

Feb. 1, 1938.

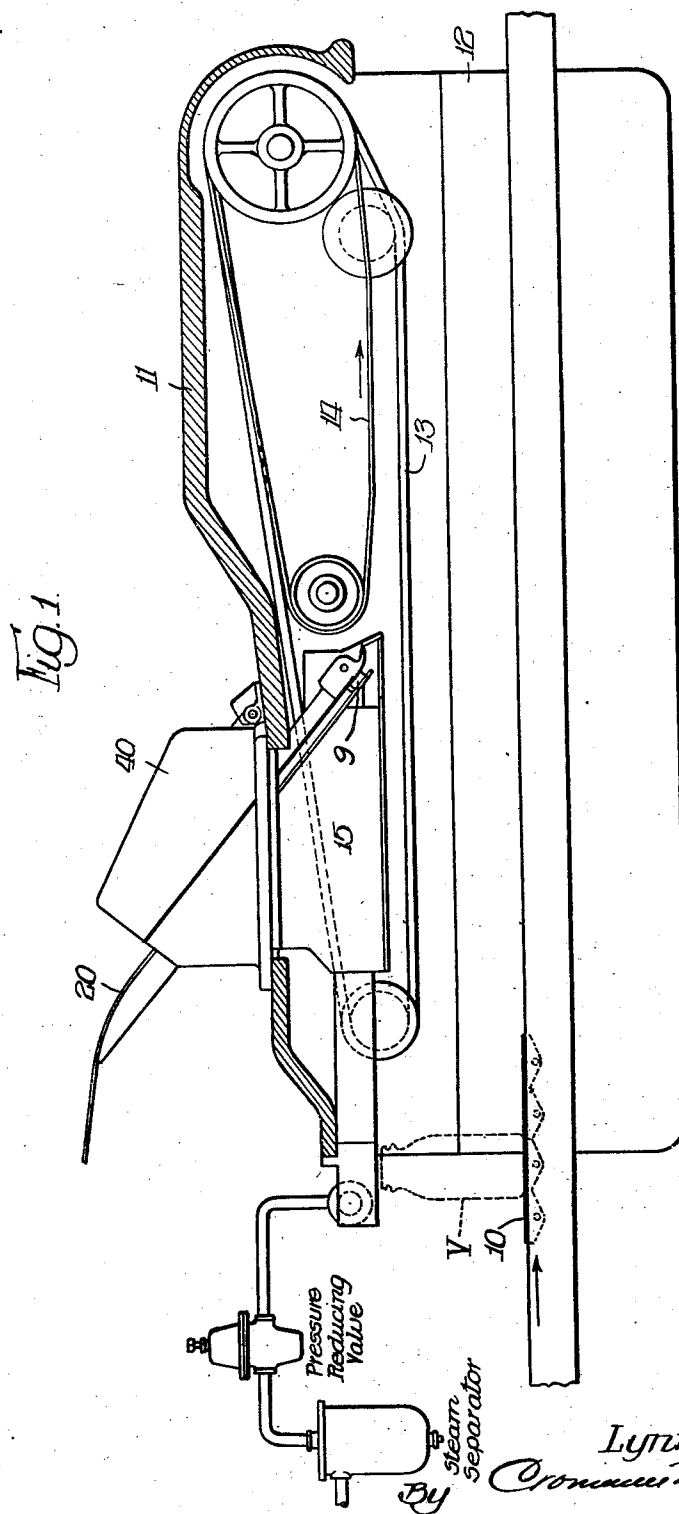
L. E. DAVIES

2,107,237

PACKAGE SEALING

Filed Oct. 25, 1935

3 Sheets-Sheet 1



Inventor:
Lynn E. Davies,

Cronquist Saint Clemente City

Feb. 1, 1938.

