March 22, 1932. W. H. TAYLOR 1,850,425

FILLING MACHINE

Filed March 7, 1929 6 Sheets-Sheet 1

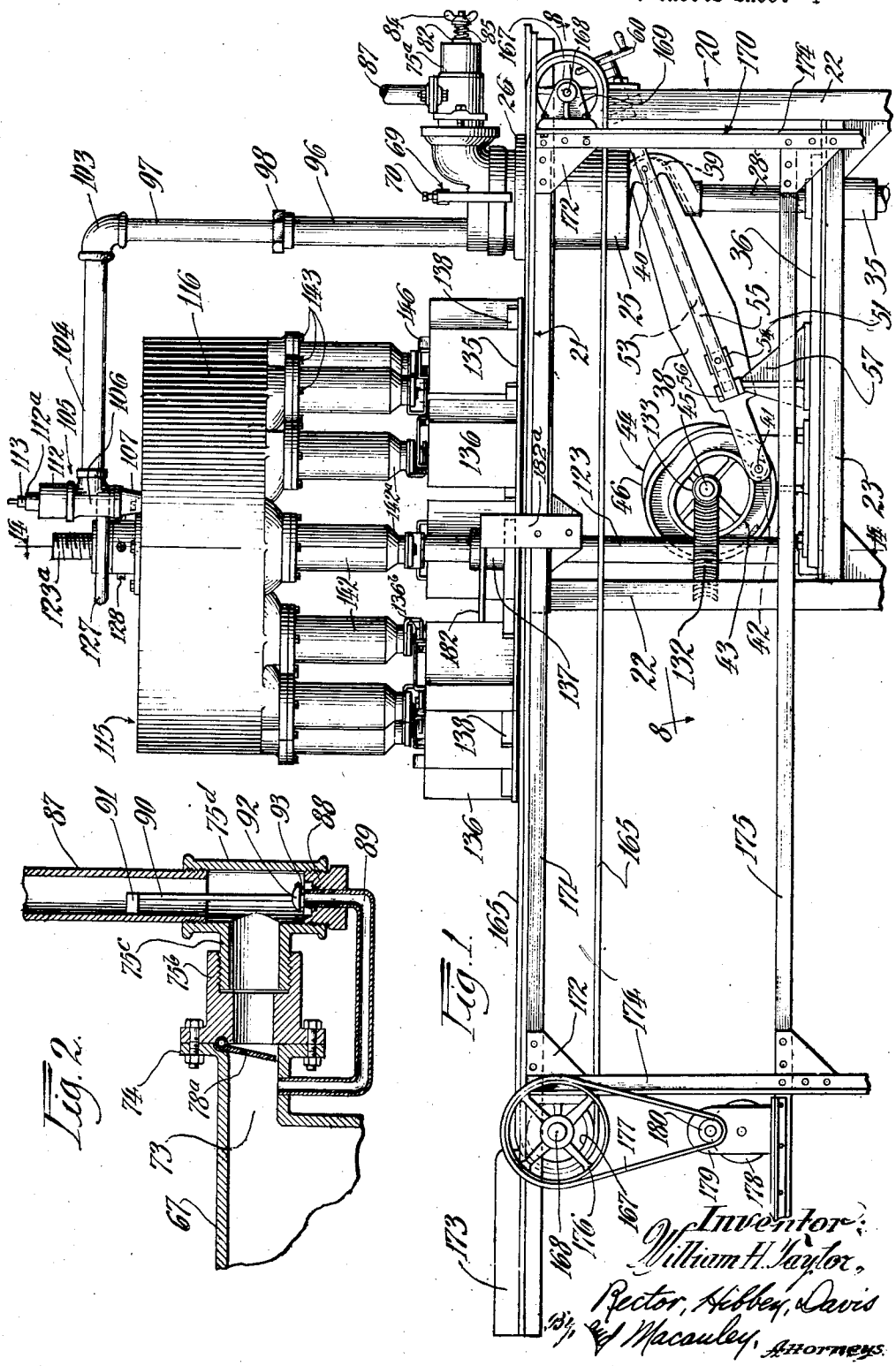

Fig. 1.

Fig. 2.

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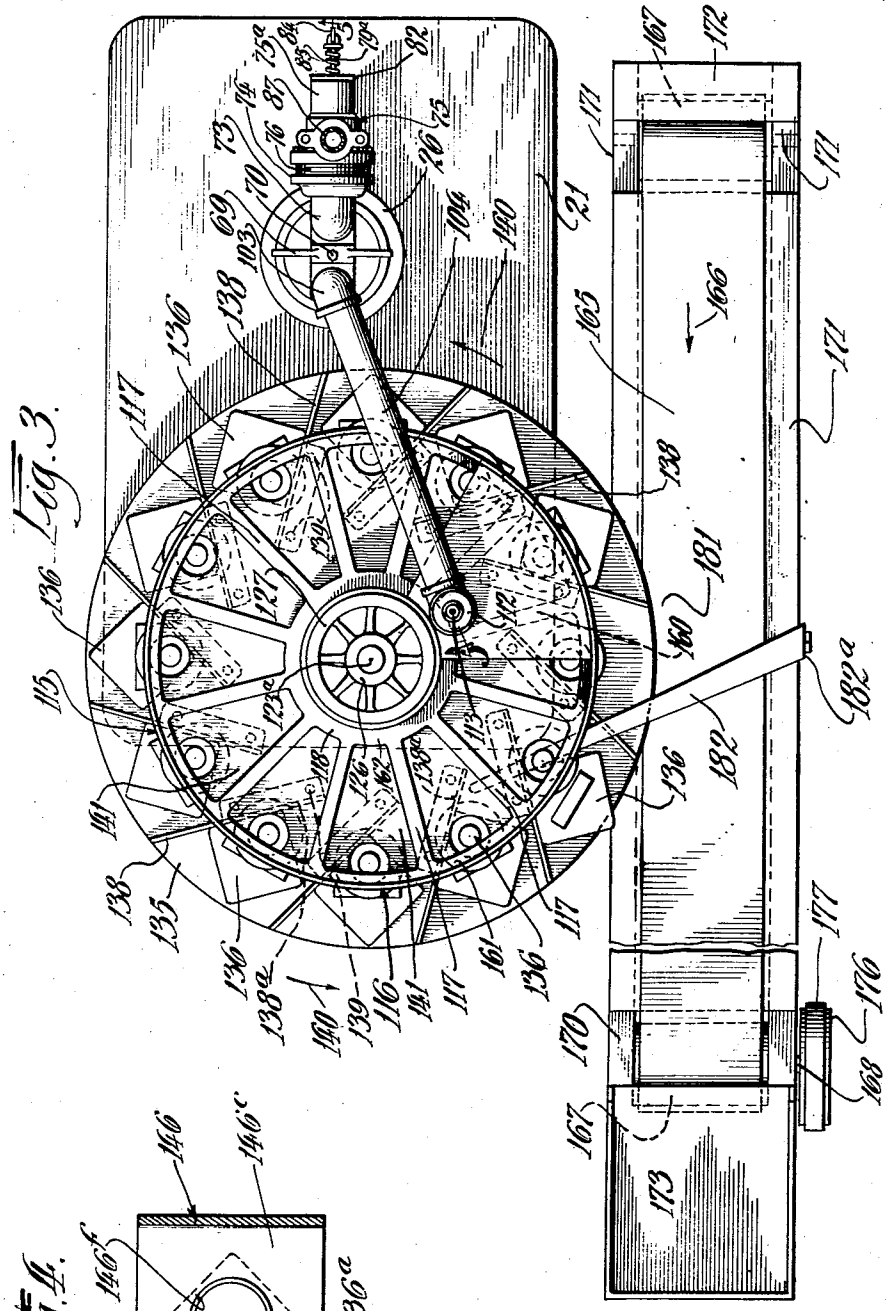

Fig. 3.

