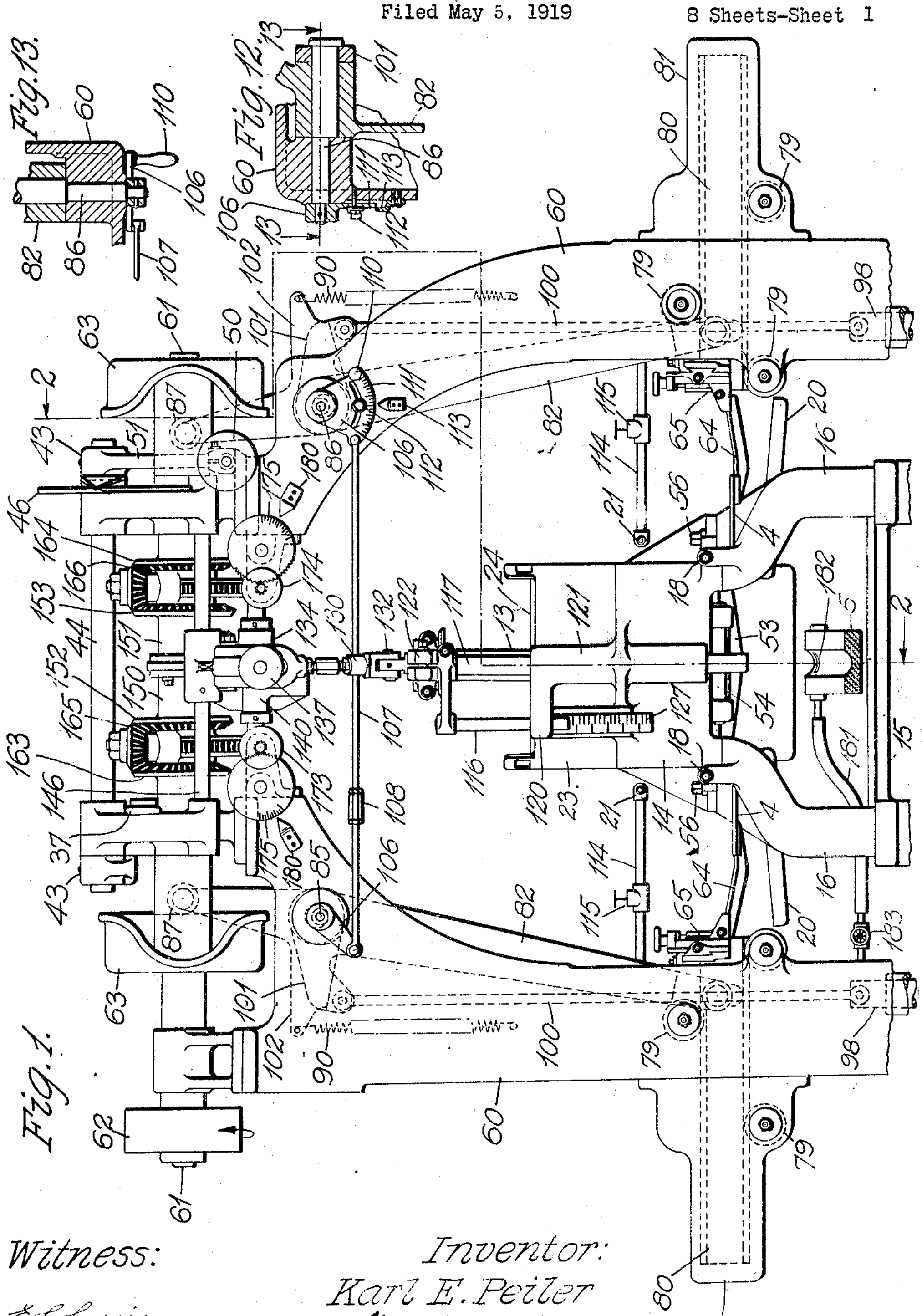
Jan. 3, 1928. **1,655,391**

K. E. PEILER

METHOD OF AND APPARATUS FOR FEEDING MOLTEN GLASS

Filed May 5, 1919 8 Sheets-Sheet 1



Witness:
E. L. Jarvis

Inventor:
Karl E. Peiler
by. W. H. Honiss.
Att'y

Jan. 3, 1928. 1,655,391

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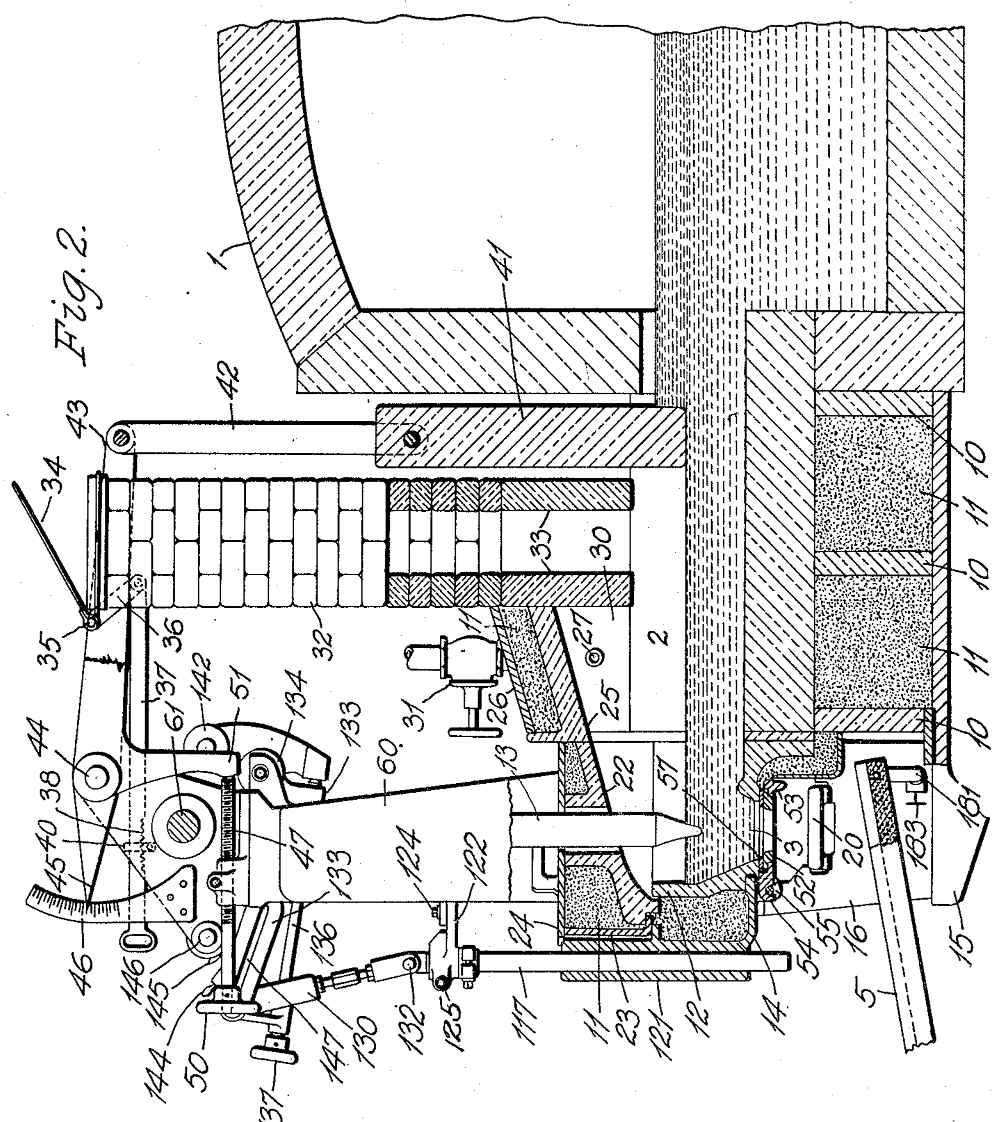
METHOD OF AND APPARATUS FOR FEEDING MOLTEN GLASS

Filed May 5, 1919 8 Sheets-Sheet 2

Fig. 2.



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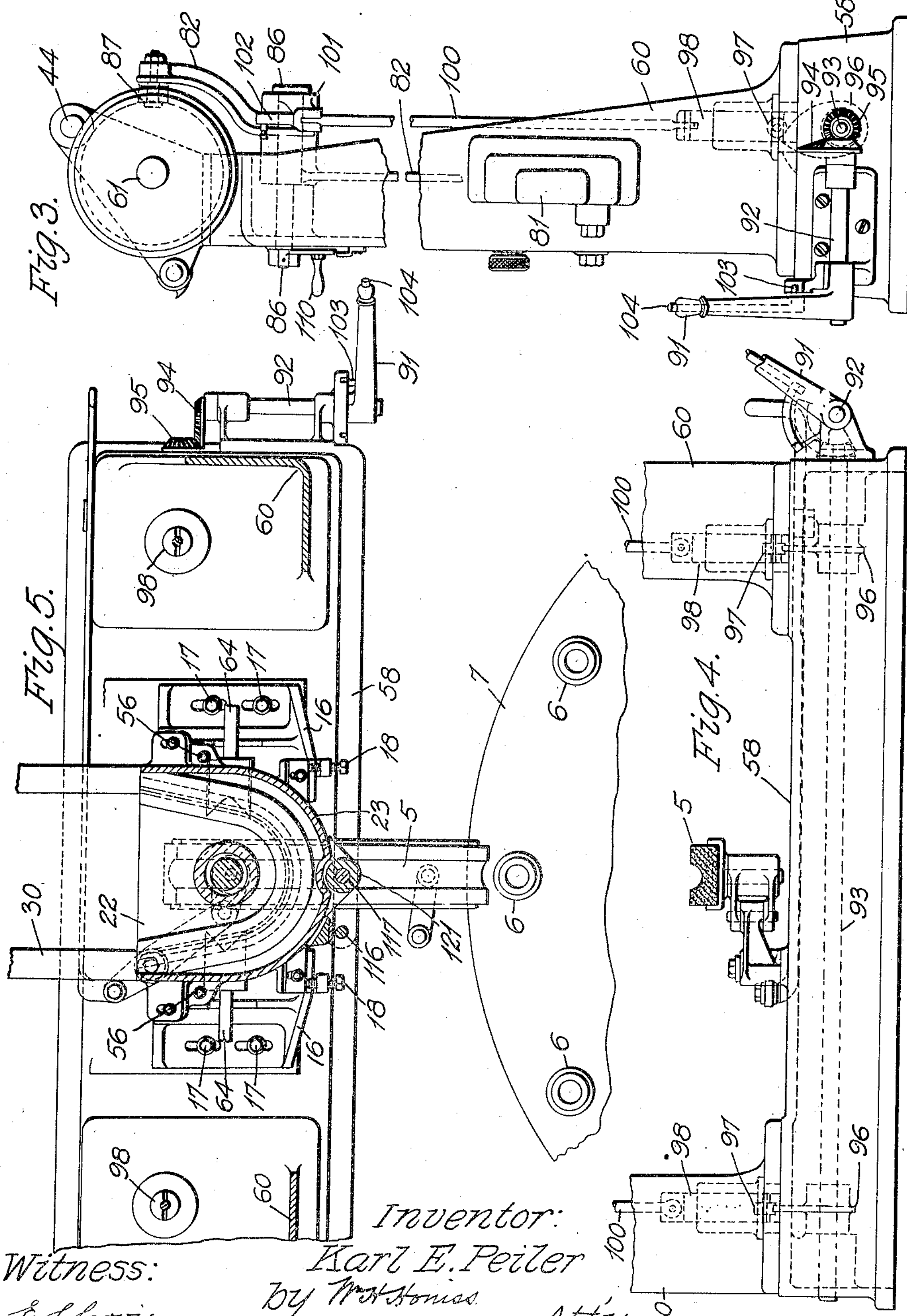
METHOD OF AND APPARATUS FOR FEEDING MOLTEN GLASS

Filed May 5, 1919

8 Sheets-Sheet 3



Inventor:
Karl E. Peiler
by Wm H Honiss Att'y.

