H. C. AYERST.

BOTTLE MAKING MACHINE.

APPLICATION FILED OCT. 29, 1914.

1,169,064.

Patented Jan. 18, 1916.

5 SHEETS—SHEET 1.

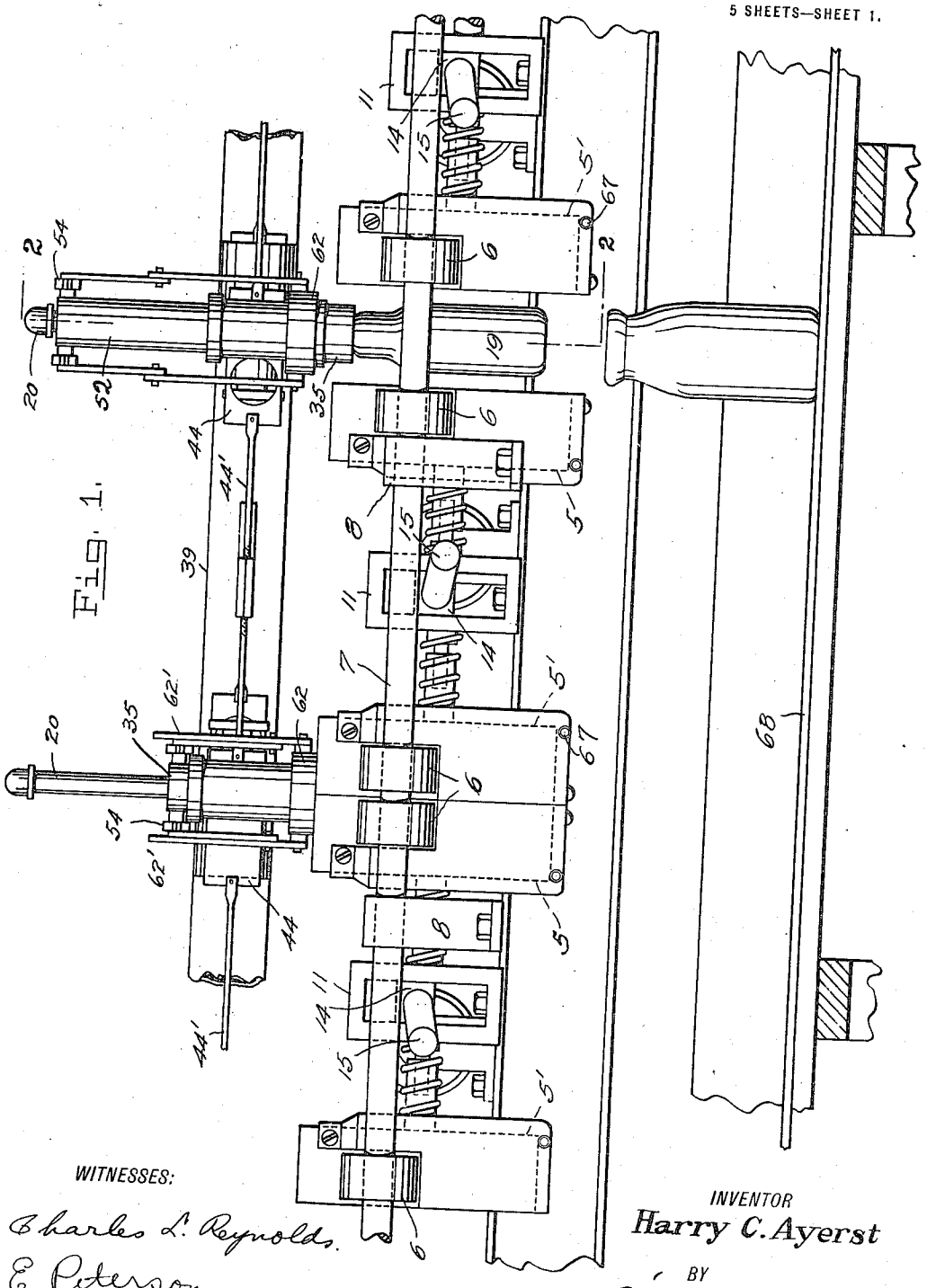


Fig. 1.

