June 27, 1939. F. L. O. WADSWORTH 2,164,184

APPARATUS AND PROCEDURE FOR SEVERING AND DELIVERING MOLTEN GLASS

Original Filed May 22, 1934 2 Sheets-Sheet 1

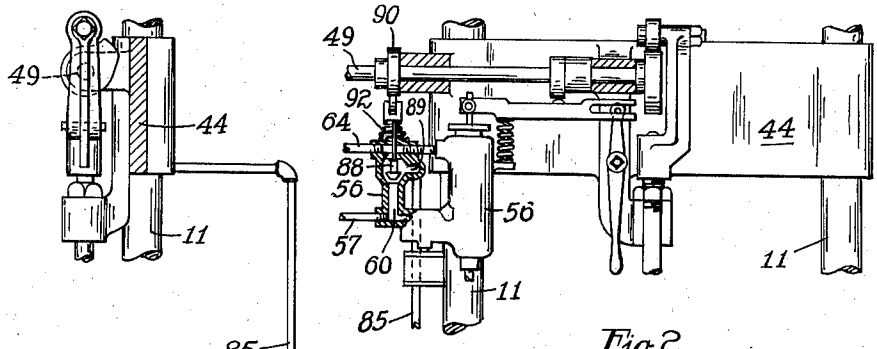



Fig. 2.

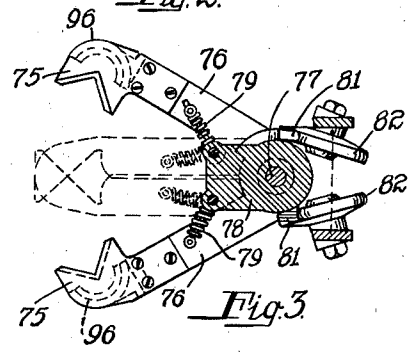



Fig. 3.

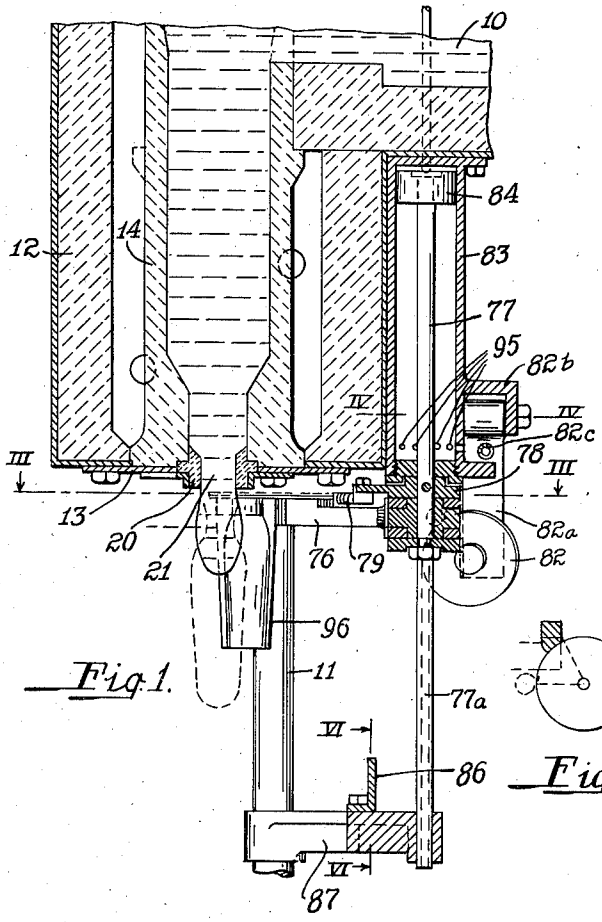



Fig. 1.

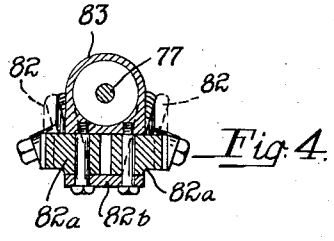



Fig. 4.



Fig. 5.

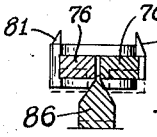



Fig. 6.

