Nov. 20, 1928. 1,692,471

P. W. SHIELDS ET AL

METHOD AND APPARATUS FOR BOTTLING

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Fig. 1.

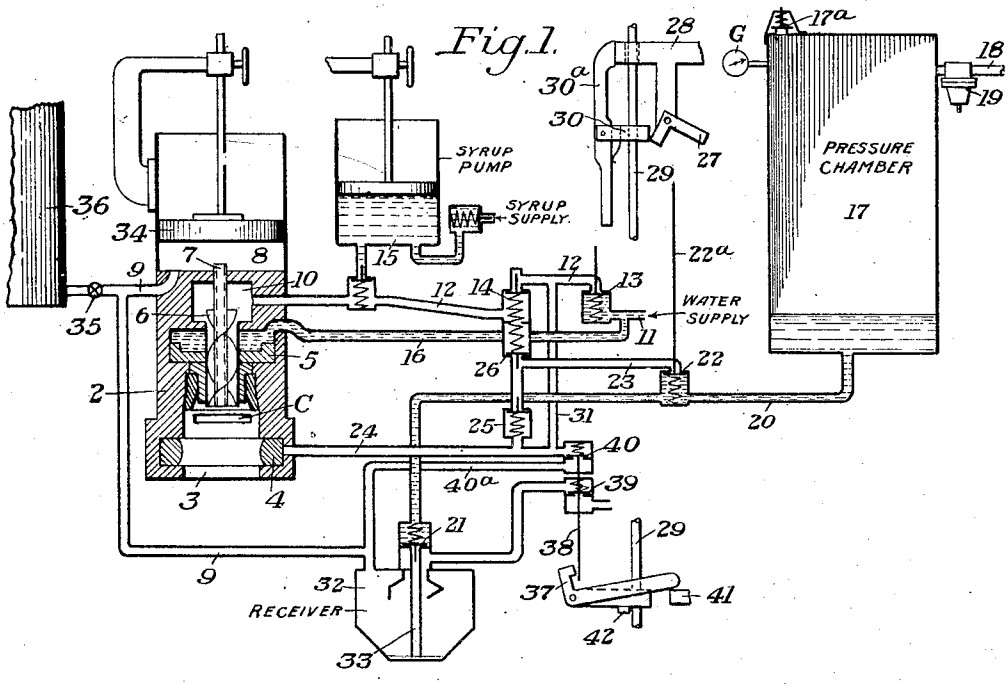
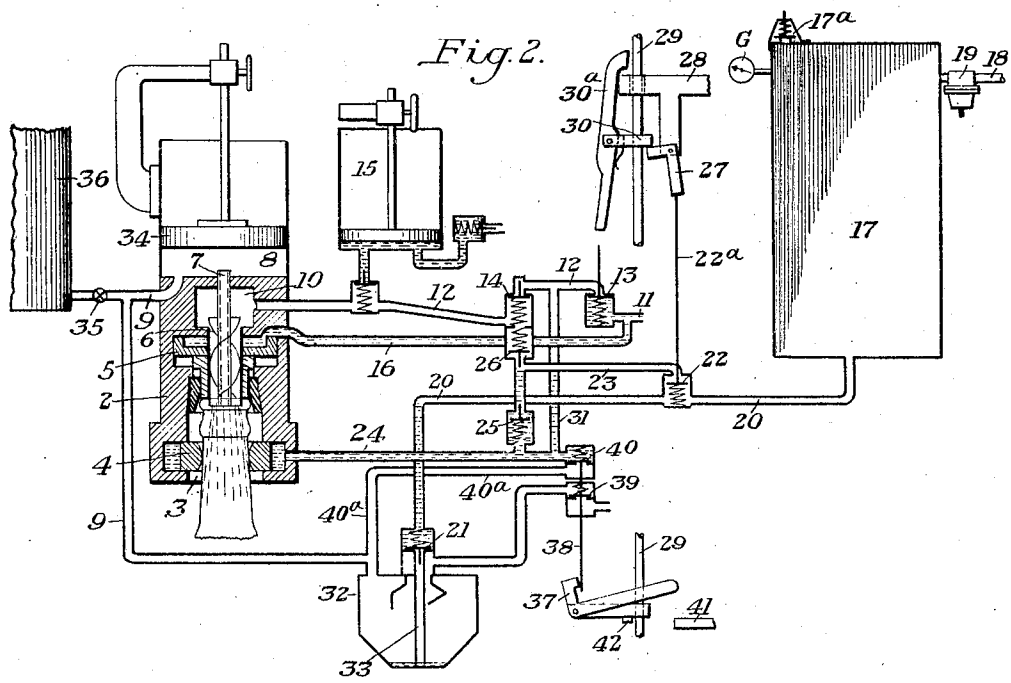


Fig. 2.



