Jan. 6, 1931. J. W. LYNCH ET AL 1,787,635

GLASSWARE FORMING MACHINE

Filed Dec. 6, 1924 4 Sheets-Sheet 1

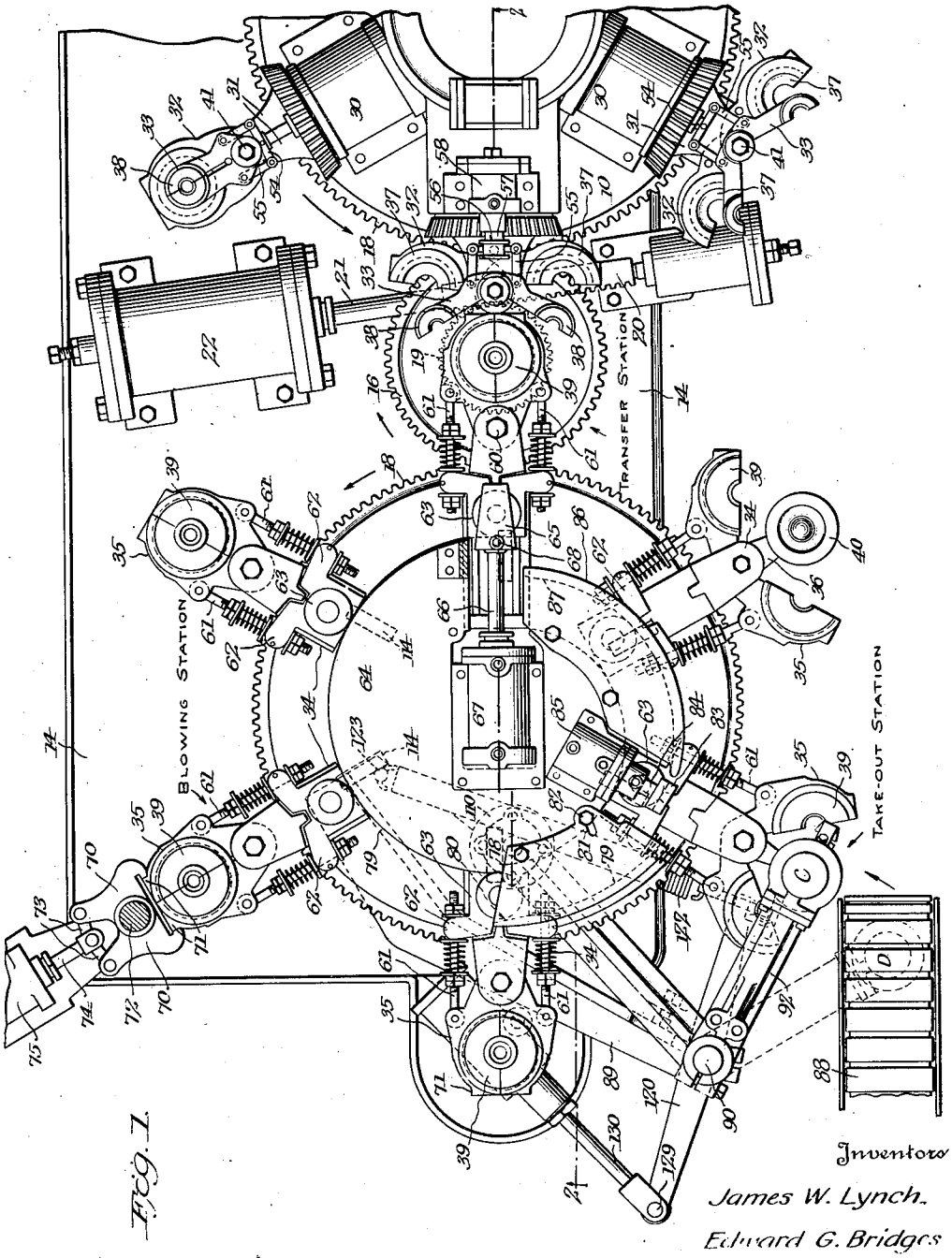

Fig. 1.

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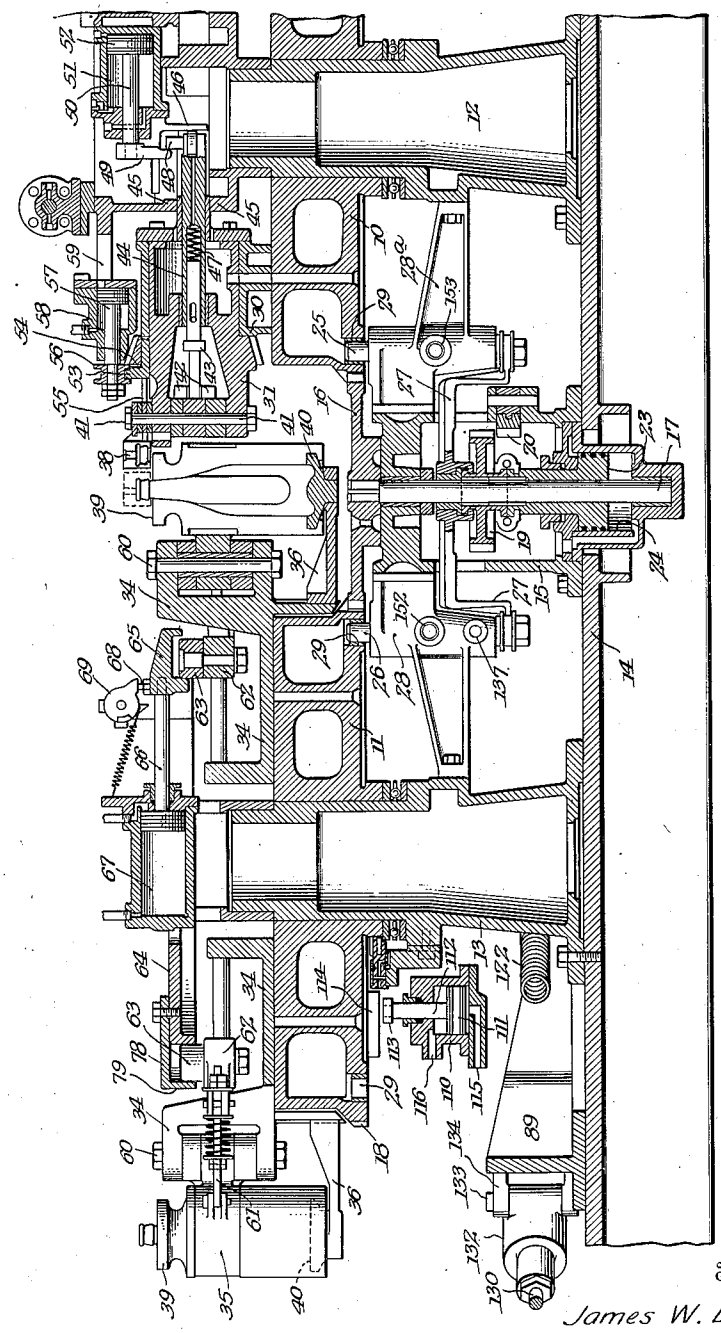

FIG. 2.

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GLASSWARE FORMING MACHINE

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Fig. 3.