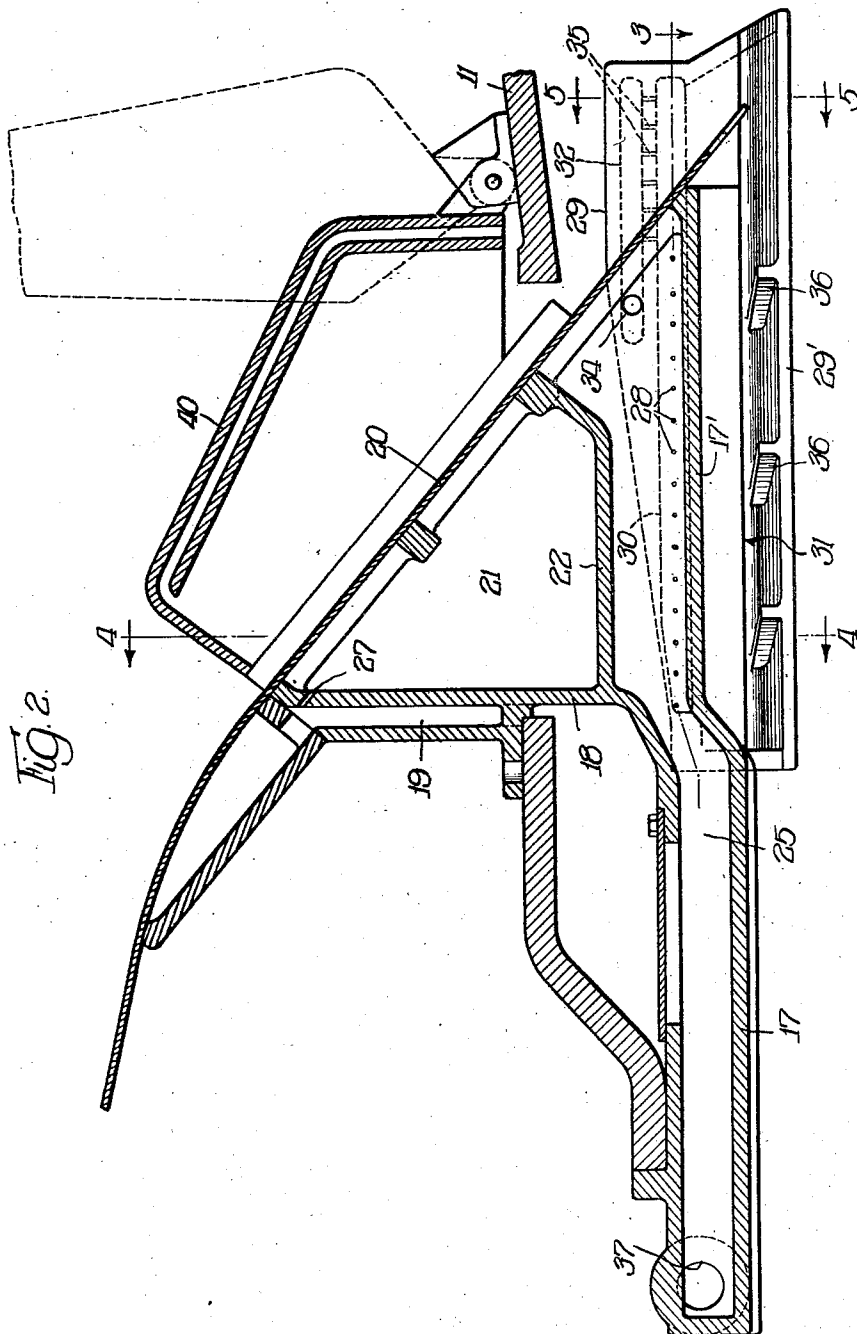
L. E. DAVIES

2,107,237

PACKAGE SEALING

Filed Oct. 25, 1935

3 Sheets-Sheet 2



Inventor:
Lynn E. Davies,
By *Cromwell McIntosh*
attys.

Feb. 1, 1938.

