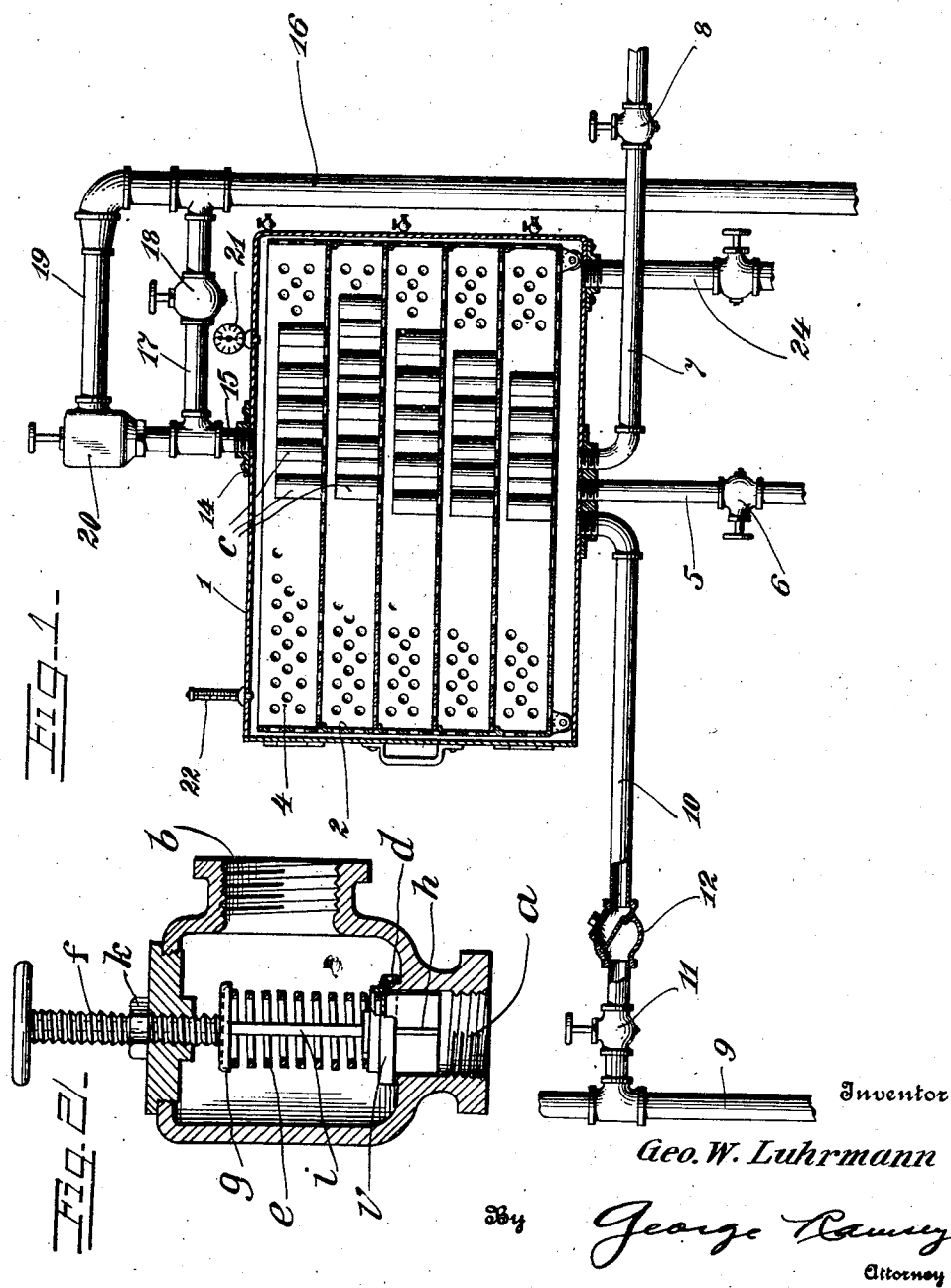


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METHOD AND APPARATUS FOR COOLING PACKAGES IN PROCESSING.
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To all whom it may concern:

Be it known that I, GEORGE W. LUHRMANN, a citizen of the United States, residing at Jersey City, in the county of Hudson, State of New Jersey, have invented certain new and useful Improvements in Methods and Apparatus for Cooling Packages in Processing, of which the following is a specification.

