improved pasteurizing apparatus includes a closed casing or tank 1 having an opening 2 at one end thereof adapted to be closed by a door 3. Brackets 4 are secured in spaced relation to each other and to the bottom of the tank on the opposite side walls thereof, whereby to support a plurality of racks 5 on which the milk bottles 6 are disposed in required numbers.

Arranged in and extending lengthwise of the tank is a pipe 7 formed in its lower side with a series of openings 8, the said pipe, hereinafter termed the spray pipe, being arranged at a distance above the bottles being treated. In the lower portion of the tank, below the positions of the bottle racks, is arranged a longitudinally extending pipe 9, formed with a series of openings 10, said pipe 9 being hereinafter termed the heating pipe.

Beyond the casing is arranged a pump 11 of any appropriate type, and in communication with said pump and supported on a plane above the same is a tank 12, hereinafter termed the hot water storage tank. The tank 12 is in communication with the pump through pipes 13 and 14 provided respectively with valves 15 and 16, the arrangement of the pipes with respect to the tank and to the pump providing for the circulation between the tank and pump when desired.

A water pipe 17 leads from the pump to the spray pipe 7, said pipe 17 being connected intermediate the pump and spray pipe with a cold water supply pipe 18 leading from any suitable source of water supply. The pipe 18 is provided with a control valve 19 and the water pipe 17 with control valves 20 and 21 arranged respectively between the pump and supply pipe 18 and between the latter and spray pipe 7. A steam supply pipe 22 leading from any suitable source opens into the coupling 23 at the juncture of the water pipe 17 and spray pipe 7 in the form of a jet nozzle 24, said steam supply pipe having a control valve 25 adjacent the nozzle. The steam supply pipe is also in communication beyond the nozzle and through the medium of the pipe 26 with the heating pipe 9, a valve 27 controlling this communication in a manner not to interfere with the direct communication between the steam supply and the spray pipe as controlled by the valve 25.

Arranged preferably below the main tank 1 is an auxiliary tank 28 hereinafter termed the cold water storage tank, this tank being in communication with the tank 1 through the bottom of the latter by means of the valve controlled pipe 29, the cold water storage tank being also in communication with the pump 11 through a pipe 30. The pump is also in direct open communication with the tank 1 through the medium of the pipe 31 having a valve 32 therein, and the tank is provided with a drain outlet 33 for obvious purposes.

In the use of the apparatus after a sufficient or desired number of bottles have been placed in the tank 1 in the manner described, the valve 19 is opened, as is also the valve 21 and water admitted through the spray pipe 7 to the interior of the tank, the spray thus produced being thrown on to and running down the sides of each bottle. After admitting the water valve 25 is opened and steam jetted into the spray pipe, with the effect to gradually heat the water and deliver it to the bottles in increasing degrees of heat. When sufficient water has accumulated in the bottom of the tank, sufficient for example to cover the heating pipe 9, the valve 19 is closed and the valve 20 is opened, the valves 27 and 32 being also opened. The steam is thus admitted to the heating pipes to raise the temperature of the water in the bottom of the tank and the pump, being started circulates this heated water in its gradually increasingly heated condition on to the bottles and through the tank. After the milk has been subjected to the proper degree of heat for the desired length of time, the valve 20 is closed and valve 15 opened, so that the water from the main tank is pumped into the heated water storage tank 12. After the heated water has been pumped from the tank 1, the valve 15 is closed and the pump stopped. Valves 19 and 21 are then opened and water admitted directly from the main source of supply to the tank to cool the bottle. As the water thus admitted passes through the spray pipe 7, it is obvious that owing to the heated condition of said pipe, the water will be initially heated and gradually cooled, thereby properly cooling the bottles without the liability of breaking them. After a sufficient quantity of water has been admitted to the main tank for circulating purposes, the supply is shut off by closing the valve 19, and the valves 21 and 32 being then open and the pump started, the cold water is circulated exactly as described in connection with the heated water until the proper cooling of the milk is had. The cold water after its use in the main tank is drawn into the cold water storage tank, from which after subsequent use, it is taken by the pump being maintained at the desired degree of low temperature in the cold water storage tank by any suitable means for cooling.

It is preferred that in the apparatus each bottle be supplied with a metal cap or other means of protecting the usual paper disk stopper, so as to prevent softening of the latter or any liability of contaminating the contents of the bottle.

By reason of the conservation of the heating and chilling mediums, there is a material saving in time owing to the less time required in bringing such mediums to their desired high and low temperatures, and by reason of such economy of time the apparatus is more effective as it permits practically a continuous pasteurizing action.

What is claimed is:

1. A pasteurizing apparatus including a tank, a spray pipe arranged in the upper portion thereof, means for circulating water taken from bottom of tank up through the spray pipe, a heating pipe in the lower portion of the tank adapted to be submerged by a head of water therein, and a steam supply in communication with the spray pipe and the heating pipe, whereby both the ingoing and outgoing water is heated during its circulatory movement.

2. A pasteurizing apparatus including a main tank, a hot water storage tank, a cold water storage tank, a pump, independent means of circulation between the pump and main tank, independent means of circulation between the pump and hot water storage tank, and a communication between the pump and main tank through the cold water storage tank.

3. A pasteurizing apparatus including a tank, a spray pipe arranged in the upper portion thereof, means for circulating water taken from the bottom of tank up through said spray pipe, a heating pipe in the lower portion of the tank adapted to be submerged by a head of water therein, and a steam supply having independently controlled communication with the spray and heating pipes, whereby either or both the ingoing and outgoing water may be heated during its circulatory movement.

4. A pasteurizing apparatus including a main tank, a spray pipe arranged in the upper portion thereof, a heating pipe arranged in the lower portion thereof, a pump, a pipe leading from the pump to the spray pipe, a second pipe leading from the pump to the main tank, a water supply pipe leading to the pipe between the pump and spray pipe, a steam pipe, a nozzle forming the terminal thereof, and opening into and in line with the spray pipe, and a pipe leading from the steam pipe to and in open communication with the heating pipe.

5. A pasteurizing apparatus including a main tank, rack supporting brackets arranged therein, a spray pipe extending longitudinally of the tank above the brackets, a heating pipe extending longitudinally of the tank below the brackets, a pump having circulatory communication with the tank through the spray pipe, means for delivering the fluid to the spray pipe, means for delivering a heating medium to the spray and heating pipe, a hot water storage tank having circulatory communication with the pump, and a cold water storage tank in series circulatory communication with the main tank and pump.

6. A pasteurizing apparatus comprising a main tank, a spray pipe arranged in the upper portion thereof, a heating pipe arranged in the lower portion thereof, a water supply pipe in communication with the spray pipe, a steam pipe in communication with the spray pipe, means for circulating the water from the bottom of tank up through said spray pipe, and a steam pipe in communication with said heating pipe, whereby the temperature of the circulating water may be progressively increased by the admission of steam both to the spray pipe and to the heating pipe.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT M. CAUFFMAN.

Witnesses:

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JAMES J. DOCK.

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PASTEURIZING APPARATUS FOR LIQUIDS IN BOTTLES.

APPLICATION FILED MAY 22, 1914.

1,115,248. Patented Oct. 27, 1914.

3 SHEETS—SHEET 1.

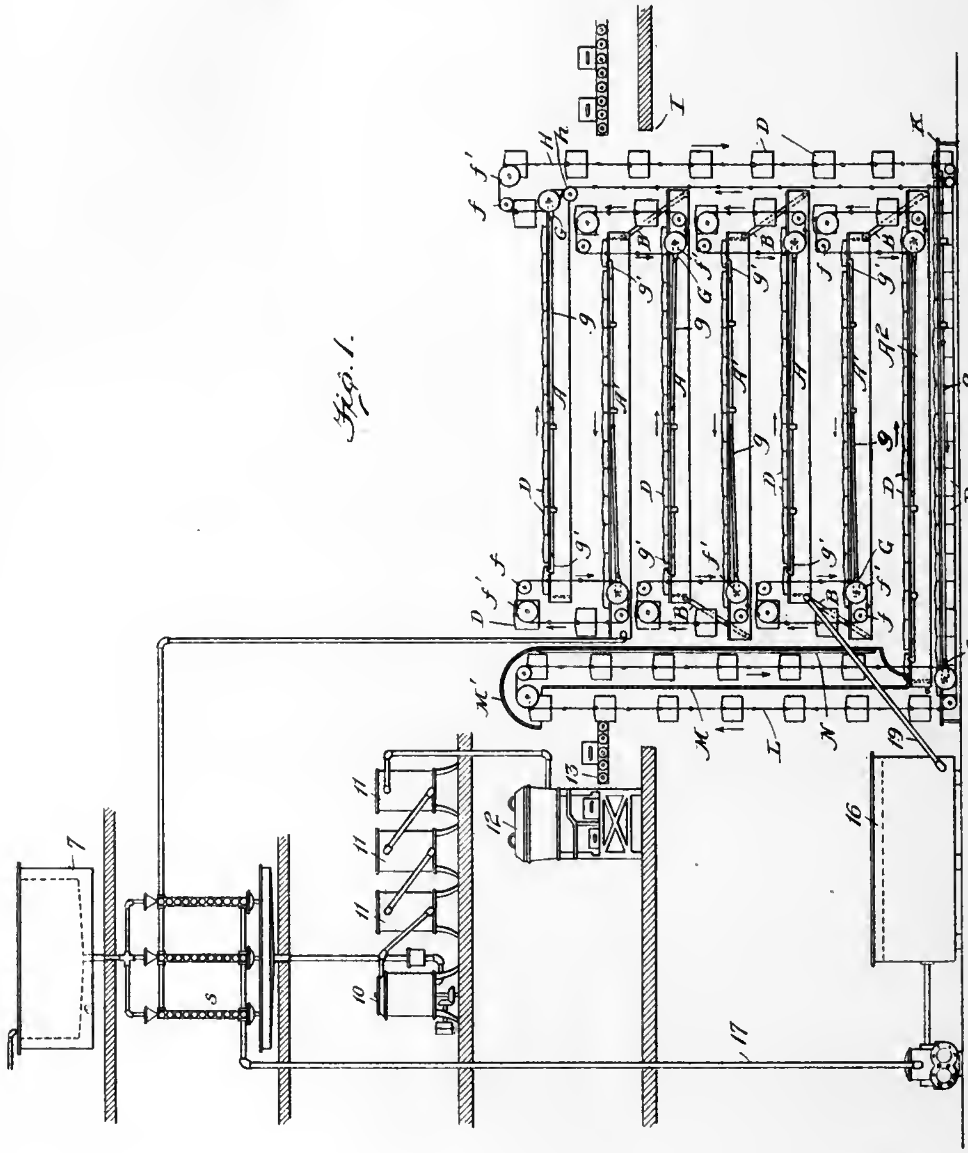

Fig. 1.

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PASTEURIZING APPARATUS FOR LIQUIDS IN BOTTLES.
APPLICATION FILED MAY 22, 1914.

1,115,248. Patented Oct. 27, 1914.
3 SHEETS—SHEET 2.

Fig. 2.

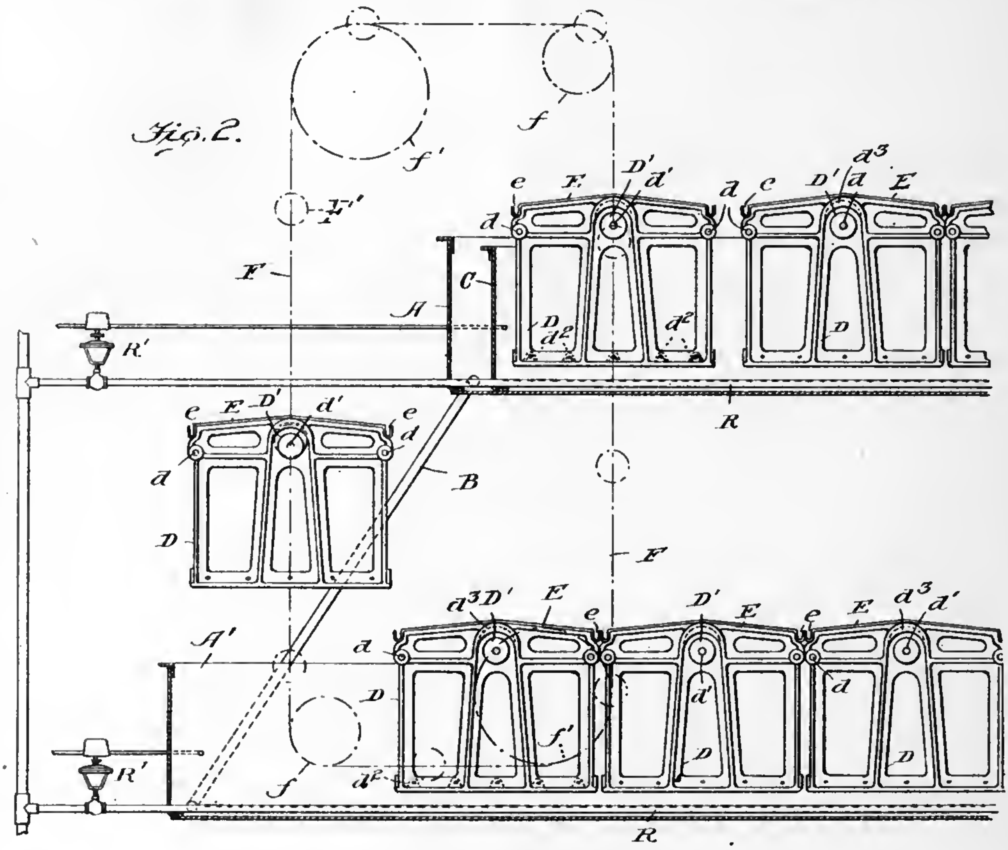
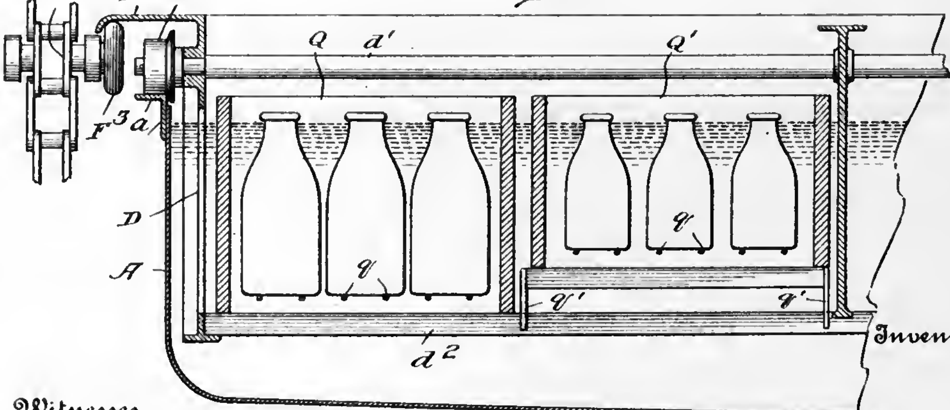


Fig. 4.



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PASTEURIZING APPARATUS FOR LIQUIDS IN BOTTLES.

APPLICATION FILED MAY 22, 1914.

1,115,248. Patented Oct. 27, 1914.

3 SHEETS—SHEET 3.

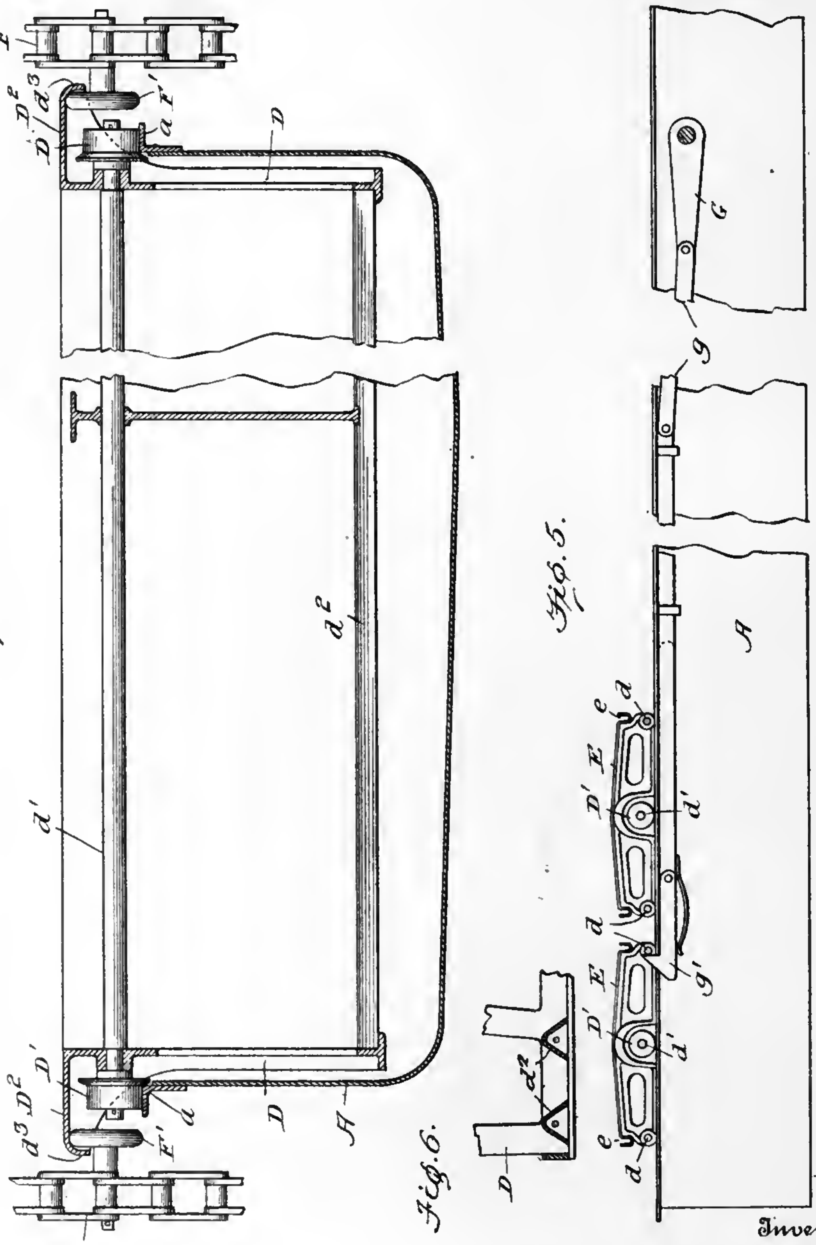

Fig. 3.

Fig. 5.

Fig. 6.

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PASTEURIZING APPARATUS FOR LIQUIDS IN BOTTLES.

1,115,248. Specification of Letters Patent. **Patented Oct. 27, 1914.**

Application filed May 22. 1914. Serial No. 840,260.

To all whom it may concern:

Be it known that I, OSCAR B. SCHIER, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Pasteurizing Apparatus for Liquids in Bottles; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, and to the fingers and letters of reference marked thereon.

The present invention relates to apparatus for pasteurizing beverages and food products, and particularly such products as are held in bottles or similar containers.

One object of the invention is to provide an apparatus of compact form and small dimensions having a very large capacity and requiring but a small volume of heated liquid for the pasteurizing operation.

A further object is to provide a pasteurizing apparatus with which bottled goods may be pasteurized without liability of recontamination and with which goods in bottles having closures of a destructible character, such, for example, as the ordinary fiber disks commonly used in milk bottles may be successfully pasteurized without destroying the efficiency of the closures, impairing their usefulness as closures, or subjecting their outer surface to the action of the pasteurizing liquid.

The invention consists in certain novel details of construction and combinations and arrangements of parts all as will be hereinafter described and pointed out particularly in the appended claims.

Referring to the accompanying drawings,—Figure 1 is an elevation of a more or less diagrammatic character of an apparatus embodying the present improvements; Fig. 2 is a detail sectional elevation on an enlarged scale through two of the pasteurizing tanks with the carrier frames in position therein. Fig. 3 is a detail partial section in a plane at right angles to Fig. 2, showing one side of the carrier frame and tank with a section of one of the conveyer chains. Fig. 4 is a section substantially corresponding to the section of Fig. 3, showing the arrangement adopted for holding bottles or containers of different size or height, and a modified arrangement of the conveyer link for coöperation with the carrier frames. Fig. 5 is an elevation showing the mechanism for advancing the carrying frames in the tanks from one end to the other. Fig. 6 is a detail view of a portion of one of the carrying frames showing the seats in cross section.

Like letters of reference in the several figures indicate the same parts.

The apparatus adopted for illustrating the present invention is one primarily designed for pasteurizing milk, although it will be understood that it is competent for use in pasteurizing any beverages or food stuffs held in containers of a water proof character. The entire operation or pasteurizing may be carried on with the apparatus illustrated by placing the cold milk in the raw state in the bottles hot or cold, and passing them through tanks filled with a pasteurizing liquid, preferably water of successive degrees of temperature, ranging from that of the temperature of the milk or bottles up to the highest temperature of pasteurization, approximately one hundred and forty-five degrees, and there held for sufficient time to complete the destruction of pathogenic or other bacteria, after which holding, the milk in the container is then cooled, but as hereafter described, the preferred system of operation, for sake of economy in time, space and cost, is one in which the milk is preliminarily heated in bulk. This preliminary heating is accomplished in a regenerative apparatus, into which the hot pasteurizing liquid is discharged from the pasteurizing apparatus and embodies a bank or series of pipes vertically superposed, and over the outside of which the cold raw milk flows, whereby the heat units of the pasteurizing liquid raise the temperature of the raw milk, and in exchange the pasteurizing liquid is by the raw milk cooled, so that the raw milk reaches a temperature approximating that temperature at which the pas- proximating the temperature at which the teurizing liquid enters the regenerative apparatus, and the pasteurizing liquid reaches a temperature approximating the temperature at which the raw milk enters the pasteurizing apparatus, at which time the pasteurizing liquid is then discharged from the regenerative apparatus back to the pasteurizing apparatus, entering at an appropriate point to begin again the cycle of pasteurization. By this continuous process the heat energy is materially conserved and the cooling cost of operation reduced. In the apparatus illustrated, the heated milk is placed in the bottles or containers by a suitable filling apparatus and the closures applied, the bottles having been placed in boxes for convenience in handling when they are ready for treatment in the apparatus.

Generally stated, the apparatus embodies a series of horizontally arranged tanks located one above the other, spaced apart only a sufficient distance to admit of the transfer of the carrying frames from one tank to the other and at the ends extending alternately beyond each other in opposite directions to permit of the convenient transfer of the carrying frames, there being a circulating system for conveying the pasteurizing liquid from one tank to another, and for maintaining the proper water level in all of the tanks. The carrying frames in which the boxes of bottles are placed are adapted to travel through the tanks on suitable tracks or ways, being advanced by feeding mechanism operating on the last carrying frame placed in the tank, thus dispensing entirely with the necessity of employing conveyers coöperating with each individual carrying frame, while in the tanks. Elevating conveyers are provided at the ends of the tanks for transferring the carrying frames from one tank to the other and from the top to the bottom of a series of tanks. the order of operation preferably employed being to place the carrying frames having the boxes of filled bottles in one end of the lowermost tank, push them forwardly successively to the opposite end of the lowermost tank, then transfer them successively to the next higher tank, and so on through the whole series of tanks, the upper tanks being maintained at a low temperature while the lower tanks are maintained at a high temperature, whereby the heating and cooling operations will be gradual, but as rapid as the character of the containers will permit. The milk is subjected to a pasteurizing temperature for a period long enough to insure the destruction of pathogenic or other bacteria which can be destroyed by a single heating operation.

The series of tanks hereinbefore referred to are indicated in Figs. 1 and 2 of the accompanying drawings by the letters A, A′, A². The lowermost tank A² is of greater length than tanks A and A′ and the tanks A and A′ are positioned to extend alternately beyond each other at opposite ends. All of the tanks are preferably formed of sheet metal of suitable gage and at their upper edges they are reinforced by angle irons *a*, adapted to form tracks or ways extending longitudinally of the tanks throughout their entire length. The circulation of water through the tanks and from one takn to the other is preferably accomplished by connecting pipes B which at their lower ends communicate directly with one end of the tank and at their upper ends communicate with compartments in the end of the tank formed by partitions C and the end wall of the tank. the upper edges of which are at the proper height to maintain the water level in the tanks at a proper height to submerge the receptacles or containers to within a fraction of an inch below the mouth of the containers, and so as not to cause their complete submergence, as will hereinafter appear. The pipes B through which the water is circulated downwardly through the series of tanks connect the tanks at opposite ends alternately; thus the water is caused to flow through each tank in succession from one end to the other.

The carrying frames in which the boxes or bottles are placed are formed by end frames D connected by cross rods *d*, *d′* at the top and at the bottom by slats d^2 of invered V-shape with the sides at an angle of about 90°. The carriers thus formed are of generally rectangular shape and will fit within the tanks with a fair degree of accuracy, being supported therein by rollers D′ at each end, preferably journaled on the center cross rod *d′* and adapted to travel on the ways formed by the angle iron edges of the tanks. The top edges of the end frames D are inclined, preferably in both directions from the center and stationary, removable or movable covers E are provided therefor, which will overlie and protect all of the bottles held in the frame from any drippings or liquid which may fall from carriers above, and the covers are preferably provided with edge gutters *e* for conducting any liquid which may fall on the covers off to one end of the carrying frames, where it can flow into the tank with the least possible liability of being splashed into the mouths of the bottles within the frame.

At each end the carrying frames are provided with projecting ears D², such ears being extended laterally beyond the carrying rollers D′ and beyond the tracks formed by the angle iron edges of the tank. These ears or brackets D² form handles by which the carrying frames are lifted and transported by the conveyers to be presently described.

The construction of carrying frames described will permit of the frames being positioned close together in the tanks whereby they will occupy the minimum longitudinal space and at the same time they may be advanced by pressure applied to the end of a line of carrying frames held in the tank and any one of them may be withdrawn upwardly without catching or interfering with the adjacent frames or sides of the tank, inasmuch as there are no projections which will interfere with each other.

For lifting the carrier frames from one tank to another and depositing them in position for traveling in the tanks, conveyers are provided which are conveniently in the form of sprocket chains F, arranged on each side of each end of the tanks, and adapted to travel over and be guided by guiding sheaves and sprocket wheels f and f', whereby each vertical reach of the chains will extend from a lower to a higher tank, the upwardly moving reach passing from the projecting end of the lower tank to a point above the upper tank, thence horizontally over the end of the upper tank and thence downwardly. At suitable intervals on the sprocket chains and projecting inwardly or toward the opposite chain of the pair constituting each conveyer, are a series of projections F′ adapted to engage the lugs or brackets D^2 on the carrier frames. The projections F′ may conveniently take the form of knobs or knob-shaped rollers, as shown in Fig. 3, which will seat in the under side of the brackets D^2 and be retained therein by the downwardly extending lips d^3 of the brackets, so that the carrier frames will be suspended from the projections during their transference from one tank to the other, and the projections will automatically move downwardly out of engagement with the said brackets when the carrying frame has been deposited in the upper tank.

It will be understood that there is one of the conveyers such as just described, extending from one end of each lower tank to the corresponding end of the next higher tank, the arrangement of conveyers being at opposite ends of the succeeding tanks, whereby carrying frames deposited in one end of the tank, must be pushed along to the opposite end before they are in position for coöperation with the elevating conveyer for carrying them to the next higher tank. The carrying frames are thus caused to follow a path back and forth across the apparatus as they progress upwardly.

Motion may be imparted to the several conveyers by any suitable driving mechanism, not shown, and this driving mechanism may be intermittent in its action or continuous, in which latter case the projections F′ are spaced apart a proper distance to permit the carrying frames to reach the proper positions for coöperation therewith on the elevating side before a projection F′ arrives at the point where it will engage the brackets on the ends of the carrying frames. In order that the timing may be easily and properly coördinated, the carrying frames are progressed through the tanks with an intermittent movement preferably through a driving mechanism operated by one of the sprocket wheels f' which is in mesh with the elevating conveyer.

A convenient arrangement of mechanism for moving the carrying frames through the tanks is shown in Fig. 5 and consists of a crank G connected with the sprocket wheel f' and adapted to operate a pull rod g extending to the opposite end of the tank and provided with a spring-pressed dog g' which will automatically engage successive carrying frames and draw the same forwardly, thereby advancing the whole line of carrying frames located in the tank. Conveniently, the dog g' will coöperate with projections on the ends of the carrying frames, such, for example, as the projecting ends of the cross rods d.

The complete and orderly handling of the carrying frames mechanically or with the least possible manual labor requires that means be provided whereby they may all be brought back to a given starting point where the boxes of filled and capped bottles to be pasteurized are placed therein, and while, under some circumstance, it may be more convenient to remove the boxes of bottles from the carrying frames at another point, still, with the apparatus illustrated, the removal of the boxes containing the bottles of pasteurized milk and the insertion of new boxes of bottles to be pasteurized may be conveniently performed at one point, and to accomplish either or both of the results stated, it is preferred to arrange long vertically extending conveyers at opposite ends of the pasteurizing apparatus, one of said conveyers,—that indicated by the reference letter H,—at its upper end being deflected over guiding sheaves h, so as to coöperate with and lift the carrying frames from the end of the uppermost tank and then convey them downwardly through a suitable doorway or opening in the floor or platform I (where the boxes could be removed if desired) to a point below the series of tanks where they are received on a track K along which they travel to the receiving end of the apparatus where they move into position for being lifted by a conveyer L which takes them up past the slide-way where the new boxes of bottles are placed in position therein, and thence over and down into the end of the lowermost tank A^2.

