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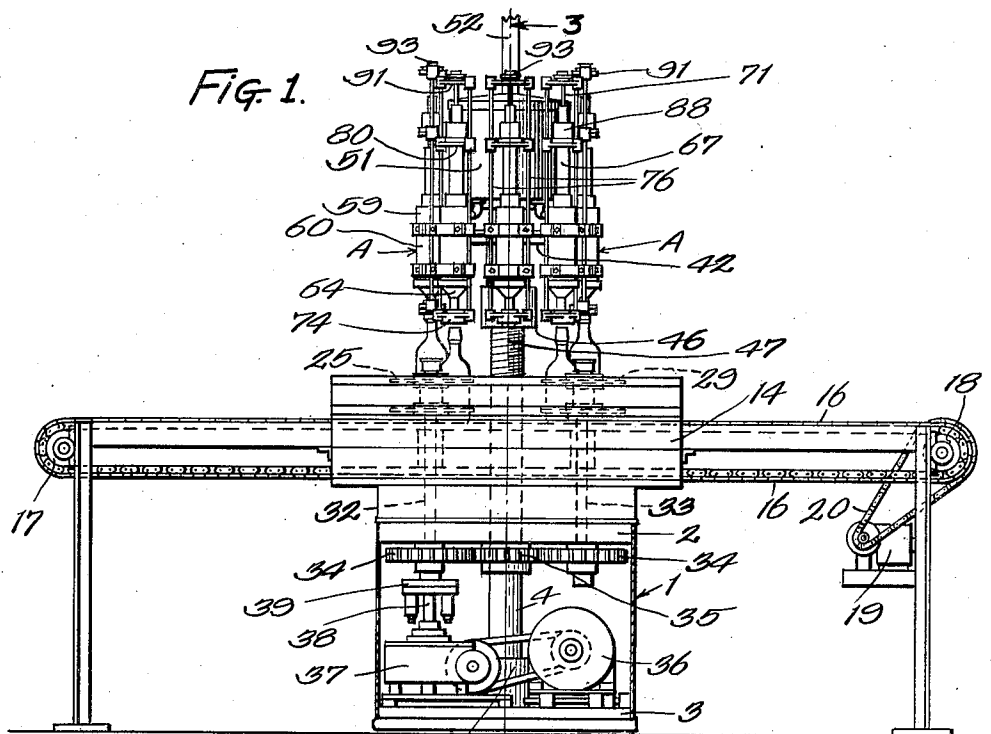
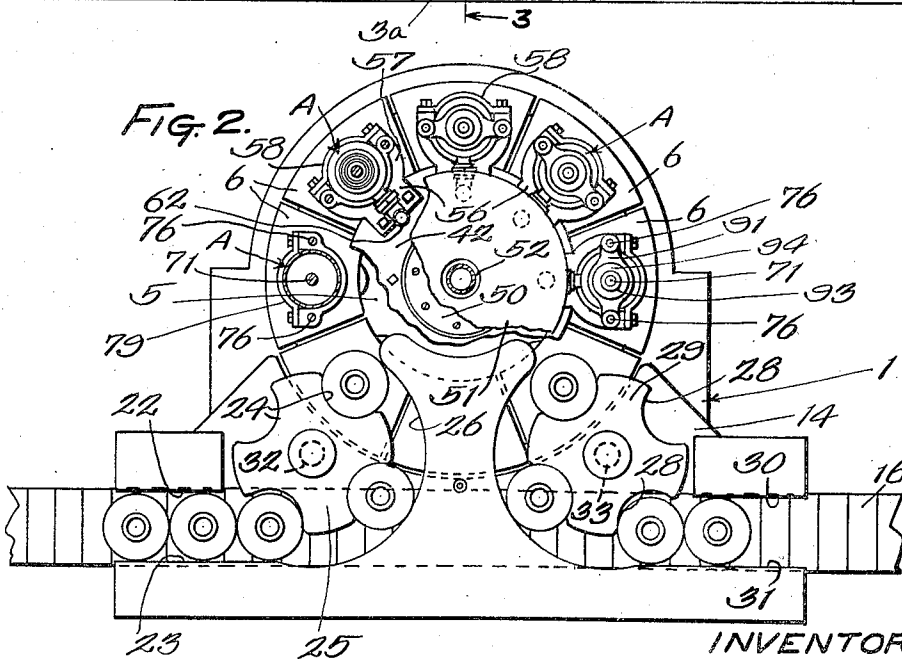
A. I. RISSE

