No. 839,421. PATENTED DEC. 25, 1906.

A. RASPILLAIRE.

MACHINE FOR MAKING GLASS ARTICLES.

APPLICATION FILED MAR. 15, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

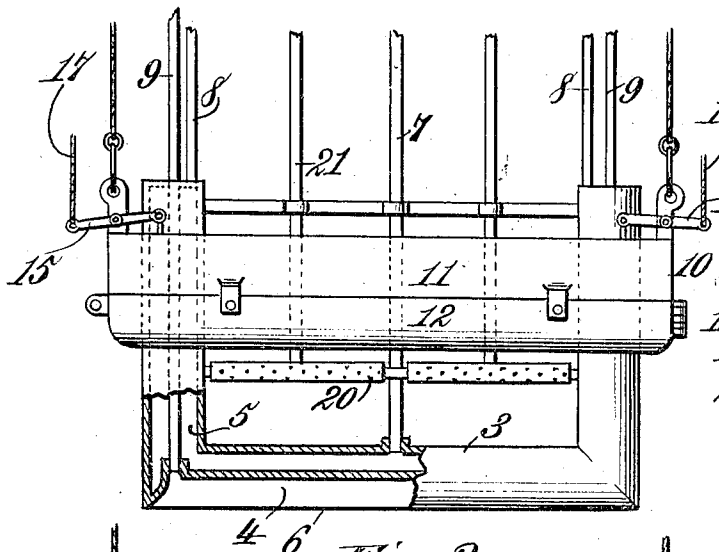


Fig. 2.

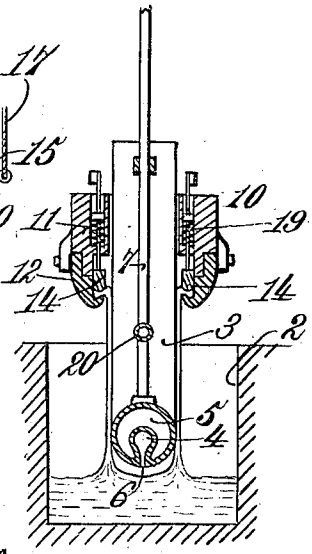


Fig. 3.

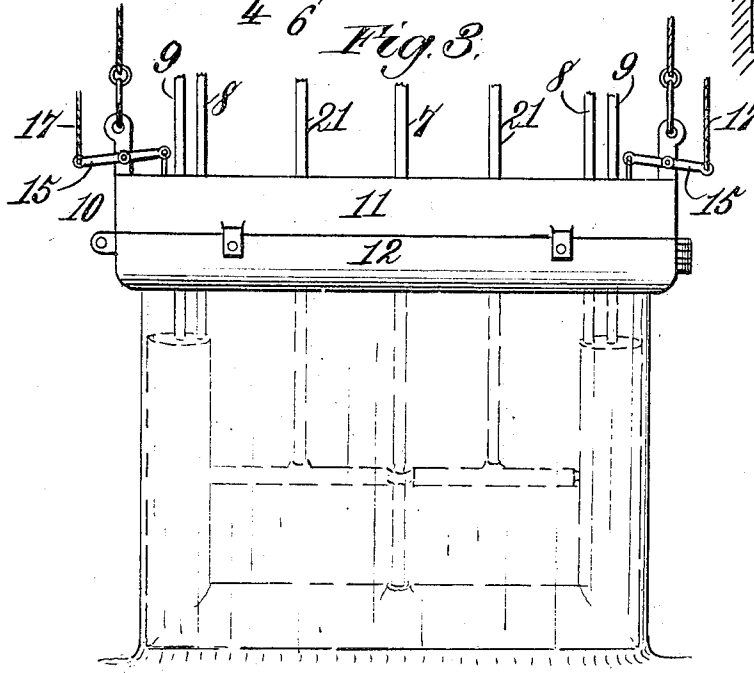


Fig. 4

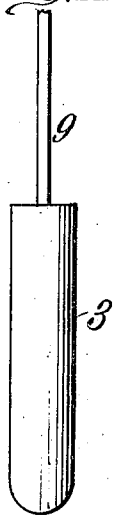
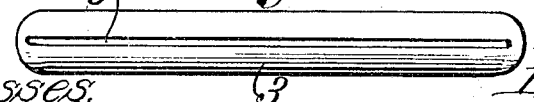


Fig. 5.