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Fig. 3.

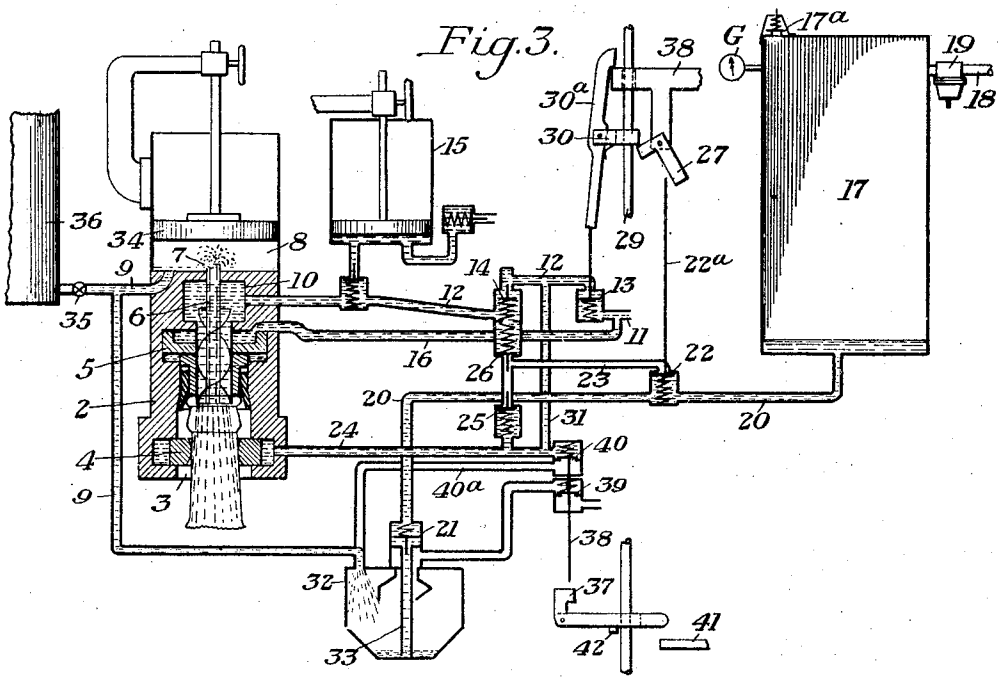
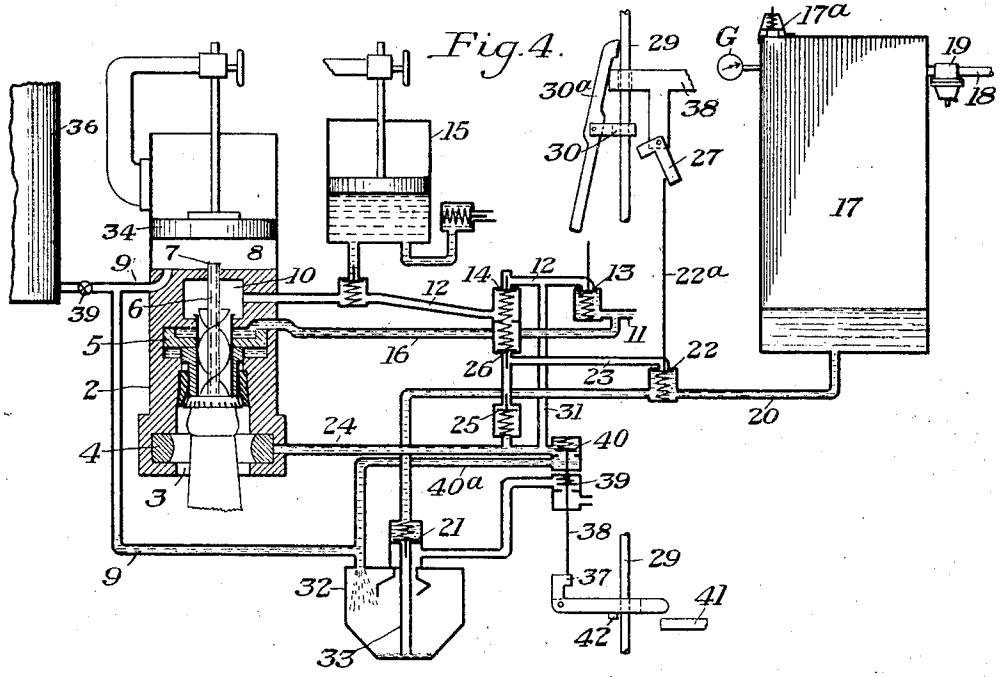