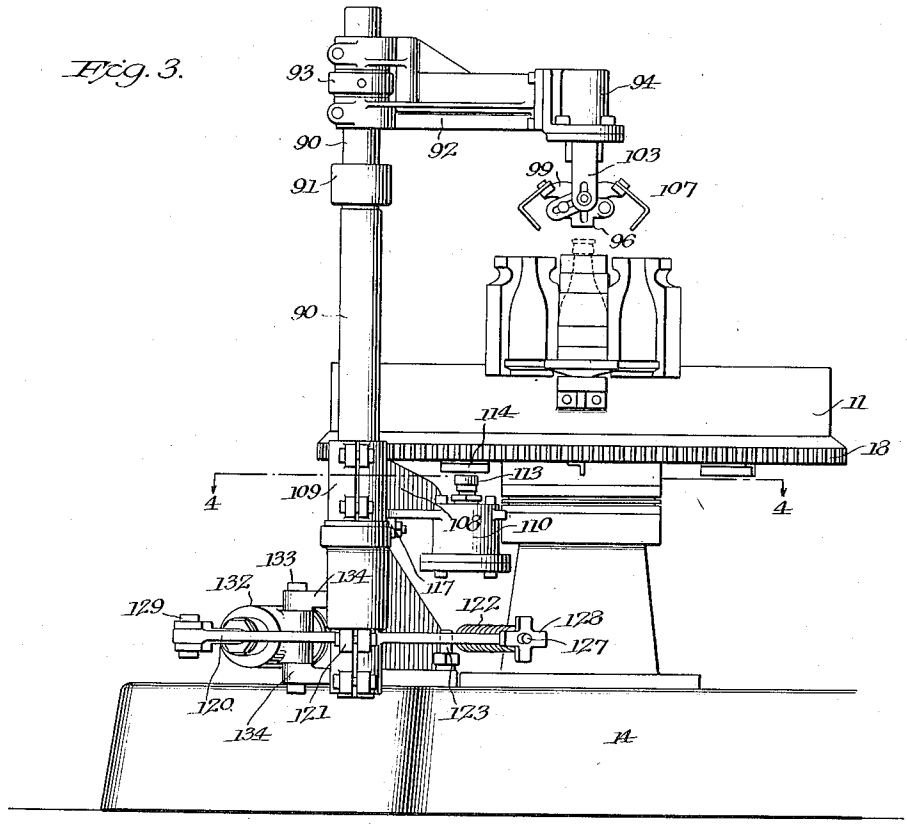


Fig. 4.

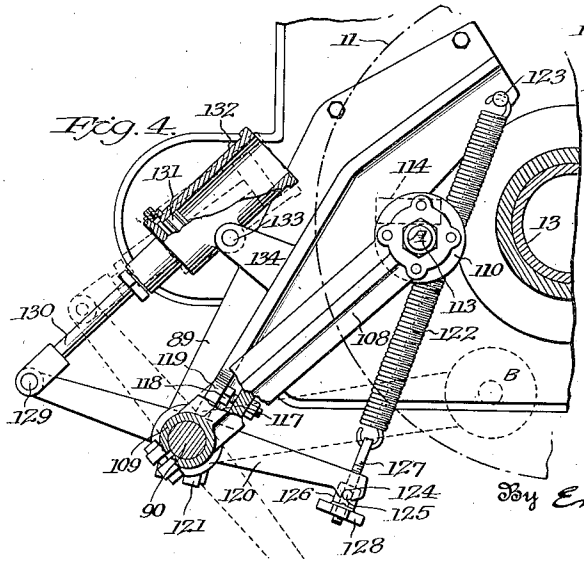
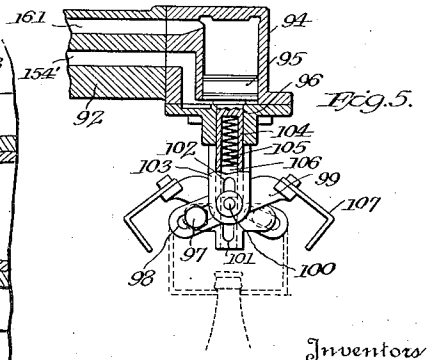


Fig. 5.



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GLASSWARE FORMING MACHINE

Filed Dec. 6, 1924 4 Sheets-Sheet 4

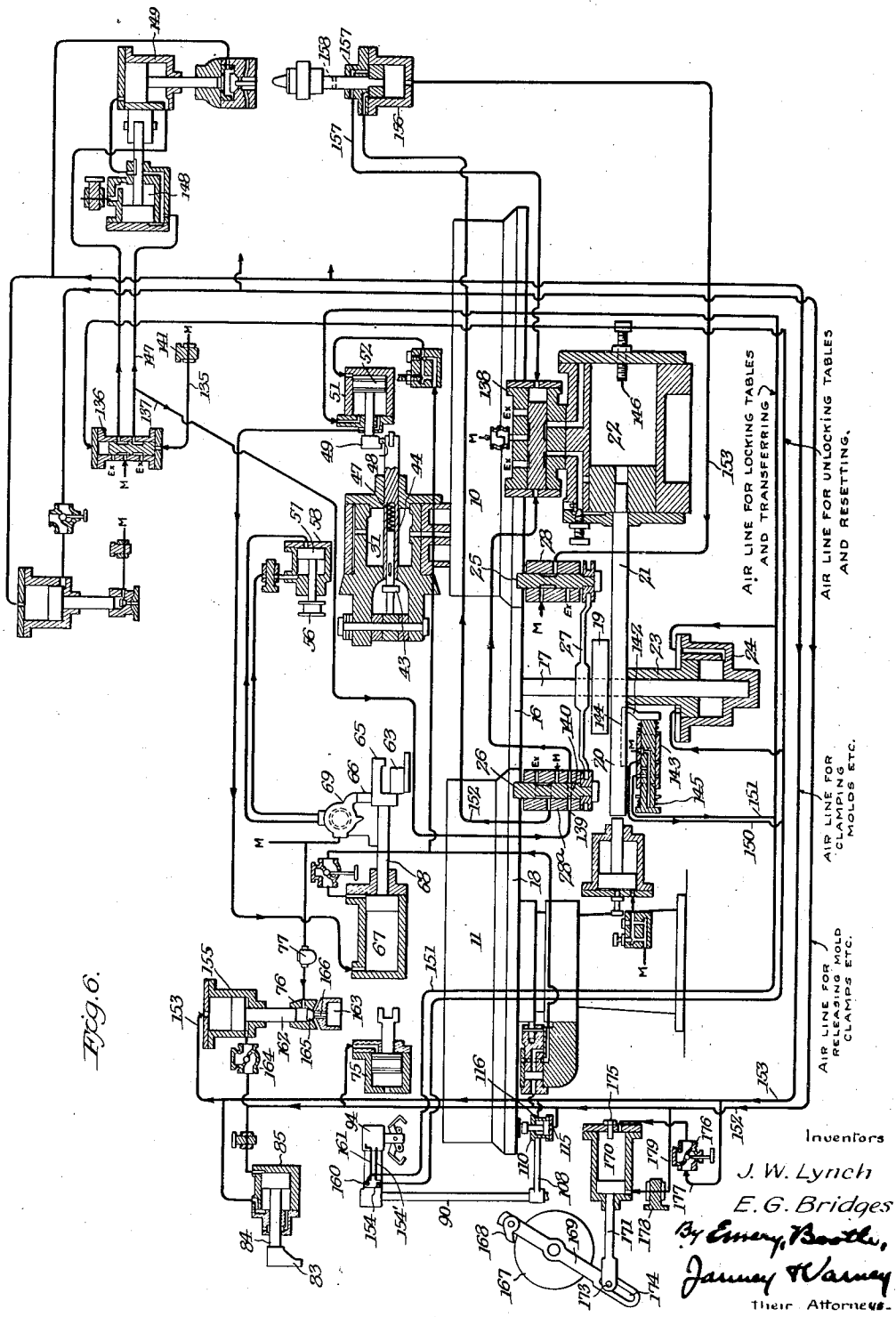

Fig. 6.

