989,546.

M. JENSEN.

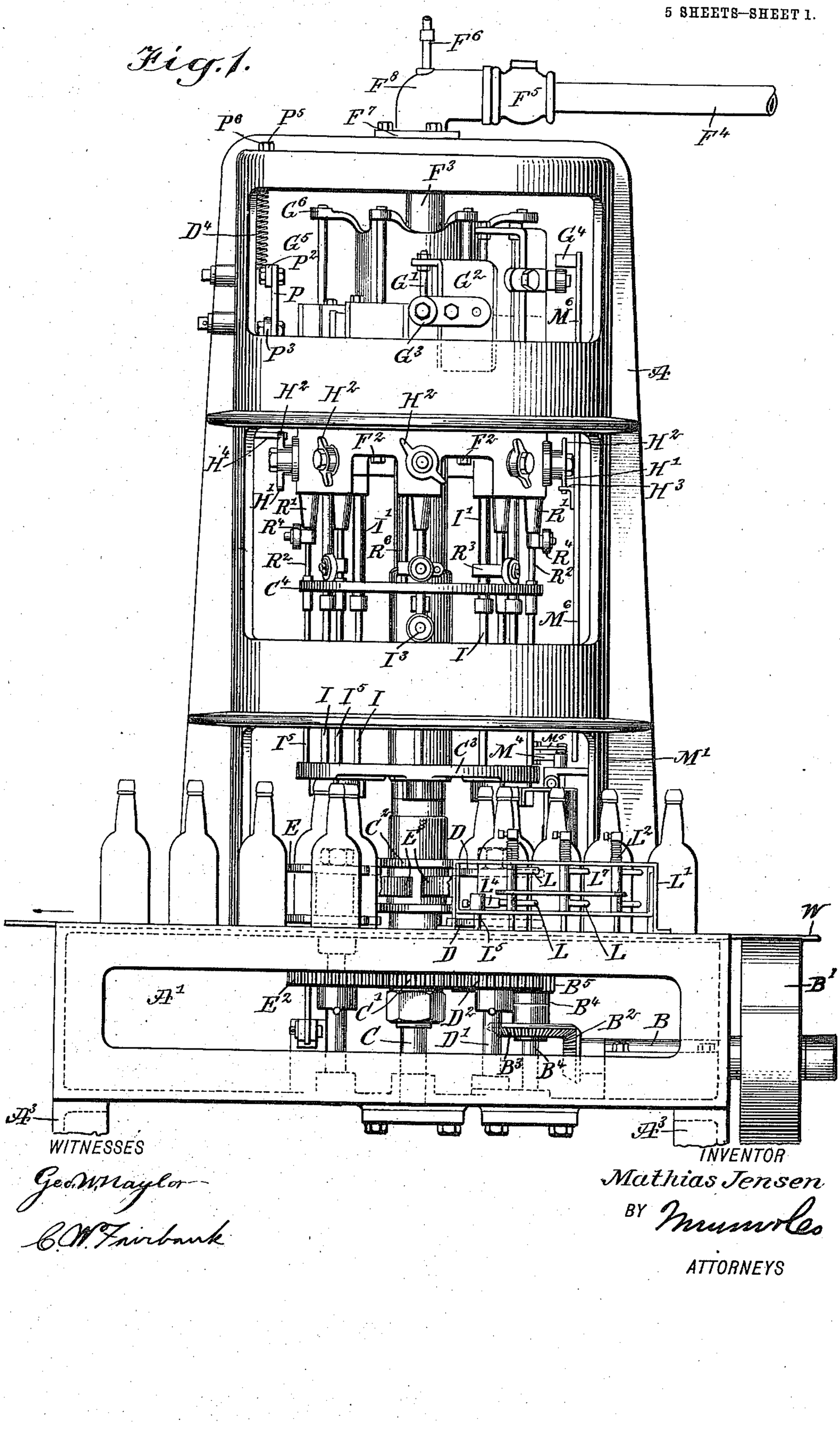
BOTTLE FILLING MACHINE.

APPLICATION FILED JUNE 13, 1907.

Patented Apr. 11, 1911.

5 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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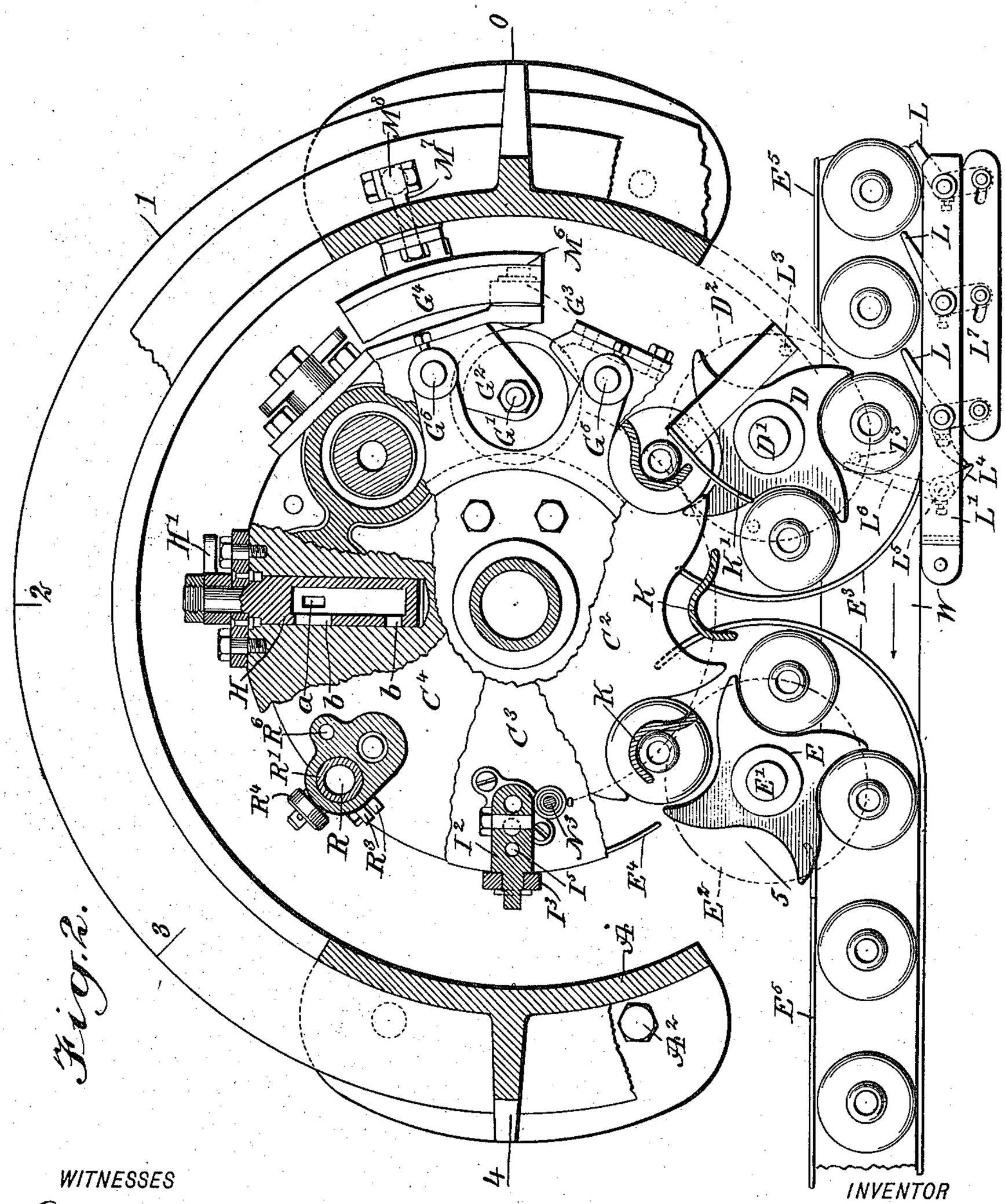