Fig. 4.

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Fig. 5.

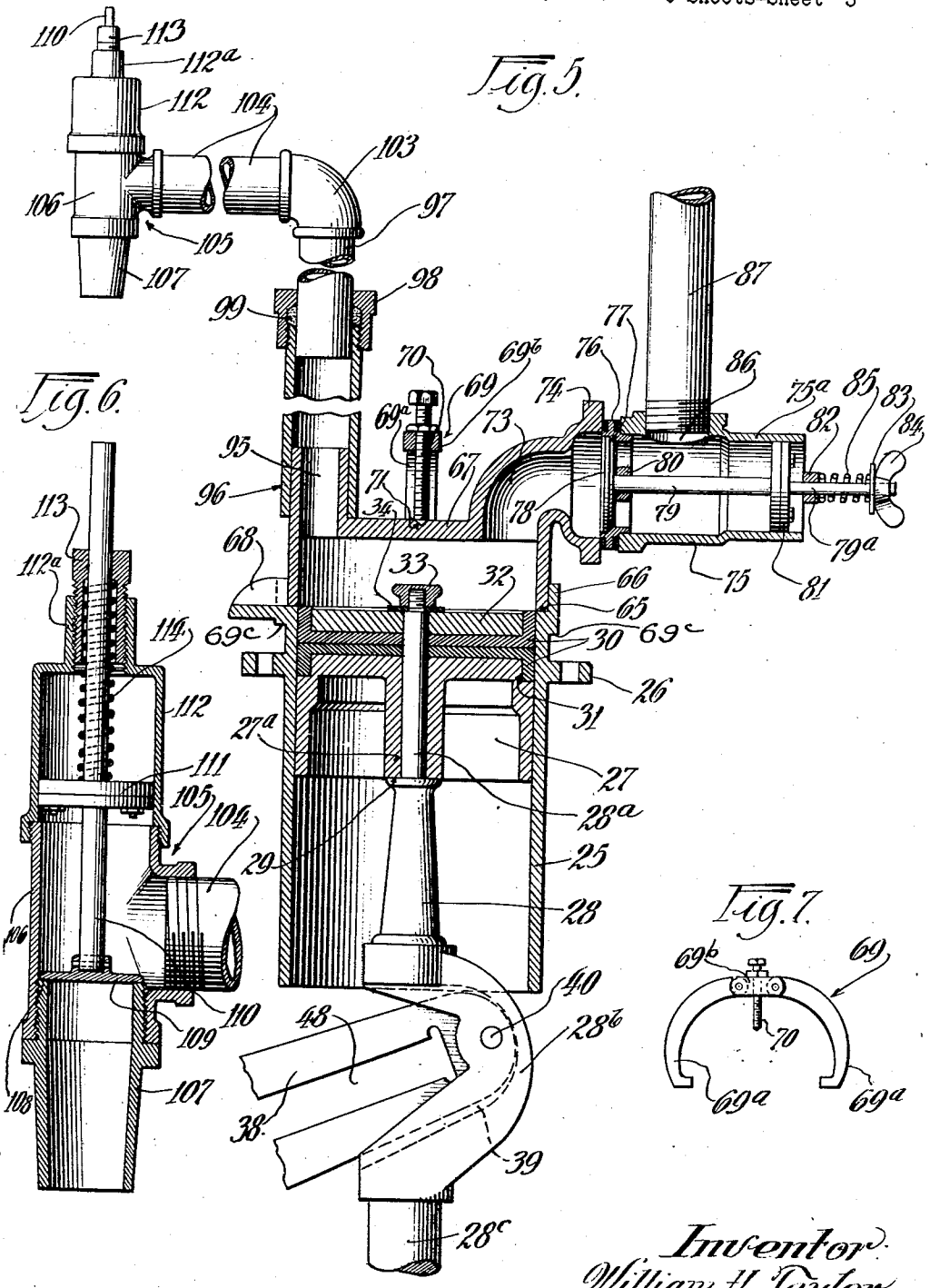

Fig. 6.

Fig. 7.

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FILLING MACHINE

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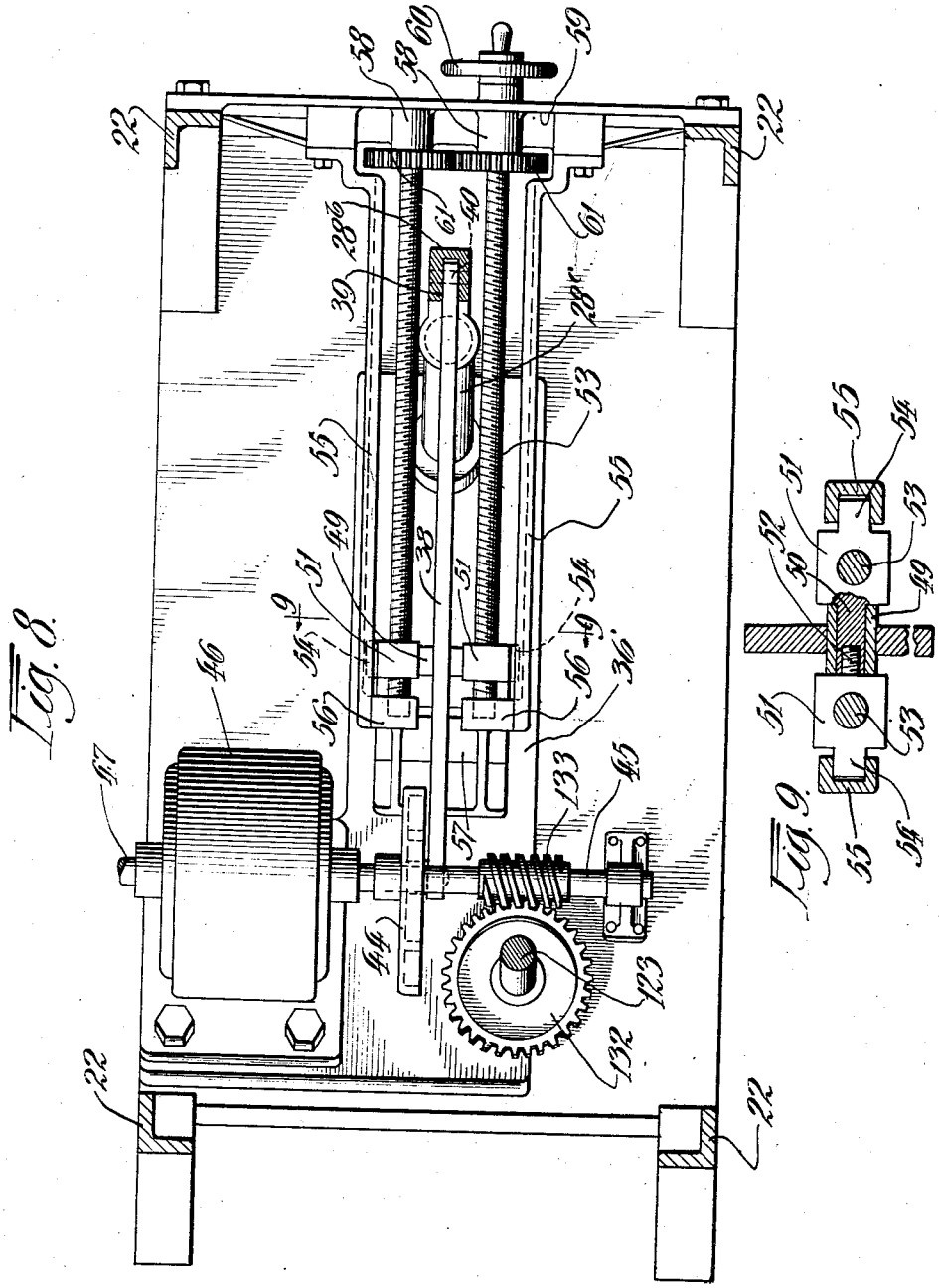

Fig. 8.