Fig. 4.



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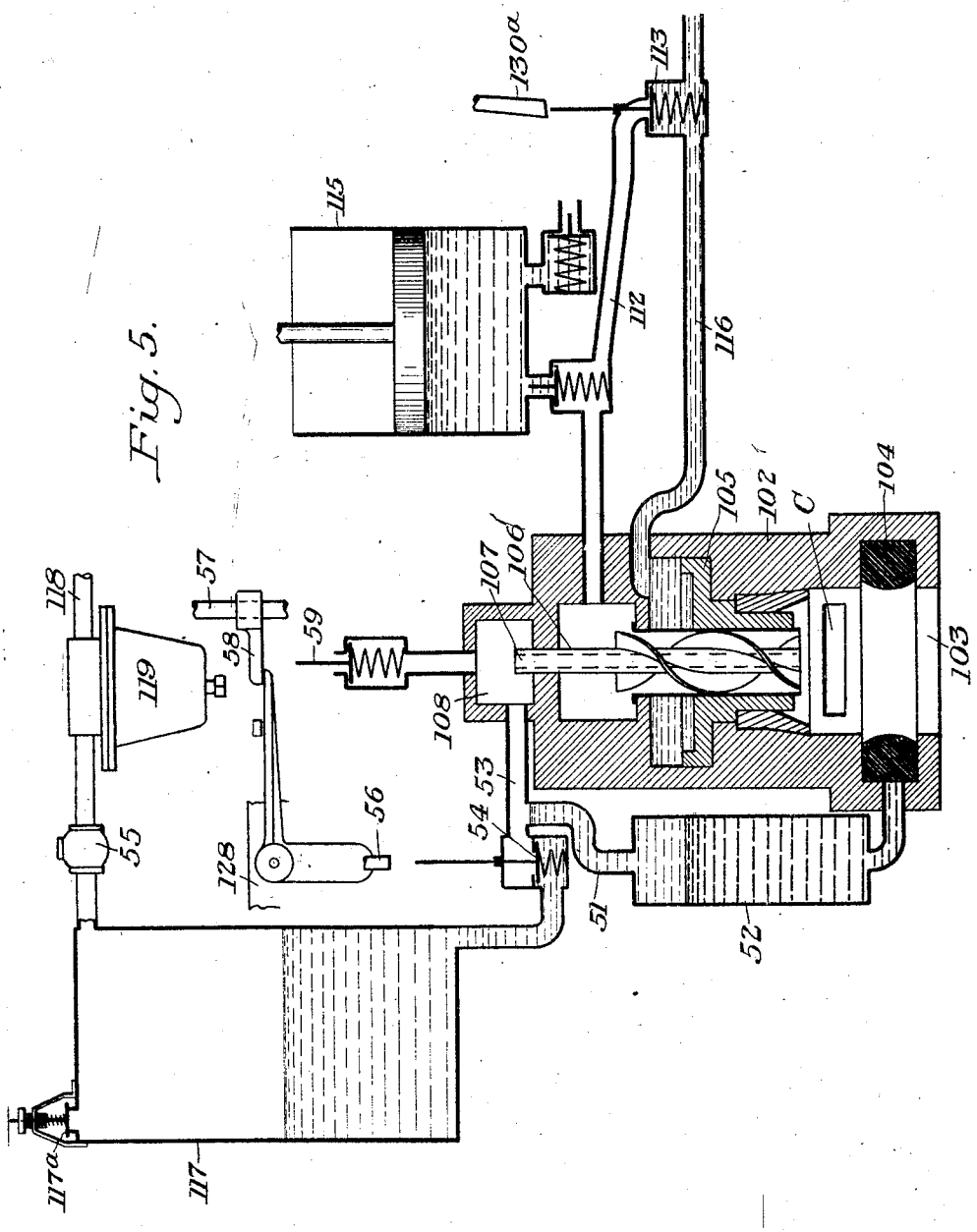
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Fig. 5.



