H. M. BROWN.

MACHINE FOR MAKING BOTTLES, ETC.

APPLICATION FILED MAR. 18, 1918.

1,406,722. Patented Feb. 14, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

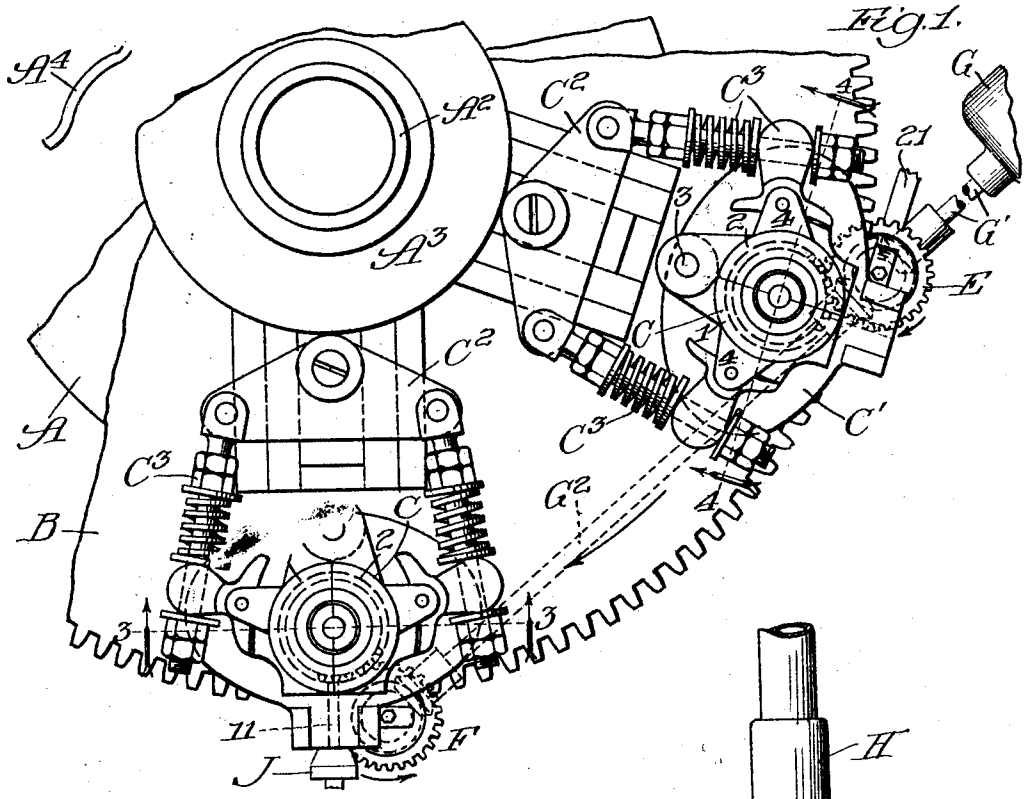
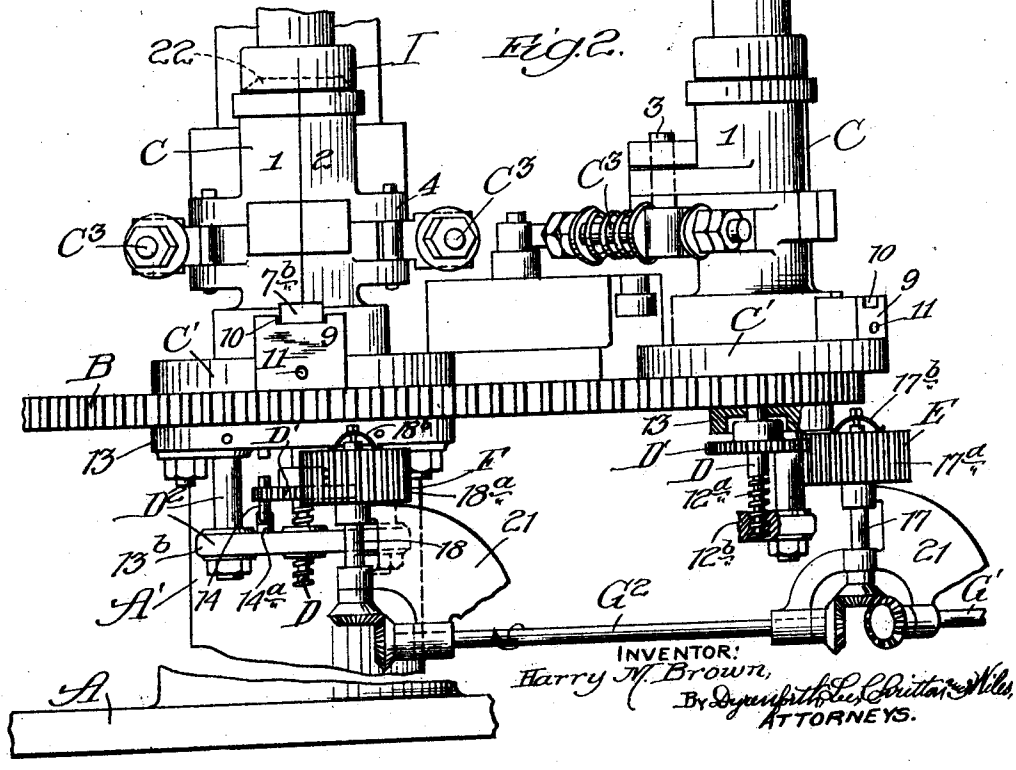


