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F. O'NEILL

BOTTLE MACHINE

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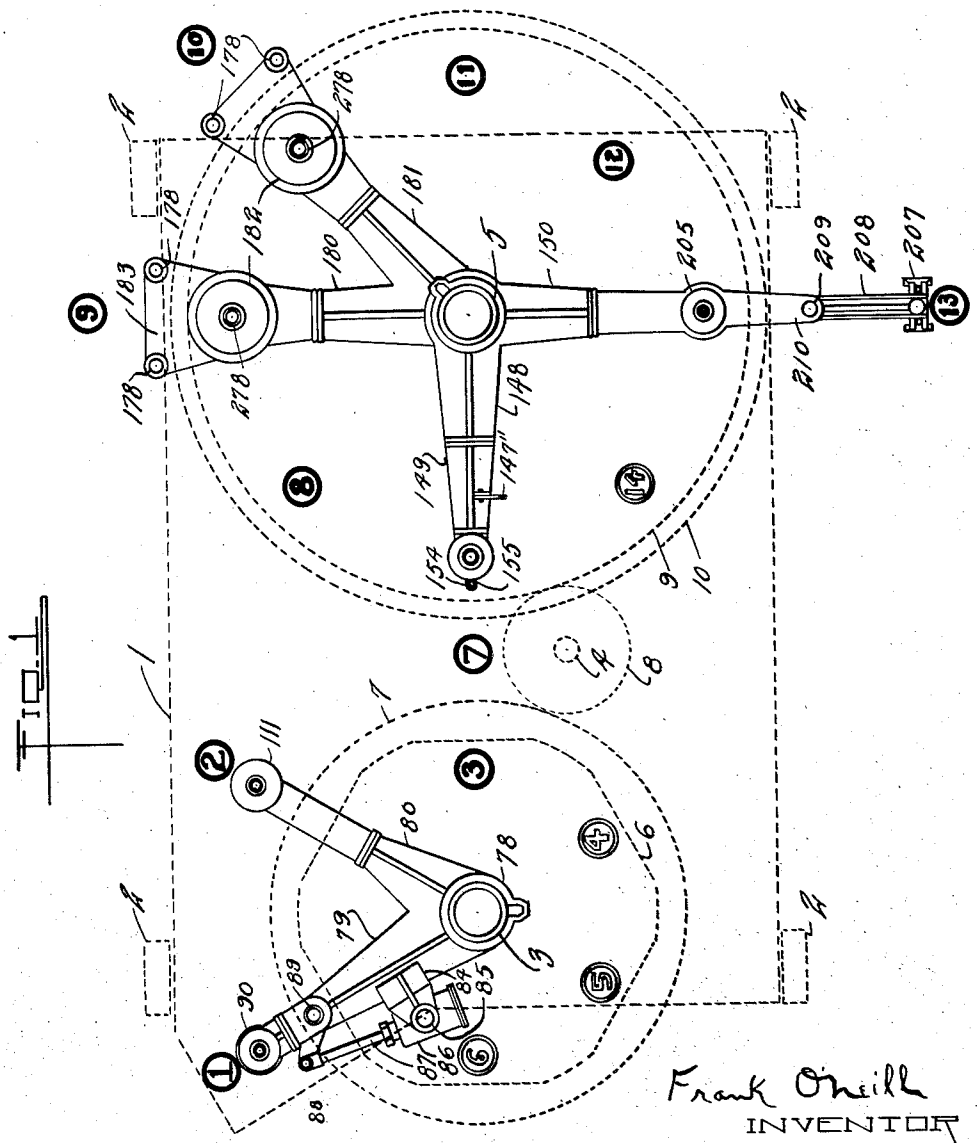

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BOTTLE MACHINE

Filed Nov. 11. 1924 11 Sheets-Sheet 2

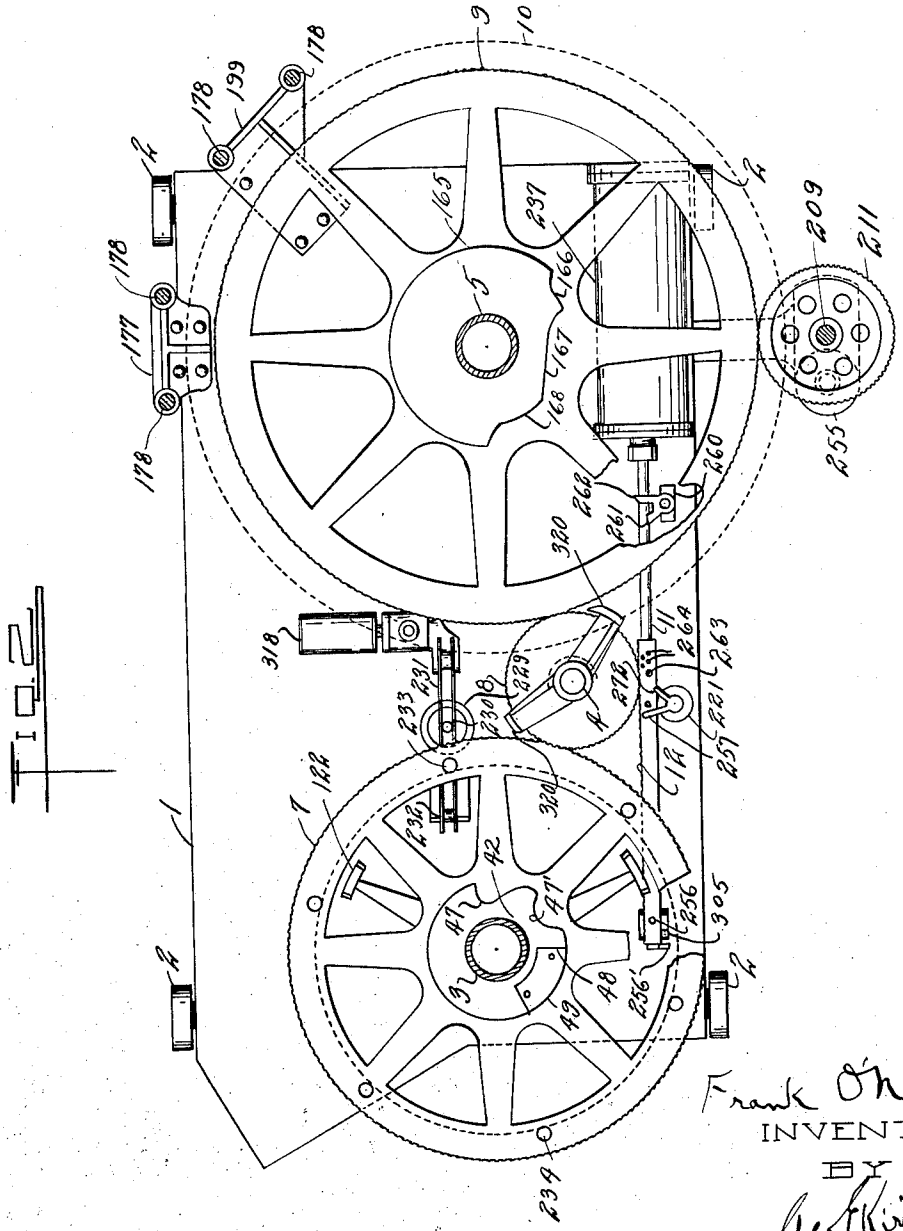

FIG. 2

Frank O'Neill
INVENTOR
BY
Geo. Kirk
ATTORNEY

Feb. 7, 1928.

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F. O'NEILL

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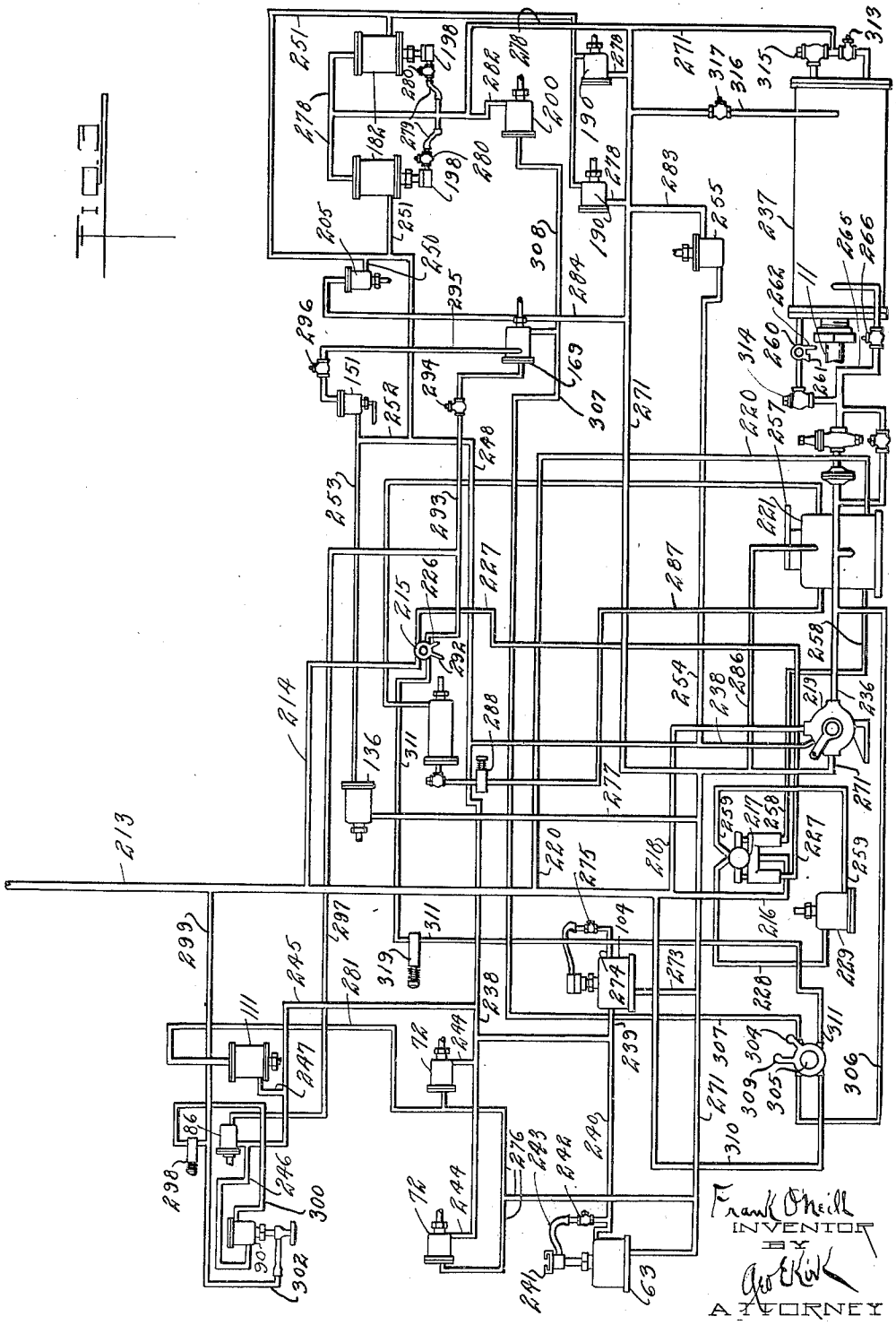
FIG. 3