10 This invention relates broadly to preserving, and more particularly to a method and apparatus for the processing with heat of materials, such as food products, in sealed containers. The invention is directed specifically to apparatus and a method for cooling the sealed packages after their treatment by heat.

As is well known in the art, it is customary in the packing industries to package various products, such as vegetables, meats, fruits, and the like, in packages which are sealed under vacuum, and then to treat the sealed packages with heat for the purpose of rendering them sterile, or cooking, or completing the cooking of the contents. The degree of heat which it is necessary to utilize develops pressures within the sealed packages, resulting from the expansion of the contents, the production of gas in the heating, and the vaporization of liquids. During the actual application of the heat, which customarily is through the medium of steam introduced into a retort into which the packages are charged, a sufficient pressure is maintained exterior of the packages, either by the heating fluid or by other means, to counteract the internal pressures developed by the heat. At the end of the cooking, however, in order to operate efficiently, it is necessary to cool the packages in the retort artificially, as their normal cooling would require too great a time. Such cooling is customarily accomplished by the introduction of cold water into the retort.

50 In the processing of packages in which tin cans are used as the containers, the reduction of pressure within the retort exterior of the cans occasioned by the introduction of the cold water,—which, of course, causes a sudden condensation of the steam in the retort,—results in the bulging or buckling of the tin cans by the internal pressures within them before they are cooled

and such internal pressure is reduced. 55 Therefore, it is necessary to introduce under pressure some suitable medium such as air, which is not condensed by the cooling action. I have found also in practice that cans may be buckled by the development of an excessive external pressure upon the cans by pressure built up within the retort due to the introduction of the water without the proper relief for the fluid pressure. This has been occasioned by the fact that the pressure sometimes builds up very rapidly during the introduction of the cooling water and, where manually controlled, this excess pressure is not taken care of quickly enough or with the necessary certainty always to forestall the distortion of the cans. Excessive external pressure may also be developed during cooking by a decrease of the steam pressure at the supply source to a point below that at which air is admitted, and then, upon steam pressure at the source being increased, the air which has been introduced into the retort to raise the pressure, is suddenly heated, and expands. This may happen where one set of boilers is being cut off, and a new set of boilers cut in. So, it will be seen, that in operation the distortion of the cans may be occasioned either by too great an excess of internal pressure over external pressure, or too great an excess of external pressure over internal pressure. A purpose of the present invention is to provide a method, and a very simple apparatus for practising it, which will be effective positively to prevent the buckling of cans from either of the causes specified. 90

A further object of the invention is to provide such an apparatus which will be practically automatic in operation so that accurate and uniform operation and results will be obtained at all times. 95

A further object of the invention is to provide a method and an apparatus whereby the cooling operation may be greatly expedited, while the packages are constantly safeguarded against distortion. 100

A further object of the invention is to provide an apparatus having the characteristics specified which may be easily and cheaply installed in connection with any of the great variety of processing retorts now in use. 105

A further object of my invention is to pro-

vide an apparatus having the characteristics specified which is simple and which will not get out of order under the contemplated usages.

5 Other and further objects of my invention will be obvious or will be pointed out in the specification hereinafter or in the appended claims, reference being had to the accompanying drawing forming a part of
10 the specification.

Figure 1 of the drawing represents diagrammatically an arrangement of a processing retort equipped with one form of the apparatus constituting my invention and
15 adapted for the practice of my improved process, and Fig. 2 represents a sectional elevation of a form of relief valve.