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Patented Jan. 6, 1931 1,787,635

UNITED STATES PATENT OFFICE

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GLASSWARE-FORMING MACHINE

Application filed December 6, 1924. Serial No. 754,396.

This invention relates to glassware forming machines having means for automatically removing the ware from the molds, and aims generally to improve machines of this type.

Further objects are to simplify the construction of such machines and to improve the means for removing the ware from the molds to enable the machine to operate satisfactorily at high speed.

Further aims and advantages of the invention appear in connection with the description of the machine shown in the accompanying drawings, illustrating one embodiment of our invention, wherein:

Fig. 1 is a plan view of a portion of a glassware forming machine showing our improved take-out mechanism;

Fig. 2 is a vertical longitudinal section of the same taken on the line 2—2 of Fig. 1;

Fig. 3 is a side elevation looking in the direction of the arrow in Fig. 1, showing the take-out mechanism ready to grasp the ware for removing it from a mold;

Fig. 4 is a horizontal cross-section on the line 4—4 in Fig. 3;

Fig. 5 is a vertical cross-section of the gripping members and actuating means therefor; and

Fig. 6 is a diagrammatic view showing the air lines and valves for actuating and controlling the various operating parts of the machine.

In the drawings the invention is illustrated in connection with an automatic or semi-automatic glassware forming machine of the general type shown and described in our application for patent filed June 14, 1917, Serial No. 172,678, and the invention is primarily intended for machines of such type, although capable of use generally for glassware finishing machines having rotatable tables.

Machines of the type referred to are well known to the trade, and the parts of which shown in Figs. 1, 2 and 3, and diagramed in Fig. 6, are deemed sufficient to illustrate the relationship of our improvements thereto. Such machines comprise two mold carrying tables, which rotate simultaneously, the molten glass being formed into "blanks" or parisons in the molds on the first or blank forming table, and thence being transferred to the finishing molds on the second or blow table, from which the finished ware may be removed by suitable take-out means, all operating automatically. The different groups of mechanisms comprised in the machine are actuated and coordinated by air lines controlled by suitable valves. In order that an adequate understanding of the take-out device may be had, it is needful that the construction and operation of the entire machine may be understood, and this may conveniently be described in the following groups.

Table turning mechanism

Referring to Figs. 1 and 2, the machine comprises two circular tables 10, 11, hereinafter designated blank mold and blow mold tables, mounted for rotation on pedestals 12, 13, which are supported on a base 14. In order to bring the blanks successively to the several operating positions, or stations (see Fig. 1) the tables are caused to turn intermittently in unison in the direction of the arrows in Fig. 1, by means of a gear 16, which is mounted on a vertical shaft 17 journaled on a pedestal 15 arranged between the tables, and which meshes with gear teeth 18 formed around the lower edges of the tables. The shaft 17 is rotated intermittently by means of a splined gear 19 which periodically engages with a rack 20 on a piston rod 21 working in a horizontal cylinder 22 supported on the base. The gear 19 is movable up and down by means of a hollow piston 23 in a vertical cylinder 24 which surrounds and supports the lower end of the shaft 17 (see Fig. 2). Upward movement of the piston 23 raises the gear 19 and disengages it from the rack 20 and also locks the tables 10, 11, by means of locking pins 25, 26, to which it is connected by a forked double armed swivel 27. The pins are sildably supported in housings or brackets 28, 28*a*, which connect the pedestals 12, 13, and 15. The upper ends of the pins engage in spaced sockets 29 in the under side of the tables in radial alinement with the mold positions. Downward movement of the piston 23 lowers the gear 19, caus-

ing it to engage with the rack 20, and also disengages the locking pins from the tables to permit them to turn.

Blank mold and neck ring actuating devices

The blank mold table 10 is provided with six journals or brackets 30 for supporting the hollow shafts or carriers 31 (see Figs. 1 and 2) for the two part blank mold holders 32 and neck ring holders 33; and the blow mold table 11 is provided with six brackets 34 for supporting the two part blow mold holders 35 and adjustable bottom plate arms 36. The blank molds 37 and neck rings 38 therefor, and the blow molds 39 and bottom plates 40 therefor, are shaped to suit each different size and style of article, in conformity with well understood practice.

The blank mold holders 32 and neck ring holders 33 are hinged to open and close on the vertical pins 41 (see Fig. 2) which are mounted in the outer ends of the hollow shafts or cylinders 31 to turn therewith. Twice during each revolution of the blank mold table these hollow shafts are caused to rotate one-half turn by any suitable means to invert the blank molds at the proper times for charging and blowing the blank; and the blank mold holders (and thereby the blank molds and neck rings) are held closed during these movements by suitable means such as links 42 and yokes 43, which are mounted to slide in the hollow plungers 44. These plungers are mounted to slide in and turn with the hollow shafts 31, which are prevented from turning in the transfer position by the upper and lower guides 45 on the pedestal 12 between which their inner ends slide. These plungers are operated by rollers on their inner ends which engage the stationary cam 46 on the pedestal 12. Springs 47 in the hollow plungers maintain the blank holders normally in closed position.

At the transfer position air operated means are provided for opening the blank mold holders 32, and neck ring holders 33 in proper sequence with the closing of the blow mold holders 35 as hereinafter described. For this purpose the inner ends of the plungers 44 (see Fig. 2) are fitted with studs 48 which at the transfer position project in the path of a radially movable finger 49 carried by a piston rod 50 mounted in a cylinder 51 on the top of the pedestal 12. At the proper time the piston 52, working in the cylinder 51 withdraws the finger and stud in engagement therewith to pull back the plunger and open the blank mold holders as they reach the transfer position. Similarly the neck ring holders are opened at the proper time to release the blank or parison (see Fig. 2) by engagement of the stud 53 on the yoke 54, which operates them through the links 55, with a grooved flange 56 carried by a piston rod 57 working in a cylinder 58 mounted on the bracket 59 over the path of movement of the blank mold carriers.

Blow mold closing device

The blow mold holders 35 (see Figs. 1 and 2) in the machine illustrated are hinged on vertical pins 60 mounted in the brackets 34, and are provided with spring pressed rods 61 adjustably connected to sliding yokes 62 actuated by cam rollers 63 to open and close the blow molds as hereinafter described. The rollers 63 engage a stationary cam 64 mounted on the pedestal 13 to hold the molds closed during the first half of the revolution of the table 11 from the transfer station. The blow molds 39 are open when they reach the transfer station, and following the opening of the blank molds 37 they are closed by air operated means to embrace the blank, which is suspended during the interim by the neck rings 38 (as indicated in dotted lines in Fig. 2). The blow mold closing means preferably comprises a fork 65 secured to the radially movable piston rod 66 and arranged in the path of the cam rollers 63 to embrace a roller as the table stops with mold open at the transfer station. The piston rod 66 works in a cylinder 67, suitably disposed and mounted on the pedestal 13 so as to be actuated upon the opening of the blank mold to close the blow mold around the blank, as hereinafter described. The piston rod 66 also carries a stud 68 for actuating the oscillating valve 69 to admit air to the neck ring operating cylinder 58 to open the neck rings after the blow mold sections have closed around the blank, as hereinafter described in connection with Fig. 6.

