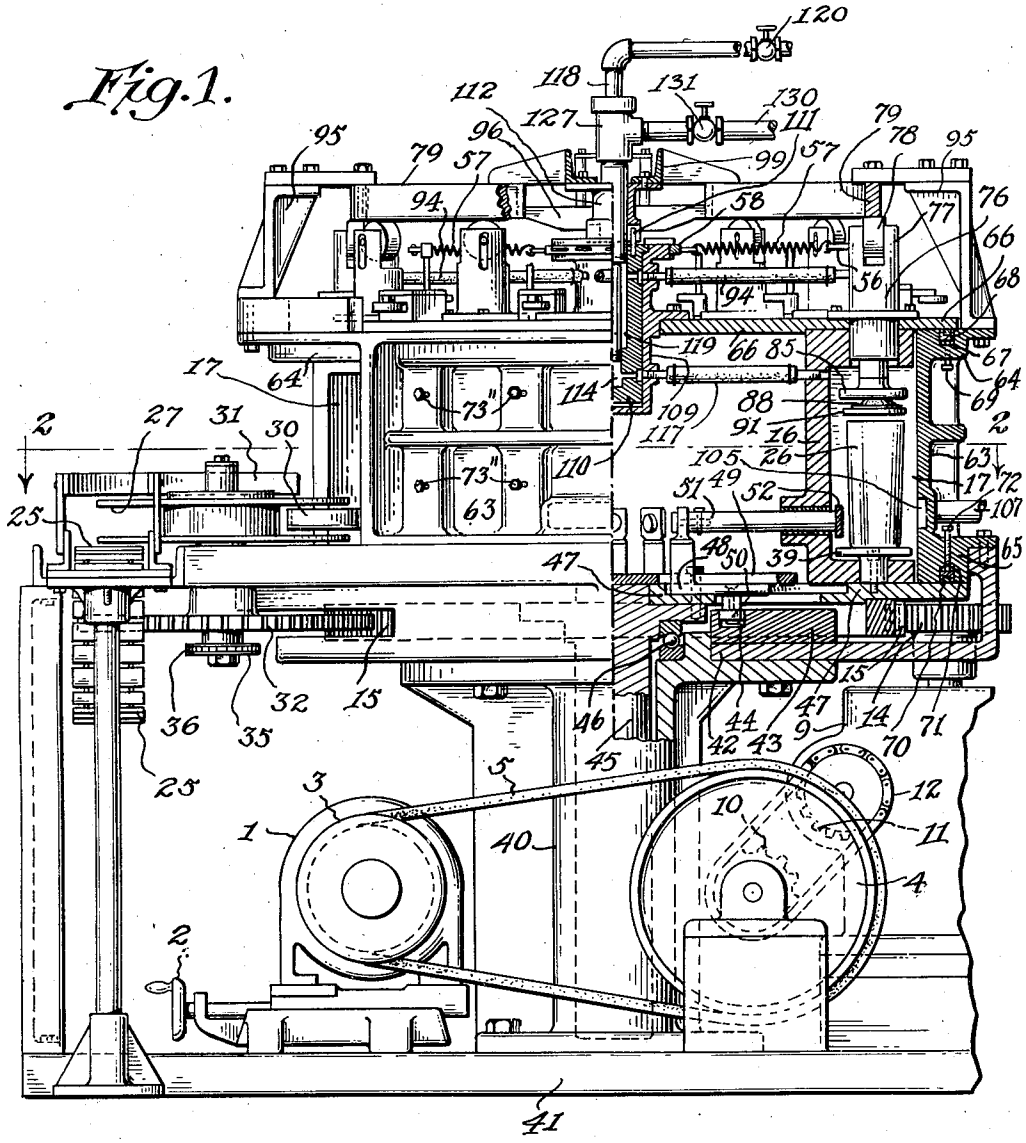
Feb. 29, 1944. J. J. WILLIAMS 2,343,104

SEALING MACHINE

Filed May 20, 1940 5 Sheets-Sheet 1

Fig. 1.



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SEALING MACHINE

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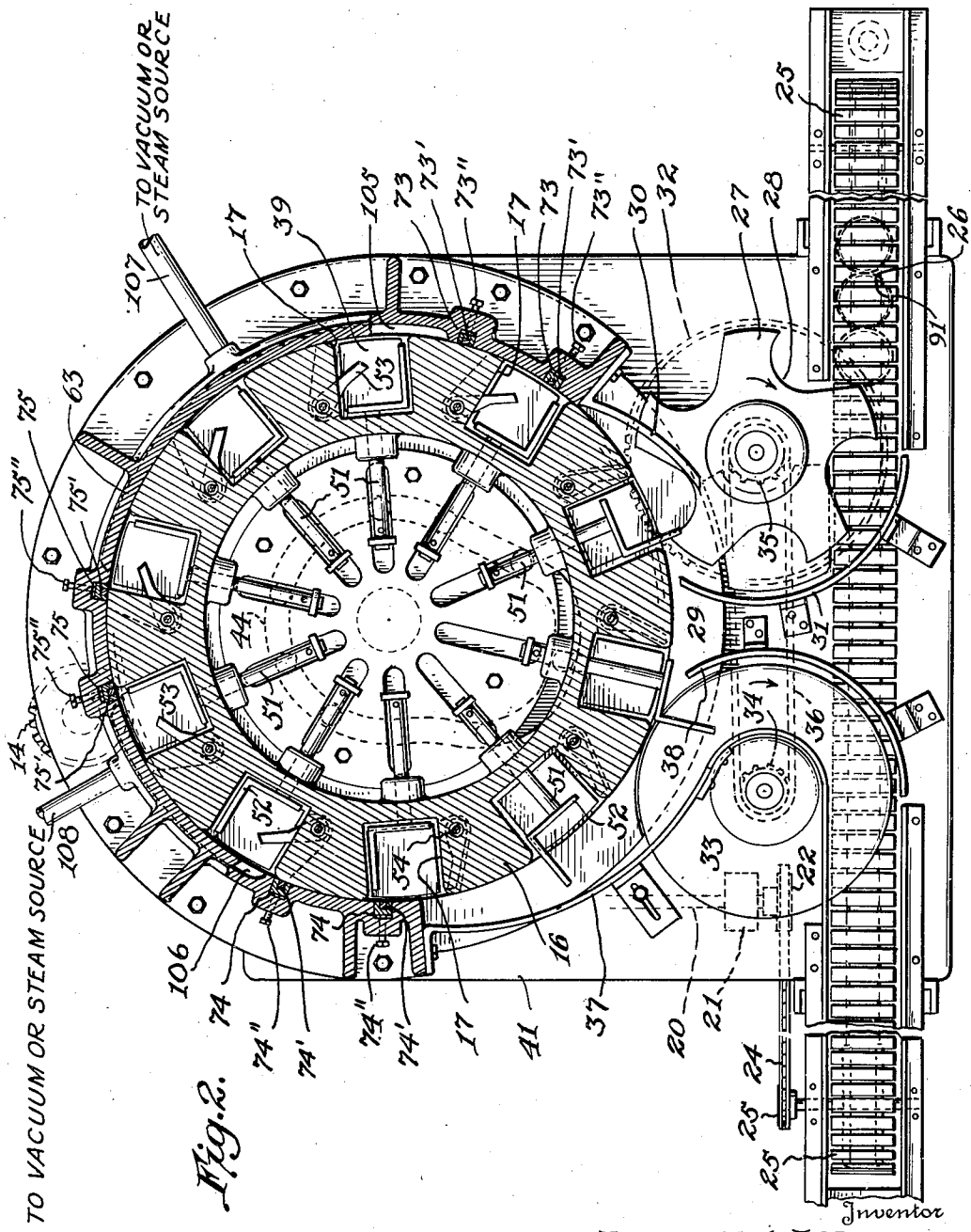