Considered generally, my improved process for cooling the packages consists in the introduction of water into the retort while
20 maintaining a supply of fluid pressure directly under automatic control of the pressure conditions within the retort, so that, when the pressure within the retort drops
25 below a predetermined minimum, fluid pressure to build it up will be instantaneously and automatically supplied to exactly the required amount, without excess. This feature of the invention constitutes a minimum pressure control. In conjunction with it the retort is equipped at its outlet with an automatic relief apparatus whereby pressure fluid, or the cooling water, may be automatically discharged from the retort upon a
30 predetermined maximum pressure being produced therein; and in conjunction with this automatic relief is arranged a manually operable relief whereby the discharge of the fluid content of the retort may be controlled
35 to regulate the flow of cooling fluid in the cooling operation.

For a more detailed understanding of the apparatus, reference may be had to the diagrammatic illustration in the drawings, wherein the character 1 designates a retort
45 which is closed by a door 2 and adapted for the reception of the packages C. These packages may be arranged in the retort in any suitable fashion to permit access of fluid to them, such as by being stacked in the retort, or by being arranged in a perforate basket or cage 4 which is movable into and out of the retort. A means 5 is provided for the supply of heat to the interior of the retort. In the embodiment shown said means
50 comprises a steam pipe whereby steam may be injected into the retort about the packages to effect the cooking and sterilizing operation. This heat supplying means may be controlled in any suitable fashion, a diagrammatic representation of the same in the drawings being the valve 6. A means such as the pipe 7 is provided whereby a cooling
55 medium such as cold water may be introduced into the retort, said supply of the cool-

ing medium being controlled by suitable means represented by the valve 8. From the source of pressure fluid supply, represented by the conduit 9, pressure fluid, such as compressed air, may be introduced into the retort, as by means of the pipe 10. A manually operable valve 11 may be arranged to control the supply of pressure fluid. An automatically operable valve diagrammatically represented by the check valve 12 is
75 also supplied in the fluid pressure line. This valve is designed to be automatically operated by the fluid pressure from the source 9 to permit the introduction of pressure fluid into the retort upon the pressure therein falling below a predetermined minimum which is necessary to keep the check valve 12 closed. Said check valve 12 has the further function of preventing the back flow of pressure fluid, water, or heating fluid, from
80 the retort into the source of fluid pressure supply 9.

From the outlet of the retort, which is designated by the numeral 14, a pipe 15 leads to the discharge pipe 16 through two paths. One path comprises the outlet pipe 17 which is controlled by the manually operable valve 18, and the other path comprises the relief pipe 19 controlled by the automatically operable relief valve 20. The relief valve 20
85 is a pressure operated valve which is designed to be selectively set for operation by any predetermined pressure developed within the retort 1. When opened by such pressure, the valve 20 permits the discharge of fluid from the retort 1 into the discharge pipe 16 by way of the relief pipe 19, and said valve 20 is arranged to close automatically upon the reduction of the pressure within the retort 1 to the predetermined
90 maximum.

There are numerous forms of relief valves suitable for this purpose well known in the art, one form being illustrated in Fig. 2 of the drawing. In this form reference character *a* designates the inlet to the valve casing and *b* designates the outlet therefrom. The valve *v* is normally held seated on the valve seat *d* under the pressure of a spring *e*, and may be unseated by application of sufficient pressure through the inlet *a* to overcome the resistance of the spring. The spring pressure exerted on the valve may be varied selectively by adjustment of a screw *f* which carries at its lower extremity a compression plate *g* which coöperates with the upper end of the spring and serves as a centering guide and abutment. The valve may be guided in its movement by guides *h* and a stem *i* which is slidable in a longitudinal channel. A jam nut *k* is set on the screw *f* for the purpose of controlling its adjustment. In operation, when the pressure underneath the valve *v* builds up to the point sufficient to overcome the resistance of the
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spring, the valve will be unseated until the pressure is reduced to the point where it is inferior to the established pressure of the spring.

