No. 674,519. Patented May 21, 1901.

A. J. RUDOLPH.

MACHINE FOR FORMING BOTTLE NECKS.

(Application filed June 4, 1898.)

(No Model.) 3 Sheets—Sheet 1.

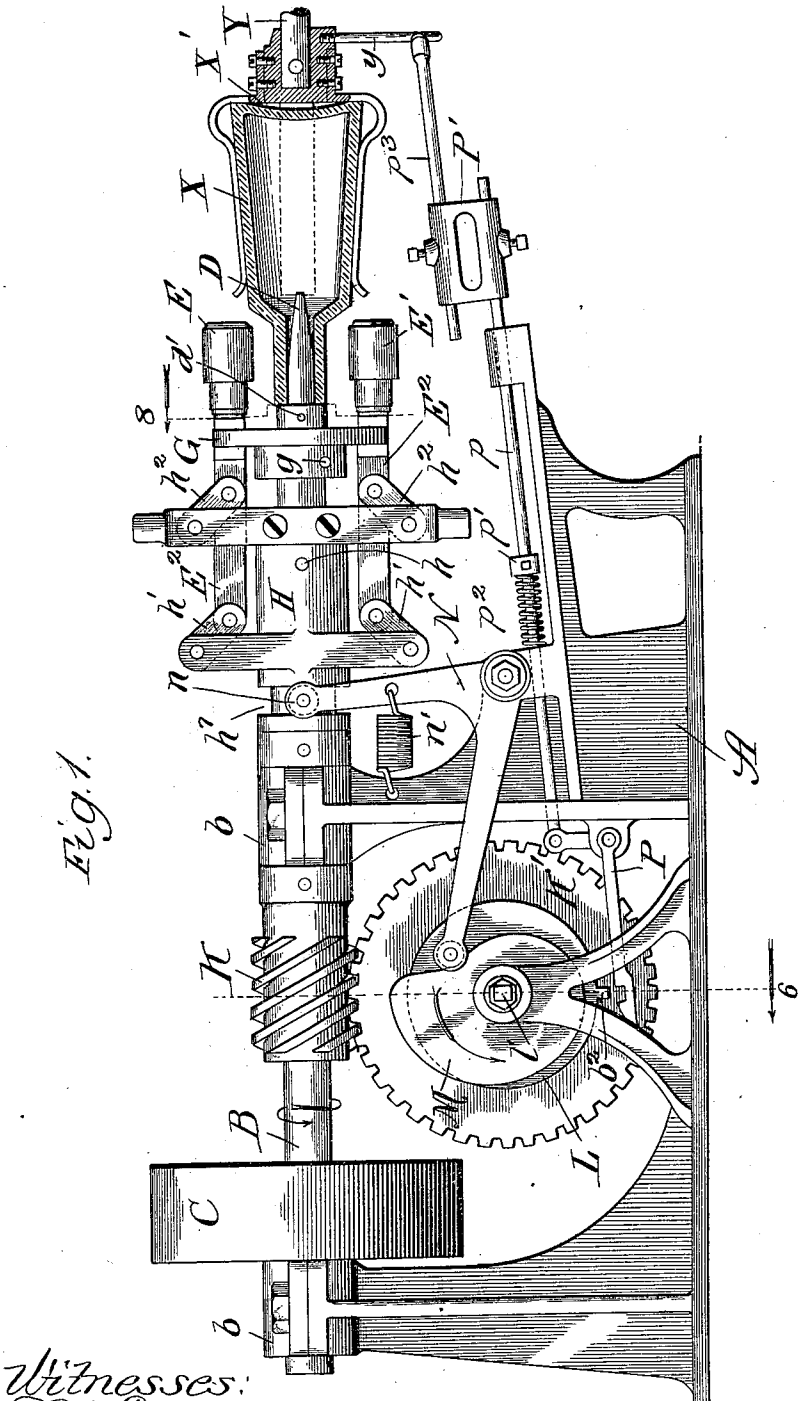


Fig. 1.