Fig. 2.

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Feb. 29, 1944. J. J. WILLIAMS 2,343,104

SEALING MACHINE

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Fig. 3.

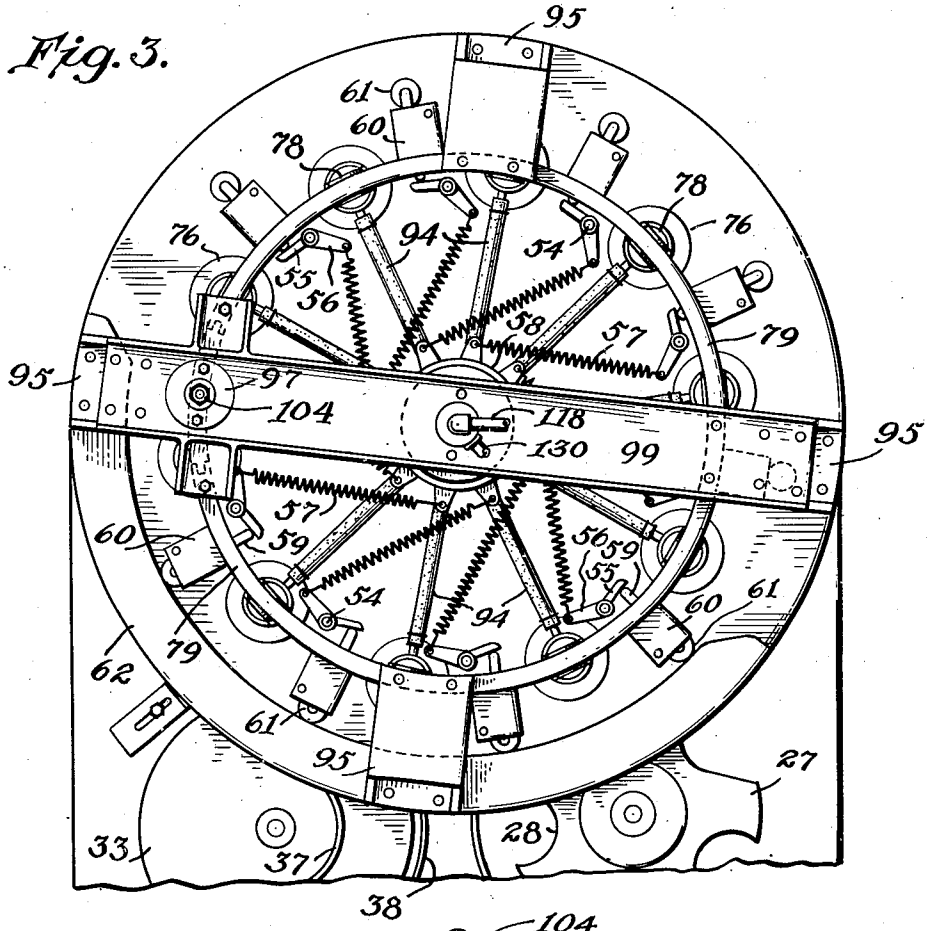
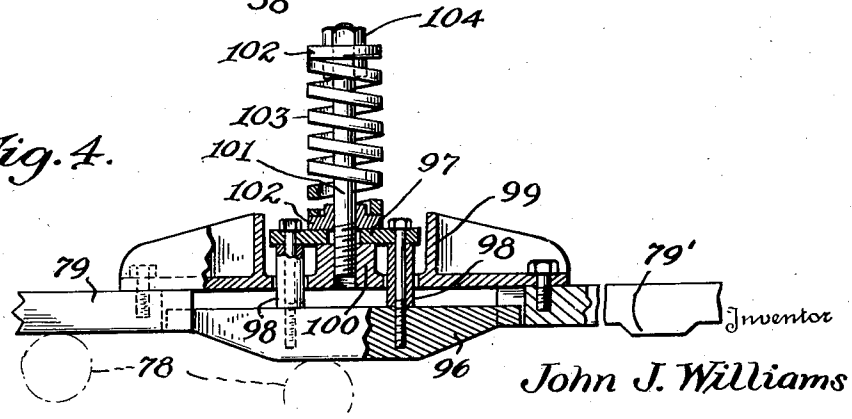


Fig. 4.