2,232,273

MEASURING CONTAINER FILLING APPARATUS

Filed Sept. 11, 1939

3 Sheets-Sheet 1



INVENTOR:
ARTHUR I. RISSE
BY *John H. Nelson*
ATTY

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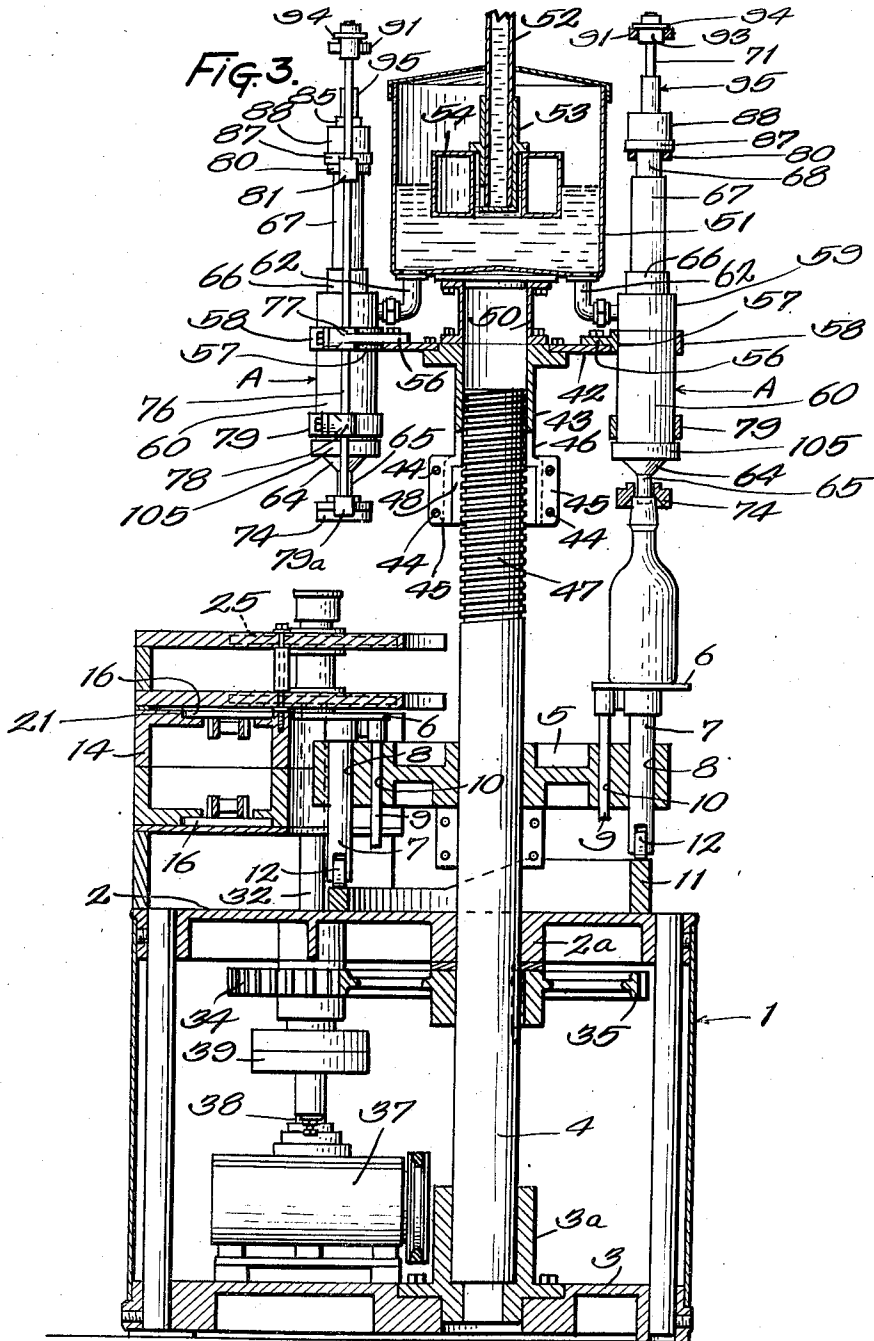
A. I. RISSE

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3 Sheets-Sheet 2



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ARTHUR I. RISSE
BY *John H. Nelson*
ATTY.