As hereinbefore stated, in the practical operation of the apparatus, it is preferred that the milk shall be preliminarily heated in bulk, and in order to avoid any cooling during the time the milk is being transferred from the filling and capping station to the lowermost tank, and if desired to supply additional heat to the bottles, the carrying frames held by the conveyer L are adapted to pass into a hot air chamber M in the form of a stack with walls of heat insulating material, said stack having a curved cover or hood M' and terminating at the lower end at a point immediately over the end of the lower tank A^2. The carrying frames are conducted up into the hood M', and thence down through the chamber M whereby their heat is conserved, and if desired additional heat is supplied by raising the temperature of the chamber, and for this purpose heating pipes N may be arranged therein in any ordinary way.

The temperature of the pasteurizing liquid in the several tanks is maintained by any suitable heating apparatus, such, for example, as steam or heating coils, arranged in or closely around the tanks, or steam pipes R arranged to discharge into the tanks, such heating apparatus for the several tanks is independently controllable as by ordinary controlling devices R', whereby certain of the tanks may be kept hot and others at successively lower temperatures, it being the design of the particular apparatus illustrated to have the lowermost tank A^2 heated to the highest degree, that is to say, it should be heated to approximately 145° F., while the temperature of the topmost tank is about 40°, the temperature of the intermediate tanks preferably being graduated up to the highest temperature. If desired more than one of the lower tanks may be kept at the highest temperature, in order to provide an adequate holding of the milk at the destructive temperature.

The arrangement of the tanks is such that a continuous procession of closely arranged carrying frames will be passing through the apparatus at all times, there being no opportunity for lost space, except at the points where the conveyers transfer the carrying frames from one tank to another. This result would be impossible of attainment, were the carrying frames conveyed through the tanks by the same conveyers which transfer them from one level to another, inasmuch as the minimum spacing would have to be the spacing required during the transfer stages, and the transfer can only be effected when the carrying frames are spaced a considerable distance apart, inasmuch as the direction of movement must be changed and space allowed to prevent interference.

From Fig. 3 it will be seen that the knob-like projection F' which coöperates with the bracket D^2 is mounted on one of the pintles forming the joint between adjacent links of the conveyer, but it is obvious that this specific construction may be varied, and in Fig. 4 a construction is shown in which the projection F^3 is mounted on an arm projecting from an intermediate point on one of the links F^4. Obviously, either arrangement may be employed and other arrangements will suggest themselves to those skilled in the art.

From Fig. 4 it will also be noted that the boxes Q and Q' for the bottles are of different depths. The boxes Q are of full depth and adapted for the reception of large sized bottles, while the box Q' is of less depth and adapted for the reception of smaller sized bottles. Both boxes are supported on the inverted V-shaped cross slats d^2 of the carrying frames and are preferably bottomless, but provided with cross pieces of rods q on which the bottles rest, thereby giving free access to the pasteurizing liquid or water contained in the tanks for controlling the temperature of the contents of the bottles.

Where boxes of different heights, as shown in Q and Q', are passing through the tanks at the same time, it is, of course, necessary that the box of shallower depth, Q', should have supporting legs or slats q' for preserving the proper height of the bottle within the tanks, for it is desired in this apparatus to advance the bottles through the tanks with their upper ends or mouths just above the water level and in such position that no water can reach the disks used for closing the bottles.

By providing the boxes with open bottoms the pasteurizing liquids will have access to the bottles therein contained, and by providing the inverted V shaped slats d^2 in the carrying frames a slight upward motion will be given to the pasteurizing liquid surrounding the bottles while the carrying frames are being advanced through the tanks. This motion, however, will not be sufficient to create waves or eddies, which would cause the pasteurizing liquid to rise or splash over the mouths of the bottles and wet the disks forming the closures thereof, resulting in a recontamination of the milk or other liquid being pasteurized.

The tanks which are maintained at the uniform highest temperature, for example, the two lower tanks, do not require an active circulation of water such as is desirable with the upper tanks where the temperature of the milk is being reduced, and hence the water may be drawn from one of the first temperature-reducing tanks through a pipe 19 to an overflow tank 16. From tank 16 the hot water is pumped through pipe 17 to the regenerator coils s from which it passes after being cooled as aforedescribed to one of the upper tanks A'. The top tank is preferably artificially cooled to bring the milk down to the temperature at which it may be most successfully preserved.

For preliminarily heating the milk in bulk it is preferably discharged from the storage tank 7 over the regenerator coils s passing thence to an apparatus 10 by means of which an even temperature is maintained for all the milk. From the apparatus 10 it passes into pre-holders 11; thence to the filling machine 12, where the hot bottles in the boxes are filled with hot milk and transferred over the slide-way 13, to the conveyer L by which they are carried to the lower tank A^2, all as heretofore described.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is,—

1. In a pasteurizing apparatus, the combination with a series of superposed pasteurizing tanks, of a series of independent carrying frames for the goods to be pasteurized, coöperating ways and supporting rollers on the carrying tanks and frames, respectively, transfer mechanism for transferring the carrying frames from one tank to another tank at a different level, separable coöperating devices on the transfer mechanism and carrying frames, whereby the carrying frames are detached from the transfer mechanism when deposited in a tank, and means for advancing the carrying frames through the tanks in immediate proximity to each other, substantially as described.

2. In a pasteurizing apparatus, the combination with a series of superposed pasteurizing tanks, each having ways extending longitudinally thereof, a series of independent carrying frames for the goods to be pasteurized having supports thereon coöperating with said ways, and means for advancing the carrying frames longitudinally of the tanks in close proximity to each other and with an intermittent movement, of transfer mechanism for transferring the carrying frames from one tank to another at a different level, and spaced engaging members on the transfer mechanism, whereby, during the transfer stage the carrying frames will be spaced from each other, substantially as described.

3. In a pasteurizing apparatus, the combination with a series of superposed pasteurizing tanks arranged to extend alternately beyond each other at opposite ends, carrying frames for the goods to be pasteurized and means for guiding said carrying frames longitudinally of the tanks, of means for transferring the carrying frames from one tank to another at a different level, said transfer mechanism operating vertically with relation to the projecting ends of the tanks, and means for advancing the carrying frames longitudinally of the tanks with an intermittent movement.

4. In a pasteurizing apparatus, the combination with a series of superposed pasteurizing tanks arranged with their ends projecting alternately in opposite directions, and a series of carrying frames for the goods to be pasteurized, of means for guiding the carrying frames longitudinally of the tanks and for advancing the carrying frames while in the tanks, and transfer mechanism embodying conveyers movable vertically from the projecting ends of the tanks up and over the end of the next higher tank, whereby carrying frames lifted from the end of one tank may be deposited in the end of the next adjacent tank at a different level.

5. In a pasteurizing apparatus, the combination with a series of superposed pasteurizing tanks having ways extending longitudinally thereof, a series of independent carrying frames for the goods to be pasteurized having supports traveling on said ways, means for advancing the carrying frames longitudinally of the tanks, and means for transferring the carrying frames from each tank to the next succeeding tank at a different level, of conveyers extending vertically at the ends of the series of tanks and adapted to transfer the carrying frames to and from the bottom and top tanks of the series, to and from the points where the goods are deposited and removed from the carrying frame.

6. In a pasteurizing apparatus, the combination with a series of superposed pasteurizing tanks having longitudinal ways at their upper edges, a series of carrying frames having supporting rollers traveling on said ways, means for advancing the carrying frames through the tanks, and means for transferring the carrying frames from one tank to another at different levels, of a liquid circulating system embodying pipes leading from the lower tanks to the next succeeding tank at a higher level, and a diaphragm forming a chamber in the end of each tank with which the circulating pipe communicates. the upper edges of each diaphragm forming the edge over which the discharge from the tank takes place, whereby the water level in the tanks may be maintained at a uniform height.

7. In a pasteurizing apparatus, the combination with a series of superposed pasteurizing tanks, a series of carrying frames for the goods to be pasteurized, means for transferring the carrying frames from one tank to another at a different level and means for advancing the frames longitudinally of the tanks, of a vertically arranged conveyer at one end of the series of tanks for transferring the carrying frames from the filling point to the first tank of the series, and a heat chamber through which said vertically arranged conveyer passes to the first tank of the series.

8. In a pasteurizing apparatus, the combination with a series of superposed pasteurizing tanks, a series of carrying frames for the goods to be pasteurized, guides extending longitudinally of the tanks, rollers on the carrying frames coöperating with said guides to support the carrying frames while being advanced from one end of the tanks to the other, conveyers arranged at opposite ends of adjacent tanks for trans-

ferring the carrying frames from one tank to the next tank of the series at a different level, said conveyers embodying sprocket chains having spaced projections thereon and coöperating brackets on the carrying frames with which said projections engage for lifting the carrying frames out of one tank and depositing said frames in the next succeeding tank.

9. In a pasteurizing apparatus, the combination with a pasteurizing tank, of a series of carrying frames for the goods to be pasteurized, each embodying end frames having brackets projecting therefrom and transfer mechanism embodying vertically arranged sprocket chains having oppositely extending projections for coöperation with the brackets projecting at the ends of the frames.

10. In a pasteurizing apparatus, the combination with a series of superposed pasteurizing tanks, means for advancing carrying frames longitudinally of said tanks, and means for transferring carrying frames from one tank to another at a different level, of carrying frames for the goods to be pasteurized, and covers extending over each of said carrying frames for protecting the goods contained therein from the drippings from tanks and frames above the same.

11. In a pasteurizing apparatus, the combination with a series of superposed pasteurizing tanks, means for advancing the carrying frames longitudinally of said tanks, and conveyers for transferring said carrying frames from a tank at one level to a tank at a different level, of carrying frames for the goods to be pasteurized, and covers for said carrying frames having edge gutters for conducting drippings laterally for discharge into the tanks.

12. In a pasteurizing apparatus, the combination with a pasteurizing tank and carrying frames for the bottles to be pasteurized, of boxes in which the bottles are mounted, having open tops, closed sides, and openings at the bottom with inclined slats for directing an upward current into the boxes to thereby effect a circulation of the liquid around the bottles.

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C. KRUG.
PROCESS FOR PASTEURIZING LIQUIDS.
APPLICATION FILED DEC. 12, 1913.

1,119,520. Patented Dec. 1, 1914.

Fig:1.

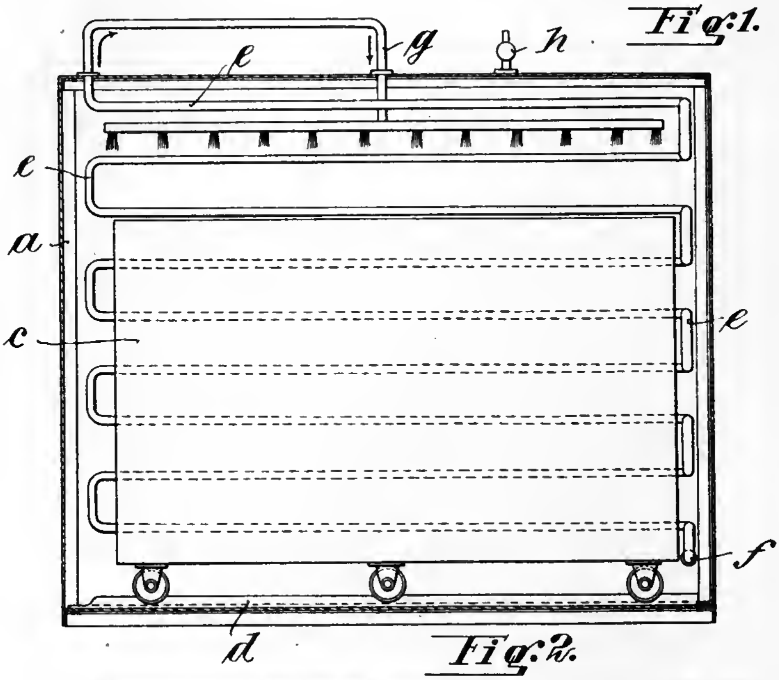


Fig:2.

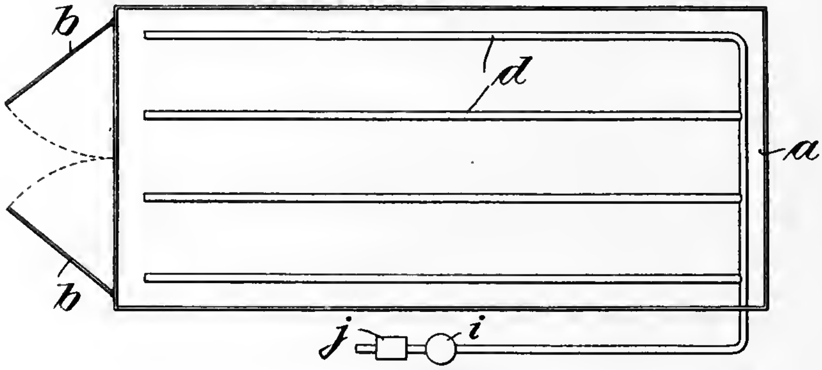
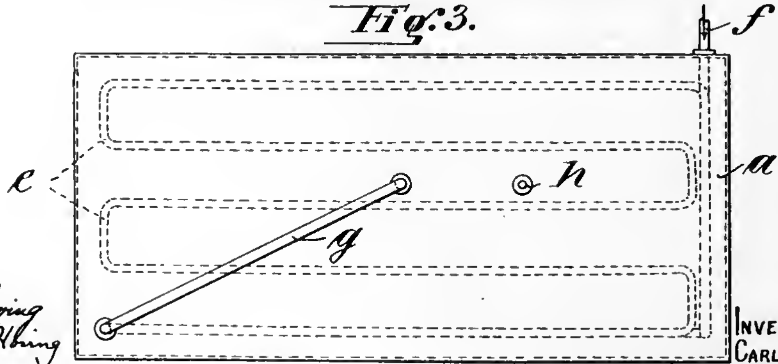


Fig:3.



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HIS ATTORNEY

UNITED STATES PATENT OFFICE.

CARL KRUG, OF FRANKFORT-ON-THE-MAIN, GERMANY.

PROCESS FOR PASTEURIZING LIQUIDS.

1,119,520. Specification of Letters Patent. **Patented Dec. 1, 1914.**

Application filed December 12, 1913. Serial No. 806,208.

To all whom it may concern:

Be it known that I, CARL KRUG, a citizen of the German Empire, and residing at Frankfort-on-the-Main, Germany, have invented a certain new and useful Improved Process for Pasteurizing Liquids, of which the following is a specification.

This invention relates to processes for pasteurizing liquids in bottles located in a closed, steam-heated chamber, compressed air being used as a counter-pressure medium.

When pasteurizing liquids in bottles it is well known to expose the latter in a box-like casing to the action of steam obtained from piping in the box. Further, in order to obviate fracture of the bottles in consequence of the pressure above atmospheric which is produced in them it is well-known to employ compressed air as a counter-pressure medium and to mix the hot steam with the compressed air. The process according to my invention differs from this known process in that the compressed air is supplied both when heating and when cooling the bottles through a system of piping suitably arranged in the pasteurizing chamber and issues therefrom into the upper part of the pasteurizing chamber, whereby the compressed air is preheated during the heating of the pasteurizing chamber by the steam and, after the pasteurization, *i. e.* after the steam has been shut off and the closure member of the pasteurizing chamber has been opened, ejects the hot mixture of steam and air out of the pasteurizing chamber and gradually cools the bottles.

The advantages to be obtained by the invention are, firstly, a smaller consumption of operating agents, because the heat of the steam is more completely utilized and the compressed air is gradually heated inside the pasteurizing chamber by the heat of the steam itself. Secondly, the process can be rapidly carried out and therefore the pasteurizing apparatus can be efficiently used, because the temperature in the apparatus can be raised relatively rapidly to the desired degree by supplying the requisite amount of steam and in such manner that the temperature in the entire casing acts uniformly on the bottles; on the other hand, the process can be accelerated by cooling the bottles systematically without the same being endangered. Thirdly, the invention very greatly reduces the number of bottles which are broken, as compared with known processes, both in consequence of the uniform pasteurizing temperature which is guaranteed by the compressed air supplied from the top and, in addition owing to the gradual cooling due to the compressed air which itself cools gradually.

One form of apparatus adapted for carrying my process into practice is diagrammatically represented by way of example in the accompanying drawing, wherein:—

Figure 1 is a longitudinal section, Fig. 2 a top plan view of the bottom, and Fig. 3 a top plan view of the top of the pasteurizing apparatus.

The pasteurizing apparatus comprises a known box-like casing *a* having at its front end a tightly closing door or doors *b* for inserting and removing a wagon or truck *c* carrying the bottles. The interior of the box *a* is heated by steam supplied by means of a system of pipes *d* on the bottom of the box. The feed pipe leading to these pipes is provided outside the box with a stop cock *i* to be operated by hand and a regulator *j* in the form of a known thermostat which operates at a predetermined temperature, *e. g.* at 70–75° C. and automatically closes a second stop cock or closure member. The outlets for steam in the piping *d* are preferably directed toward the bottom of the box, so that this is heated first. A second system of piping *e* is provided inside the box. preferably at the two sides, at the rear end wall and at the top; the inlet end *f* of this system is connected to a compressed-air vessel fed by an air compressor. Cold compressed air is supplied by the air-vessel through the piping *e* in which it is heated to the temperature of the steam (70–75° C.). The heated compressed air is forced into the pasteurizing chamber at the top of the box; the air may flow in either through a pipe *g* leading into the top of the box, or through the top turn of the pipe which will be provided with suitable outlets. A safety valve may be provided in known manner on the pasteurizing box. In the top of the box *a* is a blow-off cock *h* which is opened when the pressure above atmospheric in the box is to be let off after the termination of the pasteurization.

The apparatus is used as follows:—Steam is first allowed to pass through the piping *d* in known manner into the pasteurizing chamber. The latter is gradually heated to about 70–75° C., while the temperature of the contents of the bottles does not at once attain this height and therefore there is no dangerous excess pressure in the bottles. While the temperature of the contents of the bottles gradually rises to the temperature of the pasteurizing chamber, however, and the pressure in the bottles also rises, the admission valve of the pipe *f* is opened and steam is shut off from the pipe *d*. The compressed air flows into the piping *e*, becomes heated therein and is then supplied from above into the pasteurizing chamber. After pasteurization has taken place the cock *h* on the cover of the box is opened. The fresh compressed air which is now continuously supplied to the piping *e* drives the hot mixture of steam and compressed air out of the pasteurizing chamber into the open; in consequence of the fall of temperature occasioned hereby in the pasteurizing chamber the compressed air is also gradually cooled as it enters the latter, so that the bottles are systematically gradually cooled. The bottles are finally cooled after removing the same into the open air.

I claim:—

1. A process of pasteurizing liquids in bottles in a closed chamber, consisting in heating the chamber by supplying steam into the same, in shutting off the supply of steam, in supplying compressed air through and into the top of the chamber while the liquid in the bottles is being heated by the steam in the chamber, and in then opening an outlet of the chamber, whereby the compressed air is preheated while the chamber is being heated by the steam, subsequently ejecting the hot mixture of steam and air out of the chamber and gradually cooling the bottles.

2. A process of pasteurizing liquids in bottles in an inclosed space, said process consisting in heating said inclosed space by indirect contact and by injecting steam into and toward the bottom of the inclosed space; continuing said heating and injection until the temperature in the space registers from 70 to 75° C.; passing compressed air back and forth at the sides, end and top of said space in indirect contact with the steam whereby the compressed air is heated to approximately the temperature of the steam; injecting the heated compressed air downwardly into the upper part of said space, whereby the pressure of the steam and air therein is raised while the pressure in the bottles is being raised by the heat therein; and establishing communication between said space and the outside air whereby the injected compressed air gradually displaces the heated steam and air mixture with cooler air.

3. A process of pasteurizing liquids in bottles in an inclosed space, said process consisting in injecting steam in the lower part of said space until the temperature therein is about 70 to 75° C.; passing compressed air in indirect contact with the steam in the space and injecting the compresssed air downwardly into the space thereby raising the pressure therein; and establishing communication between said space and the outside air whereby the said compressed air gradually displaces the steam and gas mixture in the space.

4. A process of pasteurizing liquids in bottles in an inclosed space, said process consisting in injecting steam in said space until the temperature therein is raised; passing compressed air in indirect contact with the steam in the space whereby the air is heated; injecting the heated compressed air into the space; and finally displacing the steam and air mixture with the compressed air.

In testimony whereof, I affix my signature in the presence of two witnesses.

CARL KRUG.

Witnesses:
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JEAN GRUND.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

17 Feb. 1915

1,127,634

J. KERBER.

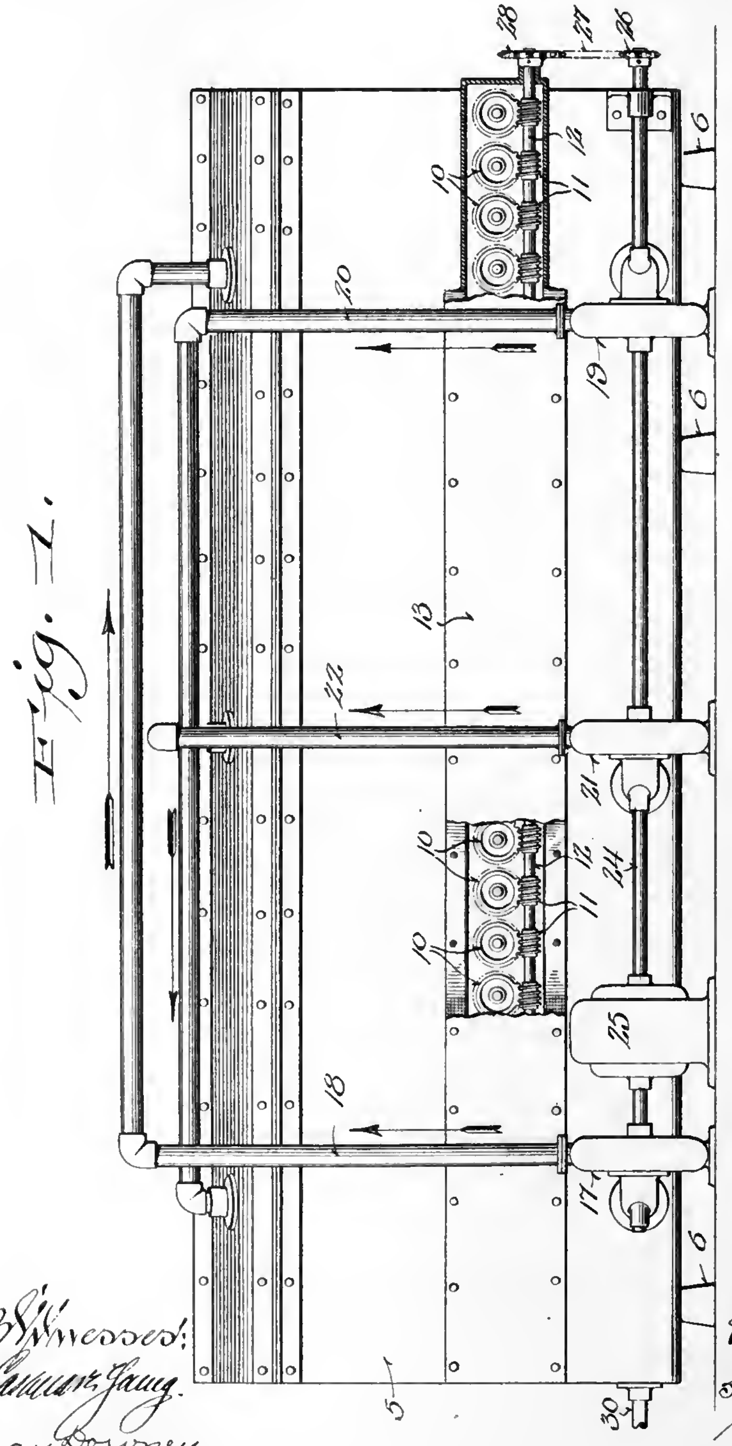
PASTEURIZER.

APPLICATION FILED AUG. 4, 1913.

1,127,634.

Patented Feb. 9, 1915.

3 SHEETS—SHEET 1.



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THE NORRIS PETERS CO. PHOTO-LITHO., WASHINGTON, D. C.

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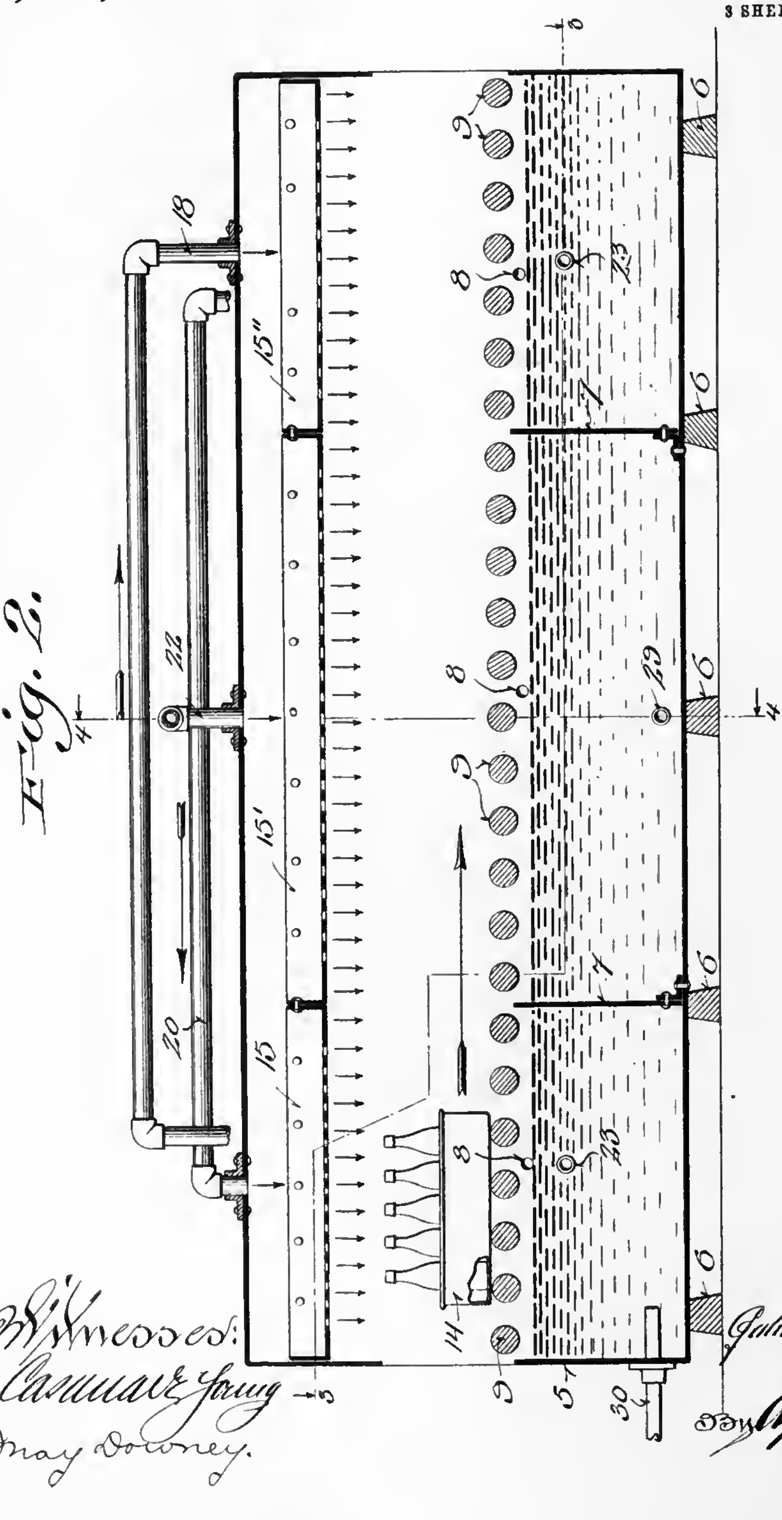
PASTEURIZER.

APPLICATION FILED AUG. 4, 1913.

1,127,634.

Patented Feb. 9, 1915.