The blow molds are securely held closed at the blowing station by clamping jaws 70 which engage lugs 71 on the blow mold holders. The clamping jaws 70 are pivoted on a support 72 and are actuated by means of toggles 73 connected to a piston rod 74 working in a cylinder 75, as illustrated in Fig. 1. Any suitable blow head 76 (see Fig. 6) may be used; and if desirable two blow heads may be supplied, one at each blowing station. In case two blow heads are provided, the pressure of the air for blowing may be adjusted by means of suitable regulating valves 77 (see Fig. 6) for each blow head independently to suit differences in the ware or in the operating conditions.

Blow mold opening device

The blow molds are opened somewhat to free them from the blown ware and permit the latter to cool more rapidly after leaving the cooling station by means of an adjustable cam 78 (see Figs. 1 and 2) which, in the form shown, is pivotally secured to the stationary cam 64 and has a depending roller track 79 engaging on the outer side of the rollers 63 and extending between the cooling station

and the take-out station. This cam track has an initial inward sloping portion 80, the remainder of its course being substantially circular and normally arranged concentric with the axis of the table, and when the rollers strike this sloping portion they are forced to ride inwards slightly and thereby slightly separate the mold holders to crack open the blow molds. The degree of opening of the molds may be controlled by adjusting the movable end of the cam 78 inward by means of the slot 81 and holding screw 82 (as indicated in Fig. 1).

If desired the amount of opening of the molds by the cam 78 may be increased to the extent necessary for removing the ware by adjusting the cam inward to the full limit of the slot 81; otherwise the molds are opened after they reach the take-out position by means of the hook or movable cam segment 83, which is positioned to engage the cam rollers 63 as they leave the track 79 and retract them radially inwards. This hook is carried by the piston rod 84 having a piston which works in the cylinder 85 (see Figs. 1 and 6) and is timed to operate in synchronism with the table rotating and locking devices as hereinafter described. This hook may be locked in its inner position by suitable means, such as a stop, to cooperate with the movable cam in its inward position of adjustment. The molds are opened wider and held open during their movement from the take-out station to the transfer station by means of a cam having a depending track 87 which engages the cam rollers 63 and holds them at the inward end of their radial movement and guides them into the fork 65 at the transfer station (see Fig. 2).

Take-out device and conveyor

The take-out device (see Figs. 1 and 3) for transferring the ware to the conveyor 88 consists of a gripping and lifting device and a swinging device to remove the ware from the open molds and deposit it on the conveyor.

In the embodiment shown, the take-out device consist of a support, such as a bracket 89, which is rigidly attached to the base 14 and at its outer end is formed with a journal for a vertical shaft 90. The upper end of the shaft 90 is journaled in the outer end of a second bracket 91 suitably mounted upon some relatively stationary part of the machine, as upon the cam 64.

The take-out arm 92 is formed with bifurcated ends adapted to be clamped to the upper end of the shaft 90. Adjustment of the arm 92 vertically on the shaft may be effected by an adjusting member such as a nut 93, whereby the take-out arm may be raised or lowered to accommodate glassware of various heights. The outer end of the arm 92 supports the vertically disposed cylinder 94 (see Figs. 3 and 5) which contains the piston 95 on the upper end of the piston rod 96. The lower end of the piston rod is T-shaped (see Fig. 5) and carries studs 97 working in slots 98 of jaws 99 that are pivoted to a cross pin 100 which works in slot 101 of the piston rod and slot 102 of a depending double bracket 103. The piston rod 96 is counterbored as at 104 to accommodate a spring 105 and a plunger 106 interposed between the spring 105 and pivot pin 100, thereby to exert a downward pressure upon the pivot pin. The weight of the piston is sufficient to hold the jaws in extended position normally as shown in full lines in Fig. 5. Gripping means such as plates 107 may be removably secured, as by bolts, to the outer ends of the jaws.

Normally the piston is in its lower position with the cross pin in the bottom of slots 102 in bracket 103, the jaws 99 and gripping plates 107 being held in upward open position against the tension of spring 105. Upward movement of the piston 95 and piston rod 96 raises the outer ends of the jaws 99, the pivot pin 100 being held stationary by the tension of spring 105 bearing thereon, and thus causes the gripping plates to swing together to grip the bottle under the finish as shown in dotted lines in Fig. 5. As the piston rod continues its upward movement the lower end of the slot 101 in the piston rod engages the pivot pin 100 and lifts it upward thereby lifting the bottle off of the bottom plate of the mold. On the return downward movement of the piston rod the bottle is lowered until the pivot pin 100 engages the bottom of the slot 102 in bracket 103. Further downward movement compresses the spring 105 in counterbore 104 of the piston rod thereby to hold the pivot pin in the lower end of the slot 102 while the gripping plates are swung upwardly and outwardly away from the ware.

Our invention contemplates the provision of novel means to swing the take-out arm in an arcuate path from a position over the mold to a position remote therefrom, as over a conveyor, and in the embodiment shown in the drawings an operating arm 108 is suitably attached to the shaft 90, as by a clamp 109 (see Figs. 3 and 4). The free end of the arm 108 is formed with a vertically disposed cylinder 110 in which a piston 111 works carrying a piston rod 112 (see Fig. 2). A roller 113 is mounted upon the upper end of the piston rod 112 for engagement with lugs 114 secured to the under side of the rotating mold table 11, there being one lug 114 for each of the molds carried by the table. Air is admitted from a suitable source, hereinafter described, into the cylinder 110 through the port 115 at the lower end, to move the roller up in front of the lug 114 at the position A (see Fig. 4). Movement of

the table swings the arm 108 to position B and thereby the take-out arm 92 from position C to D (see Fig. 1). When air is admitted to the top of cylinder 110 through port 116 the roller is lowered out of engagement with the lug 114.

In order to provide an adjustment for the arm 108 so that the roller will be in proper position relative to the lug 114 when the table is at rest, the arm 108 (see Figs. 1 and 4) as shown, is formed with a lug 117 carrying an adjustable stop screw 118 adapted for engagement with a lug 119 on the stationary arm 89. This screw 118 engages the lug 119 at the end of and limits the return swinging movement of the arm 108.

Our invention further contemplates the provision of means for returning the take-out arm to its normal position over a mold after it has been swung away to remove the ware, and also for cushioning the return stroke. In the form of machine shown in the drawings, a lever 120 is securely fixed to the lower end of the shaft 90 by suitable fastening means, as by a clamp 121, one end of the lever being connected to a spring 122 (see Figs. 1 and 4) the other end of which is attached to a lug 123 on the base 14 of the machine. Any suitable means may be provided to connect the end of the lever 120 to the spring 122 but preferably an adjustable connection is provided. In the form shown, the end of lever 120 is bifurcated and formed with transverse arcuate seats 124 to receive the trunnions 125 of a swivel block 126 loosely surrounding an adjusting screw 127 attached to one end of the spring 122. An adjusting nut 128 is threaded upon the screw 127 and abuts against the swivel block 126 to effect adjustment of the spring.