Fig. 2.



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2 SHEETS—SHEET 2.

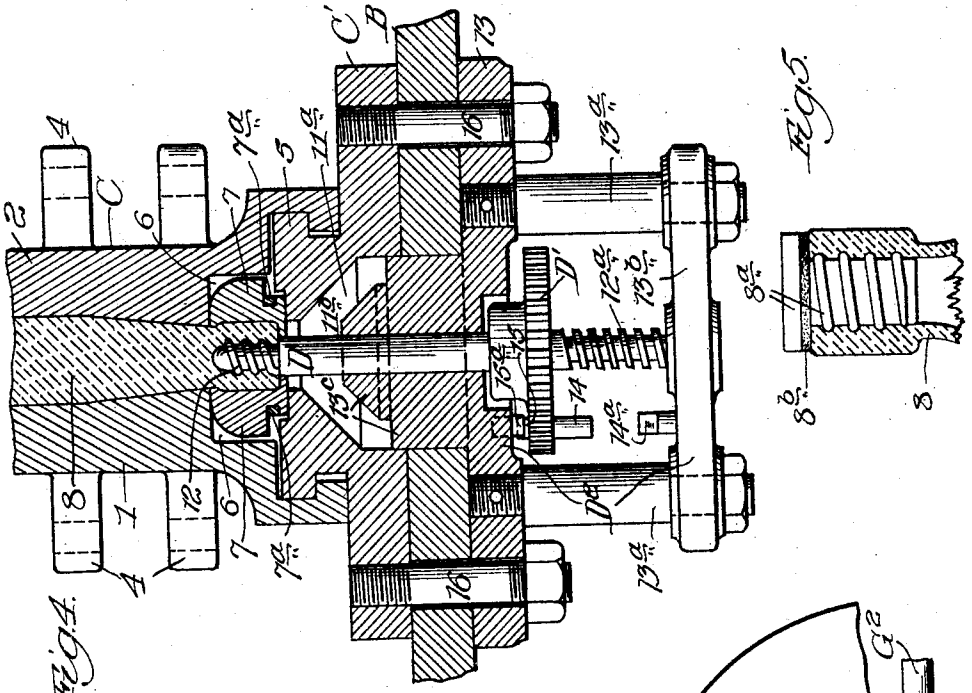

Fig. 4.

Fig. 5.