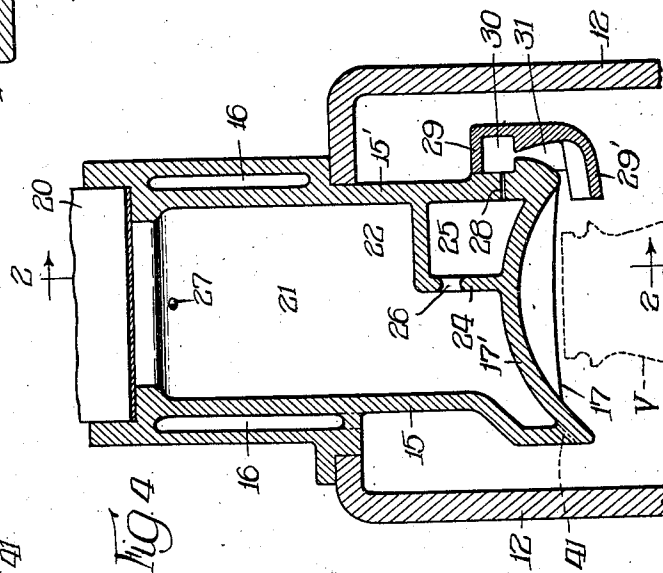
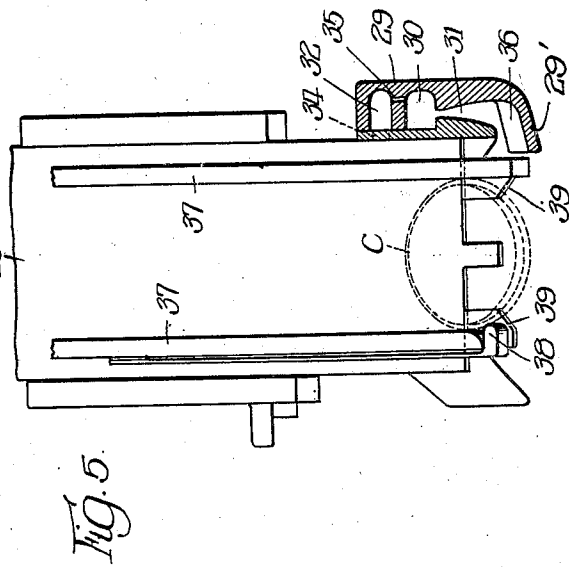
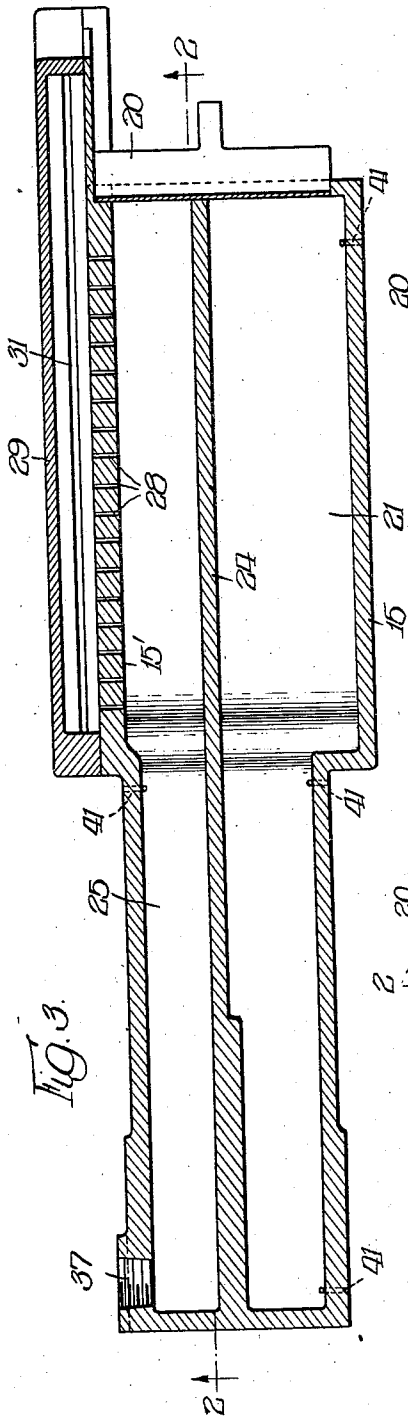
L. E. DAVIES

2,107,237

PACKAGE SEALING

Filed Oct. 25, 1935

3 Sheets-Sheet 3



Inventor:
Lynn E. Davies,
By *Cromwell Reidman*
attys.

UNITED STATES PATENT OFFICE

2,107,237

PACKAGE SEALING

Lynn E. Davies, Chicago, Ill., assignor to White Cap Company, Chicago, Ill., a corporation of Delaware

Application October 25, 1935, Serial No. 46,681

23 Claims. (Cl. 226—82)

This invention relates to the packaging of commodities, such as foods, in containers such as jars, cans, bottles, and the like, and has to do particularly with apparatus and procedure for effecting the removal of air from within the container and its closure incident to the application of the closure to the container preliminary to the sealing of the package. The present invention is in some respects an improvement on apparatus and method disclosed in U. S. Letters Patent No. 1,920,539, granted August 1, 1933 and No. 2,041,891, granted May 26, 1936 to William P. White, assignor to White Cap Company.

In the procedure described in the aforementioned patents, the containers, after being suitably filled, are moved progressively with their open mouths enveloped in an atmosphere of hot vapor, and in the course of such progressive movement, closure caps are applied to the mouths of the containers while they are in the hot vapor atmosphere, this being followed by the sealing of the closures on the container. Incident to the progressive movement of the open mouth portion of the container in the hot vapor atmosphere, air in the head space of the container is displaced by hot vapor, and air is likewise displaced from within the closure cap incident to application of it to the container in the hot vapor atmosphere. As a consequence, when the closure is sealed on the container, the head space is occupied by hot vapor, and upon the cooling or condensation thereof, the pressure within the sealed container is reduced to a value less than atmospheric pressure. The differential between atmospheric pressure and that resulting within the sealed package is generally referred to in the industry as "vacuum", and for purpose of convenience will be so designated herein.