The opposite end of the lever 120 is pivotally connected, as at 129, to a piston rod 130 carrying a piston 131 working in a cylinder 132 open at one end. The cylinder is mounted on a pivot 133 between spaced lugs 134 in order to accommodate itself automatically to the varying positions of the piston rod 130 due to the rocking movements of the lever 120. A restricted escape port is provided in the cylinder 132 near the closed end thereof to check the escape of air trapped between the piston and closed end of the cylinder, thereby to cushion the return movements of the arms 92 and 108. As the arm 108 is moved from position A to B (Fig. 4) by the movement of the lugs 114 on the table, the shaft 90 and lever 120 rotate clockwise (Figs. 1 and 4) to extend the spring 122 and move the piston 131 towards the open end of the cylinder 132. When the roller 113 is withdrawn from engagement with the lug 114, the spring contracts and swings the arms 92 and 108 back to their normal position. This return movement is, however, cushioned by means of the air trapped between the piston 131. and closed end of the cylinder. Our invention further contemplate the provision of means for operating the improved take-out mechanism in proper timed relation to the operation of the other parts of a glassware forming machine, as diagramed in Fig. 6. In this diagram air pressure mains and parts connected thereto are marked M, exhaust air ports opening into the atmosphere are marked EX, and the air pipes are indicated by the full lines upon which the direction of flow to actuate the various movements is indicated by arrows. The parts are shown in the positions which they occupy after completing the automatic cycle of movements and ready for another charge of glass.

Starting

Upon delivery of a charge of glass to the blank forming mold, the gatherer, by tripping a punty valve if the machine is fed by hand, or the timing device of the feeder if fed by machine, admits air to the pipe 135 (see upper right hand corner of Fig. 6) and thereby the control valve 136 is shifted to admit air from the main M to the pipe 137 leading to the main valve 138 to shift it to the right as shown in Fig. 6. This air must pass through the port 139 in the housing for the locking pin for the blow table which registers with a groove 140 around the pin when the latter is in locking position. Thus, if for any reason, the locking pins should not be seated in their sockets in the tables, as would happen if the tables had not completed their turning movement, the air pressure to the main valve 138 will be shut off and the machine will not start, thus preventing starting of the machine prematurely or if the tables had become jammed for any cause. A stop cock 141 is provided to shut off the pipe 135 to prevent the actuation of the blowing machine if desired.

Movement of the main valve 138 to the right as shown in Fig. 6 will admit air from the pressure main M to the left hand end of the table rotating cylinder 22 and return the piston and rack 21 secured thereto to position for engagement with the gear 19 splined to shaft 17 for rotating the tables through gear 16. As the rack approaches the end of its return movement it will move the finger 142 on the valve 143 to shift the latter to the right. This finger engages in a slot 144 on the under side of the rack. This slot is a little shorter than the movement of the rack so that the finger 142 and the valve 143 are moved just before the end of the movement of the rack in either direction. Springs 145 between the valve and ends of the valve casing enable the valve to over travel a little at each end of its stroke without detriment, and an adjustable screw 146 in the head end of the cylinder 22 limits the

travel of the piston at the head end of the stroke and positions it so the gear 19 may drop into the rack 21 without difficulty.

Simultaneously with the admission of air to the line 137, air is admitted into the line 147 leading to a blow down actuating cylinder 148 which is actuated to swing the blow down cylinder 149 over a blank mold and also admit air to the top of the blow down cylinder 149 to move the blow down head down to engagement with the top of the mold.

Movement of the control valve 143 by the return of the piston in the cylinder 22 at the end of its return stroke as hereinbefore described admits air from the pressure main M through said valve to the line 150 and opens the pipe 151 to the atmosphere, for unlocking the moving parts of the machine preparatory to the table rotating movement.

Air from the pipe 150 will pass into the upper end of the cylinder 24 and lower the hollow piston 23 and splined gear 19 to engage the rack 21, and at the same time withdraw the locking pins 25 and 26 from the tables, thereby admitting air from the pressure main M through the housing 28*a* surrounding the locking pin 26 to the pipe 152 and opening the pipe 153 through the housing surrounding the locking pin 25 to the atmosphere. The pipe 150 also leads to the control valve 136 to return it to normal position when air is admitted to it.

The pipe 150 also leads to a port 154 in the take-out arm 92 which admits air to a passage 154′ leading to the lower end of the cylinder 94 thereby to raise the piston rod 96 and cause the gripping plates 107 to grip and lift the blown bottle.

The pipe 152 leads to the cylinders that actuate the various blank and blow heads on the blank forming and blowing tables to relieve and withdraw them from contact with the molds, such as the blow mold clamping cylinder 75 and blow head actuating cylinder 155, thereby freeing the molds and permitting the tables to be turned to carry the molds to their succeeding operating stations. This pipe 152 also leads to the port 115 in the cylinder 110 to position the roller 113 in front of the table lug 114.

Part of the air admitted by the locking pin valve to the pipe 152, after passing through the neck pin actuating cylinder 156 to withdraw the neck pin from the blank mold in the charging position (as is more fully shown and described in our application filed June 4, 1917) is returned to the pipe 157 when the neck pin is withdrawn and the groove 158 in the stem registers with the ports aligning with the pipe 157. The pipe 157 leads to the right hand end of the main valve 138 to throw the valve to the left back to normal position and admits air from the pressure main M to the right hand end of the table rotating cylinder 22 as shown in Fig. 6. Thus the piston and piston rod 21 are moved to the left to actuate the rack 20 and gears 19 and 16 to rotate the tables through the angle of 60° and thereby shift the blank mold and blow mold from one operating station to the next. The lugs 114 on the under side of the rotating blow mold engage the rollers 113 and cause the take-out arm 92 to be swung from the position C to D (Fig. 1) where it is positioned above a suitable conveyor.

Upon the completion of a table turning movement of the rack 20, the valve 143 will be shifted to the left (as shown in Fig. 6) to admit air from the pressure main M to the pipe 151 and to open the pipe 150 to the atmosphere. This will raise the piston 23, withdraw the splined gear 19 from the rack 20, and lift the locking pins 25 and 26, to lock the tables. Pipe 151 leads to port 160 in take-out arm connected to passage way 161 leading to upper end of take-out cylinder 94 to move the cylinder downward and deposit the bottle upon a conveyor or other support.

The air admitted to the pipe 151 at the end of the turning movement of the table rotating cylinder also actuates the blank mold opening cylinder 51 and the blow mold closing mechanism.

Shifting the locking pins to lock the tables opens the pipe 152 to the atmosphere through the valve in the pin 26 and also admits air from the pressure main through the valve in the pin 25 to the pipe 153 thereby actuating the mold clamps and blow heads to engage the mold and perform the several forming and blowing operations, as will be understood by those familiar with machines of the same general type now in use. For example, the blow head cylinder 155 is fitted with a piston and depending piston rod 162 having the blow head 163 at its lower end. A vented check valve 164 in the pipe 151 prevents too rapid descent of the blow head. Air is piped from the pressure main M through the adjustable pressure reducing valve 77 to the blow head, which has a vertically slidable inverted cup shaped contact piece 165 adapted to engage with and form an air-tight joint on the top of the blow mold surrounding the neck of the ware as the blow head descends. Further lowering of the blow head will cause relative upward movement of the contact piece thereon to open the air valve 166 and admit air to the ware in the blow mold to blow it to finished shape. When the tables are unlocked at the close of the blowing operation, the reversal of pressure in the pipes 152 and 153 will lift the blow head and shut off further supply of air to the valve 166 by its dropping on to its seat. While this operation is taking effect, air from the line 153 passes to the port 116 in the upper end of the cylinder 110

to lower the roller 113 out of engagement with the lug 114 on the under side of the blow mold table, and permit the spring 122 to return the take-out device to its normal position as shown in Fig. 1.