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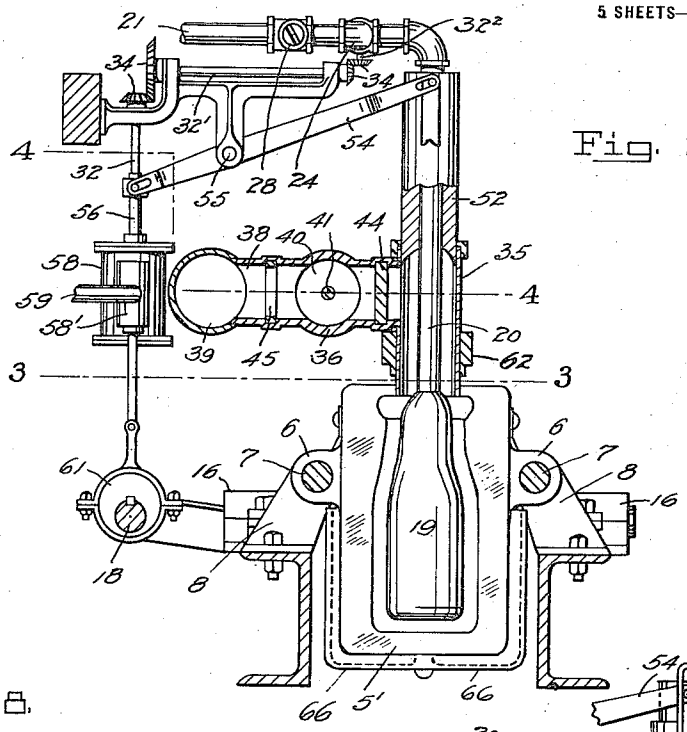


Fig. 2.

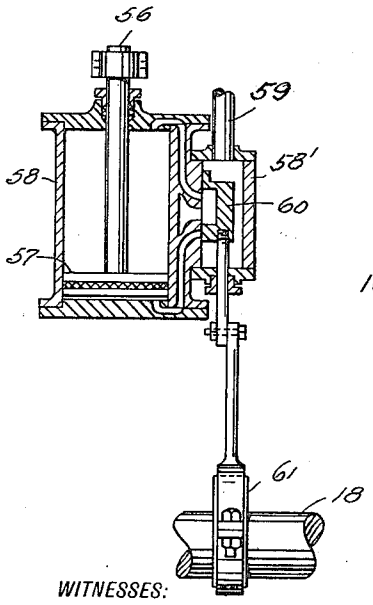


Fig. 8.

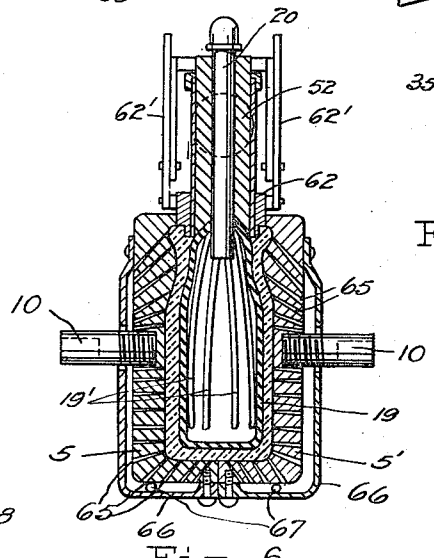


Fig. 6.

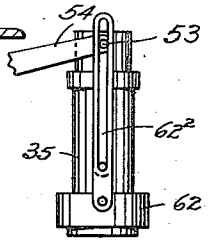


Fig. 7.