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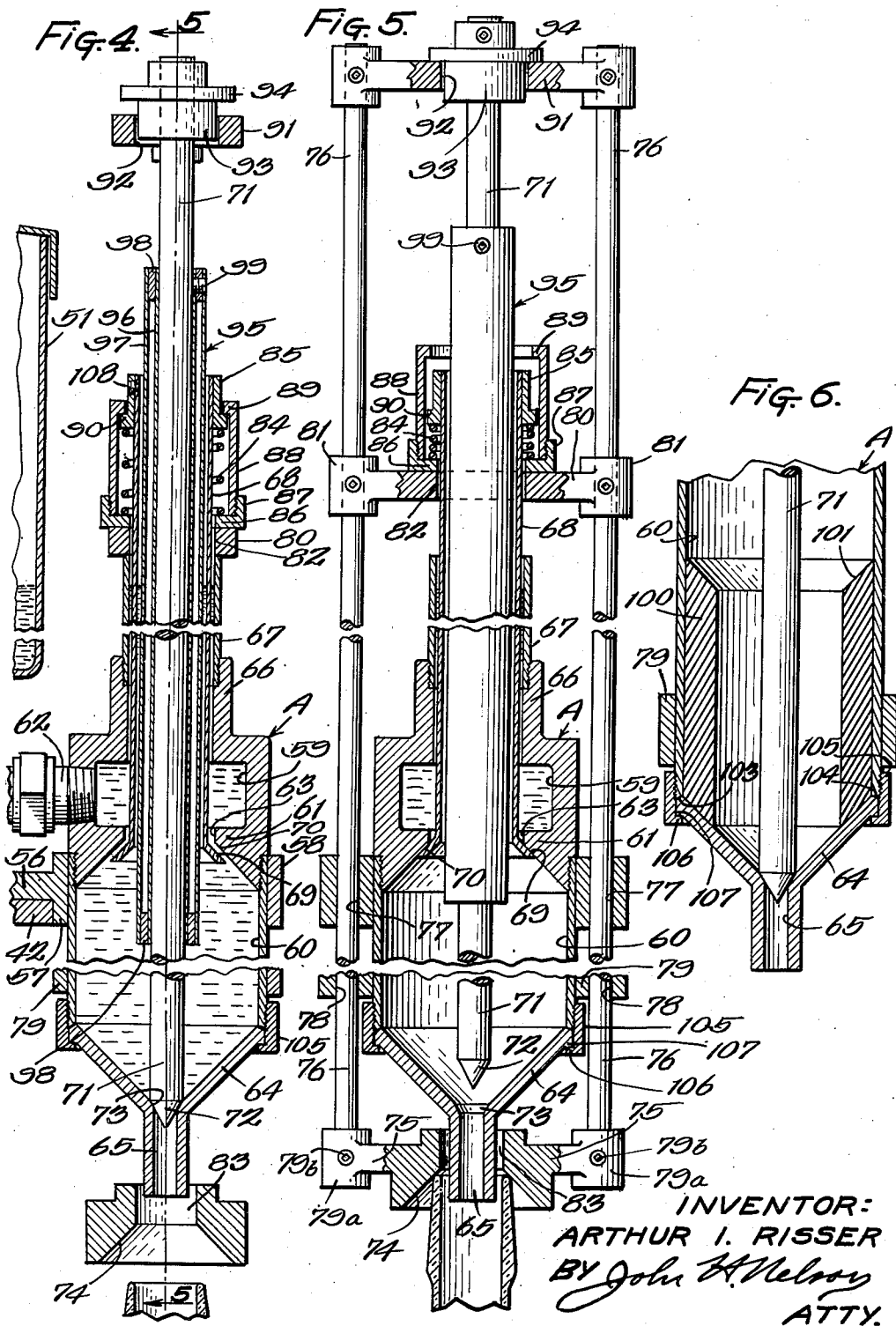
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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,232,273

MEASURING CONTAINER FILLING
APPARATUS

Arthur I. Risser, Chicago, Ill., assignor to U. S.
Bottlers Machinery Company, Chicago, Ill., a
corporation of Illinois

Application September 11, 1939, Serial No. 294,272

3 Claims. (Cl. 226-102)

This invention relates to container filling apparatus and has for its primary object to provide such apparatus wherein the quantity of liquid delivered to the container or containers is accurately measured.