Frank O'Neill
INVENTOR
BY
ATTORNEY

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F. O'NEILL

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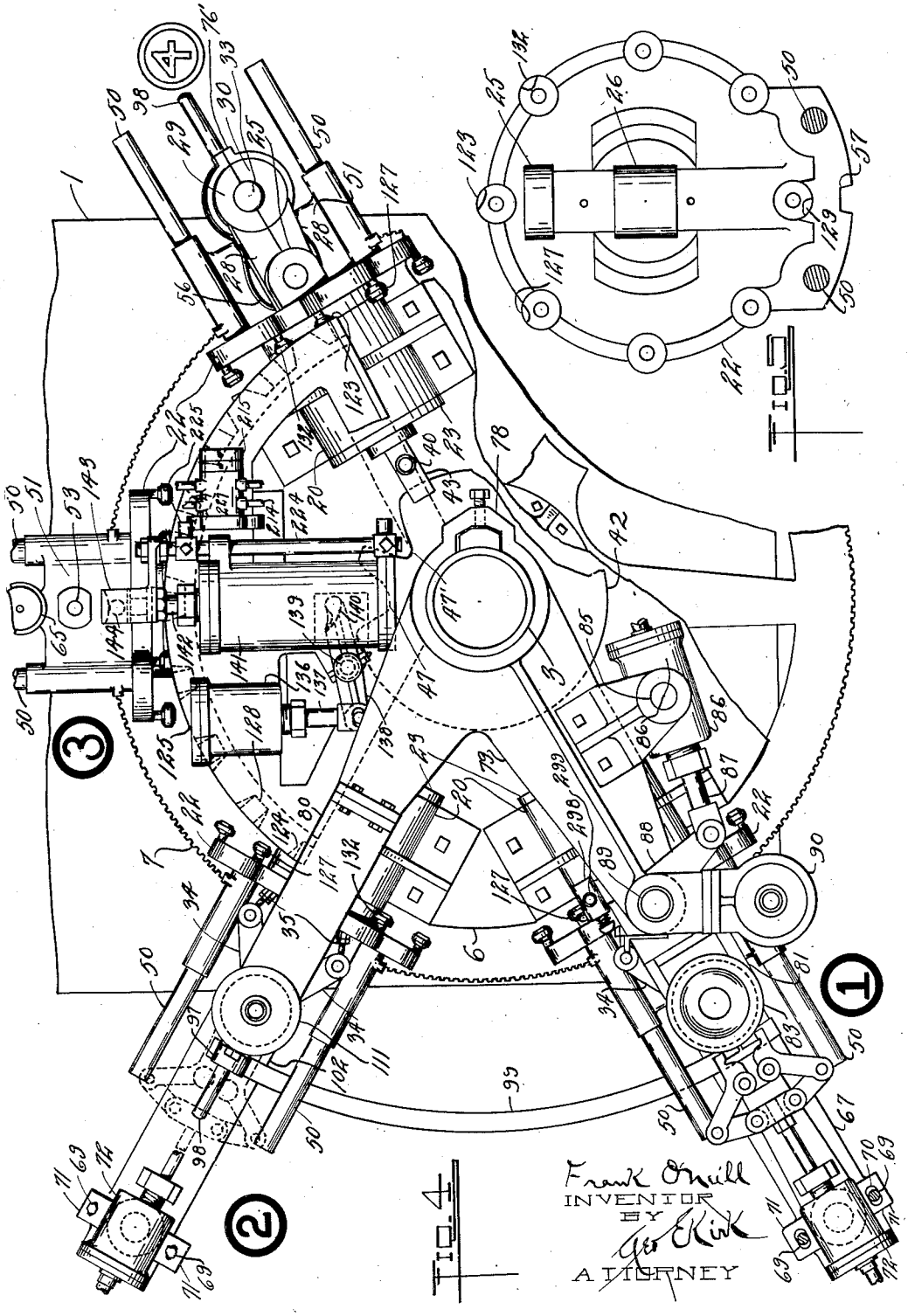

FIG. 4

Frank O'Neill
INVENTOR
BY
Geo. E. Kirk
ATTORNEY

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F. O'NEILL

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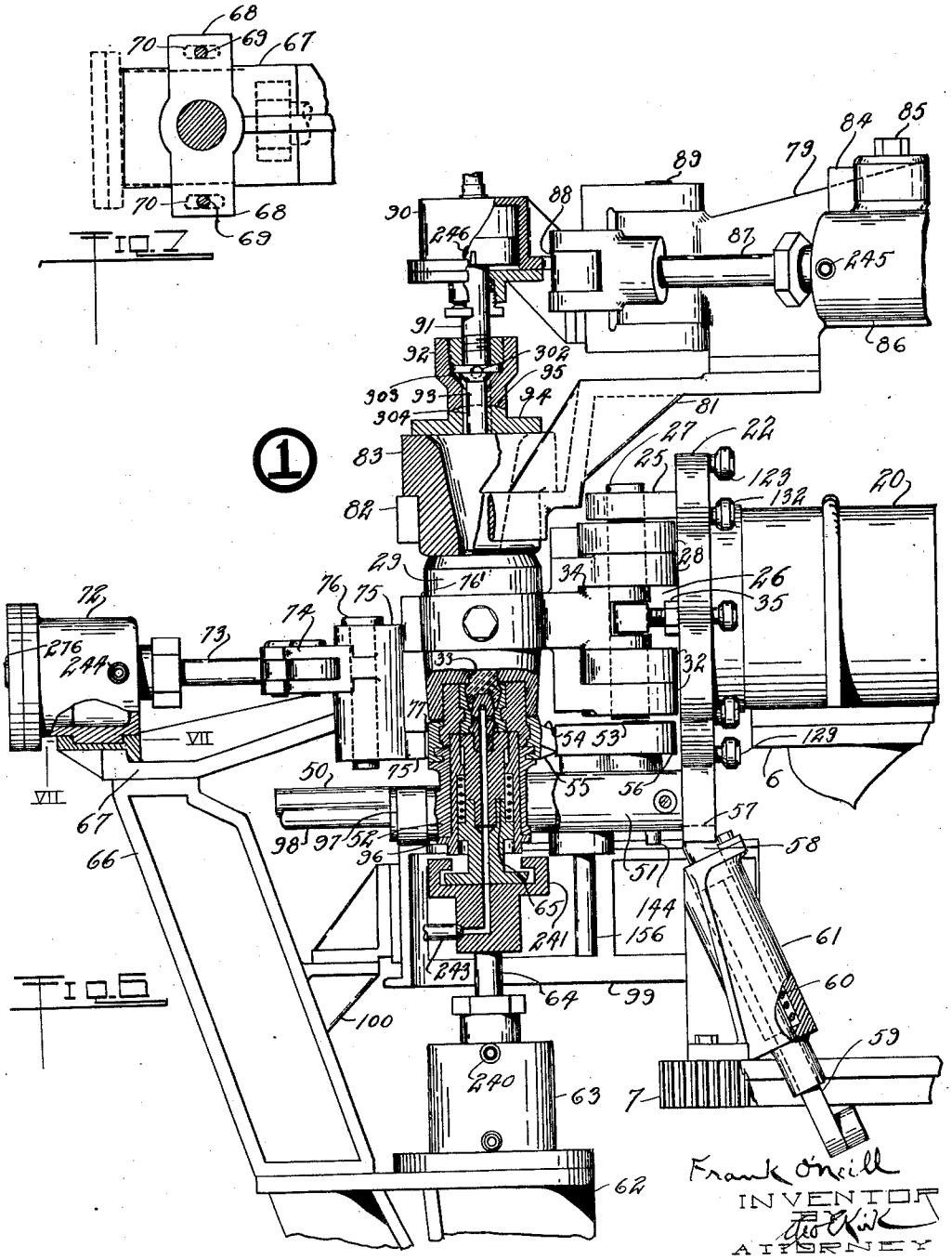

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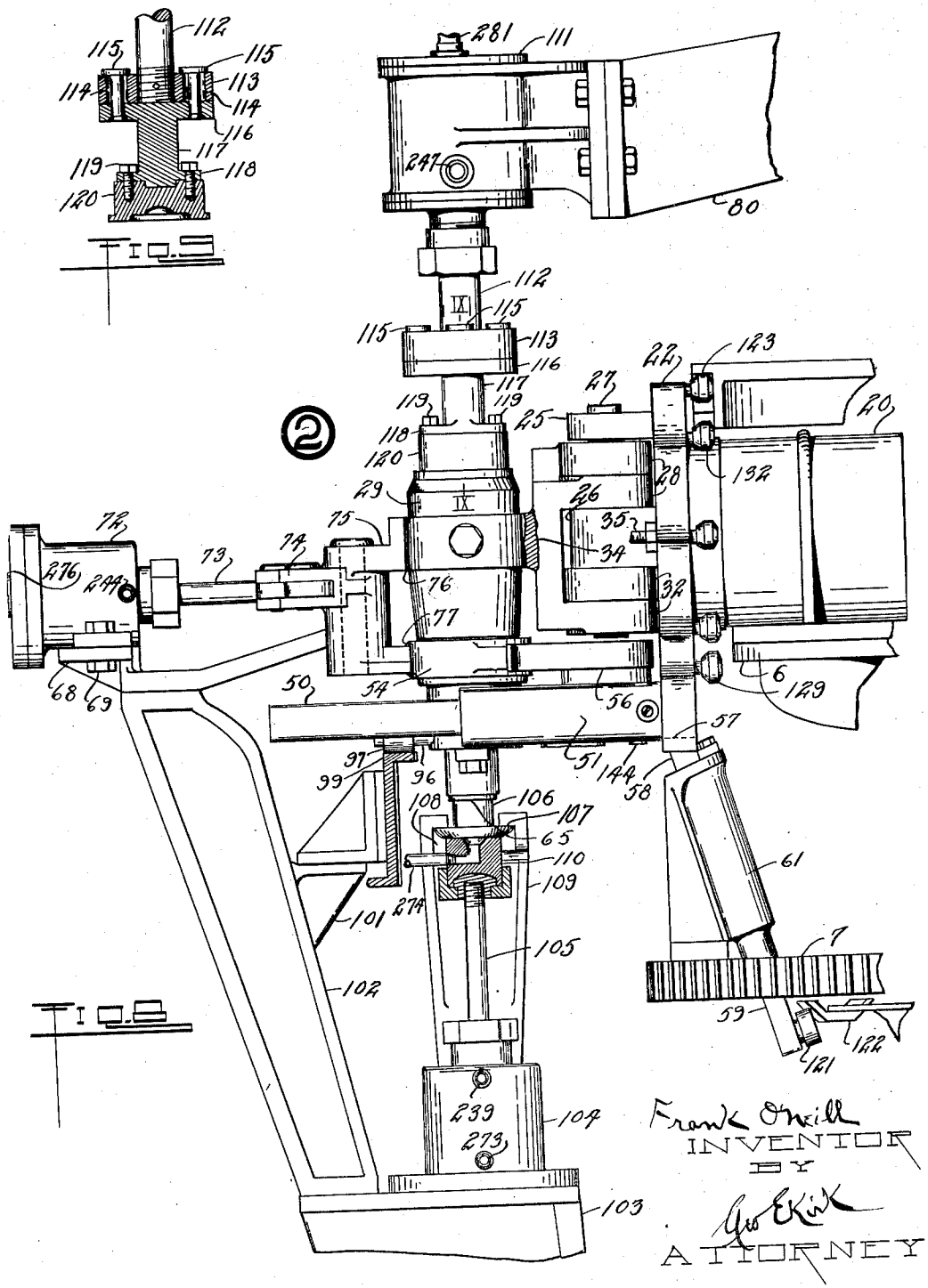