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Feb. 29, 1944. J. J. WILLIAMS 2,343,104

SEALING MACHINE

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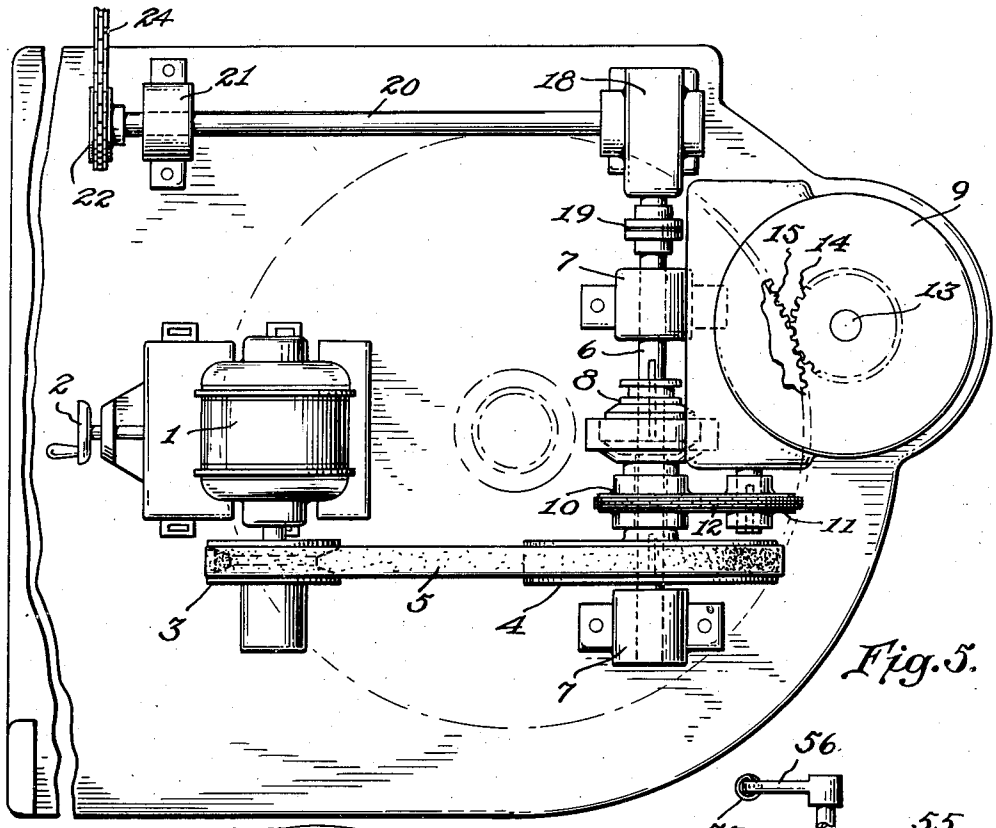


Fig. 5.

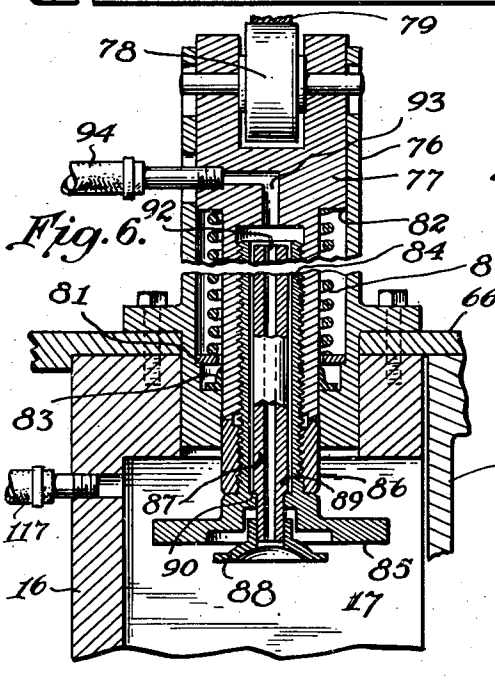


Fig. 6.

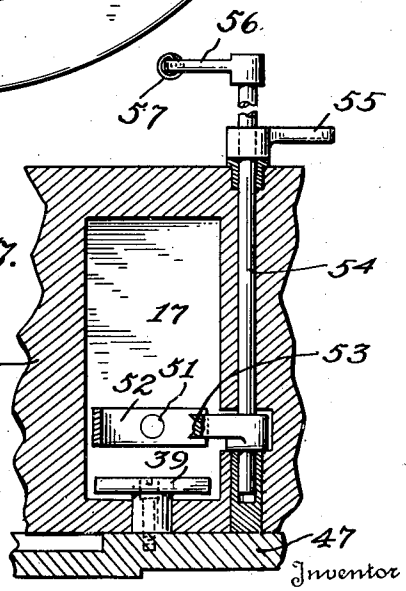


Fig. 7.

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Feb. 29, 1944. J. J. WILLIAMS 2,343,104

SEALING MACHINE

Filed May 20, 1940 5 Sheets-Sheet 5

Fig. 8.

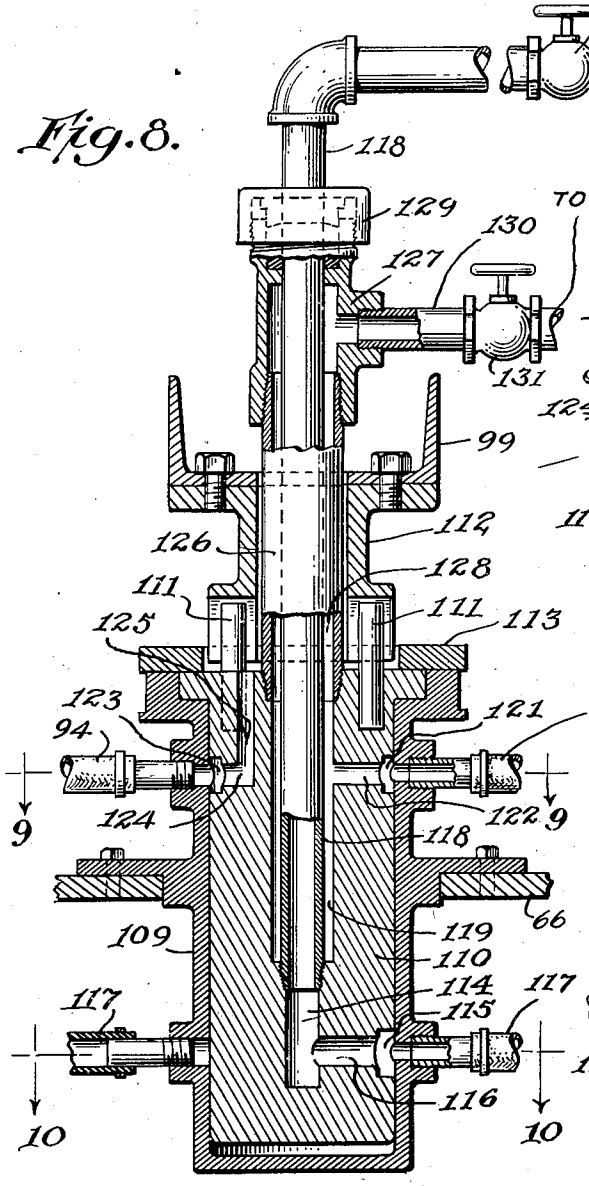
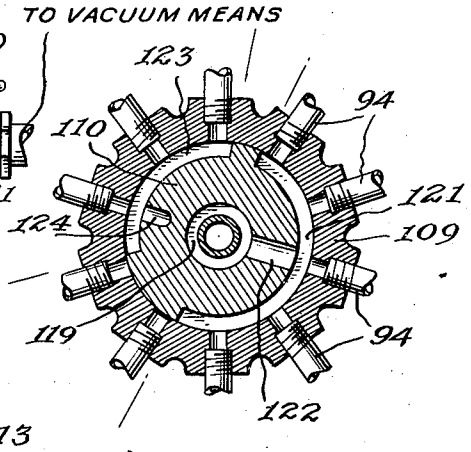