Fig. 2.

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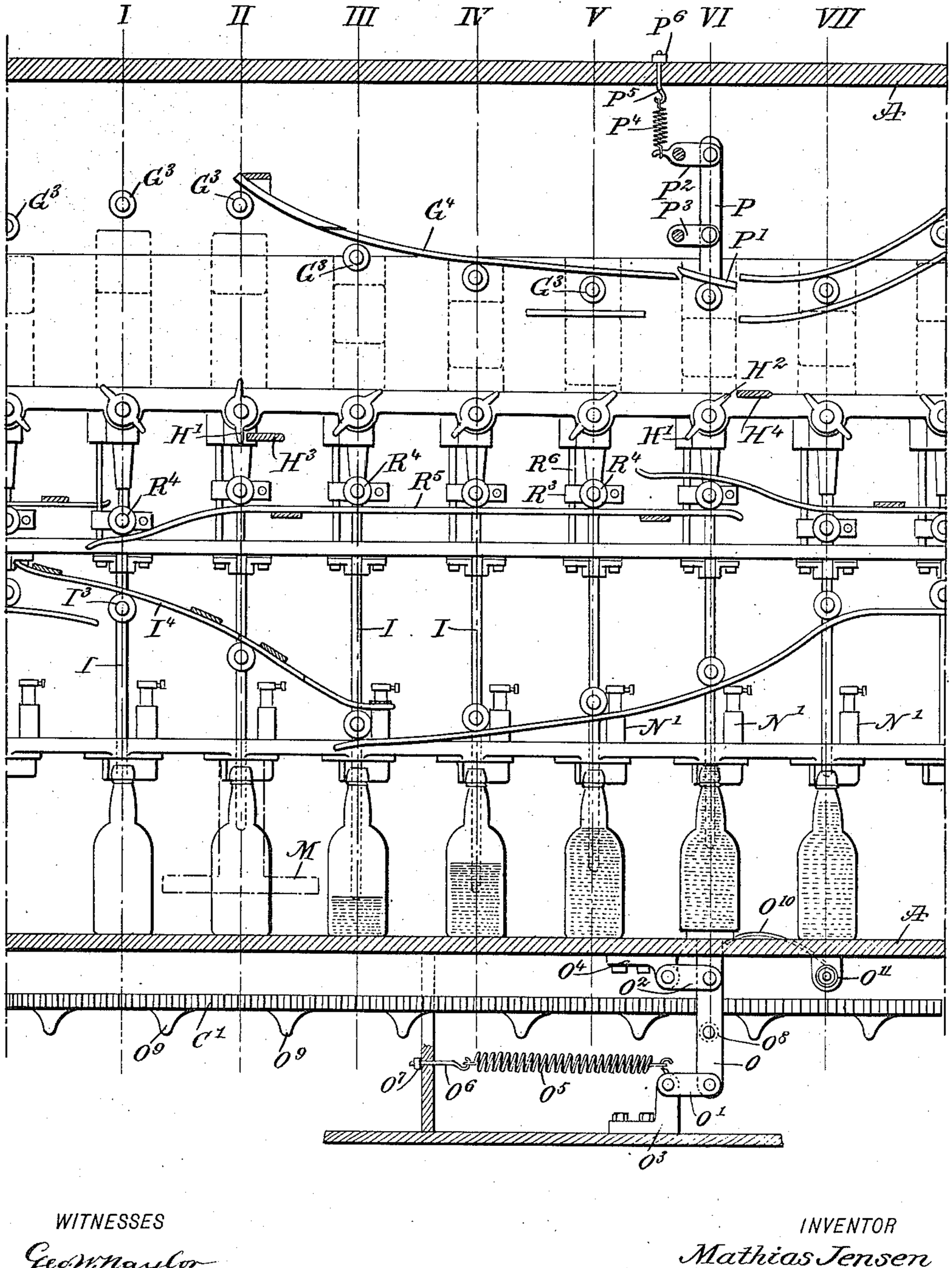
5 SHEETS—SHEET 3

Fig. 3.