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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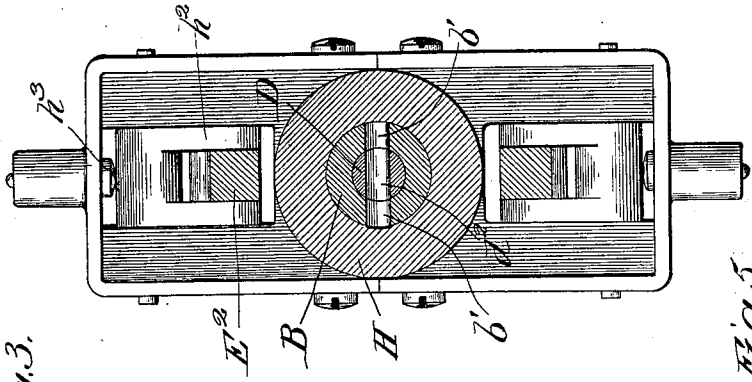


Fig. 3.

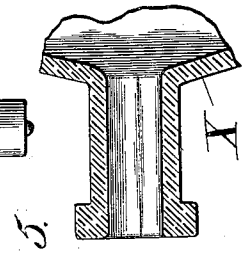


Fig. 5.

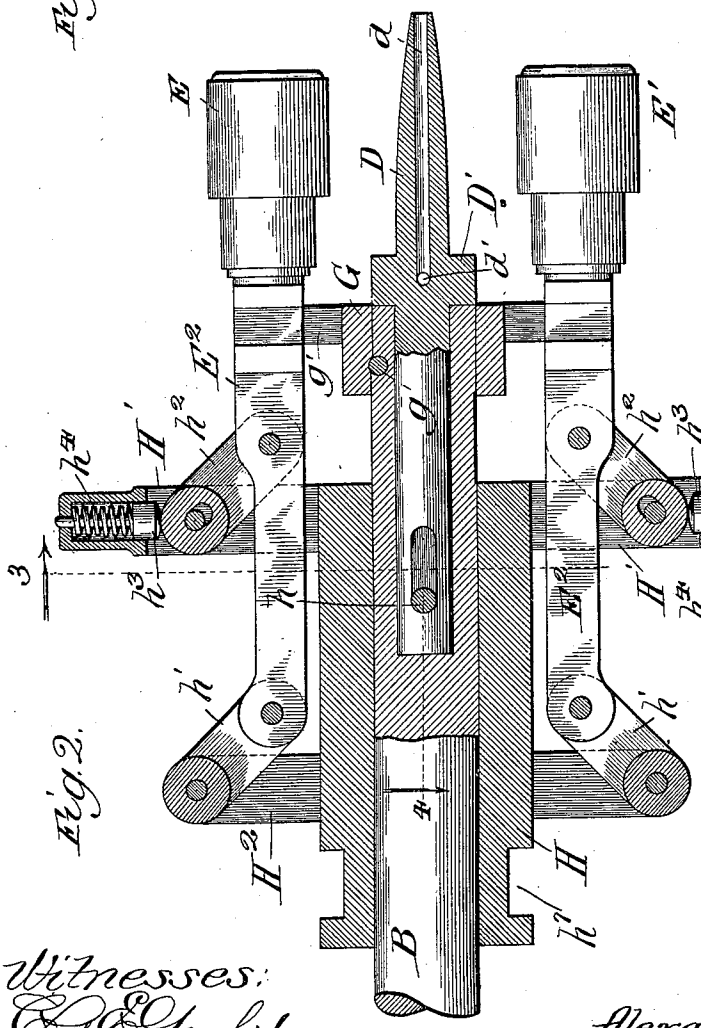


Fig. 2.