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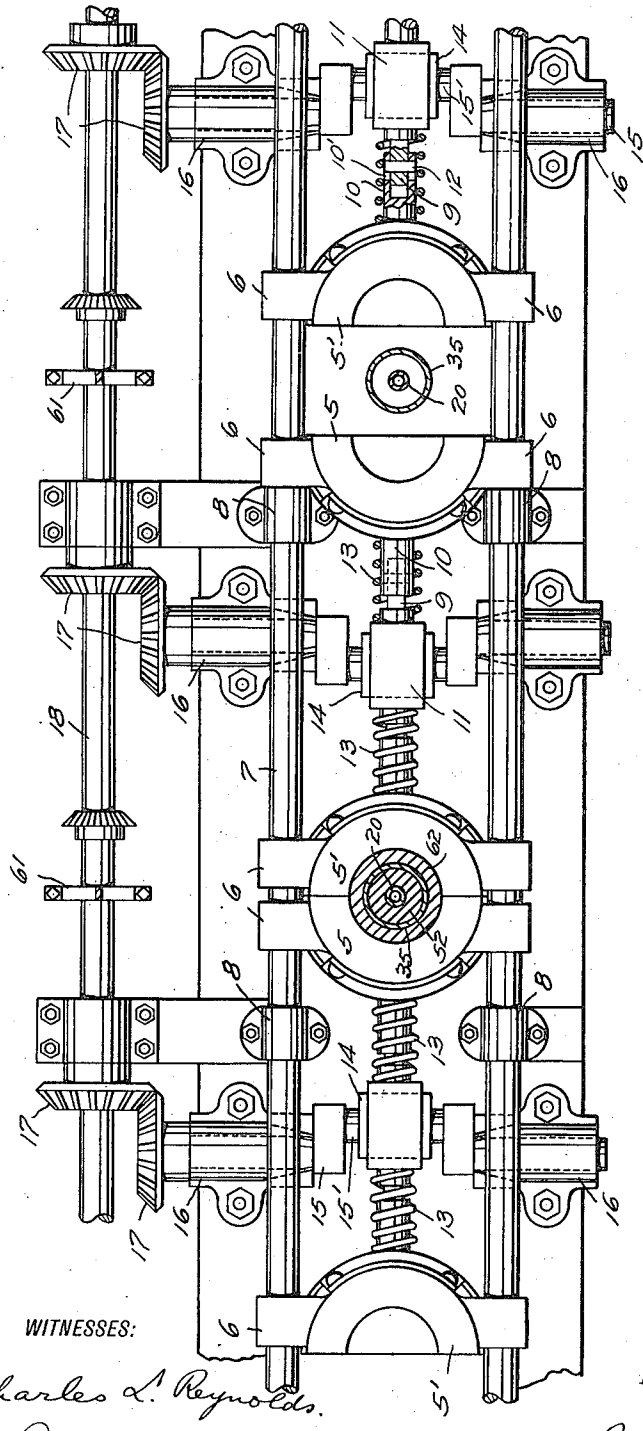


Fig. 3.

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Fig. 4.

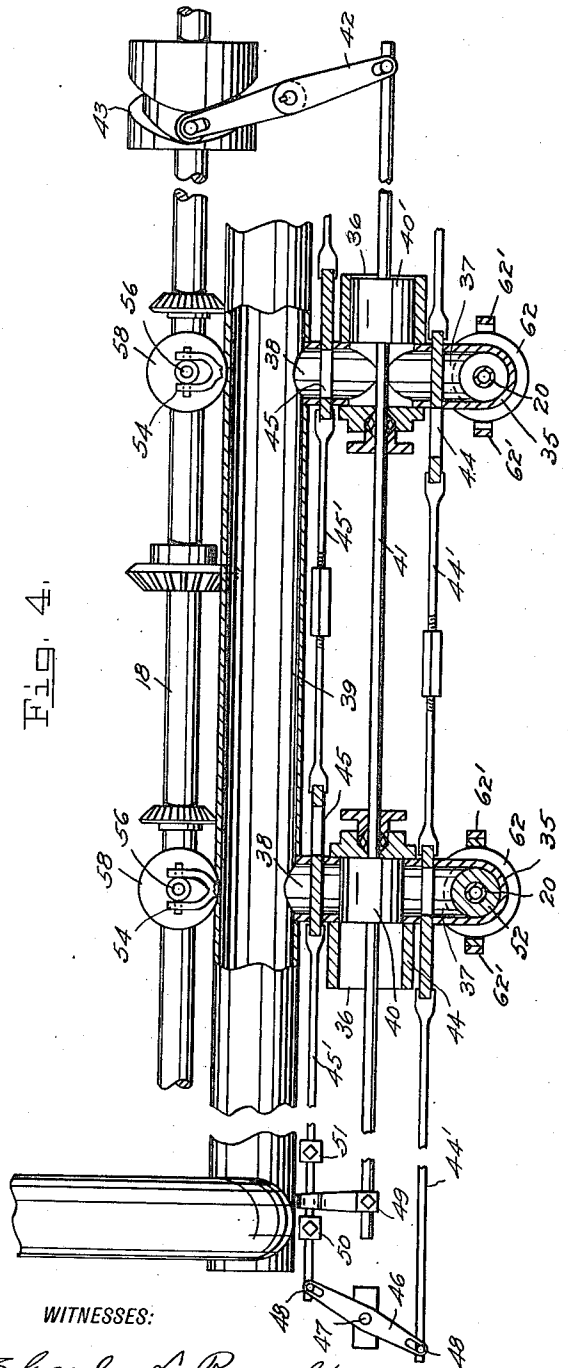
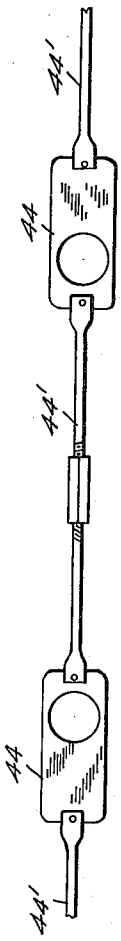