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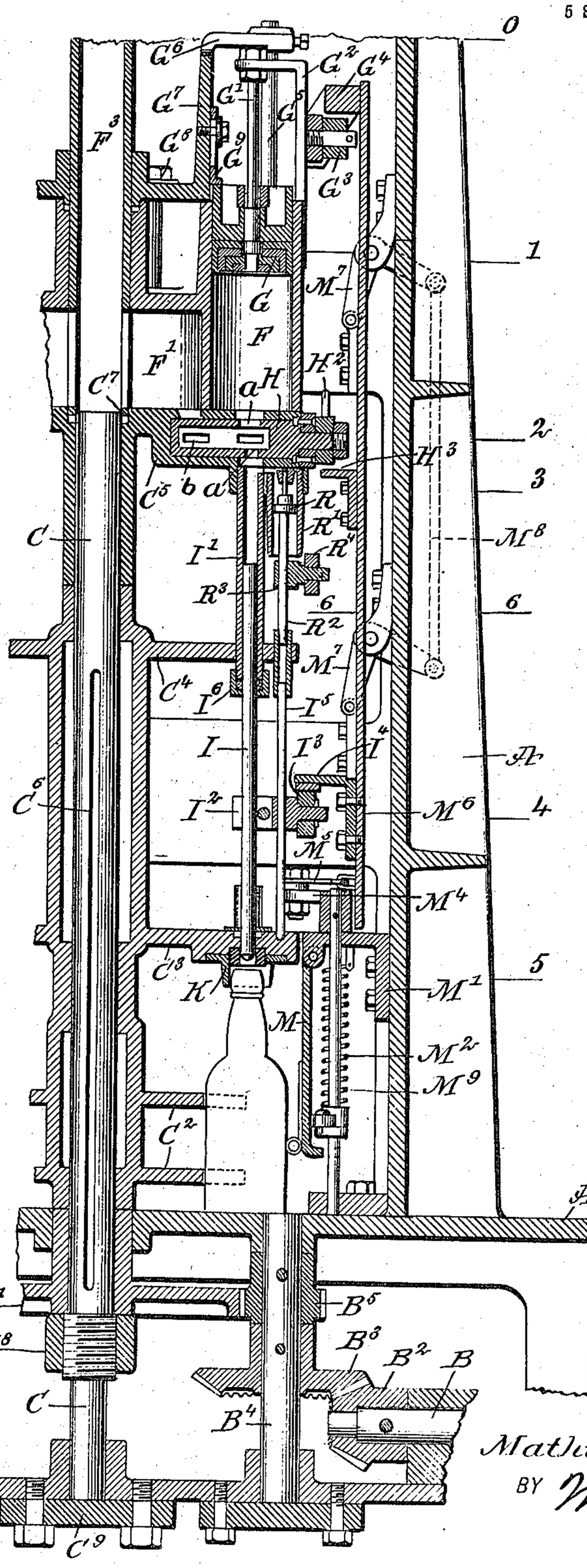
5 SHEETS—SHEET 4.

Fig. 4.



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5 SHEETS—SHEET 5.

Fig. 5.

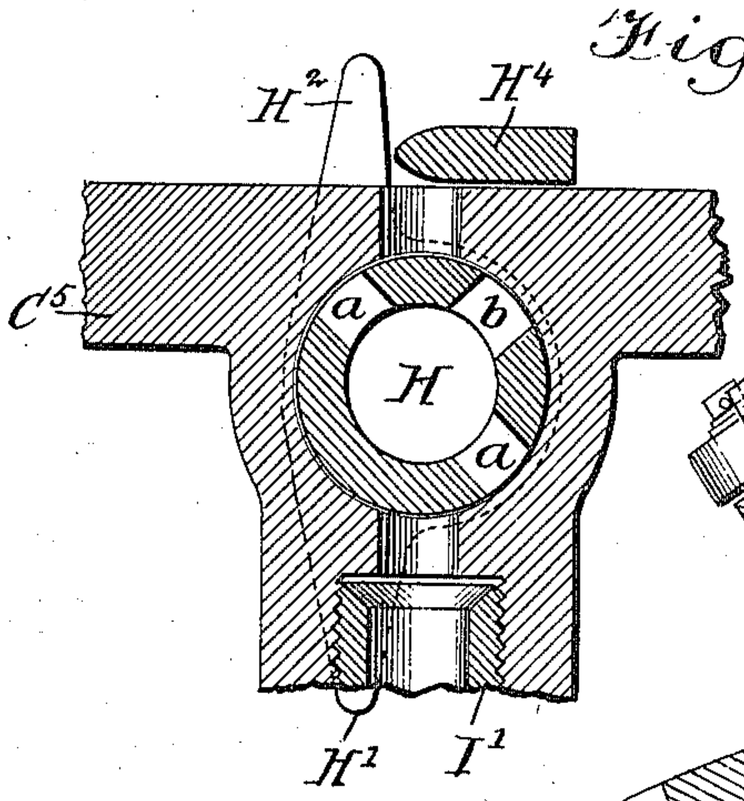

Fig. 9.