One of the objects of the present invention is the provision of apparatus and method which may be utilized to accomplish the elimination of the greatest possible proportion of air from within the head space and closure in the procedure above described, thus to obtain the highest possible degree of vacuum in the sealed package.

Another object is the provision of apparatus and method which may be employed economically and effectively in commercial packaging and which will safeguard the packages against contamination and the deposit of moisture upon the contents of the containers and/or upon inner surfaces of the containers and the closures in the course of the operations.

Another object is the provision of apparatus and method which will accomplish sterilization

of the head space and of the closure and effectively displace air from within them without subjecting the contents of the containers to disturbance.

Yet another object is the provision of apparatus and method which will operate effectively to accomplish the above stated objects incident to rapid handling of the containers and closures in the course of the operation.

Other and further objects will be pointed out or indicated hereinafter or will be apparent to one skilled in the art upon an understanding of the present invention or its employment in practice.

For the purpose of facilitating an understanding of the invention, I show in the accompanying drawings forming a part of this specification and hereinafter describe certain forms of apparatus in which it may be embodied and practiced, but it is to be understood that these are presented merely by way of illustration and are not to be construed in any fashion calculated to limit the appended claims short of the true and most comprehensive scope of the invention in the art.

In said drawings,

Fig. 1 is a longitudinal sectional view showing various parts of a machine in which the present invention may be embodied and practiced, the showing being more or less schematic and intended primarily for the purpose of illustrating the relationship of various parts of the machine;

Fig. 2 is a longitudinal sectional elevation of a portion of the apparatus constituting subject matter of the present invention, said section being taken on approximately line 2—2 of Figs. 3 and 4;

Fig. 3 is a cross section on approximately line 3—3 of Fig. 2;

Fig. 4 is a transverse sectional elevation on approximately line 4—4 of Fig. 2; and

Fig. 5 is a part end elevation partly in section on line 5—5 of Fig. 2, showing the cap-supporting device.

The nature of the invention may be most quickly ascertained from a more or less detailed explanation of the apparatus illustrated in the drawings, which will now be described.

The sealing machine illustrated in Fig. 1 is of the general character shown and described in the aforementioned patents. The reference numeral 10 designates a conveyor in the nature of an endless belt adapted to support the containers, such as jars, bottles, or the like, which are set thereon in upright position, said conveyor being suitably driven to move it and the containers in the direction indicated by the arrow. Over a portion of this conveyor is arranged a housing 11 which has

lateral walls 12 that extend down on opposite sides of the conveyor thus affording a tunnel-like passage which is open at opposite ends. By operation of the conveyor, the containers are caused to enter the passage at the end of the machine shown at the left hand in Fig. 1 and to travel progressively through the passage and out of its opposite end. In this passage at a substantial distance from the entrance end thereof, is disposed a cap-supporting device (designated generally by the reference numeral 9 in Fig. 1) and beyond this is a sealing mechanism which includes a belt 14 that is moved in the direction indicated by the arrow at a linear rate corresponding to the speed of the conveyor. Operably mounted in the passage are lateral belts, one of which is shown at 13, which are transmitted in the direction and at a rate corresponding to those of the conveyor 10, said lateral belts serving to grasp the upper portions of the containers between them, whereby definitely to maintain the containers in upright position incident to the application of the closure caps. Supported on and forming a part of the housing ahead of the sealing belt 14, is the steam distributor which is illustrated in detail in Figs. 2 to 5 inclusive.

The steam distributor comprises a casing having side walls 15 and 15', the upper portions of which are chambered as shown at 16, a heat radiating wall having a lower portion 17 and a higher portion 17', and a front wall 18, the upper portion of which is chambered at 19, said chamber communicating with the side wall chambers 16. The casing is closed at the top by a smooth inclined plate 20 to form a chamber 21, and has internal partitions 22 and 24 forming a longitudinal steam inlet passage 25 which communicates with the chamber 21 through an aperture 26 (Fig. 4) located approximately in the plane of section line 4-4 of Fig. 2. An aperture 27 places the jacket chambers 16 and 19 in communication with the chamber 21. The lower portion 17 of the heat radiating wall is approximately flat, but the higher portion 17' is arched, as seen in Fig. 4, and is somewhat wider than the portion 17.