Witnesses.
Robert Everett.
John Brown

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MACHINE FOR MAKING GLASS ARTICLES.

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2 SHEETS—SHEET 2.

Fig. 6.

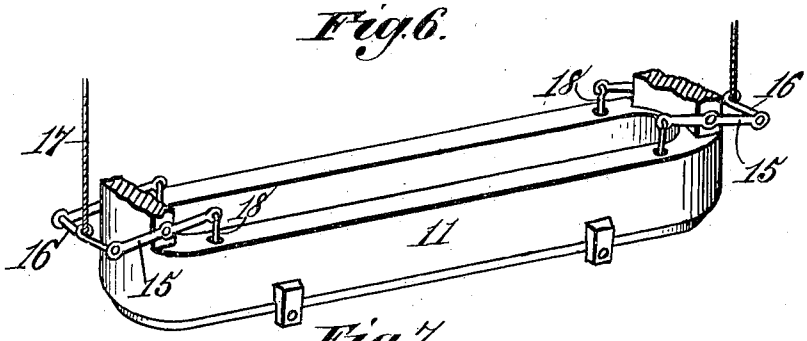


Fig. 7.

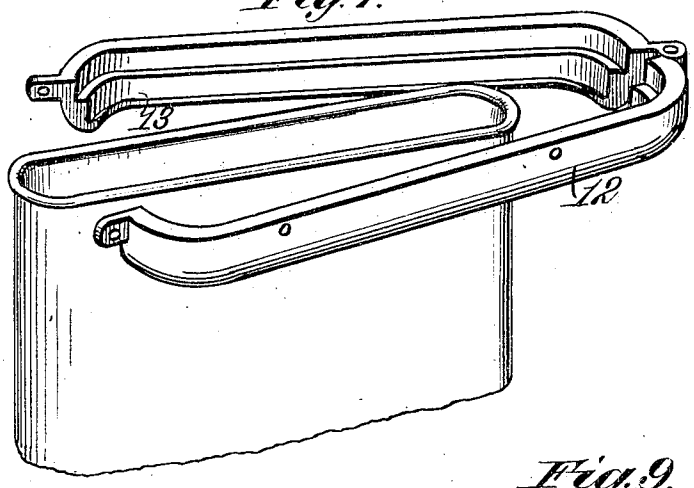


Fig. 9.

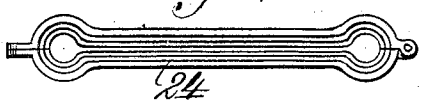


Fig. 8.

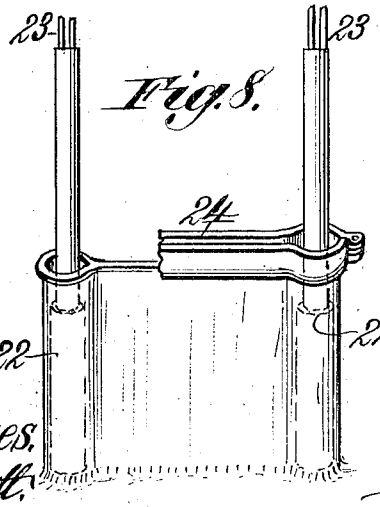
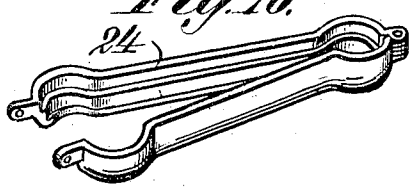


Fig. 10.



Witnesses.
Robt Cravitt.
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UNITED STATES PATENT OFFICE.

AUGUST RASPILLAIRE, OF MORGANTOWN, WEST VIRGINIA, ASSIGNOR OF ONE-THIRD TO JOSEPH L. KEENER AND ONE-THIRD TO JAMES P. WARRICK, OF MORGANTOWN, WEST VIRGINIA.

MACHINE FOR MAKING GLASS ARTICLES.

No. 839,421. Specification of Letters Patent. Patented Dec. 25, 1906.

Application filed March 15, 1904. Serial No. 198,274.

To all whom it may concern:

Be it known that I, AUGUST RASPILLAIRE, a citizen of the United States, residing at Morgantown, in the county of Monongalia and State of West Virginia, have invented new and useful Improvements in Machines for Making Glass Articles, of which the following is a specification.

This invention relates to machines for making glass articles, and it is in the nature of an improvement upon the machine disclosed by my contemporaneously-pending application, Serial No. 148,391, filed March 18, 1903.