Frank O'Neill
INVENTOR
BY
Geo E Kirk
ATTORNEY

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F. O'NEILL

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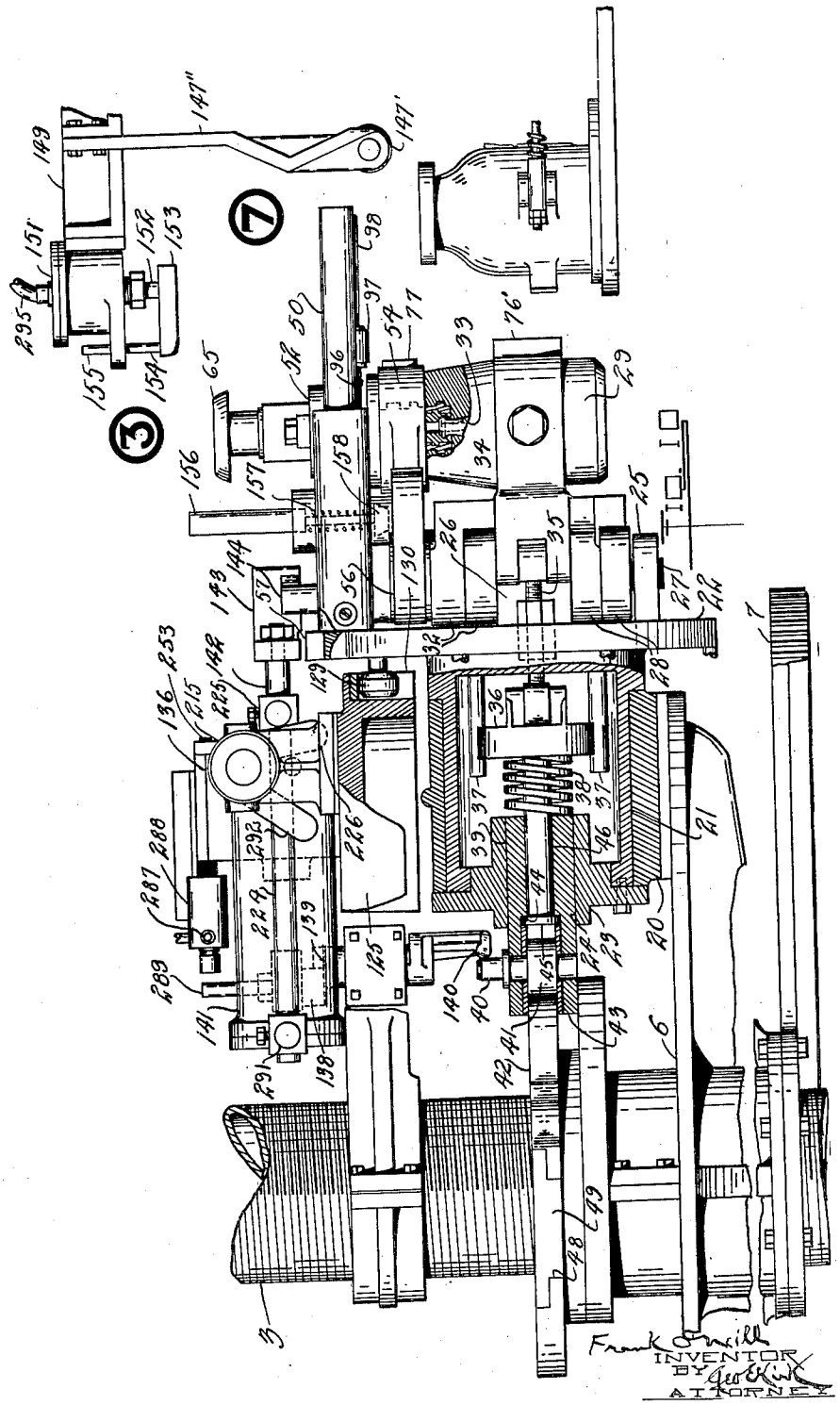

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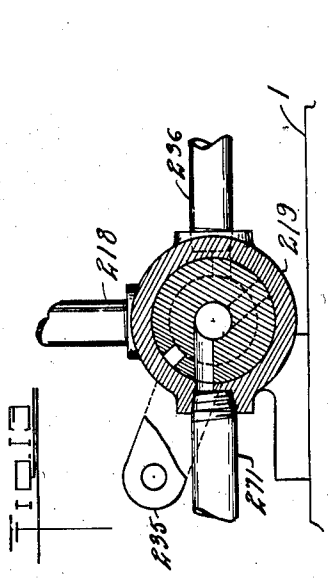

FIG. 13

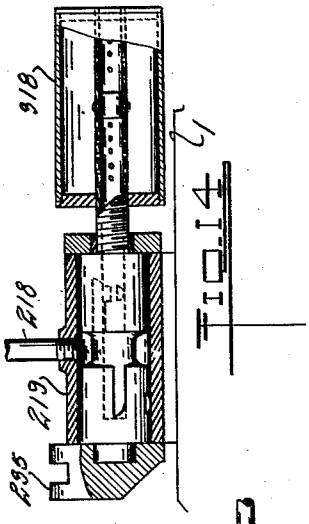

FIG. 14

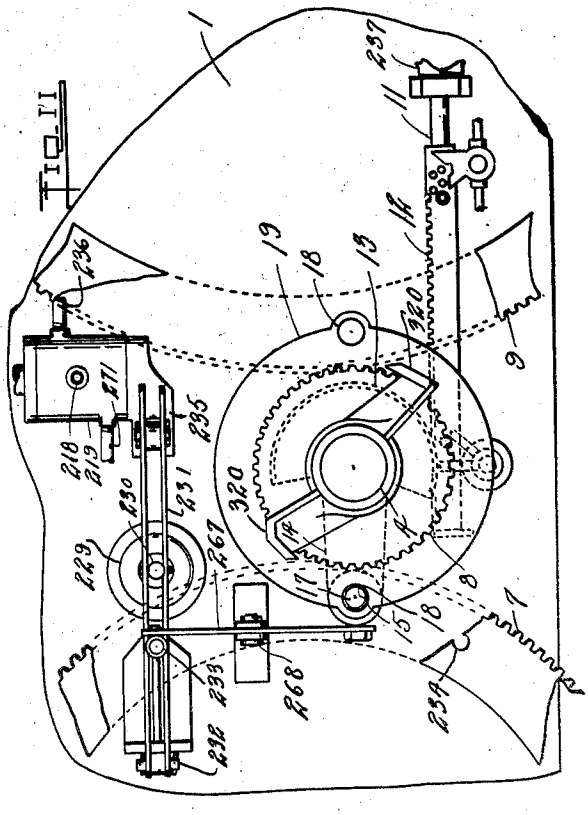

FIG. 11

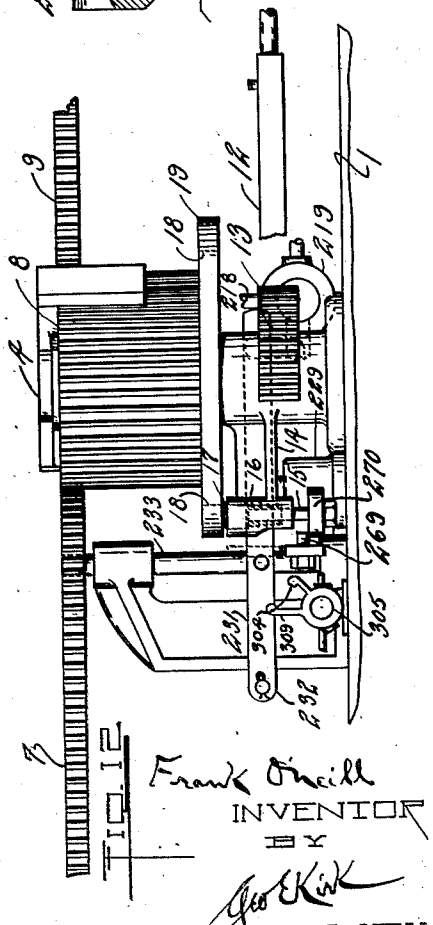

FIG. 12

Frank O'Neill
INVENTOR
BY
Geo. E. Kirk
ATTORNEY

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F. O'NEILL

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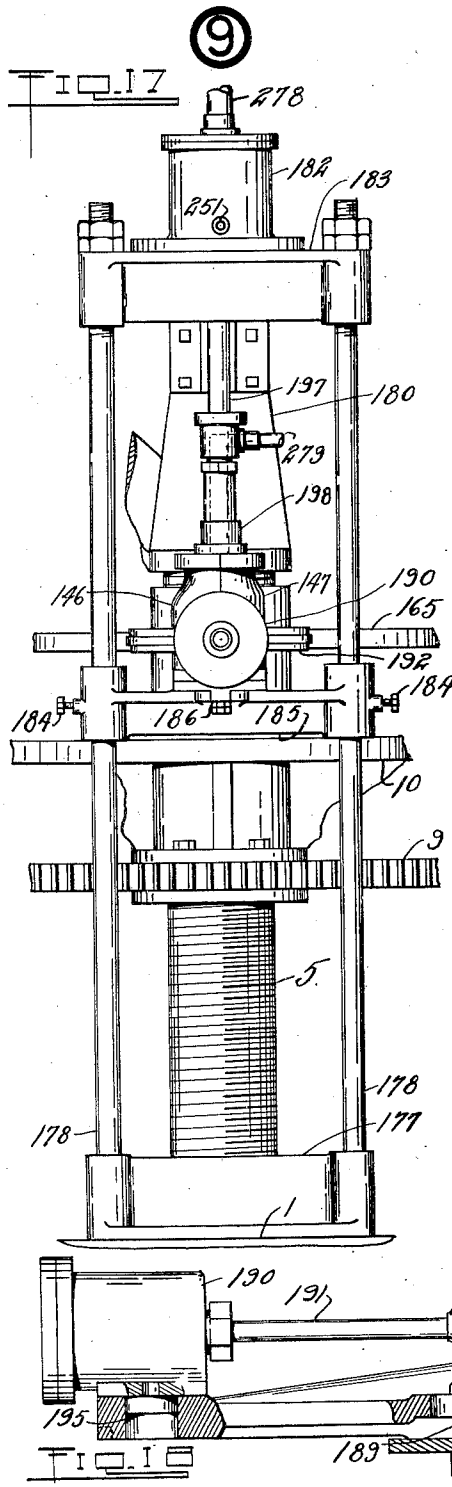

