No. 677,530.

Patented July 2, 1901.

D. MURRAY.

GLASS BLOWING MACHINE.

(Application filed June 7, 1897.)

(No Model.)

3 Sheets—Sheet 1.

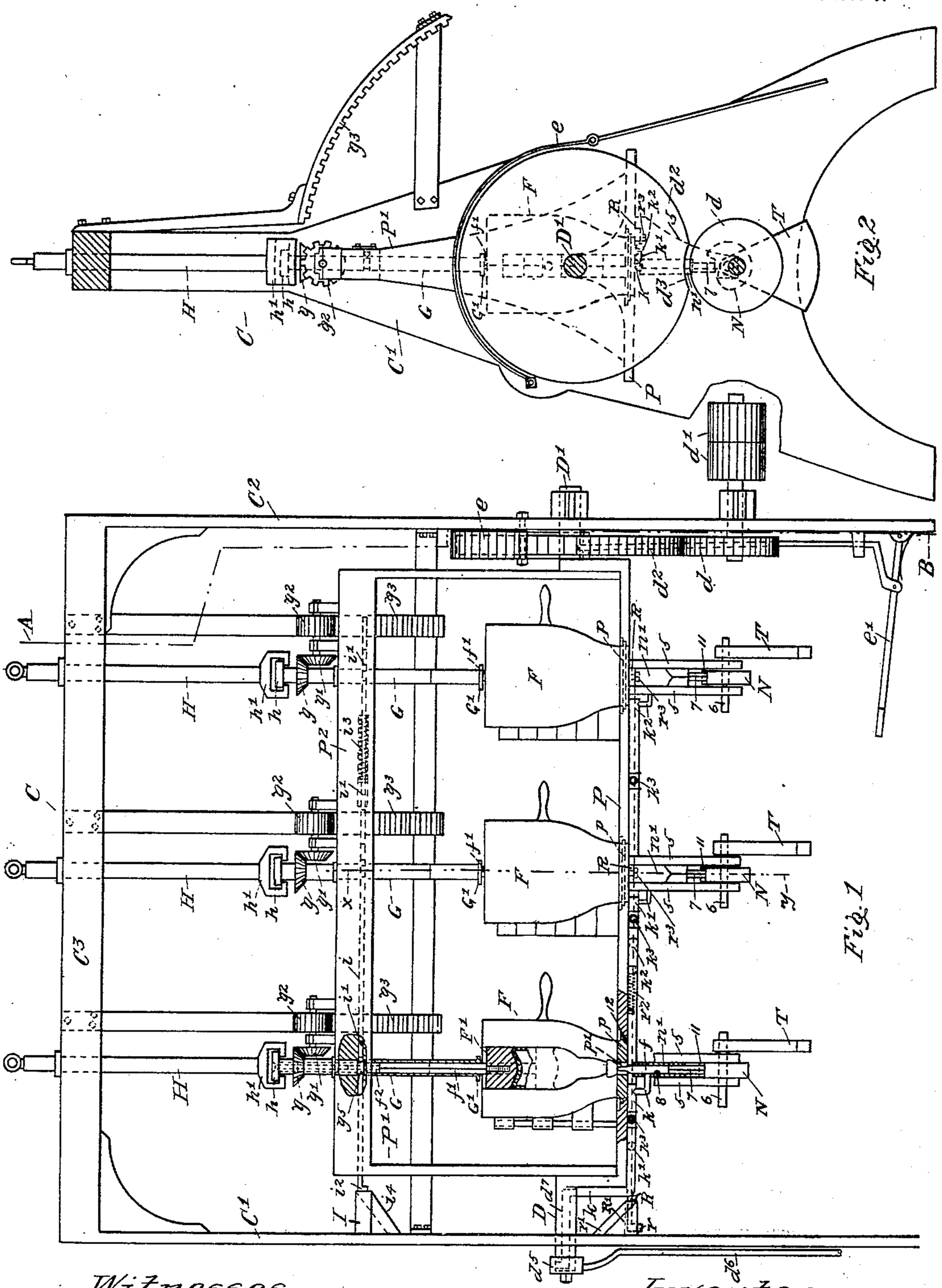


Fig. 2

Fig. 1

Witnesses
J. Notherspoon
Geo. L. Logan

Inventor
Daniel Murray

No. 677,530. Patented July 2, 1901.

D. MURRAY.

GLASS BLOWING MACHINE.

(No Model.) (Application filed June 7, 1897.)