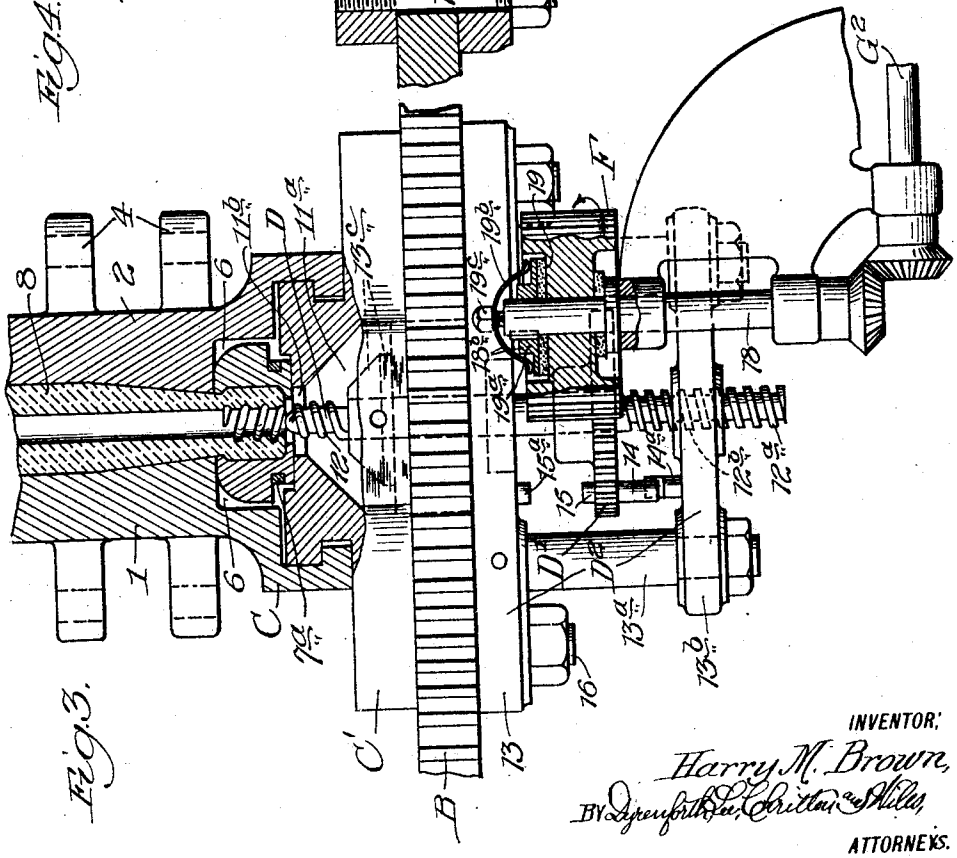

Fig. 3.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING BOTTLES, ETC.

1,406,722. Specification of Letters Patent. **Patented Feb. 14, 1922.**

Application filed March 18, 1918. Serial No. 223,090.

To all whom it may concern:

Be it known that I, HARRY M. BROWN, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in a Machine for Making Bottles, etc., of which the following is a specification.

This invention relates particularly to machines for making bottles, or similar containers, which are provided within the mouth-portion with an internal screw thread; and the primary object of the invention is to provide an improved machine for making bottles, or the like, which, while having large capacity, is capable of providing the mouth of the bottle with an internal thread simultaneously with the formation of the neck-portion and mouth of the bottle.

The invention is illustrated, in its preferred embodiment, in the accompanying drawings, in which—

Fig. 1 represents a broken plan view of a bottle-making machine constructed in accordance with the invention; Fig. 2, a broken elevational view, partly in section, of the same; Fig. 3, an enlarged broken elevational view, partly in section, taken approximately as indicated at line 3 of Fig. 1; Fig. 4, a broken sectional view taken as indicated at line 4 of Fig. 1; and Fig. 5, a broken sectional view showing the mouth-portion of a bottle formed by the improved machine, fitted with an externally-threaded glass stopper.

It may be stated, generally, with reference to the machine illustrated, that it comprises an intermittently-actuated rotatable table having mounted thereon a circumferentially-arranged series of molds; means for automatically closing the molds and for automatically opening them again after the forming and blowing operations have been performed; and a mandrel corresponding with each mold having threaded connection with the table which carries it, and provided with an extremity which co-operates with the mold and has a thread corresponding in pitch with the threaded connection between the mandrel and the table which carries it; means for forcing the glass into the mold at the glass-charging station; means for forcing air into the mold at the blowing station; and local mechanisms for turning the mandrels, seriatim, to elevate them to the molding position at the molding station, and for turning the mandrels in the opposite direction to withdraw them at the blowing station.

