

Mar. 6, 1923.

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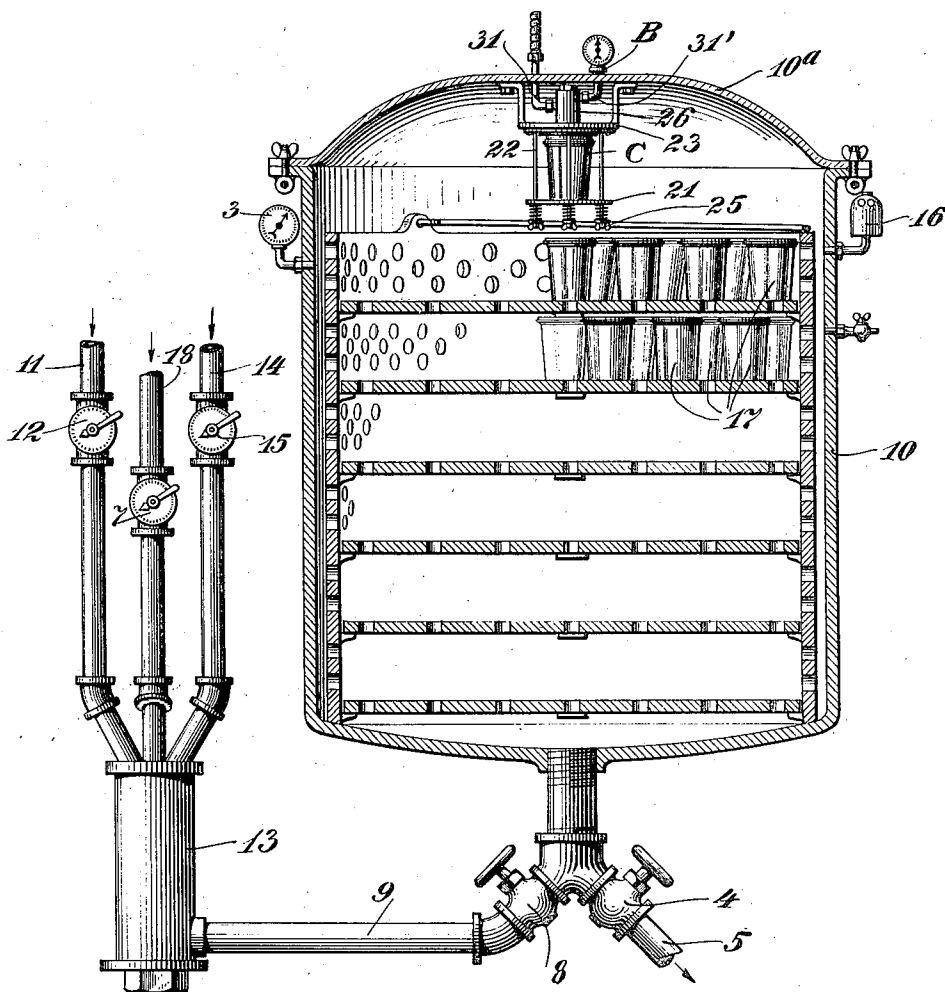
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APPARATUS FOR INDICATING PRESSURE CONDITIONS IN SEALED CONTAINERS