3 Sheets—Sheet 2.

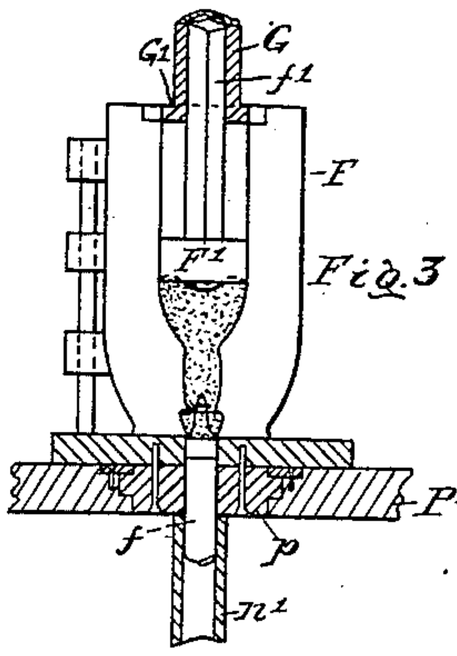


Fig. 3

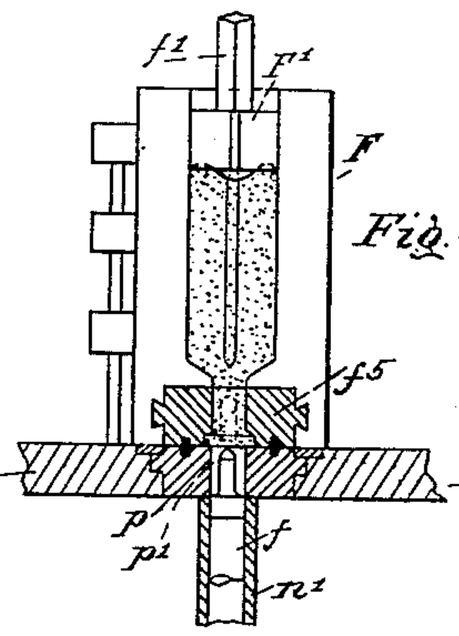


Fig. 4

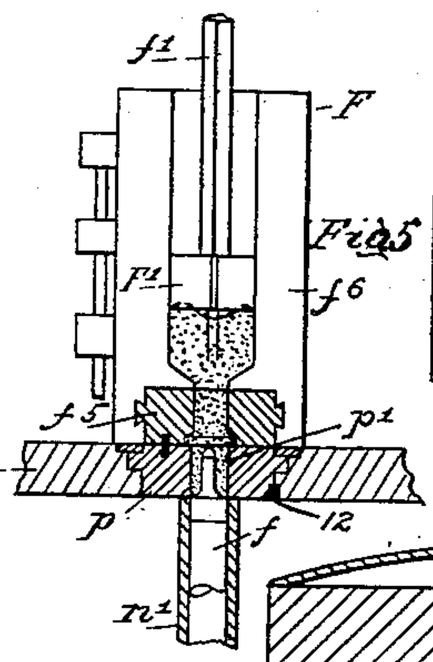


Fig. 5

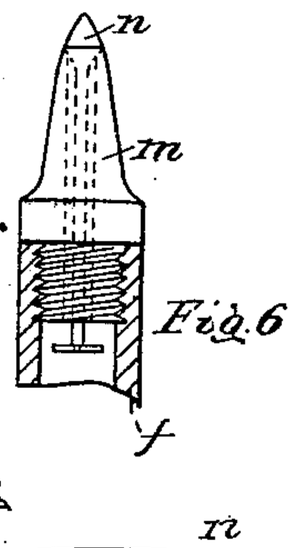


Fig. 6

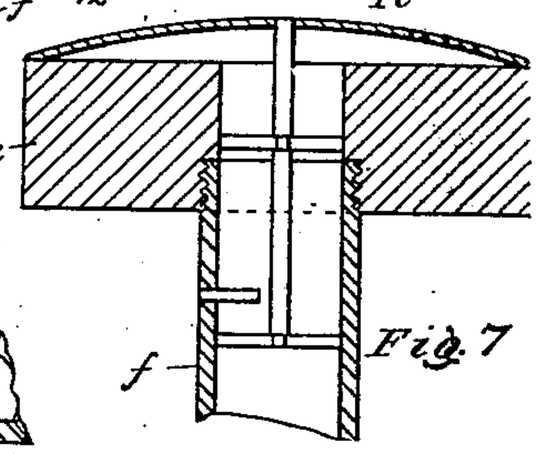