Intermittently-actuated rotatable tables equipped with molds and means for opening and closing the molds are well-known in the art of bottle-making machines; hence, it is unnecessary to show and describe the same with great detail. The accompanying drawings will suffice to enable the present invention to be fully understood by those skilled in the art.

In the construction illustrated, A represents a base which supports a central column, or standard, A′; B, an intermittently-actuated rotary table mounted on the column A′ in the usual manner and caused to rotate, in a step-by-step manner, in the usual way, by any well-known mechanism (not shown); C, C, a circularly-arranged series of molds mounted on the table B; C′, a mold base-plate associated with each mold and which is rigidly secured to the table near its circumferential edge, the switching sections of the mold being pivotally connected together and mounted on said base-plate, and also having interlocking connection with the base-plate when the mold-sections are closed; D, a mandrel associated with each mold and carried by the intermittently-actuated rotary table, each mandrel being equipped with an actuating gear D′; D^2, a mounting for each mandrel firmly secured to the rotary table; E, local mechanism located at the glass-charging station and adapted to engage the gears D′, seriatim, when they reach the glass-charging station, whereby each mandrel is, in turn, elevated to the molding position; F, local mechanism located at the blowing station and adapted to engage each gear D′, seriatim, when it reaches the blowing station, whereby the mandrels are, in turn, lowered, thus enabling air-pressure to be admitted through the bottle-neck; and G, a motor serving to communicate motion, through shafts G′ and G^2, to the gear mechanisms E and F, in such a manner that they will rotate in opposite directions.

The construction of the frame, which comprises the base A and column A′, need not be described in detail, as the same is well understood. It may be stated, however, that the column A′ has a reduced portion A^2 which extends through the rotary table B

and carries a stationary cam A^3 which serves to close the sectionally-constructed molds. There is, also, a stationary cam A^4, shown brokenly in Fig. 1, which serves to open the molds after the blowing operation is performed. These cams serve, in a well-known manner, to actuate the radially-moving slides C^2, which are joined, by connections C^3, to the mold-sections, whereby the mold-sections will be automatically closed before they reach the glass-charging station, and will be automatically opened after they pass the glass-blowing station.

Each mold C comprises, in addition to the base-plate C', a pair of vertical sections 1 and 2 having pivot-lugs connected with a vertical pivot 3 mounted on the back-portion of the base-plate C'. These mold-sections are equipped with lateral actuating arms 4 which are joined by the connections C^3 to the radially-movable slides C^2, in a well-known manner. The lower ends of the mold-sections 1 and 2 are adapted to swing over the mold-plate C'; and the mold-plate is provided with a raised central portion equipped with an annular flange 5 which is received in semi-annular recesses with which the base-portions of the mold-sections 1 and 2 are provided.

The mold-sections 1 and 2 are provided just above the raised central portion of the mold-plate C' with complemental annular recesses 6, which afford a chamber adapted to accommodate the separable sections 7 of a pair of tongs, the sections 7 having an internal contour corresponding with the external contour of the bottle-mouth. In Figs. 3 and 4, 8 represents the bottle in the process of formation. The sections 7 which comprise the head of the tongs are carried by arms, or handles, 7^a, which may extend through the recesses, or openings, 7^b, with which the mold-sections 1 and 2 are provided, as shown in Fig. 2. The tongs are introduced before the mold-sections 1 and 2 are closed, the mold-plates C' being equipped with blocks, or supports, 9, which are provided in their upper surfaces with recesses 10 adapted to receive the handles of the tongs, in the usual manner. Each mold-plate C' is further provided with a radial perforation 11, which leads to a central chamber 11^a in the mold-plate. The chamber 11^a communicates, through a central passage 11^b, with the interior of the tongs 7, it being understood that the tongs 7 form virtually a part of the mold in the bottle-forming operation, and serve afterwards as a means for removing the bottle from the mold.