Fig. 5.



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Fig. 10.

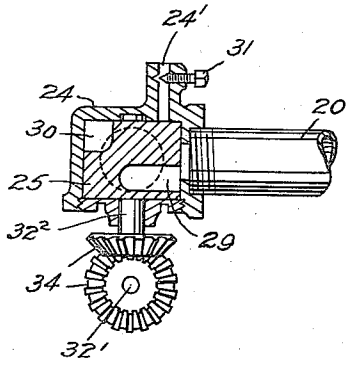


Fig. 9.

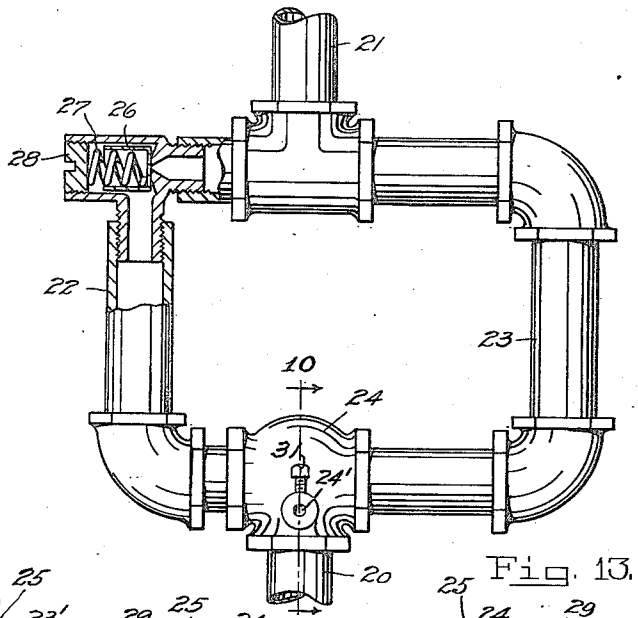
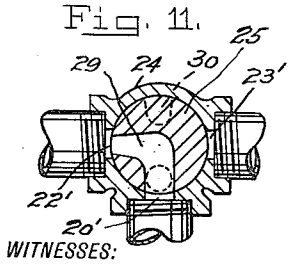


Fig. 11.



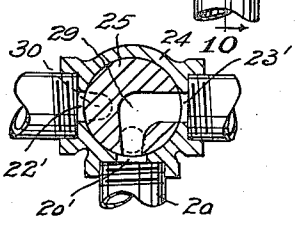
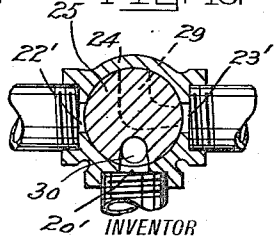


Fig. 13.



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Fig. 12.

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UNITED STATES PATENT OFFICE.