Witness:
E. L. Jarvis

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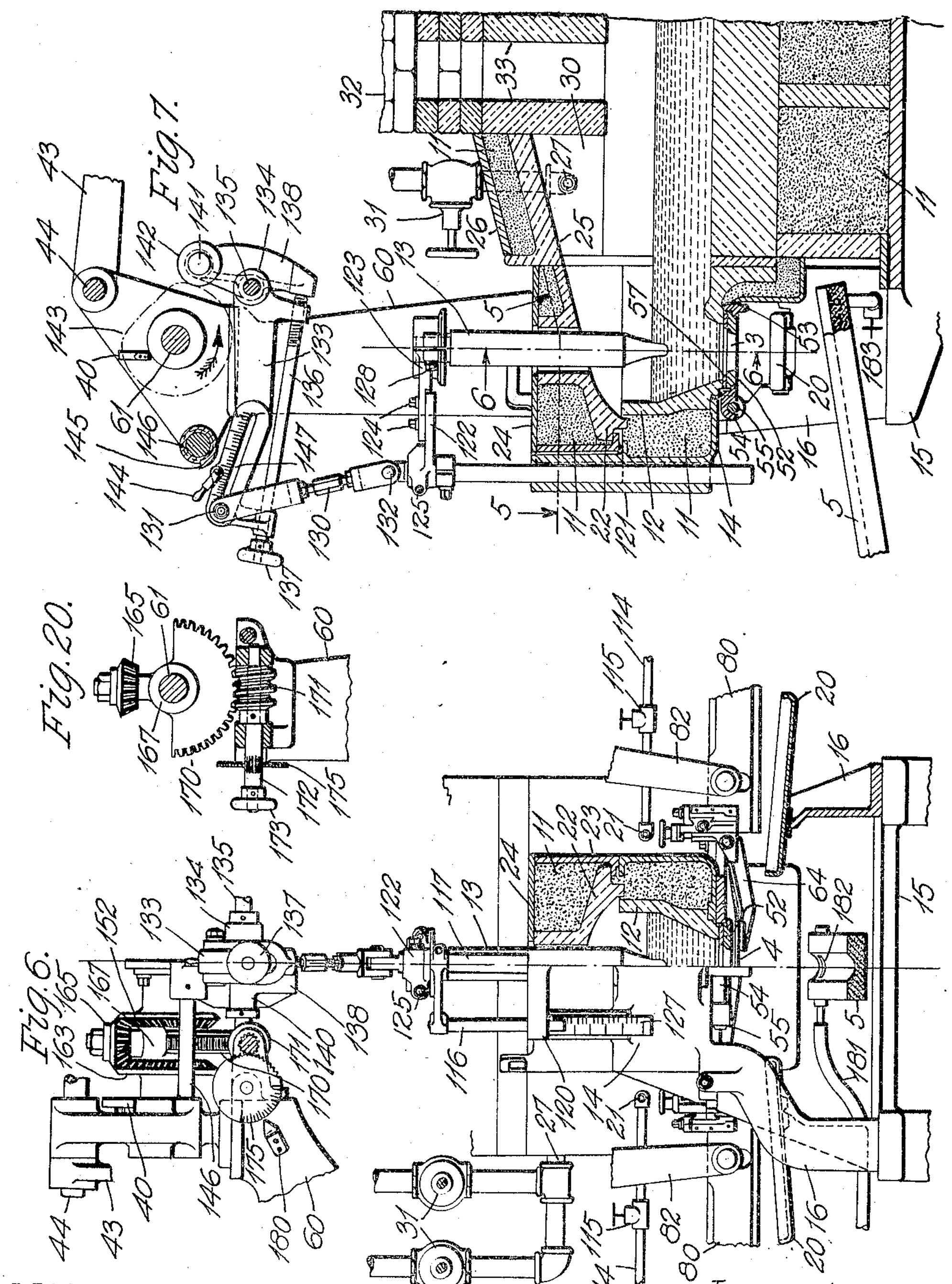
METHOD OF AND APPARATUS FOR FEEDING MOLTEN GLASS

Filed May 5, 1919 8 Sheets-Sheet 4



Witness:

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Inventor:

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by Wm H Honiss.

Att'y.

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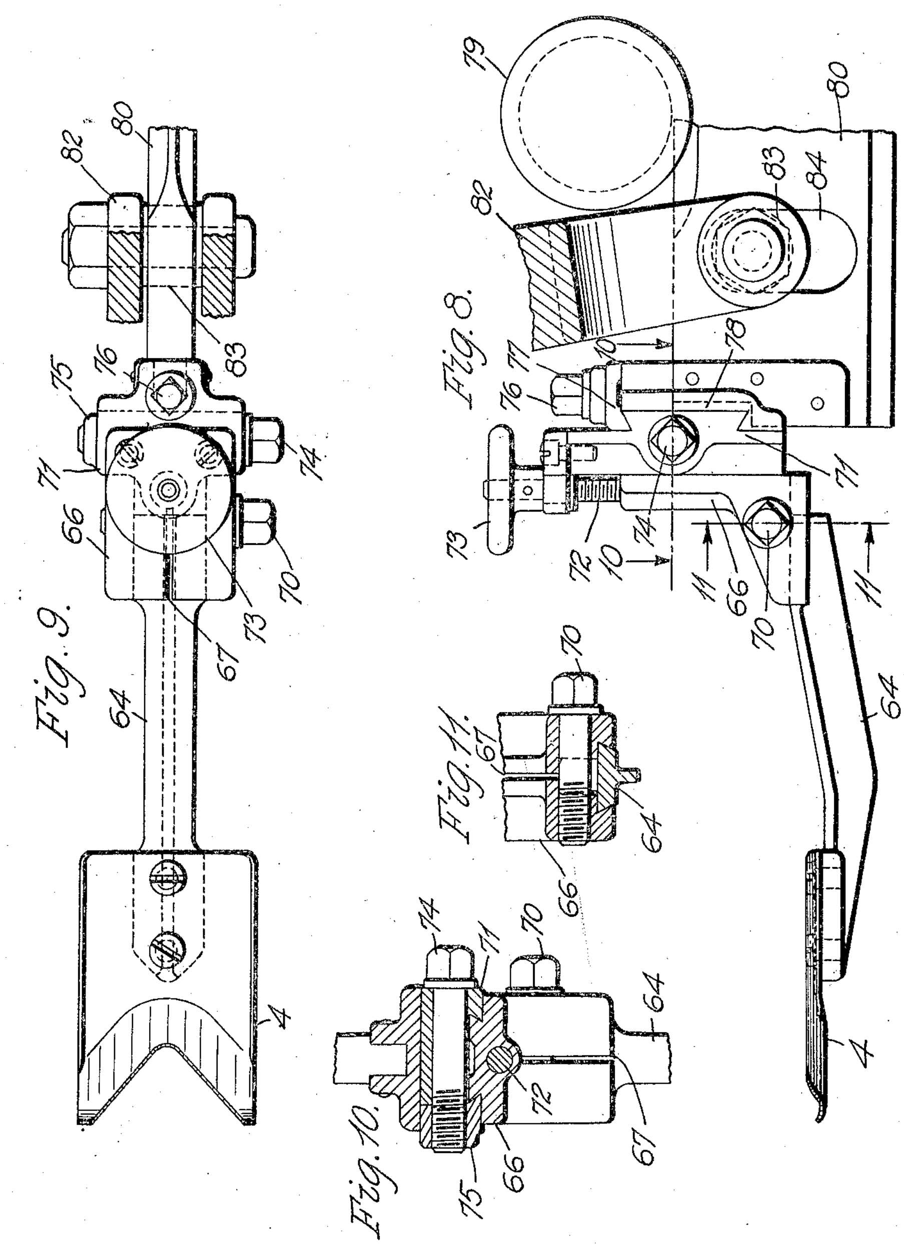
METHOD OF AND APPARATUS FOR FEEDING MOLTEN GLASS

Filed May 5, 1919 8 Sheets-Sheet 5



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Att'y

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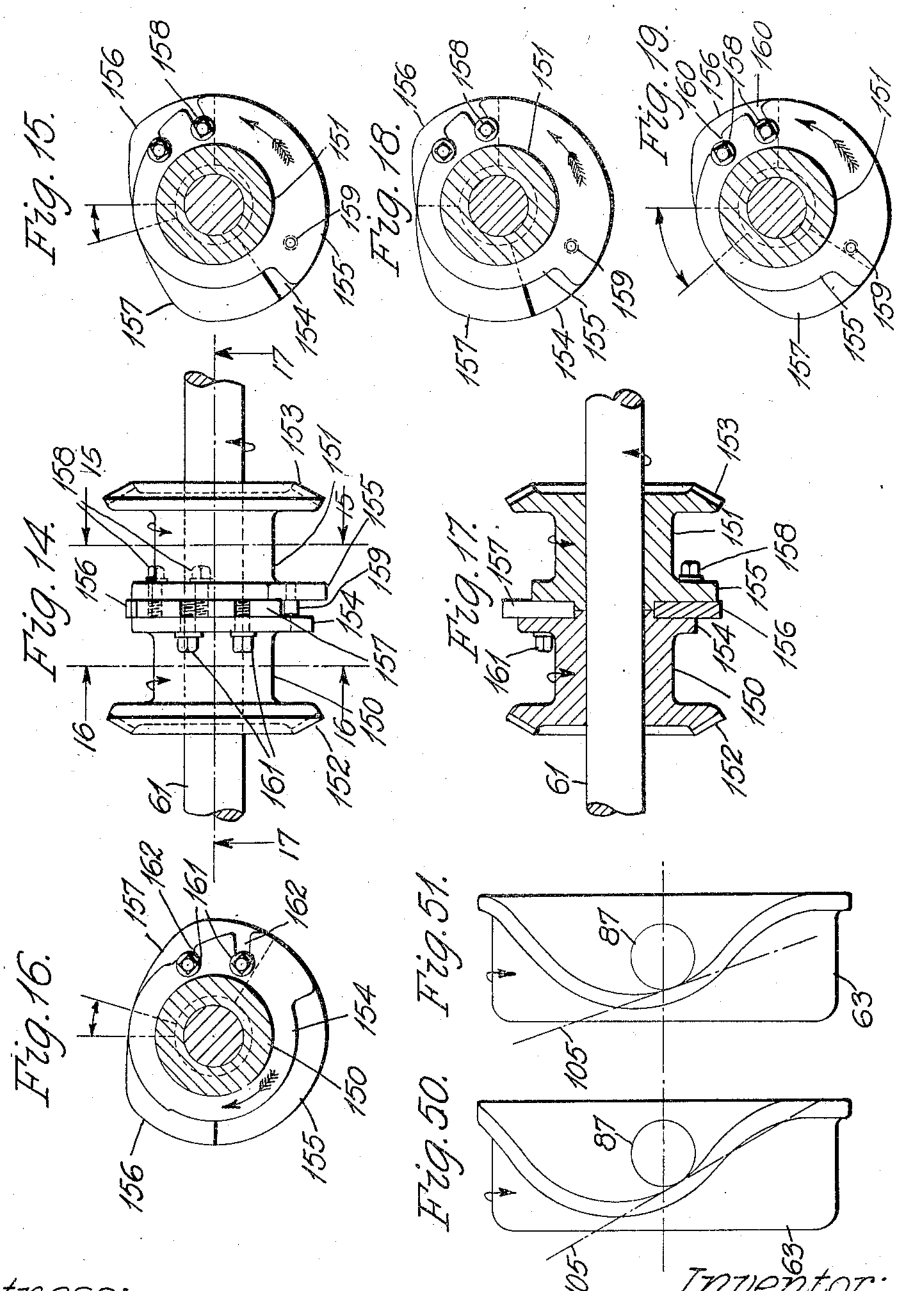
METHOD OF AND APPARATUS FOR FEEDING MOLTEN GLASS

Filed May 5, 1919 8 Sheets-Sheet 6



Witness:

E. L. Jarvis

Inventor:
Karl E. Peiler
by W. H. Honiss
Att'y.

K. E. PEILER

METHOD OF AND APPARATUS FOR FEEDING MOLTEN GLASS

Filed May 5, 1919 8 Sheets-Sheet 7

Fig. 41.

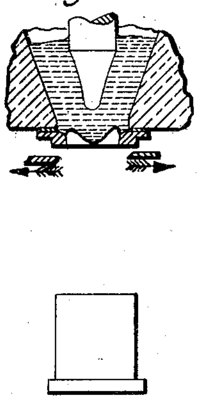


Fig. 42.

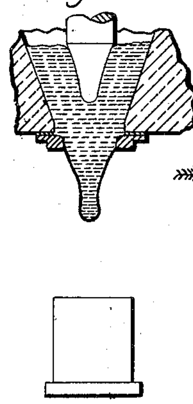


Fig. 43.

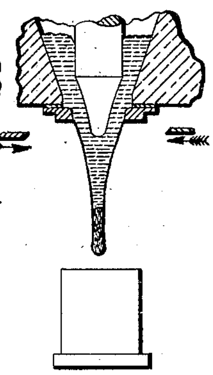


Fig. 44.

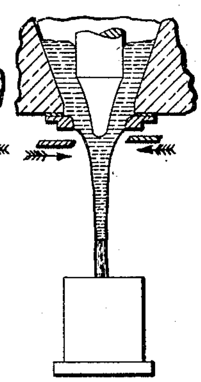


Fig. 45.

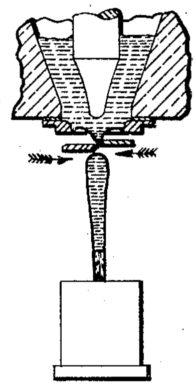


Fig. 46.

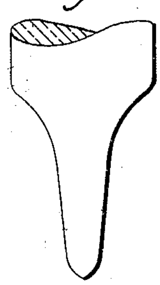


Fig. 47.

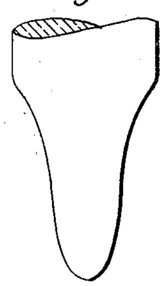


Fig. 48.

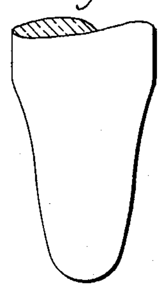


Fig. 49.

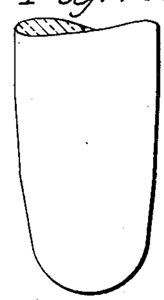


Fig. 21.