Each mandrel D comprises a spindle which has its upper end provided with a screw thread 12, and which has its lower end provided with a thread 12^a of the same pitch. The gear D', in the illustration given, is fixedly secured to the spindle. The mounting D^2 for the spindle, or mandrel, comprises a plate 13 which is firmly secured to the table B, depending posts 13^a firmly secured to the plate 13, and a cross-bar 13^b fixedly secured to the lower end of the posts 13^a. The plate 13 has on its upper surface a central boss 13^c, which fits snugly into an opening with which the table B is provided near its circumference, and extends into a corresponding central opening of the mold-plate C', which constitutes a downward extension of the chamber 11^a, and thus the plate 13 is properly centered with relation to the mold-plate. The mandrel D is journaled to turn in the bearing afforded by the central portion of the plate 13. In each case, the lower end of the mandrel D has threaded connection with the cross-bar 13^b, that is, the thread 12^a of each mandrel works in a corresponding thread 12^b (Fig. 2) with which the central portion of the cross-bar 13^b is provided. Each gear D' is equipped on its lower side with a pin, or stud, 14, which depends from it and is adapted to engage a stud 14^a carried by the cross-bar 13^b, whereby the rotation of the mandrel will be arrested when the mandrel is sufficiently withdrawn from the mold; and each gear D' is further equipped on its upper side with a stud 15, which engages a stud 15^a depending from the plate 13, whereby the right-hand rotation of the mandrel will be arrested after the mandrel reaches the molding position. In each case, the gear D' is located between the plate 13 and the cross-bar 13^b carried by the depending studs 13^a. In effect, the mandrel, in each case, has screw-connections with the revoluble mold-carrying table B. The plate 13 is secured to the table B by means of bolts 16, which serve also to firmly secure the mold plate C' to the table.

The gear mechanism E, in the preferred construction, comprises a constantly rotating spindle 17; a gear 17^a journaled thereon; and a friction-clutch device 17^b adapted to permit slippage of the spindle 17 with relation to the gear 17^a when the stud, or stop, 15, engages the corresponding stop, 15^a, after the mandrel has been elevated to the molding position. The gear 17^a, viewed from below, rotates counter-clockwise, so that each gear D', when brought into engagement therewith, will be rotated clockwise to cause the mandrel to be elevated.

The gear mechanism F comprises a constantly rotating vertical shaft 18; a gear 18^a journaled on the upper end thereof; and a friction-clutch device 18^b adapted to permit slippage after the mandrel has been withdrawn from the molding position. The gear 18^a, viewed from below, rotates clockwise, so that each gear D', when it arrives at the blowing station, will be rotated

counterclockwise, thus lowering the mandrel to the inoperative position. The friction-clutch device 18^b comprises a friction-disk 19 encircling the upper portion of the shaft 18 and received in a recess in the upper surface of the gear 18^a; a surmounting metal disk, or collar, 19^a, splined on the upper end of the shaft 18, a leaf-spring, or resilient yoke, 19^b, provided with a central perforation and having its extremities bearing on the disk 19^a; and an adjusting screw 19^c connecting the central portion of the spring with the upper end of the shaft 18. By this means proper tension may be placed upon the parts to cause the gear 18^a to perform its function of rotating the mandrel. The friction device 17^b of the gear mechanism E is of similar construction. Each of the shafts 17 and 18 is equipped with a collar 20, upon which the friction-actuated gear is supported.

The shafts 17 and 18 are journaled in stationary brackets 21, which may be suitably supported on the frame of the machine. In the illustration given, the shafts 17 and 18 are equipped at their lower ends with bevel pinions which mesh with pinions on the connecting horizontal shaft G^2. The motor shaft G′ is equipped with a bevel pinion which meshes with the bevel pinion on the lower end of the shaft 17. By this arrangement, the friction-actuated gear 17^a rotates in one direction, and the friction-actuated gear 18^a operates in the opposite direction. Thus, each of the mandrels D will be rotated clockwise and elevated when its gear D′ reaches the glass-charging station, and will be rotated counter-clockwise and withdrawn when the gear D′ reaches the blowing station.

The machine is equipped, in the usual manner, with a blow-head H (Fig. 2), which may be brought down onto the upper end of a mold after the charge of glass has been introduced into the mold. Thus, by admitting air pressure the glass, in its molten or plastic state, will be forced into the bottom of the mold and will have its neck and head shaped and the internal screw-thread formed, this operation being performed at the glass-charging station while the table B remains stationary.