Fig. 9.

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FILLING MACHINE

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Fig. 10.

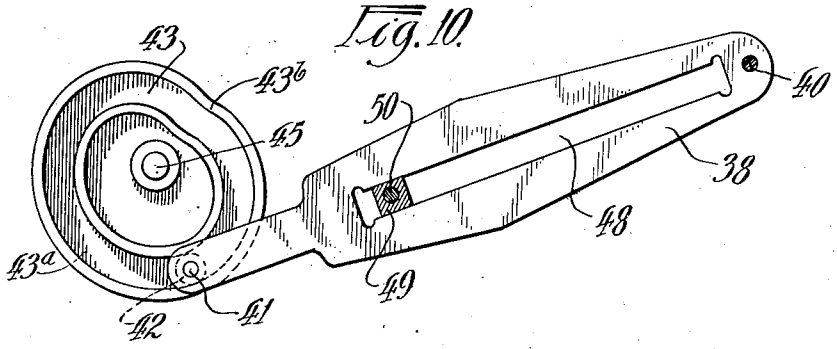


Fig. 11.

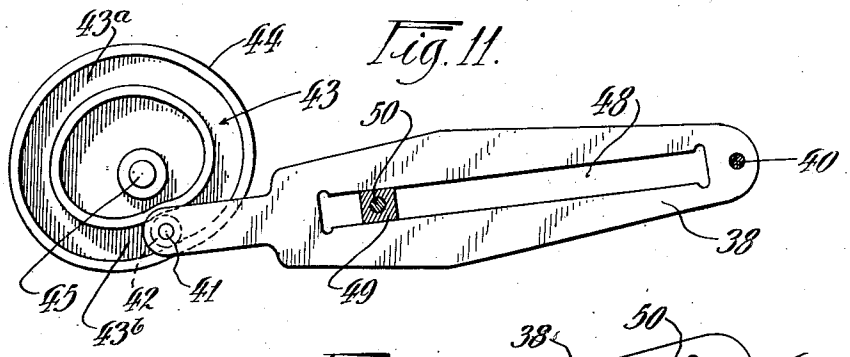


Fig. 12.

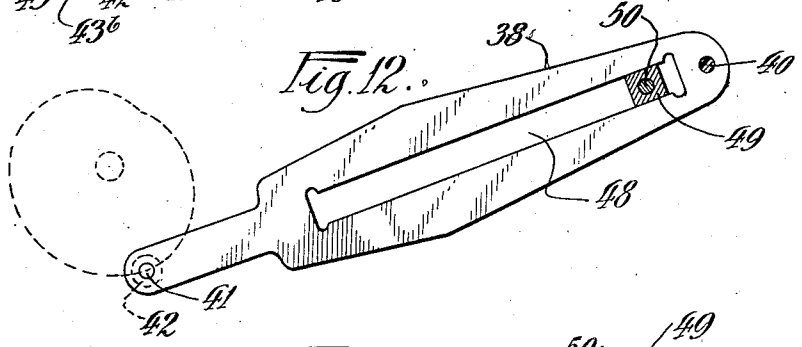
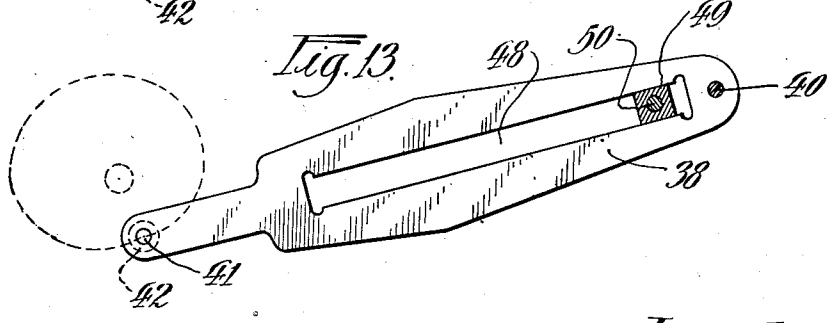


Fig. 13.



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FILLING MACHINE

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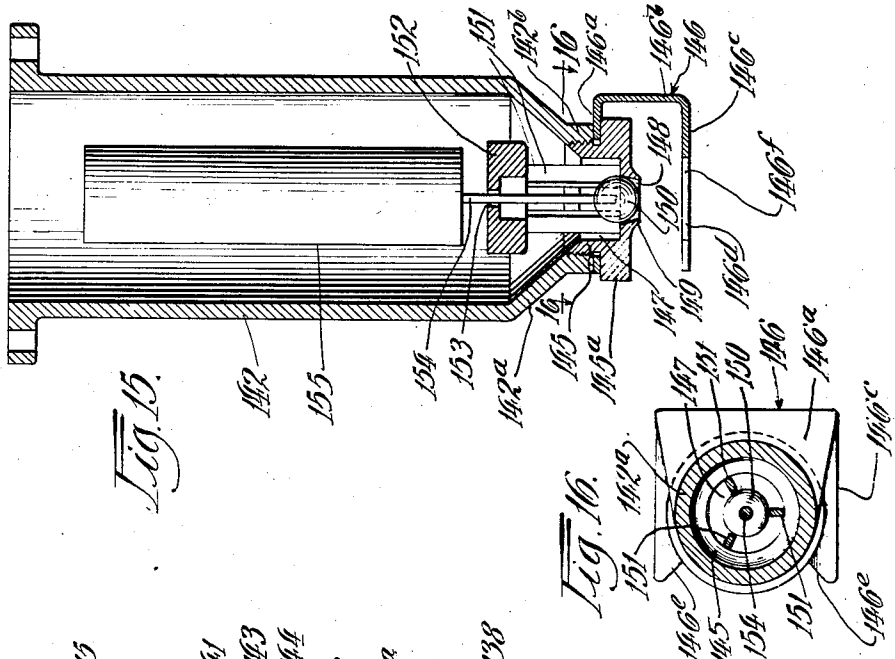

Fig. 15.

Fig. 16.