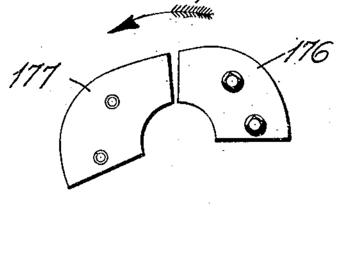
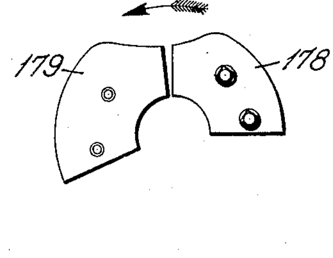


Fig. 22.



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Inventor:
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by Wm H Honiss
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Jan. 3, 1928. 1,655,391

K. E. PEILER

METHOD OF AND APPARATUS FOR FEEDING MOLTEN GLASS

Filed May 5, 1919 8 Sheets-Sheet 8

Fig. 23.

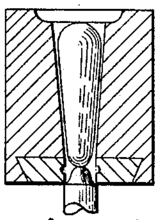


Fig. 24.

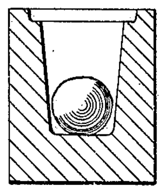


Fig. 25.

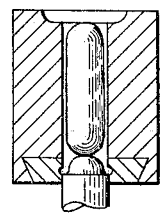


Fig. 26.

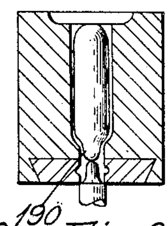


Fig. 27.

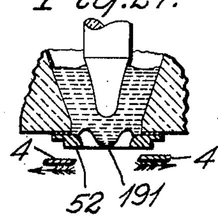


Fig. 28.

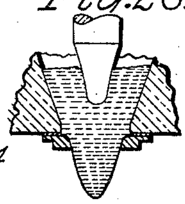


Fig. 29.

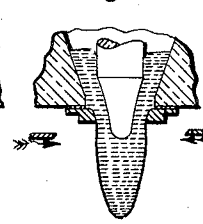


Fig. 30

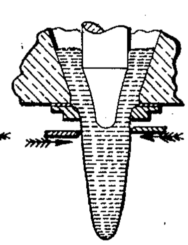


Fig. 31.

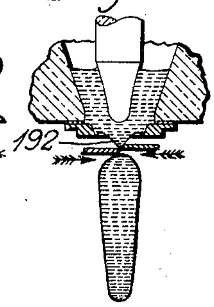


Fig. 32.

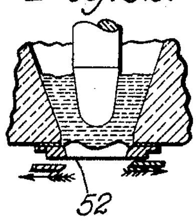


Fig. 33.

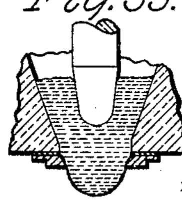


Fig. 34.

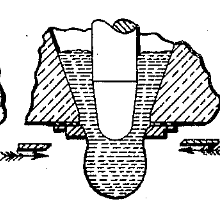


Fig. 35.

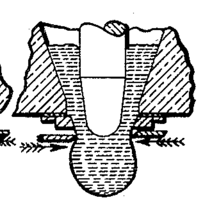


Fig. 36.

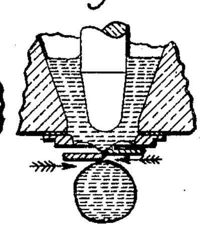


Fig. 37.

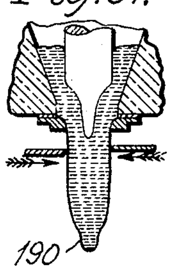


Fig. 38.

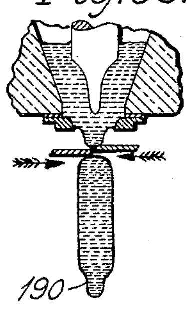


Fig. 39.

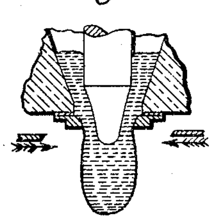
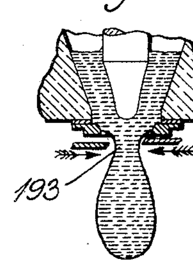


Fig. 40.



Witness:

E. L. Jarvis

Inventor:

Karl E. Peiler

by Wm H Honiss

Atty

Patented Jan. 3, 1928. **1,655,391**

UNITED STATES PATENT OFFICE.

KARL E. PEILER, OF WEST HARTFORD, CONNECTICUT, ASSIGNOR, BY MESNE ASSIGNMENTS, TO HARTFORD-EMPIRE COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF DELAWARE.

METHOD OF AND APPARATUS FOR FEEDING MOLTEN GLASS.

Application filed May 5, 1919. Serial No. 294,792.

This invention relates to the segregation and separation of molten glass into mold charges. It has for its object the production of mold charges of suitable form and homogeneity to be most advantageously used in glass shaping machines, and it comprises a method and apparatus whereby such mold charges may be preformed while segregating them from a supply of molten glass in a furnace or container, and before bringing their external surfaces into contact with relatively cold molds or other supporting or forming means, and whereby the form and size of such charges may be controlled and varied at will, and without destroying their uniform consistency by the unequal chilling action of external or relatively cold molds or other supports or forming means.

It is a prominent characteristic of molten glass, that when it issues or is withdrawn from the furnace or container, and is exposed to the colder surroundings outside of the furnace, it acquires a partially chilled surface or skin, known in this art as "enamel". This enamel is coldest and stiffest on its outer surface, and gradually merges into the hot and more plastic interior of the glass. When a charge of this glass is delivered to a mold, any undue stretching, rupture, or infolding of the enamel will cause defects in the article being made. Any trapping of air by the glass, due to lapping or folding of the surface of the glass as it is delivered to the molds will also cause defects. To avoid these defects it is desirable to pre-form the mold charge, before it enters the mold, so that its external contour will closely approximate the interior contour of the mold walls, or at least that portion of the mold which receives the gather. This is of special importance in the making of blown glassware. A mold charge which is to form a narrow necked bottle, for example, should be preformed as an elongated cylinder with a tapering end, so that its entire surface may as nearly as possible contact equally with the mold walls for the same length of time. Unequal contact of different portions of the surface, or unequal duration of contact of the different portions tends to produce an unsymmetrically chilled and enameled blank or parison, which will not blow out uniformly, because the hotter portions will stretch more than the cooler portions, resulting in a poor bottle having a wall of uneven thickness.

These conditions have evidently been recognized to some extent by the hand gatherer, practicing his ancient art, who by manipulation of his pontil or gathering rod during the gathering operation pre-formed his gather or mold charge, as well as he could by this primitive method, to fit the mold, or that portion of the mold that receives the gather, thus attempting to avoid undue deformation of the mold charge when deposited in the mold. On the other hand, these conditions have received little or no attention in the gathering or feeding of molten glass as heretofore practiced by machine or other automatic methods.

The present invention accomplishes this preliminary shaping of mold charges with greater ease and exactness than heretofore by the adjustable operation of suitable impelling means coacting with an orifice below which the mold charges are accumulated and suspended, and it employs the elongation of the suspended charges in controlling their shape. It also makes use of coaction between the impelling means and suitable severing means, convenient adjustments being provided to allow control of the severing means and impelling means as to relative time of operation, speed and position.

Various adjustments of the impelling means as well as of the severing means to control and vary the form of the gathers and mold charges during continuous operation, are herein described as operating adjustments, that is they may be made while the machine is in operation, thus allowing the maintenance of the flow of glass and the uniform heat conditions which are so essential in proper operation of glass feeding apparatus. Stopping of the machine to make adjustments would stop the flow of glass and would have the effect of allowing the glass to chill near the outlet and of changing the heat conditions. As a result the operating conditions would be changed so that the immediate effect of the adjustments could not be observed and employed as a guide in making these adjustments. In the present invention, on the other hand, these adjustments may be made while the apparatus is operating so that the progressive effect of these adjustments may be observed while they are being made, thus giving better control of the operation.

In the accompanying drawings:—

Figure 1 is a general front elevation of the apparatus with the lower part or base omitted.

Fig. 2 is a side elevation of the machine, shown partly in section, made approximately along line 2—2 of Fig. 1, with the shear mechanism omitted, and showing the glass furnace and its conduit for the molten glass.

Fig. 3 is a side elevation showing some of the shear mechanism.

Fig. 4 is a front elevation, showing the base of the machine.

Fig. 5 is a plan view in section along the line 5—5 of Fig. 7.

Fig. 6 is a front elevation taken partly in section along line 6—6 of Fig. 7 of the center portion of the machine and shows the impeller, outlet and shear carriers, with the right hand shear in place and the left hand shear omitted.

Fig. 7 is a side elevation taken in section along the center line of Fig. 6 with the shear mechanism omitted and shows the impeller drive connection and adjustments for stroke and position.

Fig. 8 is a front view of the right hand shear carrier and shear blade.

Fig. 9 is a plan view of the parts shown in Fig. 8.

Fig. 10 is a plan view in section taken on line 10—10 of Fig. 8.

Fig. 11 is an end elevation in section taken on line 11—11 of Fig. 8.

Fig. 12 is a sectional elevation taken through the right hand shear lever pivot of Fig. 1, and shows the adjustment for shear cutting speed.

Fig. 13 is a sectional plan along line 13—13 of Fig. 12.

Fig. 14 shows an elevation of the impeller driving cam with its driving gears.

Fig. 15 is a sectional elevation on line 15—15 of Fig. 14.

Fig. 16 is a sectional elevation on line 16—16 of Fig. 14.

Fig. 17 is a bottom view of a section on line 17—17 of Fig. 14.

Figs. 18 and 19 are elevations of the impeller cam partly in section similar to Fig. 15 showing extreme adjustments.

Fig. 20 shows a side elevation of the worm adjustment for the impeller cam.

Figs. 21 and 22 show different shapes of cam lobes for the impeller cam.

Figs. 23, 24, 25 and 26 show sectional elevations of various types of molds with charges of glass in them.

Figs. 27 to 31 inclusive are sectional elevations to illustrate steps in the formation of the mold charge shown in Fig. 23.

Figs. 32 to 36 inclusive are sectional elevations to show steps in the formation of the mold charge shown in Fig. 24.

Figs. 37 and 38 are sections showing steps in the formation of the mold charge shown in Fig. 26.

Figs. 39 and 40 illustrate in section the action of reducing the neck of a suspended gather before severing.

Figs. 41 to 45 inclusive are elevations, partly in section, showing steps in the formation of a more attenuated column of glass issuing as a stream.

Figs. 46 to 49 inclusive show various forms of impellers.

Figs. 50 and 51 show diagrammatic rear elevations of the right hand shear cam and roll.

The invention is herein shown embodied in a machine having the necessary mechanical movements and adjustments, and cooperating with a conduit projecting from a glass furnace, from which the molten glass is thus delivered in mold charges to an associated molding or shaping machine.

The molten glass flows from the glass furnace 1 through a channel or conduit 2 (Fig. 2) to an outlet 3. It is there acted upon by an impeller 13 mounted for vertical movement, and provided with various adjustments. As it issues periodically in regular cycles from the outlet, it forms successive gathers from which mold charges are severed by shear blades 4 reciprocating below the outlet. The separated mold charges fall upon a moistened chute 5 and slide upon it to the molds 6 mounted on the table 7 of the associated shaping machine (Fig. 5).

The channel 2 is made of refractory material surrounded on the bottom and sides by heat insulation 11. At the outer end of the channel is an outlet spout 12, the interior of which is shaped so as to coact with the impeller 13. This spout is held in an iron frame or case 14, which also serves as a retainer for the insulation 11, the spout being surrounded with insulation, except at the outlet 3.

The bed 15 is carried by the same foundation which supports the base of the machine. It serves to support the channel 2 by means of intermediate refractory supports 10 and carries two brackets 16 which are clamped thereto by screws 17 and which support the spout case 14. The brackets also carry set screws 18 which bear against projections on the spout case and hold the spout against the end of the channel. These screws may be adjusted to allow for expansion and contraction of the channel and spout. The brackets also carry removable drip pans 20 for receiving the cooling water dripping from the shear blades 4 and from the sprays 21.

Over the spout is a cover 22 of refractory material carried in a metal case 23 which also serves as a retainer for heat insulation 11, the metal plate 24 serving to keep the insulation in place. The plate 24 and cover 22 have openings through which the impeller projects. Back of this cover and over the channel is another refractory cover 25 formed so as to retain heat insulation 11 which is covered by a metal plate 26 to keep it in place.

The channel and spout are heated by suitable means, such as a gas burner 27, which projects through the side wall block 30. This burner is provided with air and gas valves 31 for regulating the flame, which partly fills the space over the molten glass. The products of combustion are carried off by the fire brick stack 32 carried on refractory lintels 33, which bridge the channel and are separated at their ends by refractory blocks. At the upper end of the stack is a damper 34 carried on a pivot 35 and adjustable through an arm 36, and connecting rod 37 having a handle at its outer end and provided with notches 38 engaging with a stop 40, thus allowing the damper to be set at any desired opening. By appropriately adjusting the burner and damper the proper temperature may be maintained in and over the channel and spout. The insulation acts to conserve the heat, and the radiation from the rear assists in heating the outlet end, thus tending to maintain a uniform temperature throughout.