3 SHEETS—SHEET 2.



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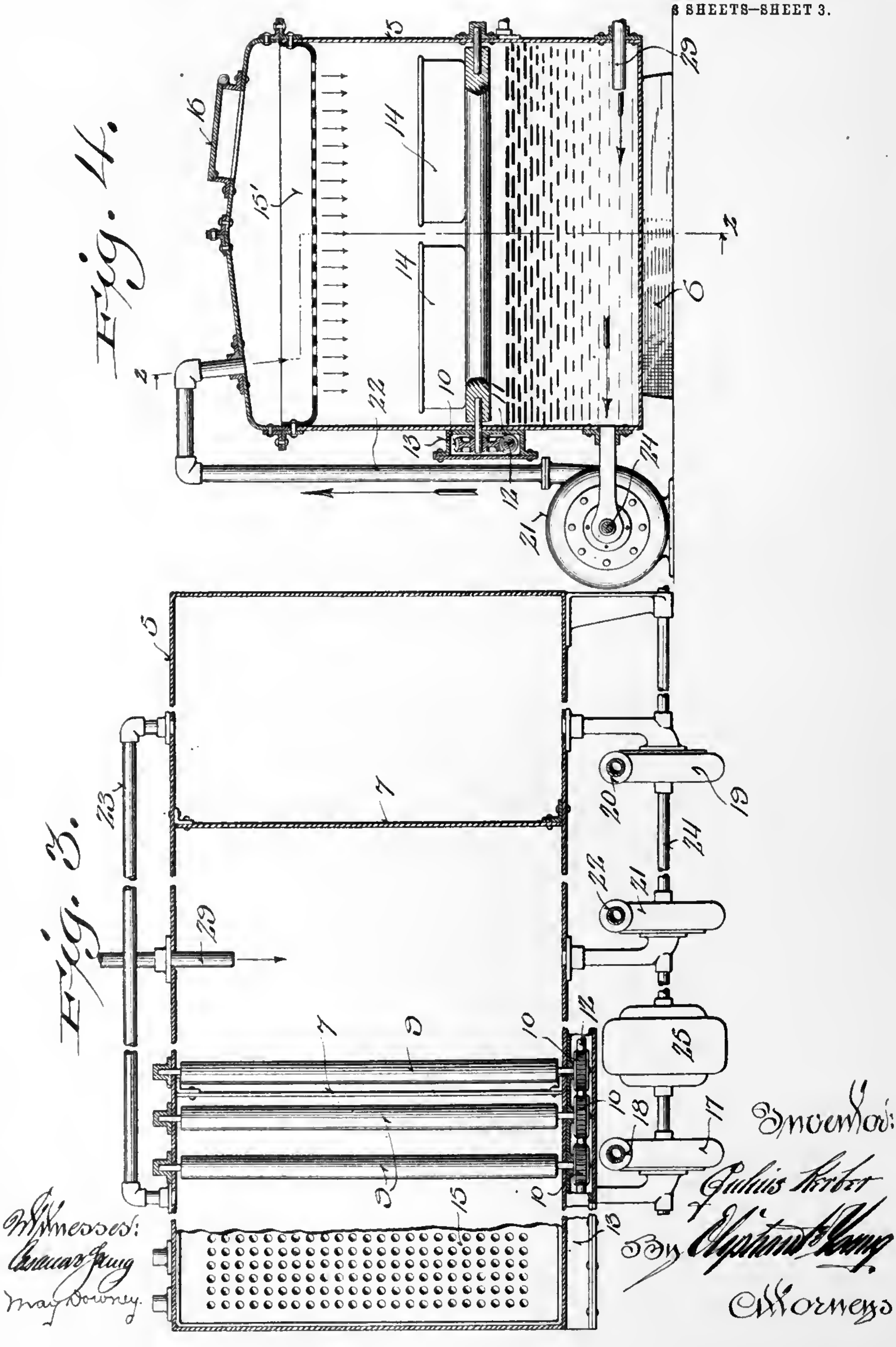
PASTEURIZER.

APPLICATION FILED AUG. 4, 1913.

1,127,634. Patented Feb. 9, 1915.

3 SHEETS—SHEET 3.



UNITED STATES PATENT OFFICE.

JULIUS KERBER, OF WEST BEND, WISCONSIN.

PASTEURIZER.

1,127,634. Specification of Letters Patent. **Patented Feb. 9, 1915.**

Application filed August 4, 1913. Serial No. 782,853.

To all whom it may concern:

Be it known that I, JULIUS KERBER, a citizen of the United States, and resident of West Bend, in the county of Washington and State of Wisconsin, have invented certain new and useful Improvements in Pasteurizers; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention consists in what is herein particularly set forth with reference to the accompanying drawings and pointed out in the claim of this specification, its object being to provide simple, economical and efficient pasteurizing apparatus especially designed for the treatment of bottled beer and having the advantages subsequently specified.

Figure 1 of the drawings represents a side elevation of a pasteurizing apparatus in accordance with my invention partly broken away; Fig. 2, a vertical section of the same longitudinally thereof, the section being indicated by line 2—2 in Fig. 4; Fig. 3, a plan view of said apparatus contracted and partly in horizontal section indicated by line 3—3 in Fig. 2, and Fig. 4, a cross-section of the same indicated by line 4—4 in Fig. 2.

Referring by numerals to the drawings, 5 indicates a rectangular covered tank resting on sills 6, and rising from the bottom of the tank to a predetermined height are transverse partitions 7 by which said tank is divided into three water compartments, each having an overflow outlet 8. Journaled in side bearings of the tank above the water level of its compartments are a series of parallel transverse preferably wooden rollers 9 at suitable intervals apart, and fast on one journal of each roller, outside of said tank is a worm-wheel 10 in mesh with one of a series of worms 11 on a driven shaft 12 for which the ends of a gear-casing 13 is provided with bearings, said rollers constituting a conveyer for steaming trays 14 in which the bottle goods to be pasteurized are carried, the bottom of the trays being perforated. The loaded trays are fed to the conveyer through an opening in one end of the tank and discharged through an opening in the opposite end of said tank, as indicated in Fig. 2, and, as indicated in Fig. 4, the width of the apparatus is such that two parallel series of said trays may be operated upon at the same time, or said apparatus may be indefinitely widened to increase its capacity.

Supported in the tank, above the end openings therein for the loaded trays, are pans 15, 15′, 15″ having perforated bottoms and corresponding in number to the aforesaid water compartments with which they register, and in Fig. 4, the tank-cover is shown provided with a manhole having a closure 16.

Reading from the left of Fig. 1, a centrifugal pump 17 in connection with the first water compartment of the tank discharges through a pipe 18 into the pan 15″, and a similar pump 19 in connection with the third water compartment of said tank discharges through a pipe 20 into the pan 15. Another centrifugal pump 21 in connection with the middle compartment of the tank discharges through a pipe 22 into the middle pan 15′ and a horizontal pipe 23 connects the first and third water compartments of said tank.

A single shaft 24 is shown common to all the pumps, said shaft being preferably that of an electric-motor 25. A sprocket-wheel 26 is shown fast on the shaft 24 and connected by a link-belt 27 with a similar wheel 28 fast on the worm-shaft.

A steam-discharge pipe 29 is shown extending into the middle water-compartment of the tank to thus provide for heating of the contents of said compartment, and a similar pipe 30 is shown leading into the front end compartment of said tank to provide for heating the contents thereof.

In practice the water in the first and third compartments of the tank (connected by the pipe 23) is of equalized temperature lower than the water in the intermediate compartment of said tank. The loaded trays are traveled slowly by the roller conveyer in the direction indicated by an arrow in Fig. 1, under the several pans aforesaid to effect a warming, pasteurizing and cooling of the bottled goods in said trays without submergence of the same.

I claim:—

A pasteurizing apparatus comprising a rectangular covered tank having opposite end openings, transverse partitions rising from the bottom of the tank to divide the same into three compartments, a series of parallel rollers arranged in the tank transversely of the same between said end openings, means for simultaneously driving all the rollers in the same direction, whereby provision is had for conveying steaming-trays of bottled goods through the tank longitudinally of the same over the water level of its compartments; pans having perforated bottoms and arranged in the upper portion of the tank to individually register with one of said compartments, means for independent attemperation of water in each tank-compartment, that in the first and third compartments being of an equalized temperature lower than that in the intermediate compartment; and means for circulating the attemperated water from each of said compartments through the pan in register therewith.

In testimony that I claim the foregoing I have hereunto set my hand at West Bend, in the county of Washington and State of Wisconsin, in the presence of two witnesses.

JULIUS KERBER.

Witnesses:

A. G. LANGENBACH,

JOSEPH M. O'MEARA.

Je 13'5

1,141,566

J. F. LESTER.

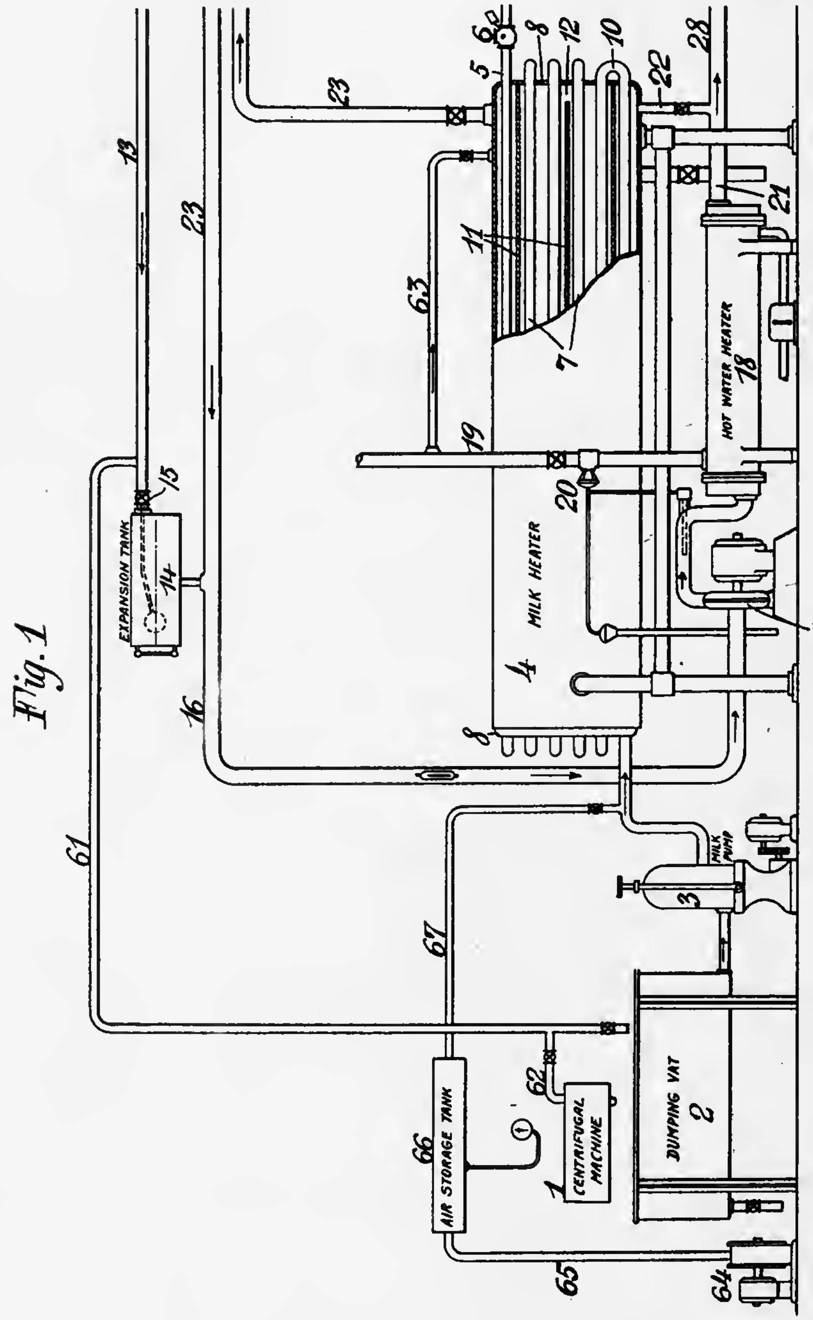
PROCESS OF PASTEURIZING MILK.

APPLICATION FILED AUG. 2, 1912.

1,141,566.

Patented June 1, 1915.

3 SHEETS—SHEET 1.



Witnesses:
G. V. Rasmussen
John A. Ferguson

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By his Attorneys
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J. F. LESTER.

PROCESS OF PASTEURIZING MILK.

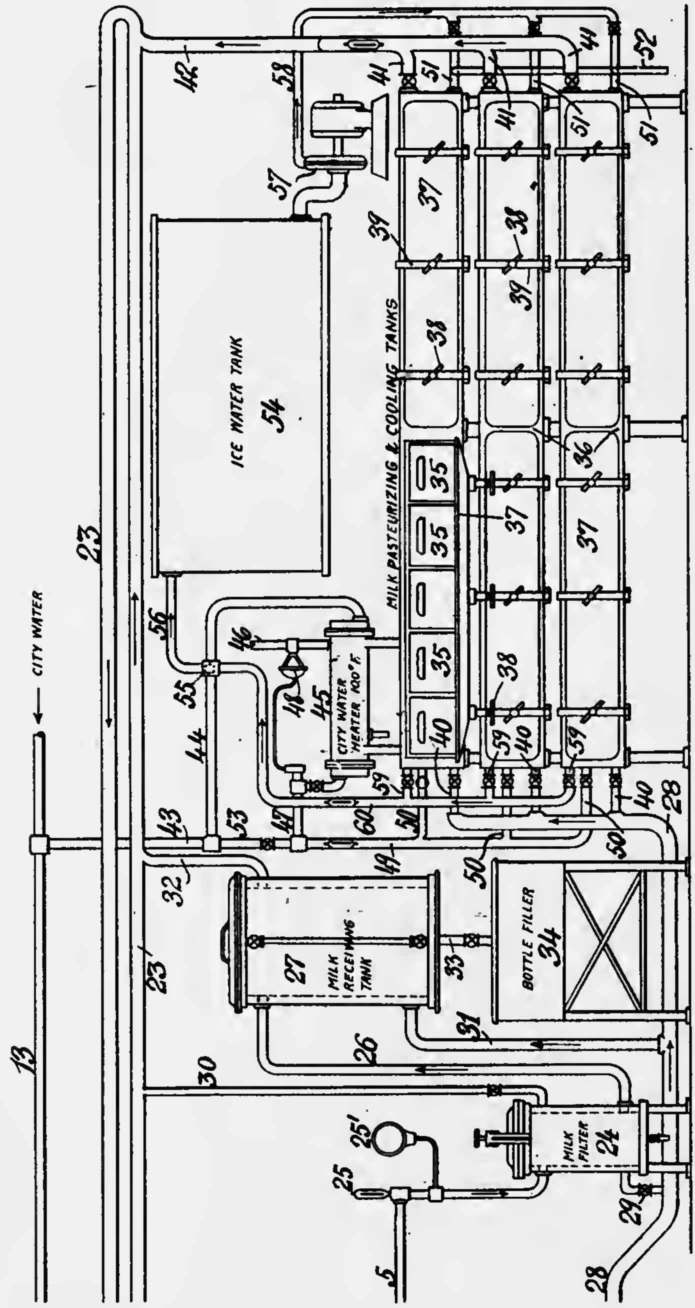
APPLICATION FILED AUG. 2, 1912.

1,141,566.

Patented June 1, 1915

3 SHEETS—SHEET 2.

Fig. 2



Witnesses:
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3 SHEETS—SHEET 3.

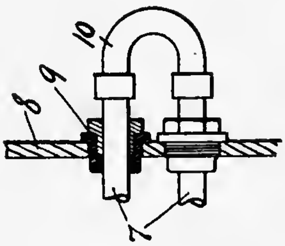

Fig. 4

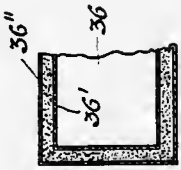

Fig. 5

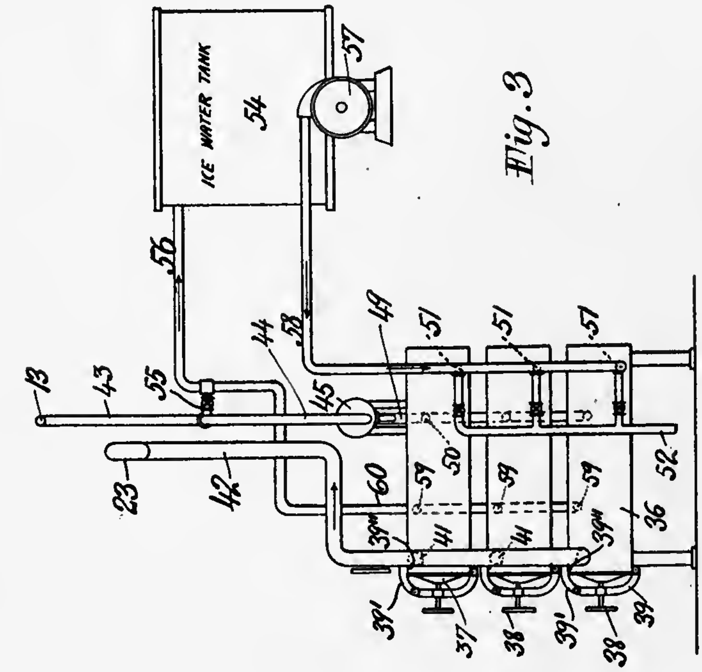

Fig. 3

Witnesses:
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By his Attorneys
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UNITED STATES PATENT OFFICE.

JAMES F. LESTER, OF NEW YORK, N. Y., ASSIGNOR TO RICHARD MERRIFIELD, OF NEW YORK, N. Y.

PROCESS OF PASTEURIZING MILK.

1,141,566. Specification of Letters Patent. **Patented June 1, 1915.**

Application filed August 2, 1912. Serial No. 712,841.

To all whom it may concern:

Be it known that I, JAMES F. LESTER, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented a new and useful Process of Pasteurizing Milk, of which the following is a specification.

My invention relates to the pasteurization or sterilization of liquids intended for human consumption. In the following description, I will set forth my process as applied to the pasteurization of milk, but it will be understood that it is equally applicable to the pasteurization of other liquids, my invention being of such scope as to include any liquid, the pasteurization of which is desirable or necessary.

Prior to my invention milk was usually pasteurized by heating it to a temperature too high for proper pasteurization for a time insufficient for such pasteurization, and then retaining it in a holding tank until pasteurization was complete. The milk was then drawn from the holding tank, cooled and bottled. The principal defect in such processes is that, after being cooled to a temperature below that required for pasteurization, the milk often became infected by contact with imperfectly cleansed pipes and tanks, the impure air of the filling room, the hands of workmen, non-sterile bottles or other sources of infection. Though regarded as sterilized milk, it is obvious that when delivered to the consumer it was frequently far from being sterile. Such processes are objectionable also because in their operation the milk is often changed chemically or otherwise injured because of being heated to a destructively high temperature. They were further found to be imperfect and objectionable in that they failed to remove dirt and deleterious foreign matter generally from the milk. In some cases, the milk was strained through non-sterilized cotton before being heated, but this crude method of filtration is obviously inefficient in that only the larger particles of dirt are removed, a part of the milk is absorbed and wasted and, especially if a cloth of fine mesh is used, the valuable butter-fat constituents of the milk are retained thereby.

The novel process of my invention obviates all of the above objectionable features and in addition possesses inherent advantages not heretofore had, such as ease and speed of operation, absolute purity and sterility of product, unimpaired richness of product, uniformity of cream line and absence of losses due to waste and injury to the milk.

According to the process of my invention the milk is first strained in the cold state through a cloth and under pressure, such as that of centrifugal force. This operation may be dispensed with though I have found it valuable in most cases because such straining separates the coarser particles of dirt from the milk while at the same time, the butter-fats passing freely through the cloth, the quality of the milk is in no wise impaired. The milk is then quickly heated, preferably under pressure and to a pasteurizing temperature, by which I mean a temperature which is high enough to accomplish pasteurization but is not so high as to injure the quality of the milk in any way, a temperature which I have found should be about 145° F., but preferably not higher than 145° F. The heated milk is then filtered, preferably under pressure, through a bed of non-absorbent material, the temperature being maintained at approximately 145° F. during the filtering operation. By such filtration all of the dirt and other solid foreign matter is removed. The filtration has also been found to remove a considerable percentage of the bacteria in the milk. The butter-fat constituents of the milk, however, pass through the filter bed together with the more liquid portions of the milk. Thus a thorough purification of the milk, so far as dirt and solid particles generally is concerned, is attained while at the same time no loss in quality is suffered. After the hot filtration, the milk, still maintained at the pasteurizing temperature of about 145° F. is introduced into containers, such as the ordinary milk bottles of commerce, which have previously been sterilized and dried and are at the time of the filling operation at the same temperature as that of the milk, this equality of temperatures assuring the successful filling of the bottles without breakage.

The bottled milk is now in a sterile condition and may at once be delivered to the consumer. Inasmuch, however, as the above steps of heating, filtering and filling may be carried out in a relatively short period of time, and as in some States, the maintaining of the milk at a pasteurizing temperature for a relatively long period of time, as for instance from twenty to thirty minutes, is required by law, I subject the bottled milk to a further temperature treatment. Before the temperature of the milk and the bottle containing it has lowered appreciably below 145° F. the bottle preferably previously sealed with a fluid-tight cap, is subjected to contact with water at 145° F. for the required period of time, after which the milk is quickly cooled by subjecting the bottle to contact with water at gradually lower temperatures until a refrigerating temperature is reached. The milk is now absolutely sterile and is in condition for delivery to the consumer; moreover it is so packaged as to be absolutely free from contaminating influences until such time as the sealing cap has been removed.

My invention has to do also with an apparatus by which my process above briefly described may be carried out. An embodiment of such an apparatus is shown in the accompanying drawings in which—

Figure 1 shows in elevation a portion of the apparatus, Fig. 2 shows in elevation the remaining portion of the apparatus a part of which is shown by Fig. 1, Fig. 3 is an end elevation of that portion of the apparatus which is shown by Fig. 2, Fig. 4 is a detail of the milk heater and Fig. 5 is a detail of the pasteurizing and cooling tanks.

The advantages of the apparatus of my invention and further advantages of my process will be pointed out or will otherwise appear in the following description of the construction and operation of the apparatus shown in the drawings.

The milk is first introduced into the centrifugal machine 1 which may be of ordinary construction although I prefer a machine in which the strainer is composed of "terry" cloth. From the centrifugal machine the milk is discharged into the dumping vat 2 from which it is pumped by the milk pump 3 into the coils of the milk heater 4, after traversing which it emerges through the pipe 5 fitted with a weighted valve 6. The coils of the milk heater comprise pipes 7 which extend horizontally through the cylindrically shaped heater and project beyond the heads 8 thereof. Where the pipes 7 pass through the heads they are each provided with a stuffing box 9. The pipes are connected in series by means of U-shaped connectors 10 which are secured by suitable means, such as screw threaded unions, to the ends of adjacent pipes. Upon the removal of the connectors 10, the interiors of the pipes 7 may be easily inspected and cleaned. If necessary the pipes 7 may readily be removed from the heater by merely loosening the stuffing-box followers and drawing the pipes in a longitudinal direction. The pipes 7, as well as all other parts of my apparatus which is adapted to come into contact with the milk, are preferably provided with tin or silver linings. Horizontal partitions 11, of which there may be any desired number, extend across the heater between the pipes 7, being riveted at their sides to the cylindrical casing of the heater. These partitions serve to divide the heater, externally of the milk coils 7, into a plurality of chambers which are in communication with each other alternately at the heads of the casing by reason of the fact that the partitions are shorter than the casing and are so disposed as to alternately leave a communicating space 12 between their ends and the heads 8.

The water for heating purposes may be conducted from the ordinary city water supply pipe 13 into the expansion tank 14, in which a predetermined level may be maintained by the float-operated valve 15. From the expansion tank the water discharges into the pipe 16 from which it is drawn by the pump 17 and forced through the hot water heater 18. This heater may be of any suitable construction and preferably comprises a coil through which the water to be heated passes and about which steam is admitted. As shown, steam is introduced into the heater 18 through the steam pipe 19, the amount of steam being regulated by the thermostatic device 20 by the operation of which the heating of the water to a certain predetermined temperature, say 145° F. is accomplished. The water after being heated is forced through the pipes 21 and 22 into the lower part of the milk heater 4 through the chambers of which it flows in series being directed continually from one end of the heater to the other by the partitions 11. After thus flowing back and forth in the heater chambers, during which time its heat is communicated to the milk in the milk pipes 7, the water is conducted through the return pipe 23 to the inlet pipe 16, in this way forming a continuous circuit. The milk thus heated to a temperature of 145° F. is forced through the pipe 5 under a pressure which is sufficient to overcome the resistance of the weighted valve 6 and enters the milk filter 24. Because of the pressure maintained in the coils, the heating is accomplished more quickly and uniformly and, all parts of the coil being completely filled with milk, the coil does not become more highly heated at one point than at another, a condition which would result in the baking or crusting of the milk within the coil. The pipe 5 may, if desired, be provided with thermometers 25 and 25′. The filter 24 which may be of any suitable construction, carries a filter bed of non-absorbent particles, such as ground quartz, of such size and in a bed of such thickness that when the hot milk is forced through it all of the dirt and a considerable percentage of bacteria will be removed. The butter-fat, however, will pass through with the other constituents of the milk, the filtered liquid being forced through the pipe 26 into the covered milk receiving tank 27.

A part of the water heated in the heater 18 is conducted through the pipe 28 connected with the heater outlet pipe 21 and the pipe 29 connected with the pipe 28 to the water jacket with which the filter 24 is provided. After traversing the water-jacket it is conducted to the return pipe 23 by means of the pipe 30. The pipe 31 also connected with the pipe 28 conducts a further portion of the water heated by the heater 18 to the water jacket of the milk receiving tank 27, after traversing which it is conducted through the pipe 32 to the return pipe 23. In this way the temperature which the milk attained in the heater 4 is maintained while it is in the filter and the receiving tank.

From the receiving tank the hot milk is forced through the pipe 33 and discharged into the covered tank of the bottle filling and capping apparatus 34. This apparatus may be of any suitable construction and is preferably an apparatus which is capable of filling a plurality of bottles, as a crate full, simultaneously and then capping the filled bottles at a single operation. The empty bottles are sterilized, heated to the temperature of the milk with which they are to be filled and placed in trays or crates 35 before being placed under the filling nipples of the apparatus 34. The sterilizing may be done by washing the bottles in an alkali solution at 140° F., then rinsing with water at 170° F. to 190° F. and then allowing them to dry and cool to the milk temperature, 145° F. When filled, the bottles are at once capped by the apparatus. The caps which I prefer to use are the fluid-tight crown caps of commerce, the under side of which are provided with a thin lining of cork or of paraffin, so that the milk will at no time be exposed to the metal of which the caps are composed. When the crate full of bottles has been capped, they are placed, crate and all, and before the temperature has fallen appreciably below 145° F. into a compartment of the sterilizing apparatus. This apparatus comprises a plurality of compartments 36, three of which are shown, in the form of tiers, one above the other. Each compartment is in the form of an elongated box, capable of accommodating a number of crates, the latter being introduced into the compartment through one or more openings in the front thereof. When a compartment has been filled with crates of filled and capped bottles, these openings are closed by closures 37 which are pressed firmly against the front of the compartment bordering the openings therein by hand screws 38 coöperating in an obvious manner with suitable yokes 39. The latter may be hinged at the bottom to the compartments and may each be provided with a hooked extension 39′ pivotally connected with the yoke and provided with a hook or projection 39″ which coöperates with a recess in the upper external wall of the compartment. It is obvious that upon loosening the screw 38, the hooked extension 39′ may be disengaged from the compartment and the yoke 39 may then be swung down on its hinge. In this way the openings may obviously be freed of their closures 37 or may be sealed by them to form a fluid-tight closed compartment. The closure at the left of the upper compartment is shown in Fig. 2 in open position, the other closures being shown in closed position.

The walls of the compartments are preferably formed of sheet metal and provided with non-corrodible sheet metal linings 36′, between which and the outer wall a filling of asbestos or other heat insulating material 36″ is placed. Each compartment is further insulated from the adjacent compartments by constructing the tiers with intermediate air spaces.

When a compartment of the pasteurizing apparatus has been completely filled with crates containing filled and capped bottles of milk at approximately 145° F., the closures 37 are forced into position to close the openings on the front wall of said compartment, and water at 145° F. is admitted through a valved pipe 40 which connects one end of each compartment with pipe 28, leading from the water heater 18. The water at such temperature is caused to flood the compartment so that it comes into contact with the whole external surface, including the cap of each bottle, and after passing through the compartment it passes through a valved pipe 41 and the pipe 42 into the return pipe 23, the flow being continued for the prescribed time for accomplishing pasteurization. After the pasteurization is complete, water at 100° F., then water at ordinary temperature and finally water at a refrigerating temperature is caused to flow through the compartment.

The water at 100° F. is obtained by conducting supply water from the pipe 13 through pipes 43 and 44 to the auxiliary heater 45 in which it is heated by steam admitted through the pipe 46. The temperature of the water in the outlet pipe 47 is regulated by the thermostatic device 48 connected with the steam pipe 46. From the pipe 47, the hot water is conducted through pipe 49 and one of the valved branch pipes 50 into the desired compartment, after flowing through which it issues from a pipe 51 and is discharged from the drain pipe 52. The water at ordinary temperature is conducted from the pipe 43 directly to the pipe 49 through the valved connecting pipe 53, the heater 45 being rendered inactive by closing the valve in the outlet pipe 47 and that in the steam pipe 46. The refrigerating water is obtained from a refrigerating apparatus, as the ice water tank 54, to which supply water may be conducted from pipe 44 through the valved pipe 55 and the tank inlet pipe 56. The refrigerating water is drawn from the tank 54 by a pump 57 and forced through the pipe 58 and the valved pipes 51 which previously served as outlets for each compartment for water at 100° F. and at ordinary temperatures. The refrigerating water after traversing the desired compartment issues through valved pipes 59 which are connected by pipe 60 with the tank inlet pipe 56. The refrigerating water is thus caused to flow in a continuous circuit which may include any one or more of the pasteurizing compartments by the obvious manipulation of the valves in the inlet and outlet pipes.