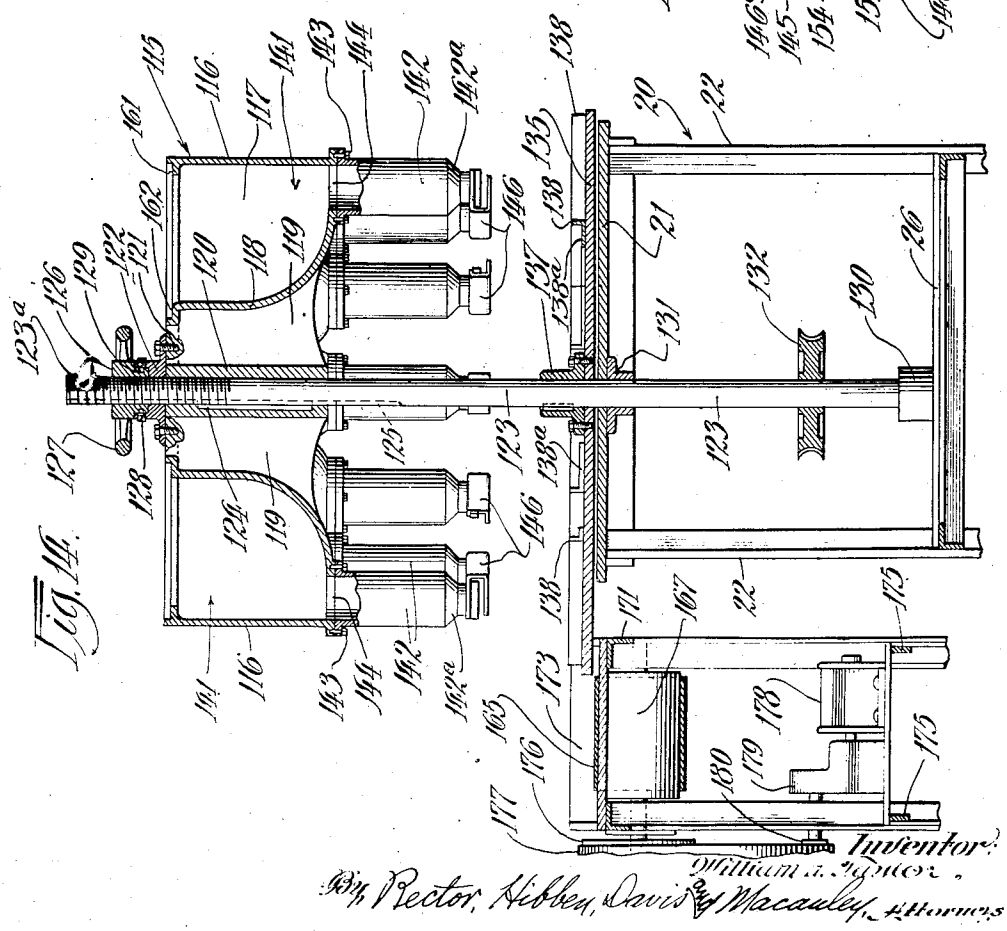

Fig. 14.

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UNITED STATES PATENT OFFICE

WILLIAM H. TAYLOR, OF BROOKFIELD, ILLINOIS, ASSIGNOR TO THE MECHANICAL MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

FILLING MACHINE

Application filed March 7, 1929. Serial No. 345,055.

This invention relates to improvements in filling machines and its purpose is to provide a machine adapted for use in filling cans or other receptacles with various fluids such as oil, turpentine, alcohol and the like. In my co-pending application Serial No. 276,560, filed May 10, 1928, there is disclosed a filling machine adapted for use in filling cans with paint or other fluids and, while the present invention bears some resemblance to said machine of said prior application, it is distinguished from the prior invention, among other features, by the provision of means for allowing a relatively slow movement of oil or other fluid into the cans so that a machine embodying the present invention is better adapted for use in filling cans having relatively small mouths or in filling cans with relatively heavy liquids. A further object of the invention is to provide a machine which may be employed conveniently and efficiently for quickly filling cans or other receptacles with predetermined quantities of oil or other liquids while at the same time permitting a relatively long period of flow of the liquid into each can. Still another object of the invention is to provide a filling machine having a measuring chamber which may be operated continuously for measuring successive quantities of liquid to be filled into cans in combination with a plurality of storage chambers into which the successive measured quantities of liquid are discharged from the measuring chamber, to remain therein until they flow into the cans to be filled. Another important object of the invention is to provide a filling machine comprising a series of movable filling chambers into which measured quantities of liquid are successively discharged and from which the liquid flows by gravity into a series of cans which move in unison with the filling chambers. A further object of the invention is to provide means for automatically controlling the flow of fluid from the filling chambers into the cans or other receptacles and for preventing the dripping of the liquid when the cans are filled. A further object of the invention is to provide a filling machine having a discharge nozzle provided with a valve and associated means whereby the discharging liquid is confined to an area of predetermined dimensions particularly adapted for the filling of cans or other receptacles having small mouths. A further object of the invention is to provide a measuring cylinder provided with a reciprocating piston for drawing in and discharging therefrom measured quantities of liquid, in combination with a rotatable head provided with a plurality of filling chambers into which successive measured quantities of liquid are discharged by the measuring cylinder. Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings in which one embodiment is illustrated. In the drawings,

Fig. 1 shows a side elevation of the improved filling machine of the present invention, provided with a conveyor for moving the cans to and from the filling nozzle;

Fig. 2 shows a vertical section through the inlet conduit leading to the measuring cylinder showing the means for regulating the weight of the liquid filled into the cans in accordance with the temperature of the liquid;

Fig. 3 is a top plan view of the machine illustrated in Fig. 1;

Fig. 4 is a detail horizontal section showing one of the guides for positioning a mouth of a can beneath a filling nozzle;

Fig. 5 is a vertical section taken on the line 5—5 of Fig. 3, showing the measuring cylinder and its piston and the valve for controlling the flow of fluid to the measuring cylinder;

Fig. 6 is an enlarged vertical section showing the construction of the nozzle through which the liquid is discharged from the measuring cylinder into the filling chambers;

Fig. 7 shows a side elevation of the clamp for securing the head and its discharge nozzle on the upper end of the measuring cylinder;

Fig. 8 is a longitudinal horizontal section taken on the line 8—8 of Fig. 1;

Fig. 9 is a transverse detail section taken on the line 9—9 of Fig. 8;

Fig. 10 shows a side elevation of the operating lever and its cam with the operating lever adjusted for the maximum stroke of the piston in the measuring cylinder, illustrating the arrangement of the parts when the piston is in its uppermost position;

Fig. 11 shows a side elevation of the parts illustrated in Fig. 10 after the cam has been rotated to a position corresponding to the lowermost position of the piston, with the fulcrum of the lever having the same adjustment as that shown in Fig. 10;

Fig. 12 is a view similar to that of Fig. 11 showing the relative arrangement of the operating lever and cam when the fulcrum has been adjusted to effect the minimum stroke of the piston, the relation of the parts corresponding to the uppermost position of the piston;

Fig. 13 is a view similar to that of Fig. 12 showing the relative arrangement of the parts, with the fulcrum of the lever in the same position, after the cam has been rotated to move the piston to its lowermost position in the measuring cylinder;

Fig. 14 shows a transverse vertical section on the line 14—14 of Fig. 1;

Fig. 15 is an enlarged vertical section through one of the discharge nozzles carried by each of the filling chambers, and

Fig. 16 is a horizontal detail section taken on the line 16—16 of Fig. 15.

In the drawings, the filling machine of the present invention is shown as being carried by a frame 20 in the form of a table having a flat top 21 which is supported by four legs 22 located at its corners and connected adjacent their lower ends by the horizontal frame members 23. The oil or other liquid to be filled into the cans or other receptacles is adapted to be alternately drawn into and discharged from a cylinder 25 which projects upwardly through a hole in the table top 21 and is provided with an annular flange 26 by which it is secured to the table top. A piston 27 is mounted to reciprocate in the cylinder 25, being secured on the upper reduced extremity 28^a of the piston rod 28. The lower portion of the piston 27 is hollow and the hub 27^a thereof seats against a shoulder 29 formed on the piston rod 28. A pair of cup-shaped leather washers 30 are mounted on the upper end of the piston 27 with their annular flanges directed in opposite vertical directions, the annular flange of the lower washer seating in a recess 31 which is formed in the upper part of the piston. A metal disk 32 seats within the upper leather washer 30 within the up-turned annular flange thereof, and all of these parts of the piston 27 are secured in assembled relation by means of a nut 33 which threadedly engages the upper end of the reduced portion 28^a of the piston rod and engages a washer 34 mounted between the nut and the disk 32. The upper surface of the disk 32 and the upturned flange of the upper washer 30, which form the upper end surface of the piston 27, normally occupy the position shown in Fig. 5 with their upper surfaces in the plane of the upper end of the cylinder 25, so that when the piston 27 reaches this position at the end of each discharge stroke, all of the oil or other liquid is discharged from the cylinder. The piston rod 28 is provided with an intermediate offset portion 28^b to which the actuating mechanism is connected, as hereinafter described, and the lower portion 28^c of the piston rod is mounted to reciprocate in a bearing 35 carried by the lower supporting plate 36 which is mounted on the lower frame members 23.