The invention is shown in one simple and convenient embodiment thereof in the accompanying drawings, forming a part of this specification, which embodiment will be set forth at length in the following description, while the novelty of the invention will be embraced by the claims succeeding such description. I wish to state at this point that I do not limit myself to the precise disclosure made by said drawings and description, for material variations as to a number of features may be adopted within the scope of my claims.

The objects and advantages of the invention will be fully set forth in such description.

Referring to said drawings, Figure 1 is a front elevation of a machine including my invention. Fig. 2 is a cross-sectional elevation of the same. Fig. 3 is a perspective view of the apparatus, showing the manner of drawing the glass. Fig. 4 is an end view of the core shown in the preceding figures, and Fig. 5 is a bottom plan view of the same. Fig. 6 is a perspective view of the plunger. Fig. 7 is a like view of the plunger-head and the leading end of the drawn glass, showing said head as opened to effect the detachment of the glass therefrom. Fig. 8 is a view in elevation of a modified form of machine. Fig. 9 is a top plan view of the modified form of plunger, and Fig. 10 is a perspective view of said modified plunger opened to secure the separation of the glass sheet therefrom.

Like characters denote like parts throughout the several figures.

The molten glass to be drawn may be contained within any suitable receptacle, such as that denoted by 2. The receptacle 2 may be the forehearth of a glass-melting tank of the ordinary kind. The glass, in practice, is melted in said tank and flows therefrom by way of an aperture opening into such forehearth.

The machine illustrated includes in its organization a core and means for drawing the molten glass from a receptacle, such as that hereinbefore denoted by 2, and placing such molten glass around the core.

The core illustrated is denoted by 3, and it is approximately of yoke form—that is to say, it comprises a horizontal bottom and vertical sides rising from the ends of said bottom. In other words, the core is of skeleton form, and it may be made from any desirable material or size. The shape illustrated of course is a simple and convenient one. The shape of the core will be altered to accord with the shape of the article it is desired to draw—oblong when the article is to be tubularly oblong, hexagonal or cylindrical when the article is to be hexagonal or cylindrical, or of other shape when the article to be drawn is of other tubular shape. The core contains interiorly two chambers, as 4 and 5, into the chamber 4 of which air may be directed, while into the chamber 5 water may be directed, or instead of air and water equivalent cooling agents may be directed into such chambers. For example, I might direct air into the chamber 5 and water into the chamber 4, but prefer to have the relation hereinbefore stated. The two chambers are separated from each other in some desirable manner. In the bottom of the core 3 is a longitudinal slot 6, into which the air-chamber 4 opens. In fact, said slot constitutes an outlet or delivery mouth for the air-chamber 4, and it is represented as extending practically the entire length of the cross-bar or horizontal portion of the core. The tops of the side bars or vertical branches of the core 3 are closed, therefore, to similarly close the two chambers therein at such points. A water-supply pipe, as 7, is connected with the upper side of the cross-bar of the yoke substantially centrally thereof, while water-outlet pipes, as 8, lead from the said water chamber or compartment at the upper ends of the side branches of the core. Upon the introduction of water into said water-chamber by way of the supply-pipe 7 such water will circulate through the water-chamber and will

pass out the outlet-pipes 8, the water during its circulation through such water-chamber effectually cooling the core, so that when the glass is drawn around the same, as will hereinafter appear, the possibility of such glass sticking against the horizontal bar of the core as it is elevated above the level of the molten mass in the receptacle 2 is eliminated. The water therefore cools or chills the core, and in addition to this it also chills the glass at about the level of the molten mass in the receptacle 2 and in this case aids the air-blast hereinafter described, which is utilized for chilling the interior of the tubular or hollow article at or about the drawing-point. By virtue of this chilling at the place indicated I am enabled to draw articles of thicker glass than where an outside chilling is used and also equalize the heat of the molten mass of glass, which is more liable to chill in its outer portion. In practice and prior to a draw the core is lowered to a position in proximity to the level of the molten bath of mass of glass, at which time the water is caused to circulate through the core to secure the advantages set forth. In practice the several pipes 7 and 8 will be supported for sliding movement in suitable guides carried by a cross-head, whereby the core can be bodily raised and lowered, it being lifted, as will hereinafter appear, out of the drawn article.