Fig. 7

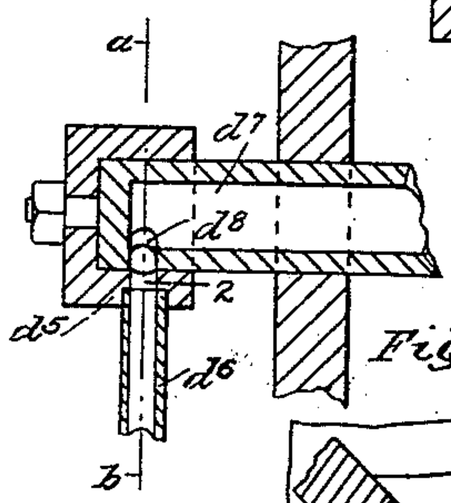


Fig. 8

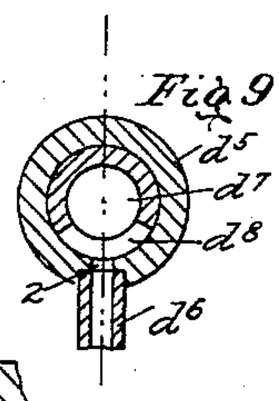


Fig. 9

Fig. 10

Fig. 11

Fig. 12

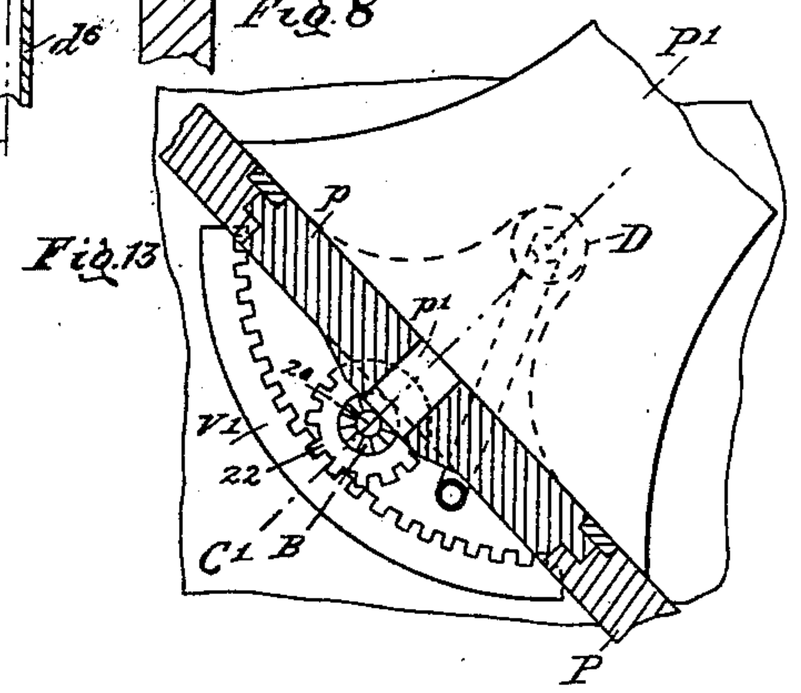


Fig. 13

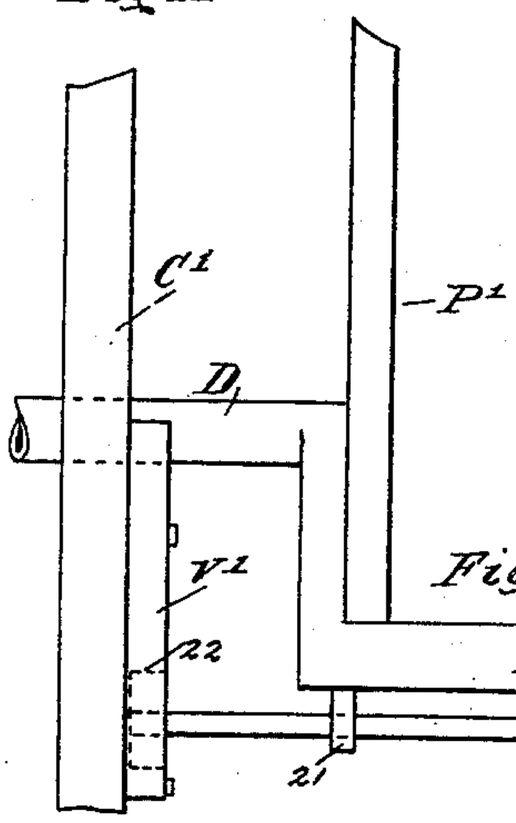
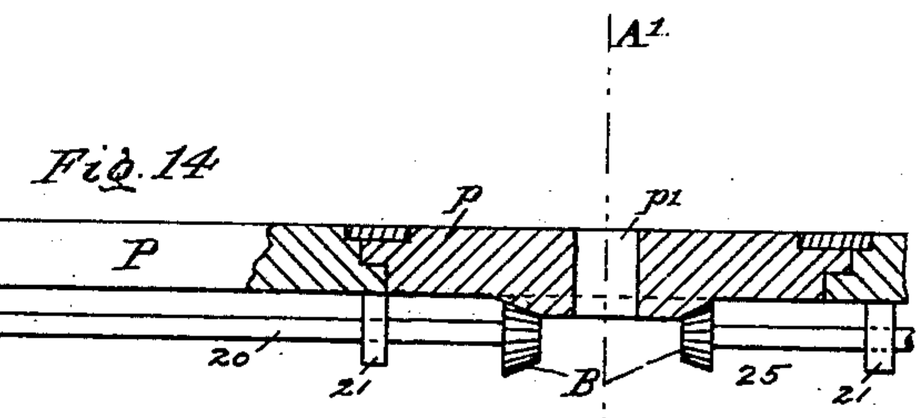