5 In the operation of the device, and practice of the process, constant fluid pressure is maintained at the source 9 sufficient to establish the necessary external pressure about the cans in the retort 1 to prevent distortion of the cans by the internal pressure developed during the processing and when said pressure of the fluid about the cans is reduced in the cooling operation. To effect the cooling at the completion of the cooking operation, cold water is introduced into the retort by the pipe 7 and the retort allowed to fill therewith. Meanwhile the necessary minimum pressure is maintained automatically by the pressure on the air supply, from which air is admitted through the check valve 12. As the water continues to flow into the retort from the pipe 7, pressure within the retort will be gradually increased due to the compression of the gaseous content of the retort. Upon this pressure reaching the predetermined maximum necessary to operate the valve 20, said valve will be opened and will permit the exhaustion of the excess pressure into the discharge pipe 16. Pressure readings may be taken from the gage 21 and, in the event the development of pressure within the retort is so rapid or so great that the relief pipe 19 can not handle it, as might occur where a sudden increase of pressure is thrown on the water supply, additional outlet may be had by the operation of the valve 18. The operation of the relief valve 20 will be a signal for the setting of the valve 18 to accommodate the discharge of the cooling fluid. This valve, accordingly, will be set to permit the proper discharge to give the necessary rate of flow of cooling fluid through the retort to cool the packages at the most efficient ratio. If the relief valve 20 were relied upon entirely to relieve the pressure as the cooling water comes in, operation of the valve is liable to cause surges in pressure due to its sudden opening and closing, whereas the hand valve control is gradual and even. The relief valve 20 will continue to be operated on such occasions as an excess pressure develops within the retort. This arrangement of supply and discharge occasions a constant flow or movement of cooling fluid about the packages, the fluid which absorbs the heat being flowed off from the retort and displaced by cold fluid. In this way the apparatus is enabled to operate at maximum efficiency so that the cooling operation may be carried on with the greatest rapidity and yet without waste of water. The introduction of water by the pipe 7 having been continued for as long a period as may be necessary to reduce the

temperature of the packages C to the desired point, which may be determined by a reading of the thermometer 22, or by other means, the water remaining in the retort may be discharged as through the pipe 24, and the packages then removed and the retort recharged for another cooking.

From the foregoing it will be seen that my invention contemplates the subjection of the packages to a moving column of cooling fluid while maintaining them under a suitable external pressure controlled automatically as to its minimum and maximum limits, said control being exercised by the pressure within the retort directly through the avenues of supply and discharge. On account of this method of regulating and by virtue of the apparatus incorporating the features described, the supply of fluid pressure to the retort and the relief of fluid pressure therefrom are instantaneous and automatic, in response to the pressure conditions within the retort. By virtue of these features the uncertainty of human control and the element of delay incident to operation through indirect control apparatus are eliminated.

Furthermore, the apparatus employed in the practice of the process is very simple, yet positive, automatic and certain in its operation; and may be installed at small cost in connection with any form of retort.

Having thus described my invention, what I claim is:

1. In the processing of materials in sealed packages, the method which resides in maintaining the packages under an adequate external pressure to counteract internal pressures while subjecting them to a continuous circulation of cooling fluid and controlling the relief of pressures supplied to the packages by pressures developed in the supplying of cooling fluid to the packages.

2. In a process of preserving, the method of cooling heated packages which consists in maintaining packages within a retort while supplying a cooling fluid about them, and maintaining pressure exteriorly of the packages to counteract interior pressures, while controlling the relief of pressures from the retort by pressures developed in the supplying of cooling fluid to the packages and controlling the rate of supply of cooling fluid to the packages by its rate of discharge from the retort.

3. In preserving, a process of cooling heated packages, which consists in maintaining the packages in confinement while subjecting them to an upwardly moving column of cooling fluid, by supplying the fluid below the packages and withdrawing the fluid above the packages while maintaining a suitable pressure exteriorly upon them to counteract interior pressures, and controlling the relief of pressures to which the packages are

subjected by the pressures induced by the supply of cooling fluid.