FIG. 17

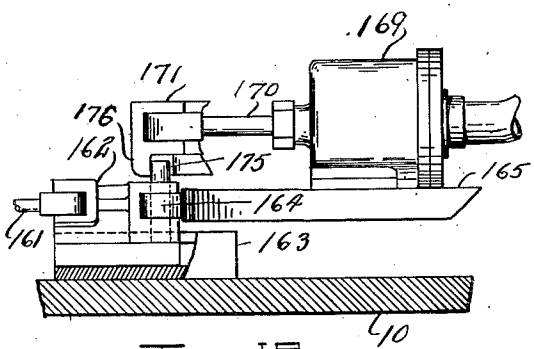

FIG. 13

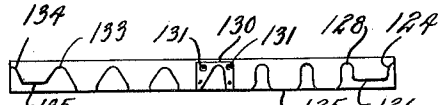

FIG. 15

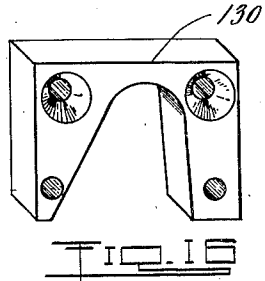

FIG. 16

Frank O'Neill
INVENTOR
BY
Geo. E. Kirk
ATTORNEY

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F. O'NEILL

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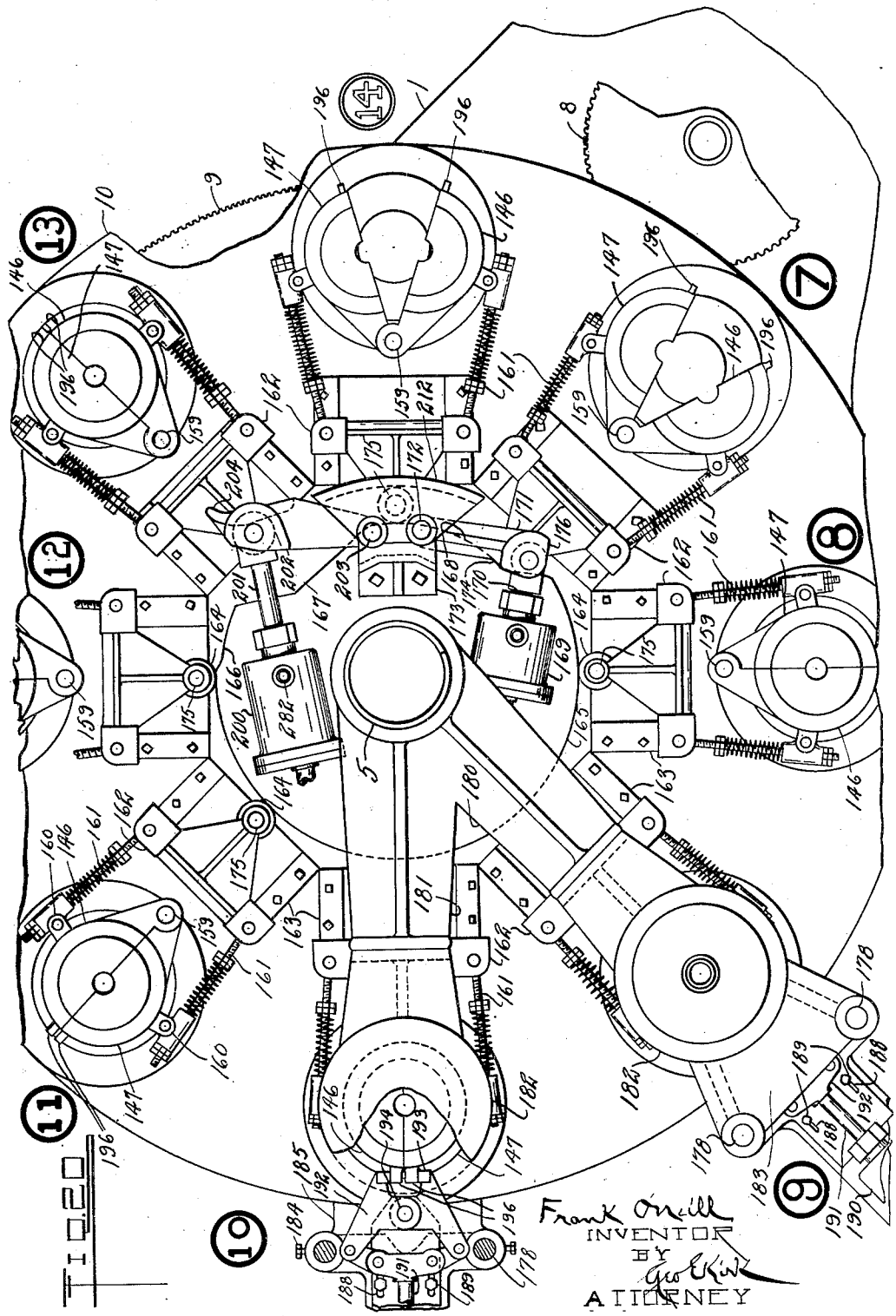

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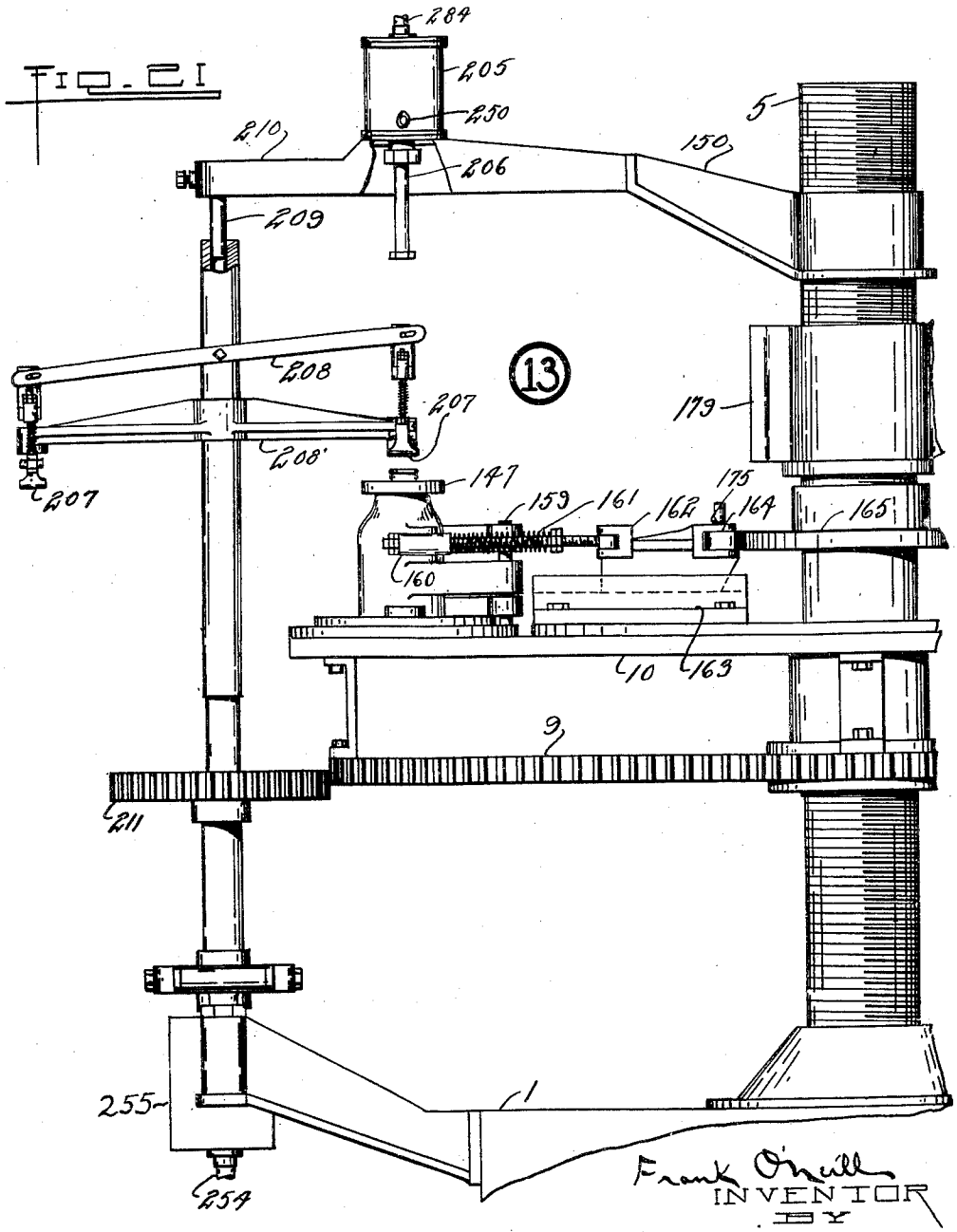
FIG. 21



Frank O'Neill
INVENTOR
BY
Geo. E. Kirk
ATTORNEY

Patented Feb. 7, 1928. 1,658,735

UNITED STATES PATENT OFFICE.

FRANK O'NEILL, OF TOLEDO, OHIO.

BOTTLE MACHINE.

Application filed November 11, 1924. Serial No. 749,153.

This invention relates to molten glass handling and shaping apparatus.

This invention has utility when incorporated in the continuous production of ware, especially hollow ware, as blown bottles.

Referring to the drawings:

Fig. 1 is a plan view, with parts broken away, of an embodiment of the invention in a bottle blowing machine of the double column type pneumatically operated;

Fig. 2 is a plan view of the machine of Fig. 1, with parts broken away for showing more directly features of the driving relation;

Fig. 3 is a power diagram of the piping connections;

Fig. 4 is a fragmentary plan view of the blank table;

Fig. 5 is a detail view of the blank mold carrying disk;

Fig. 6 is a side elevation, with parts broken away, of the blank mold table at the blow down or charging station;

Fig. 7 is a fragmentary section on the line VII—VII, Fig. 6, looking in the direction of the arrow;

Fig. 8 is a side elevation, with parts broken away, of features of the blank table at the second or blow back up station at which the blank is given a puff of air thereinto;

Fig. 9 is a section on the line IX—IX, Fig. 8;

Fig. 10 is a side elevation, with parts broken away, of the oriented blank at the transfer station;

Fig. 11 is a plan view of features of the table locking bar and intermediate drive mechanism with controls therefor;

Fig. 12 is a side elevation of features of the drive and control shown in Fig. 11;

Fig. 13 is a detail view in end elevation, with parts broken away, of the control valve for the locking bar;

Fig. 14 is a side view, with parts broken away, of the control valve of Fig. 13;

Fig. 15 is a front view of the blank mold orienting segment;

Fig. 16 is a detail view of the intermediate removable holding tooth for the segment;

Fig. 17 is an elevation looking toward the blow table at the finish blow station;

Fig. 18 is a detail view showing the adjustable feature of the mounting for the mold locking cylinder at the blow station;

Fig. 19 is a detail view of blow mold closing cylinder and its connections;

Fig. 20 is a plan view, with parts broken away, of the blow table of the machine; and

Fig. 21 is a fragmentary side elevation showing features of the take-off and blow table adjacent thereto.

Table drive.

Truck or main base 1 is shown as mounted on wheels 2. This base 1 is provided with uprights or columns 3, 4, 5 (Figs. 1, 2). The column 3 has loosely mounted thereon blank table 6, with which is fixed for rotation on the column 3, gear 7. The column 4 disposed between the columns 3, 5, has loosely mounted thereon long toothed gear 8 in mesh with the gear 7 (Fig. 12), as well as in mesh with gear 9 fixed with blow table 10 on the column 5. Piston rod 11 carries rack 12 in mesh with toothed segment 13 mounted for rotation relatively with the column 4. Fixed with this segment 13 is arm 14 carrying pin 15 normally thrust by spring 16 to have its head 17 enter the opening 18 in flange 19 fixed with the gear 8. In the reciprocation of the piston rod 11, this pin 15 is a clutch device for connecting the intermediate driving gear 8 for effecting simultaneous clockwise rotation of the tables 6, 10, on the respective columns 3, 5.

Brief description of station sequence.

These tables 6, 10, are shown as having respectively, six and eight stations of rest. Table 6 is shown as having station 1 (Fig. 1) at which molten glass is supplied to the blank mold and packed down therein to form the neck finish therebelow. At 60° therefrom, clockwise, is station 2 at which the blank has the air chamber formed therein by blowing of air upward from below. Station 3 on the table 6 in proximity to the table 10 is the transfer station. In the travel of the blank from station 2 to station 3, the blank is oriented 180° to have the neck finish portion upward at the transfer station, at which point the blank is removed from the blank mold while passing. Station 4 of the table 6, as following the transfer station 3, has the blank mold turned an additional nearly 180° to be in the position for starting. Cooling, cleaning, and washing of the molds may occur at stations 4, 5, 6, on the table 6, with

the blank mold then coming to station 1 for a repetition of this cycle of operations. In practice, the stations 1, 2, may be shifted one or more positions away from the transfer station to thereby allow period of time for carrying the blank before the transfer.