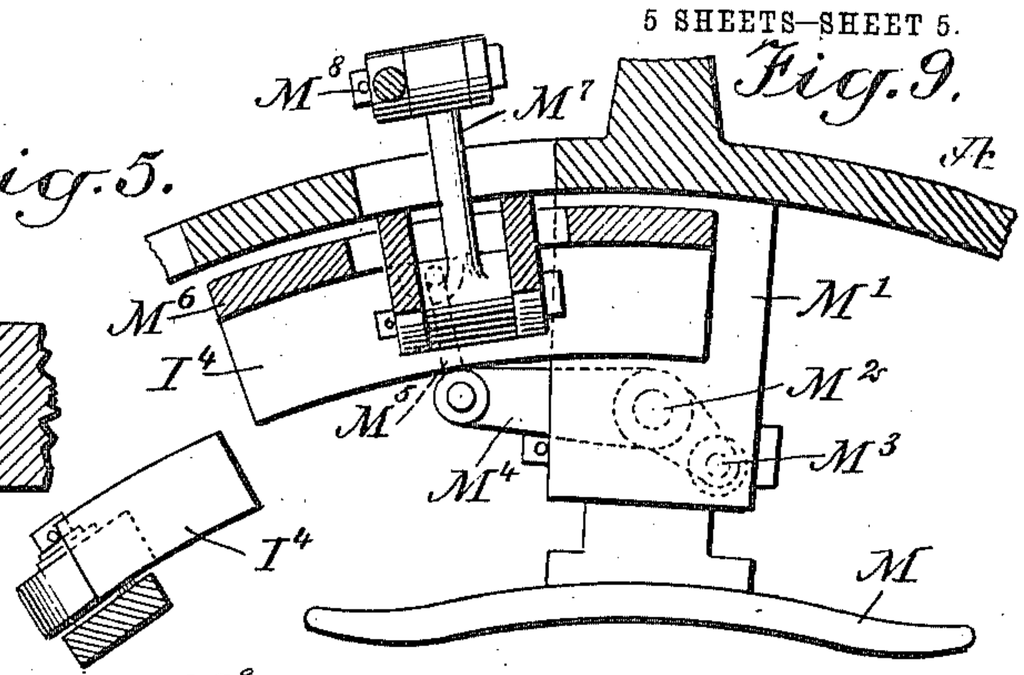

Fig. 6

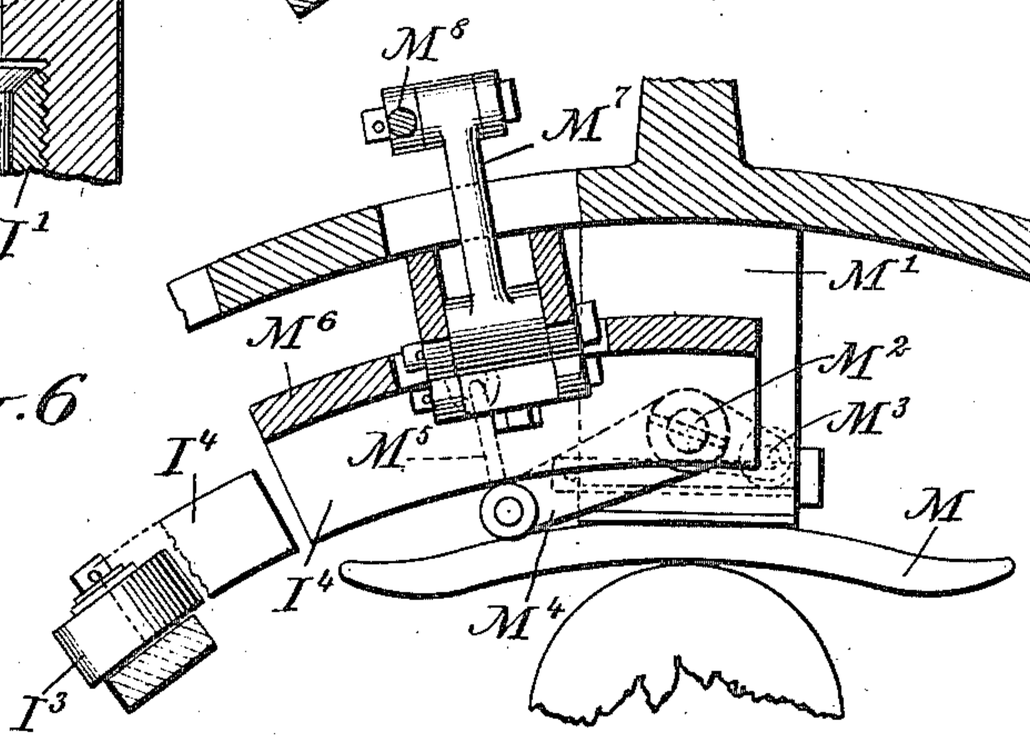

Fig. 8.

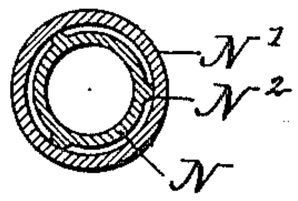

Fig. 7.

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UNITED STATES PATENT OFFICE.

MATHIAS JENSEN, OF COPENHAGEN, DENMARK.

BOTTLE-FILLING MACHINE.

989,546. Specification of Letters Patent. Patented Apr. 11, 1911.

Application filed June 13, 1907. Serial No. 378,866.

To all whom it may concern:

Be it known that I, MATHIAS JENSEN, a subject of the King of Denmark, residing in Copenhagen, Denmark, have invented a new and Improved Bottle-Filling Machine, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in machines for filling bottles, cans, or other containers with liquid or semi-liquid substances, and more particularly to that type of machine in which a series of empty containers are continuously delivered to the machine, automatically filled in succession, and continuously delivered therefrom. In a filling machine embodying all of the various features of my invention, the containers are conveyed along an endless belt to the machine and the latter operates to remove them from the belt, fill them in succession, and return them to the belt. The machine is so constructed that after filling each bottle, the liquid is removed from the bottle to a predetermined level below the mouth thereof, irrespective of slight variations in the height of successive bottles.

The invention consists in certain features of construction and combinations of parts hereinafter described and more particularly pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, and in which—

Figure 1 is a front elevation of a machine constructed in accordance with my invention; Fig. 2 is a transverse section, portions thereof along the radial lines 0 to 5, inclusive, being taken in planes indicated by the corresponding lines in Fig. 4; Fig. 3 is a developed elevation showing the entire circumference of the central rotatable portion; Fig. 4 is a vertical section through one of the filling devices; Fig. 5 is a transverse section through the valve of one filling device; Fig. 6 is a transverse section on the line 6—6 of Fig. 4; Fig. 7 is a vertical section through a portion of the filling device and the float controller therefor; Fig. 8 is a transverse section on the line 8—8 of Fig. 7, and Fig. 9 is a view similar to Fig. 6, but showing the parts rendered inoperative by the absence of a bottle.

The operating parts of the specific machine illustrated in the accompanying drawings are supported in a main frame A, which latter is in the form of a vertically-disposed cylinder having openings in the sides thereof to permit of an inspection and regulation of said operating parts. This upright cylindrical frame is supported upon a base frame A^1 and is secured thereto in any suitable manner, as, for instance, by bolts or screws A^2. The base frame is supported by suitable legs A^3, and it serves to support a main drive shaft B, having on one end thereof a pulley B^1 and on the opposite end thereof, a bevel gear B^2, which latter meshes with a bevel gear B^3 carried by a vertically-disposed shaft B^4. Parallel to this shaft B^4 is the main upright revolving shaft C, which carries the filling mechanism. The shaft is driven from the shaft B^4 by suitable gearing, including a gear wheel C^1 secured to the shaft C, adjacent its lower end and meshing with a pinion B^5 carried by the shaft B^4. The main upright shaft C is provided with a sleeve keyed thereto, which sleeve at its lower end is provided with outwardly-extending fingers or projections C^2, constituting a spider for moving the bottles and above this spider are outwardly-extending flanges C^3, C^4 and C^5, which may all be formed integral or may be formed of separate members rigidly secured together, and all rotatable with the shaft C. The sleeve, flanges and spider are preferably held from rotation by means of a key C^6, and there are held against vertical movement by means of a shoulder C^7 adjacent the upper end of the shaft. These parts are supported at their lower ends by a nut C^8, threaded on the shaft C below the top of the base frame A^1, and the shaft itself and the parts carried thereby may be supported vertically by any form of thrust bearing, as, for instance, a plate C^9.