Another object is to provide such apparatus as outlined in the form of an automatic machine of the rotary type having a number of filling heads capable of receiving a predetermined quantity of liquid from a suitable source and discharging same by force of gravity into containers or bottles passed through the machine.

Another object of the invention is to provide such a machine wherein the capacity of the filling heads may be regulated in accordance with the size or capacity of the containers to be filled.

Other objects and advantages will become apparent by reference to the specification and the accompanying drawings, in which:

Figure 1 is a front elevation of the machine of the invention with certain parts seen in section.

Figure 2 is a plan view of the machine with parts broken away and parts in section.

Figure 3 is a vertical section of the machine as taken substantially on the section line 3-3 of Figure 1.

Figure 4 is an enlarged vertical section of a filling head of the machine with parts seen in normal position and with portions of the head being broken away and brought together to reduce the overall length of the figure.

Figure 5 is a sectional view taken on the line 5-5 of Figure 4 showing parts in changed positions.

Figure 6 is a fragmentary sectional view of the lower end of one of the capping heads illustrating capacity regulating means therefor.

The machine, as illustrated, includes a supporting frame 1 in the form of a housing having top and bottom walls 2 and 3, respectively, provided with vertically aligned bearings 2a and 3a, respectively, within which is rotatably mounted a shaft 4 extending upward from the housing. Mounted on the shaft 4, to rotate therewith, is a supporting member 5 in the form of a wheel upon which is mounted, for movement to raised and lowered positions, a number of bottle supports 6 equally spaced about the axis of the shaft. The bottle supports 6 comprise shelves having depending shaft portions 7, respectively, reciprocally mounted in bearings 8 of the wheel 5. To prevent the shelves from rotating with respect to the wheels 5, each shelf has a depending pin 9 slidably mounted in a bearing 10 in the wheel.

The shaft 4 is driven to rotate continuously in a clockwise direction, as viewed in plan, and, as the shelves 6 rotate therewith they are moved to raised and lowered positions by a circular cam 11 mounted on the top wall of the housing 1 central with the shaft and causing operation of the shelves through the intermediation of rollers 12 arranged at the bottom ends of the shaft portions 7 of the shelves. The cam 11 is formed to cause the shelves to dwell in their lowered position during rotation thereof within an arc of about 170 degrees while at the front of the machine, and to cause the shelves to be raised when they approach the rear of the machine.

Mounted on the top wall of the housing 1, in spaced relation thereabove, is a hollow table 14 arranged at the front of the machine adjacent the path of the shelves when lowered, with means arranged on the table for feeding bottles in position on the shelves to be filled. The bottle feeding means includes an endless horizontal belt 16 in the form of a sprocket chain provided with cleated links. One end of the belt is supported on an idler sprocket wheel 17, and the other end of the belt is supported on a driving sprocket wheel 18 driven by a suitable combination motor and speed reducer 19 through a suitable sprocket and sprocket chain connection 20. The upper stretch of the belt is supported upon the table 14 in the plane of its top surface by being received within a recess or guideway 21 formed in the table, with the belt being driven so that its upper stretch moves from left to right as seen from the front of the machine.

The bottles to be filled are placed on the belt at the left hand side of the machine, as seen in Figure 1, where they are directed between suitable guides 22 and 23 into pockets 24 of a star wheel 25 which rotates in a counter-clockwise direction and cooperates with an arcuate portion 26 of the guide 23 to direct the bottles onto the shelves successively as the shelves are being carried past the front of the machine. As the shelves are raised at the rear of the machine, the bottles thereon are brought into cooperative relation with filling heads A designed to fill the bottles with a given quantity of liquid while same are in raised position.

As each shelf reaches its lowered position, after the bottle thereon has been filled, the bottle is received within one of a number of pockets 28 of a star wheel 29 which rotates in counter-clockwise direction, as seen in plan, and cooperates with the guides 30 and 31 to direct the bottles onto the belt to be carried thereon from the machine.

The star wheels 25 and 29 are secured on upright shafts 32 and 33, respectively, rotatably mounted in suitable bearings in the table 14 and the top wall of the housing 1, with each shaft having a spur gear 34 meshing with a spur gear 35 secured on the shaft 4 for causing the star wheels to rotate in timed relation with the bottle supports or shelves 6.