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2 sheets-sheet 1

*Fig. 1.*



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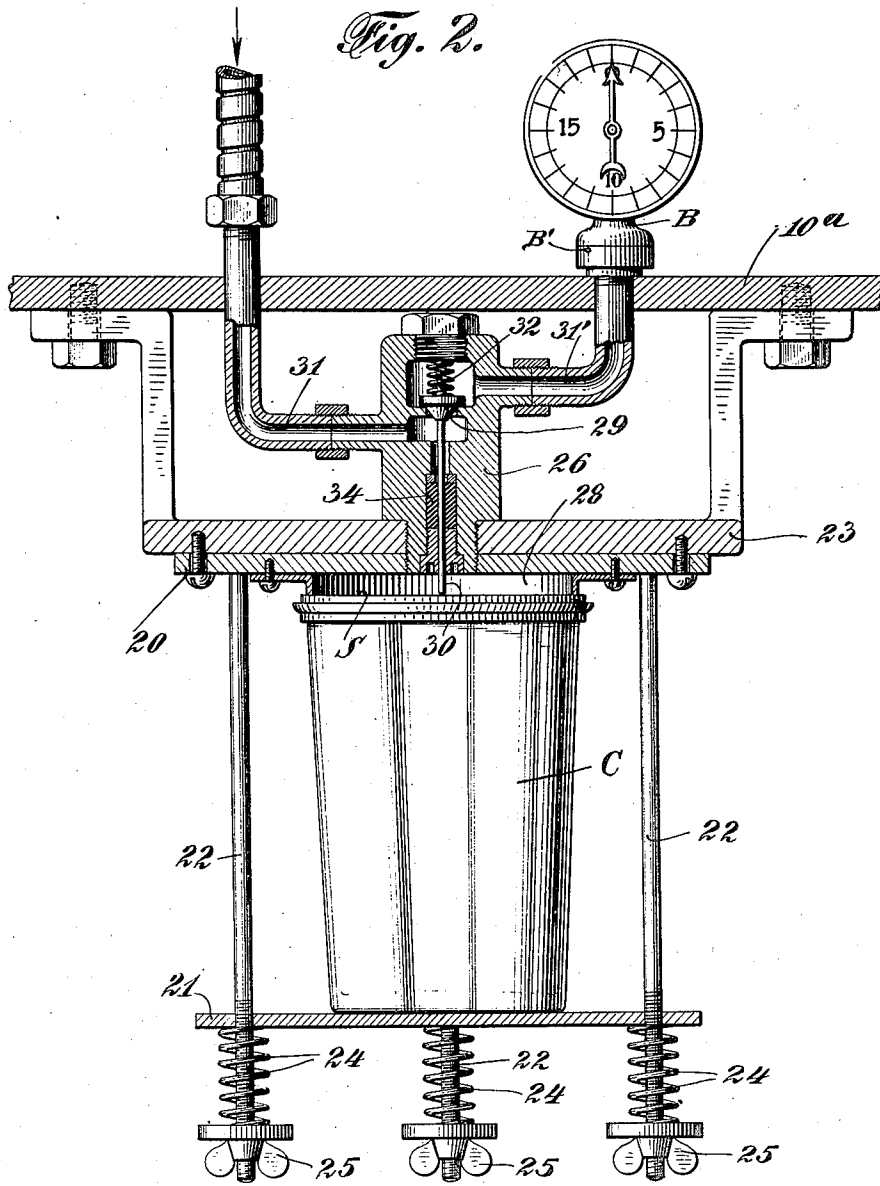
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2 sheets-sheet 2



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## UNITED STATES PATENT OFFICE.

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## APPARATUS FOR INDICATING PRESSURE CONDITIONS IN SEALED CONTAINERS.

Application filed October 2, 1919. Serial No. 327,978.

*To all whom it may concern:*

Be it known that I, WILLIAM P. WHITE, a citizen of the United States, residing at Brooklyn, in the county of Kings, State of New York, have invented certain new and useful Improvements in Apparatus for Indicating Pressure Conditions in Sealed Containers, of which the following is a specification.

This invention relates to an apparatus for use in preserving food-stuffs and the like, and has particular reference to an apparatus designed for use in the processing of food-stuffs packed in individual containers and sterilized under a heat applied to the outside of the containers.

Under present practice in the processing of food-stuffs packed in containers it is customary, while subjecting the container to a sterilizing heat, to subject it also to an exterior fluid pressure within the retort or apparatus in which it is being treated, for the purpose of counteracting or equalizing the internal pressure developed by the sterilizing heat. This is necessary in order to prevent bursting, swelling or distortion of the containers, or the forcing of the closures of the containers, by the internal pressure.

Experience has demonstrated that there is a wide variation in the amount of pressure developed within containers during the processing. This is due not only to the different degrees of heat which must be utilized with different food-stuffs, but also to the nature of the different food-stuffs themselves, some products developing pressures greater than others, and some products developing pressure more rapidly than others. Attempts have been made through experimentation, to lay out in empirical tables the proper temperatures and external pressures required by different food-stuffs, but data compiled in this form are only relative and approximate, due to the variation in pressure developed by different lots of the same sort of food-stuffs, the variation in rigidity of different lots of similar containers or jar caps, and the variation in the closeness of seals or closure seams formed by different sealing machines. As a result, the regulation of the processing pressure remains, in present practice, largely a matter of guess or estimation, the accuracy of which varies with the individual, and the results

of which entail losses through bursting, leaking, or distorted containers.