A gate 41 for regulating the glass flow is suspended by links 42 from arms 43 fast on the shaft 44 at each end thereof. The right hand arm 43 bears a pointer 45 registering with a scale 46 to indicate the setting of the gate. A screw 47 carrying a hand wheel 50 bears against an extension 51 of the right hand gate arm 43, thus allowing the position of the gate to be adjusted by turning the hand wheel 50. The glass surface in the furnace 1 is preferably maintained at a higher level than that desired in the spout 12 and the level or head desired in the spout may be maintained by adjustment of the gate.

Clamped against the outlet block or spout 12 is an outlet ring 52 (Figs. 6 and 7) made of refractory material. This ring is carried in a metal holder 53 hinged by an open sided bearing 54 to allow ready removal, on a pivot 55 and is drawn up against an abutment by screws 56 (Fig. 5). Between the outlet ring and the spout is a packing 57 of refractory clay. The object of this construction is to allow the size of the outlet to be changed at will by easy and rapid change of the outlet rings. In practice an outlet ring of the size desired is placed in the holder and covered with sufficient plastic clay to form the packing 57. The holder is then hooked over the pivot 55 and drawn up against its abutment, squeezing the plastic packing into place.

The frame of the machine is carried by the base 58 (Figs. 3, 4 and 5) and surrounds the channel and spout. The base carries columns 60 with suitable bearings at their upper ends to carry the drive shaft 61 and pivot shafts. The drive shaft may be driven by a pulley 62 (Fig. 1) as shown and may be connected to a shaping machine by any suitable means for synchronizing its operations with those of this machine. The shaft 61 carries cams 63 for driving the shears and serves as a pivot for the impeller cams.

The shear blades 4 are notched as shown in Fig. 9. This allows them to enclose the glass and to constrict it on all sides as well as to cut it. For this reason they act to separate the glass partly by constriction and partly by cutting, thereby minimizing the shear mark on the severed glass.

The shear blades 4 are fastened to shanks 64 which are carried in adjustable heads or holders 65 (Figs. 8, 9, 10 and 11, which show the right hand holder), by means of which the blades may be adjusted up, down and sidewise relatively to each other and to the outlet 3, so as to sever the glass at the desired position and to operate to the best advantage. The shank 64 of each blade is removably held in a vertical slide 66 split in its lower portion at 67 (Figs. 10 and 11) and clamped by means of the clamp screws 70. The vertical slide 66 fits a guideway on a cross slide 71 as shown in Fig. 10 and may be adjusted up and down by means of the adjusting screw 72 by its hand wheel 73. The slide 66 may be clamped in place in its guideway by the screw 74 and clamp 75. The cross slide 71, which carries the vertical slide and its adjustment fits in a guideway 78 (Fig. 8), and may be clamped in place by the screw 76 and clamp 77, thus allowing the shear blades to be adjusted for transverse position and clamped to place. The shear blades may be adjusted endwise by moving their shanks in and out in their holders, either for the proper initial setting or for a controlling adjustment although a preferable operating adjustment is provided for this purpose. In this way the shear blades may be moved in three directions so as to bring them into proper relationship to the outlet and proper alignment with each other. To move the severing plane to a higher or lower level, both shear blades are adjusted up or down as desired, the proper cutting alignment between them being maintained by turning both hand wheels 73 the same amount.

The shear holders above described are carried on the ends of the carriers 80 guided between grooved guide rollers 79 pivoted on the columns 60, and are protected by the guards 81 projecting from these columns. The carriers 80 are moved toward and away from each other by means of levers 82 carrying at their lower ends rollers 83 which engage with slots 84 in the carriers. The shear levers are pivotally mounted on studs 85 and 86 carried on the columns 60. The upper ends of the shear levers are provided with cam rollers 87 which are held by suitable springs 90 against the shear cams 63 which are fixed on the main shaft 61, the cams being shaped to move the shear blades to and from each other to cut off the successive mold charges when formed.

The shears may be stopped in their retracted positions without stopping the rest of the machine by moving the hand lever 91 to the position shown in Figs. 3, 4 and 5. This rocks the shaft 92 and transmits the motion to shaft 93 by means of bevel sector 94 and bevel gear 95. This shaft carries two cams 96 against which bear the rollers 97 carried by the slides 98 so that the rocking of the shaft 93 raises or lowers them. These slides are connected by means of connecting rods 100 with the arms 101 which are pivoted on the studs 85 and 86 with the shear levers 82. These arms bear against the lower side of the shear lever extensions 102. In this way the shear levers may be positively held against the action of the springs 90 to hold the shears inactive in their retracted positions while the cams continue to rotate. By reversing the position of the hand lever 91, the arms 101 will be swung down and the shears will be allowed to resume normal operation. The hand lever 91 may be locked in position by means of the latch 103 worked by a knob 104.

For controlling the shape of the lower ends of the gathers, while the machine is in operation, an operating adjustment is provided for increasing or lessening the rapidity with which the shear blades cut through the glass, by using earlier or later portions of the contour of the shear cams (Figs. 50 and 51). These cams are shaped to give a gradually decreasing speed to the shear slides toward the inner ends of their strokes, so that by varying the point in the path of the slides at which severing begins the severing speed may be varied. For this purpose those portions of the pivot studs 85 and 86 which carry the shear levers 82 are made eccentric to the portions which are supported in the frame, the eccentricity of one pivot stud 86 being set downwardly (Fig. 12) and the eccentric portion of the other pivot stud 85 being set upwardly. This enables these eccentric pivotal supports for the shear levers to be adjusted toward or away from each other. When adjusted toward each other the shear blades meet and sever the glass at an earlier period, at a time when the respective cam rolls 87 are in contact with a steeper or more inclined portion of the cam contour, as shown in Fig. 50, so that the severing operation is performed quicker, and therefore in shorter time, thus making a blunter ended gather. On the other hand, when the eccentric portions of the studs 85 and 86 are turned outwardly, the shear blades meet and sever the glass at a later period in their stroke, at which time their respective cam rolls 87 engage with the less inclined contours of the shear cams 63, as shown in Fig. 51, thus severing the glass in a longer time, and therefore more slowly, and making a more pointed end on the gather. The dot-and-dash tangent lines 105 in Figs. 50 and 51 show the relative steepness of the cam contour at the two cutting points. The pivot studs 85 and 86 for the shear levers are turned to utilize their eccentric movements by means of levers 106 (Figs. 1, 12 and 13), which are connected by a rod 107 so as to turn both pivot studs at the same time and to the same extent; but on account of the oppositely arranged eccentricity of the studs, move the pivotal points of the levers in opposite directions. The connecting rod 107 may be adjusted for length by a right and left hand threaded nut 108. One of the levers is provided with a handle 110 for turning the eccentrics.

The scale 111 is provided to indicate the extent to which the eccentrics are turned. The scale is read in connection with the pointer 113 attached to the column and may be clamped in any desired position by the screw 112.

The shear blades are cooled between successive severing operations by means of water sprays 21 (Figs. 1 and 6), supplied by pipes 114 and regulated by valves 115. The water from the sprays strikes the blades in their retracted positions and is finally caught by the drain pans 20 from which the water is drained away.

The impeller 13 for timing and controlling the extrusion and formation of the gathers is made of refractory clay and is guided for vertical movement into or through the outlet ring in a line concentric with this ring by the guide shafts 116 and 117 sliding in bearings 120 and 121 respectively which are formed in the spout case (Figs. 2, 6 and 7). The guide shaft 117 carries an arm 122 to which a split holder 123 carrying the impeller is detachably and adjustably secured by clamp screws 124 which pass through elongated holes in the holder 123 to allow it to be slid in and out on the arm 122. This arm 122 is clamped to the shaft 117 by a screw 125 allowing it to be swung about the shaft. In this way the impeller holder 123 may be slid radially in and out from the shaft 117 or swung about it and clamped in position to bring the point of the impeller into alignment with the outlet, thus compensating for warping of the impeller or for variation in different impellers. The shaft 117 also carries an arm in which the guide shaft 116 is fastened. The lower end of this shaft comes opposite the scale 127 fastened to the spout case. This scale is graduated to indicate the position of the lower end of the impeller relative to the lower side of the outlet ring. The impeller is clamped in its holder 123 by screw 128, and may be quickly exchanged for another impeller of any desired shape. Various shapes of impellers for different effects are shown in Figs. 45 to 48 inclusive.

The impeller and its carrier are suspended by the connecting rod 130 and its pivots 131 and 132 from the lever 133 pivoted at its hub 134 on the shaft 135. This lever carries an adjusting screw 136 bearing a hand wheel 137. The end of this adjusting screw bears against another lever 138 also pivoted at its hub 140 on the shaft 135, so that both levers are guided side by side between fixed collars. The lever 138 has at its upper end a stud 141 carrying a cam roll 142 which is held against the impeller cam shown in outline at 143 in Fig. 7 by the weight of the impeller and its carrier. The impeller cam thus governs the rise and fall of the impeller. By turning the hand wheel 137 and revolving the adjusting screw 136 the relative angular position of the two levers 133 and 138 may be varied. The effect of this is to raise and lower the working range of the impeller movements. The impeller may also be held inactive in its upper position by turning the latch 144 carried by the lever 133 over the projection 145 carried by the shaft 146.

In addition to the height adjustment above described, the connecting rod 130 is made adjustable by means of a turn buckle, provided with right and left hand screw threads at its opposite ends, and connecting the upper and lower portions of the connecting rod. Check nuts are provided to clamp the parts tightly after the desired adjustment has been made. By turning the turn buckle, the connecting rod 130 may be lengthened or shortened and the working range of the impeller lowered or raised, as desired. This adjustment may be used in place of, or in addition to the hand wheel adjustment above described.

The impeller 13 may be held inactive at lower positions projecting into the glass at the outlet, or even through the outlet, by adjusting the connecting rod 130, which connects the impeller 13 with the lever 133 and operating the latch 144. By thus holding the impeller inactive at its lower positions and adjacent the outlet, the gravity outflow of the glass can be timed and shaped for various forms of gathers by operating the severing means only.

The length of stroke of the impeller may be varied by sliding the pivot 131 of the connecting rod 130 in the slot 147 provided in the lever 133. This changes the effective length of the lever. This pivot 131 is provided with a nut by means of which it may be clamped in any desired position as indicated by graduations along the slot 147 to give the impeller the desired length of stroke.

The impeller cam is composed of several parts as shown in Figs. 15 to 19 inclusive. The sleeves 150 and 151 are loose on the main drive shaft 61 and are provided with bevel gears 152 and 153 respectively at their outer ends, and with flanges 154 and 155 at their inner ends. These flanges form part of the cam surface and also hold removable cam lobes 156 and 157 which serve to govern the rise and fall of the impeller respectively. The lobe 156 which raises the impeller, is carried by the right hand flange 155 and is removably secured to it by clamp screws 158 which enter the slots 160 therein and serve to locate the lobe. The left hand flange 154 carries the lobe 157 which governs the fall of the impeller. This lobe is also detachably secured to the flange 154 by means of clamp screws 161 which enter the slots 162 therein and thus locate the lobe. By this arrangement the two cam lobes can be revolved about the shaft independently of each other so that their angular position relative to each other and around shaft may be varied within certain limits. For instance Figs. 14 to 17 inclusive show the lobes set 17½ degrees apart, while Fig. 18 shows them set close together. Fig. 19 shows them separated to a maximum of 40 degrees, a pin 159 being provided to prevent separating them beyond the allowable limits.

The main drive shaft 61 revolves in the direction of the arrow shown on the drive pulley 62 (Fig. 1) and drives the bevel gears 163 and 164 which are fastened to it. These bevel gears drive the pinions 165 and 166 which in turn drive the bevel gears 152 and 153 thus rotating the sleeves 150 and 151 with their cam parts, respectively. The pinions are mounted for rotation on holders 167 (Fig. 20), which are revolubly mounted on the main shaft 61 and provided with worm wheel sectors 170. These sectors are engaged by worms 171 (Fig. 20) carried on shafts 172 which are provided with hand wheels 173 and 174 respectively. By revolving the hand wheels the pinion holders 167 are rotated about the shaft 61 thus moving the sleeves 150 and 151 relative to the driving gears 163 and 164, respectively. This has the effect of angularly advancing or retarding the sleeves 150 and 151 bearing the cam lobes 156 and 157. In this manner the lobes may be set to act at any desired time relative to the shears and to each other. By turning the right-hand hand wheel 174 the right hand sleeve 151 is advanced or retarded, thus advancing or retarding the cam lobe 156 by which the impeller is raised. By turning the left-hand hand wheel 173 the cam lobe 157, which governs the fall of the impeller, is advanced or retarded. By properly turning both hand wheels the same amount both lobes as a whole may be advanced or retarded, correspondingly changing the time of the impeller operations relative to the time of the shear operations. In this manner the various characteristics of the impeller action may be varied, and its operating period may be advanced or retarded relative to the severing operation. For visibly indicating these adjustments of the impeller cams, the shafts 172 are provided with gear teeth meshing with teeth on the indicator dials 175 which register with the pointers 180.