Fig. 14

Fig. 15



Witnesses
J. Wotherspoon
Geo. S. Logan.

Inventor
Daniel Murray

No. 677,530.

Patented July 2, 1901.

D. MURRAY.

GLASS BLOWING MACHINE.

(No Model.)

(Application filed June 7, 1897.)

3 Sheets—Sheet 3.

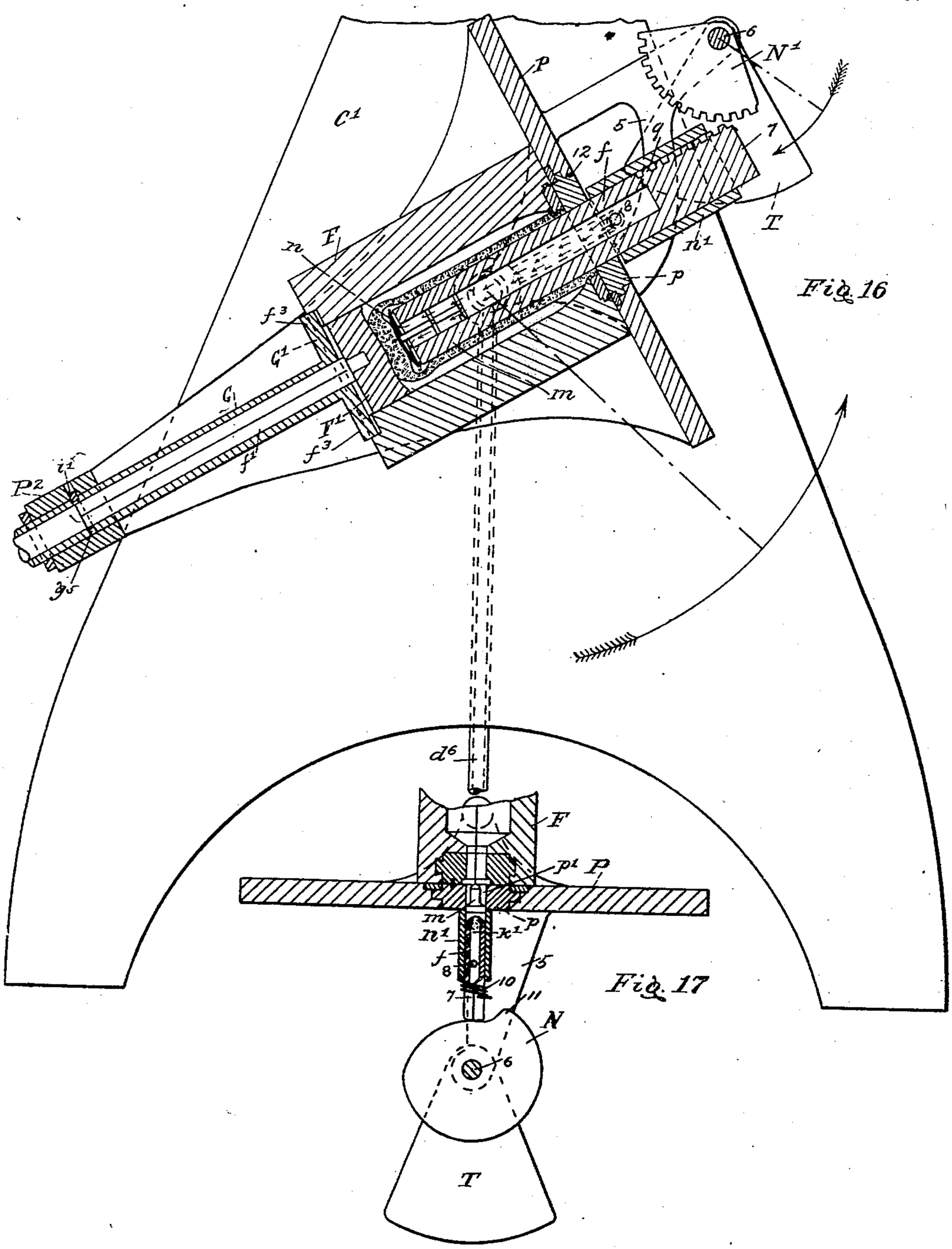


Fig. 16

Fig. 17

Witnesses:
J. Wotherspoon
Geo. L. Logan.