Fig. 9.



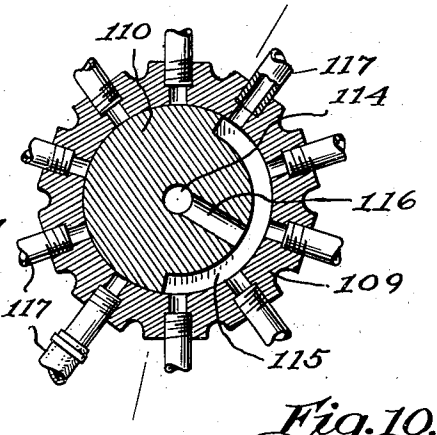


Fig. 10.

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Patented Feb. 29, 1944 2,343,104

UNITED STATES PATENT OFFICE

2,343,104

SEALING MACHINE

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Application May 20, 1940, Serial No. 336,288

9 Claims. (Cl. 226—82)

The invention relates to a machine for hermetically sealing containers, particularly glass containers, and one of the objects of the invention is to provide a machine in which vacuum may be employed in conjunction with a vapor such as steam, or with the application of vacuum without the use of steam, or merely as a sealer without either the application of steam or vacuum.

Another object of the invention is to provide a mechanism for automatically controlling the application of vacuum and steam.

A further object of the invention resides in the provision of means for lifting the closures from the containers, when steam is employed.

Various other objects and advantages of the invention will be apparent to those skilled in the art, from the following detailed description, when taken in connection with the accompanying drawings, in which,

Figure 1 is an elevational view of the apparatus; parts being shown in section.

Figure 2 is a horizontal sectional view of the apparatus, taken on line 2—2 of Figure 1.

Figure 3 is a top plan view of the apparatus.

Figure 4 is a detail view of the sealing cam and related parts.

Figure 5 is a plan view of the driving mechanism.

Figure 6 is a vertical sectional view of the mechanism for first removing the closures from the containers, and then sealing the closures on the containers.

Figure 7 is a vertical sectional view of one of the sealing chambers.

Figure 8 is a vertical sectional view of the mechanism controlling the application of steam and vacuum.

Figure 9 is a horizontal sectional view taken on line 9—9 of Figure 8, and

Figure 10 is a horizontal sectional view taken on line 10—10 of Figure 8.

Referring to the drawings in more detail, numeral 1 indicates a motor which is slidably mounted for adjustment by a handwheel 2. The motor drives a variable speed pulley 3 which is connected with a pulley 4 by means of a belt 5. The pulley 4 is secured to the countershaft 6 mounted in bearing 7. By adjusting the motor toward or from the countershaft 6, by means of the handwheel 2, the speed of the countershaft is varied as desired, in the well known manner.

Numeral 8 refers to a clutch on the countershaft 6. When the clutch is thrown in a speed reducer 9 is operated by means of gears 10 and 11 and connecting chain 12. On the vertical shaft 13 of the speed reducer is mounted a gear 14, and this gear meshes with a ring gear 15, which drives a rotary carrier 16 having a number of sealing chambers 17. The rotation of the carrier is controlled by the clutch 8.

The countershaft 6 is connected with a speed reducer 18, by means of a coupling 19. The slow speed shaft 20 of this speed reducer is extended and mounted in a bearing 21. The outer end of the shaft 20 carries a sprocket 22. This sprocket is connected with a sprocket 23 by means of a chain 24, for driving an endless conveyer 25. It is thus apparent that when the motor 1 is started the conveyer 25 will carry a supply of containers 26 into position ready for transfer to the rotary carrier 16 when it is started, as shown in Figure 2. The clutch 8 is then thrown in to start the rotation of the carrier and associated parts.

Numeral 27 refers to a feed wheel, having pockets 28, which continuously rotates over the continuously travelling conveyer 25. Each pocket of the feed wheel engages a container on the conveyer and sweeps it across an ordinary pan or plate and across the stationary ledge 29 into one of the sealing chambers 17 in the continuously rotating carrier 16. The containers are guided into the sealing chambers by the guide members 30 and 31.

The feed wheel 27 is continuously rotated, in timed relation with the rotary carrier 16, by means of gear wheel 32 on the feed wheel shaft. This gear meshes with the ring gear 15.

For carrying the sealed containers back to the conveyer 25, there is provided a delivery disc 33. This disc is continuously rotated by means of a gear 34 mounted on the delivery disc shaft and driven from a gear 35 on the feed wheel shaft, by means of a chain 36. The delivery disc 33 preferably rotates at a higher speed than the feed wheel 27, and hence the gear 34 is smaller than the gear 35. The sealed containers are guided from the sealing chambers 17 onto the delivery disc 33 and onto the conveyer 25, by means of guide members 37 and 38.

As previously mentioned, the continuously rotating carrier 16 is provided with a plurality of sealing chambers 17. In the embodiment illustrated there are ten of these chambers, but of course the number may be greater or less, as desired. In the bottom of each sealing chamber there may be mounted a plate 39, upon which the containers 26 are placed.