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UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR BOTTLING.

Application filed December 5, 1923. Serial No 678,588.

This invention relates to a method and apparatus for bottling, and particularly for the bottling of carbonated liquids. In the bottling of carbonated liquids it has been found that if a bottle is inserted into the bottling machine and carbonated liquid supplied thereto with the interior of the bottle at atmospheric pressure when the filling operation commences, there is a strong tendency, due to the release in pressure on the carbonated liquid, for the carbon dioxide to go out of solution. This results in an inferior product and incomplete control of the filling operation. This difficulty can be entirely overcome if an initial counterpressure is placed in the bottle, as the liquid is then held under such pressure during the filling, thereby holding the carbon dioxide gas in solution, and enabling a higher degree of carbonation in the bottled goods to be obtained.

In accordance with the present invention, there is provided a counterpressure filling machine wherein a bottle is placed in operative relation with a filling head, sealed from outside conditions, and the interior then put under initial counterpressure. Also, the sealing pressure is increased from the start of the filling operation, thus preventing leakage and consequent loss of gas and carbonated water. The sealing is preferably accomplished by a throat rubber which is pressed into sealing engagement around the neck of the bottle by pressure initially supplied from the same source as the counterpressure, although any other source of pressure for this purpose might be utilized. This pressure may be directly exerted by the gas which puts the counterpressure into the bottle, but is preferably exerted through the medium of a liquid, since this is more conducive to a completely sealed machine having a minimum of gas loss. There is also provided means for reclaiming not only the liquid used in sealing, but also any liquid which is left in the various passages of the filling head after the filling operation, and delivering such liquid to a succeeding bottle. This insures a dry exhaust, as nothing is given off by the machine except the air from the bottle, substantially all of the liquid being saved and placed in a succeeding bottle.

The present invention, while adapted to general types of filling machines, is herein illustrated as applied to a bottling machine structure in accordance with Shields's Canadian Patent No. 224,829 of October 17, 1922, wherein there is shown a bottling machine having a vertically moving filling head which is raised or lowered through the medium of the bottle itself, whereby such head does not operate unless a bottle is actually placed in position in the machine.

In the accompanying drawings, which illustrate more or less diagrammatically one embodiment of our invention as applied to such a machine—

Figure 1 is a vertical sectional view showing the filling head in its lowered position ready for the insertion of a bottle;

Figure 2 is a view of the same apparatus showing a bottle inserted in the head, the head being in its upper position, the entire system being under counterpressure;

Figure 3 is a view of the same apparatus with the filling head still in its upper position and showing a subsequent step in the filling process wherein liquid is being directed into the bottle;

Figure 4 shows the apparatus with the head still in its upper position but at the final step in the filling operation previous to lowering the head with the bottle sealed and ready to remove; and

Figure 5 is a view similar to Figure 1, illustrating a modified form of the invention.

In the illustrated embodiment of the invention there is shown a filling head 2 having a bottle receiving opening 3 provided with a throat rubber 4 for sealing the neck of an inserted bottle. The head is further provided with a bottle ejecting plunger 5 and filling tube 6 and a bottle cap-receiving opening C. The capping device is preferably of the character set forth in the patent above referred to, the capping dies being indicated diagrammatically in the present drawings.

The filling tube 6 has an air passage 7 communicating with an adjustable air chamber

8 above the filling head, and this in turn is provided with an outlet tube 9. As the bottle is filled, air and gas within the bottle pass upwardly through the tube 7 into the chamber 8. Also, as the filling operation nears completion, any liquid carried upwardly by reason of the foaming of the carbonated liquid also passes into the chamber 8 and escapes through the conduit 9. This foaming operation is illustrated in Figure 3 of the drawings.

The filling tube 6 leads from the bottle to a chamber 10 connected to a water inlet 11 through a conduit 12 having a water valve 13 and a check valve 14 therein. A syrup pump 15 is also connected in the conduit 12 and serves to supply the bottle with the proper amount of flavoring matter, as hereinafter described. The water inlet 11 is connected to a carbonator or other source of carbonated water under suitable pressure, and is provided with a branch conduit 16 which leads to the bottle ejector 5 and serves to exert a downward pressure on the ejector at all times.