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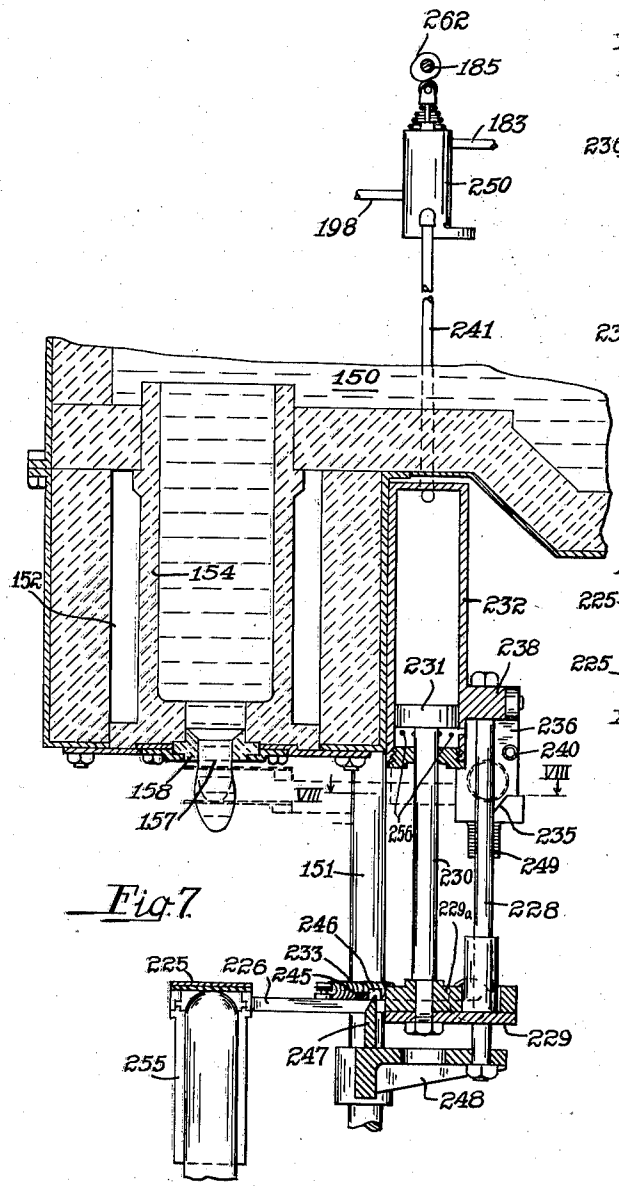



Fig. 7.

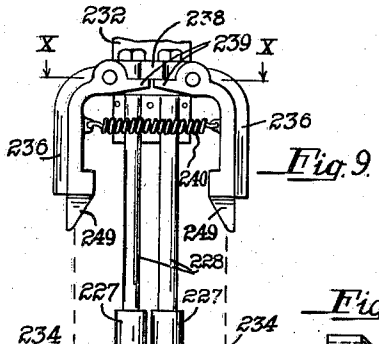



Fig. 9.

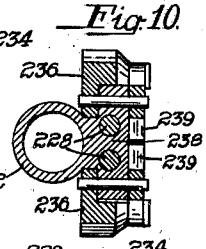



Fig. 10.

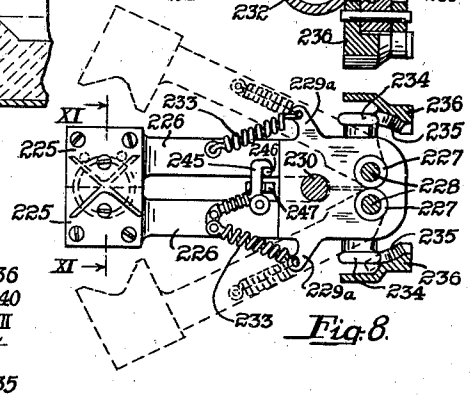



Fig. 8.

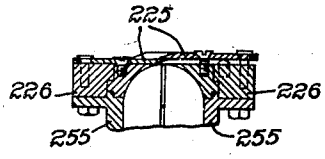



Fig. 11.