Inventor
Daniel Murray

UNITED STATES PATENT OFFICE.

DANIEL MURRAY, OF NEW YORK, N. Y.

GLASS-BLOWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 677,530, dated July 2, 1901.

Application filed June 7, 1897. Serial No. 639,723. (No model.)

To all whom it may concern:

Be it known that I, DANIEL MURRAY, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Glass-Blowing Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in glass-blowing machines; and the objects thereof are to provide automatic means for performing a complete operation of blowing and finishing glass articles and the combination of automatic mechanisms aiding in producing the aforesaid result. I attain these objects by the construction and combination of parts illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of the entire machine with a portion of the revoluble platform and arch-beam broken away and one-half of one of the divided matrices removed, disclosing a bottle and the members of the machine adapted to form said bottle shown in position after the finishing thereof; Fig. 2, a transverse section on line A B of Fig. 1; Fig. 3, an interior view, on large scale, of one-half of a divided matrix removably fixed upon a disk adapted to rotate the matrix about the article when blown; Fig. 4, an interior view, on large scale, of one-half of a divided composite matrix, with the lower portion thereof fixed to a rotatable disk and adapted to rotate thereby to finish the neck of the bottle; Fig. 5, an interior view, on large scale, of one-half of a divided composite matrix with the lower portion thereof held from rotation and the upper portion adapted to rotation and to turn the article blown; Fig. 6, a longitudinal section of the upper end of a blowpipe with the tip thereon; Fig. 7, a longitudinal section of a modified form of blowpipe-tip; Fig. 8, a longitudinal section of the hollow platform-trunnion, indicating the valve thereon adapted to control the feed of the compressed fluid; Fig. 9, a section on line *a b* of Fig. 8; Fig. 10, a longitudinal section of the tubular shaft carrying and controlling the action of the plunger and shown in position in the arch-beam, with mechanism for locking same indicated therein; Fig. 11, a cross-section of the tubular shaft at the locking-groove and engaging thereby with the locking-bolt adapted to prevent longitudinal movement of the shaft during a revolution of the revoluble platform; Fig. 12, a cross-section of the tubular shaft on line *a' b'* of Fig. 10, indicated with the plunger-rod and tension-spring therein and the socket-head thereon; Fig. 13, a cross-section of the revoluble platform on line A' B' of Fig. 14, indicating the gear-sector and pinions adapted to operate the rotatable disks and the platform shown when about to complete an entire revolution; Fig. 14, a side elevation of portions of the revoluble platform and frame end with means thereon for operating the rotatable disks; Fig. 15, a sectional view of the upper portion of a matrix, indicating the plunger about to be released by the pawl; Fig. 16, a transverse section, on large scale, on line *x y* of Fig. 1, but indicating the revoluble platform and attached parts in relative position at the end of a part of a revolution in the direction indicated by the arrow attached by the radial line to the trunnion thereof. This figure indicates also modified means for inserting the blowpipe into the mold when producing articles having a large mouth, and Fig. 17 is a similar section of the revoluble platform when in its normal position and with a cam employed to actuate the blowpipe pendent therefrom.

In the construction of my machine I have provided any suitable frame, as C, which may comprise end pieces C' and C^2 and a carrying-beam C^3, attached thereto. Journaled in the end pieces C' and C^2 of frame C are trunnions D and D', adapted to provide pivotal support for a platform, as P, which is preferably offset thereon, so as to normally hang thereby, and, as now considered, supports an arched member, as P'. The offset platform P and arch P' are adapted to revolve with the trunnions D and D' as rotated by any suitable means, which may comprise a friction-pinion *d*, journaled in the frame C and provided with any desirable means for rotation, such as pulleys *d'*. This friction-pinion *d* is adapted to contact a friction-wheel d^2, secured to the trunnion D', and to rotate same when the peripheries are brought in contact and to also provide intermittent rotation, and for discontinuance of motion

of the platform P at the end of each revolution I have introduced a cave d^3 in the periphery of the wheel d^2, thus breaking contact of the frictions, as clearly indicated in Fig. 2. It will be clearly understood that the wheel d^2 may be constructed with one or more caves d^3, as might be desirable, for the intermittent operation of the machine.