In utilizing the pasteurizing apparatus, I preferably fill one compartment with crates containing filled and capped bottles of milk at a pasteurizing temperature. The closure is sealed in place and water from the pipe 28 which has been heated to about 145° F. by the heater 18 is caused to flood the compartment, submerging the bottles therein, by opening the valves in the pipes 40 and 41. It will be seen that substantially no heat will be abstracted from this water by the filled bottles, because the latter are at substantially the same temperature as the water. After thorough pasteurization in this manner, the valves in pipes 40 and 41 connected with the compartment are closed and the valves in pipes 50 and 52 are opened, those in pipes 53 and 51 being closed, so as to allow water at a temperature of about 100° F. supplied by the auxiliary heater to flow through the compartment to cool gradually the bottles and their contents, such cooling insuring obviously a minimum breakage of the bottles. After a few minutes of such flow ordinary supply water is admitted by closing the valve in pipe 47 and opening that in pipe 53 to further cool the bottled milk. Finally the valves on the pipes 50, 52 and 53 are closed and those in pipes 51 and 59 are opened so as to allow refrigerating water to be forced through the compartment by the pump 57. The compartments being equipped with pipes and valves independently of each other, it is evident that water of varying degrees of temperature may be introduced into each compartment independently of the others. For example, while water at 145° F. is traversing one compartment, water at the same temperature or at 100° F. or at ordinary temperature may be caused to traverse any other of the compartments. In cooling the pasteurized milk, it may of course be unnecessary to first supply water at 100° F., but water at ordinary temperatures may be introduced instead. The refrigerating water may be forced through one or more of the compartments for an indefinite time, the compartment acting as a storage chamber. At any time after the milk has been cooled to refrigerating temperature, the compartment may be opened and the crates may be loaded directly on the wagons for delivery. The crates which I prefer to use in my apparatus are the ordinary non-corrodible metallic crates which are commonly used for delivery purposes. The utilization of such crates insures a minimum amount of handling for after the bottles have been placed in them preparatory to filling and capping, the bottles are at no time up to actual delivery to the consumer's door subjected to individual handling.

My apparatus has the important advantage of being easily and thoroughly cleaned as to those parts thereof with which the milk comes into contact. To clean and sterilize these parts I introduce supply water into the dumping vat 2 through the pipe 61 and by its use prepare an alkali cleansing solution which is pumped by the pumps through the milk coils of the heater 4 which is now heated by introducing steam from the pipe 19 through the branch pipe 63. The solution is thus boiled in the tubes and is forced boiling through the filter, holding tank and bottle filling machine, issuing in streams from the nipples of the latter. The filter bed may have been removed prior to the passage of the solution. This solution is followed by boiling water. The temperature of the solution and the water may be raised to 320° F. by the heater. When the water issues in clear streams from the filling nipples, steam may be forced through if desired, the flow of steam being followed by a flow of hot air. The air may be first purified and compressed by the compressor 64 and driven through the pipe 65 into the air storage tank 66, from which it may be admitted to the milk coils of the heater 4 by the pipe 67. The air becomes heated in the heater and following the course of the cleansing fluids issues finally from the filling nipples. The apparatus is thus thoroughly dried and sterilized and the nipples may be closed so as to prevent admission of atmospheric air until the apparatus is to be used again for pasteurizing purposes. After the hot air has traversed the apparatus for a time, I prefer to stop the flow momentarily and insert a new filter bed, or the old one thoroughly cleaned, into the filter. The air is then again admitted so as to sterilize and dry the new filter bed in addition to the other parts of the apparatus.

I claim:—

1. In the process of pasteurizing milk, the improvement which consists in forcing milk heated to substantially a pasteurizing temperature through a filtering medium into a storage chamber and thence into bottles, the temperature to which the milk was first heated being substantially maintained during the filtering, storing and bottling operations.

2. The process of treating milk, which consists in heating the milk, then forcing the heated milk to substantially a pasteurizing temperature through a filtering medium, then filling it into a container, the temperature to which the milk was first heated being substantially maintained during the filtering and filling operations then sealing said container and then subjecting the milk in said container to pasteurizing conditions by flowing in contact with the container for a suitable time, a liquid having a pasteurizing temperature substantially as and for the purpose described.

3. The process of treating milk, which consists in heating the milk, then forcing the heated milk to substantially a pasteurizing temperature through a filtering medium, then filling it into a container, the temperature to which the milk was first heated being substantially maintained during the filtering and filling operations then sealing said container, then subjecting the milk in said container to pasteurizing conditions by flowing in contact with the container for a suitable time, a liquid having a pasteurizing temperature and then cooling said milk by flowing in contact with the container a liquid having a lower temperature than a pasteurizing temperature, substantially as and for the purposes described.

4. The process of treating milk, which consists in heating it to substantially a pasteurizing temperature, then removing bacteria from it by filtration, and then subjecting the filtered milk to pasteurizing conditions, the milk at all times being kept at a temperature not less than that to which it was first heated.

In testimony whereof, I have hereunto set my hand in the presence of two subscribing witnesses.

JAMES F. LESTER.

Witnesses:
JOHN A. FERGUSON,
FRANK F. KIRKPATRICK.

Pa

Je, 1915

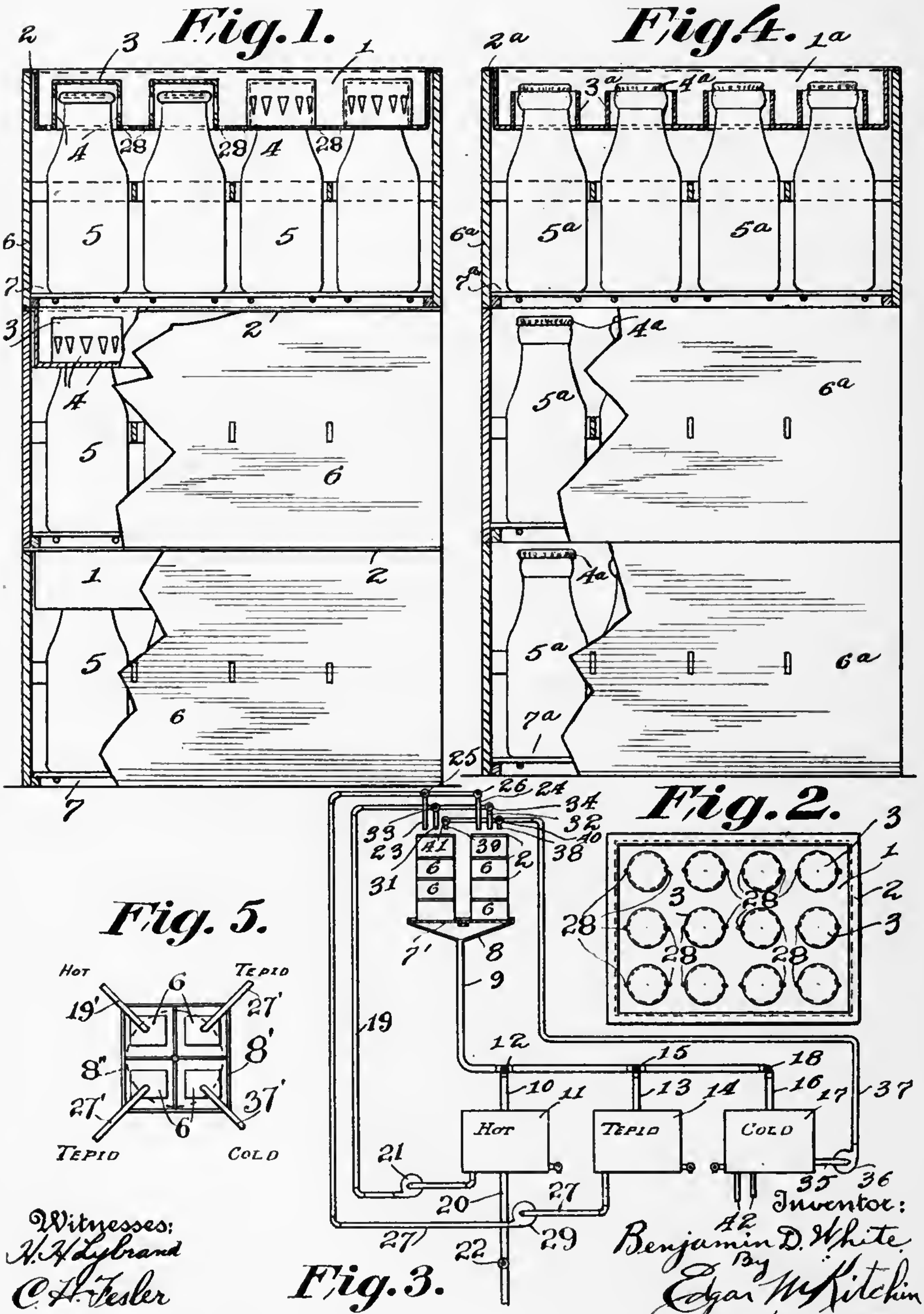
1,144,883

B. D. WHITE.

APPARATUS FOR PASTEURIZING SUBSTANCES.

APPLICATION FILED APR. 11, 1913.

1,144,883. Patented June 29, 1915.



Witnesses:
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C. H. Fesler

Inventor:
Benjamin D. White,
By Edgar McKitchin
his Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

BENJAMIN D. WHITE, OF BALTIMORE, MARYLAND.

APPARATUS FOR PASTEURIZING SUBSTANCES.

1,144,883. Specification of Letters Patent. Patented June 29, 1915.

Application filed April 11, 1913. Serial No. 760,527.

To all whom it may concern:

Be it known that I, BENJAMIN D. WHITE, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Apparatus for Pasteurizing Substances; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention is characterized by its object to enable effective pasteurization of milk or other substances in an inexpensive manner and while contained in the receptacles in which the milk or other substances is or are ordinarily delivered.

A further object is the pasteurization of milk while in the delivery bottles and disposed in the delivery cases.

With these and other objects in view, as will hereinafter in part become apparent, and in part be stated, the invention comprises certain novel constructions, combinations and arrangements of parts as will be subsequently disclosed and claimed.

In the accompanying drawing,—Figure 1 is a view in side elevation of a series of delivery crates or cases, parts being broken away and seen in section for disclosing interior structure. Fig. 2 is a top plan view thereof on a reduced scale. Fig. 3 is a diagrammatic view of the entire system. Fig. 4 is a view similar to Fig. 1 of a slightly modified embodiment. Fig. 5 is a diagrammatic plan of a further embodiment.

In the pasteurization of certain liquids, as beer and the like, it has been proposed to heat the liquid while contained in bottles by sprinkling thereon water or other heating media in sufficient quantities and at sufficient temperature for assuring pasteurization, but these apparatus have been found expensive to construct and uneconomic in maintenance, and it is for the purpose of attaining the advantages of such proposed apparatus without the objection thereto that this invention has been produced. One of the objections to the proposed apparatus above mentioned is the fact that when water is merely sprinkled upon a bottle it does not uniformly deliver heat units thereto, and to the end of obviating this difficulty the present apparatus provides for the delivery in a continuous stream of a thin film or sheet constantly enveloping substantially the entire body of the bottle, and this being carried out in multiple and by very simple apparatus renders the present invention especially effective.

Referring to the accompanying drawing by numerals, 1 indicates a pan having an exterior contour adapting it to snugly fit within the conventional case 6. The pan 1 is provided with a flange 2 about its upper edge adapted to overhang the upper edge of the respective case, and the pan is formed with a series of inverted cup-shaped caps 3, there being as many caps 3 as there are bottles 5 adapted to be contained in the case 6. Each cap 3 may be formed in the pan 1 in any suitable manner, as by being stamped from the material of the pan, so that the lower end of each cap 3 is open and freely admits the upper end portion of the respective bottle 5. The vertical wall of each cap 3 is perforated by a series of apertures 4, each of said apertures being V-shaped with the wider portion of the V terminating sufficiently below the upper end of the cap for providing an imperforate area for surrounding the upper end portion of the respective bottle. Each bottle 5 is sustained on the usual crossed wire base 7 of case 6, and the parts are proportioned so as to cause the extreme upper end portion of each bottle 5 to extend into the imperforate portion of the respective cap 3 and to at the same time expose the extreme portion of the neck of the bottle so far as contents thereof are considered to the direct action of the influx of water through the apertures 4, the larger quantities being admitted nearest the liquid level in the bottle, so that the upper portions of the neck of the bottle will receive as much water as the shoulder of the bottle, and there will be no tendency of the streams of water to break before distribution as a sheet over the bottle, and the contents of the bottle are, therefore, directly subjected to the diffused heat from the water. There is, therefore, an entire obviation of a failure to heat the entire contents of the bottle and of any dependence upon the rising of heat from lower portions of such contents. It will be observed that the imperforate area of each cap 3 serves as a temporary cover for the contained bottle and obviates liability of water entering the open neck of the bottle.

In practice, I employ a system such as indicated in diagram in Fig. 3. In this figure a series of cases 6, consisting preferably of a number of stacks of superimposed cases rest upon a grating 7′, which latter is sustained by an inclined floor 8 converging to a drain pipe 9. The pipe 9 is provided with a branch 10 controlled by a three-way valve 12 and emptying into a hot water collection tank 11. Pipe 9 is provided with a second branch pipe 13 which empties into a warm water collection tank 14, and is controlled by a three-way valve 15. The pipe 9 is further provided with a branch or terminal portion 16 emptying into a cold water collection tank 17 and controlled by valve 18. A pipe 19 leads from the tank 11 and discharges at points above the several stacks of cases 6, pipe 19 being provided with branch pipes, as 31 and 32, for each of the said stacks, and the branch pipes being appropriately controlled by valves 33 and 34. A pump 21 is disposed in the length of the pipe 19 for maintaining the circulation from tank 11 to the stacks of cases. A pipe 27 leads from tank 14 and extends above the stacks of cases 6, being provided with a branch, as 23, 24, for each stack of cases, and each branch is controlled by a suitable valve, as 25, 26. A pump 29 is disposed in the length of the pipe 27 for maintaining circulation therein. The liquid in tank 11 is heated in any preferred manner, as by steam supplied through a pipe 20 controlled by a valve 22. A pipe 35 leads from the tank 17 to a pump 36 which discharges into a tube 37, the latter extending to points above the stacks of cases 6, and being provided with a branch pipe 38, 39, for each stack, the discharge through the branch pipes being controlled by appropriate valves 40 and 41. The liquid in tank 17 may be refrigerated in any ordinary manner, as by the expansion of compressed ammonia in suitable cooling coils in the tank (not illustrated) supplied with ammonia or other cooling agent through pipes 42.

In carrying out the operation, a pan 1 is provided for each case 6, and the cases are superimposed with the bottles in each lower case vertically alined with the bottles of the next higher case. The valves 15 and 18 are closed and the valve 12 is turned to a position for delivering water through the branch 10 to tank 11 and thereupon the valves 33, 34, are opened and water thus supplied to the uppermost pans 1. Each of said uppermost pans is maintained substantially full of water at the requisite temperature for pasteurizing the contents of the several bottles. The water, entering through the several apertures 4, forms and maintains a heating film or sheet about all parts of the body of the bottle, including the bottom, the film or sheet converging substantially centrally of the bottom of the bottle into a stream which strikes the top of the cap 3 of the next lower pan. The water descends through the apertures 4 of such lower cap, and again forms a film or sheet about the respective bottle and so descends throughout all the bottles that are alined vertically. It will be observed that if there is any tendency toward deviation in the course of the water from an upper bottle to the next lower bottle such tendency will be effectively corrected by the lower pan, but I find that there is very little tendency of this kind and that I am able to gain exceptionally efficient results by the employment of only the uppermost pan and the omission of all of the lower ones, as, for instance, as indicated in Fig. 4.

In Fig. 4, I have not only illustrated the above suggested omission but have modified the construction of the pan as indicated at 1^a which is provided with the supporting flange 2^a resting upon the upper edge of the case 6^a. The pan 1^a is not provided with cups or caps such as seen at 3 in Fig. 1, but instead are provided with mere annular collars 3^a adapted to accommodate the neck or upper portions of the respective bottles 5^a which rest upon the crossed wire support 7^a of the case. Each bottle 5^a in this embodiment is preferably provided with the crimped metal cap 4^a which absolutely insures against access by the heating water to the contents of the respective bottles. In this embodiment the operation is carried out exactly like the embodiment illustrated in Fig. 1 except that the upper ends of the bottles are not protected by the pan since they are protected by the crimped caps and therefore caps 3 of the pan are unnecessary. Only the uppermost case is provided with a pan, the converging film or thin sheet of water descending in a stream from the central portion of the bottom of the upper bottle to the top of the next lower bottle and spreading therefrom into a film enveloping such lower bottle, and so on down throughout the series.

After the milk has been fully pasteurized, the valves 33 and 34 are closed, and the valve 12 is turned for cutting off pipe 10 and opening communication to valve 15, which latter valve is turned to afford communication through pipe 13, to tank 14, the valve 18 remaining closed. The valves 25 and 26 are then opened and the warm water is allowed to descend over the bottles in exactly the same manner as the hot water but only for sufficient time for reducing the temperature so as not to endanger the bottles when the cold water is turned on. When the desired reduction has been effected, the valves 33 and 34 are closed, and valve 15 is turned to cut off communication with branch 13 and to afford communication with valve 18, which latter valve is opened to afford communication through pipe 16 to tank 17.

Thereupon the valves 40 and 41 are opened and the cooling agent delivered in exactly the same manner as the heating agent was delivered, and this is continued until the milk is ready for service. The cases are then removed and may be placed in wagons for immediate delivery of the milk.

It is, of course, perfectly obvious that the present invention appertains to the pasteurization of any substance adapted to be pasteurized, and where the term "milk" is employed it is only illustrative. Furthermore, the operation as above stated is merely that incident to a very short operation or when first starting, it being preferable as soon as the liquid in tank 14 has become somewhat heated by the heat from the receptacles which it has been cooling to employ the liquid from tank 14 as the initial heating medium. That is to say, after the operation has been carried out sufficiently for appreciably raising the temperature of the liquid in tank 14 the operation will consist in first supplying liquid from tank 14 to the stacks of cases, then supplying liquid from the tank 11 thereto, then again supplying liquid from tank 14 (after pasteurization has been completed), and finally supplying the cooling liquid from tank 17. Thus the liquid in tank 14 is employed as a heating liquid for the cold receptacles and as a cooling liquid for the hot receptacles, whereby it is unnecessary to provide any means for maintaining the contents of tank 14 warm. By way of further illustrating this double use of the warming liquid, I have illustrated in Fig. 5 an extremely desirable embodiment in which 8′ indicates a supporting platform which is rotatably mounted on a circular track or turntable 8″. Mounted on the platform 8′ or on suitable gratings sustained thereby are the stacks of cases 6. It will be observed that four stacks of cases are shown, but obviously any multiple thereof may be provided. A pipe 27′ leads from a tank similar to tank 14 to a point above each of two of the stacks 6, the two pipes 27′ being diametrically opposite each other, and the stack 6 at one side of the diametrical line thus represented is supplied with hot water through pipe 19′ and the other stack 6 is supplied with refrigerating water through a pipe 37′. The operation of this device consists in supplying a stack of cases 6 on platform 8′ beneath pipe 37′, and then rotating the platform 8′ until the stack arrives beneath one of the pipes 27′. The warm water is then turned on through the respective pipe 27′ and the supply is continued until the temperature of the receptacles is raised sufficiently to obviate danger of breakage from the higher temperature. While this is going on, a second stack of cases 6 is being applied to the platform 8′ beneath the pipe 37′, and then the platform 8′ is revolved so as to bring the first stack beneath the hot water pipe 19′ and to bring the second stack beneath the respective pipe 27′. The warm water is continued to be supplied through the pipe 27′ and the hot water is turned on through the pipe 19′. The supply through pipe 19′ is maintained until perfect pasteurization is attained, and in the meantime a third stack of cases is supplied to the platform 8′ beneath pipe 37′, and upon the completion of the pasteurization of the contents of the first stack the platform 8′ is again revolved for bringing the third stack beneath one of the pipes 27′, the second stack beneath the pipe 19′, and the first stack beneath the other pipe 27′. The warm water is turned on through the second pipe 27′ and the supply thereof is thereafter continued. As the operation continues the supply through both the pipes 27′ and through pipe 19′ is maintained continuously, the liquid from the two pipes 27′ being collected in the same receptacle, that portion of the liquid which passes down over the hot receptacles serving to raise the temperature of the warm water and that passing down over the fresh receptacles tending to lower the temperature thereof so as to effect a substantial balance and gain the saving in heat units incident to utilizing the heat given off by the hot receptacles in warming the fresh or cool receptacles.

When the desired pasteurization has been accomplished with respect to the second stack, a fourth stack having in the meantime been supplied to the platform 8′ beneath pipe 37′, the platform 8′ is revolved for bringing the first stack beneath pipe 37′, the fourth stack beneath one of the pipes 27′, the second stack beneath the other pipe 27′, and the third stack beneath the pipe 19′. The cooling agent is then turned on through pipe 37′ and maintained until the several receptacles and their contents have been cooled and rendered ready for delivery. Thereupon the first stack is removed and a new stack is supplied to the platform 8′ beneath the pipe 37′. In the meantime, the third stack will have been subjected to the pasteurizing operation, the second stack reduced in temperature preparatory for cooling by the refrigerating agent and the fourth stack heated preparatory to receiving the pasteurizing temperature. After the pasteurization of the third stack, the platform 8′ is again revolved to bring a fresh stack beneath one of the pipes 27′, the other stacks continuing in the rotation above named, and the operation being completed continuously in the successive steps of warming, heating to pasteurization, cooling, and finally refrigerating. The supply through the pipes 27′ and 19′ is, therefore, continuous, but the supply through pipe 37′

is intermittent, being turned off when a new stack is to be applied to the platform 8′ and turned on again when the platform is revolved for bringing a stack from beneath one of the pipes 27′ to a point beneath one of the pipes 37′.

In the construction of pan 1 it is desirable to provide relatively small apertures 28 adjacent the caps 3 through the floor of the pan, the apertures being disposed to direct their streams against the sides of the receptacles 5 so as to add the effect of the liquid discharged therethrough, but the primary object of the apertures 28 is to insure draining of the pan after a given operation.

What I claim is:—

1. In an apparatus for pasteurizing substances while in containers, a pan or trough for distributing the pasteurizing agent upon the containers, said pan or trough having openings in its bottom, through which the tops of the containers may project, and formed to deliver the pasteurizing liquid directly upon the sides of the containers.

2. In pasteurizing apparatus, a pan adapted to deliver pasteurizing fluid to receptacles, the bottom of the pan being formed with apertures each adapted to have the upper portion of a receptacle introduced therethrough, and each of such apertures being formed for enabling the discharge of liquid from the pan substantially horizontally about the outer surface of the respective receptacle.

3. In pasteurizing apparatus, a pan having openings in its bottom adapted to accommodate therein upper portions of receptacles, the openings being proportioned to snugly surround the respective receptacles and to permit access of the liquid from the pan to the body of each of the receptacles, the liquid discharging laterally from the pan upon the sides of the receptacles and descending over the bodies of the receptacles in the form of a thin sheet.

4. In pasteurizing apparatus, a pan adapted to have upper portions of receptacles extended through its bottom, the pan being formed with an apertured bottom for accommodating such upper portions of the receptacles, and the apertures being formed for enabling the discharge of liquid from the pan substantially horizontally about the outer surfaces of the receptacles, and means for sustaining the pan out of contact with the receptacles.

5. In pasteurizing apparatus, a pan having a series of caps upstanding from the bottom of the pan, each having its lower end open for accommodating the upper end portion of a receptacle within the respective cap, the side walls of the cap being apertured for admitting liquid from the pan to the outer surfaces of the receptacle.

6. In pasteurizing apparatus, a pan having a series of caps upstanding from the bottom of the pan, each having its lower end open for accommodating the upper end portion of a receptacle within the respective cap, the side walls of the cap being apertured for admitting liquid from the pan to the outer surfaces of the receptacle, the extreme upper portion of each cap being imperforate and being adapted to surround the extreme upper portion of its respective receptacle.

7. In pasteurizing apparatus, a pan having caps upstanding from its bottom, each cap having its lower end open for accommodating the upper end portion of a receptacle, the side walls of the cap being formed with V-shaped apertures for admitting liquid from the pan to the outer surfaces of the receptacle.

8. In pasteurizing apparatus, a pan adapted to surround upper portions of receptacles, the pan being formed with an apertured bottom for accommodating such upper portions of the receptacles, and the apertures being formed for enabling the discharge of liquid from the pan substantially horizontally about the outer surfaces of the receptacles, and the bottom of the pan being formed with draining apertures disposed for discharging against portions of the receptacles.

9. In an apparatus for pasteurizing substances while in containers, a liquid distributer comprising a pan or trough and caps, the pan or trough formed with openings in its bottom through which the tops of the containers may project, and the caps extending upward from the bottom of the pan or trough and covering said openings, said distributer being also formed with perforations arranged to deliver the pasteurizing agent against the sides of the containers.

In testimony whereof I affix my signature in presence of two witnesses.

BENJAMIN D. WHITE.

Witnesses:
J. Edwin Giles,
Edgar M. Kitchin.

P

Aug 1915

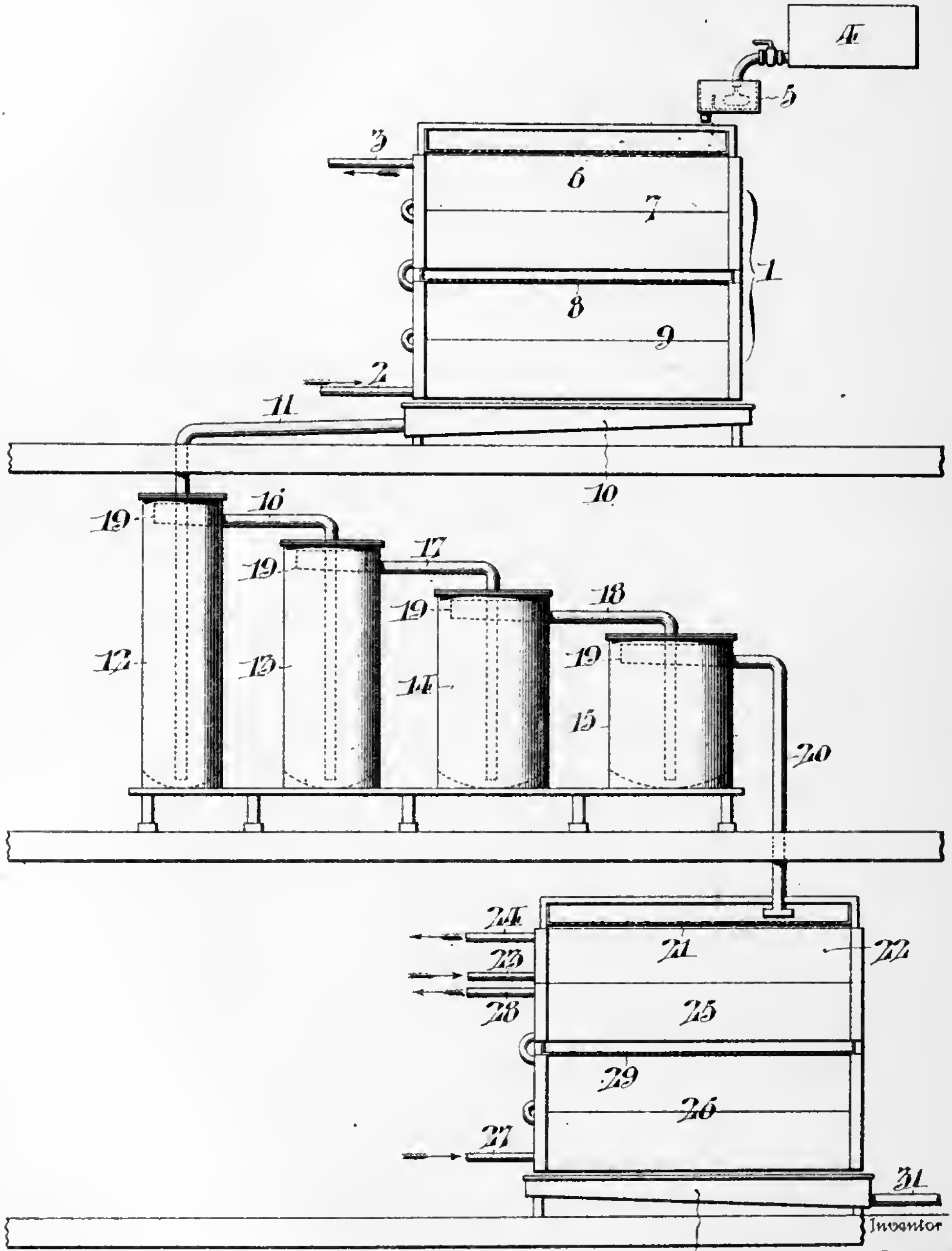
1,150,269

S. M. HEULINGS.

PROCESS OF PASTEURIZING MILK OR OTHER FLUIDS.

APPLICATION FILED DEC. 30, 1913.