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2,164,184

# UNITED STATES PATENT OFFICE

2,164,184

## APPARATUS AND PROCEDURE FOR SEVERING AND DELIVERING MOLTEN GLASS

Frank L. O. Wadsworth, deceased, late of Pittsburgh, Pa., by Mildred M. Wadsworth, administratrix, Pittsburgh, Pa., assignor to Ball Brothers Company, Muncie, Ind., a corporation of Indiana

Original application May 22, 1934, Serial No. 726,874. Divided and this application May 29, 1937, Serial No. 145,448

14 Claims. (Cl. 49—14)

This invention relates to the art of feeding plastic material, such as molten glass, and more particularly to an improved apparatus and procedure for severing a continuously flowing pulsating stream into successive mold charges and for delivering such charges to the molds of a forming machine at a relatively high delivery speed and in rapid succession, and is a division of a pending application Serial No. 726,874, filed May 22, 1934, by Frank L. O. Wadsworth, deceased.

An object of the present invention is to provide a shearing mechanism which will effect a rapid severance of a continuously flowing stream of preshaped sections into separate mold charges and will deliver these charges to successive molds of a forming machine at a speed greatly in excess of the velocity such charges would attain while falling freely under the influence of gravity. This particular purpose is to provide a severing mechanism which will perform the combined functions of cutting such successive mold charges from a continuously flowing stream and projecting each such severed charge toward and into a moving mold under the joint influence of gravity and of a supplemental accelerating force.

A further object is to provide a severed mechanism which is so designed and operated that it is adapted to sever a continuously flowing and periodically enlarged stream without retarding its downward movement and without distorting its preformed contour, and is further adapted to directly confine and project each successively cut-off gob into a mold or receiving receptacle at such velocity as to completely fill the mold cavity and also enable this delivery to be made, if desired, when the receiving receptacle is moving at a relatively high speed. This accumulated velocity of forced delivery is substantially greater than the velocity which would be attained by the charge if it were merely permitted to fall freely into the mold after severance from the stream, and this feature of my improvement materially reduces the time of delivering each successively formed and severed mold charge to a forming machine, thereby increasing the possible number of such deliveries per unit of time. Such construction also permits the receiving molds to be positioned in close proximity to the feeder orifice and decreases the loss of heat to the surrounding air.

These and other objects which may be attained are accomplished by means of this invention, one exemplification of which is illustrated in the drawings, wherein:

Figure 1 is a longitudinal vertical section through the plane of a flow orifice and illustrates one form of the improved shear mechanism;

Fig. 2 is a view in elevation of the upper part of the machine and illustrates the means for delivering motive fluid to the shear mechanism;

Fig. 3 is a section on the plane III—III of Fig. 1;

Fig. 4 is a section on the plane IV—IV of Fig. 1;

Fig. 5 is a diagrammatic view illustrating the means for closing the shear blades and the relative movement of the blades transversely and axially of the flowing stream during the severing operation;

Fig. 6 is a section taken on the plane VI—VI of Fig. 1 the blade carrying arms being shown in their lowered position, also in section, for convenience of illustration;

Fig. 7 is a vertical longitudinal section through the delivery orifice of a forehearth and illustrates a second exemplification of my improved shear mechanism;

Fig. 8 is a section taken on the plane VIII—VIII of Fig. 7;

Fig. 9 is a rear elevation of a portion of the shear mechanism shown in Fig. 7;

Fig. 10 is a section on the plane X—X of Fig. 9; and

Fig. 11 is a section on the plane XI—XI of Fig. 8.

Referring to the specific form of apparatus shown in Figs. 1 to 6 of the drawings, a forehearth extension or feeder boot 10 of the usual form is connected to the front end of a glass melting tank or furnace (not shown) and is provided at its front end with a sub-forehearth extension 12 which projects downwardly a substantial distance below the bottom of the main forehearth 10. A plate 13 is bolted against the lower end of the sub-forehearth frame and forms a support for an upwardly extending sleeve or tubular member 14 which is in communication at its upper end with the molten glass contained in the forehearth 10 and forms a passage for the delivery of the glass in the forehearth to an orifice 21 formed in a removable orifice ring or bushing 20 which is positioned in the lower end of the sleeve 14. The glass in the forehearth passes in a continuous stream through the orifice 21 and this flow is periodically increased to swell the stream by any suitable flow accelerating means, such as the feeder disclosed in the afore-

said application Serial No. 726,874, to produce a stream of regularly recurrent enlarged sections.

In order to effectively separate the continuously flowing stream passing through the orifice 21 to form separate mold charges, it is necessary to employ a severing mechanism which will not impede the flow of the stream and which will sever it at the proper time in connection with the expulsion of glass from the sleeve 14.