The platform P is offset on the trunnions D and D′ to provide for the operation of mechanism introduced to rotate the disks p, as will hereinafter be fully set forth, and to counterbalance the pendent parts attached to the platform P, and thus render it easier of movement.

To check the momentum of the revolving members attached to the trunnion D′, a friction brake-band e is introduced about the wheel d^2 and is adapted to contact same by a movement of the foot-lever e'.

In the platform P are journaled disks p, adapted for rotation, if desirable. These disks are each provided with a central aperture p' for the introduction of a reciprocal blowpipe f to a mold F, mounted thereover or thereon for support, and are adapted to perform certain functions in finishing the article blown, as will hereinafter be more fully set forth and described.

The molds F are diametrically divided and hinged as in ordinary practice and are removably secured to either the platform P or disks p, or to both, as in composite molds, (indicated in Figs. 4 and 5,) and are adapted to be rotated by the disks p or the rotatable tubular shaft G, which is mounted in the arch-beam P^2.

The tubular shafts G are adapted to rotate the molds F or the plunger F′ in the molds and are provided with gears g, meshing with similar gears g', mounted upon the arch-beam P^2 and adapted to rotation during a certain portion of each revolution of the platform P by means of pinions g^2 engaging rack-segments g^3, provided in their path of travel as they revolve with the platform.

On the upper ends of the shafts G are provided heads h, adapted to engage yokes h', provided at the lower end of the lifting-rods H, which are adapted to raise the tubular shafts G and withdraw the plungers F′ for the purpose of admitting the molten glass into the molds F when in an upright position, whereupon the shafts G are lowered, and the plungers F′, entering the molds, compress the molten glass into the lower section thereof by the gravity of the plunger.

The plungers F′ are each provided with a square shank f', adapted for rectilinear movement in the tubular shaft G and are held to rotation therewith by means of a socket-head G′, secured to the shaft G and provided with a square aperture f^2 to receive the shank f' and with ears f^3 to engage the molds F to rotation therewith when desirable.

To lock the tubular shafts G from end movement during a revolution of the platform P, a reciprocating latch-rod i is provided in the arch-beam P^2, having latch-bolts i' thereon adapted by action of the spring i^3 to engage an annular groove g^5, provided on each shaft G, but shot from engagement therewith at the end of each revolution of the platform P by the head i^2 contacting the face i^4 of the radial incline I, thereby permitting the shaft to be raised, as heretofore explained.

To accomplish the production of different sizes of articles with the same mold, I have provided for an adjustment of the plunger F′ by introducing a movable plug f^2, which is adjusted in the tubular shaft G by means of a screw f^3, bearing in the head h.

The tubular shaft G may be provided with a tension-spring f^4, bearing against the plunger-shank f' to resist the gravity of the plunger, and a gravity-pawl f^5 may be pivoted in the head G′ to engage suitable teeth in the shank f' for the purpose of raising the plunger with the tubular shaft. This pawl f^5 is provided with an arm 1, adapted to contact with the upper end of the mold when the shaft is lowered and release the shank f' and permit the plunger F′ to drop upon the molten glass in the mold, and upon introducing compressed fluid to the molten glass in the mold the plunger is raised until the shank thereon contacts with the plug f^2, provided in the tubular shaft.

To introduce compressed fluid to the several molds of my machine, the trunnion D is preferably rendered hollow and provided at the outer end with a cap d^5, which is held from rotation and provided with an aperture 2, adapted for the passage of fluid from a supply-pipe d^6 to the chamber d^7 of the trunnion through a semicircular slot d^8 during a predetermined portion of the rotation of the trunnion. At the opposite end of the chamber d^7 may be provided a conduit k, leading to the blowpipe of the first mold and having branch conduits k' and k^2 communicating with the blowpipes of the other molds. Each conduit may be provided with a valve k^3, adapted to cut off the supply of fluid from either mold independent of the supply to the other molds.