1,150,269. Patented Aug. 17, 1915.



Witnesses

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UNITED STATES PATENT OFFICE.

SAMUEL M. HEULINGS, OF HADDONFIELD, NEW JERSEY.

PROCESS OF PASTEURIZING MILK OR OTHER FLUIDS.

1,150,269. Specification of Letters Patent. Patented Aug. 17, 1915.

Application filed December 30, 1913. Serial No. 809,444.

To all whom it may concern:

Be it known that I, SAMUEL M. HEULINGS, of Haddonfield, in the county of Camden and State of New Jersey, have invented a certain new and useful Process of Pasteurizing Milk or other Fluids, whereof the following is a specification, reference being had to the accompanying drawing.

The present invention relates to a process of pasteurizing milk or other fluids, and the primary object is to eliminate the bacteria content to a greater degree than is possible by the methods and processes now employed, of which I am aware, and without materially changing the chemical condition of the milk.

My improved process of pasteurizing milk consists, generally, in heating the milk to a temperature ranging from one hundred and forty degrees to one hundred and fifty degrees F. and maintaining the milk at approximately this temperature for a period of time as from fifteen minutes to one hour or longer. This step in the process is substantially like the well known commercially designated proper or perfect pasteurization of the milk. At the expiration of such time period, the temperature of the milk is increased from five to fifteen degrees F., after which the milk is cooled to approximately fifty-five degrees F. or below.

My improved process of treating milk may be carried out by various means, but I prefer the apparatus shown more or less diagrammatically in the accompanying drawing. A description of the apparatus and the different steps in the treatment of the milk will make clear my improved process.

The primary heater 1, is provided which is supplied with a heating medium through a pipe 2, which heating medium is carried off through another pipe 3. The milk is placed in a tank or container 4, and is delivered therefrom to a controlling device 5, which supplies a perforated trough 6. This trough 6, delivers the milk over the upper portions or sections 7, of the primary heater from which it is collected in a second trough 8, and said trough 8, again distributes it over the second section 9, of the primary heater. The heating medium is supplied to the primary heater 1, at such temperature as may be required in relation to the volume of flow of the heating medium, the flow of the milk and the contiguous surfaces of contact between these two flows to raise the temperature of the milk to any point as hereinbefore described for the pasteurization of the commercially designated proper or perfect pasteurized milk. It is, however, preferable to utilize a heater with sufficient contiguous surface between the milk and heating medium so that the heating medium need not be raised in temperature more than one or two degrees above that temperature to which it is desired to raise the milk and in this manner an overheating of the milk would be impossible if for any reason the volume of the flow of the milk should be decreased or interrupted. The milk is thus raised to the desired temperature and is collected by the trough 10, from which it is delivered into the first unit 12, of a series of holding tanks or containers by means of a pipe 11, leading from the said trough 10, to a point contiguous to the bottom of said container 12. The remaining containers of the series designated respectively 13, 14 and 15, are successively of less height, and leading from each to the next adjacent are pipes designated respectively 16, 17 and 18. These pipes have their upper ends each connected to a device conveniently termed a collector or equalizer 19, in the top of one container and extend to the bottom of the next container. These containers are preferably provided with suitable insulation against the radiation of heat, so that the milk will be maintained at the aforesaid temperature in a relatively large body, and without agitation from the inflowing milk in the various containers rising slowly from the bottom of one to the top thereof, and then passing to the bottom of the next. With this arrangement it will, therefore, require such time period for the milk to pass through either one container or the series as the relations of the cubical contents of this container or series of containers bears to the amount of milk to be handled in the time period for which the milk is to be held. The time period for which the milk is preferably held, should be of such duration as hereinbefore described, for the commercially designated proper or perfect pasteurization of milk. The milk then leaves the last container 15, through a pipe 20, and is delivered into a trough 12, which distributes it over a superheater 22. A heating medium is supplied to this superheater by a suitable pipe 23, and is at such temperature relative to the temperature of the milk when discharged from the heating tank, and the amount of contiguous surfaces between this heating medium and the milk, as will raise the milk to a temperature of from five to fifteen degrees higher than the temperature at which it is discharged from the primary heater. It is preferable to use a superheater in which there is a sufficient surface, so that the heating medium need not be more than one degree higher than the maximum temperature to which it is desired to superheat the milk. Owing to this fact, the milk will not be heated by the superheater to a point higher than desired, even in the event of a fluctuation in the flow of milk from any cause, or, if it should be heated to a point higher than desired, the amount of this extra heating would be negligible.

In view of the fact that the milk is continuously traveling over the pipes 24, and 23, as shown in the drawings, the time period at which the milk is being raised to the higher point during the super-heating of the same is comparatively short.

Passing from the superheater 22, the milk is delivered upon a refrigerator or cooler comprising sections 25, and 26, supplied with a cooling medium from any suitable source through the pipe 27, an exhaust pipe 28, being employed for removing the cooling medium. After the milk passes over the first section 25, of the cooling or refrigerating compartment, it is delivered into a trough 29, which redistributes it upon the lower sections 26, and from said section 26, the milk is collected in the trough 30, to which is attached a delivery pipe 31, leading to any suitable receiver.

As is well known, raw milk has a larger or smaller bacteria content, varying greatly with its initial condition and the methods employed in its production and handling, and this bacteria content comprises germs of greater and less heat-resisting species. With the present process, those germs which are most susceptible to the action of heat, are destroyed by the initial heating of the milk, and certain of those germs having greater heat-resisting qualities, are destroyed during the time in which the milk is held at this pasteurizing temperature, as above described for the production of the commercially proper and perfectly pasteurized milk. Those germs, however, which survive both the initial heating and the holding period, are, of course, the greatest heat resisters, but they have been more or less weakened by their long exposure to the pasteurizing temperature. Consequently, as soon as the temperature is increased, many more succumb or are destroyed, and experience has demonstrated that among the content which remains, the quick cooling after the sudden increase, effects the destruction of a further quantity, thereby leaving a product that is nearer the desired germ free milk.

While I have described an apparatus for carrying out my process in which the milk is treated continuously, it will be understood that various other types of apparatus may be used and that the milk may be treated in the well-known batch method, if desired. It will also be understood that my pasteurizing process may be used for treating other liquids, if desired.

While in the apparatus shown, the milk passes immediately from the high temperature in the super-heating step to the cooling medium, I may use an apparatus wherein the milk is held at this high temperature for a short period of time, as from one to fifteen minutes, and then cooled.

Having thus described my invention, I claim:

1. The process of pasteurizing milk or other fluids which consists in heating the milk to a pasteurizing temperature and holding the milk at such temperature to effect the proper or perfect pasteurization of the milk, subsequently heating the milk to a higher temperature with no substantial reduction of temperature between the holding temperature and the subsequent higher temperature, and finally cooling the same.

2. The process of pasteurizing milk or other fluids which consists in initially heating the milk to a temperature ranging from one hundred and forty to one hundred and fifty degrees F. holding the milk at this temperature for a relatively long period of time to effect the proper or perfect pasteurization of the milk, subsequently heating the milk to a higher temperature for a relatively short period of time and finally rapidly cooling the same.

3. The process of pasteurizing milk or other fluids which consists in passing the milk through heating devices wherein said milk is brought to a temperature ranging from one hundred and forty degrees to one hundred and fifty degrees F., subsequently passing the milk through containers constructed to maintain said temperature for a relatively long period of time, then passing the milk through a superheater whereby the temperature is raised for a relatively short period of time and finally rapidly cooling the milk.

4. The process of pasteurizing milk or other fluids which consists in heating the

milk to a pasteurizing temperature and holding the milk at such temperature to effect the proper or perfect pasteurization of the milk, subsequently subjecting the milk to the action of a heating medium of higher temperature for a short period of time and cooling the same.

In testimony whereof, I have hereunto signed my name, at Philadelphia, Pennsylvania, this fifteenth day of December, 1913.

SAMUEL M. HEULINGS.

Witnesses:

JAMES H. BELL,

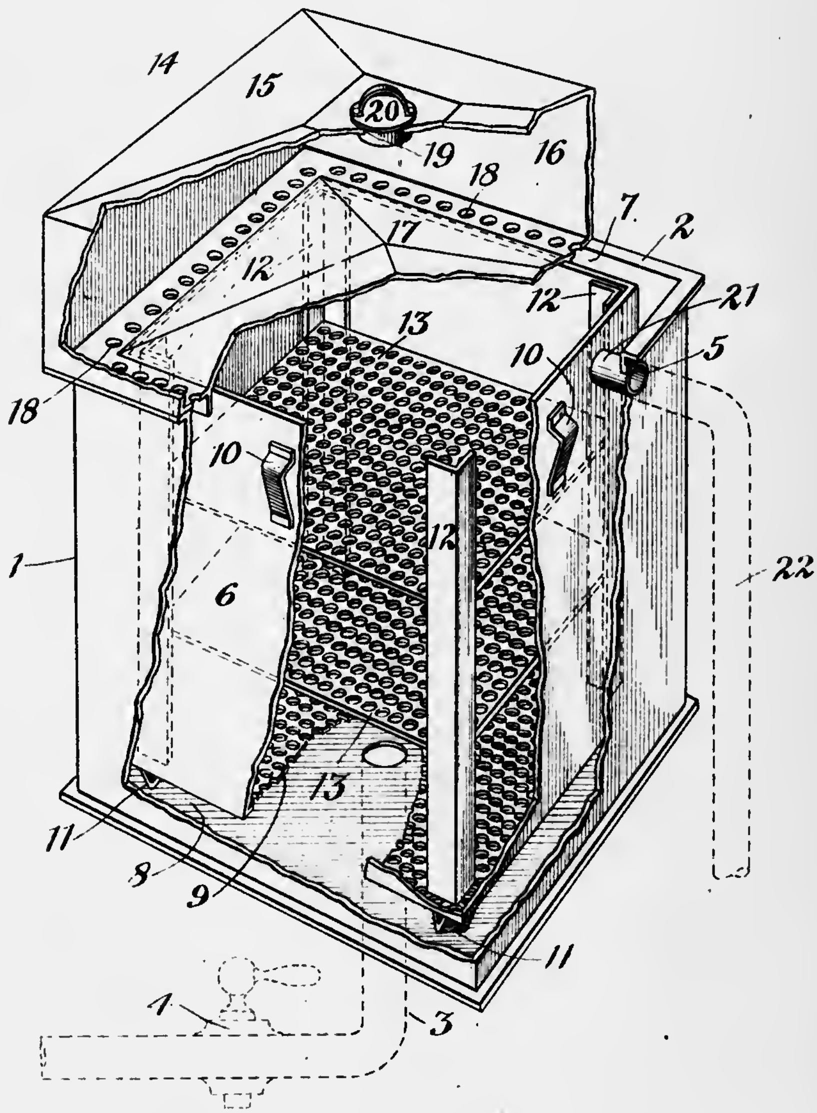
E. L. FULLERTON.

Pa 1915
Dec.

1, 162808

C. O. ROBINSON, DEC'D.
E. S. ROBINSON, ADMINISTRATRIX.
PASTEURIZER AND COOLER.
APPLICATION FILED NOV. 22, 1913.

1,162,808. Patented Dec. 7, 1915.



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UNITED STATES PATENT OFFICE.

CHARLES O. ROBINSON, OF FREDERICK, MARYLAND; EFFIE S. ROBINSON ADMINISTRATRIX OF SAID CHARLES O. ROBINSON, DECEASED.

PASTEURIZER AND COOLER.

1,162,808. Specification of Letters Patent. **Patented Dec. 7, 1915.**

Application filed November 22, 1913. Serial No. 802,467.

To all whom it may concern:

Be it known that I, CHARLES O. ROBINSON, a citizen of the United States, residing at Frederick, in the county of Frederick and State of Maryland, have invented certain new and useful Improvements in Pasteurizers and Coolers, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to the art of pasteurizing, and has for its object the production of apparatus for perfectly pasteurizing substances in their containing vessels, such as milk in the bottles, and cooling the same immediately afterward without damaging the vessels or changing the condition of the contents.

I attain my object by providing an inner and an outer container, with an intermural space between them, the inner container having a perforated or recticulated bottom, and being supported above the bottom of the outer container. The milk bottles or other vessels are placed in the inner container, and a cool liquid such as water introduced into the upper portion of the intermural space, so that it will flow down around the inner container and then up through the bottom thereof. A source of heat is applied below said bottom, and means provided for draining off the liquid from the top of the inner container. I provide also a cover for the apparatus which extends over both containers and the intermural space.

The method of pasteurizing which is disclosed herein is claimed in a copending divisional application filed February 27, 1914, Serial No. 821,502. The claims in the present application will be directed particularly to apparatus for practising the method.

My invention is illustrated in the accompanying drawing, which shows the same in perspective, with parts broken away to show the interior construction thereof.

In the drawing 1 designates the outer container, which in this case is a rectangular vessel of copper tinned inside, having a flanged upper edge 2 and a drain pipe 3 leading from the bottom and fitted with a suitable cock 4. An opening 5 is provided in the upper part of one side wall to receive an overflow pipe which will be presently described. Inside the outer container 1 is an inner container 6 of similar shape, but having its dimensions less in all directions, so that a space 7 will be left between the side walls of the inner and outer containers, extending all around between the same, and a similar space 8 beneath the bottom of the inner container. This bottom 9 of the inner container is reticulated or perforated, but the side walls are solid, so that circulation can only take place through the bottom. In order to maintain uniformity of spacing between the inner and outer containers I provide distance pieces or projections, marked 10 and feet 11 preferably on the inner container.

Fitted within the container is a rack composed of four upright angle pieces 12, carrying between them rectangular reticulated or perforated platforms or shelves 13. The rack is readily slid into and out of the inner container, and may be provided with any suitable or desired form of handles for this purpose, or it may be lifted by means of hooks inserted through the upper platform or through openings in the upper ends of the angle pieces.

Overlying and covering both containers is a hollow cover 14, having side walls 16, a top 15 and a bottom 17 with a series of perforations 18 extending all around the edges of the bottom 17 and when the cover is in position, opening communication between the chamber within said cover and the space 7 between the side walls of the inner and outer containers. The top of the cover is provided with a central opening 19 fitted with a plug 20 for the introduction of cooling water.

The inner container is provided with a short drainage pipe or nipple 21 near the top of one of its side walls, and directly opposite this, so as to register therewith when the parts are in position, is the opening 5 in the side wall of the outer container. A suitable overflow pipe 22 is connected to the nipple 21 through the opening 5 during operation.

In practising my method of pasteurizing with the apparatus thus described, the following steps are performed: First the rack 12—13 is removed and filled with bottles, some of which may also be placed upon the perforated bottom of the inner container if desired. I prefer, however, to support the bottles upon the rack alone, so that they can all be removed after sterilization by simply taking out the rack, which can then be reloaded and immediately replaced, or may be replaced without delay by a duplicate rack which has previously been loaded ready for the change. The latter mode of operating of course renders it possible to keep the sterilizer in constant operation without any loss of time. The loaded rack having been dropped into the inner container, the cover 14 is placed in position with its flanged edge fitting around the edge of the outer container and resting upon the upper flange 2 thereof, and its bottom 17, which is slightly domed or coned or otherwise raised, overlying the inner container. The containers are then filled with cool water which may be by means of the pipe 3, or any other suitable means of supply before or after the cover is put on. Heat is then applied to raise the temperature of the water. The simplest way to do this is by means of a flame or burners positioned beneath the bottom of the outer container. It should be understood that suitable heating means may be employed, whether coal, gas, electric or steam, all of which are well known in the art and need no description. The application of heat continues until the temperature of all the contents of the outer container, is raised to 140°, which may be determined, by a gage or thermometer, also not shown. This temperature is maintained for the required period of 20 to 30 minutes, and then the supply of heat is cut off, and cold water is introduced into the top 14 through the opening 19, from which the plug 20 is removed for that purpose. This cold water flows into the top, down over the inclined surfaces of the bottom 17, and through the openings 18 into the chamber or space 7 between the inner and outer containers. As the level of the water in this space is thus raised above the level of the drainage pipe or nipple 21, the top layer of hot water in the inner container flows out through the nipple 21 and the overflow pipe 22. At the same time, the cold water has a tendency to sink down and by convection gradually cool the heated water in the chamber or space 7, and also to absorb a certain amount of the heat from the inner container by conduction through the solid side walls thereof. Thus, there is a gradual abstraction of heat, and drainage of hot water from the top, until the cooled water has fallen below the bottom of the inner container when it will commence to rise through the perforated bottom 9, and gradually, both as regards its temperature and as regards its flow, to replace the hot water constantly raising the latter and causing it to drain off through the nipple 21 and pipe 22. At the end of a few minutes the process is complete, because the temperature of the bottles and their contents falls gradually with the temperature of the water surrounding them, and the heat passes off as it should, gradually from bottom to top of every object. After the desired minimum temperature is reached, the inflow of cold water is stopped, the cover 14 is removed and the rack 12—13 slid out and replaced with a fresh charge of bottles.

It is to be understood, that changes may be made in many details of this apparatus, and even in some of the structural features, without departing from the spirit of the invention, and all such changes are contemplated by me as included within the scope of the following claims. For example, I may use the opening in the top of the cover, or any other suitable means for introducing hot as well as cold water in the space between the inner and outer containers. In other words, I may first fill the machine with cold water, and then cause hot water to pass down through the space 7 and up through the bottom 9 of the inner container and out through the pipe 22, thereby gradually heating the bottles, as the cold water drains off from the top. I may also introduce hot water through the pipe 22, and cause it to pass down through the inner container, and then drain off, or I may otherwise vary the use of this apparatus.

The principal and essential feature of the invention is the gradual raising of temperature by convection or conduction or both, and the gradual reduction of the same by circulation, convection, and conduction in the general manner described.

Having thus described my invention what I claim is:

1. In a pasteurizing apparatus, an outer container adapted to hold fluid, an inner container therein, a cover for both containers, and means for draining off heated fluid, said inner container having solid side walls and a perforated or reticulated bottom, and an interior removable rack containing openings to permit the free circulation of pasteurizing fluid, and said cover extending over the intermural space between the containers and containing a chamber communicating through openings with said intermural space and adapted to receive fluid and conduct the same into said intermural space, whereby when the apparatus is closed and in operation, a continuous circulation of liquid may be produced through the hollow cover into the intermural space, down beneath the inner container, up through the reticulated bottom and the perforated rack around the articles to be pasteurized, and finally out of the drainage pipe in the upper part of the inner container.

2. A pasteurizing apparatus comprising an outer container 1, having solid sides and bottom, an inner container 6 having its several dimensions less than the corresponding dimensions of the outer container and held

therein so as to leave a space between the side walls and the bottoms of the two containers, said inner container having its upper part solid and its lower part perforated or reticulated, a perforated or reticulated rack within said inner container, drainage means extending from the upper part of said inner container, and a cover having a top, bottom and side walls inclosing a chamber, said cover being provided with an opening for the introduction of fluid, and said bottom extending over both containers and having a series of peripheral openings communicating with the intermural space between the containers when the cover is in place.

3. In a pasteurizing apparatus, an outer container adapted to hold fluid, an inner container therein, a cover for both containers, and means for draining off heated fluid, said inner container having solid side walls and a perforated or reticulated bottom, and an interior removable rack containing openings to permit the free circulation of pasteurizing fluid, and said cover extending over the intermural space between the containers together with means carried by said cover communicating through openings with said intermural space and adapted to receive fluid and conduct the same into said intermural space, whereby when the apparatus is closed and in operation, a continuous circulation of liquid may be produced through said means into the intermural space, down beneath the inner container, up through the reticulated bottom and the perforated rack around the articles to be pasteurized, and finally out of the drainage pipe in the upper part of the inner container.

4. In a pasteurizing apparatus, an outer container adapted to hold fluid, an inner container therein, a cover for both containers, and means for draining off heated fluid, said inner container having solid side walls and a perforated or reticulated bottom, and an interior removable rack containing openings to permit the free circulation of pasteurizing fluid, and said cover extending over the intermural space between the containers together with means communicating with the upper part of said intermural space through openings distributed over the entire area of said space, said means adapted to receive fluid and conduct the same into said intermural space, whereby when the apparatus is closed and in operation, a continuous circulation of liquid may be produced through said means into the intermural space, down beneath the inner container, up through the reticulated bottom and the perforated rack around the articles to be pasteurized, and finally out of the drainage pipe in the upper part of the inner container.

5. In a pasteurizing apparatus, an outer container adapted to hold fluid, an inner container therein, a cover for both containers, and means for draining off heated fluid, said inner container having solid side walls and a perforated or reticulated bottom, and an interior removable rack containing openings to permit the free circulation of pasteurizing fluid, and said cover extending over the intermural space between the containers, together with means extending over said intermural space and adapted to receive fluid and distribute the same with approximate uniformity over and into the said intermural space, whereby when the apparatus is closed and in operation, a continuous and uniform circulation of liquid of varying temperature may be produced through said means into the intermural space, down beneath the inner container, up through the reticulated bottom and the perforated rack around the articles to be pasteurized, and finally out of the drainage pipe in the upper part of the inner container.

In testimony whereof I affix my signature in presence of two witnesses.

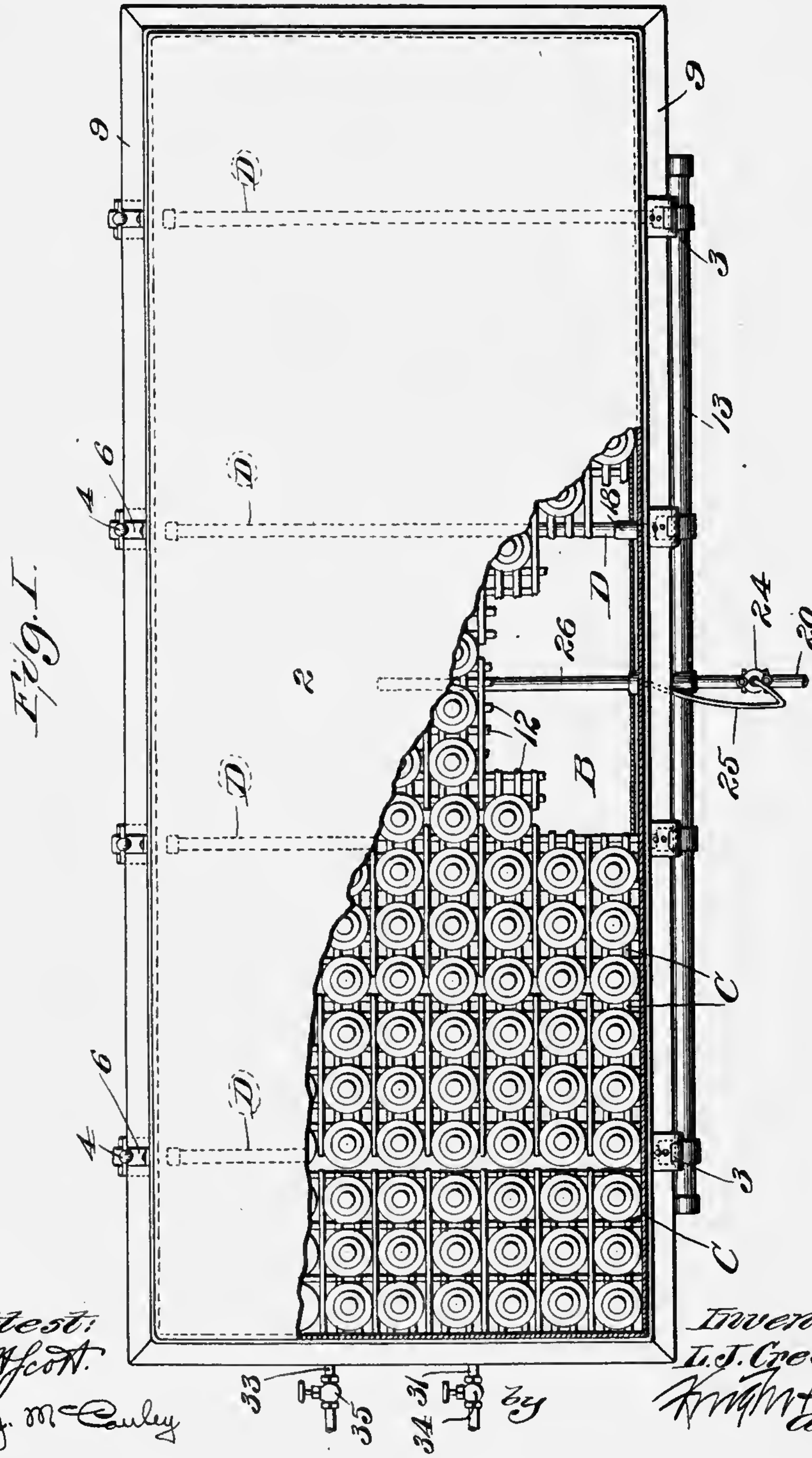
CHARLES O. ROBINSON.

Witnesses:
CLAUDE S. HAHN,
ALBERT S. BROWN.

L. J. CRECELIUS.
ART OF PASTEURIZING LIQUIDS.
APPLICATION FILED MAR. 3, 1915.

1,168,789.

Patented Jan. 18, 1916.
3 SHEETS—SHEET 1.



Attest:
Wm H Scott.
A. J. McCauley

Inventor:
L. J. Crecelius,
by Knight & Co.
Attys.

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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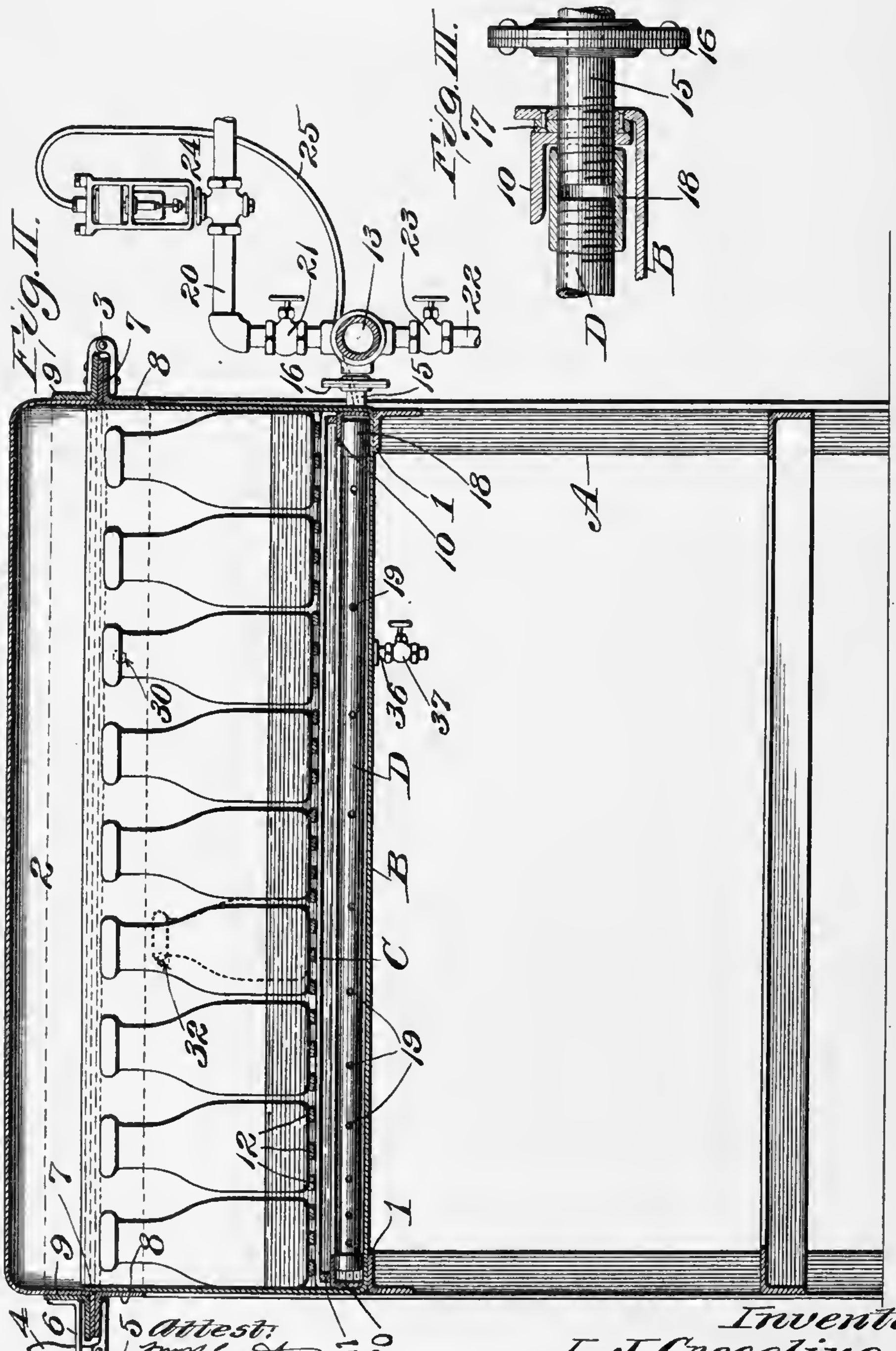
3 SHEETS—SHEET 2.



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THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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1,168,789. Patented Jan. 18, 1916.

3 SHEETS—SHEET 3.

Fig. IV.