The piston rod 28 is reciprocated by an operating lever 38, the upper end of which extends into a slot 39 in the offset portion 28^b of the piston rod where the lever is pivotally connected to the piston rod by means of a transverse pin 40. The operating lever 38 is supported at an intermediate point on an adjustable fulcrum and the lower end thereof carries a laterally projecting pin 41 on which is mounted a roller 42 adapted to travel in the slot 43 formed in the lateral side of a cam 44. The cam 44 is mounted on the shaft 45 of a speed reducer 46 which, in turn, is driven by an electric motor, not illustrated, connected thereto through the shaft 47. One side 43^a of the slot has a curvature only slightly less than that of a semicircle while the other side 43^b of the cam slot is relatively flat so that on the suction stroke of the piston 27 a rapid movement of the parts takes place as compared with the speed of operation during the discharge or filling stroke of the piston 27 when it is desired to have a relatively slow and uniform stroke and a uniform discharge of oil or other liquid being filled. In this way, about two-thirds of the time required for a complete cycle of operations effected by the measuring cylinder is devoted to the discharge of liquid from the cylinder. The speed reducer 46 is preferably driven by a variable speed motor so that the speed of operation may be varied as desired. The stroke of the piston 27 is varied by adjusting the position of the fulcrum of the operating lever 38. This lever is provided with a longitudinal slot 48 in which is located a fulcrum block 49 of rectangular cross-section which has a sliding fit in the slot and is adapted to rock on a fulcrum pin 50. This fulcrum pin extends between a pair of adjusting members 51, being formed integrally with one of these members and being threadedly engaged by a stud 52 formed on the other of these members, as shown in Fig. 9. The adjusting members 51 are each threadedly engaged by an adjusting screw 53 and each adjusting member is fur-

ther provided with an outwardly extending lug 54 adapted to travel in the groove of a channel-shaped guide member 55. The adjusting screws 53 extend in an inclined position upwardly toward the lower part of the cylinder 25, as shown in Fig. 1, being parallel to each other and to the guide members 55. The lower ends of the adjusting screws 53 are rotatably mounted in bearing members 56 which are carried by a bracket 57 fixed on the base plate 36, and the ends of these bearing members 56 also have secured thereto the lower ends of the guide members 55. The upper ends of the adjusting screws 53 are journaled in bearings 58 carried by a transverse frame 59 which has its ends secured to a pair of the supporting legs 22, as shown in Fig. 8. This frame 59 also has secured thereto the upper ends of the guide members 55. One of the adjusting screws 53 extends through its bearing 58 and has mounted thereon a relatively fixed hand wheel 60 by which the adjusting screw may be rotated. These adjusting screws 53 are threaded in opposite directions and have a driving connection with each other through the intermeshing gears 61 which are fixed thereon adjacent to the bearings 58 so that, upon rotating the hand wheel 60, the adjusting screws 53 are rotated in opposite directions and thereby effect simultaneous adjustment of the members 51 in the same direction. In this way the fulcrum block 49 and the fulcrum pin 50 may be adjusted longitudinally of the slot 48 for the purpose of varying the position of the fulcrum of the operating lever 38 and thereby varying the stroke of the piston 27 with a consequent variation of the amount of oil or other liquid discharged from the cylinder. The adjusting screws 53 and the guide members 55 are mounted in a plane which is inclined to correspond to the inclination of the operating lever 38 when the piston 27 is in its extreme upper position so that when any adjustment of the fulcrum takes place it effects an adjustment of the extent of downward movement of the piston 27 from its uppermost or zero position, with a corresponding variation in the volume of oil or other liquid drawn into the cylinder 25 on one downward stroke of the piston. By this arrangement, all of the possible strokes of the piston, brought about by the adjustment of the position of the fulcrum block 49, are measured from a common upper starting point.

When the piston 27 is in its uppermost position, as shown in Fig. 5, the topmost surface of the piston lies substantially flush with the annular shoulder 65 around the top edge of the cylinder 25 but this cylinder is provided also with an annular flange 66 of larger diameter which extends upwardly around the lower edge of the cylinder head 67 which rests on the shoulder 65. When the head 67 is taken off for purposes of cleaning, for example, when the machine is to be used for filling a different liquid, it is desirable to clean the upper end of the piston 27 of all traces of the liquid previously being filled by the use of the machine and any of this liquid which is thus collected on the upper end of the piston may be drawn off through a spout 68 which is formed in one side of the flange 66. The head 67 is detachably secured in position on the upper end of the cylinder 25 by means of a clamp 69 having the form shown particularly in Fig. 7. This clamp comprises a pair of hooks 69^a which extend over the shoulders 69^c on the sides of the cylinder and which are pivoted at an intermediate point on the connecting bar 69^b. A screw 70 engages this connecting bar and has its lower pointed end arranged to engage a recess 71 formed in the upper side of the head 67, as shown in Fig. 5, so that when the screw 70 is adjusted downwardly against the head, the parts are clamped firmly in assembled relation.

The head 67 is hollow and is provided at one side with an enlargement or lateral extension 73 which constitutes an inlet port through which the oil or other liquid flows to the cylinder 25. The inlet port 73 is surrounded by an outwardly extending flange 74 to which a valve casing 75 is secured. A circular valve member 76 is clamped between the valve casing 75 and the flange 74 and is provided with an inner annular beveled valve seat 77 adapted to be engaged by a circular valve member 78. The valve member 78 is mounted on the end of a valve stem 79 which is mounted to slide in a hub 80 carried by radiating arms at the center of the member 76. The valve stem 79 is provided adjacent its other end with a small piston 81 which has a fluid-tight sliding fit within the cylindrical extension 75^a of the valve casing. The valve stem 79 has an extension 79^a which projects beyond the piston 81 and slides in a bearing 82 carried by the casing extension 75^a. A washer 83 and a wing nut 84 are mounted on the outer threaded end of the part 79^a and a coil spring 85 is mounted between the washer 83 and the bearing 82, so that this spring tends normally to maintain the valve member 78 in engagement with the annular valve seat 77. The valve casing 75 is provided on its upper side with an inlet opening 86 in which there is threaded an inlet pipe 87 leading from a source of supply of the oil or other liquid to be filled into the cans or other receptacles. When the piston 27 moves downwardly in the measuring cylinder 25 on its suction stroke, the valve 78 is withdrawn from its seat by suction and a quantity of the oil or other liquid is drawn inwardly through the inlet port 73 into the measuring cylinder, the quantity so drawn in depending upon the adjustment of the fulcrum block 49 and the corresponding stroke

of the piston 27. At the conclusion of the suction stroke of the piston 27, the valve 77 tends to return to its closed position under the influence of the spring 85 and also under the influence of the down-flowing oil or other liquid in the pipe 87 which acts on the small piston 81, having slightly larger area than that of the inner face of the valve member 78 so that the weight of the liquid in the pipe 87 acting on the small piston 81 tends to seat the valve 78 independently of the action of the spring 85. In this way a prompt closure of the valve 78 is effected at the end of the suction stroke of the piston 27 and the force with which the valve member 78 is maintained in its closed position may be varied by adjusting the wing nut 84.