Air-supply pipes, as 9, are tapped or otherwise fitted into the tops of the side branches of the core and open into the air-chamber 4 thereof to supply air to the molten bath or mass at approximately the drawing-point, which air chills the glass at the drawing-point, so that the draw when lifted around the core which shapes it will maintain its set condition. In other words, the air prevents that part of the draw which is free of the core from collapsing or warping.

As will hereinafter appear, I may employ an auxiliary air-supply device. This auxiliary air-supply device enables the glass to be drawn more rapidly and results in its quicker cooling and setting. Its use, however, is not essential, for I can chill the glass by the primary chilling means to such an extent as to prevent its collapse or bellying inward. The principal advantage derived, therefore, from the auxiliary air-supply device is the fact that rapidity of work is assured by its presence.

As previously set forth, the core in operation is lowered to bring the under side of its cross-bar in proximity to the level of the molten bath or mass in the forehearth or other receptacle 2, and just prior to the draw water and air, through the operation of suitable cocks, (not shown,) are permitted to flow into their chambers in the hollow core. The air from the air-chamber of the core is delivered by way of the slot 6 directly on top of the molten material, and as the draw is elevated upward and around and in contact with the core the mass is chilled within the draw, so as to absolutely prevent the collapse of the free portions of the draw when the latter, which is in tubular form, surrounds the core. During the drawing operation the core is stationary or at rest, whereby the air is delivered interiorly of the draw and at substantially the level of the molten bath throughout the entire draw. The air, rising, passes upward between the horizontal bar of the core and glass draw, so as to avoid unnecessary friction between its parts and to provide an air-cushion between the same.

The plunger is denoted in a general way by 10, and it is supported, like the core, for rising and falling movement. Said plunger includes in its construction a body 11, having a removable head or bait proper, as 12, the head being removable to facilitate the disconnection of the draw or set glass tube, cylinder, or other inclosed part, from the plunger-body. The plunger is adapted to dip into the molten bath in the receptacle 2 and to be raised upward therefrom, and as the latter operation takes place the glass is drawn from the receptacle by the plunger. The plunger is adapted to surround the core, and its shape is approximately the same as that of the core, the plunger preferably having a close fit around the core. The plunger-body presents a form that is practically oblong in plan, and it has in its lower edge exteriorly thereof a rabbet into which the head 12 is set, means of a suitable nature being provided to detachably unite the two parts. When the plunger is lowered into the molten bath or mass it does not, of course, leave the core.

In the inner face of the removable head or bait 12 of the plunger is formed a groove 13 of unbroken or continuous form, into which the molten mass, as the plunger is dipped thereinto, can flow, and as will hereinafter appear I compress the molten glass in such groove in order to initially chill the same at such place and to assure its firm adherence to the plunger-head. Seated within the groove 13 is a presser-device 14 in the shape of a band, vertically movable in and shaped to agree with the groove. The groove, however, is deeper than the band to permit the vertical movement set forth. At the opposite ends of the plunger-body 11 and fulcrumed between their ends upon the forward and rear sides of said body are levers, as 15, suitably connected at their outer ends by cross-pieces, as 16, from the centers of which latter ropes or cables, as 17, extend upward, by drawing upon which the presser device can be lowered through the medium of said levers and their connections, now to be described. Links, as 18, are pivotally connected to the inner arms of the several levers 15 and are likewise jointed to the presser de-

vice 14 near the opposite ends thereof, coiled push-springs, as 19, surrounding the several links being provided to normally hold the said presser device elevated. When the plunger is dipped into the mass of molten glass and when the latter has passed into the groove 13 of the plunger-head or bait 12, the presser device is forced downward by pulling the ropes 17 upward so as to compress the glass into the groove and against the bottom thereof and assure the leading edge of the draw adhering to the bait as the draw is elevated. In addition to this the presser device also initially chills the leading edge of the draw. When the ropes 17 are released, the springs 19, of course, return the presser device to its primary position in contact with the lower edge of the body of the plunger. I have described the presser device 14 as being manually operable. This is not essential, for it may be actuated in any other desirable way.