Opposing the transfer station 3 is station 7 on the table 10, at which the blank is received from the blank table and placed in the mold on the blow table. Station 8 is a position on the blow table at which the blank may be allowed to set slightly if it be not desired to have the blowing operation occur forthwith. Station 9 is shown as a first blowing stage and it is a 45° step or station of rest on the blow table, and station 10 is shown as a second blow stage in those instances where it is desired to effect the blowing of the blank into the form of the blow molds by installments. Stations 11, 12, may be stations for cooling or setting of the blown article of ware in the blow mold. Station 13 on the table 10 is the station shown for removal of the finished or blown ware from the open blow mold. Station 14 is an intermediate station from the station 13 in the travel of the blow molds to transfer station 7 for a repetition of this cycle of operations. Each of these tables 6, 10, is shown as having an annular series of sectional molds.

Blank table.

Table 6 is shown as having radially disposed bearings 20 (Figs. 4, 10) in each of which is disposed a drum 21 having on its outward portion a disk 22. This drum 21 is maintained in position in the bearings 20 by inner head 23 providing central tubular guide 24. The disk 22 is provided with outwardly extending ears 25, 26. In these lugs 25, 26, is mounted pivot pin 27 on which is pivotally mounted ears 28, of mold sections 29, 30. Upon this same pin 27 on the other side of the ear 26 from the ear 25 are pivotal mounted ears 32, also carrying the mold sections 29, 30 of the blank or parison mold.

These mold sections 29, 30, swing to closed position to provide a form or chamber 33 therein for the glass blank. Each of these mold sections 29, 30, has an extension ear 34 to which is connected adjustable link 35 extending through opening 31 in the disk 22 to crosshead 36 as held by pins 37 on the disk 22, extending inwardly, so that this crosshead 36 as reciprocable is held for rotation with the disk 22 and the blank mold 29, 30.

Spring 38 normally urges the crosshead 36 away from the guide 24, for thus acting normally to hold the mold sections in closed position.

In this guide 24 is sleeve 39 carrying stem 40 upon which is mounted roller 41 coacting with cam 42 fixed on the column 3. Embracing means 43 from the sleeve 39 coacting with the cam 42 beyond the roller 41 hold the sleeve 39 against rotation with the drum 21. The sleeve 39 has shoulder 44 engaged by head 45 on stem 46 as extending through the spring 38 to the crosshead 36. There is thus provided a coupling permitting in the outward throw of the stem 39 a yieldable closing of the mold sections 29, 30, while in the reverse movement of the sleeve 39, the mold sections 29, 30, are positively thrown open.

Cam 42, (Fig. 2) on the column 3 has at the transfer station 3 a short radius portion 47 into which the roller 41 may be thrust in swinging the mold sections 29, 30, into open position at the transfer station. At an idle station, the cam 42 has a short radius portion 47′ permitting manual opening of the blank mold say for replacing a neck finish nipple, or mold elements without stopping the machine. At another idle station spaced from the transfer station 3, this cam 42 has opening 48 normally closed by removable filler block 49. This permits removal and substitution of disk 22 and parts mounted therewith. This is effected by removal of the block 49 so that the head 23 may be released and shifted radially inward and then taken out, while at the same time the disk 22 is released. The cam 42, with this block 49 in position, serves by coacting with roller 41 to maintain the mold sections 29, 30, in closed position at stations 1, 2, 5, and 6, on the blank table 6.

The disk 22 carries a pair of parallel outwardly extending rods 50 upon which is mounted crosshead 51 carrying closure section 52 spaced from the blank mold sections 29, 30. Pivot pin 53 carried by the crosshead 51 carries neck finish sections 54, 55, normally held toward each other in closed position by leaf springs 56.

The disk 22 is normally held from rotation by a latch. This disk 22 has seat 57 (Figs. 5, 6) in which may enter head 58 of plunger 59 normally urged into such seat 57 by helical compression spring 60 as mounted with said plunger in guide 61 fixed with the gear 7. This guide 61 mounts this latch plunger 59 inward from the disk 22 to incline outward in engaging the disk 22 to hold the disk against rotation relatively to the table 6. Accordingly, at station 1, the disk 22 is latched to hold the blank mold in inverted postion and closed above the neck finish.

Charging station.

Mounted on the main base 1, at station 1, is auxiliary bracket 62 (Fig. 6) carrying a cylinder 63 having stem 64 operable for upward thrusting of neck finish forming central stem 65. Also mounted on this auxiliary bracket 62 at station 1 is outwardly

inclined bracket 66 carrying block 67. This block 67 has ears 68 in which is fixedly mounted bolts 69 coacting in slots 70 of ears 71 from horizontally extending cylinder 72 (Figs. 6, 7, 8).

This cylinder 72 has radially inwardly extending therefrom piston rod 73 operating toggle 74 to swing jaws 75 on fixed pivot 76 as carried by the block 67. In this radial thrust inward of the piston rod 73, the jaws 75 swing toward each other to grip therebetween lugs 76′ on the respective mold sections 29, 30, and lugs 77 on the respective neck finish mold sections 54, 55. There is thus provided a locking device for holding the sectional mold closed at this station 1. This jaw lock is effective, accordingly, to grip or engage through lugs on two pairs of mold sections. The slots 70 allow such swinging of the cylinder 72 and this piston rod 73 as to bring the jaws 75 into proper alignment in effecting this holding of the mold sections in a closed position at station 1 for the charging operation.

Column 3 has branched bracket 78 having arms 79, 80, (Figs. 1, 6) integral therewith. This bracket arm 79 carries therebelow auxiliary bracket 81 having ring portion 82 in which is funnel 83 under which the closed mold sections 29, 30, ride for slightly lifting this funnel 83 as to its supporting ring 82 thereby providing for snug seating between this charging funnel 83 and the blank mold. The arm 79 additionally carries supplementary bracket 84 carrying pivot pin 85 mounting cylinder 86 having piston rod 87 connected to lever-arm 88 pivoted on fulcrum pin 89 near the free end of the arm 79. Fixed with this arm 88 for swinging on the pivot pin 89, is cylinder 90 having piston rod 91 downwardly extending therefrom and carrying stem 92. In this tubular stem 92 is valve stem 93 fixed with cap or closure member 94 having spheric top bearing portion 95 to provide a rocking bearing between this cap 94 and the stem 92. In lifted position of the piston rod 91, the cap 94 loosely hangs to have the bearing 95 clear of the stem 92 and the valve 93 seated or in closed position. Upon downward action of the piston rod 91 after such has been swung by the piston rod 87 into position over the funnel 83, the cap 94 adjusts itself for closing the funnel 83 and is permitted to take such position by the rocking bearing 95. This effects a lifting action of the valve 93, opening such valve to permit blow down or packing air to enter by way of the funnel 83 into the blank mold 29, 30, for packing the charge of molten glass down in this blow mold about the neck finish plunger 65, such glass having been charged through this funnel 83 into the blank mold at this station 1 before the cylinder 86 was effective for shifting the cylinder 90 into position over the funnel 83.

The crosshead 52, centrally thereof between the rods 50, carries boss 96 upon which is mounted roller 97. From this boss 96 there is extension stem 98 also between the rods 50. At this station 1 this roller 97 rides upon track 99 carried by bracket 100 from the bracket 66 and by bracket 101 from bracket 102 at station 2 (Figs. 6, 8). This means that the closure section 52 is snugly held against the closed neck finish sections 54, 55, in the travel of the blank mold charge from station 1 to station 2.

Blow back up.

In the intermittent driving operation of the table 6 and gear 7, this charge of molten glass is brought to station 2 for the blow back up operation. Bracket 102 carries locking cylinder 72 with operating locking jaws 75 for holding the blank mold and neck mold sections closed at this station 2, in a manner similar to the holding of these mold sections at station 1.

The bracket 102 arises from pedestal or auxiliary bracket 103 at station 2. Mounted on this pedestal 103 is cylinder 104 having piston rod 105. Lower guide portion 106 from the plunger 65 has its flange portion 107 ride into guide channels 108 carried by bracket 109 arising from the side of the cylinder 104 away from the station 1. These channel guides 108 serve as holding means for the flange 107 so that as the piston rod 105 is thrust upward, its blow head 110 may have snug seating with the flange 107. The bracket arm 80 carries fixed cylinder 111 from which downwardly extends piston rod 112 having fixed therewith flange 113 having a series of annular openings 114 carrying rivets 115 loosely therein, but fast with flange 116 on depending stem 117, loosely in alignment with the piston rod 112.

This stem 117 is remote from the flange 116 and below flange 118 through which machine screws 119 extend to fixedly mount cap 120 with this stem 117. The loose connection provided by the rivets 115 for assembling the piston rod 112 with the stem 117 and the cap 120 permits on the downward thrust of this piston rod 112, an automatic seating of this floating baffle 120 in closure position over the closed blank mold at station 2 for the blow back up operation in putting air into the blank mold through the neck finish with the plunger 65 held out below or outside said neck finish.

Up-ending the blank.

In the next step in the intermittent rotation of the blank table 6, 7, the latch plunger 59, at once the blank mold starts to leave station 2, has its roller 121 engage fixed cam

122 so that this plunger head 58 is withdrawn from the seat 57 in the disk 22. This release of the disk 22 occurs as roller 123 (Figs. 5, 15) comes against tooth 124 of segment 125 fixedly mounted on the column 3. Clearance 126 permits roller 127 to miss the tooth 124 and ride into seat 128. Accordingly, mesh relation is established between the rollers of the disk 22 and the toothed seats on the segment 125 of this gear, and in the continued travel of the table 7, the blank mold up-ending roller 129 comes to removable seat 130. This seat 130 is mounted on the segment 125 by bolts 131 and is accordingly removable. This seat takes the wear in the stopping of the rotation of the segment, and as it is replaceable will permit supply of sections to take up any slackness for wear which may occur. This entrance portion of the segment 125 has its teeth narrower than the teeth on the exit portion, or that portion of the segment 125 on the side of the removable tooth remote from the station 2. This permits the 180° rotation of the disk 22 with the disk 22 coming into engagement with the segment after the disk or just as the disk leaves station 2. In practice, this has worked out for this first section of the segment to have an arc extent on the column 3 of about 55° and 33′. With the teeth wider on the next portion of this segment 125 there is extent for the second 180° turning of the disk 21 of about 64° 23′.

As the steps for rotation of the table 6 are with the six arms, 60° steps, the stop position at tooth 130, station 3 or transfer station, is followed by station 4 with the blank mold not quite fully righted to bring the bottom of the blank mold up. At this station 4, roller 132 is in tooth 133, and tooth or roller 123 is about to enter tooth 134. The turning for starting from the station 4 is slight and the tooth 133 may ride by the clearance 135, as the head 58 of the plunger 59 rides into the seat 57 upon the completion of the full rotation of the disk 22. This holding of the disk 22 by the latch is maintained from station 4, and at station 5, 6, back to station 1 for release at station 2 in a repetition of this orienting cycle of operations.

Transfer station.

At the transfer station (Fig. 10) the roller 129 is engaged by the tooth 130, and the disk 22 is shifted the 180° from this station 3 bringing the parallel guides 50 to the upper position.

Mounted on the segment 125 is cylinder 136 (Fig. 4) having piston rod 137 in its thrust outwardly away from the column 3 effective to rock lever 138 on vertical fulcrum 139 thereby causing depending portion 140 from this lever 138, remote from the piston rod 137, to engage pin 40 to urge such pin 40 toward the column 3 to have the roller 41 in the recess 47. This effects a swinging of the blank mold sections 29, 30, upon the pivot pin 27 into opening position to expose the blank as suspended in the neck ring 54, 55.