The form of severing mechanism illustrated in Figs. 1 to 6, inclusive, comprises a pair of opposed shear blades 75, which may be of any suitable form, and which are mounted on a pair of shear arms 76 that are concentrically, or coaxially, journaled on a common shaft 77, so that they may be concurrently swung from the open position, illustrated in full lines in Fig. 3, to the closed position, illustrated in dotted lines in that figure. A plate 78 is rigidly secured to the rod 77 and is located immediately adjacent the arms 76. This plate forms a support for two pivoted spring seats that receive two coil springs 79—79, whose outer ends are engaged by pivoted heads on the arms 76—76, and which are so positioned that they perform the double function of holding the shear blade elements 75—75, in the closed (dotted line) position of Fig. 3 and of "snapping" them back to open position after the opening movement has been initiated by an external force. The rear end of each arm 76 carries a laterally projecting lug 81, which is so positioned as to engage with the edge of rotatable disc or cam roller 82, when the supporting shaft 77 is moved downwardly; and as this movement continues, the rolling cam wheel exerts a radial thrust on the engaged lug and thereby moves the associated shear blade arm to its closed position. Each roller 82 is mounted on an arm 82*a* which is pivotally supported on a bracket 82*b* extending from the side of an operating cylinder 83, that is secured to the rear side of the sub-forehearth 12. The arms 82*a*—82*a* are connected by a coil spring 82*c*, which acts to normally hold the arms and the cam rollers 82—82, in the full line position shown in Figs. 1, 3 and 4, when they are acting to close the shear blades; but which permits them to be moved outwardly away from each other, during a subsequent step in the operation of the shear mechanism (see infra).

The shaft 77 passes through a stuffing box at the lower end of the cylinder 83 and is attached to a piston 84, which is moved down and up by the successive application of a super-atmospheric and sub-atmospheric fluid pressure to its upper surface. The longitudinal axis of the cylinder 83, and of the shaft or piston rod 77, is parallel to the line of flow of the stream issuing from the orifice 21, and the parts are so positioned and adjusted that the shear blades 75 meet on the axis of the stream when in the closed position.

When the shear mechanism is in the uppermost position as shown in Fig. 1, the shear is open (as shown by the full line position of Fig. 3) and in this position each lug 81 is positioned slightly above the periphery of its associated cam roller 82. As the piston moves downwardly and carries with it the connected elements 77—78—76—76, etc., the lugs 81—81 are immediately engaged by the rollers 82—82, and the arms 76—76 are swung toward each other to close the shear blades 75—75 and sever the flowing stream of glass. It will be observed that as soon as this cam actuated movement has carried the springs 79—79 beyond their dead center, or maximum compression points, these springs will act to assist the cams in completing the severing operation; and will then act to hold the shear blades in their closed positions, after the lugs 81 have been carried beyond the roller discs 82 by the continued downward movement of the piston rod and its associated parts.

As the piston 84 approaches the end of its stroke the shear arms 76—76 approach a wedge-shaped lug 86, which is carried by a suitable cross-head 87 that is adjustably mounted on the posts 11 which also support the forehearth 10 on the front of the tank. This lug 86 is so located that its wedge-shaped upper end enters between the arms 76—76, and moves these arms outwardly to such a position that the "snap" springs 79—79 again pass through dead center points and then act to return the shear blade elements to their open position. The piston 84 is then moved back again to its upper position—by connecting the upper end of the cylinder 83 to a vacuum conduit 57 (as later described); and in this upward movement the lugs 81—81 engage the inner inclined faces of the roller cams 82—82, and swing their supporting arms 82*a*—82*a* outwardly a sufficient distance to permit the lugs to pass between them without causing any movement of the shear blade arms; after which the spring 82*c* acts to move the cam discs back again to operative position.

In order to more effectively support and guide the shear mechanism in its up and down movement, the piston rod shaft 77 is preferably provided with an extension 77*a* which passes through a bearing in the bracket 87 and which is longitudinally grooved to engage with a spline pin that will prevent angular displacement of the vertically moving parts with respect to the center of the flow orifice, or with respect to the cam elements 82*a*—82*a*, etc.