HARRY C. AYERST, OF SEATTLE, WASHINGTON, ASSIGNOR TO SANITARY PULP PRODUCTS COMPANY, OF SEATTLE, WASHINGTON, A CORPORATION OF WASHINGTON.

BOTTLE-MAKING MACHINE.

1,169,064. Specification of Letters Patent. Patented Jan. 18, 1916.

Application filed October 29, 1914. Serial No. 869,243.

To all whom it may concern:

Be it known that I, HARRY C. AYERST, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Bottle-Making Machines, of which the following is a specification.

This invention relates to machines for the manufacture of bottles or other receptacles from pulpy material such as a mixture of macerated wood fiber and water. Its object is to produce an efficient and economically operated machine of this character.

The invention consists in the novel construction and combination of devices, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a front elevation of a portion of a machine embodying the present invention. Fig. 2 is a section taken substantially on line 2—2 of Fig. 1. Fig. 3 is a plan view with the feeding devices omitted. Fig. 4 is a sectional view taken substantially through 4—4 of Fig. 2. Fig. 5 is a front elevation of a series of cut-off valves shown detached. Fig. 6 is a detail vertical section through one of the bottle molds and certain associated parts in the positions the same will occupy when the molding of a bottle is completed. Fig. 7 is a side elevation of the devices shown in Fig. 6 for filling the mold and forming the bottle mouth. Fig. 8 is a transverse vertical section of the pneumatic cylinder for controlling the operation of the devices illustrated in Fig. 7. Fig. 9 is a plan view shown partly in section, of the compressed air conduits and the valves which regulate the action of the inflatable molding core. Fig. 10 is a vertical section through 10—10 of Fig. 9. Figs. 11, 12 and 13 are sectional views showing the air regulating valve in different operative positions.

As illustrated, the molds are each comprised of two complementary members 5 and 5^1 having ears 6 through which extend horizontally disposed guide bars 7 which are supported by standards 8 of the machine frame. Said mold-members are each provided with horizontal socket elements 10 arranged in axial alinement with each other to receive stub elements 9 provided at opposite sides of vertically slotted blocks 11 which are disposed intermediate the adjacent molds, as shown in Figs. 1 and 3. 12 represent keys fitted in holes provided in said stub elements and extending through slots 10^1 provided in the respective socket elements to afford relative axial movements of such elements, but yieldingly held in their most extended positions by helical springs 13 which are interposed between the blocks 11 and the adjacent core-members.

Provided within the blocks 11 are bearing boxes 14 for the crank-pins 15^1 of transversely disposed crank shafts 15 which are journaled in bearings 16 of the frame. The cranks of the adjacent shafts 15 are directed oppositely in order to cause the complementary members of the various molds to be alternately brought together and separated. The crank shafts are rotated in unison by means of bevel tooth-gears 17 from a power driven shaft 18.

Provided for each mold is a hollow core member 19 formed of a flexible material, such as rubber, and depends from a pipe 20 which is connected to a main pipe 21 leading from a source or reservoir of compressed air. As illustrated in Fig. 9, the pipes 20 and 21 are connected by branch pipes 22 and 23 and the casing 24 of a controlling valve 25.

Included in the branch 22 is a pressure-reducing valve comprising a valve 26 which is yieldingly held against its seat and in opposition to the pressure obtaining in the pipe 21 by means of a compression spring 27 acting between the valve proper and an adjustment screw 28. The latter is adjusted to regulate the effective power of the spring so that the air pressure beyond the valve will be maintained at a relatively low pressure, say two pounds.

A controlling valve casing 24, as shown in Figs. 11, 12 and 13, is provided with ports 20^1, 22^1 and 23^1, respectively, for the delivery and branch pipes. The controlling

valve, of the type conventionally called "three-way," is of a cylindrical form with a passage 29 therein adapted to make communicative connection between the port 20^1 for the delivery pipe 20 and either of the branch ports 22^1 or 23^1. The controlling valve 25 is also provided with a cavity 30 through which the air escapes from the pipe 20 to an exhaust opening 24^1 of the valve casing when such cavity is in register with the port 20^1.