One effect of advancing or retarding the cam lobe 156 by which the impeller is raised, is to make the up stroke of the impeller earlier or later relative to the severing operation. The rapidity of the rising movement of the impeller during the severing operation may thus be varied by taking advantage of the contour of the cam lobe 156 which is preferably shaped to give a gradually increasing speed to the impeller during the first part of its up stroke. By advancing the cam lobe 156 relatively to the shear cams the impeller may be made to rise more rapidly during severing and by retarding this lobe the impeller may be made to rise more slowly during severing. This cam lobe may also be set so that the impeller begins to rise after the severing is partially or entirely completed.

The characteristics of the impeller stroke may be still further altered by substituting other cam lobes which provide a rise or fall of any desired character. The cam lobes 176 and 177 shown in Fig. 21, for instance, give a rise and fall extending over a longer period than those in Fig. 15. The lobes 178 and 179 shown in Fig. 22 give a quicker rise and fall than those shown in Fig. 15. These lobes are arranged so as to be readily changed by simply loosening the clamp screws which are carried by the lobes, and substituting other lobes.

The chute 5 is formed of porous material such as carbon and is placed in a sloping position as shown in Fig. 2 with its upper end under the outlet 3 to receive the separated mold charges, and with its lower end over the mold charging station of the shaping machine as shown in plan in Fig. 5. The chute is supplied with water through a flexible tube 181 which connects with a recess 182 (Fig. 6) formed in the upper end of the chute. A valve 183 regulates the water supply. Sufficient water is supplied to moisten the chute. When the glass falls on the chute the water is turned to steam where the glass touches it, so that the glass slides freely and rapidly down the chute on a film of steam and drops into the mold 6. The chute is supported on vertical pivots so mounted that it may be swung out of or into the glass receiving position to interrupt or begin the delivery of the mold charges to the molds as desired. When the chute is swung out, the glass drops through an opening in the base 58 into a suitable receptacle.

In operation the gate 41 is raised to the proper point to maintain the desired head of glass over the outlet and the machine is set in motion, reciprocating the impeller and the shears. The molten glass issues from the outlet under the combined influence of gravity and the action of the impeller, which times and controls its accumulation in gathers which are successively suspended from the outlet ring and from the impeller end. For each complete reciprocation of the impeller there is a reciprocation of the shears which sever a mold charge from each suspended gather. After each severing operation the freshly cut end or stub remaining below the outlet and forming the lower end of the succeeding gather, is moved upwardly or its downward movement is retarded by the action of the impeller.

By using appropriate sizes of outlet ring and impeller and by proper setting of the various adjustments, the shape of the top, body, and lower end of the mold charge may be varied separately at will as hereinafter described.

The size of the outlet ring is chosen with relation to the general shape of the body of the mold charge, a smaller diameter outlet being used for a long mold charge than for a short charge. For a nearly spherical charge a larger diameter outlet is used than for a longer cylindrical charge. The relation of the diameter of the gather to the outlet size depends partly on the speed of the machine and the viscosity of the glass, as these influence the elongation and consequent reduction in diameter of the glass column issuing from the outlet. In general a higher speed requires a larger outlet than a slower speed does, while greater viscosity requires a larger outlet than a lower viscosity would.

The size of the impeller end depends to a certain extent on the size of the outlet used, since the impeller and outlet coact to produce effects hereinafter described. The larger the outlet, the blunter the end of the impeller may be, other conditions being equal. The size of the impeller end also depends on the general shape of the mold charge desired. For a short compact charge a blunter ended impeller is preferably used, while for a more elongated charge a more pointed impeller is preferred.

The weight or quantity of the mold charge may be regulated by the gate, which determines the depth of glass over the outlet. Raising the gate gives a heavier charge and lowering it decreases the weight of the charge.

The impeller acts upon the glass partly by displacement and partly by adhesion of the glass to it. In explanation of the displacement action, it is pointed out that, as shown by a comparison of Figs. 28 and 29, for example, the impeller, when depressed as shown in Fig. 29, constricts the annular flow area in the well, in the bottom of which is the outlet 53, with a consequent increase in the resistance to flow of glass therethrough. This increase of resistance, in one aspect, results in decreasing the static head effective at the outlet to cause the issue of glass from the outlet, and hence would result in a decrease of the rate of the flow as the impeller moves down were it not for the fact that the rate of the impeller movement may be so great that the downward displacing action occurring in the well is sufficient to cause a rate of extrusion of the glass which at least compensates for the reduced flow due to decrease of effective static head. Such increased discharge due to displacement may greatly exceed the normal gravity flow through the outlet which would occur if the implement were not present. The displacing action of the plunger is assisted in accomplishing this increased rate of extrusion by the fact that, as the area of the circular flow passage in the well and around the impeller is decreased, with the attendant increase in the resistance to flow therethrough, the proportion of glass which is displaced by the lower end of the impeller and which flows through the outlet increases in comparison to that which moves upwardly. Consequently as the impeller moves downward it gives a downward or extrusion impulse to the glass issuing from the outlet. This extrusion impulse aids the gravity head at the outlet and increases the rate of discharge of the glass. As the impeller moves upward it gives an upward or intrusion impulse to the glass within and below the outlet. This intrusion impulse opposes the gravity head at the outlet, tending to retard the discharge of glass from the outlet, and may be made to reverse the motion of the glass within and below the outlet, raising it up to an extent depending on the extent and strength of the impulse. The impeller also furnishes part of the support for the glass below the outlet, this support being greatest when the impeller protrudes below the outlet and less for higher positions of the impeller. As the impeller rises it gradually withdraws this support, transferring more of the weight of the suspended glass to the outlet. Another effect of projecting the impeller below the outlet is to enlarge the neck of the suspended gather by the displacement. This also increases the amount of support.

The downward or extrusion impulse of the impeller may be used to control the shape of the body and upper end of the gather and its resulting mold charge. This impulse tends to increase the diameter of the suspended and elongating glass, in proportion to the extent and strength of the impulse. By adjusting the hand wheel 173 to advance the cam lobe 157 the extrusion impulse comes earlier which tends to increase the diameter of the body of the gather rather than the diameter of the upper end only. By retarding the impulse it tends to enlarge only the upper end of the gather. Increasing the extent of the downward impulse, which may be done by lengthening the impeller stroke, tends to enlarge more of the gather, as for instance both the body and the upper end. The strength of the impulse may be varied by varying the working position and size of the impeller and by varying the character of its downward stroke. A lower position tends to give a stronger impulse and vice versa. A larger or blunter impeller also gives a stronger impulse. By changing the cam lobe 157 the character and duration of the downward stroke and therefore of the extrusion impulse may be varied. A faster downward stroke of shorter duration increases the strength of the impulse but applies it locally to a more limited portion of the gather. The decrease in diameter of the gather due to its elongation by gravity may thus be compensated for to any extent. By shaping the cam lobe so as to increase or decrease the relative speeds of the downward stroke at different parts of this stroke a variety of effects may be secured, allowing more varied control of the shape of the gather. In this manner by use of the proper parts and by proper setting of the various adjustments the shape of the body and upper end of the gather and its resulting mold charge may be varied.

By turning the hand wheel 174 and setting the cam lobe 156 to raise or reverse the glass adjacent to the outlet while the shears are severing, the upward or intrusion impulse of the impeller, coacting with the constricting and severing action of the shears may be used to vary the shape of the lower end of the gather and its resultant mold charge. The contour of the cut glass surface may be varied by varying the cutting speed of the shears as previously described so that the shape of the stub and therefore of the end of the succeeding mold charge may be controlled. By having the shears cut as quickly as possible during the raising of the stub, a blunt ended stub is obtained. By having them cut more slowly, as the glass forming the stub is raised by the intrusion impulse, a more pointed stub is obtained. The raising speed of the glass may also be varied by advancing or retarding the intrusion impulse and taking advantage of the gradual increase in upward speed of the impeller during its stroke due to the shape of the cam lobe 156. This is similar to the described manner of varying the shear speed during severing. By setting the cam lobe 156 so that the impeller does not rise until after the shear blades have entered the glass a shoulder may be formed at the lower end of the gather. (Figs. 37, 38.) This shoulder may be made more or less abrupt by adjustment. In this manner various combinations of raising and cutting speeds may be obtained, allowing the shape of the lower end of the mold charge to be varied.

The up stroke of the impeller and its resulting intrusion impulse may also be used to vary the shape of the gather above the part formed by the severing operation. The initial formation of the stub by cooperation between the intrusion impulse and the shears has already been described. The further elongation, due to its weight of the stub and of the portion of the gather above the stub may be varied or its effect may be compensated for by varying the character of that part of the up stroke taking place after severing. For instance, by retarding the discharge of the glass the lower part of the gather may be allowed to elongate before the remainder of the gather is allowed to form. This elongation decreases the diameter of the elongated part. By diminishing the retardation and allowing a greater discharge of the glass, the lower part of the gather may be increased in diameter. Increasing the length of the impeller stroke increases the extent of the intrusion impulse. The strength of this impulse may also be increased by lowering the working position of the impeller. The character and duration of the stroke may also be varied by changing the cam lobe 156. A faster up stroke increases the strength of the intrusion impulse but applies it to a more limited portion of the gather by shortening its duration. By forming the cam lobe to change the relative speeds at different portions of the up stroke, various effects may be secured. For instance, the first part of the up stroke may be made fast enough to secure the proper shape of stub while the remainder of the stroke may be made to give any desired retardation to the glass. Thus the impeller might be held stationary for a certain period, before completing the remainder of the up stroke. This gives a varied control over the shape of the gather, and especially over the shape of its lower portion.

One effect of raising the glass below the outlet during and immediately after the severing operation is to keep it out of contact with all parts of the shear blades except the immediate cutting edges. This minimizes the chilling of the glass from the relatively colder shear blades and also aids in keeping the blades cooler. It is therefore preferable to operate this device with such adjustments as will allow the cut surface of the glass to be raised clear of the shear blades during and after severing.

By raising or lowering the shears they may be made to sever the glass at a higher or lower level, leaving a shorter or longer stub respectively. This length of stub has an influence on the length of the gather. A longer stub tends to elongate the gather and a shorter stub tends to produce a shorter gather. This influence extends to the lower part of the gather especially.

By properly combining all the variable adjustments and allowing for or making use of the elongation and decrease of diameter of the gather during its accumulation and suspension, the shape of the gather and its resulting mold charge may be varied to suit various types of molds to which the mold charge is to be delivered. Some examples of this variation are shown in Figs. 23 to 26 which represent various molds containing mold charges which have just been delivered to them. Fig. 23 for instance, shows a blank mold for a narrow neck bottle with a gradually sloping shoulder. It is a mold of the type in which the blank is formed in an inverted position, the formed blank being reverted for blowing to final form. The mold charge for this mold is largest at the upper end, tapering down gradually toward the lower end, being nearly a frustum of a cone. This charge fits the mold closely, tending to form a good blank when the forming pressure is applied. Fig. 24 shows a press mold in which a tumbler is to be pressed. The mold charge for this mold is made chunky and compact, so as to settle down and fill the lower end of the mold as soon as possible after delivery. This allows the pressing plunger to act on the glass to the best advantage. Fig. 25 shows a blank mold for a wide mouth bottle of cylindrical form. The mold charge for this is made as nearly cylindrical as possible so that it fits the mold closely and quickly fills out the lower portion of the mold when the forming pressure is applied. Fig. 26 shows a blank mold for a narrow neck bottle having an abrupt shoulder below the neck. The mold charge for this differs from the mold charge shown in Fig. 25 by having an elongation or point 190 formed at its lower end to fit the neck portion of the mold.

The steps in the formation of the mold charge required for the mold of Fig. 23 are shown in Figs. 27 to 31 inclusive. A portion of the outlet block or spout is shown in section, with the outlet ring 52 below it. A medium sized impeller shaped at the end like Fig. 48 is shown. The shear blades 4 are shown diagrammatically and the arrows beneath them indicate the direction of their motion. The cutting speed of the shears and the raising speed of the glass below the outlet are set so as to shape the stub to give the desired shape to the end of the gather in connection with the elongation later given it. The shape of the cut resulting from this setting is shown in Fig. 31 where the shears have just completed severing. The shape of this cut is the result of the molten of the shears combined with the upward motion of the glass imparted by the impeller moving upward during the cut. In Fig. 27 the stub is rounded out at the point 191 and is beginning to elongate. At the same time the entire stub has been raised into the outlet by the upward motion of the impeller which is still moving upward to retard the glass. In Fig. 28 the impeller has reached its upper position and pauses there while the glass is discharging from the outlet to form the body of the gather. When the glass has assumed the shape shown in Fig. 28 the impeller starts to move downward, accelerating the discharge of glass through the outlet as it approaches its low position shown in Fig. 29. Here the upper end of the gather is shown swelled out by the accelerated discharge of the glass. The impeller remains in this low position for a definite time while the gather elongates. It then starts to rise and has risen to the point shown in Fig. 30, when the shear blades make contact with the glass. The severing then commences and takes place during the interval between Fig. 30 and Fig. 31 while the upward motion of the impeller raises the glass to form the point 192 of the stub by cooperation with the shears.