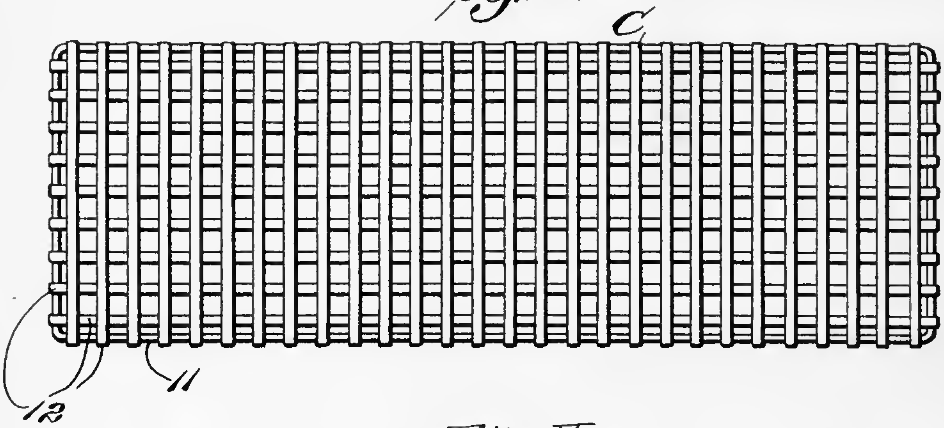


Fig. V.

Fig. VI.

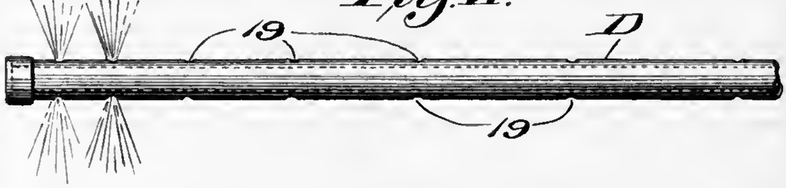
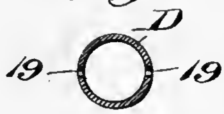


Fig. VII.



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Wm. H. Scott.
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Inventor:
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by Knight & Cook
Att'ys

THE COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

LOUIS J. CRECELIUS, OF ST. LOUIS, MISSOURI, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-FOURTH TO JOHN H. SASSEEN, ONE-FOURTH TO ALEXANDER E. FORBES, AND ONE-FOURTH TO EDWARD G. BORNEMANN, JOHN W. O'BRIEN, AND GEORGE F. KERWIN, ALL OF ST. LOUIS, MISSOURI.

ART OF PASTEURIZING LIQUIDS.

1,168,789. Specification of Letters Patent. **Patented Jan. 18, 1916.**

Application filed March 3, 1915. Serial No. 11,683.

To all whom it may concern:

Be it known that I, LOUIS J. CRECELIUS, a citizen of the United States of America, a resident of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in the Art of Pasteurizing Liquids, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to improvements in the art of pasteurizing liquids and more specifically stated to a method of pasteurizing substances contained in bottles or other containers.

One of the objects of the invention is to provide a simple and very efficient method of pasteurizing bottled milk.

Another object is to provide an improved method which comprises, placing bottled substance in a pasteurizing tank containing a liquid (preferably water) so that the lower portions of the bottles are submerged in the liquid, closing the tank to prevent the escape of vapor, heating the liquid so that the lower portions of the partially submerged bottles are heated by the liquid, while the upper portions of the bottles are subjected to the heat of the vapor which rises from the hot liquid. Since the upper ends of the bottles are not submerged, that liquid utilized in heating the bottles cannot leak through or around the bottle closures.

Another object is to provide a simple method which comprises, primarily heating the lower portions of the bottles containing the substance to be pasteurized, thereby causing said substance to circulate in the bottles at the beginning of the pasteurizing operation, and thereafter maintaining the bottles at a substantially uniform temperature throughout their length. An advantage gained by this is that the temperature of the bottled substance may be quickly raised to the desired degree, at the beginning of the pasteurizing operation.

A further object is to provide a novel method of cooling the pasteurized substance, which comprises introducing water or other liquid into the lower portion of the pasteurizing tank, thereby primarily cooling the lower ends of the bottles and gradually cooling the upper portions of the bottles as the water rises in the tank. By cooling bottled milk in this manner, the cream is separated from the milk and the cream gradually rises to the surface, a large body of cream being plainly visible at the upper portion of each bottle.

The invention also includes certain desirable new features, which will be hereinafter pointed out.

Figure I is a top or plan view of a pasteurizer adapted to be used in carrying out my method, a portion of the tank cover and a portion of the grates, which support the bottles, being broken away. Fig. II is a transverse section of the pasteurizer. Fig. III is a detail view illustrating a fragment of the tank and a portion of the sectional discharge pipe through which hot and cold fluid is conducted to the tank. Fig. IV is a top or plan view of one of the grate sections which support the bottled substance. Fig. V is an enlarged longitudinal section of the grate shown in Fig. IV, the middle portion of the grate being broken away. Fig. VI is an enlarged top or plan view of one of the discharge pipes. Fig. VII is a transverse section of one of the discharge pipes.

A designates a frame including angle bars 1, and B designates a tank resting on said angle bars and supported by the frame A. A closure 2 is connected to the tank by means of hinges 3.

4 designates latch arms pivotally supported at 5 and adapted to coöperate with fingers 6 carried by the closure 2, as shown most clearly in Fig. II. Packing 7 is preferably interposed between angle bars 8, secured to the upper margins of the tank, and angle bars 9 secured to the lower margins of the closure. The bottles containing the substance to be pasteurized, rest upon grate sections C which are separated from the bottom of the tank B. The ends of the grate sections C preferably rest upon angle bars 10 secured to the side walls of the tank B. Each grate section C preferably comprises a flat marginal bar 11 bent to form a rectangular frame, and a series of transverse and longitudinal grate bars secured to said frame.

13 designates a manifold located adjacent to one side of the tank, and 15 designates branch pipes leading from said manifold.

Each branch pipe preferably consists of a number of pipe sections connected by means of a coupling 16 located exteriorly of the tank, said sections being secured to a side wall of the tank as shown in Fig. III. The angle bar 10 which supports the different grate sections is preferably threaded to receive the branch pipe sections and threaded washers 17 are preferably located between and secured to the angle bar 10 and a side wall of the tank B. The branch pipe sections extending through the tank are coupled onto discharge pipes D by means of threaded couplings 18, see Fig. III.

It will be noted that the discharge pipes D may be readily secured to or removed from the coupling members 18. Each discharge pipe D is provided with two rows of discharge openings 19, see Figs. VI and VII.

20 designates a supply pipe for conducting steam to the manifold 13, and 21 is a manually operable valve for opening and closing communication between the steam supply and the manifold. A cold water supply pipe 22 leading to the manifold 13, is provided with a valve 23. A thermostatic valve 24 secured to the steam supply pipe, may be constructed in any suitable manner to automatically control the flow of steam during the pasteurizing operation.

25 designates a tube leading from the thermostatic valve 24 to a controller tube 26 arranged in the tank B at a point below the grate sections.

In carrying out my method, the milk or other bottled substance is placed in the tank B, the bottles being closed by closures which will not be forced from the bottles by such expansion of the milk as occurs during the pasteurizing operation. The tank cover 2 is closed to prevent the escape of vapor from the tank. The valve 23 in the cold water supply pipe is closed and the manually operable valve 21, in the steam-supply pipe, is opened to admit steam to the manifold 13. The bottles are partially submerged in a liquid, preferably water, and the steam flowing into the manifold is discharged through the discharge pipes D located below the bottles. The discharge openings 19 in the discharge pipes are so arranged that the steam is discharged horizontally as shown in Fig. VI. To insure a substantially uniform discharge of steam throughout the plane of the rows of discharge openings 19, the discharge openings nearest the steam supply, *i. e.* nearest the manifold 13, are separated from each other a distance greater than the distance between the discharge openings near the closed end of the discharge pipe. The relative positions of the unequally spaced discharge openings is shown in Figs. II and VI.

The temperature of the water is gradually raised by the steam flowing from the discharge pipes D and the steam supply is automatically controlled by the thermostatic valve which closes when the temperature in the tank rises to a predetermined degree, which is usually about 146°.

At the beginning of the pasteurizing operation the lower portions of the bottles are heated by the water in the lower portion of the tank B, and the milk circulates in the bottles as previously pointed out. The circulation is finally stopped by the uniform heating action of the hot vapor rising from the water, the vapor being utilized to heat the upper portions of the bottles which are not submerged, and after about 20 minutes the temperature is substantially uniform throughout the tank and it is maintained at a predetermined degree for any desired length of time.

After the pasteurizing operation the manually operable valve 21 in the steam supply pipe, is closed to shut off the steam, and the valve 23 in the cold water supply pipe 22 is opened to admit water to the manifold 13. The bottled substance is gradually cooled by the cold water which rises gradually in the tank and during this cooling operation the cream gradually rises to the upper ends of the bottles. The water finally overflows through a discharge opening 30 and through a pipe 31 leading from said opening. It will be noted that the discharge opening 30 is so located that the water cannot rise to a point above the upper ends of the bottles, the object being to prevent the cold water, (which may be in an unsanitary condition) from collecting on the upper ends of the bottles where it may accidentally leak through the bottle closures.

To provide for the overflow of liquid when the substance to be pasteurized is contained in small bottles (see dotted lines Fig. II) the tank is preferably provided with an overflow opening 32 and a discharge pipe 33 leading from said opening. The valves 34 and 35 in the discharge pipes 31 and 33 are closed during the pasteurizing operation.

After the temperature drops to the desired degree, the water is drained from the tank through a drain pipe 36 shown in Fig. II.

37 designates a valve for opening and closing the drain pipe. This valve may be closed before all of the water escapes from the tank, thereby leaving a quantity of water to be used as a heating medium during a subsequent pasteurizing operation.

I claim:—

1. The method of pasteurizing which comprises placing the substance to be pasteurized in containers, placing said containers in a tank and introducing liquid into said tank so that the lower portions of the containers are submerged in said liquid, heating said liquid to produce a hot vapor

which surrounds the upper portions of the containers, and closing said tank to confine the hot vapor.

2. The method of pasteurizing which comprises placing the substance to be pasteurized in containers, placing said containers in a tank and introducing liquid into said tank so that the lower portions of the containers are submerged in said liquid, heating said liquid to produce a hot vapor which surrounds the upper portions of the containers, and closing said tank to confine the hot vapor, and thereafter cooling the pasteurized substance by introducing a cooler liquid into said tank to almost completely submerge the containers, the upper ends of the containers being exposed above the surface of said liquid.

3. The method which comprises heating bottled milk for the purpose described, and thereafter gradually cooling it by first cooling the lower portions of the bottles and then gradually cooling the upper portions of the bottles.

4. The method which comprises heating bottled milk for the purpose described, and thereafter cooling it by subjecting the hot bottles to the action of a cooler fluid which primarily surrounds the lower portions of the bottles and then gradually rises to a plane near the upper ends of the bottles.

5. The method which comprises heating bottled milk in a pasteurizing tank, and thereafter cooling the milk by gradually introducing a comparatively cool liquid into said tank so that said liquid will primarily surround the lower portions of the bottles and then gradually rise to a level near the upper ends of said bottles.

6. The method of pasteurizing which comprises placing the substance to be pasteurized in containers, placing said containers in a tank and introducing liquid into said tank to submerge the lower portions of the containers in said liquid, heating the liquid to gradually heat the containers, and thereafter gradually cooling the containers by gradually introducing a cooler liquid into the tank so that the cool liquid will primarily surround the lower portions of the partially submerged containers and then gradually rise to a level near the upper ends of said containers.

7. The method of pasteurizing which comprises, placing the substance to be pasteurized in containers, heating the lower portions of the containers to cause the substance to circulate therein, and thereafter stopping the circulation by subjecting the entire surfaces of the containers to the action of a heating medium which is substantially uniform in temperature at all points throughout the outer surface of the containers.

8. The method of pasteurizing which comprises placing bottled milk in a tank, heating a liquid in the lower portion of said tank to primarily heat the lower portions of the bottles, thereby causing the milk to circulate in the bottles, and causing the upper portions of the bottles to be subjected to the heat of the vapor which rises from the liquid in said tank.

L. J. CRECELIUS.

In the presence of—
E. K. Clark,
A. J. McCauley.

which surrounds the upper portions of the containers, and closing said tank to confine the hot vapor.

2. The method of pasteurizing which comprises placing the substance to be pasteurized in containers [illegible] ers in a tank and introducing [illegible] said tank so that the lower portions of the containers [illegible] submerged [illegible] liquid, heating said liquid to produce [illegible] vapor which surrounds the upper portions of the containers, and closing said tank to confine the hot vapor, and thereafter cooling the pasteurized substance by introducing a cooler liquid into said tank to completely submerge the containers [illegible] ends of the containers being [illegible] the surface of said liquid.

3. The method which comprises [illegible] bottled milk for the purpose [illegible] and thereafter gradually cooling [illegible] first cooling the lower portions of the bottles and then gradually cooling the upper portions of the bottles.

4. The method which comprises [illegible] bottled milk for the purpose [illegible] and thereafter cooling [illegible] bottles to the [illegible] primarily surrounding the lower portions of the bottles and then gradually [illegible] placing [illegible] levels of [illegible] the [illegible].

5. The method which comprises [illegible] bottled milk in a pasteurizing tank and thereafter cooling the milk by [illegible] introducing a comparatively cool liquid into said tank so that said liquid will primarily surround the lower portions of the bottles and then gradually rise to [illegible] the upper ends of said bottles.

Copies of this patent may be obtained for [illegible] cents each, by addressing the [illegible] Washington, D.C."

N. J. NIELSEN.

METHOD AND MEANS FOR THE TREATMENT OF FLUIDS CONTAINING FAT GLOBULES, CASEIN, AND SUGAR.

APPLICATION FILED FEB. 27, 1914.

1,168,823.

Patented Jan. 18, 1916.

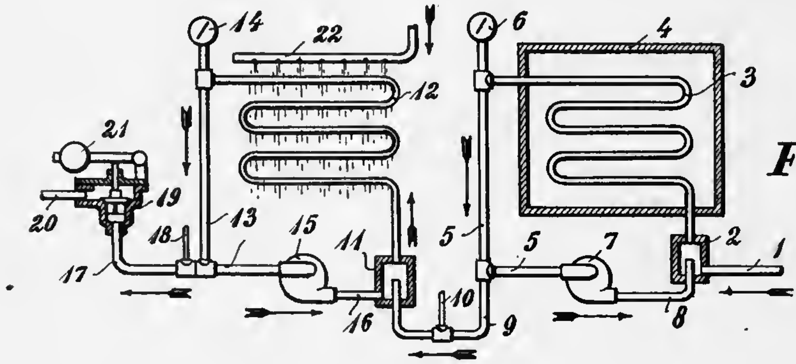

Fig. 1.

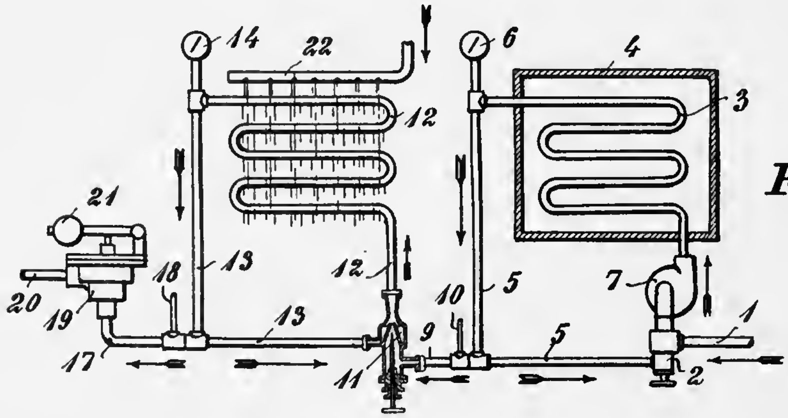

Fig. 2.

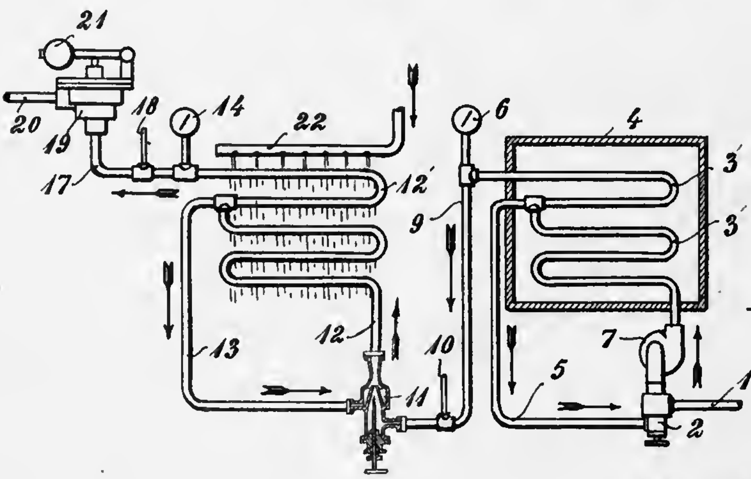

Fig. 3.

Niels J. Nielsen,
Inventor.

By B. Singer,
Attorney.

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UNITED STATES PATENT OFFICE.

NIELS JONAS NIELSEN, OF AARHUS, DENMARK.

METHOD AND MEANS FOR THE TREATMENT OF FLUIDS CONTAINING FAT GLOBULES, CASEIN, AND SUGAR.

1,168,823. Specification of Letters Patent. Patented Jan. 18, 1916.

Application filed February 27, 1914. Serial No. 821,462.

To all whom it may concern:

Be it known that I, NIELS JONAS NIELSEN, subject of the Kingdom of Denmark, residing at No. 15 Frederiksgade, Aarhus, Denmark, have invented certain new and useful Improvements in Methods and Means for the Treatment of Fluids Containing Fat Globules, Casein, and Sugar, of which the following is a specification.

My invention consists of a method for the treatment of milk, cream and similar fluids containing fat globules, casein and lactine and of the means necessary for the application of the treatment.

By the application of the method a double advantage is obtained, viz. a complete sterilization of the fluid as all living organisms are killed, and further a certain, more or less considerable change of consistency of the fluid which is obtained thereby that the state of the fat globules and the lactine is changed during the treatment.

By the already known methods of sterilizing fluids containing fat globules and casein is found the drawback that the state of the fat globules and the lactine cannot be predetermined during and after the treatment, as the fat globules, if they are heated under pressure to 110° C. and thereafter exposed to a considerably lower pressure, will burst, while the lactine when heated to a temperature of about 128° C. will change its state and bring about a coloring and a disagreeable taste of the fluid.

By the present invention one is able completely to control the state of the fat globules and the lactine during and after the treatment partly by maintaining a fixed relation between the pressures of the fluid during the heating and cooling process and a fixed relation between the temperature before the cooling and the pressure under which the latter takes place, partly by cooling the fluid during the heating process a great number of times with short intervals and by heating it during the cooling process in a similar manner.

In the drawing are illustrated the means for carrying out the method in question.

Figure 1 shows an apparatus having the same pressure in the heater and the cooler. Fig. 2 shows an apparatus having the same or different pressures in the heater and cooler. Fig. 3 shows an apparatus as in Fig. 2 but with modifications respecting heating and cooling.

The apparatus shown in Fig. 1 consists of a pipe 1 leading from a forcing-pump or an elevated reservoir to a chamber 2. From this chamber a spiral tube 3 which is arranged in a closed reservoir 4 containing heated water or steam leads a pipe 5 having a pressure gage 6 and being connected with a circulation pump 7, the latter being by means of a pipe 8 connected with the chamber 2. From the pipe 5 another pipe 9 having a thermometer 10 leads to a mixing chamber 11, the latter being connected with pipe 13 by means of a spiral tube 12, tube 12 being irrigated by water from pipe 22 and the pipe 13 having a pressure gage 14. The pipe 13 leads to a circulating pump 15 which by means of a pipe 16 is connected with the mixing chamber 11. From the pipe 13 a pipe 17 having a thermometer 18 leads to a control-valve 19 with a spring or weight 21 and provided with a pipe 20.

The above described apparatus works in the following manner: The valve 19 is loaded so that a certain pressure of the fluid in the spiral tube 12 may be obtained, the said pressure—dependent upon the resistance in the pipes and the capacity of the pumps 7 and 11—standing in a definite relation to the pressure in the spiral tube 3, but being always lower than this. The fluid which is to be treated is led in cold state through the pipe 1 into the chamber 2 and from here farther through the spiral tube 3, in which it is heated, to the pipe 5. From here a part of the fluid passes through the pipe 9 to the chamber 11, while another part passes through the pipe 5 to the pump 7, which forces the fluid through the pipe 8 into the chamber 2. The heated fluid will here meet the cold fluid coming from the pipe 1 and mix with it. The hot fluid will thereby be suddenly cooled and the cold fluid be suddenly heated. The fluid thereafter passes on to the heater 3. A quantity of fluid is thus continually supplied through the pipe 1 and a similar quantity of fluid passes through the pipe 9. At the same time a considerably bigger quantity of fluid is circulating through the heater 3 and the pump 7, the fluid being for every circulation heated in the heater 3 and cooled in the cooling chamber 2. The heated fluid led to the chamber 11 is forced from here through the spiral tube 12 which is irrigated with cold water supplied through pipe 22 or kept cooled by other means. The spiral tube 12 leads to the pipe 13 and through the latter the fluid passes one part to the pipe 17 and another part to the pump 15 the latter being by means of the pipe 16 connected with the chamber 11. Here a similar process takes place as in the heater, the cold fluid from the pipe 16 being mixed in the chamber 11 with the hot fluid from the pipe 9, the cold fluid being thereby suddenly heated and the hot fluid suddenly cooled. The fluid passes then through the pipe 17 to the valve 19 and from here through the pipe 20 to a reservoir. In the chamber 2 the hot fluid coming from the tube 5 will mix with the cold fluid supplied from the tube 9, thereby a sudden heating of the cold fluid and a corresponding cooling of the hot fluid. In the chamber 11 the cold fluid supplied from the tube 13 will in a similar manner mix with the hot fluid supplied from the tube 9, so that the cold fluid is suddenly heated and the hot fluid suddenly cooled. This is of the greatest importance both to the sterilization of the fluid and to the consistency of the substances contained in the fluid.

The apparatus shown in Fig. 2 is made with some modifications, the mixing chambers 2 and 11 being made as injectors with means for adjusting a movable piece at the end of the pipe 9 so as to vary the injector effect. By this arrangement the pump 15 may in certain cases be omitted, and the difference of pressure between the fluid in the heater and in the cooler may be kept greater. These differences in pressure and temperature are important since they cause the more or less complete bursting of the fat globules, it being desirable for the subsequent employment of the fluid for certain purposes that the fat globules shall be bursted.

In Fig. 3 the apparatus is built as in Fig. 2 but with an alteration of the heating tube 3 and the cooling tube 12, in this figure the circulating pipes 5 and 13 issue from the spiral tubes 3′ and 12′ in such a manner that the latter are elongated a certain distance before they are connected with the pipes 9 and 17.

Having now particularly described and ascertained the nature of my said invention I declare that what I claim is:

1. The method of treating liquids containing fat globules, casein and lactine, consisting in circulating two bodies of the liquid in closed circuits maintaining the pressure and temperature of the liquid in one of said circuits above the pressure and temperature in the other of said circuits, introducing said liquid into said circuit having the higher temperature, leading liquid from said last mentioned circuit into said cooler circuit, and discharging liquid from said cooler circuit, the circulation in said two circuits being maintained at high speed, and the relative pressures and temperatures being such that the fat globules will be bursted.

2. An apparatus for treating liquids containing fat globules, casein and lactine, comprising in combination two closed circuits for the liquid, means for circulating the liquid in said circuits, means for heating one circuit and cooling the other circuit, means for leading liquid into the heated circuit, means for leading liquid from the heated circuit to the colder circuit, means for discharging liquid from said colder circuit, and means for intimately mixing the liquid in said circuits with the liquid introduced thereinto.

In witness whereof I have hereunto set my hand.

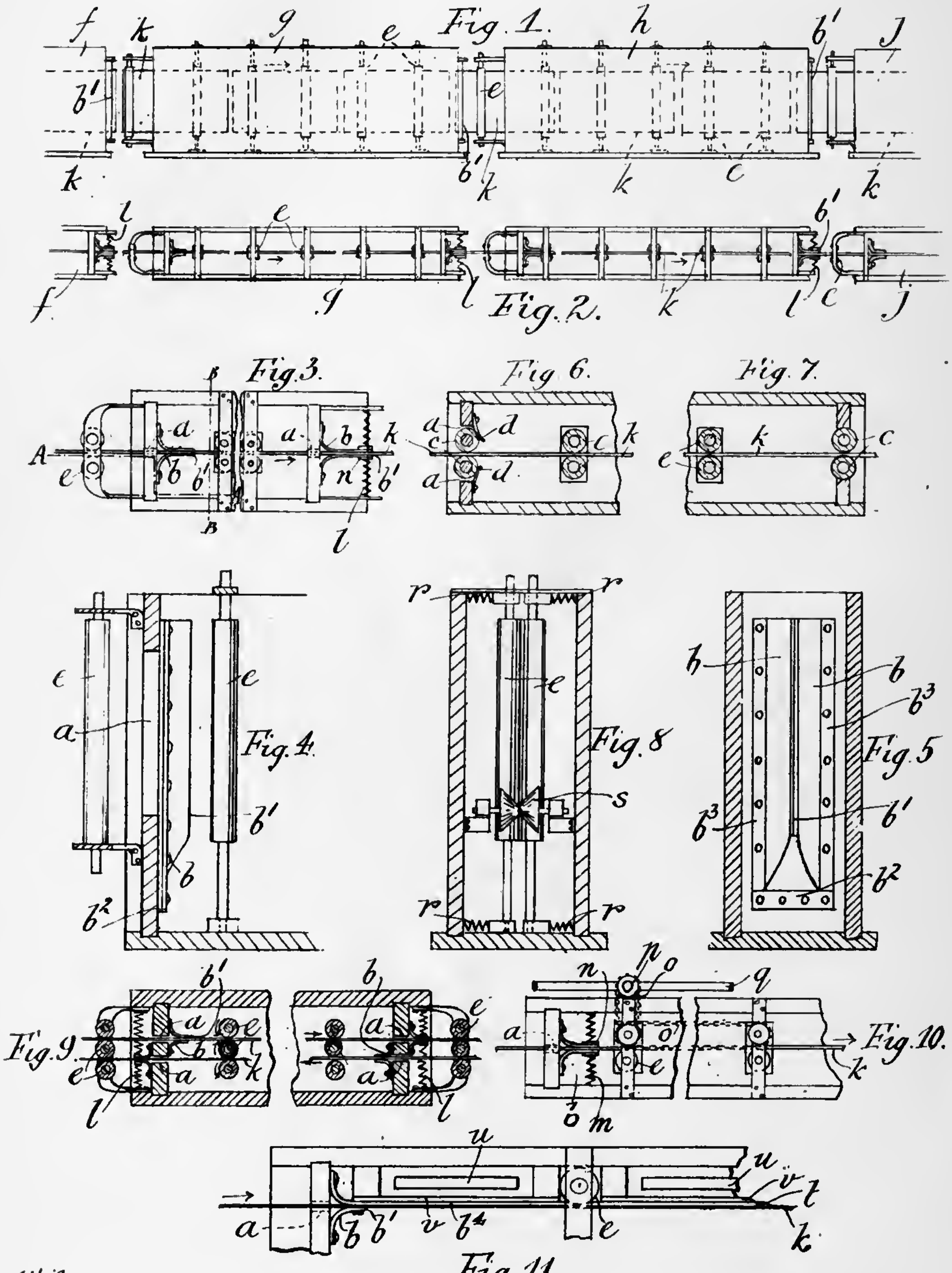
NIELS JONAS NIELSEN.

A. E. BATTLE.

APPARATUS FOR USE IN AND IN CONNECTION WITH ELECTROLYTIC PROCESSES.

APPLICATION FILED MAY 24, 1915.

1,191,386. Patented July 18, 1916.



Witnesses:
H.T.P. Gee
S.H. Webb.

Inventor:
A.E. Battle

By. H.T.P. Gee Attorney.

UNITED STATES PATENT OFFICE.

ALBERT ERNEST BATTLE, OF ALDGATE, LONDON, ENGLAND.

APPARATUS FOR USE IN AND IN CONNECTION WITH ELECTROLYTIC PROCESSES.

1,191,386. Specification of Letters Patent. **Patented July 18, 1916.**

Application filed May 24, 1915. Serial No. 30,227.

To all whom it may concern:

Be it known that I, ALBERT ERNEST BATTLE, subject of George V, King of Great Britain and Ireland, and residing at Newlyn House, 4 and 5 High street, Aldgate, in the county of London, England, have invented certain new and useful Improvements in Apparatus for Use in and in Connection with Electrolytic Processes, of which the following is a specification.

This invention is concerned with apparatus for handling work in the form of thin sheets or plates, in various electrolytic and similar processes, such as the electro-deposition of metal on to such surfaces, the removal of a surface metal from thin sheets, as for instance tin from tinned plate and the cleaning or pickling of metal sheets by an electrolytic or chemical process.