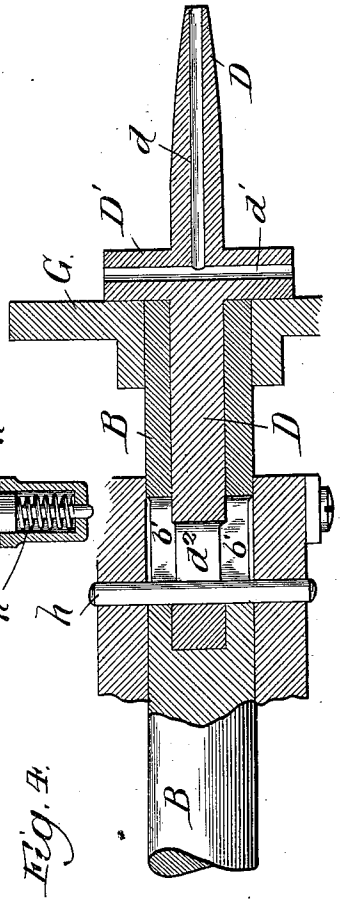


Fig. 4.

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Fig. 6.

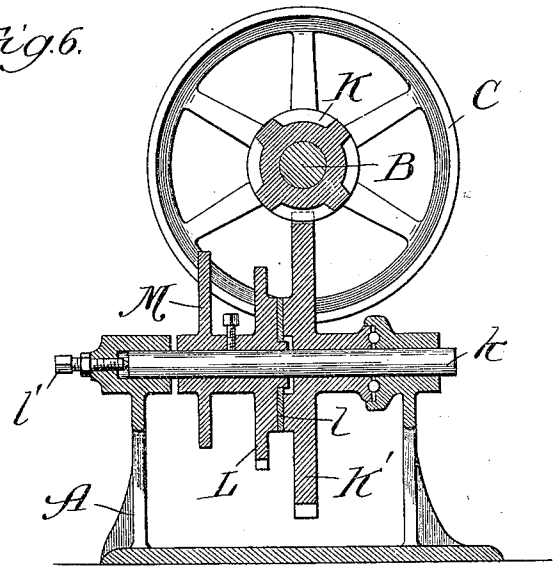


Fig. 7.

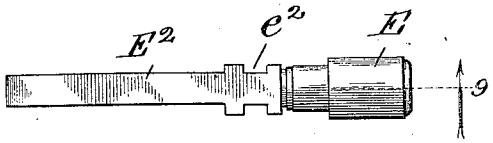


Fig. 8.

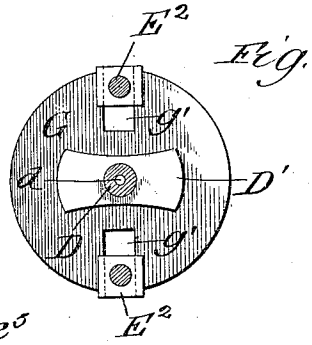
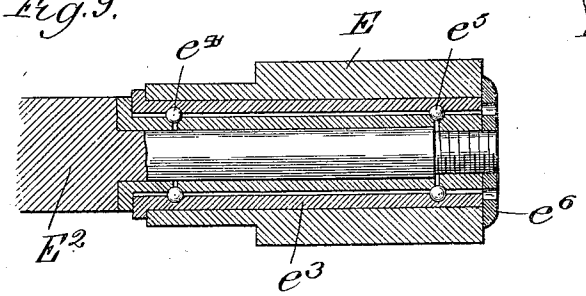


Fig. 9.



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UNITED STATES PATENT OFFICE.

ALEXANDER J. RUDOLPH, OF CHICAGO, ILLINOIS.

MACHINE FOR FORMING BOTTLE-NECKS.

SPECIFICATION forming part of Letters Patent No. 674,519, dated May 21, 1901.

Application filed June 4, 1898. Serial No. 682,592. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER J. RUDOLPH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Forming Bottle-Necks, of which the following is a specification.