To introduce compressed fluid into the molten glass compressed by the plunger F′ into the bottom of the mold and to form the inside of the neck of the article to be blown, I have provided a reciprocating blowpipe f, carrying a tip m of any desirable form, as indicated in Figs. 6, 7, and 16, and adapted to form the mouth of the article to be blown and having a gravity-valve n to protect the mouth of the tip from being filled with molten metal. The blowpipe f is guided by a tube-casing n', secured to brackets 5, and is forced to enter the mold at a predetermined point during the revolution of the platform P by a cam N or gear-sector N′, mounted upon a shaft 6, journaled in the brackets 5, which are pendent from the platform P. Upon this cam N rests the blowpipe f, which may be provided with a square shank 7 to keep the intake-aperture 8 in line with the mouth of the supply-conduit,

which is attached in the casing n', or this shank 7 may be provided with a toothed rack g, adapted to engage the gear-sector N', and a plumb-weight T is secured to the shaft 6 to rotate the cam N as the platform P revolves. It will be understood that the plumb-weight T remains in a vertical position during its revolution about the horizontal center line of rotation with the revolving platform. Thus the face of the cam acts upon the end of the shank 7 of the blowpipe f, or the gear-sector N' engages the toothed rack 9 and forces the blowpipe into the molten glass, as heretofore explained, and upon a completion of the revolution the gravity of the blowpipe f and pressure of compressed fluid contained in the article blown forces it to drop to its original position as the heel 11 of the cam N clears the end of the shank 7, or the return of the blowpipe may be insured by a spring 10, as indicated in Fig. 17. As the blowpipe f is forced into the molten glass the intake-aperture 8 registers with the mouth of the fluid-conduit, and the compressed fluid raises the gravity-valve n and inflates the glass, forming the article in the mold and assisting in raising the plunger F' until the shank f' thereof contacts the adjustable plug f^2, which limits the length of the article blown.

To provide automatic rotation of the several disks p, a reciprocating rod R may be introduced, having a head r adapted to contact the face r' of the radial incline R' during a predetermined portion of revolution of the platform P and provided with return action at the end of the incline by means of a spring r^2. This rod R is pivoted to the disks p by crank-pins r^3, and upon reciprocation, as above described, an alternating rotary movement is imparted to the disks. A rotary movement of the disks p may also be provided by introducing a bevel-pinion V, engaging suitable teeth provided upon the disk, as indicated in Figs. 13 and 14, and mounted on a shaft 20, bearing in brackets 21, pendent from the platform P and mounting a spur-pinion 22, adapted to mesh with a gear-sector V' during a predetermined portion of the revolution of the platform. It will be clearly understood upon reference to Fig. 14 that motion may be transmitted from one disk to the other by means of pinions B and shafts 25.

Having thus fully described the mechanism comprising my invention, a complete operation thereof would occur as follows: The operator takes a position on the right in Fig. 2, whereupon the tubular shafts G and plungers F' are raised by the lifting mechanism heretofore described. The molds F being closed and locked the molten glass is introduced therein from the top, whereupon the tubular shafts are lowered to their normal position, as indicated in Figs. 1 and 2, and the plungers F' are released by the pawls f^5, if employed, dropping by gravity upon the molten glass and chilling the surface thereof contacted by face of plungers and giving form to the bottom of articles to be blown, also forcing the metal into the lower portion of the molds and about the tips of the blowpipes in the disks, as indicated in Fig. 5. The platform P is then revolved sufficiently to contact the peripheries of the friction-wheels d and d^2, and motion is imparted to the platform by the driving-wheel d. As the arch-beam P^2 moves to the left in Fig. 2 the locking mechanisms of the tubular shafts G are released from the incline I, and the bolts i' are shot into place by the spring action heretofore described. As the platform P revolves the plumb-weights T actuate the cams N, forcing the blowpipe-tips into the molds, forming the mouth and throat of the articles, and registering the intake-apertures 8 with the mouth of supply-conduits, whereupon compressed fluid is admitted to the blowpipes by the opening of the valve on the end of the chambered trunnion D. The pressure of the admitted fluid opens the valves n in the tip of the blowpipes f, and the articles are blown during a predetermined portion of the revolution of the platform and pendent mechanisms. As this occurs the internal pressure of the fluid inflating the metal in the molds forces the plungers F' outward to the limit determined by the position of the adjustable plugs f^2, contained in the tubular shafts G, adapted thereby to determine the length of the articles being blown. Continuing the revolution the supply of compressed fluid is cut off at a predetermined point by action of the valve d^5 on the end of chambered trunnion D, and the surfaces of the blown articles are finished by a rotation of the articles in the molds or the molds or sections of the molds about the articles during the remainder of the revolution. This may be accomplished in different ways, according to the nature of the articles blown.

The action of the mechanism employed in finishing the article may be varied according to the style of the article blown, as indicated in Figs. 1, 3, 4, 5, and 16, and is intended to substitute the ordinary method now employed in finishing the article. In finishing the article indicated in the mold on the left in Fig. 1 it is intended that the disk p remain stationary in the platform P, and the article is rotated by means of the plunger F', which forms the bottom and holds the article to rotation thereby, while the pinion g^2 engages the rack g^3 during the revolution of the platform P.