When the machine is being used to fill cans or other receptacles with a liquid such as alcohol, for example, in which case it is important that each can be filled with the same weight of liquid, the machine is preferably equipped with the apparatus shown in Fig. 2 for regulating the amount of liquid filled on each stroke of the piston in the measuring cylinder in accordance with the temperature of the liquid. According to this construction, the flange 74 of the inlet portion 73 of the head is provided with a valve casing 75^b which is secured to the flange 74 by bolts or the like and which comprises an extension 75^c having a vertically extending cylindrical part 75^d. The inlet pipe 87 is threaded into the upper end of the part 75^d and the lower part of the member 75^d is threadedly engaged by a plug 88 having a central aperture engaged by a by-pass tube 89 leading through the plug and having communication with the inlet port of the head 67 adjacent the flange 74. The tube 89 is somewhat flexible and the upturned end thereof has a rotatably interlocking connection with the plug 88 so that when this plug is adjusted vertically the adjacent end of the tube will be raised or lowered with it. The communication between the valve casing 75^b and the part 73 of the head is controlled by the valve member 78^a. A thermostatic rod 90 of zinc or the like is suspended in the inlet pipe 87 with its upper end secured to a fixed abutment 91. The lower end of the thermostatic rod 90 terminates above the plug 88 and has secured thereto a cup-shaped valve member 92 which overlies the mouth of the tube 89. When the valve member 92 is elevated from the tube 89 and the plug 88 there is left a small opening 93 through which a liquid may pass. In the operation of this device for compensating for variations in temperature, the parts of the machine are adjusted so that the downward stroke of the piston 27 in the cylinder 25 will draw in a slightly greater quantity of liquid than that to be filled into a can following the discharge stroke of the piston. For example, if a quart of liquid is to be filled into a can, one or two ounces more than a quart will be drawn into the cylinder 25 on the downward stroke of the piston 27 and then, upon the upstroke of the piston and the discharge of the liquid into the can, through the channels to be hereinafter described, the valve 78 is closed on its seat and the excess of liquid, above a quart, is returned to the supply pipe 87 through the by-pass tube 89 and the small opening 93 beneath the valve 92. If the temperature increases and thereby causes an expansion of the liquid, with a corresponding decrease in weight per unit of volume, the valve member 92 carried by the thermostatic rod 90 is moved closer to the upper end of the tube 89, due to the expansion of the rod 90, so that the amount of liquid bypassed through the tube 89 on the upstroke of the piston 27 is decreased and a greater quantity of the liquid is filled into the can. In this way the volume of the liquid filled into the can is varied according to its temperature and this variation is adjusted automatically for different sizes of cans, since the excess of liquid drawn into the cylinder 25 will be proportional to the downward stroke of the piston 27.

The oil or other liquid discharged through the head 67 upon the upward stroke of the piston 27 flows upwardly through a discharge port 95 which leads through a tube 96 extending upwardly from the head and having a sliding fit on the outside of a downwardly extending tube 97. A packing nut 98 threadedly engages the lower end of the tube 97 and a chamber within this nut at the lower end of the upper tube is filled with packing material 99 so that a fluid-tight joint is formed between the tube 96 and the upward extension 97 thereof while at the same time permitting the tube 97 to be adjusted vertically. The tube 97 may be secured in the desired adjusted position by tightening the ring 98 to compress the packing material 99 sufficiently to hold the tube by friction. The upper end of the tube 97 is connected by an elbow 103 with a horizontal communicating pipe 104. This pipe communicates at its opposite end with a discharge valve 105, the structure of which is illustrated particularly in Fig. 6. This valve comprises a T-shaped valve casing 106 into which the pipe 104 is threaded and the lower end of this valve casing is threadedly engaged by a nozzle 107 which is downwardly tapered and which is provided at its upper end within the casing 106 with an annular valve seat 108 adapted to be engaged by a circular valve member 109. The valve member 109 is secured to the lower end of a valve stem 110 on which is mounted a piston 111 adapted to reciprocate in a cylinder 112 which is secured on the upper end of the valve casing 106. The valve stem 110 extends upwardly beyond the piston 111 and is slidably mounted in a tubular member 113 having a threaded en-

gagement with the upper extension 112ª of the cylinder 112. A coil spring 114 is mounted on the upper part of the valve stem 110, engaging the member 113 at one end and the piston 111 at the other. This coil spring 114 tends to close the valve member 109 and the compression of this spring may be varied by adjusting the member 113 within the extension 112ª of the cylinder. The piston 111 is of somewhat larger area than the circular valve disk 109 so that on the discharge stroke 27 of the measuring cylinder 25, the pressure of the liquid entering the valve casing 106 tends to open the valve 109 due to the unequal total pressures on the opposite faces of the piston 111 and the valve 109. This unbalance of pressure overcomes the compression of the spring 114 so that the valve 109 is opened and the oil or other liquid is discharged downwardly through the nozzle 107. When the piston 27 of the measuring cylinder reaches the upper end of its stroke, as shown in Fig. 5, the pressure of the liquid in the valve casing 106 between the small piston 111 and the smaller valve disk 109 ceases so that the spring 114 is then permitted to move the valve disk 109 into engagement with its seat 108, thus shutting off the further flow of liquid through the nozzle 107.

The liquid discharged from the nozzle 107 is received by one of the chambers of a rotatable filling head 115 having the form shown particularly in Figs. 1, 3 and 14. The filling head 115 has an outer cylindrical wall 116 from which extend a plurality of radially and inwardly directed partition walls 117 which are united along their inner edges with the inner annular wall 118. The annular wall 118 is connected by a plurality of radially extending vanes or webs 119 with a central hub 120 thus forming a central frame structure in which is embodied a relatively fixed annular ring 121 secured to a collar 122 located at the upper end of the filling head. The hub 120 of the filling head is mounted on a vertical shaft 123 but is restrained against rotation on this shaft by means of a key 124 fixed in the hub and slidably engaging a longitudinal keyway 125 formed in the shaft. An adjusting nut 126 threadedly engages the upper threaded end 123ª of the shaft 123 and is provided with a hand wheel 127 by which it may be adjusted. The adjusting nut 126 is connected to the ring 122 of the rotatable filling head through set screws 128 which pass through the walls of the member 122 and engage an annular groove 129 in the adjusting nut. By rotating the nut 126 on the threaded portion of the shaft 123, the elevation of the filling head 115 may be varied to accommodate it to the filling of different sizes of cans, as hereinafter described. The vertical shaft 123 is journaled in a bearing 130 fixed on the base 26 and also in a bearing 131 secured to the under side of the table 21. A worm wheel 132 is secured to the shaft 123 beneath the table 21 and is arranged to mesh with a worm 133 secured on the horizontal driving shaft 45, as shown in Fig. 8, so that when the machine is in operation the shaft 123 is continuously rotated.

Beneath the filling head 115 there is mounted a rotatable circular supporting plate 135 for the cans or other receptacles 136 which are to be filled. This support plate is provided with a central hub 137 which is secured to the vertical shaft 123 so that the support for the cans rotates in unison with the filling head. The cans 136 are mounted on this support in engagement with upwardly extending guide members 138 which are provided with flanges 138ª resting on the face of the plate 135 and secured thereto by screws 139. These guide members 138 are inclined to the radii of the rotatable supporting plate 135 and diverge outwardly, as shown in Fig. 3, so that they may be set to be inclined away from the direction of rotation of the support 135 and of the head 115 which is indicated by the arrow 140. The cans 136 illustrated in the drawings are rectangular in cross-section and their upper horizontal walls 136ª are each provided adjacent one corner with an upwardly extending spout or mouth 136ᵇ through which the oil or other liquid is inserted into the can and through which it is adapted to be poured out when the can is subsequently emptied. After the can has been filled the spout or mouth 136ᵇ is closed by a screw-threaded plug or by a cork, for example, and the location of the spout adjacent the corner of the can is of convenience in filling and also emptying the can. The cans are positioned on the support 135 with the lower part of one side face thereof bearing against an adjacent guide member 138 and each can is moved inwardly along its guide member until the spout 136 is in position to receive a quantity of liquid from one of the filling chambers 141 which are formed in the filling head 115 between the partition walls 117 thereof.