As previously stated, the piston 84 is operated by alternately connecting the upper end of the cylinder 83 to sources of super-atmospheric and sub-atmospheric fluid pressure. This is accomplished by means of a double poppet valve 88 which is located in a valve box 56 which also contains the valves for operating the feeder mechanism and which is actuated by a cam 90 on a shaft 49. The shaft 49 is journaled on a frame 44 supported on the upright posts 11 and is continuously driven from a suitable source (not shown) such as a variable speed motor and also carries cams for timing the operation of the feeder. Consequently, by properly positioning the cam 90 on the shaft 49 the desired time relation between the operation of the feeder and the shears 75—75 can be readily obtained. When this valve 88 is moved down, by the cam, the lower poppet head is seated, and the upper head is unseated to admit compressed air from the conduit 64 to the chamber 89 between the valve heads from which it passes through the pipe 85 to the upper end of the cylinder 83. When the valve is lifted—by the joint action of the cam 90 and the valve stem return spring 92—the connection with the compressed air line 64 is cut off and communication is established between the vacuum conduit 57—(through the branch passageway 60) the chamber 89 and the cylinder connection 85; and the piston 84 is then lifted by the superior pressure of the atmosphere on its under surface.

The downward movement of the piston 84 and associated parts may be cushioned by any desired means; but in the apparatus illustrated is shown a series of small vent ports 95 in the

lower end of the cylinder which control the expulsion and admission of air to the space below the moving piston 84 during its downward and upward movements. These ports are located a short distance above the lower end of the cylinder so that they are closed by the piston as it approaches the end of its down stroke. A cushion of compressed air is thus trapped in the bottom of the piston chamber and serves to arrest the motion of the downwardly moving parts without shock or jar.

In order to assist in the proper delivery of the charges by the shear mechanism and also to prevent any charge from being displaced laterally by one of the other shear blades during the severing operation each blade is provided with a downwardly extending semi-cylindrical shield 96; which is so shaped that it, with the corresponding shield of the other blade forms a laterally closed but open-ended guard sleeve when the blades are closed. It will be apparent that these two shields 96—96 encircle the depending end of the stream as the shear blades are moving toward each other; and when the shear blades are completely closed and the severance is completed the severed charge is completely surrounded by the closed shields which not only retain it in a definite position but also protect it from the cooling effect of the air during its subsequent downward travel.

As already stated, the lower end of the guard sleeve formed by the closed shields 96—96 is open; but inasmuch as the shear mechanism is moved downwardly at a more rapid speed than the charge would fall freely under the action of gravity the upper end of the cut-off mass remains in contact with the lower surfaces of the closed shear blades during this forced downward movement; and when the said downward movement is checked the charge is projected through the open bottom of the sleeve and into the mold even before the shears are completely opened by the coaction of the wedge and spring elements 86—79—79.

Briefly summarized, the operation of the above described embodiment of the invention is as follows: Concurrently with or in closed timed relation to the operation of the feeder mechanism, the cam 90 comes into action to depress the valve 88, admit compressed air to the top of the cylinder 83 and move the shearing mechanism downwardly at a rapidly accelerated speed thus severing the flowing stream of glass and projecting the severed charge of material into the receiving receptacle at a speed which is substantially in excess of that of free fall under gravitational force and which is sufficiently high to permit of its delivery to the receptacle while the latter is moving since the shear mechanism moves faster than the stream during the operation of the severance and faster than the oncoming end of the stream after the severance is completed. The mechanism which is provided also makes it possible to vary the ratio or relation of the transverse and axial movement of the shear blades both during and after severance and thus effect a mechanical shaping of both the lower end of the severed stream and also of the upper end of the severed mold charge.

The shields 96 also shield the cut-off gob from chilling and lateral displacement effect of surrounding air currents and the mechanism delivers the shielded charge to a receiving receptacle at a speed which is substantially greater than that which it would acquire if allowed to fall freely by the action of gravity alone.