Inasmuch as the internal pressure developed in the food containers during the progress of the process varies over a wide range, first rising as the sterilizing temperature is raised, and then falling, as the containers are cooled, it necessarily follows that the regulation of the equalizing pressure must be continuous, and must follow immediately the sometimes slow and sometimes rapid changes of pressure within the containers and in the retort exterior of the containers.

It is an object of my invention to provide an apparatus whereby the pressure conditions within sealed containers during their processing in closed retorts may be indicated automatically to an operator of the processing apparatus in order that suitable adjustments may be made in the pressure or heat supply, particularly for the purpose of compensating or counterbalancing such internal pressures in the sealed containers.

It is a further object of my invention to provide an apparatus which is operable effectively to indicate to an operator the relative condition of internal and external pressures on a container during the processing, as above described, in order that a proper balance of external to internal pressure may be maintained.

A still further object of my invention is to provide an apparatus having the attributes above mentioned, the range of application of which is unlimited as to the diversity of products, packages and containers upon which it may be employed.

More specifically stated, an object of my invention is the provision of an apparatus in which the condition of the container itself while undergoing the processing is the initiating factor in accomplishing the indication of the relationship of external to internal pressures effective upon the containers.

Still more specifically stated, an object of my invention is an apparatus whereby a specimen container from the lot which is being processed is utilized to indicate the relationship of external pressure to internal pressure upon the containers during the processing.

Another object of my invention is the provision of an apparatus having the attributes above mentioned and which is adapted to

utilize a commercial package in the indicating operation without rendering it unsalable.

Other and further objects of my invention will be pointed out hereinafter or indicated in the appended claims or will be obvious from the following specification and claims and accompanying drawings forming a part of this specification, and wherein is illustrated one of the wide variety of devices in which my invention may be embodied and by which the objects of the invention may be accomplished. It will be understood that the arrangements shown in the drawings and hereinafter described are given as illustrative of the invention merely and not for the purpose of portraying the limits of its embodiments.

In the drawings Figure 1 is a diagrammatic illustration of a form of retort and processing apparatus, shown partly in sectional elevation, and illustrating the application of my invention.

Figure 2 is a detail in the nature of a sectional elevation of an apparatus embodying my invention, the illustration being diagrammatic.

Referring to these illustrations in detail by use of the reference numerals, it will be understood that the numeral 10 designates generally a processing retort suitable for use in the processing of food-stuffs in sealed containers, which may be of the sort illustrated in the patent to Luhrmann and Magrane, No. 1,184,252, granted May 23, 1916. This retort is fed by a steam inlet pipe 11 coming from a suitable source of hot steam supply; the admission of steam from this source being controlled by a valve 12, a thermometer 3 serving to indicate the temperature in the retort. The retort is also fitted for the introduction of a pressure fluid, such as compressed air, which may be by way of the pipe 14 illustrated, the same being fed from a suitable compressor or fluid pressure storage. Admission of the pressure fluid may be controlled by a suitable valve, as 15. It is immaterial, of course, so far as my present invention is concerned, whether or not the steam and the pressure fluid are mixed before introduction into the retort, or introduced separately, it being simply necessary that they be subject to independent control.

I have indicated diagrammatically in the drawings a mixer 13 in which the air, which is the pressure fluid, and the steam, which is the heating fluid, may be combined in proper proportions before introduction into the retort by way of pipe 9. The mixer 13 may be completely cut off from the retort by valve 8. The apparatus is also equipped for the introduction of water into the retort from a supply pipe 18 controlled by valve 7. In the illustration pipe 18 is associated with the mixer 13 in such fashion that

there may be a mixture of water with heating fluid introduced through pipe 11, in suitable proportions, before the introduction of the water into the retort by way of pipe 9. This supply of water is utilized in the cooling of the packages after their subjection to the sterilizing temperatures, and it must be graduated in temperature in order to prevent breakage of frangible containers. Numeral 17 designates packages of food-stuffs disposed in the retort for subjection to the processing. As is well known in the art, the packages of food-stuffs having been deposited in the retort, and the retort sealed, the packages are subjected to the sterilizing heat introduced through the pipe 11, whereby the temperature within the retort is raised to the proper degree. It is also to be understood that the fluid pressure supplied by way of the pipe 14 is such that a suitable excess pressure may be built up within the retort exterior of the containers therein to prevent distortion, breakage or uncapping of such containers by the pressure developed within them due to the sterilizing or cooking temperature.