The conveyor 88 (see Fig. 1) is of the link belt or other suitable form, and preferably is operated by means of a ratchet wheel 167 (see Fig. 6) that is attached to one of the belt carrying pulleys and is engaged by a pawl 168 on an oscillating lever 169. The conveyor is operated with a step by step movement by an air cylinder 170 and piston, the piston rod 171 of which is connected to the lever 169 by a pin 173 working in a slot 174 in the lever, or other suitable connection. A screw 175 in the end of the cylinder 170 enables the stroke of the piston to be adjusted to the length of travel of the conveyor desired for the size of ware being manufactured.

During the time that the tables are locked by the locking pins 25 and 26, the conveyor actuating mechanism is being returned to normal position, shown at the lower left hand side of Fig. 6, by air from the pipe 153. An adjustable check valve 176 is provided for the pipe 177 which connects the head end of the cylinder with the pipe 153 for choking the exhaust and thereby controlling the speed of the working stroke of the conveyor operating devices; and a stop cock 178 is arranged in the pipe 179 which connects the outer end of the cylinder 170 with the pipe 152 whereby the speed of returning the conveyor actuating mechanism may be controlled.

When the locking pins 25 and 26 are released from engagement with the tables, air is admitted into pipe 152 passing to pipe 179 to move the piston forward in the cylinder 170, thereby moving the conveyor forward, to make room for the next bottle deposited thereon by the take-out mechanism.

Summarizing the operation of the take-out device in connection with an illustrative machine (see diagram Fig. 6) it will be observed that when the piston that operates the rack 20 for intermittently rotating the tables reaches the right hand end of the cylinder 22 at completion of its idle stroke, the valve 143 is tripped admitting air into the line 150 to actuate the piston in the cylinder 94 to grip and raise the bottle off of the bottom plate of the mold. At the same time, air is admitted to the cylinder 24 to lower the piston 23 and withdraw the locking pins 25 and 26 from engagement with the mold carrying tables. Air from the pressure main M then passes through the valve in the casing surrounding the locking pin 26 into the pipe 152 to admit air into the lower end of the cylinder 110 to raise the roller 113 into position in front of the lug 114 on the under side of the blow mold table. Simultaneously, air is admitted to the top of the neck pin cylinder 156 to lower the neck pin out of engagement with the blank mold. As the neck pin is lowered, a groove 158 on the stem registers with the port in the housing leading to pipe 157 and admits air into the right hand end of the main control valve 138, thereby moving the valve to the left as shown in Fig. 6, and thus air from the main pressure line M is admitted to the rear of the cylinder 22 to move the piston and rack 20 to the left to rotate the table. Rotation of the table moves the take-out arm 92 and the bottle held by the gripping members 107 from the position C to the position D, preferably over a conveyor 88 of any suitable type as shown in Fig. 1. When the rack 20 completes its table rotating stroke the valve 143 is tripped, thereby exhausting air from the line 150 and admitting air from the main pressure line M through the pipe 151 to lower the piston in the cylinders 94 and drop the bottle upon the conveyor. At the same time air is admitted into the upper end of the cylinder 23 to disconnect the rack 20 from the pinion 19 and raise the locking pins 25 and 26 to lock the tables. Air in line 152 is then permitted to exhaust through the valve surrounding locking pin 26, while air is admitted from the main pressure line M in the valve surrounding locking pin 25, to the line 153 to lower the roller 113 out from engagement with the lug 114. The take-out arm 92 and arm 108 are then quickly returned to their normal positions by means of the spring 47.

The invention is not restricted to the construction shown, nor to the combination of a blowing apparatus with a blank forming apparatus as illustrated, and obviously it is applicable to glass ware shaping apparatus generally.

What we claim as our invention and desire to secure by Letters Patent is:

1. In a glassware forming machine, a movable carrier having a mold thereon, a ware removing device normally disconnected from said carrier adapted in one position to overlie the mold and to move to another position remote therefrom, and means associated with said ware removing device for periodically engaging said carrier thereby to establish an operative connection between said ware removing device and said mold carrier whereby movement of the mold carrier moves the ware removing device from its position over the mold to the position remote therefrom.

2. In a glassware forming machine, a movable carrier having periods of rest, molds thereon, a ware removing device including means for gripping the neck finish of the ware in the mold when the carrier is at rest, and means associated with said ware

removing device for periodically establishing an operative connection between said ware removing device and said mold carrier whereby movement of the mold carrier effects removal of the ware from the mold.

3. In a glassware forming machine, a movable carrier having periods of rest, molds thereon, ware removing device including means for gripping the ware while the mold carrier is at rest, and means for locking said ware removing device to said mold carrier during movement thereof to remove the ware from the mold during movement of the carrier.

4. In a glassware forming machine, a movable carrier having periods of rest, molds thereon, a pneumatically operated means for gripping the ware in said molds during said period of rest and lifting it therefrom, a movable member supporting said ware gripping means and constituting therewith a ware removing device, and means for locking said ware-removing device to said mold carrier during movement thereof, whereby the ware may be removed from said mold to a position remote therefrom during movement of the carrier.

5. In a glassware forming machine, a movable carrier having periods of rest, molds thereon, a ware-removing device including two arms one positioned above and the other positioned below said mold carrier, means on the upper arm to grip the ware in the mold, and means on the lower arm adapted to lock said arm to said mold carrier during movement thereof.

6. In a glassware forming machine, a movable carrier having a mold thereon, an oscillating ware removing device adapted in one position to overlie the mold and to be moved to a position remote therefrom by movement of the carrier, and other means for returning said ware removing device to its original position.

7. In a glassware forming machine, a movable carrier having molds thereon, means for removing ware from said molds including a vertical oscillatable shaft, means carried by the upper end of said shaft normally positioned over said mold and adapted to grip and hold the ware therein, means secured to the lower end of said shaft adapted to be locked to said carrier during movement thereof whereby movement of the carrier effects removal of the ware from the molds and means for returning the parts of said ware removing means to their normal positions.

8. In a glassware forming machine, a rotatable carrier having molds thereon adapted to be opened and closed, and means for removing formed ware from said mold including a vertical oscillatable shaft, ware gripping and lifting means carried by the upper end of said shaft, and means secured to the lower end of said shaft and adapted to be locked to said carrier during movement thereof, said gripping and lifting of the ware and carrier movement occurring in the order named whereby the removal of the ware from the mold is effected by the movement of the carrier.

9. In a glassware forming machine, a movable mold carrier having periods of rest and molds thereon, and means for removing formed ware from said molds including a vertical shaft mounted adjacent said carrier, gripping means secured to said shaft adapted to grip the neck finish of the ware in said mold while at rest, means associated with said ware removing means for periodically establishing an operative connection between said carrier and said shaft, and means for automatically controlling said gripping means and said connecting means whereby the ware is gripped while the molds are at rest and moved to a position remote therefrom during travel of the molds and released from the gripping members during a succeeding period of rest.