4. In an apparatus for preserving, the combination of a retort, means for sustaining packages within the retort, means arranged to introduce a cooling liquid into the retort below packages therein, means arranged to withdraw cooling liquid from the retort above packages therein, means operable directly by pressure within the retort for controlling the introduction of fluid pressure into the retort, and relief means associated with the discharge means and operable by pressures within the retort to permit relief of fluid pressure therefrom.

5. In an apparatus for preserving, the combination of a retort, means for sustaining packages within the retort, means for supplying cooling fluid to the retort about packages therein, discharge means for conducting cooling fluid from the retort, and relief means associated with the discharge means and operable by pressure within the retort to permit discharge of fluid therefrom.

6. In an apparatus for preserving, in combination, a retort, means for supplying a cooling fluid into the retort, a discharge means arranged to accommodate withdrawal of cooling fluid from the retort, an adjustable means operable to establish a normal rate of discharge from the retort and a relief means associated with said discharge means and operable directly by pressures within the retort to accommodate the discharge of fluid therefrom.

7. In a preserving apparatus, the combination of a retort, means for sustaining packages in the retort, means for supplying cooling fluid into the retort, means for accommodating the withdrawing of fluid from the retort, means for supplying pressure fluid into the retort, and a valve operable directly by pressure within the retort for controlling the supply of fluid pressure thereinto.

8. In a preserving apparatus, the combination of a retort, means for sustaining packages within the retort, means for supplying cooling fluid into the retort about the packages, a discharge conduit for conducting fluid from within the retort, a relief conduit having communication with the discharge conduit and the retort, an outlet conduit having communication with the retort and the discharge conduit, adjustable means for varying the capacity of said outlet conduit, and means operable directly by pressures within the retort for controlling the relief conduit.

9. In a preserving apparatus, the combination of a retort, means for sustaining pack-

ages within the retort, means for supplying cooling fluid into the retort about packages therein, means for supplying pressure fluid into the retort about packages therein, a discharge conduit for conducting fluid from within the retort, a relief conduit connecting the discharge conduit with the retort, an outlet conduit connecting the discharge conduit with the retort, adjustable means for controlling the capacity of the outlet conduit, and means controlled by the pressure of the cooling fluid supply and the pressure fluid supply means, for controlling the operation of the relief conduit.

10. In a preserving apparatus, the combination of a retort, a fluid pressure source, means for supplying cooling fluid into the retort, means for supplying pressure fluid from the fluid pressure source into the retort, means for accommodating discharge of fluid from within the retort, an automatic valve operable by pressure from the fluid pressure source and from the retort for controlling the supply of fluid pressure into the retort, and relief means operable by fluid within the retort for varying the discharge of cooling fluid therefrom.

11. In a preserving apparatus, the combination of a retort, means for sustaining packages within the retort, means for supplying cooling fluid into the retort about the packages, means for withdrawing cooling fluid from within the retort, a source of pressure fluid supply, a valve operable by pressure from said source and from the retort for controlling the supply of pressure fluid into the latter, and a valve operable by pressure in the retort for controlling the relief of pressure therefrom.

12. In a preserving apparatus, the combination of a retort, means for sustaining packages within the retort, means for supplying cooling fluid into the retort about the packages, means for supplying pressure fluid into the retort about the packages, means for accommodating the withdrawal of fluid from within the retort, adjustable means for controlling discharge of fluid from the retort, and a relief means operable directly by pressure within the retort for accommodating discharge of fluid therefrom.

13. In the processing of materials in sealed packages, the method which resides in maintaining the packages under an adequate external pressure to counteract internal pressure while subjecting them to a controlled circulation of cooling fluid and controlling the relief of pressures applied to the packages by pressures developed in the supplying of cooling fluid to them.

GEORGE W. LUHRMANN.