For establishing the desired initial pressure or counterpressure in the bottle, there is utilized a pressure chamber 17 having a pressure inlet 18 provided with a pressure regulating valve 19 whereby any desired minimum pressure condition may be established and maintained in the chamber 17, such pressure being indicated by suitable gauge G. A conduit 20 extends from the bottom of the chamber to a check valve 21, the purpose of which will hereinafter be described. Connected to this conduit through a mechanically operated valve 22 is a branch conduit 23. This branch conduit is connected through a check valve 25 to a conduit 24 leading to the throat rubber 4. It is also provided with a check valve 26 through which pressure in the conduit 23 may be communicated to the conduit 12. The operation of the apparatus, as will be hereinafter more clearly pointed out, is preferably such that at the commencement of each filling operation there is a small amount of water in the bottom of the pressure chamber 17.

When a bottle is inserted in the filling head and raised the entire head is moved upwardly, and the stem 22ª of the valve 22 comes into contact with a pressure foot 27 loosely pivoted on the frame 28 of the machine and normally adapted to gravitate into the position shown in Figure 2.

Further raising of the head opens the valve 22 and the water in the bottom of the chamber 17 passes therefrom through the valve 22 into the branch conduit 23. From this branch 23 it passes through the check valve 25 and conduit 24 to the throat rubber, thereby sealing the bottle from outside conditions. Any remaining water passes through the check valve 26, the conduit 12, the chamber 10 and the filling tube 6 into the bottle. The chamber pressure is also communicated to the bottle, thus putting the entire system under pressure. During this raising of the head the syrup pump 15 is actuated so that the bottle, now under pressure, is provided with the requisite quantity of flavoring matter and ready to be filled with carbonated water. The operation of the syrup pump may be so timed as to supply the flavoring matter, either before or during the time counterpressure is being established, within the bottle. With the entire system under pressure, and the head in upper position, a valve-operating rod 29 provided with a collar 30 having a presser finger 30ª pivotally secured thereto is moved downwardly. The rod 29 corresponds to the rod 134 in the patent referred to, while the finger 30ª corresponds to the lever 144. The first portion of the downward movement from the position shown in Figure 2 to that shown in Figure 3 effects a closing of the valve 22, as the collar 30 contacts with the arm of the presser foot 27 and rotates it about its pivot out of operative engagement with the valve stem 22ª. Further movement of the rod 29 serves to open the water valve 13.

When the valve 13 is opened carbonated water enters the bottle through the conduit 12 and at the same time the desired carbonator pressure is communicated to the throat rubber through the conduit 24 and a connecting conduit 31. This additional pressure effectually seals the bottle, no matter what the transmitted carbonator pressure may be, and sealing during the filling operation is, of course, independent of the original counterpressure placed in the bottle.

As the filling operation continues, the pressure in the system builds up as the gases become more and more compressed. This increase in pressure effective through the chamber 8 causes the rate of filling to sharply decrease, so that the increased pressure is of itself an excellent regulator of the quantity of water which goes into the bottle, although the timing of the machine is also of importance. At the end of the filling operation, the filling head is maintained in its upper position while the valve 13 is closed by upward movement of the valve rod 29. The bottle is then capped while still in the head, as set forth in the above mentioned patent.

As the bottle is filled, the pressure is communicated through the conduit 9 to a receiver 32 whose function is to collect the excess water in the system. This receiver is provided with a pipe 33 leading to the check valve 21, whereby any water in the receiver is forced upwardly through the check valve and into the chamber 17 by reason of the superior pressure in the receiver as compared with that in the chamber 17 during the filling operation. The chamber pressure is, of

course, also raised during the filling operation as gases also pass by the check valve 21 into the chamber. If desired, a spring-closed relief valve 17ª may be placed in the chamber 17 to control the maximum pressure therein. Such maximum pressure, however, may also be determined by controlling the bottling pressure, the minimum chamber pressure being, of course, determined by the regulating valve 19. The increase in pressure in the chamber 17 over the minimum pressure established therein may be regulated by adjusting a plunger 34 for varying the size of the air chamber 8 or also by opening a valve 35 connecting the conduit 9 to an auxiliary chamber 36. It will be understood that the final pressure in the system is substantially the pressure of the carbonator as delivered at the inlet 11, and is generally materially higher than the initial counterpressure placed in the bottle, and further, that the regulation of the filling height may be obtained by changing the air space above the bottle as described.