At a point somewhat above the lower limit of the chamber 25, the wall 15 is provided with small apertures 28, and upon the outer side of said wall is applied a nozzle member 29 which has a longitudinal passage 30 into which said apertures 28 lead. As shown in Figs. 4 and 5, the facing lower portions of the wall 15' and said nozzle member are shaped to form a downwardly expanding passage 31, which communicates with the passage 30 through a narrow slot. The lower portion of the nozzle 29 is turned inwardly and extended somewhat below the wall portion 17', as illustrated at 29', thus forming an inward continuation of the downwardly expanding passage 31. The rearward portion of the nozzle 29 extends somewhat beyond the rearward end of the wall portion 17', and it is also of somewhat increased depth so as to afford space for a supplemental steam outlet passage 32 above the rearward end portion of the steam outlet passage 30. Supplemental steam outlet passage 32 is in communication with steam inlet passage 25 by way of an aperture 34, and it is in communication with steam outlet passage 30 by way of a plurality of quite small apertures 35. The lower portion 29' of the nozzle member is provided with a plurality of diagonal ribs 36 directed inwardly and rearwardly below the lateral portion of the bottom wall 17'.

At its front end the steam distributor is provided with a steam inlet 37, to which steam from a suitable source is supplied by way of a steam separator and a pressure-reducing valve, as indicated diagrammatically in Fig. 1. It is desirable that the pressure at which the steam is supplied to the separator be as high as it is practicable to obtain, as from the plant boiler, and that the steam separator be effective to extract free moisture from the steam. Through the pressure-reducing valve the steam is expanded and its pressure reduced to a value of from one to three pounds (gauge). As a result, the steam supplied to the steam distributor is dry, and, in fact, somewhat superheated at its then pressure, and it is not permitted to cool appreciably while it is in the steam inlet passage 25, for the reason that said passage is substantially surrounded by hot steam as hereinafter pointed out. Through apertures 26 and 27 chamber 21 and jacket chambers 16 and 19 are kept filled with steam from steam inlet passage 25 and at approximately the same pressure.

Steam passes from steam inlet passage 25 into distributing passage 30 through the quite small apertures 28, a substantial proportion of the pressure being converted to velocity, so that the pressure in distributing passage 30 is lower than that in inlet passage 25. Issuing from distributing passage 30 through expanding passage 31, the steam is further expanded and its pressure and velocity reduced, so that it issues continuously below the wall portion 17' with a gentle flow. The change in direction given by the portion 29' of the nozzle member contributes to reduction of its velocity, and likewise aids to throw out of suspension any globules of free moisture which may be carried in the steam. The supplemental distributing passage 32 serves to provide an increased supply of steam at the rearward end of the nozzle member 29. The steam which passes from inlet passage 25 through aperture 34 into supplemental distributing passage 32 proceeds through the small apertures 35 into the rearward end of distributor passage 30, its pressure being thereby reduced, this steam issuing through expanding passage 31 at the rearward end of the nozzle member. The ribs or vanes 36 function to direct the issuing steam diagonally below the wall portion 17', directing it somewhat toward the outlet end of the housing, the freshly admitted steam flowing as a stratum, an inch and a half or more in depth, below the wall portion 17' and being somewhat augmented in volume at and rearwardly adjacent the rearward terminus of the plate 20. Thus the portion of the housing 11-12 about the steam distributor is kept filled with hot steam which insulates the steam in inlet passage 25 and chamber 21 against cooling and maintains the wall portions 15 and 15' and the portions 17 and 17' at high temperature. The upper portion of chamber 21 is likewise insulated by the steam in jacket chamber 16, and the cover plate 20 is kept at high temperature by contact with the steam in passage 25 and chamber 21.

This inclined plate 20 forms the bottom of a chute down which closure caps may slide to a position where they are supported within the tunnel-like passage by the cap-supporting device. As seen in Fig. 5, guide rails 37 are positioned on the plate 20 and are adjustable toward and from its median line for guiding cooperation with closure caps of different diameters. One of these guide rails carries at its lower end a stop detent 38 held yieldably in a position to arrest

the lowermost cap in a sloping position in which a portion of it projects a substantial distance beyond the lower terminus of plate 20, said cap being supported at opposite sides on short wings 39 which lie flush with the surface of plate 20 and are carried on and project inwardly from the guide rails 37. These parts thus constitute the cap-supporting device, which is adapted to support a cap approximately in the position indicated in dotted lines at C in Fig. 5. In such position the rearward portion of the skirt of the cap depends in the path of the upper rim of the container which is being moved progressively by the conveyor. The approaching container is indicated at V in Figs. 1 and 4.