10. In a glassware forming machine, a movable carrier having molds thereon, means for removing ware from said molds including a gripping member normally overlying one mold and a vertical shaft therefor, means for establishing an operative connection between said table and said shaft whereby movement of said carrier effects movement of said gripping member from a position over said mold to a position remote therefrom and means including a spring for returning said gripping member from its remote position independently of the movement of the carrier to its normal position.

11. In a glassware forming machine, a movable carrier having periods of rest, molds on said carrier, means for removing formed ware from said molds including a vertical shaft mounted adjacent said carrier, gripping means carried by the upper end of said shaft and normally positioned over said molds, means including a spring device for normally maintaining said gripping means over said molds, and means for establishing an operative connection between said carrier and said shaft whereby movement of the carrier effects removal of the ware from the molds to a position remote therefrom, the gripping member being permitted to return to its normal position during the next succeedingly period of rest of said carrier.

12. In a glassware forming machine, a movable carrier having molds thereon, means for removing formed ware from said molds, and clutch means for establishing an operative connection between said mold carrier and said ware removing means, and means for maintaining said clutch in operative engagement only during movement of said mold carrier.

13. In a glassware forming machine, a movable carrier having periods of rest, molds on said carrier, means for removing formed ware from said molds including gripping means and means adapted to be locked to the carrier only during movement thereof whereby to cause the gripping means to move away from the mold as the carrier is moved, said connecting means being adapted to be unlocked from the carrier when the latter is at rest.

14. In a glassware forming machine, a rotatable carrier having molds thereon and having periods of rest, means for removing formed ware from the molds including a gripping member, a vertical shaft upon which said gripping member is mounted, an arm in the lower end of said shaft and extending beneath said carrier, and pneumatically controlled means on said arm adapted to be locked to said carrier during movement thereof to cause the movement of the carrier to effect the movement of the gripping means away from the molds.

15. In a glassware forming machine, a base, a mold carrier mounted for rotation upon said base, a support fixed to said base, ware removing mechanism mounted on said support adjacent said mold carrier and including an arm extending beneath said carrier, a locking means carried by said arm, means on the under side of said carrier for engagement with said locking means, and means for adjusting the position of said arm to insure the engagement of said locking means with the means on the underside of the carrier when the latter is at rest.

16. In a glassware forming machine, a base, a mold carrier mounted for rotation upon said base, a support fixed to said base, a vertical shaft journalled in said support, gripping means adjustably secured to the upper end of said shaft, and adapted in its normal position to overlie one of the molds on said carrier when at rest, an arm adjustably secured to the lower end of said shaft and extending laterally therefrom beneath said mold carrier, a locking pin vertically movable in the outer end of said arm, a plurality of lugs carried by the under side of the carrier there being one of said lugs for each of said molds and means for causing vertical movement of said locking pin to engage said lug whereby movement of the carrier effects the movement of the gripping means from its normal position over the mold to a position remote therefrom and means for automatically returning said gripping means and arm beneath the carrier to their normal position during the succeeding period of rest of the mold carrier.

17. In a glassware forming machine, a base, a mold carrier mounted for rotation upon said base, a support fixed to said base, a vertical shaft journalled in said support and rotatable therein, gripping means adjustably secured to the upper end of said shaft, and adapted in its normal position to overlie one of the molds on said carrier when at rest, an arm adjustably secured to the lower end of said shaft and extending laterally therefrom beneath said mold carrier, a locking pin vertically movable in the outer end of said arm, a plurality of lugs carried by the under side of the carrier, there being one of said lugs for each of said molds, and means for causing vertical movement of said locking pin to engage said lugs whereby movement of the carrier effects the movement of the gripping means from its normal position over the mold to a position remote therefrom, means for automatically returning said gripping means and arm beneath the carrier to their normal position during the next succeeding period of rest of the mold carrier, including an arm and a spring interposed between the outer end of said arm and said base, and means for positioning said arm upon the completion of its return movement for engagement with the next succeeding lug on the bottom of the mold carrier.

18. In a glassware forming machine, having a rotatable carrier, reciprocable, pneumatically operated means having idle and actuating strokes for intermittently rotating said carrier, pneumatic control means operated by said carrier rotating means at the limits of its reciprocating movements, swinging ware-removing means for removing ware from said molds to a position remote therefrom, and connections between said pneumatic control means and said ware removing means for causing said last named means to grip the ware at the end of the idle stroke of said carrier rotating means, remove the ware during the actuating stroke thereof, release the ware at the end of the actuating stroke, and return said ware-removing means to its normal position over a mold during the idle stroke thereof.

19. In a glassware forming machine, a rotatable carrier having molds thereon, pneumatically operated means for intermittently rotating said carrier and for locking said carrier during periods of rest, means for removing ware from said molds including a gripping member and an actuating member, means on said actuating member for establishing an operative connection with said carrier, and control means actuated by said carrier rotating means for actuating said carrier locking means, gripping means and connecting means on said actuating member, said control means actuating the ware removing means to grip the ware and lock itself to the carrier when the latter is at rest, to remove the ware during rotation of the carrier, and to release the ware and unlock itself from the carrier during the next succeeding period of rest.

20. In a glassware forming machine, a rotating carrier having a mold thereon, and means including a swinging arm and gripping means carried by the outer end of said arm for removing formed ware from said mold, means associated with said ware removing means for periodically connecting said ware removing means and carrier whereby said ware removing means is actuated directly by movement of the carrier.

21. In a glassware forming machine, a rotary carrier having a mold thereon, means for intermittently rotating said carrier, means normally disconnected from said carrier and operatively connected therewith periodically only during movement thereof for removing formed ware from said mold during movement of said carrier, a conveyor, means for imparting a step by step movement to said conveyor, and control means for all of said means for actuating the ware removing means to grip the ware in the mold to move the conveyor, and then rotate the carrier in the order named.

22. In a glassware forming machine, a rotary carrier having molds thereon, means for intermittently rotating said carrier, carrier-locking means for locking the carrier against movement, means for removing formed ware from said molds including gripping members, pneumatic control means actuated by said carrier rotating means for actuating said gripping members, and pneumatically operated means controlled by said carrier locking means for causing said ware-removing means to be operatively connected to said carrier to remove the ware from the molds during movement of the carrier.

23. In a glassware forming machine, a rotary carrier having molds thereon, means for intermittently rotating said carrier including a reciprocatory member, gripping means operable by movements of said carrier for removing formed ware from said molds including a vertically movable gripping member, and means actuated by said reciprocatory carrier rotating member in one position to cause the gripping member to grip the ware and lift it in the mold and in another position to release the ware.

24. In a glassware forming machine, a rotary carrier having molds thereon, means periodically connected to said carrier for removing formed ware from said molds including a vertically movable gripping member, means for intermittently rotating said carrier, locking means for locking said carrier during periods of rest, pneumatically operated means actuated by said carrier rotating means causing said gripping member to grip the ware and lift it in the mold, and means associated with said carrier-locking means for causing said ware-removing means to remove the ware from the molds during rotation of the carrier.

25. In a glassware forming machine, a rotary carrier having molds thereon, means for intermittently rotating said carrier, means for locking said carrier against rotation during periods of rest, a ware removing device for removing ware from the molds, a conveyor for receiving ware released by said ware removing device, means for intermittently actuating said conveyor, and pneumatically operated means controlled by said locking-means for establishing an operative connection between said carrier and said ware-removing device only during movement of the carrier and for actuating said conveyor actuating means to impart to the conveyor a step by step movement.