The valve rod 29 also carries a pivotally mounted presser foot 37 adapted to cooperate with the valve stem 38 for controlling a pair of exhaust valves 39 and 40. When the filling head is in its lowered position, as shown in Figure 1, the presser foot is held out of operative engagement with the valve stem by a trip 41 on the frame of the machine. As the head and valve rod 29 are simultaneously moved upwardly, this foot leaves the trip 41 but bears laterally against the side of the valve stem 38. Thereafter, when the rod 29 is moved downwardly relative to the head, the presser foot 37 is freed of this sidewise engagement, and rotates clockwise into engagement with a stop 42. On the succeeding upward movement of the rod 29 the foot is now in proper position to operate the valve stem 38 to open the exhaust valves 39 and 40. When the head is lowered and the capped bottle is moved, the trip 41 again moves the presser foot to the position shown in Figure 1, thus permitting the exhaust valves 39 and 40 to close so that counterpressure may be established in the succeeding bottle.

The opening of the exhaust valve 39 relieves the pressure above the filling head and reduces the pressure in the system to atmospheric, with the exception of the counterpressure for the next bottle. This counterpressure is sealed in the pressure chamber 17 and the conduit 20 thereafter, the opening of the exhaust valve 40 relieves the pressure on the throat rubber, and any water behind the throat rubber or in the conduits 24 and 31 flows through the valve 40 and a conduit 40ª into the receiver 32.

The head is now at atmospheric pressure and another bottle may be inserted. As the head is raised with such bottle, the valve 22 is operated as before and the system is again put under initial pressure from the chamber 17, while any water in the chamber beyond the amount required by the throat rubber is discharged into the bottle. The filling operation then takes place as before described, the small amount of water remaining in the receiver together with any which may be carried over from the filling head being forced into the chamber 17 through the check valve 21, ready for delivery to the succeeding bottle.

If for any reason the pressure in the chamber 17 should fall below the desired or predetermined minimum which is to be maintained therein, the regulating valve 19 automatically opens and admits gaseous fluid under pressure in an amount sufficient to reestablish the requisite pressure conditions.

In Figure 5 of the drawings there is illustrated a modified embodiment of the invention, in which parts corresponding to parts already described are for convenience designated by the same reference characters as those heretofore used, but having in each instance 100 added thereto.

In this form of the invention the throat rubber 104 is connected to the counterpressure chamber 117 through a conduit 51, preferably having a liquid reservoir 52 therein. This conduit is provided with a branch conduit 53 leading to the chamber 108 above the filling tube 106, and also with a valve 54. The chamber 117 is supplied with gaseous fluid under suitable pressure through a conduit 118 having a reducing valve 119 therein, and may be further provided with a check valve 55 if desired.

An adjustable pressure relief valve 117ª is also provided for the chamber 117, whereby the maximum pressure may be regulated as before described. When a bottle is inserted in the filling head and raised, the filling head is moved upwardly as in the embodiment of Figures 1 to 4, and the stem of the valve 54 comes into contact with a presser foot 56 carried on the frame 128 of the machine. The opening of the valve 54 admits gaseous pressure from the chamber 117 through the conduit 51 to the throat rubber. This pressure is preferably communicated through the medium of a liquid in the reservoir 52. The pressure is also communicated to the interior of the bottle through the branch conduit 53, and the entire system is therefore under the desired counterpressure. At this time the water valve 113 is actuated by the presser foot 130ª, in the manner already described, and the bottle is filled with carbonated liquid.

When the filling operation is completed, a valve operating rod 57 is moved downwardly, and a trip 58 thereon engages the foot 56 and rotates it out of operative engagement with the valve 54, whereupon this valve closes and leaves the chamber 117 with pres-

sure therein isolated from the remainder of the filling head. After the bottle is capped the operating rod 57 is moved downwardly a further distance and operates an exhaust valve 59 whereby the pressure above the capped bottle is released, the pressure of the throat rubber removed and the bottle free to be withdrawn from the head.

During the filling operation any liquid which may pass upwardly through the passage 107 escapes through the conduit 53 into the chamber 117, together with the gases displaced from the bottle by the liquid. Any pressure above the predetermined maximum is relieved through the valve 117a.