The steps in the formation of the mold charge shown in Fig. 4 are shown in Figs. 32 to 36 inclusive. The impeller for the compact charge desired is made blunter than in the previous example, being like that shown in Fig. 49. The outlet ring 52 is also made of a larger diameter, to give the necessary increased diameter of gather. The shears are set to sever more quickly so as to produce a stub which is blunt when rounded out, as shown in Fig. 32 where the impeller is moving upward. In Fig. 33 the impeller has reached its upper position and the body of the gather is discharging through the outlet. The impeller then starts to move downward and is shown still moving downward in Fig. 34, having, by its downward impulse, swelled the gather as shown. This swelling action is continued by the continued downward motion of the impeller until the shears contact with the glass as shown in Fig. 35. The impeller cam is set so that the impeller starts up immediately after reaching the position shown in Fig. 35. The severing operation takes place between the positions shown in Figs. 35 and 36. The effect of the impeller cam adjustment, both for character of the stroke and for relative time, is to continue swelling the gather until the severing operation starts and then to allow a minimum time for elongation of the gather before or during severing so that a short compact spheroidal gather is produced.

Figs. 37 and 38 illustrate the modifications employed to obtain the mold charges shown in Fig. 26. There a more pointed impeller is used, the one shown in Fig. 46 being employed. The orifice ring is chosen of the proper size to form the body of the gather. The shears are set lower down than in the first example, namely Figs. 27 to 31, to form a longer stub. They are also set for slower cutting speed than in this first example and the impeller is set to rise later to give the shapes of shoulder and point shown. The impeller stroke is set so as to allow the proper elongation of this point and after this to give a cylindrical body to the gather by the proper amount of additional impulse to the glass.

The mold charge shown in Fig. 25 is like the body of the charge shown in Fig. 26, the point 190 of Fig. 26 being absent. To form this charge the shears are set to cut more rapidly than for the charge of Fig. 26. The impeller is also set to give slower rise to the glass during severing. This gives the blunter point shown.

Figs. 39 and 40 illustrate a setting of the impeller stroke by which the impeller moves upward rapidly enough before the severing operation starts, to form a reduced neck 193 above the gather before it is severed. This gives an approximately pear shaped gather. It also avoids the severing of a large column of glass.

Figs. 41 to 45 inclusive illustrate the delivery of mold charges at such speed and temperature that the glass issues from the outlet in a more elongated column breaking into a stream between interruptions. Here the impeller is moving upwardly in Figs. 44, 45 and 41, having reached its upper position in Fig. 42. It then moves downward to accelerate the flow of glass and reaches the lower position in Fig. 43 after which it begins to move upward again. The effect is to withdraw or retract the stub of glass and interrupt the downward flow as shown. It also tends to compact and round the end of the stream and to make the mold charge as compact as possible under the circumstances. It thus aids in minimizing the difficulties due to lapping and folding of the charge when it settles in the mold.

One of the advantages of the illustrated embodiment of the invention over that type of glass feeding machine which employs a relatively large impeller or plunger, is in the more uniform heat distribution in the mold charge. This desirable result is obtained by the use of an impeller of comparatively small diameter which greatly reduces the screen or shadow effect of a larger impeller, which cuts off the direct radiation of heat from the furnace in the rear to the front of the forehearth, and thereby produces a chilled zone on the front of the mold charge. By the use of a small impeller as described, this chilling of the glass is reduced to a minimum and to all practical purposes entirely removed.

The organized machine shown and described herein as a preferred embodiment of this invention is only one of many possible embodiments of the invention. It should be understood that the various features of the invention may be modified, both in structure, combination, and arrangement, to adapt the invention to different uses or different conditions of service. The vertically reciprocating impeller 13 disclosed herein is shown associated with a primary impeller or paddle in a companion application Serial No. 294,793, filed on the same day as the present application. In that application Serial No. 294,793, and in divisions thereof, there are claims directed to the associated use of the two impellers, while the present application is concerned with the use of the vertical impeller without the paddle. The vertical impeller of the copending application 294,793 is used in the manner described herein for producing the various forms of mold charges described above, some of which are shown in Figs. 23 to 40 of the drawing of the present application.

The action of the vertical impellers of these two applications is also similar in certain respects to the action of the impeller shown and described in another copending application filed by me December 4, 1916, Serial No. 134,828. Therefore, the present application is a continuation of my application Serial No. 134,828 as to certain of the appended claims.

I claim:—

1. In the manufacture of glassware, the method of delivering, to successively presented molds, continuous series of similar and compact charges of molten glass of shape and weight appropriate to the particular molds to be fed, which method comprises superimposing a sufficient head of molten glass, of proper viscosity for suspension in mold-charge masses, upon a delivery orifice of a proper contour and area to permit the feeding of charges appropriate to the molds to be fed, and, for each mold charge, discharging the glass through said orifice, reciprocating a discharge-controlling implement toward and from said orifice to determine selectively the shape of the discharged glass suspended beneath said orifice, and severing a mold charge from the discharged glass before the shape imparted to the discharged glass is lost and before the discharged glass receives any substantial under-support.

2. The method of feeding molten glass from a parent body in a succession of similar mold charges, that comprises flowing glass downwardly from the parent body around the lower end of a reciprocating discharge-controlling implement and through a submerged outlet completely enclosing the issuing glass, the glass being in a condition suitable for working and of such viscosity that a compact mass of glass at least equal to a mold charge is accumulated by suspension of the issuing glass beyond the outlet, and shearing a mold charge from the pendant mass at a level spaced below the outlet while the glass is still suspended and prior to its reception in any receptacle, and repeating the several operations in regular cycles.

3. The method of obtaining mold charges of molten glass, which comprises suspending successive masses of the glass from a plurality of supporting members having a periodic relative movement, and shearing a mold charge from each mass while it remains suspended without substantial under-support.

4. The method of forming and separating molten glass into mold charges, which comprises discharging successive masses of the glass through an outlet and suspending each mass from the outlet and from coacting supporting means, then moving said supporting means to assist in determining the shape of each suspended mass, and shearing a mold charge from each mass while it remains suspended.

5. Apparatus for feeding and receiving mold charges of molten glass, comprising a container for molten glass having a discharge outlet submerged in the glass in said container, a periodically reciprocating implement projecting into the glass toward said outlet and cooperating with said outlet to expel glass intermittently through said outlet, reciprocating mechanical shears comprising two cutting members both spaced below said outlet and arranged to sever mold charges suspended beneath said outlet, and a charge-receiver having its glass-supporting surface spaced below the said shears at a distance

greater than the length of the suspended mold charges when severed.

6. The combination, with apparatus for segregating mold charges of molten glass including a container for the glass having a discharge outlet and shear operating below the outlet, of vertically reciprocating means coacting with the outlet to suspend beneath the outlet successive accumulations of the glass, each at least equal to a mold charge and a charge-receiver having its glass-supporting surface spaced below the said shears at a distance greater than the length of the suspended mold charges when severed.

7. Apparatus for separating molten glass into compact mold charges of controllable weight, including a furnace for supplying molten glass, a discharge chamber connected with the furnace by a supply passage and provided with a submerged discharge outlet, manually adjustable control means controlling the effective size of the supply passage to regulate the depth of glass over the discharge outlet and the weight of the mold charges, an implement projecting downwardly into the glass and movable toward and from the outlet, means for reciprocating the implement periodically to form and selectively control the shape of a succession of compact masses of the glass beneath the outlet, and movable shear blades meeting periodically beneath the outlet, in timed relation to the motion of the implement, to shear a mold charge from each suspended mass and a charge-receiver having its glass-supporting surface spaced below said shears at a distance greater than the length of the suspended mold charges when severed.

8. In apparatus for separating molten glass into mold charges, a container for the glass having a submerger outlet, shears adapted to open and close below the outlet to sever mold charges suspended therebeneath, a vertically movable rigid implement projecting downwardly into the glass in working alignment with the outlet, means for so moving the implement downwardly during the issue of each mold charge, and upwardly after the issue of said charge, that each charge will be produced and selectively shaped in suspension by the movement of the implement, means operating in timed relation to the motions of the implement for closing the shears to sever each suspended charge from the glass above the severing plane and a charge-receiver having its glass-supporting surface spaced below said severing plane at a distance greater than the length of the suspended mold charges when severed.

9. The method of forming a mold charge of molten glass of desired shape, appropriate to the mold in which it is to be fabricated, which comprises discharging glass downwardly through an outlet and modifying the rate of the discharge by applying to the glass, above the outlet, a force which modifies gravity to produce a rate of discharge for any portion of glass being discharged, proportionate to the desired diameter of that portion and to the tendency of the weight of the previously discharged portions to elongate that portion, maintaining the discharged glass in a suspended mass, and then severing a mold charge from the suspended mass.

10. The method of forming a mold charge of molten glass of predetermined artificial shape controlled at will and appropriate to the mold in which it is to be fabricated, which comprises extruding molten glass through an outlet submerged in a glass supply, and so varying the extrusive pressure applied above the outlet, during the extrusion of the charge, and in accordance with the desired cross-sections of the charge at different points along its length, as to impart the desired contour to the charge.

11. The method of feeding, from a parent body of molten glass, a succession of uniform mold charges, appropriate in size and shape to the molds in which they are to be fabricated, that comprises so periodically flowing glass from the parent body through a discharge outlet submerged by the parent body as to form a mass of glass pendant beneath the orifice, and entirely suspended from above, shaping each pendant mass by applying to the glass, above the outlet and in a predetermined manner during the formation of each mold charge, a force which modifies gravity to change the rate of flow through the outlet, and, when the mass is formed to the desired shape, severing a mold charge from the pendant mass at a level spaced below the plane of suspension of the mass, and repeating the several steps in regular cycles.

12. The method of forming mold charges of molten glass that comprises causing glass to flow downwardly through a discharge opening submerged by the parent body of glass, applying intermittent extrusive impulses to the glass above the opening to increase its rate of discharge from the said opening, and, after each impulse, severing a mold charge from the glass at a level spaced below the said opening while the discharged glass is hanging freely below the opening.

13. The method of feeding, from a parent body of molten glass, a succession of similar mold charges appropriate in size and shape to the molds in which they are to be fabricated, that comprises periodically flowing glass from a parent supply body through a discharge outlet submerged by the parent body, under a pressure so low as to form a mass of glass pendant beneath the outlet and entirely supported from above, shaping each pendant mass by then increasing, dur-

ing the formation of each charge and in a predetermined manner, selected in accordance with the desired shape of that mold charge, the force applied above the outlet and under which the glass issues from the outlet, severing a mold charge from the pendant mass, at a level spaced below its plane of suspension, when formed to the desired shape, and repeating the said steps in regular cycles.

14. The method of feeding, from a parent body of molten glass, a succession of similar mold charges appropriate in size and shape to the molds in which they are to be fabricated, that comprises periodically flowing glass from a parent supply body through a discharge outlet submerged by the parent body, under a pressure so low as to form a mass of glass pendant beneath the outlet and entirely supported from above, shaping each pendant mass by then progressively increasing, during the formation of each mold charge, the force applied above the outlet and under which the glass issues from the outlet, such increased force being sufficient to compensate fully for the tendency of the issued glass to attenuate by its own weight, severing a mold charge from the pendant mass, at a level spaced below its plane of suspension, and repeating the said steps in regular cycles.

15. In the method of feeding molten glass from a parent body through a submerged discharge outlet in a succession of similar mold charges appropriate in size and shape to the molds in which they are to be fabricated, and each suspended in a compact mass beneath the outlet, and connected with the parent body through the issuing glass, the steps of determining the shape of each suspended mass by applying directly to the glass adjacent to and above the outlet, and without interrupting the continuity of the connection, a force acting to extrude glass from the outlet and progressively increasing during the issue of the glass, severing a mold charge from the pendant mass of glass, at a level spaced below its plane of suspension, when the mass is formed to the desired shape, and repeating the several steps in regular cycles.

16. The method of feeding molten glass from a parent body through an outlet connected by a restricted passage with the parent body, that comprises flowing glass from the parent body through the passage and into suspension below the outlet, the suspended mass being connected with the parent body through issuing glass, determining the shape of each suspended mass by a displacing action on the glass in the passage and by simultaneously increasing the resistance to the flow of the glass in the passage between the point at which such action is applied and the parent body so that a compact mass of glass at least as great as a mold charge is accumulated by suspension of the issuing glass beneath the outlet, severing a mold charge from the pendant mass of glass, at a level spaced below its plane of suspension, when the mass is formed to the desired shape, and repeating the several steps in regular cycles.

17. The method of delivering molten glass from the outlet of a container in similar mold-charge masses of controlled shape appropriate to the molds in which they are to be fabricated, that comprises discharging the glass through said outlet under the control of a reciprocating implement which accelerates the discharge of the glass to a sufficient extent and at the proper time to shape the glass, while hanging below said outlet, into an elongated mass at least as great as a mold charge.

18. The method of feeding molten glass in a regular and uniform succession of suspended and freely dropped mold charges appropriate in size and shape to the molds in which they are to be fabricated, that comprises discharging the glass for each mold charge downwardly around an implement and through a restricted passage having a discharge outlet, moving the implement downwardly in the glass toward the outlet, during the discharge of each mold charge, so as to increase the resistance to the discharging movement of glass in said passage but at such speed as to accelerate the discharge of glass through said outlet notwithstanding such increased resistance, and shearing a mold charge from each discharged mass of glass.