Numeral 40 refers to a spindle housing which is secured to a base plate 41. Bolted to the spin-

dle housing is a table 42, to which is secured a cam plate 43 having a cam groove or track 44.

Mounted within the housing, in appropriate bearings (not shown), is a flanged spindle 45; the weight of the spindle assembly being supported by a ball thrust bearing 46. To the flange of the spindle is bolted a drive plate 47, and secured to the under side of the drive plate is the previously mentioned ring gear 15 which meshes with the gear 14. The plate is provided with radially extending keyway-like grooves in which slides 48 are reciprocated. The slides are kept in the grooves by a cover plate 49 which is secured to the drive plate. The slides are reciprocated by means of rollers 50 which are carried by the slides and ride in the cam track 44.

Mounted on the upper side of the drive plate 47 is the carrier or rotor 16, which is in the form of a hollow cylinder provided with outwardly-opening sealing chambers 17.

Each sealing chamber is preferably provided with means for accurately positioning the containers therein, and for ejecting the sealed containers from the sealing chambers, which means will now be described.

Numeral 51 refers to a rod which is slidably mounted in the rear wall of each sealing chamber. These rods have their rear ends connected with the previously mentioned slides 48, and hence are reciprocated in the proper timed relation with the movements of the sealing chambers, by means of the rollers 50 in the cam track 44. The forward end of each rod 51 carries an L-shaped centering guide and ejector member 52. When the containers have been sealed these members move outwardly to eject them from the rotary carrier, and then the members move backwardly in the sealing chambers, as fresh containers are delivered thereto, into position to accurately center the containers. L-shaped members of different sizes are substituted for centering containers of different diameters.

For the purpose of positioning the packages against the L-shaped member 52, each sealing chamber is provided with a placing finger 53. These fingers are carried by vertical shafts 54, rotatably mounted in the carrier 16. The upper end of each shaft carries a lever 55 and a spring arm 56. A spring 57 has one end attached to the spring arm, and the other end is attached to a spring holder ring 58. A plunger 59, slidably mounted in a housing 60, is associated with each lever 55, and the outer ends of the plungers carry rollers 61 adapted to cooperate with a placing-finger cam 62. The arrangement is such that when the rollers 61 successively engage the cam 62, the plungers 59 will be moved inwardly to engage the levers 55, and thereby swing the placing fingers clear of the sealing chambers, to permit the ejection of the sealed packages. As the rotation of the carrier continues fresh packages to be sealed are delivered into the sealing chambers, and the rollers 61 successively ride off the cam 62, so that the springs 57 swing the placing fingers 53 inwardly, thereby causing the package to be forced against the centering angle member 52, where it will be held during the vacuumizing and sealing operations.

Numeral 63 refers to a stationary casing surrounding the rotary carrier or rotor 16. The top and bottom portions 64 and 65 of the casing encircle the rotor completely, but the portion of the casing between the top and bottom portions extends only about two-thirds of the distance around the rotor, as best shown in Figure 2. Thus the sealing chambers are closed during two-thirds of a cycle of rotation of the rotor, and are open during the remaining one-third rotation, during which the sealed packages are removed from the sealing chambers and new packages to be sealed are delivered thereto.

A plate 66 mounted on the top of the rotary carrier 16 projects across the top of the stationary casing. Of course a seal must be effected between the plate and the casing, and for that purpose a groove 67 is provided in the top of the casing, extending completely around the rotary carriage, and a sealing ring 68 carrying suitable packing is fitted in the groove. The ring can be adjusted for correct sealing pressure by means of screws 69. Similarly, the casing and rotary carriage are sealed at the bottom by means of a sealing ring 70 mounted in a groove 71, and adjustably pressed against the plate 47 by means of screws 72.

As mentioned hereinbefore, the stationary casing 63 encloses only about two-thirds of the rotor 16. Hence a seal must be provided between the rotor and the ends of the casing. For this purpose two vertical spaced grooves 73, 73, are provided adjacent the entrance end of the casing, and two similar vertical spaced grooves 74, 74, are provided adjacent the exit end of the casing. Sealing strips 73', 73' and 74', 74' are mounted in the grooves 73 and 74, and are adjustably pressed against the face of the rotor by means of screws 73'' and 74''. The grooves of each set are spaced a distance slightly greater than the width of the sealing chambers. In the present embodiment of the invention there is also provided a third set of similarly spaced vertical grooves 75, 75, in which are mounted sealing strips 75', 75', adjustably pressed against the face of the rotor by means of screws 75''. This third set of sealing strips is located about two-thirds of the way around the casing, from the entrance end thereof, and they permit the application of two different degrees of vacuum, as will appear more fully hereinafter.

The means for lifting the closures from the containers, and then sealing the closures on the containers, will now be described, and this will be followed by a description of the means for controlling the application of steam and vacuum.

Numeral 76 refers to the sealing head housings. Of course one of these is associated with each sealing chamber, and they are mounted on the top plate 66. Reciprocably mounted within the housing is a plunger 77, having at its upper end a roller 78. The plunger is urged upwardly, to maintain the roller against the cam ring 79, by means of a coil spring 80. This spring has its lower end resting on a washer 81, and its upper end pressing against a shoulder 82 on the plunger. A packing 83 prevents air from leaking along the plungers into the sealing chambers.

The plunger is threaded interiorly to receive the shank 84 of a sealing head 85. Of course the sealing head can be vertically adjusted by means of the threaded connection between the shank and plunger, and the sealing head is locked in its adjusted position by means of a lock nut 86. The sealing head and its shank are centrally bored to receive a vacuum cup holder 87, carrying at its lower end the vacuum cup 88. By reference to Figure 6 it will be noted that the vacuum cup holder is loosely mounted in the sealing head shank, and may move freely up and down to a limited extent. The vacuum

cup holder has its lower portion reduced in diameter to provide a shoulder 89 which normally rests on a shoulder 90 provided in the sealing head shank, thereby supporting the vacuum cup holder. When the sealing head is moved downwardly, to bring the vacuum cup into contact with the closure or cap, the shoulder 89 will be lifted slightly from the shoulder 91, so that the weight of the vacuum cup 88 and its holder 87 rests on the closure.

The vacuum cup holder is centrally drilled to provide a passage 92 for air to and from the vacuum cup, and the plunger 77 is provided with an aligned passage 93. Leading to the passage 93 is a vacuum pipe or hose 94. The manner in which air is withdrawn from and admitted to the vacuum cup through the pipe 94, will be descriped hereinafter.