The machine is further equipped with a mold-cap I (Fig. 2), located at the blowing station. This cap is adapted to be lowered on to the upper ends of the mold-sections 1 and 2, and is suitably socketed, as indicated by dotted lines at 22, to lock the mold-sections in closed position. The mold-cap I, also, is suitably formed to give the exterior finish to the bottom of the bottle. While the mold-cap I is forcibly held upon the top of the sections 1 and 2 of the mold, the blowing operation is performed, it being understood that the mandrel D is at this time retracted, as shown in Fig. 3. At this station, the air-conduit 11 of the mold-plate C comes into registration with a blow-head J (Fig. 1), which is held by the usual means (not shown) against the projecting portion of the mold-plate, while the table B is at rest. The air passes through the chamber 11^a into the mouth-portion of the bottle, and forces the glass to conform to the interior configuration of the mold, as will be understood from Fig. 3. After this operation, the mold is carried by the table to the point where the bottle is to be removed, the cam A^4 serving to automatically open the mold. The bottle may then be transferred to a finishing machine provided with molds of larger internal contour, where the blowing operation is finished, in which operation the glass is reduced to the desired thickness. It is common in this class of machines to construct a single machine with a finishing table as well as a molding table. This forms no part of the present invention, and is not illustrated.

From the description given, the operation will be readily understood. The revoluble table B is intermittently actuated, and the molds mounted on the table are so spaced that one mold will be located at the glass-charging station while the mold in advance thereof will be located at the blowing station. The table carries the molds in an annular path, and with each mold carries a mandrel which has a threaded upper end and a correspondingly threaded shank having screw-connection with the table, or a member carried by the table. The molds are closed, in turn, before they reach the glass-charging station. When a mold reaches this station, the gear D′ of its mandrel comes into mesh with the frictionally-actuated rotating gear 17^a, which turns the mandred right-handedly and elevates it, thus bringing the threaded upper end of the mandrel to the molding position. A charge of glass is introduced into the mold, the blow-head H is lowered upon the mold, and the charge of glass in the mold is subjected to air-pressure to force the glass to fill the lower portion of the mold and mold the neck-portion of the bottle and give the interior finish to the bottle-mouth. The blow-head H is then elevated, and the table is advanced another step, carrying the charged mold to the blowing station, at which station the gear D′ of the mandrel comes into mesh with the rotating frictionally-actuated gear 18^a, which operates to turn the mandrel counter-clockwise and lower it. The mold-cap I is lowered upon the mold, and air is admitted into the mouth-portion of the bottle, thus forcing the glass in the mold to conform to the internal configuration of the mold. While the molding operation is being performed at the charging station, the

blowing operation is being performed at the blowing station. The bottles are carried from the blowing station to the point where they are to be removed from the machine, the molds being automatically opened during this time.

The frictionally-actuated gears 17[a] and 18[a] rotate rapidly, so that the work of raising the mandrel at one station and lowering it at another requires but an instant.

It will be noted that the mandrel is positively withdrawn by reason of its screw-connection with the table which carries it; and the rate of rotation and withdrawal correspond exactly with the screw thread in the glass, so that there is a perfect unscrewing action in the glass, without exerting any pressure upon the glass, which at this stage still remains in a more or less plastic condition. There can be no deformation of the thread in the glass, because the mandrel can neither drop of its own weight nor lag behind so as to exert pressure upon the threads in the glass, because of the fact that the mandrel is positively held in exactly the proper height at every degree during the unscrewing operation by the metal screw-connections at 12[a] and 12[b]. The very simple expedient of the friction-clutch device employed enables the mandrels to be screwed up and down expeditiously and without danger of injury to the parts, inasmuch as slippage will occur after the desired movement of the mandrel is effected.

A machine of the character described is adapted to produce rapidly and economically bottles provided in the mouth-portion with an internal screw thread, adapted to receive a threaded stopper, such as a glass stopper 8[a], equipped with a gasket 8[b], as shown in Fig. 5.