According to this invention the sheets are fed into and out of the electrolyte or solution through a slit or opening or elongated valve by means of rollers or similar means, so that the sheets enter or leave the vat, as the case may be, below the level of the solution. The rollers and slits are arranged so that the path of the sheets or plates can be continuous through a series of vats, in which such operations as pickling, washing electro-depositing and the like may be carried out. Thus, if this path is horizontal, the sheets or plates will enter and leave the various vats through slits in the ends of the vats. If the path is a vertical one, the various vats may be placed one above the other and the sheets or plates may enter through slits in the bottom and leave at the open top of the vat. Of course the direction may be reversed and the sheets made to enter at the top and leave by the slit at the bottom.

In order that my invention may be clearly understood and readily carried into effect, I will proceed to describe one form of it with reference to the accompanying drawings, in which like letters of reference indicate like parts in all the views.

Figure 1 shows in elevation an arrangement of vats adapted for a series of electroplating operations. Fig. 2 is a plan of Fig. 1. Fig. 3 shows in broken plan a vat having valves provided with flaps for preventing escape of the solution through the slits while the sheets are under treatment in the vat. Fig. 4 is a section on line A—A of the left-hand end of Fig. 3. Fig. 5 is a section on line B—B of Fig. 3. Fig. 6 shows in horizontal section a portion of a vat having a modified form of valve, and Fig. 7 is a similar view illustrating a further modified form of valve. Fig. 8 shows in vertical section a vat having a horizontal roller for supporting the thin sheets, also springs for keeping the vertical rollers in close engagement with the thin sheets. Fig. 9 shows in broken horizontal section a vat constructed so that two lines of work can be passed therethrough. Fig. 10 shows in broken plan a portion of a vat with means for driving the rollers. Fig. 11 shows in plan a portion of a vat designed for treating one side only of the thin sheets.

In carrying out this invention, the vat is provided at each end with a slit or slot *a* combined with suitable means for rendering it liquid-tight when the thin sheets are under treatment in the vat. Such means may comprise flexible flaps *b* covering the slit or slot *a*, as shown in Figs. 1, 2, 3, 4, 5, 9, 10, and 11, or flaps *d* and rollers *c*, as shown in Fig. 6, or rollers, *c*, only, as shown in Fig. 7.

The rollers for feeding the thin sheets through the vats are shown at *c*, and are arranged to be in close contact with one another when there is no thin sheet between them, as shown clearly in Fig. 8. The rollers *c* Figs. 6 and 7, are similarly arranged, as also are the flaps *b*, see Fig. 5. Thus, when the thin sheets enter between the flaps or rollers, as the case may be, they press tightly upon the same and thereby make a close joint.

The nose portion b^1 of the flaps is so dimensioned as to cover an appreciable area of the thin sheets in order to make a more efficient joint.

Preferably, the flaps are made of rubber, and the rollers are, in some cases, covered with the same material.

Where flaps are employed to make the joint their nose portion b^1 is directed along the line of motion of the thin sheets; this will be understood on reference to the arrows shown in the drawings. The flaps are also preferably curved at their mouth or entrance end, as shown in the drawings, so as not only to facilitate the entry of the thin sheets between them, but also to insure that their mutually opposed faces shall not be suddenly opened, but only gradually so, as the thin sheets travel forward. In this way, any undue escape of liquid is prevented. Thus, non-continuous lengths of work are, by means of any of the forms of valve above described, enabled to be passed through the vat without any harmful loss of solution. Such valves have proved to be very efficient and, moreover, owing to their large wearing surface, very durable.

The arrangement of the vats *f*, *g*, *h*, *j*, indicated in Figs. 1 and 2, is suitable for a series of operations such as pickling (electrolytic or chemical), washing after pickling, electro-depositing, and cleaning after electro-depositing, respectively. In this arrangement the sheets or plates *k* are shown following a horizontal path through the several vats, being passed along by the rollers *e* and entering and leaving the vats below the level of the liquid.

The flaps *b* can be made from a strip of rubber, rubber insertion or similar material of a length about equal to the depth of the vat. The bottom of this strip is fastened flat against the end of the vat covering the slit as shown at b^2, Figs. 4 and 5, and the strip is then drawn in so as to form the nose or fold b^1 along its center line. When drawn in enough to give sufficient bearing surface to the folded part, the side edges are fastened to the end of the vat as shown at b^3. The rubber strip is then cut along the fold at the center line so as to form the valve through which the sheets can pass into or out of the vat. These flaps or valves can of course be molded of suitable material to the required shape instead of being made from a strip of rubber as above described.

The flaps or valves at the entrance end of the vat are placed inside so that the pressure of the liquid will keep the two parts thereof pressed toward each other and so make a watertight joint on the sheet or plate. At the other or exit end of the vat they are placed outside, and springs such as 1, (Figs. 2, 3 and 9) are provided to exert a pressure on the two parts of the valve greater than that exerted by the liquid inside, and so keep them pressed toward each other to make a watertight joint on the sheets or plates. Similar springs may of course be placed on the valves at the entrance end as shown at *m* in Fig. 10, to act in addition to the pressure of the liquid. The nose portion of the flaps may, if desired, be reinforced by strips *n* (Figs. 3, 9 and 10) of suitable material.

The feed rollers *e* are driven in any suitable manner as, for instance, by means of chains *o* and toothed wheels *p* driven from a shaft *q*, see Fig. 10.

Referring now to Fig. 6, the rollers *e*, which constitute feed-rollers, are placed in the slit or opening *a* in direct contact with the flaps *d* so that the latter press against them. This is a very suitable arrangement when very thin sheets are being handled, as they then encounter no obstable to this passage into or out of the vat. In some cases, however, when the rollers are placed in the slit or opening of the vat, the flaps may be dispensed with as shown in Fig. 7, the rollers themselves being then made to fit closely at the sides and bottom, or any suitable means of packing may be adopted to render the sides and bottom of the rollers watertight.

The rollers may be made to give electrical contact with the thin sheets, if such is required, in any of the vats, or they may be made of non-conducting material and the electrical contact made by other suitable means.

Arrangements may be made to keep the rollers pressed together by springs *r*, Fig. 8, or other suitable means. The rollers may thus be used to press on and level the deposited metal in the plating vat. Revolving and sliding brushes may be arranged to work on the surfaces of the sheets as they are passed along by the rollers.

To assist in keeping the sheets or plates in the correct path and to take the weight of them, small rollers such as the V-shaped one *s* shown in Fig. 8, may be fitted.

It is an advantage to be able to treat one side only of the metal sheets, as for instance in electro-deposited tinned plate, where no tin, or only a very slight deposit may be wanted on one side and a good deposit on the other. This may easily be done according to my invention by blocking off either entirely or partially one side of the sheets from electrolytic action. Fig. 11 shows how this may be simply arranged for by providing one of the flaps *b* with an extension b^4 extending up to the first inside roller *e*. The flap would be jointed to the bottom of the vat so that no liquid could get in behind it. Similar extended flaps would be fitted between the sets of rollers a portion of one of these being indicated at *t*. Magnets *u* may be placed behind these extended flaps so that the sheets are, by the attraction exerted by the magnets, kept in close contact with the flaps and thereby exclude the liquid.

v shows a backing for the extended flaps.

It is obvious that any number of lines of work may be passed through the vats if the latter are made wide enough. They may all pass in the same or in opposite directions, as desired, with independent sets of rollers or the rollers may be arranged to pass alternate lines in alternate directions, as shown in Fig. 9.

The anodes may also be made to pass through rollers, slits and valves in the same way as the sheets or cathodes either in the same or in opposite direction. By this means the tin from a tinned plate made by the usual method of dipping in molten tin may be entirely or partially removed and deposited on to other sheets.

I claim:—

1. In electrolytic apparatus for treating

disconnected sheet members, a vat adapted to contain liquid and having an elongated opening, self-closing flaps covering said opening, feed-rollers without and within the vat, means for keeping the feed-rollers in driving contact with the sheet members, and means for driving the feed-rollers.

2. In electrolytic apparatus for treating disconnected sheet members, a vat adapted to contain liquid and having an elongated opening at each end, self-closing flaps covering said openings, feed rollers without and within the vat, means for keeping the feed-rollers in driving contact with the sheet members, and means for driving the feed-rollers.

3. In apparatus for use in handling sheets in and in connection with electrolytic and similar processes, a vat adapted to contain solution and having an elongated opening at each end, and flaps and rollers closing said openings, said flaps being adapted to press upon said rollers.

4. In apparatus for use in handling sheets in and in connection with electrolytic and similar processes, a vat adapted to contain solution and having an elongated opening at each end, and rollers closing said openings.

5. In apparatus for use in handling sheets in and in connection with electrolytic and similar processes, a vat adapted to contain solution and having an elongated opening through which the sheet can pass, flaps covering said opening, one of said flaps having an extended portion b^4 for shielding one side of said sheets from electrolytic or chemical action while they are in motion through the vat.

6. In apparatus for use in handling sheets in and in connection with electrolytic and similar processes, a vat adapted to contain solution and having an elongated opening through which the sheets can pass, flaps covering said opening, one of said flaps having an extended portion such as b^4 for shielding one side of said sheets from electrolytic or chemical action while they are in motion through the vat, and electrical means for maintaining the sheets in close engagement with said extended portion.

7. In electrolytic apparatus for treating disconnected sheet members, a vat adapted to contain liquid and having an elongated opening at each end, flaps covering said openings, springs for pressing said flaps into close contact with the sheet members, feed-rollers without and within the vat, means for keeping the feed-rollers in driving contact with the sheet members, and means for driving the feed-rollers.

8. In electrolytic apparatus for treating disconnected sheet members, a vat adapted to contain liquid and having an elongated opening, flaps covering said opening, and means for feeding the sheet members through the vat so constructed and arranged that they cause the sheet members to be fed independently of one another.

9. In electrolytic apparatus for treating disconnected sheet members, a vat adapted to contain liquid and having an elongated opening, flaps covering said opening, and means within the vat for feeding the sheet members therethrough so constructed and arranged that they cause the sheet members to be fed independently of one another.

10. In electrolytic apparatus for treating disconnected sheet members, a vat adapted to contain liquid and having an elongated opening, flaps covering said opening, and feed rollers within the vat for feeding the sheet members therethrough so constructed and arranged that they cause the sheet members to be fed independently of one another.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ALBERT ERNEST BATTLE.

Witnesses:
JOHN FRANK BONIFACE,
W. E. YOUNG.

H. M. RUDD.
COMBINED PASTEURIZING, HOLDING, AND COOLING MEANS.
APPLICATION FILED DEC. 11, 1915.

1,214,376. Patented Jan. 30, 1917.

2 SHEETS—SHEET 1.

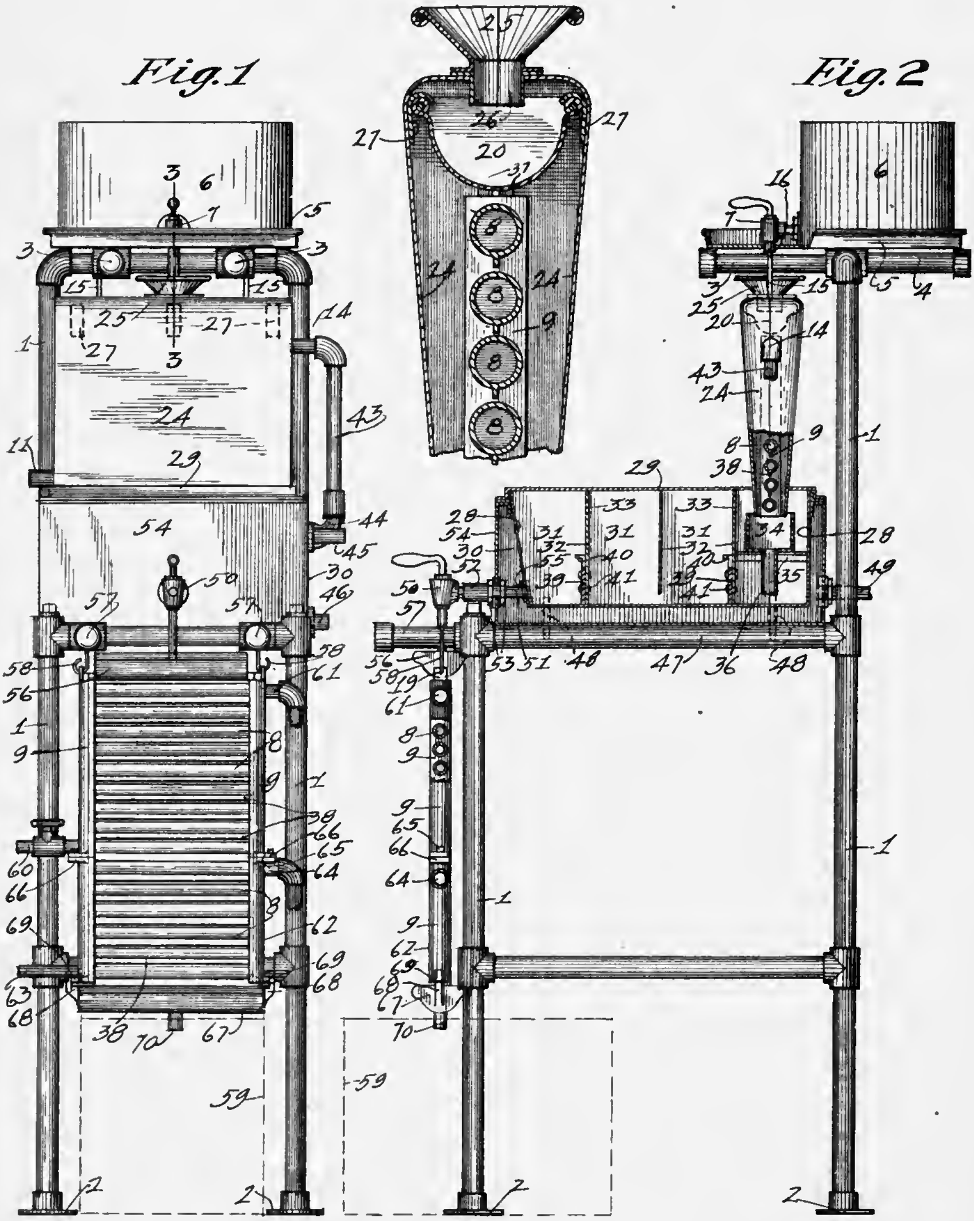


Fig.3

Fig.1

Fig.2

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By Luther L. Mead
Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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COMBINED PASTEURIZING, HOLOING, AND COOLING MEANS.

APPLICATION FILED DEC. 11, 1915.

1,214,376. Patented Jan. 30, 1917.

2 SHEETS—SHEET 2.

Fig. 9

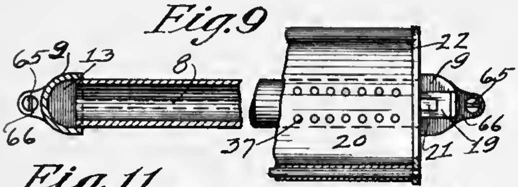


Fig. 10

Fig. 8

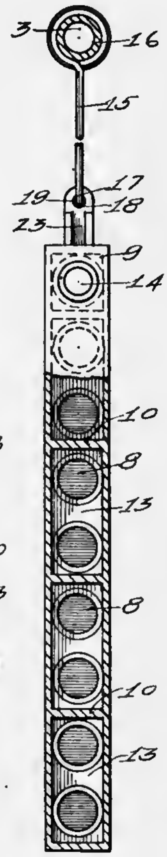


Fig. 11

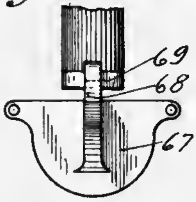


Fig. 12

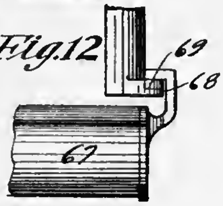


Fig. 7

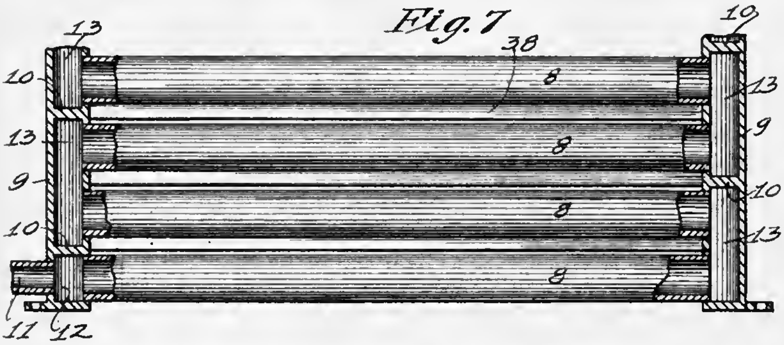


Fig. 4

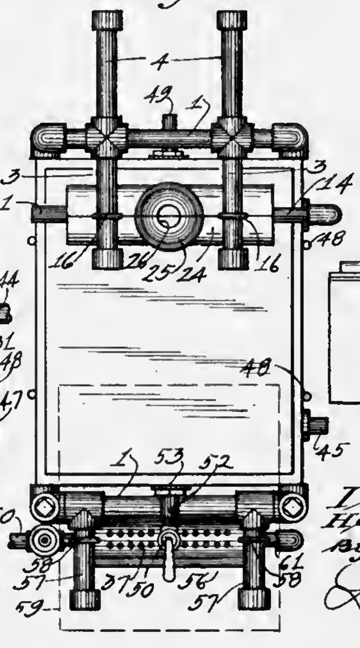


Fig. 5

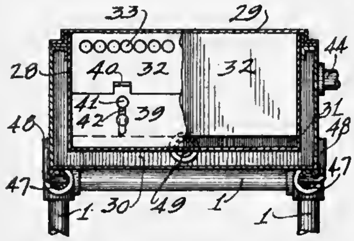
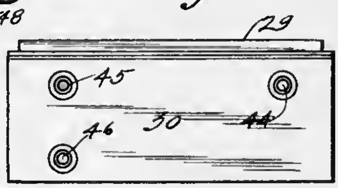


Fig. 6



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Inventor,
Henry M. Rudd
By L. Luther L. Mack
Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HENRY M. RUDD, OF LOS ANGELES, CALIFORNIA.

COMBINED PASTEURIZING, HOLDING, AND COOLING MEANS.

1,214,376. Specification of Letters Patent. Patented Jan. 30, 1917.

Application filed December 11, 1915. Serial No. 67,288.

To all whom it may concern:

Be it known that I, HENRY M. RUDD, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Improvement in Combined Pasteurizing, Holding, and Cooling Means, of which the following is a specification.

My invention relates to pasteurizing mechanism for use in dairies and like places and particularly to a form of device which includes in addition to the pasteurizing means, means for temporarily storing and holding the milk or liquid and subjecting the same to a slightly reduced temperature than that employed in the pasteurizing process, and also means for cooling the liquid after a predetermined length of time. All of the elements above enumerated are incorporated in the device hereinafter described and they are arranged in compact form and are readily accessible for the purpose of cleaning, etc.

It is necessary that the several elements employed in a device of this kind should be easily disassembled for the purpose of sterilization after each operation, and in my invention each of the elements is suspended or otherwise held loosely in position in such a manner that it may be individually displaced from the assembled mechanism and separately cleaned or sterilized.

Heretofore the pasteurizing process has only occasionally been employed by the small dairies because of the prohibitive price of the modern pasteurizing mechanism which involves the use of large machine operated plants, requiring either electricity or engine for supplying power to the mechanism. It has also been the practice heretofore to embody the pasteurizing, storing and cooling of the milk in separate processes and by separate mechanisms. In my device, as hereinbefore stated all of these operations are effected in the single mechanism, which being portable, and relatively small and simple in comparison with the usual methods and means, may be supplied to the small dairies at a price within their means, notwithstanding the fact that it meets all of the requirements imposed by recent legislation for the prevention of supplying impure milk.

My invention is fully disclosed in the specifications hereinafter following and in the accompanying drawings, in which similar characters of reference indicate the same parts throughout the several views, and in which—

Figure 1 is a front elevation of the assembled mechanism; Fig. 2 is a side elevation of the same, partly in section; Fig. 3 is an enlarged sectional elevation of the upper portion of the pasteurizer and cover therefor; Fig. 4 is a plan of Fig. 1; Fig. 5 is a transverse sectional elevation of the milk holder and heater; Fig. 6 is a side elevation of Fig. 5; Fig. 7 is an elevation of the lower portion of the cooling elements which is also typical of the pasteurizer and with portions thereof shown in section; Fig. 8 is a complete end elevation of Fig. 7, partly in section; Fig. 9 is a plan of Fig. 8, partly in section and showing the distributing trough attached thereto; Fig. 10 is an end elevation of one of the upper troughs; Fig. 11 is an end elevation of the lower trough showing the manner of its suspension from the cooling elements; Fig. 12 is a fragmentary side elevation of Fig. 11.

A rigid frame 1 is provided for supporting all of the elements of my device and this frame is formed of gas pipe, preferably, with suitable vertical, transverse and longitudinal members secured together rigidly by means of ordinary pipe fittings of different character, depending upon the number and character of the members which are to be braced and held together. The frame may be secured to the floor by means of ordinary floor flanges 2, or a cast base may be provided for extremely large devices, and additional members may be added to the frame for convenience.

The top of the frame 1 has a pair of forwardly extending members 3 and a similar pair of rearwardly extending members 4 which are horizontally disposed and are adapted to form a support for the tray 5 in which is placed a receiving tank or receptacle 6 for holding the supply of milk and from which it is delivered through a valve 7 to the pasteurizer. The pasteurizer, as shown in Figs. 2, 3, 7 and 8, consists of a plurality of longitudinal tubes 8 which terminate at opposite ends in vertical members 9 having a plurality of passages arranged therein and separated by partitions 10 so as to form a continuous passage for hot water in only one direction through the tubes.

A hot water inlet 11, which may be connected with a hot water service pipe or tank, communicates with the lower left hand compartment or passage 12 in the member 9 and the water circulates through the several tubes 8 and the passages 13 in the members 9 until a passage similar to the one 12 in the left hand member 9 is reached when it is discharged through an outlet 14. The several tubes 8 and the members 9 are integrally formed or secured together with water tight connections and joints, and are suspended by means of the hangers 15 from the forwardly extending frame members 3, the hangers having loops 16 at the top for engaging the members 3 and hooks 17 at the bottom which are hooked into the eyes 18 of the lugs 19 on the members 9, as shown in Fig. 8. Distributing troughs 20 are carried by and in parallel relation with the pasteurizer, lugs 21 being formed on the ends 22 of the troughs which seat the grooves 23 on the lugs 19 of the members 9, and the troughs being thus easily removable from position on the pasteurizer for any purpose.

A cover 24 which may be in a single piece or formed of two similar sides as shown, is provided for the pasteurizer and has funnel 25 formed in the top which receives the milk from the valve 7 and delivers the same to the trough 20 into which the neck 26 of the funnel extends. The cover is supported on the rims of the trough by means of one or more flat hooks 27 which are soldered or riveted to the inner surface of the cover.

A milk holder 28 which is of rectangular form and which has a suitable cover 29 is suspended in a heating tank 30 of substantially larger dimensions than the holder, and the lower end of the pasteurizer and cover 24 extends downwardly into the holder and at the rear end thereof. The outer edges of the heating tank 30 are bent over at the top so as to form a seat for the flanges of the holder tank and the cover 29 is suitably flanged so as to completely cover the tank and prevent the entry of dust or dirt therein.

The holder tank 28 is subdivided into several compartments 31, four being shown in the drawings, by means of vertical partitions 32, each alternate partition being provided with a plurality of perforations 33 near the top of the tank, and the other of the partitions being shortened at the bottoms to permit the flow of the milk under them. In the first or rear compartment in the holder tank and just beneath the lower end of the pasteurizer, a rectangular trough 34 is provided which extends the full length of the pasteurizer and is seated loosely upon cleats 35 secured to the sides of the tank and a tube 36 serves to drain the milk from the trough into the bottom of the holder tank 28. The trough 20 at the top of the pasteurizer has a plurality of perforations 37 in the bottom arranged in rows on opposite sides of the center so as to distribute the milk in a sheet over the tubes and ribs 38 on the bottoms of the tubes 8 of the pasteurizer insures an even flow of the milk from one to the other of the tubes in the form of a sheet.

It is desirable and necessary that the milk in the holder tank 28 should be agitated to prevent the accumulation of sediment and also for the purpose of preventing the rising of the cream to the surface of the milk in the tank. The arrangement of the vertical partitions 32, as shown, is such that the milk from the trough 34 will fall to the bottom of the tank 28 and will gradually rise in the first of the compartments to the level of the row of perforations 33 near the top of the first partition 32, when it will emerge through these perforations and fall into the second compartment, thence under the second partition, it will enter and rise in the third compartment to the level of the row of perforations and fall into the bottom of and rise in the third compartment, and likewise through as many of the compartments as may be provided.

Those of the partitions 32 which are provided with the rows of perforations 33, while being shortened at the bottom similar to the other of the partitions, have slides 39 with right angularly bent pull pieces 40 at the top and are adapted to slide vertically on the partitions proper by means of rivets or screws 41 which move in slots 42, as shown in Fig. 5. These slides are normally in their lowermost position, as shown in Fig. 2, when the holder tank is in operation, but at the completion of an operation, the slides must be raised so as to permit the milk within the compartments to be completely drained out.

The pasteurizer, as described, is provided with a hot water circulating system, the temperature of which is maintained at about 160 degrees Fahrenheit, and the water from the pasteurizer outlet 14 is discharged into a pipe 43 which is connected with an inlet 44 on the side of the heating tank 30 through which the water circulates and is discharged from the tank at the outlet 45, the temperature of the heating tank being maintained at a temperature of about 140 or 145 degrees Fahrenheit. A clean-out 46 is provided on the side of the tank so that all residue and sediment may be cleaned out when necessary and the standing water drained off. The heating tank 30 is seated on the members 47 of the frame between the pins 48 which are secured in the members 47 and are bent upwardly into contact with the sides of the tank. If it is desired to use steam for heating the tank 30, a steam inlet 49 may be provided at the rear, as shown, or at any other suitable or convenient position, and connected with a steam supply pipe.

The tank 28 is only loosely seated in the outer tank 30 and may be easily removed therefrom, and the cover 29 may be similarly removed from the tank 28. A valve 50 is provided for draining the milk from the tank 28 and is connected with the tank 28 by means of a nipple 51 on the inside of the tank 30 and a nipple 52 on the outside thereof. The nipples 51 and 52 are secured in nuts 53 on opposite sides of the front wall 54 of the tank 30 and the nipple 51 is threaded into a flange 55 on the front wall of the tank 28. Thus when the outer nut 53 is loosened, the inner nipple attached to the tank 28 may be removed from position with the tank 28.

The cooler is composed of tubes and vertical members identical with those of the pasteurizer and is otherwise similarly arranged, there being substantially the same number of tubes and the trough 56 being superimposed upon the vertical members of the cooler after the fashion of the trough 20 on the pasteurizer. The cooler is suspended from the forwardly extending arms 57 at the front of the frame by means of the hangers 58 which are similar to those 15 of the pasteurizer. When the valve 50 is open, the milk will flow therefrom into the trough 56, thence through the perforations in the trough and over the tubes 8 and ribs 38, and finally into a receiving tank which may be provided for the purpose, as represented by broken lines at 59.

Cold water is admitted to the cooler through the inlet 60 and is discharged through the outlet 61, the water circulating through the tubes and vertical members of the cooler in the same manner as previously described in the case of the hot water through the pasteurizer. If it is necessary, a substantially shorter section of cooler 62 may be secured to the bottom of the water cooler, as shown in Figs. 1 and 2, for the purpose of circulating brine or chemicals through the tubes thereof by means of the inlet 63 and the outlet 64. In such case the two sections of coolers may be secured together by means of bolts 65 through the adjacent flanges 66 on the vertical members 9.

A trough 67 similar to troughs 20 and 56 just described, is attached to the lowermost section of the cooler by means of upwardly extending arms 68 on the ends of the trough which seat in grooves formed in the lugs 69 on the lower ends of the vertical members 9 of the cooler, the trough 67, however, being provided with a tube 70 for discharging the milk therefrom instead of the rows of perforations, as in the other form of troughs.

In operation, the tank 6 is first filled with fresh milk and the hot and cold water systems are connected with the pasteurizer and coolers, respectively. When the temperatures have been tested and found to be correct, the valve of the receiving tank is opened and the milk permitted to flow downwardly into and through the trough 20, thence over the heated tubes of the pasteurizer and into and through the trough 34, thence into the bottom of the holder tank 28, when, as previously described, the milk will gradually flow from one of the compartments to the other until the last compartment is reached. It is required that the milk should accumulate and remain in the holder tank 28 for at least 30 minutes in order to insure that all germs have been killed, and after the proper elapse of time the valve 50 may be opened and the milk will then flow into and through the trough 56, from thence downwardly over the tubes of the coolers and into and through the trough 67 to the tank 59 therebelow. The valves on the various tanks may be regulated to provide the proper flow of the milk over the tubes of either the hot or cold water systems, care being taken that the troughs do not overflow and that the flow of the milk over the tubes will be even and smooth for obtaining the best results. The cover over the pasteurizing tubes serves to retain the heat and thus to more quickly heat the milk in its passage thereover, while the cooling tubes remain uncovered, preferably, for the purpose of effecting a more rapid cooling of the milk.