My invention is adaptable for use in filling any kind of container, but the specific form illustrated is especially designed for filling bottles. The empty bottles are delivered to the machine by an endless belt W, having a portion thereof extending substantially tangentially of the machine and this same belt serves to convey the filled bottles from the machine. The belt is disposed upon approximately the same horizontal level as the upper surface of the base frame A^1 and the spiders on both moving arms are

disposed at such an elevation above the base frame that the bottles may be engaged by the arms and moved about the machine along a circular path.

For transferring the bottles from the conveying belt to the spider C^2, between the successive pairs of adjacent arms, I provide a conveying mechanism including a rotatable spider D, (see Fig. 2), mounted upon a vertically-disposed shaft D^1, which latter is driven by the engagement of the gear wheel C^1 with a gear wheel D^2 carried by said shaft. As the gear wheels C^1 and D^2 intermesh, the peripheral speeds of the spiders C^2 and D will be substantially the same, and the arms are so disposed that the spider D will operate to engage with successive bottles on the belt and deliver them to the spaces intermediate the successive arms of the spider C^2. For retransferring the bottles from the spider C^2 to the belt at the delivery side of the machine, I substantially duplicate the spider D^2. This second transferring means includes a spider E, mounted on a shaft E^1, which latter is driven by the engagement of the gear wheel C^1 with a gear E^2 adjacent the lower end of said shaft. In connection with the three spiders and the belt, I preferably employ suitable guides for maintaining the bottles in their proper positions. These include curved plates, bars, or strips, E^3 for engaging with the outer sides of the bottles and holding them in engagement with the spiders D and E while the bottles are being transferred, and a curved bar E^4 for retaining the bottles between the arms of the spider C^2. The guides E^3 may extend along the outer edge of the belt and additional guides E^5 may be disposed adjacent the inner edges of the belt to form channels of which the belt constitutes the bottoms. As both the spiders D and E are driven from the gear wheel C^1 and the power is delivered directly to the latter, it will be evident that the parts always maintain a constant relative speed.

The bottles when delivered along the belt W may be carelessly placed thereon at varying distances apart, and it is desirable that their positions be controlled and regulated as they approach the spider D, so that they will enter the proper recesses between the arms of said spider. For accomplishing this, I provide bottle-spacing and controlling mechanism, including a series of fingers or prongs L. Each of these fingers has its free end extending out over the belt W and into the path of the bottles delivered along said belt. The fingers are mounted on suitable pivot pins supported in a frame L^1, and the fingers are normally held resiliently in the path of the bottles by suitable springs L^2 encircling said pivot pins. All of the fingers are connected together by a link L^7, so that a movement of one finger insures a movement of each and all of the fingers. The first finger of the series is controlled by an arm L^4, pivoted on a pin L^5 in the frame L^1 and rigid with an arm L^6 extending into the path of a series of pins L^3 carried by the gear wheel D^2. The pins L^3 are disposed in such relationship to the arms of the spider D, that each time an arm of the spider comes to the proper position, the fingers L are withdrawn and each bottle on the belt is permitted to advance one step and the first bottle of the series will enter the proper position in the spider and be delivered to the filling machine.

After the bottles leave the spider D and are moved about the circular path by the spider C^2, the filling mechanism comes into operation and delivers to each bottle a measured quantity of liquid. The filling mechanism, as previously stated, is rotated with the main shaft C, and there are as many separate filling mechanisms as there are spaces in the spider C^2 to receive bottles. In the present instance, I employ eight separate filling mechanisms, and, therefore, all of the parts rotatable with the shaft C are provided eight times. A detail description of one of these filling mechanisms is thought to be sufficient, reference being had particularly to Fig. 4. Above the shaft C and in vertical alinement with each of the several bottles carried by the spider C^2, I provide a plurality of measuring chambers F, each preferably in the form of a cylinder and having valve-controlled communication with a main supply pipe and with a delivery pipe to the bottle. These measuring chambers are preferably formed in a separate member secured to the flange C^5 by bolts F^2, which flange forms a flooring or bottom for each of the measuring chambers and also for an annular chamber F^1, disposed within the annular row of measuring chambers F. The annular chamber F^1 is in open communication with a centrally-disposed conduit or passage F^3 in alinement with the shaft C^6 and rotatable therewith. At the upper end, the conduit F^3 is connected to a general supply pipe F^4, by means of an elbow F^8, and the joint between the elbow and the conduit F^3 is rendered substantially liquid-tight by a packing F^7. The pipe F^4 contains a controlling valve F^5 and the elbow carries an air escape pipe F^6, through which the air within the annular chamber F^1 and the connecting parts may escape while the machine is being filled for the first time.

Within each measuring chamber or cylinder F, there is mounted a vertically-movable piston G. Extending upwardly from the piston is a piston rod G^1 connected to a guide rod G^2 extending substantially parallel to the piston rod and adjacent the outer surface of the cylinder. Intermediate its ends, the guide rod carries a roller G^3

mounted on an outwardly-extending horizontally-disposed stud or pin, and this roller engages with a fixed camway G^4, whereby the movements of the piston are controlled and the amount of liquid delivered to the measuring chamber and forced from there to the bottle, is determined. The guide rod G^2 has a horizontally-disposed portion extending from the piston rod G^1 to the main portion of the guide, and this horizontally-disposed portion is slidable upon a rod G^5, which serves to prevent the guide rod from moving in other than a vertical direction. The rod G^5 is supported at its upper end by an outwardly-extending bracket G^6, carried by an annular flange G^7, secured to the member forming the several measuring chambers. This flange may be held by bolts G^8 and its central portion may constitute a gland or packing about the central conduit F^3. The flange G^7, also preferably carries a small adjustable slide G^9, adjacent the upper end of the cylinder and adapted to engage with the piston and serve as a stop to limit the upward movement of the latter and prevent its displacement from the cylinder, as well as control the maximum quantity of liquid which can be forced into the measuring chamber.