31 represents a screw having its end extending into the opening 24^1 whereby the air discharging therethrough may be more or less throttled. The controlling valve may be rotated from the power shaft 18 by means of shafts 32, 32^1 and 32^2 and the coupling gears 34. Concentric with the upright portion of a pipe 20 is a cylinder 35 extending into the upper end of a mold when the same is closed and intermediate its height the chamber of each of these cylinders communicates by a conduit 37 with a pump cylinder 36 (Figs. 2 and 4), the latter being, in turn, connected by conduit 38 with a pipe 39 through which the pulp from which the bottles are made is supplied to the machine molds. The several pump cylinders are desirably in axial alinement with each other to enable the pump pistons 40 and 40^1 to be operated by a single rod 41. This rod is actuated to reciprocate said pistons through the instrumentality of a vibratory lever 42 and a cam 43 which is mounted on the power shaft 18.

Gate valves 44 and 45 (see Figs. 4 and 5) are provided in the conduits 37 and 38 to regulate the admission and discharge of the pulp to and from the respective pump cylinders. To which end, such inlet and outlet valves are respectively connected to stems 44^1 and 45^1 and the latter are operatively connected by a lever 46 which is fulcrumed at 47 and engage studs 48 provided on said stems.

The gate valves, as illustrated in Fig. 4, are operated by means of an arm 49 secured to the piston-rod 41 and encountering spaced set collars 50 and 51 provided on one of said valve stems. The pump pistons 40 and 40^1 and the respective gate valves are disposed so that the pulp will be drawn into one of the pump cylinders simultaneously with the expulsion of the pulp from the adjacent pump cylinder into the associated upright cylinder 35. Operable within each of the cylinders 35 and inclosing the upright part of the pipe 20 therein, is an annular plunger 52 whose office is to force a charge of pulp which has been pumped into a cylinder 35 into the mold after the same is in closed condition. To accomplish which, a plunger 52 is provided with trunnions 53 for engagement with the forked arm of a lever 54 which is fulcrumed at 55 and has its other arm connected to the piston rod 56 of a piston 57 provided in a power cylinder 58. This piston may be operated by compressed air supplied through a pipe 59 into the valve chest 58^1 and controlled by a valve 60 (Fig. 8) actuated by an eccentric 61 on the shaft 18. Also operated through the medium of a lever 54 is an annular coping piece 62 which is connected to the trunnions 53 by links 62^1. The latter are provided with slots 62^2 to afford movement to a plunger during the early portions of its up-and-down strokes, independently of said coping piece, whereby the latter is brought down into the mouth of the mold subsequently to the mold being positively charged through the office of the plunger. After a bottle has been formed, the plunger is first raised while the coping-piece remains in operative position and while the bottle material within a mold is subjected to air pressure which is exercised through the medium of the core.

The mold parts, as shown in Fig. 6, are provided with perforations 65 for the escape of water which is expelled by pressure exerted by an expanding core from the material in the mold to escape into a casing or receptacle 66 secured to the mold parts and whence it is discharged through outlets 67 after a bottle is pressed in the mold. Said outlets are closed by plugs or otherwise during the inflating of the core so that the water received from the pulp in the receptacle will prevent the fibrous or granular components of the pulp from being forced through the mold perforations.

19^1 represents resilient fingers depending from a pipe 20 within the core 19 for yieldingly holding the latter in distended condition and also serving to cause the bottles to be slowly lowered upon a conveyer belt 68 subsequent to the opening of the respective molds.

The operation of the invention is as follows: The members 5 and 5^1 of the alternate molds are brought together and separated as before explained, through the instrumentality of the crank-shafts 15 and the blocks 11. A pair of mold members are thus brought together before the cranks of the respective shafts have reached the extent of their travel and during the termination of the mold-closing strokes of the cranks, the springs 13 are compressed to maintain the referred to molds in closed condition. While this endures, the core is inflated under a relatively low air pressure, say two pounds, which is governed by the controlling valve 25 when the same is in the position in which it is shown in Fig. 11 for the flow of air through passage 29 from pipe branch 22, which leads from the pressure-regulating valve 26, to the pipe 20. With a core thus partially distend-