Figs. 7 to 11 illustrate a second embodiment of the improved shear mechanism in association with a forehearth 150 for molten glass having a hollow member 154 projecting downwardly from the bottom thereof through a sub-forehearth chamber 152 lined with refractory material. The top of the hollow member 154 is in open communication with the glass in the forehearth and the lower end thereof is of reduced size and is partially closed by an orifice ring 158 which defines the size of the flow orifice 157 and through which glass issues in a continuously flowing but pulsating stream. This second illustrative embodiment of the improved shear mechanism comprises a pair of opposed shear blades 225 which may be of any suitable form but are also preferably of the "cat's-eye" type. Each blade is mounted on a separate shear arm 226 and each of these arms terminates at its rear end in a sleeve 227 which is slidably and rotatably mounted on one of a pair of vertically disposed parallel guide rods 228—228 that are rigidly secured at their upper ends to a bracket 238 on the operating cylinder 232 and at their lower ends to a crosshead 248 extending between the forehearth supporting posts 151—151. The arms 226—226 are maintained in proper operative alignment with each other by two rectangular plates 229 and 229*a*, which engage the opposite sides of these arms and which are secured as a unit to the lower end of a piston rod 230 that is attached at its upper end to a piston 231 slidably mounted in the cylinder 232 and the lower plate member of this unit assembly is also provided with guide bearings which slidably engage the rods 228—228.

The blades are normally held in their open position by coil springs 233 which are attached at their outer ends to the arms 226—226 and at their opposite extremities to laterally projecting side lugs on the upper plate 229*a*. The arms are provided, near their rear ends with cam rollers 234 which are adapted to engage and cooperate with inclined cam surfaces 235—235, and to move the shear blade members from the dotted line open position to the full line closed position of Fig. 8, when the piston actuated shear arm supports are moved downwardly from the upper dotted line position of Fig. 7. Each of the cam surfaces 235 is formed on the lower end of a downwardly extending arm 236 which is pivotally mounted on the cylinder bracket 238 and each of these arms is provided with a lug 239 which is normally held against the bottom of the flange 238 by means of a coil spring 240 (see Fig. 9) the arrangement being such that any downward thrust on the cam surfaces 235 tends to aid the spring 240 in holding the lugs 239 in contact with the bracket 238.

The piston 231 is moved down and up within the cylinder 232 by alternately connecting the upper end of the latter with the pressure and vacuum conduits 183 and 196. When the piston is at the top of its stroke, the shear blades are open; and in this position each of the rollers 234 is positioned just above the upper edge of its cooperating cam surface 235. As the piston 231 moves downwardly and carries with it the shear arms and guide frame elements 226—227—229—229*a*, etc., the shear blades are swung toward each other (by the cooperation of the cam rollers and cam surfaces 234—235) to sever the flowing stream of glass; the parts being of course

so arranged and adjusted that the shear blades meet and cross each other on the axis of the stream while they are moving downwardly in line therewith.

When the blades are moved to the closed position, the arms 226—226 are locked together by means of a spring actuated latch 245 which is pivoted to one of the arms 226 and is adapted to engage a pin 246 on the other of the shear blade arms before the rollers 234 have moved beyond the cam surfaces 235. As the piston 231 approaches the lower limit of its stroke, the latch 245 is disengaged from the pin 246 by means of a vertically disposed wedge-shaped finger 247 that is mounted on the crosshead 248; and the arms and shear blades are returned to their open position by the springs 233. After the blades have been opened, the piston 231 and the parts connected thereto are returned to their upper position by connecting the top of the cylinder 232 with the vacuum line 198 and as the shear frame approaches the end of this upward movement the rollers 234 engage the beveled ends 249 of the arms 236 and separate them sufficiently to permit the rollers 234 to pass between them, without disturbing the position of the separated shear arms. When the return movement is completed the rollers 234 have been lifted above the level of the cam surfaces 235 and the arms are then restored to their operative position (see Figs. 8 and 9) by the tension of the spring 240.

The above described movements of the piston 231 and of the parts associated therewith are controlled by the action of a two-way valve (located in the valve box 250) which is similar in all essential respects to the corresponding valve 88 heretofore described in connection with Fig. 2; and which is alternately moved up and down (in the box 250) under the control of a cam 262 on the cam shaft 185. When the valve is moved up the line 241 which leads to the upper end of the piston cylinder 232 is connected to the compressed air conduit 183; and when it is moved down this line (241) is put in communication with the vacuum conduit 198.

The cylinder 232 is provided at a point adjacent its lower end with a series of vent ports 256 which control the flow of air from and to the space below the moving piston; and which are closed thereby, near the end of its downward stroke, to provide a cushion of compressed air that will arrest the moving parts without sensible shock or jar.