It will be understood that the table B is, in effect, a mold-carrier; and it is to be understood, also, that the mold-carrier may be given any suitable form, and that the molds may be mounted on the carrier in any suitable manner, various forms of mold-carriers and various methods of mounting the molds on such carriers being known in the art.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitation should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

What I regard as new, and desire to secure by Letters Patent, is:

1. In a machine of the character set forth, the combination with an intermittently-actuated table and a series of molds mounted on the upper side thereof, of a blow-head located at a glass-charging station above the path of said molds, a mold-cap located above the path of said molds at a blowing station, a mandrel for each mold extending through and having screw connection with the table and having an upper extremity adapted to project into the mold cavity and provided with a thread of the same pitch as said screw connection, local gear mechanism below the table at one station adapted to rotate each mandrel in a direction to elevate the mandrel to the molding position preparatory to the glass-charging operation, and local gear mechanism located beneath the table at the other station and adapted to rotate each mandrel in the opposite direction and lower the mandrel from the molding position.

2. In a machine of the character set forth, the combination with a revoluble table and a series of molds mounted thereon, of a mandrel for each mold having screw connection with the table and provided with a threaded extremity adapted to extend into the mold cavity, and local mechanisms adapted to rotate said mandrels, seriatim, in one direction to project them into the molds and in the other direction to effect withdrawal, each of said local mechanisms being equipped with a friction-clutch device to permit slippage.

3. In a machine of the character set forth, the combination with a revoluble table and a series of molds mounted thereon, of a mandrel for each mold having screw connection with the table and provided with a threaded extremity adapted to project into the mold, a gear element on each mandrel, a gear element at a local station rotating in one direction, a gear element at another local station rotating in the opposite direction, said gear-elements being adapted to be engaged, in turn, by the gear-elements of the mandrels, one set of said gear-elements being capable of slippage, for the purpose set forth.

4. In a machine of the character set forth, the combination with a revoluble table and a series of molds mounted thereon, of a mandrel for each mold having screw connection with the table and having a threaded extremity adapted to project into the mold, gear-elements mounted on the mandrels, oppositely rotating gear-elements located at different local stations and adapted to engage, in turn, the gear-elements of the mandrels as they arrive at said stations, one set of said gear-elements being capable of slippage, and means for arresting the rotation of each mandrel in each direction after the mandrel has risen or fallen the requisite distance.

5. In a machine of the character set forth, the combination with an intermittently-actuated rotary table and a series of molds mounted thereon, of a mandrel for each mold having screw connection with the table and having a threaded portion adapted to project into the mold, a pair of oppositely-rotating vertical shafts situated at different local stations, gear elements journaled on

said shafts and adapted to be engaged, in turn, by the gear-elements of said mandrels, and friction-clutch devices connecting said shafts with the gear-elements mounted thereon.

6. In a machine of the character set forth, the combination with an intermittently-actuated rotary table and a series of molds mounted thereon, of a mandrel for each mold having screw connection with the table and having a threaded portion adapted to project into the mold, a pair of oppositely-rotating vertical shafts situated at different local stations, gear-elements journaled on said shafts and adapted to be engaged, in turn, by the gear-elements of said mandrels, and friction-clutch devices mounted on said shafts and equipped with adjusting devices, said clutch-devices being adapted to cause the gear-elements on said shafts to rotate with the shafts and permit slippage after the mandrels have been moved the requisite distance.

7. In a machine of the character set forth, the combination with an intermittently-actuated rotary table and a series of molds mounted thereon, of a blow-head located at a glass-charging station above the path of said molds, a mold-cap located above the path of said molds at a blowing station, a mandrel for each mold having screw connection with the table and having a threaded extremity adapted to project into the mold, gear-elements mounted on said mandrels, oppositely-rotating gear-elements located, respectively, at the glass-charging station and the blowing station and adapted to be engaged, in turn, by the gear-elements of said mandrels when they arrive at said stations, and means for permitting slippage of one set of gear-elements after the mandrels have been moved the requisite distance.

8. In a machine of the character set forth, the combination with an intermittently-actuated rotary table and a series of molds mounted on the upper side of said table, a mandrel for each mold journaled in the table and having a threaded upper end adapted to project into the mold and equipped below the table with a gear-element, a threaded bearing for the lower end of each mandrel disposed below the table and fixedly connected with the table, and power actuated local gear mechanisms disposed at different stations below the plane of the table and adapted to be engaged, in turn, by the gear elements of said mandrels when they arrive at said stations, whereby the mandrels will be elevated and lowered, seriatim, as they arrive successively at said stations.