With the blank thus suspended by the neck finish mold sections 54, 55, everything is in readiness for the transfer operation. Carried on the segment 125 at this station 3 is horizontal cylinder 141 having piston rod 142 carrying head 143 in its thrust outwardly effective to engage pin 144 and thereby shift the crosshead 52 on the guide rods 50, toward station 7 for carrying suspended blank 145 between partially closed blow mold sections 146, 147, (Fig. 20) as steadied by stem 98 passing over register aligning rod 147′ mounted by depending bracket 147″ from arm 149. At this outward position for the blank, completion of the transfer is effected by release of the blank for deposit in this closed blow mold comprising sections 146, 147.

The column 5 is provided with bracket 148 (Fig. 1) comprising arms 149, 150. The arm 149 at its terminus carries vertical cylinder 151 from which depends piston rod 152 carrying shoe 153 held in radial position by stem 154 operating in guide 155 (Fig. 10). Depression of this shoe 153 by downward thrust of the piston rod 152 strikes plunger 156 to shift such downward against the resistance of spring 157 causing wedge 158 to move the neck finish ring mold sections 54, 55, away from each other against the resistance of springs 56 thereby releasing the partially blown ware 145 for deposit in the blow mold sections 146, 147, as closed thereabout.

As herein shown blow table 10 is provided with eight stations or sets of blow molds 146, 147, and the shifting of this table 10 (Fig. 20) as driven from the gear 8 in mesh with the gear 9 is 45° as against 60° for the blank table 6. These blow mold sections 146, 147, are mounted on fixed pivot 159. Each section has an ear 160 from which extends inwardly an adjustable yieldable link 161 to cross-head 162 radially reciprocable in guide 163. Each crosshead 162 carries roller 164 riding against cam 165 carried by the column 5. This cam 165 has its periphery engaged by the rollers 164 on its maximum radius portion for holding the blow mold sections 146, 147, closed for leaving transfer station 7 and continuing said holding at station 8, blow stations 9, 10, and station 11. As leaving station 12, this cam 165 has relief portion 166 which extends to short radius portion 167 at the take off station 13. From this short radius portion 167, the cam 165 has intermediate portion 168 for partially closing the blow mold sections 146, 147, as such sections move to station 14. These partially closed mold sections 146, 147, of the blow

mold have their roller 164 ride on this intermediate section 168 of the cam to station 7. Mounted on the cam 165 adjacent station 7 is cylinder 169 having piston rod 170 extending therefrom to engage arm 171 fulcrumed on pin 172 carried by pad 173 on the cam 165 adjacent station 14.

As this plunger 170 is thrust outward from the cylinder 169, it has ledge 174 on the arm 171 engage pin 175 upstanding from the roller 164 for thrusting the crosshead 163 radially outward. Guide rib 176 is engaged by this pin 175 in its travel outward at station 7 so that there may not be impact as the mold sections 146, 147, are closed. If it be desired to have the blank cooled to some extent before the final blowing operation, such may occur at station 8 and to this end adjustable brackets mounted on the base 1 may be positioned at the succeeding station or stations for blowing operation or operations.

Finish blowing.

Mounted on the base 1 is detachable plate 177 mounting upright rods 178 (Figs. 1, 2, 20). Mounted on the column 5 adjacent the bracket 148 is bracket 179 having arms 180, 181. The arm 180 has fixed therewith vertical cylinder 182 with extension 183 therebeyond coacting with the rods 178.

Between the extension 183 and the plate 177 and adjustably mounted by set screws 184 (Fig. 17) is brace 185 having tongue and groove seat 186 (Fig. 18) for mounting auxiliary support 187 having slot 188 engaged by bolt 189. This permits adjustment in and out of cylinder 190 carried by the bracket 187, while the set screws 184 permit vertical adjustment of this brace 185. The cylinder 190 is shown as provided with piston rod 191 acting through toggle 192 for swinging jaws 193 on bearing 194. Circular base 195 as a mounting for the cylinder 190 similar to the mounting for the cylinder 72, permits horizontal rocking of the cylinder 190 into compensating position for acting through the toggle 192 in swinging the jaws 194 into locking position in coacting with ears 196 (Fig. 20) on the blow mold sections 146, 147. There is accordingly a holding of the blow mold sections 146, 147, in locked position as the piston rod 191 is thrust toward the column 5. The cylinder 182 has downwardly extending therefrom piston rod 197 (Fig. 17) carrying blow head cap 198 for descending into blow mold closing position on the blow mold sections 146, 147.

A secondary blowing may occur at station 10 with the locking cylinder supporting rods 178 upstanding from plate 199 (Fig. 2) and the cylinder 182 being carried by arm 181 (Fig. 1). It may be desirable to have the blown ware held for an interval as distended against the mold and such may occur in the travel from the station 10 to the station 11, and thence to the station 12. As passing the station 12, shorter radius portion 166 of the cam 165, permits a relief of the closed blow mold sections 146, 147, so that such may loosen or be partially started away from the ware.

Take off.

As the ware in the loosened blow mold passes from station 12 to station 13 and there comes to rest, opening of the blow mold may occur. Mounted on the cam 165 adjacent the cam portion 166 is cylinder 200 having piston rod 201 extending to lever 202 mounted on fulcrum 203 carried by the pad 173. When the blow mold comes to rest at take-off station 13, piston rod 201 is drawn into cylinder 200 as flange 204 on the lever 202 engages the pin 175 and directs such pin toward the column 5 thereby swinging the mold sections 146, 147, at the take-off station into fully open position. At this take-off station 13 bracket 148 has from its arm 150 cylinder 205 downwardly from which extends piston rod 206 effective for actuating pinchers 207 as controlled by walking beam 208 for engaging the neck of the ware as released by the mold sections as opening at this take-off station.

These pinchers 207 are carried by cross arm 208′ mounted on rod 209 positioned by extension 210 beyond the cylinder 205. This rod 209 has gear 211 thereon in mesh with blow table gear 9. This means that the pincher engaged ware at this take-off station 13, after being lifted at once the table 9 starts from this take-off position, has this ware as carried by the pinchers 207 swung away from the table 10. As the next article of ware comes to this station 10 and the walking beam 208 is depressed to have the pinchers 207 engage such ware, the ware on the outer end of this cross arm 208′ is released for deposit on the conveyor or other means for transporting or accumulation for transporting to a lehr or place for annealing such ware.

As the mold sections 146, 147, pass from this take off station 13, the roller 164 rides from the cam portion 167 to the intermediate cam portion 168 and effects a partial closing of this blow mold. The extent of such closing is limited by outer guide member 212 (Fig. 20). The partially closed mold is accordingly in position at this station 14 for passing to station 7 and there receiving the blank for a repetition of this cycle of operations.

THE POWER CONTROL.

Main power air supply.

Power air line 213 (Fig. 3) has branch 214 extending to valve 215 (Fig. 10). This power line 213 has additional branch 216

extending to lock bar trip rocker valve 217, and branch 218 extending to lock bar valve 219 (Figs. 3, 12). Branch 220 from power line 213 extends to main valve 221.

Table release.

When the transfer operation has been effected by the shifting of the crosshead 52 from station 3 to station 7, and the return operation has occurred, guide rod 224 (Fig. 10) has stop 225 thereon strike depending arm 226 and operate the valve 215 so that power air from the line 214 may pass by line 227 and the valve 217 and shift such valve 217 so that power air from the line 216 may pass the valve 217 and go by line 228 to the top of lock bar cylinder 229 (Figs. 3, 11, 12) thereby pulling downward piston rod 230 and thus acting through lever 231 swinging on fulcrum 232 to depress lock bar 233 from engagement with seat 234 in the gear 7. The tables 6, 10, are, accordingly, released. This lever 231 in this operation rocks arm 235 of lock bar valve 219, and thereby allows flow of power air from the line 218 to flow by line 236 to the driving end of power cylinder 237 for thereby shifting piston rod 111 to travel into this cylinder 237.

Station devices rendered idle.

Just before this supply of air from the lock bar valve 219 for driving action in the cylinder 237, this lock bar valve 219 connects line 238 to receive power air from the line 218. This line 238 has branch line 239 to blow up cylinder 104 (Figs. 3, 8), thereby depressing the head 110 to release the blowing up means from the blank mold at station 2. Branch 240, from the line 238, extends to the top of cylinder 63 at station 1 (Figs. 3, 6), and depresses piston rod 64 in the cylinder 63 for withdrawing nipple head 241 and thus moving downward flange 107 for withdrawing plunger 65 from the inwardly thrust position in the neck finished at station 1. In those instances, wherein it is desired to release the glass from following the plunger 65 or to give a slight volume of air to the blank at this point, valve 242 may be adjusted to allow flow of air by duct 243 through the guide 106 and the plunger 65.

From the line 238, extends branch lines 244 to the front end of lock cylinders 72 (Figs. 3, 6, 8) for bringing jaws 75 into blank mold releasing position in the movement of the piston rods 73 outwardly from the column 3. The line 238 has branch 245 to the front end of cylinder 86 (Figs. 3, 6) effective for swinging cylinder 90 and its depending cap 94 away from position over the funnel 83 at station 1.

From this branch 245 there is branch 246 to the lower end of cylinder 90 to effect lifting of the cap 94 clear of the funnel 83 at station 1. The line 245 has an additional branch 247 extending to the lower end of cylinder 111, station 2, for lifting the baffle plate or cap 120 clear of the blank mold. From the line 238 is branch 250 to the bottom of pincher operating cylinder 205 (Figs. 1, 3, 21). This effects lifting of the piston rod 206 clear of the pinchers 207. From this branch 250 are branches 251 to the lower ends of blow cylinders 182 at stations 9, 10, and to the inner ends of blow mold locking cylinders 190. The blow heads are thus lifted clear of the blow molds and the blow molds are unlocked at the blow stations 9, 10. Branch 252 from the branch 248 extends to the bottom of neck finish opening cylinder 151 (Figs. 3, 10) to effect a lifting of the shoe 153 clear of the travel limit of the pin 152. From the line 252 extends branch 253 to the back end of blank mold opening cylinder 136, which brings the lever depending portion 140 clear of the travel of the stem 40 as coming to transfer station 3. Branch 254 from the line 238 extends to the bottom of pincher lifting cylinder 255 (Figs. 3, 21) to lift rod 209 and thereby clear the blown bottle from its position on the blow table 10 after it is gripped by the pinchers 207.

By the above series of operations all locks, or inter-connections between elements at stations, are released or opened and the action of the live air as entering the main driving cylinder 237 is effective for shifting operation by driving the piston rod 11 into the cylinder 237. This shifts the blank table 60° and the low table 45° to new stations of rest.

Drive stroke.

As this piston rod 11 moves on its inward stroke, pin 256 strikes arm 257 on the main valve 221, rocking this main valve 221 to such extent that power air from the line 220 passes by the line 258 (Figs. 2, 3,) to the valve 217 shifting such valve 217 so that the power air from the line 216 instead of passing to the line 228 now passes to line 259 to the lower end of lock bar cylinder 229. The line 228 is now free to exhaust through the valve 217. This effects a thrusting upward of the lock bar 233, so that as the rack 12 finishes its stroke, this bar 233 may ride into the next seat of opening 234 in the blank table gear 7 for locking such table against shifting. Mounted adjacent the piston rod 11 is valve 260 carrying arms 261, 262. Pins 263 as adjusted in the desired opening 264 of the rack 12 (Figs. 2, 3) may coact for cutting off flow of power air to the cylinder 237 and allow such power air to be by-passed by branch 265 at a rate adjustable by valve 266 so that while power air is supplied to the full end of its stroke such power air may extend to the full stroke action as insured by

the supplemental decreased power air supply. This means that while the speed may be maintained for driving operation there is minimized or actually eliminated any hammer tendency which might tend to arise from the supply of power air to the full end of the driving stroke.