19. The method of obtaining mold charges of molten glass from a supply thereof, by extrusion through an aperture and by severance, which comprises severing each charge of glass from the supply while such charge is hanging freely and before it is received in any receptacle, stopping or retarding the extrusion of the glass through the extrusion aperture after each severing operation, starting a separate extrusion of glass for each charge at a definite instant prior to each severing operation, and then increasing the rate of extrusion of the glass for that charge by forcing a plunger downwardly into the mass of glass above the extrusion aperture to compensate at least partially for the increasing tendency of the glass to attenuate by reason of the weight of the already extruded glass.

20. The method of obtaining mold charges of molten glass from a supply thereof, by extrusion through an aperture and by severance, which comprises severing each charge of glass from the supply while such charge is hanging freely and before it is received in any receptacle, stopping or retarding the extrusion of the glass through

the extrusion aperture after each severing operation, starting a separate extrusion of glass for each charge at a definite instant prior to each severing operation, and then progressively increasing the rate of extrusion of the glass for that charge by forcing a plunger downwardly into the mass of glass above the extrusion aperture to compensate fully for the increasing tendency of the glass to attenuate by reason of the weight of the already extruded glass.

21. The method of obtaining mold charges of molten glass from a supply body thereof, by extrusion through an aperture and by severance, which comprises severing each charge from the supply body of glass while such charge is hanging freely and before it is received in any receptacle, stopping or retarding the extrusion of the glass through the extrusion aperture after each severing operation, starting a separate extrusion of glass for each charge at a definite instant prior to each severing operation, and then increasing the rate of extrusion of the glass for that charge by applying a pressure directly to the glass adjacent to the extrusion aperture to compensate at least partially for the increasing tendency of the glass to attenuate by reason of the weight of the already extruded glass.

22. The method of obtaining mold charges of molten glass from a supply body thereof by extrusion through an aperture in a container and by severance, which comprises severing each charge of glass from the supply body while such charge is hanging freely and before it is received in any receptacle, stopping or retarding the extrusion of the glass through the extrusion aperture after each severing operation, starting a separate extrusion of glass for each charge at a definite instant prior to each severing operation, and forcing a plunger downwardly into a somewhat restricted portion of the glass container above the extrusion aperture during each extrusion period, to increase the pressure under which the extrusion occurs during each extrusion period, and to thereby increase the rate of extrusion of the glass through the aperture and to compensate at least partially for the increasing tendency of the glass to attenuate by reason of the weight of the already extruded glass.

23. The method of obtaining mold charges of molten glass from a supply body thereof by downward extrusion through an aperture and by severance, which comprises severing each charge of glass from a supply body while such charge is hanging freely and before it is received in any receptacle, stopping or retarding the extrusion of the glass through the extrusion aperture after each severing operation, starting a separate downward extrusion of glass for each charge at a definite instant prior to each severing operation and applying a pressure directly to the glass adjacent to the extrusion aperture during each extrusion period, and simultaneously restricting upward movement of the glass adjacent to the aperture, so as to increase the pressure under which the extrusion occurs during each extrusion period to increase the rate of extrusion of the glass for that charge and to thereby compensate at least partially for the increasing tendency of the glass to attenuate by reason of the weight of the already extruded glass.

24. The method of forming and separating molten glass into mold charges from a container, which comprises discharging successive portions of glass from a supply body through an outlet below the surface of the glass in the container and in an amount sufficient to form a mold charge, suspending each portion below the outlet, closing shears beneath the outlet to sever mold charges from the suspended portions, and retarding the discharge of glass through the outlet while the shears are closed, so as to prevent glass from piling upon the closed shears.

25. The method of segregating a mold charge of molten glass from a supply of molten glass, which includes the steps of discharging glass from a supply through an outlet submerged by said supply and in an amount sufficient to form a mold charge, retarding the further discharge of glass through the outlet by the upward motion of an implement in adhesive contact with the glass above the outlet, temporarily suspending the discharged glass in a compact mass, and shearing a mold charge from the suspended mass.

26. The method of separating a mold charge of molten glass from a supply of the glass, which comprises flowing glass from a supply body downwardly around the end of a movable implement and discharging it through an outlet and in an amount sufficient to form a mold charge, temporarily suspending the discharged glass in a mass below the outlet, severing a mold charge from the discharged glass at a level spaced below the outlet, and arresting further discharge of glass through the outlet by upward movement of the implement after the severing operation.

27. The method of separating a mold charge of molten glass from a supply of the glass, which comprises flowing glass from a supply body downwardly around the end of a periodically movable implement and discharging it through an outlet and in an amount sufficient to form a mold charge, temporarily suspending the discharged glass in a mass below the outlet, severing a mold charge from the discharged glass at a level spaced below the outlet, and arresting further discharge of glass through the out-

let by upward movement of the implement during and after the severing operation.

28. The method of separating a mold charge of molten glass from a supply of the glass, which comprises flowing glass from a supply body downwardly around the end of a periodically movable implement and discharging it through an outlet and in an amount sufficient to form a mold charge, temporarily suspending the discharged glass in a mass below the outlet, severing a mold charge from the discharged glass at a level spaced below the outlet, and arresting further discharge of glass through the outlet by upward movement of the implement prior to, during and after the severing operation.

29. The method of separating suspended individual mold charges from a parent body of molten glass that comprises flowing glass downwardly around a vertically moving implement and through a downwardly opening discharge outlet submerged in the parent body, and in an amount sufficient to form a mold charge, moving the implement downwardly in the parent body and toward said outlet, severing a suspended mold charge from the glass beneath said outlet after the downward movement of said implement, and checking the flow of glass through said outlet by raising the said implement, thereby preventing glass from piling upon the shears.

30. The method of segregating a mold charge of molten glass from a supply of molten glass, which comprises discharging glass from a supply body through an outlet submerged by said supply and in an amount sufficient to form a mold charge, retarding further discharge and raising a portion of the discharged glass and suspending the remainder of the discharged glass in a compact mass by the upward motion of an implement in adhesive contact with the glass, and severing a mold charge from the remainder of the discharged glass while the latter is suspended below the outlet.

31. The method of segregating a mold charge of molten glass from a supply of molten glass, which includes the steps of discharging glass from the supply through an outlet submerged by said supply and in an amount sufficient to form a mold charge, temporarily suspending the discharged glass in a freely-hanging compact mass, shearing a mold charge from the freely-hanging mass, and thereafter lifting the glass immediately above the plane of severance, and retarding the further discharge of glass through said outlet, by the upward motion of an implement in adhesive contact with the glass.

32. In the manufacture of glassware, the method of delivering, to successively presented molds, continuous series of similar and compact charges of molten glass of shape and weight appropriate to the particular molds to be fed, which method comprises superimposing a sufficient head of molten glass, of proper viscosity, upon a delivery orifice of a proper contour and area to permit the feeding of charges appropriate to the molds to be fed, and, for each mold charge, discharging glass from said head supply through said orifice, moving a discharge-controlling implement downwardly in the glass above said orifice, thereby accelerating the discharge of the glass, and, after discharging from said supply a quantity of glass sufficient to form a mold charge, moving said implement upwardly, thereby retarding the discharge of the glass through said outlet, and severing a mold charge from the discharged glass before the discharged glass breaks into a stream.

33. The method of feeding a supply of molten glass in mold charges, which comprises discharging glass from said supply through an outlet submerged by said supply, accelerating the discharge by downward movement of an implement in adhesive contact with the glass supply and after discharging from said supply a quantity of glass sufficient to form a mold charge, suspending the discharged glass beneath the outlet, shearing a mold charge from the discharged glass, retarding the further discharge of glass from the outlet by upward movement of the implement after the shearing operation, thereby preventing glass from piling upon the shears, and repeating the said operations in regular cycles.

34. The method of feeding a supply of molten glass in mold charges, which comprises discharging glass from said supply through an outlet submerged by said supply, accelerating the discharge by downward movement of an implement in adhesive contact with the glass supply, suspending the discharged glass beneath the outlet, and after discharging from said supply a quantity of glass sufficient to form a mold charge, shearing a mold charge from the discharged glass, retarding the further discharge of glass from the outlet by upward movement of the implement during and after the shearing operation, thereby preventing glass from piling upon the shears, and repeating the said operations in regular cycles.

35. The method of feeding a supply of molten glass in mold charges, which comprises discharging glass from a supply through an outlet submerged by said supply, accelerating the discharge by downward movement of an implement in adhesive contact with the glass supply, suspending the discharged glass beneath the outlet, and, after discharging from said supply a quantity of glass sufficient to form a mold charge, shearing a mold charge from the discharged glass, retarding the further discharge of

glass from the outlet by upward movement of the implement prior to, during and after the shearing operation, thereby preventing glass from piling upon the shears, and repeating the said operations in regular cycles.

36. The method of separating a supply of molten glass into mold charges, which includes the steps of discharging glass from a supply through an outlet submerged by said supply and in a quantity sufficient to form a mold charge, periodically accelerating the discharge by downward movements of a rigid implement in adhesive contact with the glass above the outlet, and alternately retarding the discharge through the outlet by upward movements of the implement to form successively suspended masses of the glass, and shearing a mold charge from each suspended mass.

37. The method of feeding molten glass in a regular and uniform succession of suspended and freely dropped mold charges appropriate in size and shape to the molds in which they are to be fabricated, that comprises discharging glass from a supply body for each mold charge downwardly around an implement and through a passage having a discharge outlet, moving the implement downwardly in the glass toward the outlet, during the discharge of each mold charge, so as to partially close the said passage, but at such speed as to accelerate the discharge of the glass notwithstanding such partial closure of the passage, and thereafter, and after the discharge of glass from the supply body in a quantity sufficient to form a mold charge, moving the implement upwardly so as to enlarge the effective size of the passage, but at such speed as to retard the discharge of glass through the outlet passage notwithstanding such enlargement of its effective size.

38. The method of feeding molten glass in a regular and uniform succession of suspended and freely dropped mold charges appropriate in size and shape to the molds in which they are to be fabricated, that comprises, for each mold charge, discharging glass from a supply body downwardly around an implement and through a passage having a discharge outlet, moving the implement downwardly in the glass toward the outlet, during the discharge of each mold charge, so as to partially close the said passage, but at such speed as to accelerate the discharge of the glass notwithstanding such partial closure of the passage, thereafter, and after the discharge of glass from the supply body in a quantity sufficient to form a mold charge, moving the implement upwardly so as to enlarge the effective size of the passage, but at such speed as to retard the discharge of glass through the outlet passage notwithstanding such enlargement of its effective size, severing a mold charge from the discharged glass and permitting glass to issue from the outlet of said passage during a further upward movement of said implement, so as to initiate the discharge of glass for the next mold charge.

39. The method of feeding molten glass in a regular and uniform succession of suspended and freely dropped mold charges appropriate in size and shape to the molds in which they are to be fabricated, that comprises discharging glass from a supply body for each mold charge downwardly around an implement and through a passage having a discharge outlet, moving the implement downwardly in the glass toward the outlet, during the discharge of each mold charge, so as to increase the resistance to the movement of glass in said passage, but at such speed as to accelerate the discharge of the glass through said outlet notwithstanding such increased resistance, and thereafter, and after sufficient glass has been discharged to form a mold charge, moving the implement upwardly so as to decrease the resistance to the movement of the glass in said passage, but at such speed as to retard the discharge of glass through the outlet passage notwithstanding such decreased resistance.

40. The method of feeding molten glass in a regular and uniform succession of suspended and freely dropped mold charges appropriate in size and shape to the molds in which they are to be fabricated, that comprises discharging glass from a supply body for each mold charge downwardly around an implement and through a passage having a discharge outlet, moving the implement downwardly in the glass toward the outlet, during the discharge of each mold charge, so as to increase the resistance to the movement of glass in said passage, but at such speed as to accelerate the discharge of the glass notwithstanding such increased resistance, thereafter, and after sufficient glass has been discharged to form a mold charge, moving the implement upwardly so as to decrease the resistance to the movement of the glass in said passage, but at such speed as to retard the discharge of glass through the outlet passage notwithstanding such decreased resistance, severing a mold charge from the discharged glass, and permitting glass to issue from the outlet of said passage during a further upward movement of said implement, so as to initiate the discharge of glass for the next mold charge.

41. The method of feeding mold charges from a supply of molten glass discharged from an outlet submerged by said supply, which comprises periodically retarding the discharge of glass from the supply through the outlet by periodic upward movements of an implement in adhesive contact with the glass, discharging glass from the supply through the outlet in amount sufficient to

form a mold charge, to form successive suspended masses of the glass beneath the outlet, periodically accelerating the discharge by the periodic intervening downward movements of the implement to oppose the tendency toward attenuation of the upper portion of each suspended mass, and shearing a mold charge from each mass while so suspended, and at a level spaced below the outlet.

42. The method of feeding mold charges from a supply of molten glass discharged from an outlet submerged by said supply, which comprises periodically retarding the discharge of glass from the supply through the outlet by periodic upward movements of an implement in adhesive contact with the glass, discharging glass from the supply through the outlet in amount sufficient to form a mold charge, to form successive suspended masses of the glass beneath the outlet, periodically accelerating the discharge by the periodic intervening downward movements of the implement to oppose the tendency toward attenuation of the upper portion of each suspended mass, and shearing a mold charge from each suspended mass after acceleration, prior to the completion of the succeeding retardation, and at a level spaced below the outlet.