For controlling the inhausting and exhausting of the liquid, I provide a valve H, directly below each measuring chamber. The valve is hollow and provided with ports *b*, *b*, which may register with corresponding ports in the bottom of the supply chamber F^1 and the measuring chamber F, when the valve is in one position, and having ports *a*, *a*, which may register with the port in the bottom of the measuring chamber and with the inlet end of the supply pipe to the bottle, when the valve is in a second position. The valve is radially disposed in respect to the main shaft C, and at the outer end of the valve stem, I provide a collar terminating in two oppositely-disposed studs or projections H^1 and H^2, by means of which the collar and the valve are rotated at the proper time. The main frame of the machine carries two stationary studs or projections H^3 and H^4, so disposed that as the shaft C and the parts carried thereby rotate, the projections H^1 will engage with the single projection H^3 at one part of the circuit and rotate the valve in one direction, and each projection H^2 will engage with the projection H^4 at a different portion of the circuit, to rotate the valve in the opposite direction. The two projections H^3 and H^4 are at approximately diametrically opposite points on the machine, so that the valve will be moved twice, once in each direction during a complete rotation of the shaft C. The projections H^4 serve to turn the valve, to bring the ports *b*, *b* into operation and permit the measuring chamber to be filled, while the projection H^3 serves to bring the ports *a*, *a* into operation and permit the bottle to be filled from the measuring chamber. When the ports *b*, *b* are in operation, the liquid delivered under pressure will enter the measuring chamber and raise the piston G into engagement with the stop G^9, where it will remain until the valve is again rotated.

The liquid is conveyed from the valve H to the bottle through a pipe formed of two telescoping sections, the lower section I being vertically movable, and the upper section I^1 being rigid with the flanges C^4 and C^5. The lower or movable pipe section I carries a bracket I^2, vertically adjustable in respect thereto and normally rigid therewith, and upon an outwardly-extending stud or pivot integral with the bracket is a roller I^3. This roller engages with a fixed camway I^4, which by its engagement with the roller I^3 controls the reciprocating movement of the pipe I. To prevent rotation of the pipe I, I provide a stationary rod I^5, along which the bracket I^2 may slide, but which serves to prevent rotation of the bracket about the pipe. At the lower end of the stationary pipe section I^1, a suitable packing I^6 is employed, to prevent leakage between the two pipes, and at the lower end of the lower pipe section I, is a valve I^7, serving to close openings I^9 in the sides of the pipe, and normally held over said openings by a suitable coil spring I^8. The tension of the spring is such that, together with atmospheric pressure, it will close the lower end of the pipe as soon as the valve H is closed, and thus the liquid remaining in the pipe will be prevented from escaping after the bottle is removed.

To insure the proper positioning of the bottle mouth in regard to the pipe I, the flange C^3 preferably carries a curved collar K, shown in section in Fig. 2. The main frame carries a guide K^1 above the spider D and so disposed as to force the bottle neck into the curved collar and retain it there at the time the tube is being forced downwardly into the mouth of the bottle.

In order to prevent the opening of the valve and the delivery of liquid in case no bottle should arrive along the belt in time to be received in the proper position in the spider C^2, I provide mechanism controlled by the presence of a bottle for throwing certain elements of the mechanism in operation only in case a bottle is in the proper position. This mechanism includes a depending plate or bar M, hinged at its upper end to a bracket M^1, rigidly secured to the main frame A at the entrance side thereof and at approximately the level of the flange C^3, as indicated particularly in Fig. 4. A vertically-disposed rod M^2 is mounted intermediate the plate M and the frame and extends

through the bracket M^1. This rod carries an arm M^3, engaging with the rear side of the plate M, and also carries a second arm M^4 at its upper end. The arm M^4 is connected by a link M^5 to a plate M^6, which carries a portion of the camways G^4 and I^4, and the projection H^3. The plate is supported by two bell crank levers M^7, each of which is fulcrumed on the main frame and has its opposite ends projecting through the frame and connected together by a link M^8. A spiral spring M^9 on the rod M^2, serves to hold the plate M in the path of the bottles as they are moved along by the spider C^2, and it also serves to hold the plate M^6 closely adjacent the inner surface of the main frame A, as indicated in Fig. 9. This brings portions of the camways G^4 and I^4 and the projection H^3 out of the path of the rollers G^3 and I^3 and the valves, so that in case no bottle is in position in the spider, the operating parts of the filling mechanism remain stationary during the rotation of the shaft C. When a bottle is in position, the plate M is moved outwardly and the parts are brought to the position indicated particularly in Figs. 4 and 6. Now, when the shaft C is rotated, the mechanism will operate in its proper sequence and the pipe I will be projected into the bottle, the valve H will be rotated and the piston G will be forced downwardly to deliver the liquid.

The mechanism above described serves to fill each and all of the bottles with the same quantity of liquid, said quantity being determined by the positions of the several stops G^9. In filling bottles with certain kinds of liquid, it is desirable that the neck of the bottle should remain empty for a definite distance down from the mouth, irrespective of the height of the particular bottle. As is well known, bottles of the same kind vary slightly in height, and in order to provide for this variation in height, and at the same time leave an empty space of definite height in the neck of the bottle, I so construct the mechanism as to deliver to each bottle a predetermined quantity of liquid which will be more than sufficient to fill the bottle, and then to withdraw from the mouth of the bottle a sufficient quantity of liquid to lower the level to a definite distance below the mouth of the bottle. For accomplishing this purpose, I provide the mechanism, a portion of which is illustrated particularly in Figs. 7 and 8. The flange C^3, adjacent each pipe I, carries a float N, open at its lower end and supported within a casing N^1. The float is slightly smaller than the casing and is held concentric therewith by longitudinally-disposed ridges or flanges N^2, as illustrated in Fig. 8. The upper end of the float carries a rod N^3, extending through an opening in the upper end of the casing N^1, and a packing ring N^4 is provided which will engage with a flange on the inner surface of the top of the casing, to seal the latter substantially air-tight when the float is raised to its limiting position. The bottle as it is filled is automatically raised into engagement with a packing ring N^5, encircling the pipe I but spaced therefrom, and the interiors of the casing and float are both in open communication with the interior of the bottle through a passage N^6 and the annular passage between the pipe I and the packing ring N^5. The stem N^3 of the float is provided with a spring N^7, the tension of which is such that air may readily escape past the float and out of the opening in the top of the casing, but as soon as the liquid rises into engagement with the under side of the float, the latter rises to seal the outlet and prevent the escape of liquid.