ed, the space thereabout is filled with the pulp received from a cylinder 36 through the conduit 37 and forced into the mold through the agency of a plunger 35. A coping-piece 62 is then forced down into the upper end of the mold to furnish a form against which the mouth of the bottle is made. When a mold is thus charged and closed at its mouth by the said plunger and coping-piece the valve 25 is rotated into position in which it is illustrated in Fig. 12 for the admission of air under a relatively high pressure of, say, one hundred pounds, from the pipe 21 and branch 23 to the interior of the core, resulting in the further expansion of the core and subjecting the material in the mold to a pressure which will cause the greater portion of the water to be driven from the material through the mold perforations 65 into the receptacle 66 to serve for the purpose explained. After the material has been sufficiently pressed, the valve 25 turns into the position in which shown in Fig. 13, to present the exhaust cavity 30 of the valve to the port 20^1 whereupon the air from the inside of the core escapes to the external atmosphere through opening 24^1. As the air escapes, the mold-parts 5 and 5^1 are separating and when sufficiently far asunder to allow the bottle just formed to fall, the bottle will gradually drop upon the conveyer belt 68 to be carried thereby to a dry kiln. The discharge of air from the core, it is to be noted, is regulated by the screw 31 which serves as a valve. Should the air, however, discharge too rapidly, the power of the resilient fingers 19^1 asserts itself to prevent the rapid falling of a bottle.

What I claim as my invention, is—

1. In a machine of the class described, a plurality of two-part molds, supporting and guiding means for the members of said molds, a slotted block interposed between the adjacent molds, a power-driven crank engaging in the slot of each such block, and yielding connections between the mold-members and the adjacent blocks whereby the mold members after being brought together are held in juxtaposition during a portion of the revoluble movements of the respective cranks.

2. In a machine of the class described, a plurality of two-part molds, power-actuated means interposed between the adjacent molds whereby the members of the alternate molds are successively drawn apart and brought together and yielding connections provided on said means whereby the mold members after being brought together are held for a time in juxtaposition without interrupting the operation of said means.

3. In a machine of the class described, a two-part mold, power-driven means for affecting the movements of the members of said mold toward and from each other, means associated with the aforesaid means to retain said mold in closed condition during a portion of the time the first-named means is tending to move the mold members, and an expansible core arranged to be operated within the mold.

4. In a machine of the class described, a mold comprising a pair of complementary parts, means to move said parts into opened and closed relations, an expansible core for said mold, means to effect the expansion of said core, means to supply in a single charge a definite quantity of bottle-forming material into said mold and about the core to afford an entire bottle from such charge, and means for forming the mouth of a bottle being pressed within said mold.

5. In a machine of the class described, a mold comprising a pair of perforated mold-members, means to reciprocate said members to and from juxtaposed positions, a hollow core formed of an expansible material, and means to supply a predetermined quantity of hydrated bottle-making material into the space surrounding and below the bottom of the core in the mold, of means to inflate said core to primarily afford suitable space to accommodate material to make an entire bottle and to ultimately exercise sufficient pressure against said material to expel the water from said material through the perforations of the mold.

6. In a machine of the class described, the combination with a perforated separable mold, a water receptacle provided exteriorly of each mold member and communicating with the interior of the mold through the perforations thereof, an inflatable core for said mold, means to supply a mixture of pulp and water around the core when the mold is closed thereabout, of means to supply a fluid under pressure within the core to expel water from the pulp through the perforations of said mold into the respective receptacles, said last-named means also serving to release the air from the core whereby the bottle formed in said mold is lowered by the deflating of the core subsequent to the separation of the mold members.

7. In a machine of the class described, an expansible core, a tubular support for said core, a plurality of resilient fingers depending from said support within the core, and means for supplying air into the core at various pressures to inflate the core for the purposes specified.

8. In a machine of the class described, the combination with a core, and a mold composed of members arranged for movements relative to each other and to the core, of means for supplying material to be formed

in said mold, said means including a pump having intake and discharge passages, valves for said passages, and a pump plunger adapted in coöperation with said valves, to draw a charge of said material into the pump and thence deliver the same to the mold.

Signed at Seattle, Wash., this 23rd day of October, 1914.

HARRY C. AYERST.

Witnesses:
HORACE BARNES,
PIERRE BARNES.