Each filling chamber 141 of the head 115 has a downward extension which is formed within a cylindrical valve casing 142. These valve casings are secured to the body portion of the head 115 by means of cap screws 143 and a communication is thus established at 144 between each valve casing and its associated filling chamber. The inner annular wall 118 of the head 115 is curved outwardly and downwardly at its lower part so that the contents of each filling chamber are directed toward the opening 144 which communicates with the extension formed by the valve casing 142. Each valve casing 142 is of the form illustrated particularly in Figs 15 and 16 where it will be seen that the lower part of the casing terminates in an annular downward-

ly converging portion 142ª provided at its lower extremity with a cylindrical internally threaded flange 142ᵇ. This threaded flange is engaged by a threaded plug 145 having an outwardly directed flange 145ª which engages the under side of the upper arm 146ª of a stop member 146. The arm 146ª is provided with an aperture to receive the threaded stem of the plug 145 and it is clamped between the flange 145ª and the flange 142ᵇ. This stop member extends downwardly as shown at 146ᵇ and terminates in a lower horizontal plate 146ᶜ provided with a notch 146ᵈ adapted to engage the side of the stem or spout 136ᵇ of a can when the can is moved into position beneath the casing 142 on the supporting plate 135. Each notch 146ᵈ is formed with inwardly diverging inclined walls 146ᵉ terminating adjacent their inner ends in a substantially semicircular wall 146ᶠ which is adapted to conform to the curvature of the spout 136ᵇ of the can. The plug 145 is provided with a central passage 147 terminating in a circular mouth 148 around which there is formed a downwardly extending flange 149. A ball valve 150 is adapted to seat within the slightly tapered wall of the mouth 148 to close the opening and prevent the outow of the contents of the filling chamber 141 when the valve is closed. The plug 145 is provided with three upwardly extending legs 151 which are distributed around the ball 150 to permit the upward movement thereof and these legs support a block 152 having an aperture 153 therein which is loosely engaged by the valve stem 154. This valve stem is secured to the ball valve 150 and the upper end thereof is attached to a central part of a cylindrical hollow metal float 155. This float is located axially within the cylindrical casing 142 and its weight maintains the valve 150 on its seat but, when a sufficient quantity of oil or other liquid enters the casing 142, the float is elevated due to its buoyancy and the ball valve is then lifted to permit the contents of the casing 142 and its communicating filling chamber 141 to flow downwardly into the can 136.

The casings 142 are so located around the outer edge of the cylindrical head 115 that the centers of the openings 148 through which the liquid is discharged lie on a circle concentric with the axis of rotation of the head and the stop members 146 are so positioned on the casings 142 that the cans or receptacles 136 are located with their spouts 136ᵇ so positioned that their centers lie on the same circle, each spout 136ᵇ being concentric with one of the mouths or openings 148 through which the liquid is discharged. During the operation of the apparatus, the head 115 rotates continuously at a relatively low speed, for example two and one-half revolutions per minute, although this speed may vary depending upon the character of the liquid being filled into the cans. The movement of the head 115 is so timed that one of the filling chambers 141 will be located beneath the discharge nozzle 107 each time that a measured quantity of liquid is discharged from the measuring cylinder 125 by the upward movement of the piston 127. To prevent the splashing of the liquid out of the filling chamber 141 as it is discharged therein through the nozzle 107, a segmental cover plate 160 is provided. This cover plate has an aperture which is engaged by the nozzle 107 and it remains stationary while the head 115 revolves beneath it, being guided by the annular flanges 161 and 162 which are formed on the upper parts of the outer and inner walls 161 and 162, respectively, of the head 115, as shown in Fig. 14. The cover 160 is of such area that it closes the upper opening of any single chamber 117 when that chamber is positioned beneath the nozzle 107 to receive a measured quantity of liquid therethrough. By turning the hand wheel to adjust the nut 126, the elevation of the head 115 may be varied so that the stop members 146 will actively engage the spouts 136 of the cans with the upper end of the spout located in proximity to one of the mouths 148 through which the liquid is discharged from a filling chamber 117. Due to the use of a spherical ball 150 within a mouth 148 having a tapered wall, the oil or other liquid discharged from a filling chamber travels downwardly in a stream of regular circular cross-section which gradually diminishes as its distance from the mouth 148 increases. The upper part of this stream is hollow due to the fact that the oil or other liquid flows downwardly around all sides of the ball 150 when this ball is elevated and there is a complete absence of splashing or irregular flow so that the stream discharged may be caused to engage a spout 136 having an internal dimension only slightly greater than that of the stream of liquid flowing therethrough into the can. For example, an annular clearance of one-thirty-second of an inch between the stream of liquid and the surrounding wall of the spout is sufficient to prevent possible splashing of the liquid on the spout during the process of filling the can. The machine of the present invention is thus adapted for filling cans having relatively small spouts and it overcomes the necessity of cleaning any splashed oil or other liquids from the outside of the can before the spouts are closed by corks or other stoppers preliminary to packing them in the cases in which they are ordinarily shipped.

The cans 136 may be placed on and removed from the circular supporting plate 136 manually or by any of the automatic devices which are well known in the art. In the accompanying drawings, an endless belt 165 is illustrated as a means of conveying the cans to and from the rotating head 115. The upper

stretch of this belt travels in the direction indicated by the arrow 166 and the end portions thereof travel around pulleys 167 which are mounted on shafts 168 journaled in bearings 169 carried by an auxiliary frame 170. This auxiliary frame is movable independently of the frame of the filling machine so that the belt conveyor may be brought into position adjacent the machine when the operator desires to use it while at the same time allowing its use to be dispensed with when desired. The frame 170 comprises upper longitudinal frame members 171 located on opposite sides of the upper stretch of the belt 165 and these longitudinal frame members are connected by end frame members 172. At one end the frame members 171 serve as a support for a tray 173 in which the filled cans are collected. The upper frame members 171 and 172 are supported by vertical legs 174 which are in turn connected by longitudinal lower frame members 175. The shaft of one of the pulleys 168 is provided with a larger fixed pulley 176 which is connected by a belt 177 with a driving motor 178, a speed reducer 179 being inserted between the motor and the pulley 180 which drives the belt 177 so that the conveyor belt 165 may be caused to move at a relatively low speed. With the construction illustrated, the empty cans are placed on the right-hand end of the belt conveyor, as viewed in Fig. 3, and are carried along thereon until they reach the region indicated at 181 where the attendant pushes them inwardly onto the rotating support 135, causing each can to be guided by one of the members 138 until its spout 136[b] is located beneath the mouth 148 of one of the casings 142. The cans are then carried around in an anticlockwise direction as viewed in Fig. 3. At or about the time a can is placed in position on the rotating support 136, the chamber 141, from which it is subsequently to be filled, begins to receive a supply of liquid through the discharge nozzle 107 and after a sufficient interval of time has elapsed to make sure that the can 136 is in place, a large enough quantity of oil will have flowed into the adjacent casing 142 to elevate the float 155 and open the ball valve 150. The liquid then begins to flow into the can 136 and may continue to flow into the can through the major portion of the revolution of the head 115. Assuming a speed of rotation of the head of two and one-half revolutions per minute and with provision for the filling of twelve cans by the head, as shown by the accompanying drawings, thirty cans may be filled in one minute and eighteen seconds of time are allowed for the filling of each can. It is thus apparent that a relatively great length of time is allowed for the flow of the oil or other liquid through a relatively small opening 148 into a can having a relatively small spout. By the time a can is moved through the circular path of travel represented by a substantially complete rotation of the supporting plate 136, it will have been filled by the liquid discharged by gravity from its associated filling chamber 141 and is then in readiness to be removed from the support 136. This removal may be effected manually but, in the accompanying drawings, it is shown as being effected automatically by an arm 182 which has a downwardly extending part 182[a] secured to the outer frame member 171 of the auxiliary frame 170. This frame extends inwardly over the belt conveyor 165 above the guide members 138 in such position that it engages each can as that can reaches the point where it is completely filled and the continued rotation of a supporting plate 135 causes the can to be moved therefrom by the arm 182 onto the moving belt 165 by which it is carried along and deposited onto the stationary tray 173. The attendant then removes the cans from the tray 173.

Although one form of the invention and a modification thereof have been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments within the scope of the appended claims.