As previously mentioned the roller 78 is urged against a cam ring 79 by the coil spring 80. This cam ring is carried by brackets 95 mounted on the stationary casing 63, and it controls the vertical position of the sealing heads at all times except during the actual sealing of the cap on the container. The actual sealing, and the amount of pressure applied, is controlled by a sealing pressure mechanism, best shown in Figure 4. Numeral 96 refers to a sealing pressure cam. which is in the shape of an arc of a circle, so that the rollers 78 can ride upon it. It is carried by a plate 97, and held in spaced relation to this plate by spacers 98. Numeral 99 refers to a channel iron which extends entirely across the apparatus, as shown in Figure 3, and has its ends mounted on previously mentioned brackets 95. The channel is provided with a threaded boss 100, to receive the lower end of an adjusting bolt 101. Collars 102, on the bolt, provide seats for a coil spring 103, which normally holds the plate 97 down against the boss. When the rollers 78 successively pass under the cam 96 the sealing heads will be forced downward to a sufficient extent to seal the closures on the containers, and if the pressure becomes too great the cam will rise against the pressure of the coil spring 103. The pressure of the coil spring is regulated by adjusting a nut 104 on the bolt 101.

When the packages are placed in the sealing chambers, the rollers 78 are travelling along a high part of the cam ring 79, so that the sealing head or pad 85 and the vacuum cup 88 are spaced above the cap or closure 91. At the proper instant the roller reaches a downward projection 79' on the cam ring 79, thereby causing the sealing head to move downwardly until the vacuum cup rests on the top of the cap or closure, and the sealing head continues its downward movement for a slight distance so that the vacuum cup holder is in effect lifted slightly, whereby its weight rests on the cap. The vacuum cup is now vacuumized, as will be described hereinafter, and the roller 78 rides onto a high part of the cam ring 79, whereby the cap or closure is lifted from the container. The sterilizing and vacuumizing operation are now carried out, as will appear hereinafter, and at the proper time the rollers 78 ride down the sealing pressure cam 96 thereby forcing the sealing heads downwardly to an extent sufficient to seal the caps on the containers. When the sealing heads have been moved downwardly air is admitted to the vacuum cups, to release the caps, and the rollers now ride up the cam 96 to the cam ring to lift the sealing heads from the caps. It should be mentioned here that, when using a vacuum pump instead of vapor to produce a vacuum, the cap lifting mechanism is not necessary.

The mechanism for controlling the application of steam and vacuum to the sealing chambers will now be described. The stationary casing 63 is provided with two aligned, spaced, channels 105 and 106. The channel 105 extends from a point adjacent the first set of sealing strips 73', 73' at the entrance end of the casing, to a point adjacent the intermediate set of sealing strips 75', 75'; and the channel 106 extends from a point adjacent the opposite side of this set of sealing strips to a point adjacent the sealing strips 74', 75', at the exit end of the casing. It might be mentioned here that if the apparatus were intended for use only with steam one continuous channel would be sufficient, but as the apparatus is also intended for use with a vacuum pump and without steam, it is desirable to have two separate channels, so that two different degrees of vacuum may be employed.

A pipe 107 leads to the channel 105, and a pipe 108 leads to the channel 106. These pipes may be connected with either a source of steam or a source of vacuum. If steam is employed they may be connected to the same source, so that they are in effect a single pipe. But if vacuum is employed they lead to separate sources of vacuum so that a higher degree of vacuum may be maintained during the latter part of the travel of the sealing chambers.

Referring particularly to Figures 8, 9 and 10, numeral 109 indicates a valve body which is bolted to the top plate 66, so that the valve body rotates with the rotor 16. Within the valve body is a valve plug 110 which is stationary. The plug is maintained in its fixed position by means of pins 111 which extend from the plug into appropriate recesses in a holder 112 which is secured to the channel member 99. A cover ring 113 is secured to the top of the valve body, to hold the valve body and valve plug in correct relation. The purpose of the control valve is to control and time the vacuumizing and venting of the suction cups, and to exhaust the steam or other vapor from the sealing chambers, so as to improve the circulation of the steam and expedite the steaming or vaporizing process.

The lower portion of the valve plug 110 is provided with a central passage 114 which communicates with an arcuate channel 115, by means of a radial passage 116. Leading from valve body 109, in the plane of the arcuate channel 115, to the sealing chambers 17, are ten pipes or hose sections 117; there being one such pipe for each sealing chamber. Numeral 118 refers to a pipe which has its lower end threadedly attached to the wall of passage 114. This pipe extends upwardly through an enlarged vertical passage 119 in the valve plug, and leads to a vacuum pump (not shown) or other source of vacuum. As the apparatus rotates, the pipes 117 will be successively brought into communication with the arcuate channel 115, whereupon the vacuum acting through the pipe 118, and passages 114 and 116, will increase the circulation of the steam which is being admitted through the channels 105 and 106, thereby improving and facilitating the vaporizing or steaming process. As the rotation of the apparatus continues the pipes 117 pass cut of communication with the channel 115, and the application of the vacuum is shut off. When steam is not employed, and the channels 105 and 106 are connected with vacuum pumps, there is

no longer any need for the suction pipe 118 and its associated parts, and a valve 120 is therefore provided for closing the pipe 118.

Numeral 121 refers to an arcuate channel in the valve plug, and a radial passage 122 connects the passage 119 with this channel. Numeral 123 refers to another arcuate channel in the same plane as the channel 121, but separated therefrom, as clearly shown in Figure 9. This channel 123 communicates, through a horizontal radial passage 124, with a vertical passage 125 which leads to the atmosphere. Leading from the valve body 109, in the plane of the separate arcuate channels 121 and 123, are the ten pipes or hose sections 94. As previously mentioned these pipes connect with the passage 93 in the sealing plunger, which communicates with the vacuum cup 88. In the present instance there are ten of the pipes 94, as there are ten sealing chambers in the present embodiment of the apparatus.

Numeral 126 refers to a pipe which has its lower end threaded into the wall of the passage 119, and its upper end threadedly connected to a manifold 127. The internal diameter of the pipe 126 is greater than the external diameter of the pipe 118 which extends therethrough, thereby leaving a passage 128 which communicates with the passage 119 and with the interior of the manifold 127.