For raising the bottles into engagement with the packing rings N^5 during the time the last portion of the liquid is delivered to the bottle and a portion thereof withdrawn, I provide a lifter O, shown particularly in Fig. 3. This lifter is pivoted to two arms O^1, O^2, hinged to brackets O^3, O^4, carried by the frame A, and in connection with one of these is a spiral spring O^5, for raising the lifter and the bottle. One end of the spring is connected to a rod O^6, provided with a nut O^7, whereby the tension of the spring may be readily adjustable. The gear wheel C^1 of the shaft C carries a series of cams O^9 on its under side and adjacent its periphery and the lifter O carries a roller O^8 lying in the path of these cams. The spring O^5 normally holds the lifter in raised position, but as each bottle approaches the lifter, the latter is depressed by the engagement of a cam O^9 with the roller O^8, so that the bottle may readily pass on to the lifter, whereupon the lifter is immediately released, and the bottle raised upwardly into engagement with the packing ring N^5. In order to retain the bottle in its raised position for a short time after it leaves the lifter and to accurately and yieldingly return it to its lowered position, I employ a light bar O^{10}, pressed upwardly by a coil spring O^{11} at the pivotal support of the bar.

As different bottles have slightly different forms and no liquid can escape either from the bottle or past the float N, I so construct a portion of the camway G^4, which forces downwardly the pistons in the several measuring chambers, that the piston when it reaches approximately the end of its stroke, will be resiliently operated. For accomplishing this, I provide the construction illustrated particularly in Fig. 3, which includes a vertically-movable bar P, having a camway section P^1 at its lower end and substantially in alinement with the main portion of the camway G^4. The bar P is mounted directly above the lifter O and is

supported upon two pivoted arms P^2 and P^3 carried by the frame A. One of these arms is connected to a spring P^4, whereby the camway section P^1 is normally forced downwardly, and the opposite end of this spring may be connected to a rod P^5, having a nut P^6 to facilitate the adustment of the tension of the spring. Thus the pistons of the several measuring chambers are forced downwardly until nearly all of the liquid has been forced into the bottle, and the rollers G^3 then come into engagement with the resiliently-mounted section of the camway, and in case the bottles vary in size this variation may be taken up by permitting a portion of the liquid to remain in the measuring chamber after the bottle has been filled and the air outlet closed by the float N.

After the neck of the bottle has been completely filled mechanism comes into operation for withdrawing a certain amount of liquid to lower the level to a predetermined distance below the mouth. This mechanism, as shown particularly in Fig. 4, includes a suction piston R, adjacent each pipe I^1 and vertically movable with a small cylinder R^1 carried by the flange C^5. Each piston is secured to a piston rod R^2, and each piston rod has a bracket R^3, clamped thereto and carrying a roller R^4. This roller may engage with a camway R^5, secured to the main frame A. The upper end of the cylinder R^1 is in open communication with the upper end of the pipe I^1, and the camway is so disposed that the piston is drawn downwardly to withdraw liquid from the upper end of the pipe I^1 after the valve H is closed and while the pipe I is being lifted out of the bottle. To prevent rotation of the piston rod R^2, a guide rod R^6 (see Fig. 2) is preferably employed, and is so disposed as to extend through a portion of the bracket R^3. Each suction piston R is so constructed that it works equally well in both directions, so that during the downward movement of the piston, liquid is positively sucked out of the pipe I^1, while upon the return movement of the piston, the liquid is positively forced into said pipe.

In Fig. 3, I have illustrated a developed exterior view of the machine with the casing removed, so that the course of the bottles and the steps in the operation may be more clearly disclosed. The machine is capable of receiving eight bottles at one time, but as there is always one space vacant at the entrance side of the machine, the filling operation is carried on in seven steps or stages, numbered as I to VII, inclusive, in Fig. 3. The bottle enters the machine with the parts in the position indicated on the line I of Fig. 3. The valve H is in such a position that the liquid is entering the filling chamber and the piston G and the roller G^3 have moved to their upward limiting position. The roller R^4 immediately engages the camway R^5, to raise the piston R, and the roller I^3 engages the camway I^4 to lower the tube I into the bottle. When the parts have rotated to the position indicated on line II, the valve H is rotated by the engagement of the stud H^3 with the projection H^1 and the roller G^3 comes into engagement with the cam G^4 preparatory to forcing the piston G downwardly. The pipe I continues its downward movement until the position indicated in line III is reached, and the piston G and roller G^3 continue their downward movement until the position indicated in line VI is reached. The pipe I reaches its lowermost position shortly after the valve H is closed and as the liquid enters the bottle the pipe is gradually withdrawn until the entire operation is completed and the bottle reaches the position indicated on the line VII. The piston R remains stationary from the time the valve H is opened to fill the bottle until after the valve is closed. As soon as the valve is closed, which takes place when the bottle is in the position indicated on the line VI, the lifter O comes into operation to raise the bottle into engagement with the packing N^5 and the piston R is brought downward as the pipe is brought upward, so that a predetermined quantity of liquid is withdrawn from the bottle. Each and all of the bottles as they are fed into the machine and come to the position indicated on the line II, contact with the plate M, which controls the operation of the successive steps. In case any space in the spider C^2 is left vacant by the failure of the bottle-delivering means, the plate M swings inwardly, and permits the plate M^4 to swing outwardly against the wall of the casing. This movement of the plate removes sections of the camways G^4 and I^4 and the stop H^3 from the path of the approaching rollers and the projection H^1, respectively, so that said rollers pass directly through on to the opposite side of the camway and are unaffected by the latter. Thus, the piston G, pipe I, and valve H, of the corresponding space, remain inactive throughout the circuit.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In a filling machine, the combination of a semi-circular collar, a telescopic pipe, a revolving spider, and a fixed guide to force the head of a bottle into said collar and hold it in position while said pipe is entering the mouth of the bottle, said spider serving to move said bottle laterally simultaneously with the movement of the collar and pipe.

2. A bottle-filling machine having means for conveying a series of empty containers, a series of yielding prongs in the path of said containers, a revolving spider for receiving

said containers, and a series of pins combined with said prongs, whereby containers arriving at random will enter the machine at predetermined intervals.

3. A filling machine having a filling pipe, a reservoir, a valve controlling the flow of liquid through said pipe, a chamber in communication with the mouth of the bottle, a float within said chamber for controlling the escape of liquid, and means for withdrawing liquid through said pipe as said pipe is withdrawn from the bottle.

4. A filling machine having a measuring chamber adapted to contain a quantity of liquid in excess of the total capacity of a container to be filled, a chamber adapted to communicate with the interior of the bottle and receive the excess of the liquid, a piston for forcing the liquid from said measuring chamber, and means for yieldingly operating said piston when the filling of the container is approximately completed.