In operation the core 3 is lowered until its horizontal bar or transverse portion is at about the level of the molten glass, at which time both air and water are directed into said core. At this point the plunger, including, of course, the head or bait 12 thereof, is lowered into the molten bath, after which the presser device 14 is operated, as previously described The plunger is then elevated, drawing the glass therewith and carrying it around the core which shapes the glass, the draw agreeing in contour with that of the core in plan view. As the core thus far described is of oblong form, the draw will be of a similar shape. The water of course cools or chills the core, and the air aids this result and also chills the level of the molten glass at the drawing-point. The air also flows upward between the glass and core for the purpose hereinbefore set forth. When the plunger is lifted above the core a desired distance, the tube of glass is separated from the molten bath in some suitable manner—as, for example, by means of shears. During the draw the core of course is stationary. When, however, a draw of a suitable length has been obtained, the core is lifted out of the tube of glass. The tube of glass, with the plunger-head attached thereto, can be removed from the body of the plunger and can be introduced into a heating-furnace (not shown) for a short while as a preliminary annealing. After being removed from such furnace the glass, with its attached plunger-head or bait, can be transported by means of a crane (not illustrated) to an annealing-oven to toughen the glass. When the glass is annealed, it is removed from the annealing-furnace with the plunger-head or bait attached thereto. The plunger-head is then removed from the bait, and to facilitate this operation said plunger-head consists of two hingedly-connected sections which can be opened to bring about the result set forth. When the plunger-head is in its operative position, the two hingedly-connected sections of course are united to each other.

Although the glass when detached from the bait is tubular, it presents two large flat portions which are separated from the curved portions of the draw so as to form two flat sheets. The said flat portions may be separated from the curved portions in any desirable way to form the sheets, and such sheets will be found to be without flaws or burns. As the bait when dipped into the molten glass is cool or comparatively so, the molten glass will not stick to it, but is simply hooked into the groove of the bait or plunger-head, thereby preventing the cracking or breaking of the glass due to contraction and expansion.

A machine constructed as hereinbefore described prevents the collapse or shrinkage of the sheet-glass during the drawing operation and the cracking or breaking of the glass at the point where it is united to the bait and also facilitates the separation of the glass from the bait after the draw.

The air-blast hereinbefore described initially chills the molten bath within the draw, so as to avoid the possibility of the draw or the free portions thereof collapsing when the core is inclosed or partially inclosed by such draw. The core maintains the draw in a stretched condition.

I provide auxiliary cooling or setting means for the glass, as hereinbefore stated; but of course said auxiliary cooling means may be omitted. By their provision, however, rapidity of work is assured. The auxiliary cooling or air-supply means illustrated will now be set forth. A horizontal pipe is represented at 20, located above and in parallelism with the cross-bar of the core 3. This pipe consists of two sections suitably connected, and air-supply pipes, as 21, are connected with such pipe-sections, which, it will be observed, have a multiplicity of perforations for the exit of air therefrom. This air is directed into the draw at a point above the level of the molten bath and serves, as previously set forth, to augment the effect of the main air-supply. The pipe 20 may be united with the core or may be separate therefrom, as deemed desirable. It does not, of course, come in contact with the draw. The air rising into the interior of the draw both from the main and auxiliary air-supply means passes out of the top of the draw, which, as is understood, is open. The auxiliary air-supply pipe 20 is of course removed from the draw with the core 3.

In Figs. 8 to 10 I have illustrated a modified form of the apparatus, which I will now describe. The core represented in these figures consists of two parts, each denoted by 22 and hollow and vertically disposed.

Water supply and outlet pipes (each denoted by 23) are connected with the top of the core parts 22, so as to secure the circulation of water through the said core parts to chill or cool the same precisely as the case with the core 3. This result, however, may be otherwise accomplished. For example, the core parts might be covered with asbestos. The plunger is denoted by 24 and is in the form of two hingedly-connected sections which approach each other between their ends and which are widened at their ends to present sleeve-like parts 25 to traverse the two core parts 22 on the lowering and raising of the plunger. This plunger is grooved exactly like the plunger hereinbefore described and operates in practically the same manner. It does not, however, draw a tube, but draws a sheet of glass with two tubular parts connected to its ends surrounding the core parts, which tubular parts are subsequently disconnected from the intermediate flat portion to form a sheet of glass. The core parts keep the sheet of glass drawn from the bath or molten mass in a stretched condition. At a predetermined point in the height of the two core parts 22 they are of less diameter than the lower part thereof, so as to facilitate the separation of the sheet from such core parts after the draw. The operation of drawing the glass with the modified form of apparatus, the annealing, and other steps in the procedure are substantially the same as those hereinbefore indicated and need not, therefore, be repeated. The core in both of the forms hereinbefore described is chambered for the circulation of water, the water-chambers except for the inlets and outlets thereof being imperforate.