By reference to Figs. 1 and 4 it will be appreciated that as a container enters and moves progressively through the tunnel-like passage, its mouth rim travels below the heat radiating wall portion 17. Hot steam within passage 25 and chamber 21 maintains this wall portion 17 at a high temperature so that no condensation of moisture upon it can occur. Heat radiated from portion 17 is effective to heat the rim of the container and the air which is within the head space. As the container travels along under the wall portions 17 and 17', its mouth portion enters the gently and continuously flowing stratum of freshly emitted hot dry vapor issuing from passage 31. Progressive movement of the container produces a certain amount of turbulence over and about its mouth which aids in displacement of air from within the head space, and the displaced air is carried off in a lateral direction by the current of hot steam. The hot steam in chambers 21 and 25 maintains the portion 17' at a high temperature so that no condensation can occur on its lower surface. When the container contacts the depending skirt of the lowermost cap on the cap chute, the continued progressive movement of the container will draw that cap past the spring-pressed detent 38, and the cap will come to rest upon the mouth of the container. This occurs in a location where the volume of emitted steam is augmented as above described. As a consequence of the procedure the head space of the container and the space within the closure cap thus applied to the container are substantially evacuated of air and filled with hot vapor. The container with the cap thereon then passes immediately under the sealing belt 14 and the cap is pressed down to seal the vessel hermetically. The holding-down pressure is maintained until the cap is sufficiently cooled to produce some contraction of the trapped vapor, and thus produce negative pressure within the sealed package.

The closure caps which are to be thus applied to the containers are placed upon the upper portion of the plate 20, and slide down the same by gravity, one in contact with another, and feed downwardly as they are withdrawn one by one from the lower end of the chute as above described. By virtue of their contact with the heated plate 20, the caps are themselves heated, thus avoiding formation or effecting re-evaporation of any condensate from steam which may enter them while they are on the chute. As they reach the lower portion of the chute they enter the stratum of freshly emitted high temperature steam which is flowing below them, with the result that the air is displaced from them and they are filled with the hot vapor. To expedite the heating of the caps, the intermediate portion of the chute is housed by a cover 40,

which becomes filled with hot steam which passes up along the chute. This cover is preferably made with hollow walls, for insulating effect, and is mounted so as to be swung to a position away from the chute, as illustrated in dotted lines in Fig. 2.

From the foregoing it will be understood that all portions of the apparatus under which the containers pass before the closure caps are applied to them are maintained constantly at sufficiently high temperatures to prevent any condensate from forming thereon and dropping into the containers, and that the caps are preheated for like purpose. Furthermore, it will be seen that the hot steam is supplied and flowed in such fashion as to contribute to the displacement of air from within the containers and the caps, and such as to carry away the displaced air, without subjecting the contents of the containers to disturbance and without drawing additional air into the vicinity of the containers' mouths or of the closures in the course of application thereto. As a consequence, a very high degree of evacuation of the containers is obtained, under conditions which safeguard their contents against contamination and accomplish sterilization of the closures and the mouth portions of the containers.

It will be understood that in the heating-up of the steam distributor preliminary to a run, or after the steam has been turned off at the end of a run, condensation is likely to occur within the various chambers and passages. In order to dispose of the condensate so formed, small outlet passages 41 are provided at suitable low points, said passages opening at points safely removed from the path of the containers.

By virtue of the means and procedure above described it will be seen that the steam within the steam inlet passage 25 may be maintained in a superheated condition, and that by virtue of its expansion into steam distributing passage 30 and through expanding passage 31, it may be maintained in superheated condition so as to issue in that condition. This effectively precludes condensation of moisture within the container or cap while the container mouth is passing through the hot steam stratum and while the cap is being applied. This is because of the fact that, being superheated, it cannot itself carry any particles of free moisture, and has to be cooled sufficiently to lose its superheat before it will condense in contact with a relatively cooler surface such as the container or the cap. Because of the proximity of the hot surface 17' and the continuous supply of dry steam to and the free flowing away of the steam from the container mouth and closure, it does not have time to lose its superheat while it is in contact with the latter. Likelihood of such condensation is further reduced by the preheating of the cap and of the mouth of the container and the surface of the material therein as they travel along under the heat radiating wall portions 17 and 17'.