The pipe 118 extends through a suitable stuffing box 129 in the top of the manifold, and connects with a vacuum pump or other source of vacuum, as previously described.

A pipe 130 is connected with the manifold and leads to a vacuum pump or other source of vacuum. As the apparatus rotates the pipes 94 are successively brought into communication with the arcuate channel 121, whereupon the vacuum acting through the passages 122, 119, 128, the manifold 127, and pipe 130, vacuumizes the vacuum cup 88 which is now in contact with the cap or closure 91, whereupon the vacuum cup is elevated to lift the cap from the container. The continued rotation of the apparatus carries the pipes successively out of communication with the channel 121 and into communication with the arcuate channel 123, whereupon the pipes successively communicate with the atmosphere, through passages 124 and 125. The vacuum cups 88 are thus vented to thereby release the caps from the cups. This venting of the vacuum cups occurs after the caps have been sealed on the containers.

When the containers are vacuumized by a vacuum pump instead of by the vapor method, the cap lifting mechanism is not necessary, and in such case communication between the cap lifting mechanism and a source of vacuum, is shut off by means of a valve 131 provided in the pipe 130.

The operation of the apparatus has been largely described along with the details of construction thereof, nevertheless it seems desirable to describe briefly here the complete operation of the apparatus, from the delivery of a package to be sealed, to the ejection of the sealed package. The operation of the apparatus will now be so described, when in use with steam or other vapor, and the application of vacuum to increase the circulation of the vapor. This will be followed by a brief description of how the apparatus operates with the application of vacuum without the use of steam, and how it operates merely as a sealer without either the application of steam or vacuum.

In starting the operation the motor 1 is first started, and the conveyer 25 will carry a supply of filled packages into position ready for transfer to the rotor 16. The closures 91 are loosely mounted on the containers 26, either by hand or machine. The clutch 8 is then thrown in to start the rotary movement of the rotor 16, and the feed wheel 27 geared to rotate therewith.

The pockets of the feed wheel will carry the packages, in proper timed relation, to the sealing chambers 17 of the rotor. From the feed wheel the packages will be guided into the sealing chambers by the guide member 30, and while the packages are entering the chambers, the L-shaped centering guide and ejector members are being moved back in the chambers by reason of the rollers 50 riding in the cam track 44.

When packages are being delivered to the sealing chambers, the placing fingers 53 are held out of the path of the packages by the rollers 61 riding on the cam 62, but when the packages are in the sealing chambers the rollers will ride off the cam, whereupon the springs 57 close the placing fingers 53, causing the package to be forced against the centering angle 52, where it will be firmly held, in vertical alignment with the sealing head 85, during the entire operation.

The sealing head and the vacuum cup 88 are well above the top of a package when it is being delivered to a sealing chamber, because the roller 78 is riding on a high part of the cam ring 79. But when the package is fully placed within the sealing chamber, the roller has reached a downward projection 79' on the cam ring, which causes the sealing head and vacuum cup to move downwardly. This downward movement continues until the vacuum cup rests on the top of a cap 91, and the cup holder is in effect lifted slightly, causing the weight of the cup holder to rest on the top of the cap.

The pipe 94 of this particular sealing chamber now comes into communication with the channel 121 of the control valve, whereby the cup 88 is vacuumized as previously described. At this stage the sealing chamber has passed the first set of sealing strips 73', 73', and the roller 78 rides up onto the high part of the cam ring 79, and the sealing head is thus raised to its former elevated position. And of course the cup 88 moves upwardly with the sealing head, and as the cup has been vacuumized the cap is lifted off the package.

The cap has now been lifted off the package, and the sealing chamber is in communication with channel 105, so that the chamber is filled with steam. This steam sterilizes the cap and the container, and also displaces the air, so that when the package is sealed a high vacuum is produced therein by the condensation of the steam upon cooling.

During this steaming or vaporizing period, the process is expedited and improved by drawing the steam from the sealing chambers at the same time that steam is being delivered to the chambers. That is, when a sealing chamber comes into communication with the steam channel 105, by which the chamber is continuously flooded with steam, the pipe 117 at the same time comes into communication with the channel 115 of the control valve, whereby the sealing chamber is connected through pipe 118 with a source of vacuum, to exhaust the steam. Thus there is maintained a continuous circulation of fresh steam, and this

is maintained all during the operation, until the package has been sealed.

The continued rotation of the carrier brings the sealing heads 85 successively to the sealing pressure cam 96. The contour of this cam causes the sealing head to move downwardly, and in this downward movement the vacuum cup first places the cap on the container, and the sealing head continues its downward movement to engage the cap and force it into sealing position on the container. If the pressure becomes too great, the cam 96 rises against the pressure of spring 103, until the two pressures balance, whereby breakage is prevented. The container is now sealed, and when the steam in the package cools a high vacuum will be produced. This sealing pressure is maintained on the package until the continued movement of the sealing chamber has cut off communication between it and the steam channel 106, and between it and the vacuum channel 115 of the control valve.

The seal having been completed, the roller 78 of the sealing head starts to ride up the sealing pressure cam 96, but just before this occurs the pipe 94 comes into communication with the channel 123 of the control valve. This channel communicates with the atmosphere, as previously described, so that the vacuum cup 88 is vented to release the cup from the cap. Thus the sealing head and vacuum cup are elevated to free the sealed package.

The continued rotation of the carrier 16 has now carried the particular sealing chamber past the last set of sealing strips 74', 74', in the stationary casing 63, and the sealed package is ready to be ejected. The roller 61 engages and rides upon the cam 62, to thereby swing the placing finger 53 back into open position so that the package may be freely discharged; and when the sealing chamber is entirely free of the casing 63, the ejector 52 starts to move outwardly by reason of the roller 50 riding in the cam track 44.

The package is thus moved outwardly upon the delivery disc 33, and as previously mentioned this disc travels with sufficient speed to carry the package clear of the path of the ejector 52. The sealed package is guided by the guide members 37 and 38 onto the conveyer 25 which originally carried the unsealed package to the sealing apparatus, and the conveyer may now carry the sealed package forward to the next operation, or to any point desired.

This completes the description of the operation in connection with a single package, but of course it is a continuous operation, with unsealed packages being continuously delivered to the sealing chambers of the rotor, and sealed packages being continuously delivered therefrom.