My invention relates to that class of mechanism for forming and finishing the necks of glass bottles and other open-ended tubular articles formed of glassware or similar material while such articles are in a heated, malleable, or ductile condition.

The principal object of my invention is to provide a simple, economical, and efficient machine for forming bottle-necks.

The invention consists in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side elevation of a machine constructed in accordance with my improvements, showing a bottle in longitudinal section as it appears when inserted in the machine for forming and finishing; Fig. 2, a detailed longitudinal sectional view of the forming mechanism; Fig. 3, a cross-sectional view taken on line 3 of Fig. 2; Fig. 4, a longitudinal sectional view taken on line 4 of Fig. 2; Fig. 5, a broken sectional elevation of a portion of a bottle and bottle-neck; Fig. 6, a cross-sectional view taken on line 6 of Fig. 1; Fig. 7, a detail view of one of the parallel bars with its forming-roll removed from the machine; Fig. 8, a cross-sectional view taken on line 8 of Fig. 1; and Fig. 9, a longitudinal sectional detail of one of the forming-rolls, showing the sleeve and antifriction-bearing upon which it is mounted.

In the art to which this invention relates it is well known that heretofore in the forming and finishing of bottle-necks the operations have been carried out almost exclusively and entirely by the use of hand-tools. The carrying out of these operations by hand requires a high degree of skill and expensive labor, and, further, the operations are so extensive as to consume considerable time. The principal object of my invention, therefore, is to remove such objections and provide a simple, economical, and efficient machine for the forming and finishing operations.

In constructing a machine in accordance with my improvements I make a frame portion A of the desired size, shape, and strength to support the operative and other mechanisms. For convenience I have shown this frame portion without any supporting means; but it will be understood that it may be supported upon a bench, standard, or suitable legs, as may seem desirable or necessary to suit different circumstances and conditions.

Rotatably mounted in suitable bearing portions *b b* is a main spindle B, which is provided with a driving-pulley C for operating the same. This main spindle at its forward end is provided with an axial opening, in which is longitudinally and movably mounted a forming-plug D, tapered at its front end and adapted to enter the neck of a bottle, as shown particularly in Fig. 1. This forming-plug is provided with longitudinal and transverse channels *d* and *d'*, adapted to furnish an exit for the air in the bottle, so as to prevent compression of the air and consequent inflation or distortion of the bottle. It will be noticed from an inspection of Fig. 1 that while the main spindle, with its forming-plug, is rotated the bottle X is held stationary by means of a snap-holder X', so that the plug sizes and gives a gloss and finish to the material on the inside of the bottle.

In order to form and finish the outer portion of the bottle-neck in the desired manner, a pair of shouldered forming-rolls E and E' are provided, mounted upon parallel bars E^2. Of these parallel bars there are two in number, oppositely mounted with regard to each other and eccentrically mounted with regard to the axis of the driving-spindle; but it will be understood that one only can be used by increasing the number of rotations, or three or more can be used by decreasing the speed of rotation.

During the operation of forming and finishing and in order to contact the bottle-neck and allow such bottle to be inserted or withdrawn it is necessary that these parallel bars, with their forming-rolls, be rotated in an orbital path at the same angular velocity as the forming-plug and at the same time that means be provided for moving such bars, with

their forming-rolls, inwardly and outwardly. In order to accomplish these results, a guide-disk G is provided and suitably secured to the main spindle by means of a cotter g. This disk is provided with radial grooves or slots g', in which the recessed portions e^2 of the parallel bars are placed, so as to prevent such parallel bars from having independent longitudinal movements with regard to the main spindle, permit them to be moved inwardly and outwardly, and at the same time to carry them around in their orbital path with the same angular velocity as the main spindle.