26. In a glassware forming machine, a rotary carrier having molds thereon, means for intermittently rotating said carrier, carrier locking means for locking said carrier against rotation during periods of rest, means normally disconnected from said carrier and periodically connected thereto for removing formed ware from said molds during movement of said carrier, a conveyor for receiving the ware from said ware-removing means, conveyor actuating means for imparting thereto a step by step movement, and means associated with said carrier-locking means for actuating said conveyor actuating means.

27. In a glassware forming machine, a base, a mold carrier rotatably journalled upon said base, ware removing mechanism journalled on said base adjacent said mold carrier, and including a vertical shaft, a pneumatically operated gripping member secured to the upper end of said shaft, a pneumatically operated locking member secured to the lower end of said shaft and adapted in its operative position to establish an operative connection between said carrier and shaft, means for intermittently rotating said carrier, means for locking said carrier against rotation during periods of rest, and control means for causing the gripping members to grip the ware and lift it in the mold, locking the ware removing mechanism to the carrier, rotating the carrier to thereby remove the ware from the mold, releasing the ware from the gripping member, and then unlocking the ware-removing mechanism from the carrier.

28. In a glassware forming machine, a mold carrier rotatably mounted on said base, a ware-removing mechanism journalled on said base adjacent said carrier and including a vertical shaft, a gripping member mounted on the upper end of said shaft, a pneumatically operated locking member associated with the lower end of said shaft and adapted to periodically lock the ware removing mechanism to the carrier, means for intermittently rotating said carrier, means for locking said carrier against rotation during periods of

rest, control means actuated by said carrier-rotating means for actuating said pneumatically operated gripping members, and additional control means associated with said carrier-locking means and actuated by said first-named controlled means for actuating said pneumatically operated locking means, the order of actuation of the control devices being as follows: first the gripping member is actuated to grip and lift the ware in the mold, second, the pneumatically operated locking member is actuated to lock the ware removing mechanism to the carrier, third, the carrier-rotating means is operated to move the carrier and thereby remove the ware from the mold, fourth, the gripping member is actuated to release the ware, and fifth, the locking member is unlocked from the carrier.

29. In a glassware forming machine, a rotary carrier having molds thereon, a ware removing device mounted adjacent said mold carrier and including an arm extending beneath said carrier, pneumatically operated means for periodically locking said arm to said carrier, means for intermittently rotating said carrier, means for locking said carrier against rotation during periods of rest, and means associated with said carrier-locking means for controlling the locking member between the ware removing arm and the carrier.

30. In a glassware forming machine, a rotary carrier having molds thereon, means for removing formed ware from said molds, means for intermittently rotating said carrier, means for periodically establishing an operative connection between said ware removing means and said mold carrier, carrier-locking means for locking said carrier against rotation during periods of rest, and means associated with said carrier-locking means for establishing an operative connection between said carrier and said ware removing means when said carrier-locking means are released from engagement with said carrier.

31. In a glassware forming machine, a base, a plurality of mold carriers rotatably mounted upon said base, means for intermittently rotating said carrier, means for locking said carrier against rotation during periods of rest, a ware removing mechanism mounted upon said base adjacent one portion of said carrier and including a vertical shaft, pneumatically operated gripping means associated with said shaft adapted to grip the ware in the mold, an arm associated with the lower end of said shaft and extending beneath said carrier, pneumatically operated means on said arm for periodically establishing a locking connection between said arm and said carrier, a conveyor, means for imparting to said conveyor a step by step movement, means controlled by said carrier rotating means for operating said pneumatically operated gripping means, means associated with said carrier-locking means for operating said locking means between said carrier and arm on the lower end of said shaft and conveyor actuating means, the order of actuation of the control devices being as follows: first, the gripping members are actuated to grip and lift the ware in the mold, second, the locking means are actuated to establish an operative connection between the carrier and the arm on the ware-removing shaft, third, the carrier rotating means actuated to rotate the carrier and thereby remove the ware from the mold, fourth, the gripping means are released to drop the ware, fifth, the operative connection between the arm and the carrier is broken to permit return of the arm to its normal position over the mold.

32. In a glassware forming machine, a movable carrier having molds thereon, a device for removing ware from the molds, and pneumatically actuated means for automatically connecting said ware removing device to said carrier for actuating said ware removing device directly by movements of said carrier.

33. In a glassware forming machine, a carrier having molds thereon, means for intermittently actuating said carrier, means for removing formed ware from the molds on said carrier and normally disconnected from said carrier operating means, and pneumatically operable means for connecting said ware removing means to said carrier for actuation directly by movements thereof.

34. In a glassware forming machine, an intermittently movable mold carrier having molds thereon, a reciprocatory ware removing device for removing ware from the molds, pneumatically actuated means operative during movements of the carrier for connecting said ware removing device with said carrier for actuating said ware removing device in one direction, said pneumatically actuated means being operable to disconnect said ware removing device from said carrier during the period of rest, and retractible means for returning said ware removing device to its normal position.

35. In a glassware forming machine, a circular series of blow molds, a rotatable support therefor, means for automatically opening said molds, means for intermittently rotating said support including a reciprocable actuator, valve means arranged to be operated on opposite strokes of said actuator, means for removing formed ware from an opened mold comprising ware-gripping means, a shaft carrying said ware-gripping means and rotatably mounted adjacent the opened mold, a fluid pressure operated motor associated with said ware-gripping means for movement therewith, and controlled by said valve means and adapted during one of its movements to actuate the gripping

means to grip and lift the ware from the mold and during its opposed movement to lower and release the ware at a point remote from said mold, and means for rotating said shaft and ware-gripping means simultaneously with the movement of said mold support.

36. In a glassware forming machine having a series of molds, a rotatable support therefor, means for rotating said support, valve means arranged to be shifted by said support rotating means, mechanism for removing ware from the molds comprising ware-gripping members, a shaft rotatably mounted adjacent said mold support and carrying said ware-gripping members for moving said gripping members during rotating movements of the machine from its position over a mold to a position laterally remote therefrom, and fluid pressure operated means associated and movable with said gripping members and controlled by said valve means for operating said gripping members.

37. In a glassware forming machine, a movable mold support, sectional forming molds mounted on said support, means for opening said molds upon arrival at a predetermined position, reciprocable means for moving said mold support intermittently, valve means arranged to be actuated on opposite movements of said reciprocable means, a take-out device comprising a vertical shaft adjacent said predetermined position for mold opening, ware-gripping members, a support therefor carried by said shaft for movement therewith, and pneumatically operated means controlled by said valve means, and associated with said gripping members for movement therewith for actuating said gripping members in ware-gripping and releasing directions at the ends of opposite movements of the reciprocable means, and means for rotating said shaft simultaneously with and by the mold support.

38. In a glassware forming machine, a movable mold support, sectional forming molds carried thereby, fluid pressure operated means for opening said molds upon arrival at a predetermined position, means for removing ware from the molds comprising pivoted ware gripping members, a vertically disposed shaft journalled for rotation on an axis parallel to but laterally spaced from the axis of said molds, and carrying said gripping members, fluid pressure operated means associated with said grippers for movement therewith for actuating said grippers; a reciprocable actuator for intermittently moving said mold support, and valve means arranged to be controlled by said actuator upon opposite strokes thereof, and arranged to control the supply of operating fluid to the fluid pressure operated means for actuating said gripping members and mold opening means.

In testimony whereof, we have signed our names to this specification.

JAMES W. LYNCH.
EDWARD G. BRIDGES.