In this operation of the lock bar valve 229, for shifting the lock bar 233 into table engaging position, lever 267 (Figs. 11, 12) as acted upon by the lever 231 to swing on its fulcrum 268 has lug extension 269 engage collar 270 on pin 15 for pulling this pin downward against the resistance of spring 16 for withdrawing head 47 from opening 18. There is, accordingly, an unclutching of the segment 13 from the gear 8. This frees the rack 12 so that for the return stroke of the piston rod 11 outward from the drive cylinder 237, the collar 270 as riding off the lug 269 holds the head 217 clear of the opening 18 in the flange 19, but that such is released to enter the next opening 18, herein shown as 180° from the one just unclutched.

Idle stroke and station operations.

This operation of the lock bar cylinder 229 and rocking of the lever 231 also rocks the arm 235 on the valve 219 repositioning this valve so that power air from the line 218 is cut off from the line 238, and now passes by line 271 to the back end of the power cylinder 237 for effecting the recover, idle, or resetting stroke of the rack 12. The arm 261 coacts with the pin 263 to effect the resetting of the valve 260 while the pin 256 coacts with arm 272 for resetting the valve 221. This line 271 has branches 273 to the bottom of blow up cylinder 104 and to the bottom of nipple cylinder 63. By-pass 274 partially up the cylinder 104 and adjustable by valve 275 permits a jet or puff of air to be supplied through the neck finish of the blank at station 2 for blowing the molten glass into the blank mold and forming a slight recess adjacent the neck finish in the formation of the blank. The action of the air from the line 273 in lifting the nipple 241 at station 1 is to effect closing of the lower portion of the blank mold at the charging station 1, as well as thrusting of the plunger 65 up into the neck finish.

From this line 271 extends branches 276 to the outer ends of lock cylinders 72 at stations 1, 2, for thrusting the piston rods 73 toward the column 3, thereby to effect swinging of the locking jaws into blank mold locking position at these two stations.

At the stations of rest of the tables as now locked, it is in order to open the blank mold sections 29, 30, at station 3. To this end, the line 271 has branch 277 extending to the front end of blank opening cylinder 136 to effect a swinging of the lever depending portion 140 toward the column 3 to engage the stem 40 and thereby pull the sleeve 39 and operate through the links 35 for swinging the blank mold sections 29, 30, into open position at the transfer station. This leaves the blank in suspended position as held by the neck finish blank mold sections 54, 55.

This line 271 has branches 278 to the outer ends of blow mold locking cylinders 190 and to the top of blow cylinders 182 at stations 9, 10, effective to unlock the molds and to depress the plungers 197, and thereby bring the blow heads 198 into seating position at each of said cylinders. By-pass branches 279 supply air through the blow heads 198 to the respective blow molds, said by-pass being adjusted by valves 280. From the line 276 extends branch 281 to the upper end of baffle plate carrying cylinder 111 at station 2, to effect thrusting of the baffle plate 120 into sealing position at station 2.

Line 278 has branch 282 to the outer end of mold opening cylinder 200 at the take-off station effective for shifting the piston rod 201 inward and through lever 202 (Figs. 3, 20) pulling the crosshead 163 for opening the blow mold sections 146, 147, at the take-off station. Branch 283 from the line 271 extends to the top of pincher lifting cylinder 255 for lowering the pinchers toward the ware as thus exposed at the take-off station. Branch 284 from the line 271 to the upper end of pincher closing cylinder 205 brings the pinchers 207 (Figs. 3, 21) into ware gripping position at the take-off station.

This branch 271 has branch 286 to the main valve 221 which is timed by said machine valve for permitting flow of air from this main valve 221 by line 287 to the back end of transfer effecting cylinder 141 (Figs. 3, 10). This line 287 is opened by valve 288, which valve 288 is operated by pin 289 rising from the lever 138 thereby insuring that the molds 29, 30, are fully opened before the transfer cylinder 141 may thrust its piston rod 142 outward in shifting the crosshead 52 from the station 3 to the station 7.

In the travel of the crosshead 52 away from the disk 21, stop 291 strikes depending arm 292 (Figs. 3, 10) and resets the valve 215 so that live air from the line 214 may pass by the line 293 as adjusted by valve 294 to the back end of cylinder 169 for effecting thrusting of the piston rod 170 outward and thereby through the lever 171 effect closing of the blow mold sections at the transfer station 7 about the blank as suspended therein. From the side of this cylinder 169 extends branch line 295 for flow as adjusted by valve 296 to the upper end of cylinder 151 to thereby effect lowering of the shoe 153 for striking wedge pin 156 thus to force open the finish 54, 55, and release the blank

into the blow mold at station 7. From the line 293 extends branch line 297 to the back end of cylinder 86 for swinging the cylinder 90 over the funnel 83. In this swinging operation, valve 298 is struck to open and supply power air from the line 213 through branch 299 in the line 213 to flow by line 300 to the upper end of cylinder 90 for thereby lowering closure cap 94 upon the funnel 83 at station 1.

This power line 299 has branch 302 (Figs. 3, 6) to chamber 303 in the stem 92. This chamber 303 is normally closed by valve 93. As the piston rod 91 descends and brings the cap 94 into seating position on the funnel 83, the valve 93 is unseated to give packing or blow down action in the funnel 3, and the blank molds 29, 30, at station 1 to thus pack the charge of molten glass down in the blank molds about the blank 65 in forming the neck finish.

When the rack 12 has travelled on its drive stroke about one-fourth distance inward, the lug 256′ strikes finger 304 of valve 305 and thereby connects power air from line 236 by way of branch 306 as extending to this valve 305 for passing therefrom by line 307 to the inner end of blow mold closing cylinder 169 at the transfer station thereby to reset the lever 171 at station 7. This line 307 has branch 308 extending to the back end of cylinder 200 at the take off station for thrusting the piston rod 201 outward resetting the lever 204 at station 13.

When the drive rack 12 in its reverse travel approaches the end of its idle stroke, the pin 256 strikes arm 309 on the valve 305 and resets this valve 305 so that power air from the line 213 may pass by line 310 to the valve 305, and thence by line 311 directly to the valve 215. When the full return stroke has been accomplished at the transfer station, this valve 215 has been so shifted that this supply of air from the line 311 may pass this valve 215 to line 227 extending to the valve 217, resetting this valve 217 for a repetition of this cycle of operations.

The timing of the travel of the rack 12 may be adjusted not only by the valve 266 but also by valve 313 as such may check the rate of power air travel in exhaust as check valve 314 precludes blow of exhaust air from the cylinder 237 in the outward stroke of the piston while check valve 315 precludes flow of power air from the cylinder 237 in the inward stroke of the piston. Branch 316 from the cylinder 237 has its exhaust adjusted by valve 317, and this is another factor in controlling the speed of operation or timing for a repetition of this cycle of operations, in the machine of this disclosure. This exhausting of air from the various cylinders as receiving power air from the valve 219 is back through this valve 219, and such is there muffled or quieted by passing into exhaust receiving muffler 318 (Fig. 14) located medially of the machine extent for there spilling the cool fresh air and thereby promoting ventilation at the machine by causing circulation of the warm air away from the machine. If it be desired to have a different timing as by the feeder, the line 311 may extend say to a point adjacent the feeder and have the valve 319 therein controlled by the feeder.

Shields or guards 320 (Figs. 2, 11, 12) preclude breakage of glass at the transfer station falling down to clog the gear teeth. These guards 320 thus serve as gear clearing means.

What is claimed and it is desired to secure by Letters Patent is:

1. A glassware forming machine comprising a table, intermittent driving means therefor providing a station of rest, a fixed arm at said station of rest, a funnel carried by said arm, and a mold mounted on said table and as coming to said station of rest shifting said funnel upward in said arm.

2. A glassware forming machine comprising a table, intermittent driving means therefor providing a station of rest, a fixed arm at said station of rest, a funnel carried by said arm, a mold mounted on said table and as coming to said station of rest shifting said funnel upward in said arm, a cap for closing the funnel and holding the funnel seated against the mold, and means for supplying air through said cap to the funnel for delivery into the mold.

3. A glassware forming machine comprising a table, intermittent driving means therefor providing a station of rest, a fixed arm at said station of rest, a funnel carried by said arm, a mold mounted on said table and as coming to said station of rest shifting said funnel upward in said arm, a rockable cap for closing the funnel and holding the funnel seated against the mold, and an air supply valve unseated by said movement of the cap into funnel closing position to supply air to the mold through said cap and funnel.

4. A glassware forming machine comprising a movable mold, a funnel, a fixed support for the funnel, means for shifting the mold to take the funnel off its support, a reciprocable head, a cap rockably carried by the head, and means for thrusting the head to throw the cap into self-seating position against the funnel for holding the funnel against the mold.

5. A glassware forming machine including a movable table, a mold carried thereby, driving means providing a charging station for said mold, a funnel at said station into registry with which said mold is movable by said table, a fixed support for the funnel, means for shifting the mold to take the

funnel off its support, a cap for the funnel, and means for shifting the cap into position over said funnel.

6. A glassware forming machine including a movable table, a mold carried thereby, driving means providing a charging station for said mold, a funnel at said station into registry with which said mold is movable by said table, a fixed support for the funnel, means for shifting the mold to take the funnel off its support, a cap for the funnel, and a swingable carrier for the cap for shifting the cap into position over said funnel.

7. A glassware forming machine including a movable table, a mold carried thereby, driving means providing a charging station for said mold, a funnel at said station into registry with which said mold is movable by said table, a fixed support for the funnel, means for shifting the mold to take the funnel off its support, a cap for the funnel, a swingable carrier for the cap for shifting the cap into position over said funnel, and a plunger sustaining the cap with the carrier and movable to thrust the cap against the funnel.

8. A glassware forming machine comprising a mold embodying two pairs of sections, hinge means mounting the sections to swing toward closed position, a rockably mounted lock extending directly to engage both pairs of sections for holding the sections closed, and operating means for the lock.

9. A glassware forming machine comprising a mold embodying two pairs of sections, hinge means mounting the sections to swing toward closed position, a rockably mounted lock comprising a pair of jaws extending directly to engage both pairs of sections as swingable toward each other for holding the sections closed, and a toggle for throwing said jaws.

10. A glassware forming machine comprising a mold embodying two pairs of sections, hinge means mounting the sections to swing toward closed position, a lock comprising a pair of jaws extending directly to engage both pairs of sections as swingable toward each other for holding the sections closed, a toggle for throwing said jaws, and a swivel mounted piston and cylinder device for operating the toggle.

11. A glassware forming machine mold lock comprising a cylinder, a fixed support for the cylinder, and swivel connection between the cylinder and support.

12. A glassware forming machine embodying a traveling sectional mold, mounting means for the lower mold section, said means provided with a blow down station for glass in the mold and spaced therefrom a blow up station for glass in the mold, rollers carried by the mounting means for the lower mold section, and a track extending between said stations and engaged by said rollers for holding said lower mold section against the upper mold section.

13. A glassware forming machine comprising a blank table, a blow table, molds carried by the tables, driving means for the tables providing a station of rest with the mold of one table in proximity with the mold of an adjacent table, guide means extending from adjacent the mold position of one table at the station of rest toward the mold position on the other table at the station of rest, a transfer device for shifting an article from the mold on one table to position into the mold on the other table, and including a crosshead movable along said guide, and a piston and cylinder actuator for the crosshead embodying a pair of adjustable stops, a bar on which said stops are mounted, and a rocker valve having arm means actuable by the stops for controlling the actuator.

14. A glassware forming machine comprising a blank table, a blow table, molds carried by the tables, driving means for the tables providing a station of rest with the mold at the blank table in proximity to the mold of the blow table, a pair of guide rods extending from adjacent the blank mold position at the station of rest toward the blow mold position at the station of rest, a transfer device for shifting a blank from the blank mold to position in the blow mold, and including a crosshead movable along said guide rods, and a piston and cylinder actuator for the crosshead embodying a pair of stops, a bar on which said stops are mounted, and a rocker valve having a pair of depending arms actuable by the stops for controlling the actuator.