In order to assist the action of the downwardly moving shear blades in accelerating the delivery of the severed mold charges to the forming receptacles, each shear arm 226 is provided with a detachable semi-cylindrical shield 255; and when the blades are closed, these shields are brought together to form an inverted cup guard member, that closely embraces the sides and upper end of the severed charge as it is projected downwardly at a rapidly accelerated speed by the piston actuated parts.

When the stream issuing through the orifice 157 is to be severed, compressed air is admitted to the top of the cylinder 232 and the piston actuated shear mechanism is moved downwardly. At the beginning of this movement the co-engagement and coaction of the cam elements 234—235 closes the shear blades 225—225 and severs a charge of glass from the continuously flowing stream. The downward movement of the piston 231 is then rapidly accelerated by the increasing fluid pressure in the cylinder 232 and the closed shear blade and guard elements 225—225, 255—255 direct and project the severed charge toward the receiving mold at a velocity which is not only greater than the maximum rate of flow of the oncoming stream but is also preferably in excess of that which the severed charge would acquire under gravitational action alone. This rapid acceleration of the downward movement is aided by the fact that the mass of the moving parts is relatively small, and by the elimination of any retractive springs for the purpose of returning these parts to their upper position; and it is obvious that the accelerating force may be augmented to any desired degree, either by increasing the pressure in the compressed air supply line or by increasing the size of the cylinder 232. Shortly before the parts reach the end of the down stroke, the shear blades and guard elements 225—255 are opened and the charge is delivered to the mold at the highest attained velocity of movement. As soon as the blades have been opened, the downwardly moving elements are brought to rest by the compression of the air cushion in the bottom of the cylinder 232; and this action may be aided, if desired, by connecting the top of the cylinder to the vacuum line 198 before the end of the down stroke.

From the foregoing it is apparent that by using this improved shear mechanism, successively severed mold charges can be delivered to the receiving receptacles of a forming machine at a velocity materially greater than they would attain under natural gravity fall and that there is thus eliminated the necessity of bringing these receptacles to a stop for the purpose of receiving the charges and thereby materially increase the speed of operation of the machine in which they are pressed and/or blown to finished form.

The shape of each of the severed charges may be controlled by varying the initial downward speed of travel of the shear mechanism—which is accomplished by varying the rate at which compressed air is admitted to the operating cylinders (83 or 232) by the valves 88 or 250—and by altering the relation between the axial travel with the flowing stream and the accompanying transverse movement of the shear blades through the stream. This last mentioned alteration or adjustment is effected by changing either the size and axial positions of the cam wheels 82—82 (as best shown in Figs. 1 and 2) or by changing the inclination of the cam surfaces 235—235 of the Figs. 7 and 8 construction. In either case an increase in the speed of the transverse cutting movement of the shear blades, as compared with their concurrent downward movement will result in the production of blunter or more obtuse severed ends, and vice versa. A further control of the final shape of the severed mold charges may be secured by altering the internal contour of the guard sleeve elements which are attached to the ends of the shear arms and which embrace and confine the sides and upper ends of these charges during the time of their forced accelerated delivery to the receiving receptacles. In this connection, it is to be noted that these guard elements are preferably made of some thermally resistant material and are highly polished in both these inner and outer surfaces to reduce to a minimum any effect which they might otherwise have on the external surfaces of the hot material. This feature of construction is particularly important if the guard sleeve members are to exert any reshaping action of the enclosed mold charge.

It is desired that it be understood that there has been designed various apparatus and procedures for severing a continuously flowing stream of molten glass into successive individual mold charges in which the shear blades move downwardly with the stream during the severing operation, and that such apparatus and procedures structurally and functionally distinguish from the subject matter herein claimed and form the subject matter of copending applications.

What is claimed as new and desired to secure by Letters Patent is:

1. The method of severing a charge from a stream of plastic material which consists in moving a pair of shear blades in the direction of travel of the stream while closing said blades to effect the severance, and continuing the movement of said blades after the severance to accelerate the delivery of the charge and to simultaneously shape the upper end of said charge.

2. The method of severing successive mold charges from a flowing stream of plastic material which consists in moving a pair of opposed shear blades in the direction of travel of said stream while rapidly closing the blades at the beginning of such movement to effect a severance, maintaining said blades in their closed position after the severance while continuing the movement thereof to accelerate the speed of the severed charge and then opening said blades while the movement thereof is continued to release such charge and propel it into a receiving mold at its attained velocity.