9. In a machine of the character set forth, the combination with a revoluble table equipped on its upper side with a series of molds, mechanism for opening and closing said molds during the rotation of the table, a mandrel for each mold extending through and having screw connection with the table and having a threaded upper end-portion adapted to project into the mold, means located above the table at one station for admitting air-pressure to the upper portion of the molds as they arrive in turn thereat, local mechanism disposed below the table for rotating each mandrel, in turn, in a given direction to elevate it to the molding position, a mold-cap located above the table at a blowing station and adapted to be lowered on said molds, in turn, and local mechanism disposed below the table and adapted to rotate each mandrel, in turn, in the opposite direction to lower it to the inoperative position to enable the blowing operation to be performed.

10. In a machine of the character set forth, the combination of a revoluble table, a series of mold-plates mounted thereon provided with central chambers, mold-sections mounted on said mold-plates, means for opening and closing said mold-sections during the rotation of the table, a series of plates secured to the lower side of the table, each plate having a central projection extending through an opening in the table and into the central cavity of the corresponding mold-plate, posts depending from said last-named plates and equipped with cross-bars, mandrels journaled in said last-named plates having threaded upper end-portions adapted to project into the molds and having threaded connection at their lower end with said cross-bars, gear-elements mounted on said mandrels, means for limiting the rotation of said mandrels in both directions, and local gear mechanisms having gear-elements rotating in opposite directions which are adapted to engage the gear-elements of said mandrels as they arrive in turn thereat.

11. In a machine of the character set forth, the combination of an intermittently-actuated revoluble table, a series of sectional molds mounted thereon, means for closing and opening said molds during the rotation of the table, a mandrel projecting through the table and having a threaded upper end-portion adapted to extend into the mold, a gear-element mounted on each mandrel below the table, a member having screw connection with the lower end of each mandrel and fixed connections with the table, a pair of vertical shafts equipped with frictionally-connected gear-elements adapted to be engaged successively by the gear-elements of said mandrels, and mechanism for continuously rotating said shafts in opposite directions.

12. The combination with a horizontal intermittently rotated table carrying a series of spaced molds having bottom openings, of

means mounted beneath said table for forming an internal screw thread in the neck of a bottle blank, which is placed in a mold, said means consisting of an attachment comprising a screw tap or plug having a stationary axis adapted to simultaneously rotate and reciprocate longitudinally whereby it will be moved into the bottom opening of the mold prior to the delivery thereto of a charge of molten glass and withdrawn therefrom prior to blowing the blank.

13. The combination with a horizontal intermittently rotated table carrying a series of spaced molds having bottom openings, of means mounted beneath said table for forming an internal screw thread in the neck of a bottle blank, which is placed in a mold, said means consisting of an attachment comprising a rotatingly and reciprocatingly mounted spindle located beneath the table, having a stationary axis and having a screw tap or plug on one end thereof constructed and arranged whereby when the spindle is rotated in one direction it will be moved endwise to place the screw tap or plug in the bottom opening of the mold and when rotated in the opposite direction it will move endwise to withdraw the screw tap or plug from the mold.

14. The combination as defined in claim 12 in which the spindle is supported by a bracket carrying a stationary nut, and a thread provided on the spindle and engaging said nut and forming the means for moving the spindle axially when said spindle is rotated.

15. In a machine of the character set forth, the combination with a mold-carrier and a series of molds carried thereby, of a mandrel for each mold having screw connection with the mold carrier and provided with a threaded extremity adapted to project into the mold, a gear-element on each mandrel, a gear-element at a local station rotating in one direction, a gear-element at another local station rotating in the opposite direction, said local gear-elements being adapted to be engaged, in turn, by the gear-elements of the mandrels, one set of gear-elements being capable of slippage, and means for limiting the axial movements of the mandrels.

16. In a machine of the character set forth, the combination with a revoluble mold carrier and a series of molds mounted thereon, of a mandrel for each mold having screw-connection with the mold carrier and provided with a threaded extremity adapted to project into the mold, a gear-element on each mandrel, and local driving mechanisms having oppositely-rotating gear-elements adapted to be engaged, in turn, by the gear-elements of the mandrels, the connections being adapted to permit slippage when the mandrels are held against rotation, and means for limiting the axial movements of the mandrels.

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