To move the bars, with their parallel rollers, as above stated, inwardly and outwardly and in a parallel manner, an operating-sleeve H is provided and mounted upon the main spindle, so as to rotate simultaneously therewith, but have independent longitudinal movements. In order to provide for this simultaneous rotation and independent longitudinal movements, the main spindle has an elongated slot b' and the operating-sleeve a driving-pin h, which is passed through the slot. The sleeve is further provided with a rectangular frame portion H′ at the front end thereof and a second frame or projecting portion H^2 at the rear part thereof. Pivotally mounted in these frame portions are links h' h^2, which are also pivotally connected with the parallel bars. The operations of the parts are such that while the parallel bars are held from independent longitudinal movement the operating-sleeve H may be moved backwardly and forwardly and through the action of the links force the parallel bars, with their forming-rolls, inwardly and outwardly.

To provide for inequalities in the bottle-necks and to permit of a cushioning effect on the parallel bars, the links h^2 at their upper pivotal connection are provided with elongated slots and the frame portion with plugs h^3, bearing against cushion-springs h^4, which act to hold these links with their fulcrum-points normally and yieldingly on their pivots, but which will permit such links to be slightly raised against the tension of the springs whenever necessary.

When the bottle-neck has been sized by means of the forming-rolls, it is desirable that the mouth and lip portion of the bottle-neck be formed also and finished. In order to accomplish this result, the forming-pin is longitudinally and movably mounted in the spindle portion and is provided with an elongated slot d^2, through which the driving-pin h is also passed. During the forward movement of the operating-sleeve the forming-rolls are moved to the limit of their inward movement, and the pin h contacts the stock at one end of the elongated slot of the forming-plug and moves such plug forward during the remaining portion of its motion. This forward movement of the plug carries its shoulder portion D′ against the material of the bottle-mouth, which is in a heated ductile condition, and forces or carries the same up, so that the lip of the bottle-neck is given the square appearance shown in Fig. 5. When the parts are released, the sleeve first moves backwardly to carry the rolls outwardly and then carries the plug back to its normal position.

As is well known, there is a large variety of bottles which have different-sized necks and openings. As a consequence it would be necessary to have a machine for each size of bottle-neck if no means were provided by which one machine could form a large number of sizes of bottle-necks. In order to accomplish this result, I make the forming-rolls in two parts—a main roll E, as shown particularly in Figs. 3 and 9, which is removably mounted upon a second or sleeve portion e^3, which in turn is mounted upon the parallel bars by means of the antifriction-bearings e^4 and e^5. When it is desired to change the size of the roll, the lock-nut e^6 is removed, which permits the removal of the main portion of the roll and the insertion of a new one. It will also be seen from an inspection of Fig. 2 that the forming-plug may be removed and a different-sized plug inserted whenever desirable or necessary.

In order to provide for the uniform rolling of the bottle-necks, it is desirable that some means automatic in its nature be provided, whereby the same amount of pressure is used at all times on the same-sized bottle and exerted during equal periods of time. To accomplish this result, I provide automatic mechanism, which consists of a worm K, mounted upon the main spindle and meshing with a worm-gear K′, loosely mounted on a spindle or shaft k. (Particularly shown in Fig. 6.) A friction-clutch is provided which consists of a disk L, mounted rigidly on the cam-shaft k and having a piece of leather or similar material l inserted between it and the face of the worm-gear. A set-screw l' is provided, which bears against the end of the cam-shaft, so as to regulate the amount of friction existing between the disk and the worm-gear. This "cam-shaft," as I term it, is provided with a cam M, rigidly secured to it, which is in contact with a bell-lever N, having a yoke-shaped end n, engaging with an annular groove h^7 in the operating-sleeve. A helical spring n' serves to hold the bell-crank or operating lever in engagement with the cam and operating-sleeve and hold them at their inoperative or inward limit of motion. In order to hold the cam, its shaft, and friction-disk from operative connection with the worm-gear, the disk is provided with a projection b^2, arranged to be engaged by a pivotal dog P. This pivotal dog is held in engagement with the lug on the friction-disk by means of a releasing-rod p, which is provided with a collar p' and a helical spring p^2, inserted between the collar and a rigid portion of the frame of the machine. This release-rod is

made in two parts, joined together by means of an adjustable block P′, so that its end p^3 may be moved inwardly and outwardly whenever desirable or necessary.