3. A severing mechanism for plastic material such as molten glass, comprising a pair of opposed and vertically movable shear blades, means for moving said blades downwardly at a high speed, means operative at the beginning of the downward movement for moving said shear blades to their closed position, means for holding said blades in their closed position, means for retarding the downward speed of said blades as they approach the end of such downward movement, and means operative just prior to the end of the downward movement for opening said blades.

4. A shear mechanism comprising a pair of opposed shear blades, means for vertically reciprocating said blades, means operative at the beginning of a downward movement for closing said blades, means for locking said blades in their closed position, and means for unlocking said blades near the end of the downward movement.

5. A shear mechanism comprising a pair of opposed and vertically reciprocable shear blades, means for reciprocating said blades, means associated with said blades for moving them from open to closed position during the downward movement thereof, means for locking said blades in closed position, means for opening said blades near the completion of their downward movement, and means for yieldingly holding said blades in their open position.

6. A method of forming charges of plastic material such as molten glass, which consists in establishing a depending stream of such material, periodically severing a freely hanging portion of such stream and subjecting the severed end of such portion to a shaping force while propelling such portion toward a receptacle therefor.

7. A method of forming mold charges of plastic material such as molten glass, which consists in establishing a depending stream of such material, periodically severing a freely hanging portion of such stream, subjecting each such portion to a projecting force while shaping the severed end thereof.

8. A shear mechanism comprising a pair of opposed shear blades, a piston attached to said blades for vertically reciprocating the same, a cylinder in which said piston reciprocates, means for closing said blades during the downward movement thereof, means for locking said blades in a closed position, and means for opening said blades as they approach the end of such downward movement.

9. A shear mechanism comprising a pair of opposed shear blades, means for vertically reciprocating said blades, pivotally mounted members projecting underneath said blades for closing the same during the downward movement thereof, and means for holding said members in position beneath said blades at the beginning of such downward movement while permitting such members to be moved outwardly during the upward movement of said blades.

10. A shear mechanism comprising a pair of opposed shear blades, means for vertically reciprocating said blades, pivotally mounted members for engaging said blades and moving the same to a closed position during the downward movement thereof, a spring connecting said pivotally mounted members, and inclined surfaces on said members adapted to be engaged by said blades on the upward movement thereof to move said members outwardly without changing the position of said blades.

11. A shear mechanism comprising a pair of opposed vertically reciprocable shear blades, means for reciprocating said blades, pivotally mounted members having cam portions projecting underneath said blades adapted to be engaged by said blades on the downward movement thereof to move said blades to a closed position, means for yieldingly holding the cam surfaces of said members beneath said blades, means for holding said blades in a closed position, and means for opening said blades as they approach the end of their downward movement, said members being provided with inclined surfaces adapted to be engaged by said blades on the upward movement thereof to move the same outwardly without affecting said blades.

12. A shear mechanism comprising a pair of opposed vertically reciprocable shear blades, a piston attached to said blades for reciprocating the same, a cylinder in which said piston reciprocates, means for periodically delivering motive fluid to said cylinder, pivotally mounted members projecting underneath said blades for engaging and closing the same during downward movement thereof, and means for moving said members outwardly during the upward movement of said blades whereby the position of said blades is not changed.

13. A shear mechanism comprising a pair of opposed shear blades, a piston attached to said blades for vertically reciprocating the same, a cylinder in which said piston reciprocates, means for periodically delivering motive fluid to said cylinder, cams for engaging and closing said blades during the downward movement thereof, means for holding said blades in their closed position, means for opening said blades as they approach the end of their downward movement, and means for moving said cams to an inoperative position during the upward movement of said blades.

14. A shear mechanism comprising a pair of

opposed shear blades, a piston attached to said blades for vertically reciprocating the same, a cylinder in which said piston reciprocates, a pair of cams for moving said blades to their closed position during the downward movement thereof, means for yieldingly holding said cams in position to be engaged by said blades on the downward movement thereof, means for holding said blades in their closed position, means for opening said blades as they approach the end of their downward movement, and means associated with said cams and adapted to be engaged by said blades on the upward movement thereof for moving said cams out of the path of travel of said blades.

MILDRED M. WADSWORTH,
*Administratrix of the Estate of Frank L. O. Wadsworth, Deceased.*