The star wheels and bottle supports are rotated by an electric motor 36 which drives the star wheel shaft 32 through the intermediation of a suitable speed reducer 37. The motor and speed reducer are mounted within the housing 1, with the speed reducer having an upright drive shaft 38 connected with the bottom end of the star wheel shaft 32 through a suitable automatically releasable clutch 39. The clutch is of a common type designed to automatically release in the event the star wheel shaft is prevented from rotating by a bottle becoming jammed in the machine.

The filling heads A are arranged in spaced relation above the shelves 6, respectively, and are caused to rotate with the shelves by being supported upon a supporting member 42 mounted on the shaft 4 for vertical adjustment. The member 42 is in the form of a disc having a hub 43 surrounding the shaft with a bifurcated lower end portion clamped to the shaft by suitable bolts 44 passing through flanges 45 of the bifurcations 46 of the hub. The shaft 4 is externally threaded, as at 47, to receive threaded segments 48 in the bifurcations 46, respectively, whereby the filling heads A may be raised or lowered in accordance with the height of the bottles to be filled by loosening the bolts 44 and then turning the disc on the shaft in the proper direction.

Arranged above the disc 42 central therewith and mounted on a bracket 50 on the hub of the disc, in a supply tank 51 for supplying the filling heads. A given supply of liquid is maintained in the tank by means of a supply pipe 52 extending downwardly into the tank, with said pipe being continuously supplied with liquid from any suitable source, not shown. On the lower end of the pipe 52 is a conventional valve 53 and float 54 shown closed in Figure 3, which shuts off liquid from the pipe 52 from entering the tank whenever the liquid in the tank reaches a given level, and causes liquid to flow from the pipe into the tank when the float is lowered by the lowering of the level of the liquid in the tank.

The filling heads will now be described.

Each filling head A comprises an upright cylindrical vessel arranged so that it will be co-axial with a bottle positioned on the shelf 6 therebelow, and is removably secured to the supporting disc 42 by means of a bracket 56 on the disc having a U-shaped portion 57 within which the vessel is snugly received and held by a clamp member 58 extending across and bolted to the ends of the legs of the U-shaped portion, whereby the vessel may be readily attached to or removed from the disc.

The vessel includes an upper supply chamber 59 and a lower measuring chamber 60 separated by a partition 61 forming, respectively, the bottom wall and top wall of the supply and measuring chambers. The supply chamber is arranged in subjacent relation to the tank 51 and is connected therewith to receive liquid therefrom by force of gravity, by means of a conduit 62 connected between the bottom of the tank and side of the chamber. The measuring chamber 60 is in communication with the supply chamber to re-

ceive liquid therefrom through a supply port 63 arranged centrally in the partition 61 therebetween. The measuring chamber is provided with a downwardly and inwardly sloping conical bottom wall 64 terminating at its bottom end in a downwardly extending tubular portion 65 forming a discharge port or nozzle for the measuring chamber adapted to enter the neck of a bottle as same is raised on the shelf 6 therebelow.

The top wall of the supply chamber is provided with a centrally located bearing formation 66 within which is secured a tube 67 extending upward to a point above the level of the liquid in the tank so as to form a riser or vent for the supply chamber, as will be hereinafter more fully explained. Loosely received and reciprocally mounted within the riser tube is a valve operating tube 68 extending downwardly through the supply chamber and through the supply port 63, with said tube being smaller in diameter than the port 20 to form an annular passage therebetween and being provided with an annular tapered valve formation 69 adapted for sealing engagement with the tapered valve seat 70 of the port when the valve tube is raised, to close the port with respect to the supply chamber while liquid is being discharged from the measuring chamber. The valve tube 68 extends upward beyond the level of the liquid in the tank 51 whereby it provides a riser or vent duct for the measuring chamber during the filling or discharging thereof.

Extending freely through the vent tube 67 central therewith is a reciprocable valve operating rod 71 having a tapered valve formation 72 at its bottom end for sealing engagement with the tapered valve seat 73 of the discharging port for closing the port in the lowered position of the rod. Normally the valve rod 71 and the valve operating tube 68 are in their lowered positions so that the supply port 63 will be open and the discharge port will be closed when the filling head is passing around the front of the machine, whereby liquid will be supplied to the measuring chamber while a bottle is being positioned on the shelf 6 therebelow.