When the heated unformed bottle is placed in the snap X′, which is mounted on a rod Y, such rod carrying a radially-projecting pin y, the bottle is brought into position with its mouth and neck on the forming-plug. The radial pin y then contacts the release-rod to push it inwardly and throw the dog out of engagement with the friction-disk. This permits the worm-gear to carry the cam-shaft, with its cam, around one rotation and move the operating-sleeve forwardly to bring its forming mechanism into contact with the bottle-neck. When the cam-shaft has made one rotation, a slight turn of the bottle-holder allows the radial pin to pass out of contact with the release-rod and permits the dog to engage with the lug or projection on the friction-disk and stop further rotation. It will thus be seen that the same amount of pressure and the same amount of time is used on every bottle inserted in the machine, which, as a consequence, produces uniformity in result.

While I have described my invention with more or less minuteness as regards details and as being embodied in certain precise forms, I do not desire to be limited thereto unduly or any more than is pointed out in the claims. On the contrary, I contemplate all proper changes in form, construction, and arrangement, the omission of immaterial elements, and the substitution of equivalents, as circumstances may suggest or necessity render expedient.

I claim—

1. In a machine for forming bottle-necks, the combination of a rotatable spindle, a forming-plug slidably mounted in the forward end of and at the axial center of the spindle to revolve therewith and have an endwise movement independent thereof, a forming-roll carried by the spindle and revolved thereby coincident with and in an orbital path around the forming plug, an endwise-movable bar longitudinal of and parallel with the spindle, carrying the forming-roll at its forward end and having a transverse movement in relation to the spindle given thereto without changing the parallelism of its body with relation to the spindle, and means for automatically moving the roll-carrying bar endwise for the endwise movement to carry the forming-roll sidewise in parallel planes with the spindle inward and outward toward and from the forming-plug during the rotation of the spindle, substantially as described.

2. In a machine for forming bottle-necks, the combination of a rotatable spindle, a plug mounted in one end thereof and provided with longitudinal and transverse perforations to furnish an exit for the air, forming-rolls eccentrically mounted on such spindle opposite the plug portion, and means for moving the forming-rolls inwardly and outwardly in a parallel manner, substantially as described.

3. In a machine for forming bottle-necks, the combination of a rotatable spindle, a forming-plug slidably mounted in the forward end and at the axial center of the spindle to revolve therewith and have an endwise movement independent thereof, two bars on opposite sides of the spindle and parallel therewith and with each other, both bars carried by the spindle and revolving therewith, a forming-roll journaled on the outer or forward end of each bar to revolve coincident with and around the forming-plug, a support mounted on the spindle and endwise movable thereon and revoluble therewith, a swinging connection for each bar with the sliding support for moving the bars in unison, maintaining their parallelism and preventing independent endwise movements, and means for automatically moving the sliding support endwise simultaneously advancing and receding both bars to have the advancing and receding movements carry the forming-rolls sidewise coincidingly in parallel planes inward and outward toward and from the forming-plug, substantially as described.

4. In a machine for forming bottle-necks, the combination of a rotatable spindle, a forming-plug slidably mounted in the forward end of and at the axial center of the spindle to revolve therewith and have an endwise movement independent thereof, a radially-slotted disk fixed to the spindle at its outer or forward end, bars located on opposite sides of the spindle and parallel therewith and with each other, each bar having its body extending through a radial slot of the fixed disk, a forming-roll journaled on the outer or forward end of each bar to revolve coincident with and around the forming-plug, a sleeve slidably mounted on the spindle to rotate therewith and have an endwise movement thereon, a link at each end of the sliding sleeve pivotally connecting the parallel bars with the sleeve to move sidewise in planes parallel with the sleeve, and means for automatically moving the sliding sleeve endwise simultaneously advancing and receding the bars to have the advancing and receding movements carry the forming-rolls sidewise coincidingly in parallel planes inward and outward toward and from the forming-plug, substantially as described.