43. The method of feeding mold charges from a supply of molten glass, which comprises discharging the glass from said supply body through an outlet submerged by said supply, alternately accelerating and retarding the discharge by periodic downward and upward movements of an implement in adhesive contact with the glass to suspend the discharged glass in successive masses beneath the outlet, continuing each upward movement of the implement during the discharge of a lower portion of each mass to reduce the rate of said discharge for the purpose of attenuating said lower portion, and shearing a mold charge from each suspended mass after each acceleration, prior to the completion of the succeeding retardation and at a level spaced below the outlet.

44. The method of feeding mold charges of controllable shape from a supply of molten glass which comprises discharging glass from the supply through an outlet submerged by said supply to suspend successive masses of the glass beneath the outlet, periodically retarding the discharge by periodic upward movements of an implement in adhesive contact with the glass and continuing the upward movement of the implement during the discharge of a lower portion of each mass to reduce the rate of said discharge to attenuate said lower portion, periodically accelerating the discharge by the periodic alternate downward movements of the implement to oppose the tendency toward attenuation of the upper portion of each mass, and shearing a mold charge from each suspended mass after each acceleration, prior to the completion of the succeeding retardation, and at a level spaced below the outlet.

45. The method of feeding a supply of molten glass in mold charges, which comprises discharging the glass from an outlet submerged by the supply of molten glass, accelerating the discharge by downward movement of an implement in adhesive contact with the glass, suspending the discharged glass beneath the outlet, shearing a mold charge from the suspended mass of glass, retracting the glass in the outlet by upward movement of the implement after the completion of the shearing operation, thereby preventing glass from piling upon the shears, and repeating the said operations in regular cycles.

46. The method of feeding molten glass in a series of individual mold charges, that comprises causing a mass of glass to hang freely below an opening in a container, quickly ejecting additional glass from a supply body through said opening, retracting a portion of the ejected glass at the upper part of the suspended mass, the said retraction taking place more slowly than the said ejection, providing a substantial period of time between said retracting and ejecting steps during which period the glass is permitted to flow by gravity from said supply body through said opening, and severing a mold charge from the suspended mass after said ejection.

47. The method of feeding molten glass in a succession of freely hanging mold charge masses that comprises causing glass to flow into an impulsion chamber around the end of a periodically moving impeller constantly in said chamber and thence to a discharge outlet, and reciprocating said impeller to alternately expel glass from said chamber into suspension below said outlet and to retract glass into said chamber through said outlet.

48. In apparatus for separating molten glass into mold charges and for receiving the charges, the combination with a container for the glass having a submerged discharge outlet, of a vertically movable implement projecting into the glass toward the outlet, shears spaced below the outlet and closing to sever mold charges suspended therebeneath, means for closing the shears periodically, means operating in timed relation to the shear-closing means for moving the implement downwardly during the issue of a mold charge and immediately prior to its severance, and for moving the implement upward immediately after the severance of the mold charge, and a charge-receiver having its glass-supporting surface spaced below the

said shears at a distance greater than the length of the suspended mold charge when severed.

49. In apparatus for separating molten glass into mold charges and for receiving the charges, the combination with a container for the glass having a submerged discharge outlet, of a vertically movable discharge-controlling implement projecting into the glass toward the outlet, shears spaced below the outlet and closing to sever mold charges suspended therebeneath, means for closing the shears periodically, means, operating in timed relation to the shear-closing means, for moving the implement downwardly during the issue of a mold charge and prior to its severance, and for moving the implement upwardly during and after the severance of the mold charge, and a charge-receiver having its glass-supporting surface spaced below the said shears at a distance greater than the length of the suspended mold charge when severed.

50. In apparatus for separating molten glass into mold charges and for receiving the charges, the combination with a container for the glass having a submerged discharge outlet, of a vertically movable implement projecting into the glass toward the outlet, shears spaced below the outlet and closing to sever mold charges suspended therebeneath, means for closing the shears periodically, means, operating in timed relation to the shear closing means, for moving the implement downwardly during the issue of a mold charge and prior to its severance, and to move the implement upwardly prior to, during and after the severance of the mold charge, and a charge-receiver having its glass-supporting surface spaced below the said shears at a distance greater than the length of the suspended mold charge when severed.

51. In apparatus for separating molten glass into mold charges, the combination with a container for the glass having a submerged outlet, of a vertically movable rigid implement projecting downwardly into the glass in vertical alignment with the outlet but out of contact therewith and adapted by its upward motion to retard the discharge of glass through the outlet, and by its downward motion to accelerate the discharge of glass from the outlet, means for reciprocating the implement periodically while out of contact with the outlet to produce successive suspended masses of glass beneath the outlet, and shears inactive on the glass during the downward motion of the implement and meeting at a level spaced beneath the outlet in timed relation to the reciprocations of the implement to sever a mold charge from each suspended mass.

52. In apparatus for separating molten glass into mold charges, the combination with a container for the glass having a submerged outlet, of a vertically movable rigid implement projecting downwardly into the glass in working alignment with the outlet, means for reciprocating said implement periodically to form successive suspended masses of the glass beneath the outlet, shears adapted to close at a level spaced beneath the outlet to sever mold charges from the suspended masses, and means for closing and opening the shears periodically in timed relation to the reciprocations of the implement, said means being adapted to keep the shears out of contact with the glass during the downward motion of the implement and while it is in its lowest position.

53. In apparatus for separating molten glass into mold charges and for receiving the charges, the combination, with a container for the glass having a discharge outlet submerged in the glass in said container, of a movable implement projecting downwardly into the glass toward the outlet, but never touching the walls of the outlet, and adapted by its upward motion to retard the discharge of glass through the outlet, and by its downward motion to accelerate the discharge of glass from the outlet, means for reciprocating the implement periodically to produce successive masses of glass suspended beneath the outlet, shears out of contact with the glass during the downward motion of the implement and meeting beneath the outlet in timed relation to the reciprocations of the implement to sever a mold charge from each suspended mass, the upward movement of said implement being so timed as to raise the glass immediately above the plane of severance after each mold charge is severed, thereby preventing glass from piling upon the shears, and a charge-receiver having its glass-supporting surface spaced below the said plane of severance at a distance greater than the length of the suspended mold charge when severed.

54. In apparatus for separating molten glass into mold charges, the combination, with a container for the glass having a discharge outlet submerged in the glass in said container, of a movable implement projecting downwardly into the glass toward the outlet but never in contact with the walls of the outlet, shear blades arranged to approach each other from opposite directions and meeting centrally with and at a level spaced beneath said outlet to sever mold charges suspended therebeneath, means for closing the shear blades periodically and for retracting them away from each other after each closure, and means operating in timed relation to the shear-operating means and adapted to move said implement upward after the severance of each mold charge and adapted to move the implement downward

after each retraction of the shear blades from severing position, during the issue of each mold charge, and prior to its severance.

55. Apparatus for feeding molten glass in a succession of freely hanging mold charge masses, comprising a glass container provided with a restricted well or impulsion chamber having an upper inlet in communication with a parent body of glass, a downwardly opening outlet, and a vertically reciprocating implement having its lower portion constantly in said impulsion chamber and alternately expelling and retracting glass through said outlet, without interrupting communication between the outlet and the inlet of said impulsion chamber.

56. Glass manufacturing apparatus comprising, in combination, a glass melting furnace, an impulsion chamber in communication with the tank of the furnace and having an outlet orifice submerged under a head of the molten glass, a forming machine provided with a plurality of molds presented in succession beneath said outlet orifice, an implement working in the glass above the orifice and serving in conjunction with the surrounding walls of the impulsion chamber to exert impulses tending alternately to expel the glass through the orifice and to retard its outflow, shear blades movable toward and from each other and coacting below and in line with, but independently of, the outlet orifice to sever the suspended end of the issuing column of glass in timed relation to the plunger movements so as to provide a succession of freely dropping mold charges.

57. In apparatus for feeding molten glass in a regular succession of similar mold charges suitable for fabrication into glassware and appropriate in size and shape to the molds in which the charges are to be fabricated, the combination of a furnace to supply the molten glass, an extension arranged to receive molten glass from the furnace and having a discharge well or impulsion chamber in its bottom terminating at its lower end in a discharge opening of substantially smaller diameter than the upper portions of said well, a rigid impelling implement reciprocating with its lower end in the glass in said extension and entering said well, but loosely fitting in said well and always out of contact with the walls of said well and the walls of said discharge opening, even when said impelling implement is depressed to its lowest limit of movement in normal operation, shear blades spaced below said discharge opening and reciprocating horizontally toward and away from each other and meeting beneath said opening to sever the issued glass, at a level spaced below said opening, and means for periodically moving said shears and reciprocating said impelling implement in such timed relation to each other as (1) to cause said impelling implement to descend in said well at suitable speeds, during successive periods of its descent, to insure, through a substantial part of the complete mold-charge feeding cycle, a rate of extrusion of glass through said discharge opening sufficient to compensate at least partially for the tendency toward attenuation by gravity of the glass already extruded through said opening and to control the shape of the pendant mass of glass, (2) to cause the said shears to sever a mold charge from the pendant glass when said impelling implement is approximately in its lowest position, and (3) to lift said impelling implement from its lowest position at such speed and through such vertical distance as to retard the descent of the glass immediately above said shears, and to thereby prevent glass from piling upon the shears.

58. In apparatus for feeding molten glass in a regular succession of similar mold charges suitable for fabrication into glassware and appropriate in size and shape to the molds in which the charges are to be fabricated, the combination of a furnace to supply the molten glass, an extension arranged to receive molten glass from the furnace and having a discharge well or impulsion chamber in its bottom terminating at its lower end in a discharge opening of substantially smaller diameter than the upper portions of said well, a rigid impelling implement reciprocating with its lower end in the glass in said extension and entering said well, but loosely fitting in said well and always out of contact with the walls of said well and the walls of said discharge opening, even when said impelling implement is depressed to its lowest limit of movement in normal operation, shear blades spaced below said discharge opening and reciprocating horizontally toward and away from each other and meeting beneath said opening to sever the issued glass, while leaving a substantial quantity of glass above the shearing plane and below said opening, and means for periodically moving said shears and reciprocating said impelling implement in such timed relation to each other as (1) to cause said impelling implement to descend in said well at suitable speeds, during successive periods of its descent, to insure, through a substantial part of the complete mold-charge feeding cycle, a rate of extrusion of glass through said discharge opening sufficient to compensate at least partially for the tendency toward attenuation by gravity of the glass already extruded through said opening and to control the shape of the pendant mass of glass, (2) to cause the said shears to sever a mold charge from the pendant glass when said impelling implement is approximately in its lowest position, and (3) to lift said impelling implement from its lowest position

at a relatively rapid rate and then to lift said impelling implement at a slower rate, the lifting of said impelling implement being at such speed and through such vertical distance as to retard the downward flow of the glass in said well and to raise the glass immediately above the shears, and a mold-charge receiver having its glass-supporting surface spaced below the said shears at a distance greater than the length of the mold-charges when severed.

59. A glass feeder for delivering glass mold charges of a variety of controlled sizes and shapes, including an enclosure defining a channel for flowing the glass from a furnace and having a discharge outlet near its outer end, an impeller extending down into the glass and reciprocating in line with said outlet to control the discharge of glass from said outlet, shears periodically closing and opening below said outlet, and a system of controls, including means for adjusting the upper and lower limits of the movement of said impeller, means for adjusting the vertical position of said shears, means for adjusting the relative time of operation of the impeller movements and of the shear movements, and means for controlling the temperature of the glass delivered to said outlet, all of the said controls being selected in relation to one another for mutual cooperation and acting in combination, to produce compact mold charges of workable glass below said outlet, to impart to said charges the particular weight, length and cross-sectional dimensions best suited to the molds which receive said charges, to maintain constant the selected weight and dimensions of the charges, and to change the weight and dimensions of the charges to suit a variety of molds.

60. In apparatus for separating molten glass into mold charges, the combination with a discharge basin for the glass having a well in its bottom terminating in a discharge outlet, of a vertically movable shape-controlling plunger projecting into the well, means for moving said plunger periodically to form by its movements successive suspended masses of glass of definitely controlled shape beneath the outlet, stationary means adjustable to regulate the level of the glass in the discharge basin, thereby controlling the amount of glass admitted to the well, and shears operating periodically beneath the outlet and in timed relation to the plunger movements to sever a mold charge of predetermined size and shape from each suspended mass.

Signed at Hartford, Conn., this 1st day of May, 1919.

KARL E. PEILER.

CERTIFICATE OF CORRECTION

Patent No. 1,655,391. Granted January 3, 1928, to

KARL E. PEILER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 9, line 24, for the word "molten" read "motion"; line 55, for "Fig. 4" read "Fig. 24", and line 89, for the word "There" read "Here"; page 11, line 6, claim 6, for the word "shear" read "shears; line 33, claim 7, for "motion" read "motions", and line 41, claim 8, for "submerger" read "submerged"; page 14, line 5, claim 28, for "glas" read "glass"; page 18, lines 110 to 112, claim 58, strike out the words "while leaving a substantial quantity of glass above the shearing plane and" and insert instead "at a level spaced"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of February, A. D. 1928.

M. J. Moore,
Acting Commissioner of Patents.

Seal.