When a bottle is raised on a shelf 6 so that the nozzle 65 of the filling head thereabove enters the neck of the bottle, the valve tube 68 and the valve rod are raised successively to respectively close the supply port 63 and open the discharge port 65 to cause the contents of the measuring chamber to be discharged into the bottle through the intermediation of actuated bottle centering means co-operating between the bottle and the valves.

To this end said centering means includes a bottle centering bell 74 arranged centrally below each filling head for movement to raised and lowered positions by having oppositely extending lateral arm portions 75 removably secured to the lower ends of vertically arranged connecting rods 76 which are reciprocally mounted in bearings 77 of the filling head supporting bracket 56 and bearings 78 in a split collar 79 clamped to the filling head. The arms 75 of the centering bell are removably secured to the connecting rods by having bearing formations 79a at the ends thereof receiving the lower ends of the rods and being held thereon by a set screw 79b threaded in each bearing. Mounted on the connecting rods 76 is a crosshead 80 having bearing formations 81 through which the rods extend, respectively, and having a central opening 82 through which the valve tube 68 extends so that the crosshead may rest upon the top end of the riser tube 67 of the supply chamber to limit downward movement of 75

the centering bell 75 and rods 76, as seen in Figure 4. The centering bell has a central opening 83 into which the nozzle 65 of the filling head thereabove may freely extend, and with said opening being smaller in diameter than the mouth end of a bottle so that when the bottle is raised on the shelf 6 its neck will engage within the bell and be held central with the nozzle, and whereby the bell will be moved to its raised position with the bottle. A resilient connection is provided between the crosshead 80 and the valve operating tube 68 to cause the tube to raise and close the supply port upon initial upward movement of the centering bell, and a lost-motion connection is provided between the connecting rods 76 and the valve rod 71 to elevate the rod and open the discharge port upon said continued upward movement of the centering bell.

Said resilient connection includes a coiled spring 84 which surrounds the valve tube 68 and which is positioned between a collar 85 removeably mounted on the top end of the valve tube and the internal flange 86 of a collet 87 loosely surrounding the tube and being threaded on the bottom end of a spring housing or barrel 88 which surrounds the spring. The barrel 88 has an internal flange 89 at its top end which normally loosely surrounds the collar 85 and rests upon an annular shoulder 90 provided at the bottom end of the collar for cooperating to hold the spring 85 under partial compression between the collar 85 and the flange 86 of the collet 87 at the bottom of the barrel. The spring barrel normally rests upon the crosshead 80 under the weight of the valve tube transmitted thereto through the spring 84, whereby the barrel serves as a resilient abutment on the tube to resiliently limit downward movement of the valve tube to open the supply port 63.

The spring barrel is so arranged that upon initial upward movement of the centering bell 74, the valve tube 68 will be raised to valve closing position thereby to close the supply port 63 upon raising of the crosshead 80 and the spring barrel with the centering bell, without further compressing the spring 84, and whereby upon continued upward movement of the centering bell the spring will become further compressed against the collar 85 as the barrel continues to move upward to cause the valve 69 to have pressure engagement with the valve seat 70 of the supply port 63.

The lost-motion connection between the connecting rods 76 and the valve rod 71 includes a crosshead 91 extending between and connected to the top ends of the connecting rods 76 and having an opening 92 therein central with the filling head adapted to loosely receive a collar 93 on the valve rod, with the collar having an annular shoulder or flange 94 arranged above the opening 92 for engagement with the crosshead upon upward movement thereof with the centering bell to raise the valve rod to open the discharge port of the measuring chamber. The crosshead is normally spaced below the flange 94 of the collar 93 an amount permitting initial upward movement of the crosshead with the centering bell during the closing of the supply port of the measuring chamber before the collar will be engaged by said crosshead to raise the valve rod upon continued upward movement of the centering bell.