My device as herein described is thoroughly sanitary and may be easily kept clean and sterile, inasmuch as all parts are removable, and the several processes being combined as hereinbefore described, and the use of power eliminated renders the device economical and capable of use in remote districts where electricity is not ordinarily available.

Having thus described my invention, what I claim as new and desire Letters Patent for, is:—

1. A combined pasteurizing and cooling device comprising a liquid receiving receptacle, a removable pasteurizing element provided with a series of communicating compartments, means for distributing the liquid over the pasteurizing element, liquid retention means for holding the liquid and subjecting the same to prolonged auxiliary heating, and tubular cooling means for effecting the rapid cooling of the liquid, the said elements being combined for effecting the treatment of the liquid in a single and continuous operation.

2. A combined pasteurizing and cooling device comprising means for holding the supply of liquid to be treated, primary tubular heating and liquid distributing means for heating the liquid during its passage thereover, intermediate liquid holding means for receiving and holding the liquid in a heated state for a given period of time,

tubular cooling means, and distributing means for spreading the liquid over said cooling means, as set forth.

3. A combined pasteurizing and cooling device comprising tubular means for spreading and distributing the liquid to be treated and for heating the same during the distribution thereof, means for retaining the liquid in its heated state under agitation for a predetermined period of time, and tubular means for redistributing the liquid and cooling the same, in a single continuous operation.

4. A combined pasteurizing, liquid holding and cooling device including a primary heating coil for receiving and distributing the flow of liquid, a removable receptacle for receiving the liquid from said coil, heating means for said receptacle, a cold water coil for cooling the liquid discharged from said receptacle, and means for spreading and evenly distributing the liquid over said heating and cooling coils.

5. A combined pasteurizing and cooling device including a circulating hot water heating coil and liquid distributing means therefor, removable liquid holding means for receiving and holding the liquid from the heating coil, hot water heating means for said liquid holding element, a cold water coil for cooling said liquid, and means for spreading and distributing said liquid over said cooling coil.

6. A combined pasteurizing and cooling device including primary heating and liquid distributing means, liquid holding means comprising a plurality of compartments subdivided and alternately communicating at the top and bottom for agitating the liquid in its passage therethrough, auxiliary heating means for prolonging the application of the heat to the liquid during its retention in said holding means, and means for finally cooling said liquid after the heating operation.

7. A combined pasteurizing and cooling device including primary liquid heating and distributing means, liquid holding means comprising a plurality of compartments alternately communicating at the top and bottom for agitating liquid in its passage therethrough, auxiliary heating means for heating the holding means, cooling means arranged adjacent to the holding means, and distributing means for spreading the liquid over said cooling means.

8. A combined pasteurizer and cooler including circulating hot water heating system for the primary and auxiliary heating of the liquid to be treated, liquid retention means comprising a plurality of compartments separated by baffle plates and communicating alternately at the top and bottom for agitating the liquid in its passage therethrough and subjecting the same to the heat from said auxiliary heating means, means for cooling the liquid subsequent to the heating operation, and means for spreading the liquid over said primary heating means and said cooling means.

9. A combined pasteurizer and cooler for pasteurizing, holding a liquid in a heated state for a period of time and cooling the same in a single and continuous process, including a series of heating tubes and means for evenly spreading the liquid thereover for the primary heating of the liquid, a retention receptacle for holding and agitating the liquid delivered thereto from said heating tubes, means for supplying heat to said receptacle, a series of cooling tubes arranged adjacent to said receptacle and means for spreading and delivering the liquid thereto from said receptacle, and a suitable support for and common to all of said elements.

10. A combined pasteurizer and cooler including a primary heating element and liquid spreading means therefor, a cover for said heating element for retaining the heat in the zone of the heater, liquid retention means for receiving the liquid from the heating element, means for heating the liquid in its passage through said retention means, means for cooling the liquid subsequent to the heating operation, and means for spreading the liquid over the cooling means.

11. A combined pasteurizer and cooler including a primary heating element provided with a cover for retaining the heat in the zone of the heater and a liquid spreading means for distributing the liquid over the heater, a retention receptacle for receiving the liquid from and holding the same in a heated state for a period of time, heating means for said receptacle, means for cooling the liquid subsequent to the heating operation, and means for delivering the liquid from said receptacle to and for spreading the same over the cooling means.

Signed at Los Angeles, in the county of Los Angeles and State of California, this 20th day of October, 1915.

HENRY M. RUDD.

Witnesses:
Geo. E. Marlatt,
Anne Hartenstein.

W. W. BARNUM.

MILK PASTEURIZER.

APPLICATION FILED NOV. 19, 1917.

1,260,127. Patented Mar. 19, 1918.

FIG. 1.

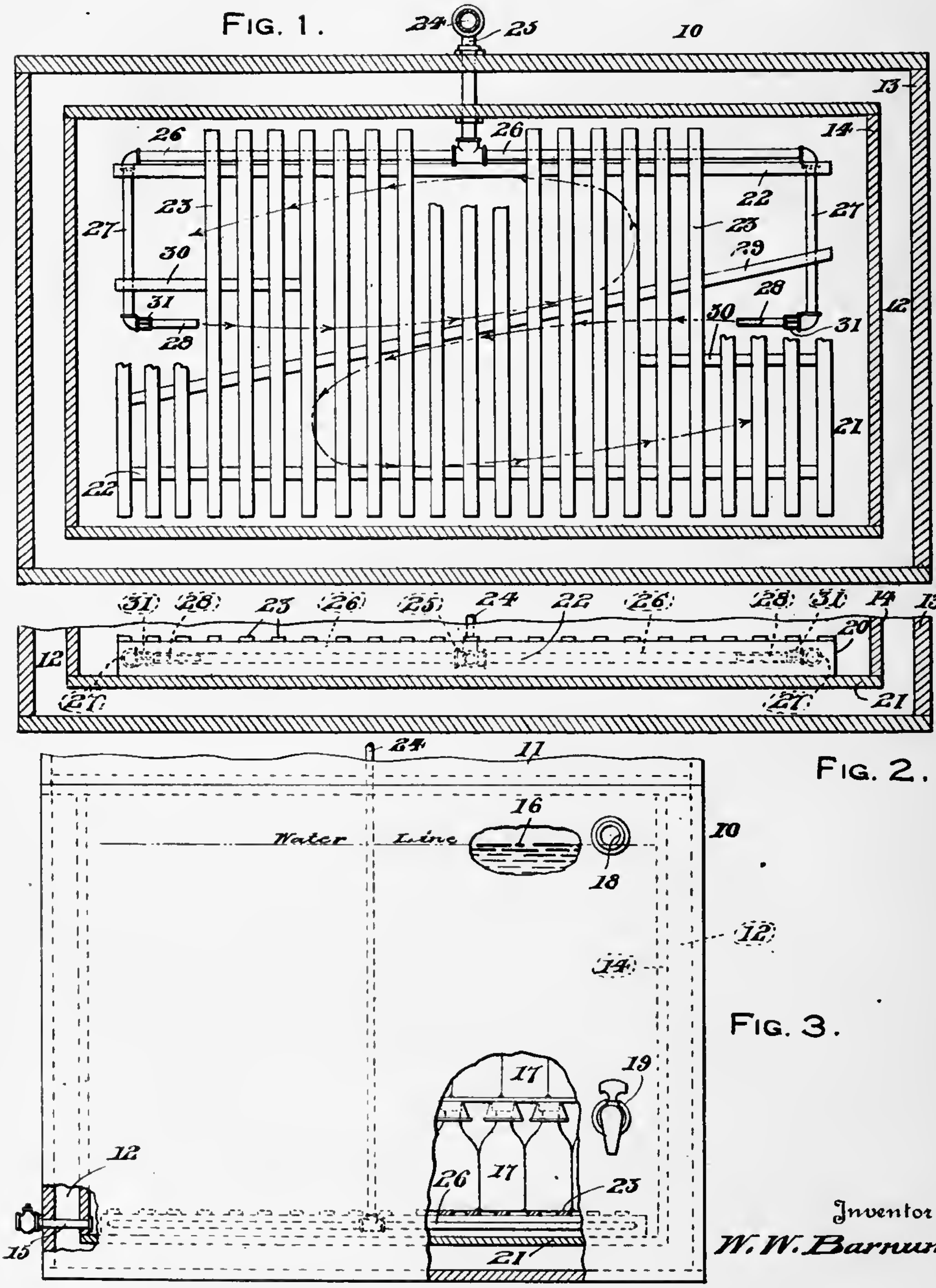


FIG. 2.

FIG. 3.

Inventor
W. W. Barnum

By T. K. Bryant, Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM W. BARNUM, OF NIAGARA FALLS, NEW YORK.

MILK-PASTEURIZER.

1,260,127. Specification of Letters Patent. Patented Mar. 19, 1918.

Application filed November 19, 1917. Serial No. 202,788.

To all whom it may concern:

Be it known that I, William W. Barnum, a citizen of the United States of America, residing at Niagara Falls, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Milk-Pasteurizers, of which the following is a specification.

This invention relates to certain new and useful improvements in milk pasteurizers.

The primary object of the invention is the provision of a pasteurizer especially adapted for use in sterilizing bottle liquids such as milk, the construction thereof being inexpensive and easy to manufacture but serviceable and efficient in its use.

A further object of the invention is the provision of a device for sterilizing bottle liquids without the liability of loss by reason of bursting bottles, this result being accomplished by the perfect circulation of the sterilizing fluid resulting in an equal distribution of heat.

A still further object of the invention is the provision of a cabinet suitably insulated for retaining heat adapted for employment in carrying out a pasteurizing process and arranged with a support for the contents which serves the purpose of directing the circulation of heating medium for perfecting the sterilization by the accurate control of temperature.

With these general objects in view and others that will appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawing, and then claimed.

In the drawing forming a part of this application, and in which like reference characters designate corresponding parts throughout the several views,

Figure 1, is a horizontal sectional view through the device,

Fig. 2, is a vertical longitudinal sectional view through the lower portion thereof, and

Fig. 3, is a side view of the same, upon a reduced scale with parts broken away.

Referring more in detail to the drawing, a box or cabinet 10 is arranged having a suitable lid 11 while a space 12 is provided between the outer and inner walls 13 and 14 respectively, adapted for the reception of heat insulating material such as cork.

The box 10 is adapted to be filled with fluid such as water through an inlet pipe 15 while the level thereof is adapted to be maintained constant as at 16 for immersing the bottles 17, and an overflow pipe 18 being arranged at the water level and an outlet draw faucet 19 positioned therebeneath adjacent the bottom of the box.

A rack 20 is positioned upon the bottom 21 of the box being preferably formed of cypress with opposite side beams 22 spaced from the sides of the box and having a plurality of parallel slats 23 transversely secured thereon for mounting the bottles 17 spaced above the bottom 21. A steam pipe 24 is arranged with a branch 25 extending through the rear wall of the box 10 and connecting with a longitudinally arranged pipe 26 within the box 10 outwardly of the adjacent beam 22 and having L-shaped arms 27 at its opposite ends for arranging inturned nozzles 28 substantially centrally of the box in alinement with and pointing toward each other beneath the rack 20.

A direction plate 29 is diagonally arranged beneath the slats 23 having its opposite ends terminating at the ends of the rack at points upon relatively opposite sides of the nozzles 28. Baffle plates 30 of relatively short length are arranged beneath the slats 23 at opposite ends of the rack arranged parallel with the nozzle 28 with a baffle plate between each of the opposite beams 22 and one of the nozzles 28. The arms 27 pass through the beams 22 with one of the arms passing through an end of the direction plate 29 and the other arm at the opposite end of the box passing through the adjacent baffle plate 30.

With the box filled with bottles 17, arranged upon the rack 20, and with the box filled with water, to the point 16, an inflow of steam through the nozzles 28, results in sterilizing the contents of the bottles by the raising of the temperature of the water, to the desired degree and in the desired time. The provision of the slats 23 and the direction given to the injected steam by the direction and baffle plates beneath the rack 20 creates the proper circulation within the box 10, resulting in an even distribution of the heat for perfecting sterilization. The draw-off 19 is for removing the water to the level beneath the tops of the lower row of bottles 17 when pasteurization is completed, while the overflow 18 is constantly open and as the water expands, during heating, and augmented by the condensation of steam, a constant slight outflow is maintained therethrough.

A simple and inexpensive apparatus for performing the process of pasteurizing liquids, is arranged, it being understood that the direction imparted to the steam from the nozzles 28, which agitates the water without the employment of any mechanical circulating means constitutes the gist of my invention. Adjusting means 31 may be arranged for the nozzles 28 if desired, while it will be evident that the beams 22 and plates 29 and 30 which support the slats 23 above the bottom 21 may be either perforated or slotted, for accommodating the passing of the pipe therethrough. Also, while the preferred form of the device is herein set forth, it will be understood that minor changes may be made therein, without departing from the spirit and scope of the invention as claimed.

What I claim as new is:—

A pasteurizer comprising an insulated box, a rack positioned therein, upon the bottom thereof, including opposite parallel beams spaced from the sides of the box, a direction plate diagonally positioned between the said beams longitudinally of the box, terminating in the same planes as the said beams, baffle plates arranged parallel with the beams at opposite sides and spaced from the direction plate adjacent its opposite ends, a steam pipe centrally entering the box, a longitudinally arranged pipe carried by said steam pipe positioned adjacent one of the said beams, L-shaped arms at the ends of said longitudinal pipe terminating in steam ejecting nozzles, pointing toward and in substantial alinement with each other, centrally of the box at opposite sides of the direction plate and inwardly of said baffle plates, and transverse slats carried by said beams and plates, adapted for supporting articles to be sterilized, a water-inlet pipe adjacent the bottom of the box, and an overflow pipe arranged at the normal water level therein.

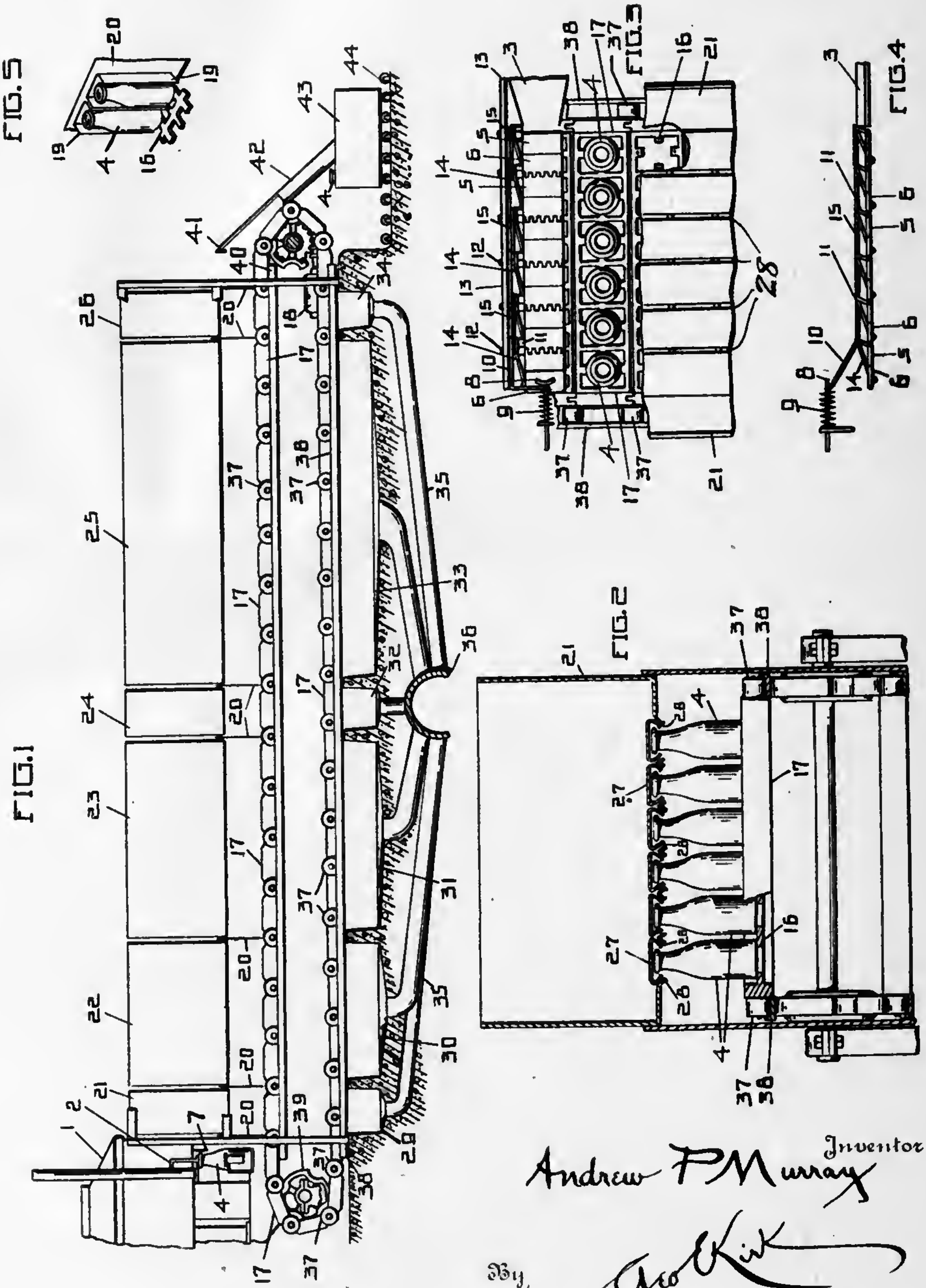
In testimony whereof I affix my signature.

WILLIAM W. BARNUM.

A. P. MURRAY.
PASTEURIZATION APPARATUS.
APPLICATION FILED MAY 3, 1917.

1,307,689. Patented June 24, 1919.

2 SHEETS—SHEET 1.



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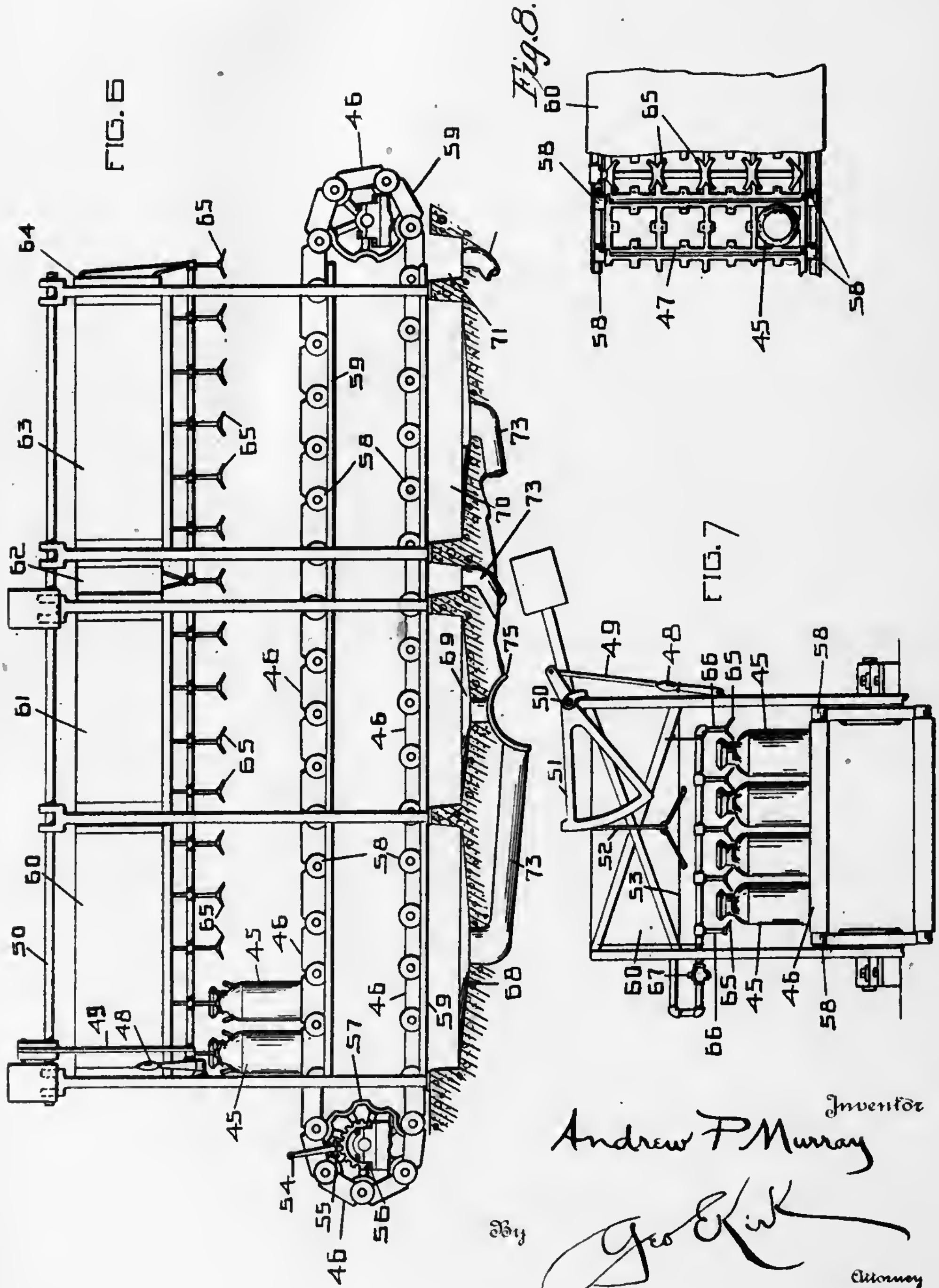
2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

ANDREW P. MURRAY, OF TOLEDO, OHIO.

PASTEURIZATION APPARATUS.

1,307,689. Specification of Letters Patent. Patented June 24, 1919.

Application filed May 3, 1917. Serial No. 166,110.

To all whom it may concern:

Be it known that I, ANDREW P. MURRAY, of Toledo, Lucas county, Ohio, a citizen of the United States of America, have invented new and useful Pasteurization Apparatus, of which the following is a specification.

This invention relates to the temperature control treatment of liquids, more particularly in containers.

This invention has utility when incorporated in continuous output installations, as in the pasteurization of milk.

Referring to the drawings:

Figure 1 is a side elevation, with parts broken away of an embodiment of the invention in an apparatus for the continuous pasteurization of milk in bottles;

Fig. 2 is a transverse section of the apparatus of Fig. 1, near the left end thereof;

Fig. 3 is a fragmentary plan view of the charging end of the device of Fig. 1:

Fig. 4 is a fragmentary side elevation of features of the charger;

Fig. 5 is a fragmentary perspective view of the curtain through which the containers pass from one treatment stage to another;

Fig. 6 is a view similar to Fig. 1 of an adaptation of the invention to less fragile containers, as milk cans;

Fig. 7 is an elevation of the charging end of the device of Fig. 6; and

Fig. 8 is a fragmentary plan view of the device of Fig. 7.

The bottle filler 1, in its operation may pass the filled containers or bottles to the capper 2, from whence along the way 3, the bottles 4 are successively shoved in pairs over the sectional way 5, 6. As the third pair of bottles is moved into position on the way 5, 6, being held in alinement on the forward side by the bar 7, and on the after side by the linkage, the leading bottle 4 is thrust against the abutment 8 against the action of spring 9, and through the angular arm 10 from the abutment 8, rocks the arm 11 on the shaft 12 mounted in the support 13. Fast on each shaft 12 is a way section 5, while extending from each arm 11 is a link 14 engaging a way section 6. The several arms 11 are connected by the links 15.

This quick thrust action as the third pair of bottles 4 is shoved upon the sectional way 5, 6, causes this transverse way to open downward under each bottle that it may settle down into a seat 16 in the treatment way or endless conveyer 17 continuously driven at a slow speed by the motor 18, so that at each supply of six bottles, of the desired charge for a transverse row of containers, a row of seats may be in registry therebelow for receiving the containers. As the conveyer slowly travels and the bottles 4 move clear of the opened sections 5, 6, the spring 9 recovers to bring the ways into closed position for the receiving of the next charge of bottles.

The seats 16 of the conveyer 17 are in transverse and also in alined longitudinal rows. The parallel longitudinal rows conduct the bottles 4 through the flexible flaps 19 of the curtains 20 at the entrance, at the discharge, and between the different stages of treatment in the housing for the closed treatment lanes including the superposed tanks 21, 22, 23, 24, 25, 26. The bottoms of these tanks have relatively alined shower means for multi-stage temperature control provision for each lane, in the form of the shields 27 protecting the tops or closure sections of the containers from action by the temperature controlling substance or wash from the tanks. From each side of the shield and directed toward each other is a sheet or film projecting nozzle 28 serving effectively to envelop the entire lateral extent of the container below the protected top region. This liquid temperature controlling envelop sheet then passes through the openwork of the conveyer 17 to the respective spill tanks 29, 30, 31, 32, 33, 34, therebelow to be conducted by a line 35 to a sewer 36, for waste or desired selective or regenerative re-use. In bottle treatment for milk pasteurization, the tank 21 may provide preheating liquid; the tank 22 heating liquid; the tank 23 liquid to hold the milk heated; the tank 24 liquid for precooling; the tank 25 brine for cooling; and the tank 26 for washing the brine off the bottles.

In the further travel of this endless conveyer 17, normally sustained by its rollers 37 on the tracks 38 between its terminal sprocket wheels 39, 40, the tops of the bottles 4 engage the bar 41 to preclude forward tilting. Accordingly in this forward travel, the tops of the bottles are held back and the bottles move bottom downward along the chute 42. The bottles of cooled pasteurized milk are thus delivered top side up into the crates 43, which crates are readily shiftable on the rollers 44 into proper bottle receiving position.

There is by the above installation a continuous handling of the pasteurized product without exposure to contamination after the pasteurizing treatment. The duration of the several stages may be gaged as to the container size, temperatures found most acceptable, and travel rate of the conveyer. For usual form of quart glass milk bottles, five minutes preheating, fifteen minutes heating, twenty minutes heat holding, five minutes precooling, thirty-five minutes cooling, and then washing suffices.

For larger containers, as ten gallon milk cans 45, these may be charged upon an endless conveyer 46, say in gangs of four deposited in the conveyer seats 47 for parallel longitudinal row alinement. Rocking of the handle 48, will serve through the link 49, rock shaft 50, levers 51, cables 52, to lift the several counter weighted doors 53 between the treatment stages of the housing. The conveyer 46 may then be moved ahead the proper distance for recharging by turning the handle 54, which through the pinion 55, and gear 56 actuates the conveyer sprocket 57 that the conveyer 46 may have its rollers 58 travel along the ways 59 and carry the containers 45 one step forward. Handle 48 may then be swung up for closing the various doors 53, and the cans for a succeeding charge supplied.

The tanks 60, 61, 62, 63, 64, supply respectively liquid for heating, holding heat, precooling, cooling and washing the cans. These form portions of the housing and shield the upper or filling portions of the cans 45 from the washings, as the pairs of sheet film nozzles 65 envelop each can with a sheet of liquid over the entire sides at the stopping positions below the shielded upper portions of the cans. The nozzles 65 are supplied by the ducts 66 with the flow from the respective tanks controlled by valve 67.

The open conveyer 46 allows the wash to pass therethrough to the various spill ways 68, 69, 70, 71, 72, for conduct by the ways 73 to sewer 75, or such desired return as may be acceptable for re-use of the liquids. The filled treated liquid containing cans passing from the housing, as a new charge is supplied at the opposite end, may be removed as ready for storage or transport without contamination.

What is claimed and it is desired to secure by Letters Patent is:

1. An endless conveyer for parallel rows of containers having tops, a housing providing lanes alined with said container rows, and shower means for said relatively movable containers, said means having an imperforate portion enveloping the container tops to shield said tops during the travel of the containers therethrough.

2. An endless conveyer provided with alined seats for parallel rows of containers, and housing means for said conveyer providing a continuous lane for each row of relatively movable containers, there being showers supplied by said housing means, said shower means providing a downwardly open channel at each lane into which channels the container tops may protrude, the channel formed by the shower means being provided by the housing means, and serving as a shield for the container tops.

3. A series of tanks, parallel rows of alined shower means therefrom disposed to form downwardly open channels, an endless conveyer below said shower means having container seats for containers provided with tops projecting to travel in the channels of the shower means, and driving means for the conveyer effecting the travel of the containers as to the shower means, said channels between the rows of shower means serving as shields for the container tops.

4. Pasteurization apparatus comprising a stationary horizontal guide, conveyer means coacting longitudinally of said guide to provide longitudinally extending series of seats for the bottoms of containers with the tops of the containers extending upwardly therefrom, said series of seats being disposed to form transverse rows as to the guide, shower means in longitudinally extending rows between the containers in the seats for showering directly upon the container in said seats below the tops of the containers with clear showerless regions provided to coincide with the longitudinal rows at the container tops, and means for actuating the conveyer for shifting the containers horizontally along the longitudinal rows in coaction with the shower means on the sides of the containers, the tops of said containers being shielded by the position of the shower means to keep the top of the containers in the clear showerless region of the longitudinal rows of the seats.

In testimony whereof I affix my signature.

ANDREW P. MURRAY.

4

U.S. Patent Office.
Milk and the handling
of milk.