In the foregoing description the packages have been vacuumized by the steam or vapor method. But as previously mentioned the apparatus is also adapted to the vacuumizing of the packages by a vacuum pump, without the application of steam. When the apparatus is to be so used, the pipes 107 and 108 which were previously delivering steam, are now connected with vacuum pumps or other sources of vacuum. And in this operation of the apparatus it is not necessary to lift the caps from the containers, and hence the valve 131 is closed, so there will be no vacuumizing and venting of the vacuum cups 88. And of course the valve 120 is also closed. The operation of the apparatus then proceeds just as before described, except that the caps are not lifted from the containers, and the packages are vacuumized not by the steam or vapor method, but by the withdrawal of the air in the sealing chamber through the channels 105 and 106. These two separate channels make it possible to maintain a higher degree of vacuum in the sealing chamber during the latter part of their travel, than in the first part of their travel when the sealing chambers and packages containing air are being continuously brought into communication with the channel 105.

If the apparatus is to be used purely as a sealer, the valves 120 and 131 remain closed, and the pipes 107 and 108 are not connected with either steam or vacuum. The operation of sealing the packages is carried out exactly as described hereinbefore, but of course the caps are not lifted from the containers, and the packages are not vacuumized, either by the steam or vapor method or by the use of a vacuum pump.

Having fully described the invention, what I claim is:

1. An apparatus for sealing caps on containers, including a continuously rotating carrier having a plurality of sealing chambers, means for closing the sealing chambers during a part of the rotation of the carrier, means for lifting the caps from the containers, means for admitting steam to the closed chambers, vacuum means for exhausting steam from the closed chambers while steam continues to be admitted thereto and during the continued rotation of the carrier, and means for sealing the caps on the containers while the chambers remain closed.

2. An apparatus for sealing caps on containers, including a continuously rotating carrier having a plurality of sealing chambers, means for closing the sealing chambers during a part of the rotation of the carrier, a vacuum cup associated with each chamber, means for moving the cup into contact with the cap, means for vacuumizing the cup, and means for lifting the cup and cap, means for admitting the steam to the closed chambers, vacuum means for exhausting steam from the closed chambers while steam continues to be admitted thereto and during the continued rotation of the carrier, means for sealing the caps on the containers while the chambers remain closed, and means for venting the vacuum cups.

3. An apparatus for sealing caps on containers, including a continuously rotating carrier having a plurality of outwardly opening sealing chambers, a stationary casing partly surrounding the carrier and closing the sealing chambers during a part of the rotation of the carrier, said casing having an inner channel extending part way therearound and communicating with the sealing chambers, means for delivering steam to said channel and thence to the sealing chambers, vacuum means for exhausting steam from the closed chambers while steam continues to be admitted thereto and during the continued rotation of the carrier, means associated with each sealing chamber for lifting the caps from the containers, and means for sealing the caps on the containers.

4. An apparatus for sealing caps on containers, including a continuously rotating carrier having a plurality of outwardly opening sealing chambers, a stationary casing partly surrounding the carrier and closing the sealing chambers during a part of the rotation of the carrier, said casing having an inner channel extending part way therearound and communicating with the sealing chambers, means for delivering steam to said channel and thence to the sealing chambers, a pipe communicating with each sealing

chamber, a control valve for successively causing said pipes to communicate with a source of vacuum while steam is being admitted to the chambers, means associated with each sealing chamber for lifting the caps from the containers, and means for sealing the caps on the containers.

5. An apparatus for sealing caps on containers, including a continuously rotating carrier having a plurality of outwardly opening sealing chambers, a stationary casing partly surrounding the carrier and closing the sealing chambers during a part of the rotation of the carrier, said casing having an inner channel extending part way therearound and communicating with the sealing chambers, means for delivering steam to said channel and thence to the sealing chambers, a vacuum cup associated with each chamber for lifting the caps from the containers, a pipe associated with each chamber and communicating with the vacuum cup, means for raising and lowering the vacuum cup, a second pipe communicating with each sealing chamber, a control valve causing the first-mentioned pipes to successively communicate with a source of vacuum and successively communicate with the atmosphere, and said valve causing the second-mentioned pipes to successively communicate with a source of vacuum while steam is being delivered to the sealing chambers, and means for sealing the caps on the containers.

6. An apparatus for sealing caps on containers, including a continuously rotating carrier having a plurality of sealing chambers, means for closing the sealing chambers during a part of the rotation of the carrier, means for admitting steam to the closed chambers, a vacuum cup associated with each chamber for lifting the caps from the containers, a source of vacuum and a control valve for causing the vacuum cups to be vacuumized and subsequently vented to the atmosphere, and said control valve causing the application of vacuum to the sealing chambers while steam is being delivered thereto, and means for sealing the caps on the containers.

7. An apparatus for sealing caps on containers, including a sealing chamber adapted to receive containers to be sealed, means for admitting steam to the sealing chamber, a vertically reciprocable sealing head shank, a sealing head carried thereby, a vacuum cup holder carried by the sealing head shank, the vacuum cup holder being movable vertically relatively to the sealing head shank, a vacuum cup carried by the holder, means for vacuumizing and venting the vacuum cup, and means for moving the sealing head toward and from the container.

8. An apparatus for sealing caps on containers, including a continuously rotating carrier having a plurality of sealing chambers, means for closing the chambers during a part of the rotation of the carrier, means adapted to connect the chambers with a source of steam or a source of vacuum, other means for connecting the chambers with a source of vacuum, said last-mentioned source of vacuum exhausting steam from the chambers while steam continues to be admitted thereto and during the continued rotation of the carrier, and means for sealing the caps on the containers.

9. An apparatus for sealing caps on containers, including a continuously rotating carrier having a plurality of outwardly opening sealing chambers, a stationary casing partly surrounding the carrier and closing the sealing chambers during a part of the rotation of the carrier, means associated with each chamber for lifting the caps from the containers, said casing having an inner channel extending part way there around and communicating with the sealing chambers, said channel adapted to be connected with a source of steam or a source of vacuum, other means for connecting the chambers with a source of vacuum, said last-mentioned source of vacuum exhausting steam from the chambers while steam continues to be admitted thereto and during the continued rotation of the carrier, means for rendering the cap-lifting means inoperative, and means for sealing the caps on the containers.

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