In accordance with the objects of the invention, means is provided for varying the capacity or volume of the measuring chamber of each filling head in accordance with the size or capacity of

the bottles to be filled. To this end, said means includes a liquid displacing sleeve 95 freely received within the valve tube 68 and being mounted on the valve rod 71 for adjustment into and out of the measuring chamber for respectively slightly decreasing or increasing the volume thereof. To simplify the construction of the displacing sleeve it is made up of inner and outer tubes 96 and 97 secured at their ends to spacer rings 98 interposed between adjacent ends of the tubes. The sleeve 95 is held in adjusted positions on the valve rod 71 by means of a set screw 99 threaded in the top spacer ring 98 so as to engage the valve rod. The sleeve 95 is smaller in diameter than the inside diameter of the valve tube 68 so as to form an annular space therebetween for the passage of air into or out of the measuring chamber as liquid is being discharged from or supplied to the chamber. The sleeve is also smaller in diameter than the opening 92 in the crosshead 91 thereabove so that the valve rod 71 with the sleeve thereon may be removed from the filling head through said opening for replacement or repair.

For greatly decreasing the volume of the measuring chamber in accordance with the capacity of the bottles to be filled, the invention contemplates the provision of a tubular displacing member 100 adapted to be snugly received within the measuring chamber, with the bottom wall of the measuring chamber being removeably mounted on the bottom end of the side wall of the chamber so as to permit insertion of the member into the chamber from its bottom. The top and bottom ends of the member 100 are bevelled inwardly and downwardly so that the bottom end of the member snugly fits the inner wall of the cone-shaped bottom 64 of the measuring chamber and so that the top end of the member will shed liquid into the center of the chamber. For removeably mounting the bottom wall of the measuring chamber on the side wall thereof, the side wall has a bevelled bottom edge 103 adapted to have sealing engagement with the correlatively bevelled top edge 104 of the bottom wall of the chamber, and with the bottom wall being held in sealing engagement with the side wall by means of a collet 105 threaded on the bottom end of the side wall and having an internal flange 106 engaging under an annular shoulder 107 on the bottom wall.

Thus the displacing member 100 may be readily inserted in the measuring chamber upon removal of the centering bell 74 and bottom wall 64 from the rods 76 and measuring chamber, respectively. Also upon removal of said parts the valve tube 68 may be readily removed from the bottom of the measuring chamber for replacement or repair by detaching the collar 85 from the top end of the valve tube. The collar 85 may be detachably mounted on the valve tube by means of a set screw 108, or other similar means.

While it is essential to the invention that the measuring chamber should be vented at all times to permit liquid to flow therein and therefrom, it is not entirely essential that the supply chamber be vented through the tube 67, as provided, to enable successful operation of the machine. However, the object of extending the bearing tube 67 above the level of the liquid in the tank is that it provides a loose bearing for the valve tube permitting same to lower of its own weight to valve opening position without necessitating the introduction of sealing means, such as gas-

kets, between the tubes to prevent the escape of liquid therebetween in maintaining the liquid at a given level in the tank.

Having thus described my invention, I claim:

- 5 1. In apparatus of the class described, a filling head comprising a supplying chamber, a measuring chamber arranged below the supplying chamber and having a supply port in its wall separating the chambers and having a discharge port in its bottom wall, valve means controlling the opening and closing of the supply port with respect to the supply chamber and being inclusive of means forming a vent duct extending through said supply port and through an opening in a wall of the supply chamber, valve means for controlling the opening and closing of the discharge port and being inclusive of operating means therefor extending through the vent duct, container engaging means moveable into and out of cooperative relation with the discharge port, and means operative upon said movement of the engaging means for causing the operation of the supply port valve means and discharge port valve operating means successively, whereby one port will be closed when the other port is open.

2. In apparatus of the class described, a filling head comprising a supplying chamber, a measur-

ing chamber arranged below the supplying chamber and having a supply port in its wall separating the chambers, valve means controlling said port and being inclusive of means forming a vent duct for the measuring chamber extending through said port and through an opening in a wall of the supply chamber, and liquid displacing means arranged within the duct for movement into and out of the measuring chamber.

3. In apparatus of the class described, a filling head comprising a supplying chamber, a measuring chamber arranged below the supplying chamber and having a supply port in its wall separating the chambers and having a discharge port in its bottom wall, valve means controlling the supply port and being inclusive of means forming a vent duct for the measuring chamber extending through an opening in a wall of the supply chamber, valve means for controlling the discharge port and being inclusive of operating means therefor extending through the vent duct, and liquid displacing means disposed in the vent duct and arranged on the valve operating means for movement into and out of the measuring chamber.

ARTHUR I. RISSE.