What I claim is:

1. In package sealing apparatus, a housing affording a tunnel-like passage, means for moving containers into and progressively through said passage, portions of said housing forming a steam distributor affording a chamber having a heat radiating wall overlying the path of the mouths of containers adjacent and rearwardly from the entrance of the housing, said steam distributor having an outlet opening at one side of the path of the containers adjacent the rearward portion of said heat radiating wall, and means for providing the chamber with hot steam effective

to heat said heat radiating wall, said outlet permitting discharge of steam from the chamber into said passage.

2. In package sealing apparatus including cap-applying means and feeding means for moving containers progressively thereto, a housing forming a tunnel-like passage leading to the cap-applying means, said housing including a steam chamber having a wall overlying the path traveled by the containers from the entrance end of said passage to the cap-applying means, a steam outlet from said chamber being provided to direct steam transversely below the rearward portion of said wall, and means for supplying steam to said chamber to heat said wall and issue through said outlet.

3. In package sealing apparatus including a housing affording a tunnel-like passage cap-applying means disposed in said passage and means for moving containers progressively through said passage and to said cap-applying means, a heat-conducting plate forming a canopy overlying the path traveled by the containers from the entrance end of said passage to the cap-applying means, a steam conduit having an opening arranged to direct steam transversely below the rearward portion of said plate, and means for supplying steam to said conduit and heat to said plate exteriorly of said passage.

4. Package sealing apparatus as specified in claim 3 and wherein the said rearward portion of said plate affords a greater clearance above the mouths of the containers than does the forward portion of said plate.

5. In package sealing apparatus, a steam distributor affording a chamber and having a heat radiating wall, said distributor having an inlet for steam to said chamber and an outlet at one side of said heat radiating wall, said outlet being arranged to direct steam transversely below a portion of said heat radiating wall.

6. In package sealing apparatus, a steam distributor as specified in claim 5 and including also means for effecting expansion of steam on its way from said chamber to said outlet.

7. In package sealing apparatus, a steam distributor having a heat radiating wall and affording a chamber for confining steam under pressure, a steam inlet provided for said chamber, and a steam conduit having an outlet arranged to direct steam transversely below a portion of said heat radiating wall, said steam conduit having restricted communication with said chamber by way of which steam may be supplied to said conduit and its outlet from said chamber but at materially reduced pressure.

8. In package sealing apparatus, a steam distributor having a bottom wall and affording a chamber for confining steam under pressure, a steam inlet to said chamber being provided, a steam conduit having an outlet arranged to discharge steam in a horizontal direction below a portion of said bottom wall, said conduit having an inlet for steam from said chamber, which latter inlet is of materially smaller flow capacity than said outlet and said chamber inlet respectively, for the purpose described.

9. In package sealing apparatus, the combination with means for moving containers progressively, of a heat radiating plate forming a canopy overlying the path traveled by the mouths of the containers, means for supplying heat to said plate, and means at one side of said plate for directing flow of steam below and clear across the same.

10. In package sealing apparatus having means

for moving containers progressively, a heating device having a lower wall overlying the path traveled by the mouths of the containers and an upper wall spaced from said lower wall, said device affording a chamber for confining steam under pressure in heat-transfer association with said lower and upper walls, said upper wall affording a runway for closure caps, and means associated with said upper wall for guiding closure caps in movement along the same toward the path of the containers.

11. Package sealing apparatus as specified in claim 10 and wherein said upper wall slopes toward the bottom wall in the direction of the containers' movement, and including means for introducing steam below the lower wall adjacent the lower end of the upper wall.

12. Package sealing apparatus as specified in claim 10 and including a movable cover for housing closure caps on said upper wall.

13. In package sealing apparatus having closure applying means and means for moving containers progressively thereto, a plate overlying the path traveled by the mouths of the containers, means for heating the plate, and means for emitting and inducing a gentle flow of steam across and below said plate ahead of and adjacent the closure applying means.

14. In the art of sealing containers, a method which comprises moving the container progressively through a steam chest while keeping its open mouth continuously below a heat radiating surface, maintaining said surface at a temperature above the boiling point of water, flowing hot dry steam over and across the mouth of the container and across a closure cap in association therewith, applying the closure cap to the container in the flowing steam, and hermetically sealing the closure cap on the container.