5. In a machine for forming bottle-necks, the combination of a rotatable spindle, a forming-plug slidably mounted in the forward end and at the axial center of the spindle to revolve therewith and have an endwise movement independent thereof, bars on opposite sides of the spindle and parallel therewith and with each other, both bars carried by and revolving with the spindle and each bar having its forward end projecting beyond the forward end of the spindle, a forming-roll journaled on the forward projected end of each

bar, a guide on the spindle through which the projected end of each bar passes for holding the bars and preventing independent longitudinal movement thereof, a sleeve slidably mounted on the rotating spindle to rotate therewith and have an endwise movement thereon, radial arms at each end of the sleeve, a link for each radial arm pivotally connected at one end with the arm and at the other end with the sliding bar, and means for moving the sleeve endwise on the spindle and simultaneously advancing and receding the bars and have the initial advance carry the forming-rolls inwardly and toward the forming-plug and the further advance to move the forming-plug endwise and assist in the formation of the lip of the bottle-neck, substantially as described.

6. In a machine for forming bottle-necks, the combination of a rotatable spindle, a forming-plug mounted in one end thereof, parallel bars adapted to be moved inwardly and outwardly in a parallel manner, means for imparting such movements, and a forming-roll on each of such bars and made in two parts—an inner tubular sleeve portion rotatably mounted on the bar and an outer removable shell on such sleeve portion forming the roll proper, substantially as described.

7. In a machine for forming bottle-necks, the combination of a rotatable spindle, a forming-plug mounted in one end thereof, a forming roll or rolls adapted to be moved inwardly and outwardly, a parallel bar for each roll mounted on the main spindle so as to rotate therewith, a reciprocating operating-sleeve engaging with the parallel bar mechanism to operate the same mounted on the main spindle so as to operate simultaneously therewith but have independent longitudinal movements, a bell-crank lever engaging with such operating-spindle to move it backwardly and forwardly, a rotating cam to operate such bell-crank lever, worm-and-gear mechanism in engagement with the driving-spindle to operate the cam, and means for throwing the cam into and out of operative engagement with the worm-and-gear mechanism to automatically operate the parts, substantially as described.

8. In a machine for forming bottle-necks, the combination of a rotatable spindle, a forming-plug mounted in one end thereof, a forming roll or rolls adapted to be moved inwardly and outwardly, a parallel bar for each roll mounted on the main spindle so as to rotate therewith, a reciprocating operating-sleeve engaging with the parallel bar mechanism to operate the same mounted on the main spindle so as to operate simultaneously therewith but have independent longitudinal movements, a bell-crank lever engaging with such operating-spindle to move it backwardly and forwardly, a rotating cam to operate such bell-crank lever, worm-and-gear mechanism in engagement with the driving-spindle to operate the cam, a friction-clutch interposed between the cam and the worm-gear, and means for throwing the friction-clutch into and out of operative action so as to operate the cam and other parts, substantially as described.

9. In a machine for forming bottle-necks, the combination of a rotatable spindle, a forming-plug mounted in one end thereof, and roll mechanism for forming the exterior of a bottle-neck composed of an inner rotatable tubular sleeve portion and an outer removable shell on such sleeve portion forming the roll proper, substantially as described.

10. In a machine for forming bottle-necks, the combination of a rotatable spindle, a forming-plug in the end thereof, parallel bars carrying the mechanism for forming the exterior of a bottle-neck, a reciprocating operating-sleeve mounted on the rotatable spindle, link mechanism connecting the parallel bars with the operating-sleeves, and spring mechanism interposed between the links and the operating-sleeve to form cushions for the parallel bars, substantially as described.

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