In my co-pending application, S. N. 288,725, filed April 9, 1919, which eventuated into Patent 1,385,599, July 26, 1921, I have disclosed an apparatus whereby the regulation of the fluid pressure supply is automatically effected. In certain instances it may be desirable to control the supply of heating fluid, pressure fluid, and cooling fluid by hand. In such instances it is necessary that there be some accurate and constant means of indicating the status of pressure conditions upon the containers which are in the retort. By following such indications the operator, by the manipulation of the valves 12, 15, and 7, is enabled to make the proper and accurate adjustments to maintain his proper pressure conditions within the retort.

The apparatus whereby this automatic indication is effected is embodied in the form of a device for supporting a specimen package typical of the lot with which the retort is charged, and may include end or head members 20 and 21 in the form of plates or discs, one of which may be mounted upon a portion 10<sup>a</sup> of the wall or top of the retort by means of a suitable support 23. The other head member 21 may be supported therefrom on suitable guide members which may be in the form of rods 22 on which the member 21 is adjustable toward the member 20 and retained by adjustable members such as the wing nuts 25. Elastic members such as the extension springs 24 may be interposed between the wing nuts 25 and the member 21 for the purpose hereinafter specified. The member 20 may support a spacing member 28 of suitable size and disposal to make contact with the top or cover of a suit-

able container C when the same is disposed between the members 20 and 21. In such disposal the container C is supported by the member 21 and maintained in engagement with the spacing member 28 by suitable adjustment of the member 21 by means of the nut 25. This adjustment should be such as to put the elastic means 24 under compression, so that the container will be held in proper contact with the spacing member 28 even upon elongation of the rods 22 from heat or other causes. The disposal of these parts is such as to maintain a flexible or expansible portion of the container, such as the cap or head S, in operative association with a detecting member 30. The disposal and arrangement of this detecting member is such that it may be moved by flexion or expansion of the portion of the container wall with which it is associated.

In the embodiment shown the detecting member is a small rod forming the stem for a valve 29 which is suitably mounted in a valve casing 26 associated with the member 20. Suitable packing 34 may be provided to prevent the passage of pressure from the retort into the valve chamber around the rod 30, or the channel in which the rod is seated may be vented.

The valve 29 controls a pressure line, the supply side 31 of which leads from a suitable source of pressure fluid, such as a reservoir of compressed air, and the discharge side 31' of which leads to a suitable fluid pressure actuated indicating device B, of a type well known in the art. The valve 29 may be of differential area, such as a conical valve, so that the discharge aperture from the supply side 31 to the discharge side 31' may be varied in proportion to the degree to which the valve is unseated. The valve is normally held seated by suitable means such as the spring 32. By the unseating of the valve, pressure fluid is admitted to the discharge side 31' whereby it is conveyed to the pressure actuated indicating device B, and the device actuated thereby to indicate the presence of pressure and, if desired, the degree of such pressure. Likewise, as the valve 29 closes, pressure from line 31 upon the indicating device B will be shut off, and the device being relieved, as by a vent B', the indicator will return toward zero.

In actual operation, when the retort 10 is filled with containers of food-stuff to be processed, one of the containers typical of the lot with which the retort is charged, is placed in the retaining device, suitable adjustment of the member 21 being accomplished to position a pliable or movable portion of the container, such as the metal of a cap S, in operative association with the extremity of the valve stem 30, the container being supported in this fashion by contact with the resiliently held header 21

and the spacing member 28. The valve 29 is held seated, the position of the container C being regulated by spacing member 28 to permit the valve 29 to remain seated while the container is in its normal condition. The retaining device with the container mounted therein is confined in the retort along with the other containers to be processed, and the retort is closed and the sterilizing or cooking heat introduced into it. Upon the heat becoming effective upon the contents of the containers in the retort to produce internal pressure within them, pliable or movable portions of the containers will be under the tendency of moving outwardly. This will be true of the pliable or movable portion of the specimen container C associated with the valve stem 30, as container C is typical of the other containers, both as to structure and contents. Upon a predetermined amount of expansion or movement of the pliable or movable portion of the container associated with the valve stem 30, the valve 29 will be unseated by the pressure of the expanding portion of the container, permitting the operating pressure in line 31 to become effective upon the indicating device B.