15. In the art of sealing containers, a method which comprises maintaining steam under pressure in heat-transferring association with a heat radiating surface, maintaining the open mouth of the container below and in proximity to said heat radiating surface, while moving the container progressively through a distance materially greater than the diameter of the container emitting some of the steam in a dry state at approximately atmospheric pressure at a location below said heat radiating surface, directing the emitted steam transversely of the direction of movement of the container and in enveloping association with the mouth thereof, applying a closure to the mouth of the container while it is enveloped in the flowing steam, and hermetically sealing the closure on the container.

16. In the art of sealing containers, a method which comprises moving the container progressively through a distance materially greater than the diameter of the container while keeping its open mouth continuously sheltered below a heat radiating surface, maintaining at a temperature above the boiling point of water, heating a closure cap while moving it toward the path of the container, flowing hot dry steam under said surface in a direction transversely of the direction of movement of the container and in enveloping association with the mouth thereof, introducing the closure into the flowing steam and applying it to the mouth of the container therein, and hermetically sealing the closure on the container.

17. In package sealing apparatus, a steam distributor comprising a casing having a steam inlet conduit therein and having a chamber for confining steam under pressure, and a steam

outlet conduit having an expanding outlet directed under the casing, said inlet conduit having an outlet to said chamber and having communication with said outlet conduit restricted to a flow capacity materially less than the flow capacity of said expanding outlet.

18. In package sealing apparatus, the combination with a housing, of a steam distributor having wall portions partly within the housing and partly outside thereof, said steam distributor having an internal chamber in which steam may be maintained under pressure, the wall portions outside the housing having jacket chambers communicating with said internal chamber and the wall portions within the housing being connected by a bottom closure wall, said internal chamber being provided with an expanding outlet for conducting steam therefrom to a location under said bottom wall, and an inlet for steam to the internal chamber being provided.

19. In package sealing apparatus, in combination, a steam chest affording a tunnel-like passage, a conveyor for moving packing containers progressively into and through said passage, cap-supporting means disposed in said passage at a substantial distance from its entrance end, the roof of said passage between the entrance end and said cap-supporting means being formed as a heat radiating wall overlying the path of the mouths of the containers, said heat radiating wall constituting also a portion of a steam chamber, and means for supplying steam to said steam chamber to heat said wall, said steam chamber being provided with an outlet disposed below said heat radiating wall and laterally of the path of the containers for emitting steam into said tunnel-like passage.

20. In package sealing apparatus, in combination, a steam chest affording a tunnel-like passage, a conveyor for moving packing containers progressively into and through said passage, cap-supporting means disposed in said passage at a substantial distance from its entrance end, said steam chest including a heat radiating roof portion extending between the entrance end of said passage and said cap-supporting means and overlying the path of the mouths of the containers, said heat radiating roof portion constituting also a portion of a steam chamber, and means for supplying steam to said steam chamber to heat said roof portion, said steam chamber being provided with an outlet opening below said heat radiating roof portion and laterally of the path

of the containers for emitting steam into said tunnel-like passage.

21. In package sealing apparatus, in combination, a housing affording a tunnel-like passage, a conveyor for moving packing containers into and progressively through said passage, a cap-supporting device positioned in said passage at a substantial distance from its entrance end, the roof of said passage for a substantial distance inwardly from its entrance end comprising a heat radiating wall overlying the path of the containers, portions of said housing being associated with said heat radiating wall to form a steam chamber over said passage, and means for supplying steam to said chamber to heat said wall; the arrangement being such that the mouth portions of the containers are subjected to heat radiated from said wall throughout a substantial proportion of their travel in the passage to the cap-supporting device.

22. In package sealing apparatus, in combination, a housing affording a tunnel-like passage, a conveyor for moving packing containers into and progressively through said passage, a cap-supporting device positioned in said passage at a substantial distance from its entrance end, the roof of said passage between its entrance end and said cap-applying device comprising a heat radiating wall disposed over the path of the mouths of the containers, and means for applying heat to said heat radiating wall externally of said passage; the arrangement being such that the mouth portions of the containers are subjected to heat radiated from said wall throughout a substantial proportion of their travel in the passage to the cap-supporting device.

23. In package sealing apparatus, in combination, a housing affording a tunnel-like passage, a conveyor for moving packing containers into and progressively through said passage, a cap-supporting device positioned in said passage at a substantial distance from its entrance end, the roof of said passage between its entrance end and said cap-applying device comprising a heat radiating wall disposed over the path of the mouths of the containers, said heat radiating wall constituting a portion of a steam chamber disposed above said passage, and means for supplying steam to said steam chamber, said steam chamber being provided with an outlet arranged to emit steam in said passage laterally of the path of said containers.

LYNN E. DAVIES.