If desired, the exhaust valve 59 may be dispensed with and the pressure above the capped bottle dissipated through the capping opening C. Such operation, however, is not entirely satisfactory and the valve 59 has been shown in the diagrammatic drawing of Figure 5 to represent a completely operative efficient mechanism.

In this modified form of the invention there is no necessity for draining off the water used in compressing the throat rubber, as the liquid in the reservoir 52 is used time after time, and any excess which is brought up through the passage 107 goes into the chamber and is delivered directly to the succeeding bottle. It will be apparent that a liquid having a higher specific gravity than carbonated water may be used in the reservoir 52 if desired.

The advantages of the present invention arise not only from the provision of a machine in which a higher degree of carbonation in the bottled goods may be obtained, but from the provision of means for reclaiming both the liquid utilized for effecting the sealing operation and any surplus liquid directed to the bottle.

Still further advantages of the invention arise from the provision of an apparatus capable of establishing counterpressure in the bottle and of sealing the bottle by means of fluid under pressure, such sealing preferably being effected by the same pressure which establishes the counterpressure condition.

Further advantages arise from the provision of an apparatus of the character set forth in which a dry exhaust is obtained, thereby resulting in a clean and expeditious operation of the apparatus.

A still further advantage of the present invention arises from the provision of a filling apparatus with means for establishing a counterpressure in the bottle to be filled in combination with means for cutting off the source of such counterpressure prior to the actual filling operation, whereby in the event of breakage of a bottle the loss of counterpressure from such source is prevented.

While we have illustrated the invention as applied to a machine constructed generally in accordance with the Canadian patent to Shields before referred to, it will be understood that the utility of the invention is not so limited, but may be otherwise embodied within the scope of the following claims:

We claim:

1. The method of bottling carbonated liquids which includes placing a bottle in operative relation with a filling head, sealing the bottle from outside conditions, raising the pressure of the interior of the bottle above atmosphere, the sealing of the bottle from outside conditions being effected by said pressure through the medium of a liquid, and thereafter supplying liquid to the interior of the bottle.

2. The method of bottling carbonated liquids which includes placing a bottle in operative relation to a source of carbonated liquid, sealing the bottle through the medium of a liquid under pressure, raising the pressure inside the bottle to above atmosphere, and thereafter directing carbonated liquid into the bottle, the sealing pressure and the pressure within the bottle being maintained substantially equal.

3. The method of bottling carbonated liquids, which includes placing a bottle in operative relation to a source of carbonated liquid, sealing the bottle from outside conditions through the medium of a liquid, putting initial pressure in the bottle, filling the bottle, and thereafter capping the bottle and reclaiming the liquid used in sealing.

4. The method of bottling carbonated liquids, which includes placing a bottle in operative relation with a source of carbonated liquid, sealing the bottle from outside conditions, through the medium of a liquid, filling the bottle with carbonated liquid, unsealing the bottle, reclaiming the liquid used in sealing, and directing the reclaimed liquid into a succeeding bottle.

5. The method of bottling carbonated liquids, which includes placing a bottle in operative relation to a source of carbonated liquid, sealing the bottle from outside conditions through the medium of a liquid, putting initial pressure in the bottle, filling the bottle, thereafter capping the bottle and reclaiming the liquid used in sealing, and directing the reclaimed liquid into a succeeding bottle.

6. The method of bottling carbonated liquids, which includes placing a bottle in operative relation with a filling head having a liquid passage connected to a source of carbonated liquid, sealing the bottle from outside conditions through the medium of a liquid, filling the bottle under pressure, capping the bottle, exhausting back the liquid head pressure through the liquid passage, and reclaiming the liquid therein and the liquid used in sealing.

7. The method of bottling carbonated liquid, which includes placing a bottle in op-

erative relation with a filling head having a liquid passage connected to a source of carbonated liquid, sealing the bottle from outside conditions through the medium of a liquid, putting initial gaseous pressure in the bottle, filling and capping the bottle, and exhausting back the liquid head pressure through the liquid passage and reclaiming the liquid therein and the liquid used in sealing while releasing at least a portion of the gases.