15. A glassware forming machine comprising a rotary table, an annular series of sectional molds carried by the table, reciprocable means actuating the mold sections toward opening and closing positions, a stationary cam coacting with said means for holding the molds closed, said cam being configured to provide a position to permit actuation of the means for mold opening, and spaced from said position, said cam having a removable section permitting manual shifting of the reciprocable means upon removal of said section.

16. A glassware forming machine comprising a rotary table, an annular series of sectional molds carried by the table, reciprocable means actuating the mold sections toward opening and closing position, a stationary cam coacting with said means for holding the molds closed, actuating means for the table providing a transfer station of rest, said cam being configured at the transfer station to permit actuation of the means for mold opening, and spaced from said transfer station said cam having a removable

section permitting manual shifting of the reciprocable means upon removal of said section.

17. A glassware forming machine comprising a rotary table, an annular series of radially disposed bearings carried by the table, a drum in each bearing, a mold carried by each drum, and each drum being provided with a seat, an outwardly inclined spring thrown plunger carried below the table and movable therewith for engaging each seat, and stationary means effective during table travel for withdrawing said respective plungers from said seats.

18. A glassware forming machine comprising a rotary table, an annular series of radially disposed bearings carried by the table, a drum in each bearing, a mold carried by each drum, and each drum being provided with a disk having a peripherally disposed seat inwardly open from said disk, outwardly and upwardly directed guides carried by the table, spring thrown plungers in said guides for engaging the respective seats and a stationary cam effective during table travel for successively withdrawing each plunger from its seat.

19. A glassware forming machine comprising a rotary table, an annular series of radially disposed bearings carried by the table, a drum in each bearing, a mold carried by each drum, each drum provided with a disk, pins carried by the disk, driving means for the table providing stations of rest, and a fixed segment with which said pins may coact, said segment extending from short of one station of rest past a second station of rest and just beyond a third station of rest.

20. A glassware forming machine comprising a rotary table, an annular series of radially disposed bearings carried by the table, a drum in each bearing, a mold carried by each drum, each drum provided with a disk, rollers carried by the disk, driving means for the table providing stations of rest, and a fixed segment with which said rollers may coact, said segment having its central portion nearer a station of rest at different pitched teeth on one side of said station of rest from the other side.

21. A glassware forming machine comprising a rotary table, an annular series of radially disposed bearings carried by the table, a drum in each bearing, a mold carried by each drum, each drum provided with a disk, rollers carried by the disk, driving means for the table providing stations of rest, and a fixed segment with which said rollers may coact, said segment having different pitched teeth.

22. A glassware forming machine comprising a rotary table, an annular series of radially disposed bearings carried by the table, a drum in each bearing, a mold carried by each drum, each drum provided with a disk, rollers carried by the disk, driving means for the table providing stations of rest, and a fixed segment with which said rollers may coact, said segment having intermediate its length a replaceable tooth.

23. A glassware forming machine mold, a rotatable support for the mold, a carrier for the support having teeth and a turn over segment into mesh with which said carrier teeth may travel, said segment having an entrance tooth of less extent outward from its root than an intermediate tooth.

24. A glassware forming machine embodying a rotatable disk, a mold carried by the disk, movable means carrying the disk providing stations of rest, disk engaging means for righting the mold having transmission connection for said righting of less than 180° extent to bring the mold slightly short of upright at a station of rest, and latch means engaging the disk as the movable means starts the nearly righted disk away from said station of rest to lock said disk into fully righted position.

25. A glassware forming machine comprising a sectional mold, a movable table carrying said mold, vertical axis hinge means mounting the mold on said table, driving means for the table providing a take-off station and a transfer station, control means for the mold sections operable for opening and closing the mold, a vertical axis lever with which said control means may come into co-operative relation adjacent the take-off station, a piston and cylinder device adjacent said take-off station for operating said lever to effect mold opening, a way providing guide from adjacent said take-off station and adjacent said transfer station for coacting with the control means in holding the mold open in the travel from the take-off station, a second vertical axis lever with which said control means may come into co-operative relation adjacent said transfer station, and a second piston and cylinder device adjacent said transfer station for effecting mold closing operation of the control means.

26. A glassware forming machine comprising a sectional mold, a movable table carrying said mold, vertical axis hinge means mounting the mold on said table, driving means for the table providing a take-off station and a transfer station, control means for the mold sections operable for opening and closing the molds, a vertical axis lever with which said control means may come into co-operative relation adjacent the take-off station provided with a guide, a piston and cylinder device adjacent said take-off station for operating said lever to effect mold opening, a way to which said guide directs said control means, said way providing guide from adjacent said take-off station and adjacent said transfer

station for coacting with the control means in holding the mold open in the travel from the take-off station, a second vertical axis lever with which said control means may come into co-operative relation adjacent said transfer station, and a second piston and cylinder device adjacent said transfer station for effecting mold closing operation of the control means.

27. A bottle forming machine comprising a table having a station of rest, a mold on the table, shifting means at the station of rest for acting to remove glass from the mold at said station, a drive for the table, and control means for the drive rendered operative by said shifting means recover.

28. A bottle forming machine comprising a carrier, having a station of rest, a sectional mold on the carrier, and a lock for holding the mold sections closed at said station of rest, said lock comprising a piston and cylinder device and means for adjusting said device toward and from said carrier, mold, and station of rest.

29. A bottle forming machine comprising a carrier, having a station of rest, a sectional mold on the carrier, and a lock for holding the mold sections closed at said station of rest, said lock comprising a piston and cylinder device and tongue and groove means for adjusting said device toward and from said carrier, mold, and station of rest.

30. A glassware forming machine comprising a traveling mold for molten glass provided with a station of rest, means providing an air supply to the lower portion of said mold, and a seal for the upper portion of the mold comprising a cap, a plunger for thrusting the cap into sealing position upon the mold upper portion, said plunger terminating toward said cap in a collar, and a loose connection between the plunger collar and cap including a doubly flanged stem, connecting pins through the flange and collar loosely coacting with one thereof, and bolts fixedly connecting the other flange of the stem to the cap.

31. A glassware forming machine comprising a rotary table, a sectional mold thereon, hinge means mounting the sections, means for rotating the mold relatively to said table, a column for the table, a cam carried by the column and having a region coacting to maintain the mold sections closed during said mold rotation as to the table, said cam having an additional region ineffective for holding the mold sections closed, mold closing means including a reciprocable device coacting with the cam and connections therefrom extending to throw the sections into closed position, and mold opening means for operating on the mold closing means at the ineffective region of the cam, there being a radially inward extension from the device movable with the device for holding the mold closing means from rotation.

32. A glassware forming machine comprising a rotary table, sectional molds thereon, hinge means mounting the sections, means for rotating the molds relatively to said table and relatively to each other in sequence, a column for the table, a cam carried by the column and having a region coacting to maintain the mold sections closed during said rotation of the molds as to the table, said cam having an additional region ineffective for holding the mold sections closed, mold closing means coacting with the cam and extending to throw the sections into closed position, and mold opening means for operating on the mold closing means at the ineffective region of the cam, there being an extension from the mold closing means embracing the cam for holding the mold closing means from rotation.

33. A glassware forming machine comprising a rotary table, a sectional mold thereon, a rotary drum on the table carrying the mold, means for rotating the mold relatively to said table, a column for the table, a cam carried by the column and having a region coacting to maintain the mold sections closed during said rotation of the mold as to the table, said cam having an additional region ineffective for holding the mold sections closed, mold closing means carried by the rotary drum and coacting with the cam and extending to throw the sections into closed position, and mold opening means for operating on the mold closing means at the ineffective region of the cam, said mold closing means having bearing in the drum and overlapping engagement with a portion of the cam for holding the mold closing means from rotation with the drum during travel of the drum as carried by the table.

34. A glassware forming machine comprising a blank table, a blow table, driving means providing a transfer station therebetween, rotatable molds carried by the blank table, a support as to which the table is rotatable, and mold turn-over mechanism including interengaging seat means between the table and support having greater angular turn-over coaction extent as to the table movement toward than from the transfer station.

35. A glassware forming machine comprising a blank table, a blow table, driving means providing a transfer station therebetween, rotatable molds carried by the blank table, and mold turn-over gearing including teeth of different pitch toward the station than therefrom.

36. A glassware forming machine comprising a pair of tables, one radially beyond the other, each table having a gear fixed

therewith, an intermediate driving gear in mesh with both of said tables, and a guard adjacent the mesh approach region of said gears as a clearance device precluding glass particles from the table lodging upon the gears at the intermeshing region thereof.

37. A glassware forming machine comprising a pair of driving gears having a mesh approach region, and a guard adjacent the mesh approach region of said gears as a clearance device precluding glass particles from the table lodging upon the gears at the intermeshing region thereof.

38. A glassware forming machine comprising a sectional mold, a movable table carrying said mold, vertical axis hinge means mounting the mold on said table, driving means for the table providing a transfer station, control means for the mold sections and operable for opening and closing the mold, a vertical axis fulcrum bearing eccentric to the axis of and above the table, an angle lever mounted in said bearing inward of the table from and to one side of said transfer station, and a piston and cylinder device adjacent the transfer station above said table and as to which the table is movable, said device effective for operating said lever other arm to effect swinging of the mold sections toward each other on said hinge means.

39. A glassware forming machine comprising a mold carrier, intermittent driving means for said carrier embodying a reciprocable bar, an actuating piston and cylinder device for said bar, and a variable lineal travel rate control for the device including a valve and connections from the bar for operating said valve to effect checking fluid flow as to the cylinder for reducing the speed of said bar as approaching an end of its stroke.

40. A glassware forming machine comprising a mold carrier, an intermittent driving piston and cylinder device for said carrier, a reciprocable bar actuable by said device, an intake duct for the cylinder, a check valve for free flow from the duct to the cylinder, and an exhaust rate adjusting means for slowing up the device action on said bar including a valve by-passing said check valve.

41. A glassware forming machine comprising a rotary mold carrying table, an intermittent drive for said table embodying a piston and cylinder device, a power air supply duct to the cylinder, a power air by-pass for said duct, and valve means operable by the drive for cutting out the duct and cutting in said by-pass for terminally slowing up to be thereby effective for drive stroke travel of the device.

42. A bottle forming machine comprising a table having a station of rest, a mold on the table, shiftable glass transfer means at the station of rest for coacting with the table carried mold at said station, an intermittent drive device for rotating the table, and control means for the drive including a cut-out device disposed to act in conjunction with the movement of the shiftable glass supporting means from the mold at the station of rest in one direction for rendering operation of the drive impossible and in the reverse direction for rendering operation of the drive possible.

43. A glassware forming machine comprising driven mechanism including a mold carrier, intermittent driving means for effecting operation of said mechanism to cause step by step movement of said carrier, said driving means including a piston and cylinder device, and a variable lineal travel rate control for the device including a valve and connections from the driven mechanism for operating said valve to effect checking fluid flow as to the cylinder for reducing the speed of said carrier as approaching an end of its step by step movement.

44. A glassware forming machine comprising driven mechanism including a mold carrier, intermittent driving means for effecting operation of said mechanism to cause step by step movement of said carrier, said driving means including a piston and cylinder device, a variable lineal travel rate control for the device including a valve and connections from the driven mechanism for operating said valve to effect checking fluid flow as to the cylinder for reducing the speed of said carrier as approaching an end of its step by step movement, and an adjusting means for the control.

In witness whereof I affix my signature.

FRANK O'NEILL.