When the fluid pressure becomes effective upon the indicating device B, the latter is operated to indicate the pressure on the dial. Obviously this is indicative of the condition of the sealed container, which condition is the resultant of the status of external and internal pressures to which the container is subjected. The operator, by observing the indications conveyed by the device B is enabled to make suitable adjustments in the valves 7, 12, and 15 to rectify the condition of pressure within the retort to restore the specimen container, and consequently the other containers in the retort, to the normal or desired condition. This is accomplished, of course, by the establishment of a balance between the external and internal pressures on the containers. This indication and control is of utility both in the heating of the containers and in the subsequent cooling, as it is necessary to maintain the proper pressure balance during both periods of the process.

The necessary connections for the pressure line 31 may be made by flexible metal pressure hose such as to permit movement of the device, and disposal of the valve casing 26, or equivalent element, may be either within the retort or exterior thereof, as desired.

Various modifications in structure and details of the device will be obvious to those skilled in the art.

Having thus described my invention, what I claim is:

1. In an apparatus for processing packages, the combination of a retort, an indica-

tor exterior thereof, means for inducing pressure in the retort, a detecting member operable by movement of a package portion and controlling the operation of the indicator, and means for operably associating a package within the retort with the detecting member.

2. In a processing apparatus, the combination of a detecting member operable by a movement of a portion of a sealed package, means for operably associating a package with the detecting member, selectively operable means for applying pressure to the package so supported, and an indicator controlled by the detecting member.

3. In a processing apparatus, the combination of a retort, means for indicating pressure therein, an indicator disposed exterior of the retort, a detecting member controlling the operation of the indicator and operable by a movement of a portion of a sealed package, and means for operably associating a reentrant portion of package within the retort with the detecting member.

4. In a processing apparatus, in combination with a retort, means for supporting packages within the retort, means for collectively subjecting the packages within the retort to modifying influences, an indicating device, a detecting member operable by a movement of a portion of a specimen package for controlling the operation of the indicating device, and means for operably associating one of the packages within the retort with the detecting member.

5. In a processing apparatus, the combination of a retort, means for supporting a sealed package within the retort, means for subjecting the supported package to external fluid pressure, an indicator, and means operably associating an expansible portion of the sealed package with the indicator.

6. In a processing apparatus, the combination of a retort, means for supporting a package within the retort, means for subjecting the package to opposing internal and external fluid pressures, an indicator exterior of the retort, and means movable by a wall of the package operably associating the package with the indicator.

7. In a processing apparatus in combination a retort, means for supporting a package within the retort, means for subjecting a package so supported to heating, cooling and pressure media, an indicator exterior of the retort, and means operable by a wall of the package operably associated with said indicator and with a package within the retort.

8. In a processing apparatus in combination with a retort, an indicating device, a movable detecting member controlling the operation of the indicating device, and means within the retort for sustaining a package with a reentrant wall portion there-

of in operative association with the detecting member.

9. In a processing apparatus, the combination of a retort, means for collectively treating sealed packages therein, an indicator outside of the retort, means operable by a movement of a portion of one of said packages for controlling the operation of said indicator, and means operably associating one of the packages in the retort with said last mentioned means while undergoing processing treatment.

10. In a processing apparatus, the combination of a retort, selectively variable means for admitting fluid to said retort for collectively treating commercial packages therein, an indicator, and means operably associating a commercial package in the retort with the indicator in such manner that a movement of a portion of a package operates said indicator.

11. In an apparatus for processing packages, the combination of a retort for confining packages, an indicator arranged for inspection while the retort is in use, means for subjecting packages in the retort to pressure, a detecting member operable by pressure from a wall portion of a package in the retort, said detecting member being effective to operate the indicator, and means for operably associating a package within the retort with the detecting member.

12. The art of controlling pressure upon food packages in a closed retort during processing by means of heat treatment, which comprises operating an indicator by a movement of a portion of a specimen package within the retort and then controlling the pressure in the retort to balance the exterior pressure on the package against the interior pressure thereof.

13. The art of controlling temperature and pressure upon sealed food packages within a sealed retort, which comprises associating a specimen package with an indicator adapted to indicate movement of a flexible portion of said specimen package and manually controlling the temperature and pressure in the retort in such manner as to maintain the exterior pressure on the package sufficient to cause the indicator to show the flexible portion of the package to be under predetermined interior and exterior pressures.

14. The art of processing food in sealed packages within a closed retort provided with an indicator operatively connected with the package in the retort and adapted to be operated by a flexible portion of the package, which comprises subjecting the sealed containers to heat and external fluid pressure, and then manually controlling the pressure according to the movement of the indicator.

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