I claim:

1. The combination in a filling machine, of a measuring chamber, means for drawing measured quantities of liquid into said chamber and discharging said quantities successively therefrom, a plurality of filling chambers adapted to receive a succession of consecutive measured quantities of liquid discharged from said measuring chamber, and means controlled by the level of the liquid therein for discharging the liquid from each filling chamber into a receptacle.

2. The combination in a filling machine, of a measuring chamber, means for drawing measured quantities of liquid into said chamber and discharging said quantities successively therefrom, a plurality of filling chambers adapted to receive a succession of consecutive measured quantities of liquid discharged from said measuring chamber, means for supporting a receptacle in position to receive a measured quantity of liquid from each of said filling chambers, and means operative after a predetermined quantity of liquid has passed into a filling chamber for causing said liquid to flow therefrom into the associated receptacle.

3. The combination in a filling machine, of a measuring chamber, means for drawing measured quantities of liquid into said chamber and discharging said quantities successively therefrom, a plurality of movable filling chambers adapted to receive in succession the consecutive measured quantities of liquid discharged from said measuring chamber, a movable support adapted to carry a plurality of receptacles through an endless

path coincident with the path of movement of said filling chambers, the receptacles being adapted to be placed on said support adjacent the point from which they are removed therefrom, and means operative after a receptacle has been placed on said support for causing the measured quantity of liquid in one of said filling chambers to flow into said receptacle as it continues its movement on said support.

4. The combination in a filling machine, of a measuring chamber, means for drawing measured quantities of liquid into said chamber and discharging said quantities successively therefrom, a plurality of movable filling chambers adapted to receive in succession the consecutive measured quantities of liquid discharged from said measuring chamber, a movable support adapted to carry a plurality of receptacles through an endless path coincident with the path of movement of said filling chambers, the receptacles being adapted to be placed on said support adjacent the point from which they are removed therefrom, means operative after a receptacle has been placed on said support for causing a measured quantity of liquid in one of said filling chambers to flow into said receptacle as it continues its movement on said support, said means being operative automatically as each receptacle approaches the point of removal from said support for preventing a further flow of liquid into said receptacle from the associated filling chamber.

5. The combination in a filling machine, of a measuring chamber, means for drawing successive measured quantities of liquid into said chamber and discharging said quantities successively therefrom, a plurality of filling chambers movable in succession to a position to receive a measured quantity of liquid discharged from said measuring chamber, supporting means movable with said filling chambers for supporting a plurality of receptacles each in position to receive a measured quantity of liquid from one of said filling chambers, and means comprising a float valve associated with each of said filling chambers for automatically causing said liquid to flow therefrom after a predetermined quantity has been received therein from said measuring chamber.

6. The combination in a filling machine, of a measuring chamber, means for drawing measured quantities of liquid into said chamber and discharging said quantities successively therefrom, a rotatable filling head comprising a plurality of filling chambers each adapted to receive a measured quantity of liquid from said measuring chamber, means movable with said filling head for supporting a plurality of receptacles each adapted to receive liquid from one of said filling chambers, and a discharge valve associated with each of said filling chambers for controlling the flow of liquid therefrom into its receptacle.

7. The combination in a filling machine, of a measuring chamber, means for drawing measured quantities of liquid into said chamber and discharging said quantities successively therefrom, a rotatable filling head comprising a plurality of filling chambers each adapted to receive a measured quantity of liquid from said measuring chamber, means movable with said filling head for supporting a plurality of receptacles each adapted to receive liquid from one of said filling chambers, means movable with said filling head for positioning each receptacle in relation to one of said filling chambers, and a valve associated with each filling chamber for controlling the flow of liquid therefrom into its receptacle.

8. The combination in a filling machine, of a measuring chamber, means for drawing measured quantities of liquid into said chamber and discharging said quantities successively therefrom, a rotatable filling head comprising a plurality of filling chambers each adapted to receive a measured quantity of liquid from said measuring chamber, means movable with said filling head for supporting a plurality of receptacles each adapted to receive liquid from one of said filling chambers, means movable with said filling head for positioning each receptacle in relation to one of said filling chambers, and a valve associated with each of said filling chambers for causing the liquid to flow therefrom into its receptacle and comprising means for causing it to flow in a stream of regular unvarying cross-section.

9. The combination in a filling machine, of a filling head rotatable about a vertical axis and having a plurality of separate filling chambers, means for discharging a measured quantity of liquid into each of said chambers, a rotatable receptacle support mounted beneath said filling head, a valve for controlling the flow of liquid from each of said filling chambers, means mounted on said head for positioning the spout of a receptacle in registry with the valve of each of said filling chambers, and means comprising a plurality of outwardly diverging inclined guide members secured on the upper face of said rotatable support for engaging the sides of said receptacles.

10. The combination in a filling machine, of a filling chamber, means comprising a valve for controlling the flow of liquid from said chamber, a stop member mounted adjacent said valve for engaging the side of a spout formed on a receptacle, and means comprising a float for opening said valve when a predetermined quantity of liquid is contained in said chamber.

11. The combination in a filling machine, of a filling chamber having a discharge mouth, means for accurately positioning the

mouth of a receptacle beneath the mouth of said filling chamber, a ball valve for closing the mouth of said filling chamber, and means comprising a float for elevating said ball valve to permit the outward flow of liquid around all sides thereof through the mouth of said filling chamber.

12. The combination in a filling machine, of a filling chamber having a discharge mouth, means for accurately positioning the mouth of a receptacle beneath the mouth of said filling chamber, a ball valve for closing the mouth of said filling chamber, means comprising a float for elevating said ball valve to permit the outward flow of liquid around all sides thereof through the mouth of said filling chamber, and means for guiding said ball valve in a vertical path of movement.

13. The combination in a filling machine, of a measuring chamber, an inlet conduit leading to said chamber, an outlet conduit leading from said chamber, means for drawing a liquid through said inlet conduit into said chamber and expelling it therefrom through said outlet conduit, and means for causing a part of the liquid drawn into said chamber to be returned to said inlet conduit when said liquid is discharged from said chamber.

14. The combination in a filling machine, of a measuring chamber, an inlet conduit leading to said chamber, an outlet conduit leading from said chamber, a one-way valve for controlling the flow of liquid from said inlet conduit into said chamber, means for drawing liquid into said chamber through said inlet conduit and discharging it through said outlet conduit, and means for causing a portion of the liquid drawn into said chamber to be by-passed around said valve into said inlet conduit when the major portion of the liquid in said chamber is discharged into said outlet conduit.

15. The combination in a filling machine, of a measuring chamber, an inlet conduit leading to said chamber, an outlet conduit leading from said chamber, a one-way valve for controlling the flow of liquid from said inlet conduit into said chamber, means for drawing liquid into said chamber through said inlet conduit and discharging it through said outlet conduit, and thermostatically controlled means for causing a part of the liquid drawn into said chamber to be by-passed around said valve into said inlet conduit when the major portion of the liquid in said chamber is discharged into said outlet conduit.

16. The combination in a filling machine, of a measuring chamber, an inlet conduit leading to said chamber, an outlet conduit leading from said chamber, a one-way valve for controlling the flow of liquid from said inlet conduit into said chamber, means for drawing liquid into said chamber through said inlet conduit and discharging it through said outlet conduit, a by-pass conduit leading around said valve from said chamber into said inlet conduit, and a thermostatically controlled valve for regulating the flow of liquid through said by-pass conduit.

17. The combination in a filling machine, of a measuring chamber, an inlet conduit leading to said chamber, an outlet conduit leading from said chamber, means for drawing a predetermined quantity of liquid into said chamber through said inlet conduit and discharging it therefrom through said outlet conduit, and means for automatically varying said predetermined quantity of liquid in proportion to its temperature.

In testimony whereof, I have subscribed my name.

WILLIAM H. TAYLOR.