8. The method of bottling carbonated beverages, comprising placing the bottle in operative relation to a filling head, sealing the bottle by means of a liquid, directing the carbonated liquid to the sealed bottle, reclaiming the surplus liquid directed to the bottle, together with the liquid used in sealing, and delivering the reclaimed liquid to a succeeding bottle prior to the actual filling thereof.

9. The method of bottling carbonated liquids, which includes sealing a bottle in a filling head through the medium of a liquid, placing the bottle under initial pressure, directing carbonated liquid into the bottle at a pressure higher than the initial pressure, and utilizing the pressure difference to reclaim excess liquid in the filling system.

10. The method of bottling carbonated liquids, which includes sealing a bottle in a filling head through the medium of a liquid, placing the bottle under initial pressure, directing carbonated liquid into the bottle at a pressure higher than the initial pressure, and utilizing the pressure difference to reclaim excess liquid in the filling system, together with the liquid used for sealing.

11. A filling machine including bottle-sealing means, a liquid inlet passage for the bottle, a source of gaseous pressure, pressure connections from the source to the bottle-sealing means and the liquid inlet passage, and means for breaking said connections.

12. A filling machine including bottle-sealing means, a liquid inlet passage for the bottle, a source of gaseous pressure, pressure connections from the source to the bottle-sealing means and the liquid inlet passage, and means controlled by the bottles for opening said connections, whereby the connection is maintained only when a bottle is in the machine.

13. A filling machine including bottle-sealing means, a liquid inlet passage for the bottle, a source of gaseous pressure, pressure connections from the source to the bottle-sealing means and the liquid inlet passage, means for breaking said connections, and means for maintaining the pressure in excess of a predetermined minimum in the pressure chamber.

14. A filling machine including bottle-sealing means, a liquid inlet passage for the bottle, a source of gaseous pressure, pressure connections from the source to the bottle-sealing means and the liquid inlet passage, means for breaking said connections, and means preventing the accumulation of a pressure in said chamber in excess of a predetermined maximum.

15. A filling machine including bottle-sealing means, a liquid inlet passage for the bottle, a source of gaseous pressure, pressure connections from the source to the bottle-sealing means and the liquid inlet passage, means for breaking said connections, means maintaining a pressure in excess of a predetermined minimum and means preventing the accumulation of pressure in excess of a predetermined maximum.

16. A filling machine including bottle-sealing means, a liquid inlet passage for the bottle, a source of gaseous pressure, pressure connections from the source to the bottle-sealing means and the liquid inlet passage, whereby gaseous pressure may be supplied to the interior of the bottle and to the bottle-sealing means, the pressure connection between the source and the liquid inlet passage permitting free travel of gaseous fluid from the bottle back to the source, means for breaking the connections, and means for releasing a portion of the gaseous fluid.

17. A filling machine including bottle-sealing means, a liquid inlet passage for the bottle, a source of gaseous pressure, pressure connections from the source to the bottle-sealing means and the liquid inlet passage, whereby gaseous pressure may be supplied to the interior of the bottle and to the bottle-sealing means, the pressure connection between the source and the liquid inlet passage permitting free travel of gaseous fluid from the bottle back to the source a valve for establishing or breaking the connection upon opening and closing thereof, and means for releasing a portion of the gaseous fluid, the valve seating in such manner that pressure in the chamber urges the valve against its seat, whereby the valve is effective for maintaining the chamber under pressure after the releasing means has acted.

18. A bottle-filling machine including a movable filling head, whose filling position is determined by the bottle being filled, and having a pressure-operated sealing means, a source of gaseous pressure, pressure connections between the pressure source and the filling head and between the source and the sealing means, and means controlled by the movement of the head for maintaining or breaking said pressure connections.

19. A bottle-filling machine including a movable filling head, whose filling position is determined by the bottle being filled, and having a pressure-operated sealing means, a source of gaseous pressure, pressure connections between the pressure source and the filling head and between the source and the sealing means, means controlled by the movement of the head for maintaining or break-

ing said pressure connections, and means for limiting the maximum pressure in the chamber.

20. A bottle-filling machine including a movable filling head, whose filling position is determined by the bottle being filled, and having a pressure-operated sealing means, a source of gaseous pressure, pressure connections between the pressure source and the filling head and between the source and the sealing means, means controlled by the movement of the head for maintaining or breaking said pressure connections, and means for maintaining the pressure in said chamber between definite limits.

In testimony whereof we have hereunto set our hands.

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