5. A filling machine having a central shaft, a plurality of flanges extending outwardly therefrom, a plurality of valves carried by one of said flanges, a plurality of measuring chambers carried by said flange and communicating with said valves, a plurality of filling tubes depending from said valves, a casing inclosing the shaft and flanges, a cam mounted on said casing for raising and lowering said filling tubes in succession, and means also mounted on said casing for alternately opening and closing said valves in succession.

6. A filling machine having a central shaft, a plurality of outwardly-extending flanges rotatable therewith, one of said flanges adapted to carry a plurality of containers to be filled, a plurality of movable filling tubes carried by another of said flanges, measuring chambers carried by another of said flanges, and a casing inclosing said shaft and flanges, and having means mounted thereon for reciprocating said tubes into and out of said containers.

7. A filling machine having a central shaft, means rotatable therewith for carrying a plurality of containers, means rotatable with the shaft for carrying a plurality of filling tubes, valves rotatable with the shaft for controlling the flow of liquid to said tubes, and a casing inclosing said shaft, tubes and valves, and having cams for raising and lowering the tubes into and out of the containers.

8. A filling machine having a central shaft, means rotatable therewith for carrying a plurality of containers, means rotatable with the shaft for carrying a plurality of filling tubes, valves rotatable with the shaft for controlling the flow of liquid to said tubes, and a casing inclosing said shaft, tubes and valves, and having stationary cams for raising and lowering the tubes into and out of the containers, and also having stationary cams for intermittently operating said valves.

9. A filling machine having a central shaft, means rotatable therewith for carrying a plurality of containers, means rotatable therewith for carrying a plurality of reciprocating filling tubes, a casing inclosing said shaft, container-carrying means and filling tubes, and a cam mounted upon the inner surface of said casing for engaging with said filling tubes and raising and lowering them during the rotation of the shaft.

10. A filling machine having a plurality of measuring chambers rotatable about a common center, a piston within each of said chambers, a piston rod connected to each piston, a roller connected to each piston rod, a stationary casing inclosing said chambers, and a cam carried upon the inner surface of said casing for engaging with said rollers during the rotation of the measuring chambers to reciprocate said piston.

11. A filling machine having a plurality of reciprocating filling tubes rotatable about a common center and movable into and out of containers to be filled, a plurality of valves for controlling the flow of liquid to said tubes, a chamber communicating with each tube below its valve, a piston within each chamber, and means for moving said pistons to return liquid from the container to the filling tube.

12. A filling machine having a filling tube formed of two telescoping sections, one of which is movable into and out of the container to be filled and is provided with a valve at its lower end, and means connected to the other section for withdrawing liquid therefrom during the removal of the first-mentioned section from the container.

13. A filling machine, comprising a plurality of filling tubes rotatable about a common center and each adapted to deliver to a container to be filled, a plurality of valves for controlling the flow of liquid to said tubes, and a plurality of chambers communicating with said tubes intermediate said valves and the containers to be filled, and means within said containers for withdrawing liquid from said tubes during the removal of said tubes from their containers.

14. A filling machine having a measuring chamber, a valve for controlling the flow of liquid therefrom, a filling tube receiving liquid from said chamber and adapted to deliver to a container to be filled, a chamber communicating with the tube between the valve and the container, and means for withdrawing liquid from the tube into said last-mentioned chamber.

15. A filling machine, comprising a plurality of filling tubes rotatable about a common center and each adapted to deliver to a container to be filled, a plurality of valves

for controlling the flow of liquid to said tubes, a plurality of chambers communicating with said tubes intermediate said valves and the containers to be filled, means within said chambers for withdrawing liquid from said tubes during the removal of said tubes from their containers, and a casing inclosing said tubes, container-carrying means and valves, and having means for reciprocating said last-mentioned means.

16. A filling machine, comprising a plurality of filling tubes rotatable about a common center and each adapted to deliver to a container to be filled, a plurality of valves for controlling the flow of liquid to said tubes, a plurality of chambers communicating with said tubes intermediate said valves and the containers to be filled, means within said chambers for withdrawing liquid from said tubes during the removal of said tubes from their containers, a casing inclosing said tubes, container-carrying means and valves and having means for reciprocating said last-mentioned means during said rotation, and means also carried by said casing for reciprocating said tubes during their rotation.

17. A filling machine having a rotatable shelf or flange adapted to support a plurality of containers to be filled, a plurality of filling tubes, means for reciprocating said tubes into and out of said containers during the rotation, and means for raising each of said containers to seal the upper end thereof during the final portion of the filling operation.

18. A filling machine having a rotatable shelf or flange adapted to support a plurality of containers to be filled, a plurality of filling tubes, means for reciprocating said tubes into and out of said containers during the rotation, means for raising each of said containers to seal the upper end thereof during the final portion of the filling operation, and means for withdrawing liquid from the container through the tube during the removal of the tube from the container.

19. A filling machine having a filling tube adapted to enter a container to be filled and having openings in the side thereof adjacent the outlet end, a sliding sleeve within said tube for controlling said side openings, a chamber communicating with said tube adjacent the upper end thereof, and means for withdrawing liquid from the tube into said chamber.

20. A filling machine having a filling tube adapted to enter a container to be filled and having openings in the side thereof adjacent the outlet end, a sliding sleeve within said tube for controlling said side openings, a chamber communicating with said tube adjacent the upper end thereof, and means for withdrawing liquid from the tube into said container, during the withdrawal of the tube from the chamber.

21. A filling machine having a plurality of measuring chambers rotatable about a common center, a piston forming the top of each chamber, a filling tube for each chamber, a casing inclosing said chambers and tubes, means for reciprocating said filling tubes, and a cam carried by said casing for reciprocating said pistons during the rotative movement of the chambers.

22. A filling machine having a plurality of measuring chambers rotatable about a common center, a plurality of pistons movable within said chambers, piston rods connected to said chambers, means for reciprocating said pistons during the rotation of said chambers, and independent means for reciprocating the containers during a portion of the rotative movement.

23. A bottle filling machine having a rotatable container carriage, filling devices carried thereby, a conveying belt extending substantially tangentially to said carrier, a curved guide adjacent the point of tangency and extending across the conveying belt, a rotatable spider adjacent the guide, and a plurality of pivoted dogs adjacent said guide and controlling the delivery of containers to said spider.

In testimony whereof I affix my signature in presence of two witnesses.

MATHIAS JENSEN.,

Witnesses:

CHR. DIBBERN,

KNUDT PETERSEN.