It will be observed that according to my invention the core determines the shape of the "draw," the glass being drawn about the core in practically operative contact therewith, whereby the core gives shape to the draw. If the core be oblong in configuration, the draw will be a tubular oblong. If it be hexagonal in shape, the draw will correspond thereto, and so on, according to the shape of the core. The air which may be introduced into the draw is not intended to and does not, in fact, perform any function with relation to shaping or maintaining the shape of the draw, but is intended when used to assist in chilling the draw in order to give it "set" and to lubricate the core, as it were—that is to say, to form a thin film of air about the core to assist in preventing the glass sticking to the material of the core. Such air is not intended to in any manner assist in either initiating or maintaining the shape of the draw, but when used is used merely for the purpose of assisting in the chilling action and lessening the possibility of the glass adhering to the material of the core. This is an idea radically distinguished from apparatus in which air is introduced into a draw for the purpose of filling out the space inclosed by the draw, preventing the collapse of the walls of the draw, and maintaining the shape of the draw. Heretofore in the art of mechanical glass-drawing, so far as I am aware, it has been possible only to draw cylinders, and this has been proposed to be done by utilizing a cylindrical-shaped bait which initially will draw glass in cylindrical form from the molten bath and then maintain that cylindrical form by proposing to introduce into the draw just a sufficient quantity of air to maintain that cylindrical form. My invention contemplates no such idea, but rather to give form to the draw by the core, against which core the glass in the act of drawing is in actual operative contact, whereby the shape of the draw will accord with the shape of the core. When it is desired to introduce air into the draw to facilitate, as it may be, the cooling of the glass and prevent possible clinging of the glass to the material of the core, the air does not perform any function whatever in relation to the shape of the draw, but serves merely as a cooling or chilling and lubricating agent.

A distinct broad characteristic of my invention resides in the utilization of a core about which the glass is drawn and with which the glass is in operative contact sufficient to give the shape to the draw without the use of auxiliary means for determining or altering the shape of the draw.

When the core is of oblong configuration, such as illustrated in the drawings in my application, the draw will be of oblong tubular configuration—that is to say, it will have two straight flat sides joined together at the ends by semicircular portions—and the draw when removed may be separated at the ends to form two flat sheets of glass, dispensing with the necessity of the usual necessary flattening process, which has been found essential where glass is drawn in cylinders. This idea is a valuable one, materially cheapening the process of mechanically drawing or producing flat sheets of glass, and, so far as I am aware, no one prior to my invention has proposed or has succeeded in accomplishing this desirable result.

Having thus described the invention, what I claim is—

1. In a machine of the class described, the combination of a core having water and air chambers, the air-chamber having an outlet, means for delivering air and water into the core, means for drawing glass around the core, and supplemental air-supply means situated at a point above said outlet.

2. In a machine of the class described, means for drawing glass in tubular form from a glass-bath, and means for directing a cooling agent into the draw simultaneously at different points in its height.

3. In a machine of the class described, means for drawing glass in tubular form from a glass-bath, means for directing a cooling agent into the draw at approximately the level of the bath, and independent means for delivering a cooling agent into the draw at a higher point.

4. In a machine of the class described, the combination of a core, and a plunger surrounding the core and arranged to dip into a glass-bath and to draw glass therefrom around the core, the plunger having a groove to receive the molten material, and means for compressing the molten material into said groove.

5. In a machine of the class described, the combination of a core, and a plunger surrounding the core and arranged to dip into a glass-bath and to draw glass therefrom around the core, the plunger having a groove to receive the molten material, a presser device seated in the groove and adapted to press the molten material against the bottom of the draw, means for normally holding the presser device in its ineffective position, and means for imparting a working movement to said presser device.

6. In a machine of the class described, the combination of a core, and a plunger surrounding the core and arranged to dip into a glass-bath and to draw glass therefrom around the core, the plunger having a groove to receive the molten material, a presser device seated in the groove and adapted to press the molten material against the bottom of said groove, yieldable means for normally holding the presser device in an ineffective position, and independent means for imparting a working movement to the presser device.

7. In a machine of the class described, a glass-drawing bait having a groove to receive molten glass from a bath, and means for compressing the molten material in said groove.

8. In a machine of the class described, means for drawing glass in tubular form from a glass-bath, and means for directing a cooling agent into the draw interiorly thereof at uniform but different points in the height of the draw.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

AUGUST RASPILLAIRE.

Witnesses:
JESSIE MORRIS,
JAS. A. MEREDITH.