In Fig. 3 it is intended to lock from rotation the plunger F' and its carrying mechanism contained in the arch-beam P^2 and to afford a rotation of the disk p and mold contained thereon about the article blown, which is held from movement by contact with the plunger F', the movement of the disk being accomplished by either of the means heretofore mentioned.

In Fig. 4 it is intended to finish the article by a rotation of a section of a mold, as f^5,

which is driven by the disk p, while the remainder of the mold and the article blown are held stationary.

In Fig. 5 it is intended to finish part of the article by a rotation of the plunger F', upper section f^6 of the mold, and the article blown therein by means as described for Fig. 1, the lower part f^5 of the mold and disk p being held from rotation in the platform P by any ordinary means, as dowel-pin 12. In certain instances the blowpipe-tip may be held in position in the mouth of the article during the rotation thereof to give full finish to the inside mouth. As the platform P is nearing a completion of a revolution the friction-band e may be employed to check the momentum and stop the platform, with the heads h engaging the yokes h', whereupon the plungers F' may be raised, the molds opened, and the blown articles removed.

A plurality of molds is introduced to admit resting one or more molds for the purpose of cooling during an operation of the remaining molds.

Having thus fully described my invention and a complete operation thereof, what I claim, and desire to secure by Letters Patent, is—

1. In a machine of the class described, the combination with a platform supported by offset trunnions, of a wheel on said trunnions, adapted to contact a driving member, but having caves to break said contact.

2. In a machine of the class described, the combination of a revoluble platform with offset trunnions, with matrix-disks adapted to rotate therein, when said platform is revolved.

3. In a machine of the class described, the combination with a revoluble platform having offset trunnions and carrying matrix-disks, of means for rotating said disks, when said platform is revolved.

4. In a machine of the class described, the combination with a movable platform having offset trunnions and carrying matrix-disks, of means for rotating said disks, and thereby said matrices, or a portion thereof, by a movement of said platform.

5. In a machine of the class described, a blowpipe, provided with means for the advance thereof, said means adapted to retain said pipe in an advanced position, for a certain period, and release said pipe for return.

6. In a machine of the class described, a plumb-weight, having a center of rotation adapted to revolve about a support-center, and means adapted to actuate a blowpipe by said movements.

7. In a machine of the class described, a pluinb-weight, having a center of rotation revolving about a support-center, a cam actuated by said movements, and a blowpipe by said cam.

8. In a machine of the class described, a plumb-weight, adapted to rotation by revolving the center of rotation about a support-center, a toothed member actuated by said movements, and a blowpipe actuated by said member.

9. In a machine of the class described, a revoluble platform, a plumb-weight journaled thereto, and adapted to rotation, when said platform is operated, and means to actuate a blowpipe by said movements.

10. In a machine of the class described, a revoluble platform, a plumb-weight thereon, having a center of rotation, adapted to revolve about the center of support of said platform, a cam journaled with, and adapted to rotation by said weight when rotated, and a blowpipe actuated by said cam.

11. The combination, with a revoluble platform hanging by offset trunnions, of matrices thereon, blowpipes thereunder, fluid-conduits to said pipes, and means to reciprocate said pipes to control the flow of fluid thereto, and introduce said pipes to said matrices, by, and during a revolution of said platform.

12. The combination, with a revoluble platform hanging by offset trunnions, of matrices thereon, blowpipes thereto, and means to rotate said matrices, or portions thereof, by, and during a revolution of said platform.

13. The combination, with a revoluble platform hanging by offset trunnions, of matrices thereon, blowpipes thereto, means to reciprocate said pipes, and rotate said matrices, or portions thereof, at predetermined periods, by, and during a revolution of said platform.

14. In combination, with a revoluble platform, having matrices thereon, and carrying an arch-beam thereover, of means, on said beam, adapted to rotate said matrices, or portions thereof, by, and during a portion of the revolution of said platform, and supported parts.

15. In combination, with a revoluble platform, having matrices thereon, and carrying an arch-beam thereover, of a plunger, to enter and compress molten metal in said matrices, and means on said beam, adapted to carry and rotate said plunger, and thereby said matrices, or portions thereof, by, and during a portion of the revolution of said platform and supported parts.

16. In combination, with a revoluble platform, having matrices thereon, and carrying an arch-beam thereover, of plungers for said matrices, tubular shafts in said beam, carrying the shanks of said plungers, and means for the rotation of said shafts, plungers and matrices, by, and during a portion of the revolution of said platform and supported parts.

17. In combination, with a tubular shaft, having suitable support, and a matrix thereunder, of a plunger, with a shank in said shaft, and adapted to reciprocate therein, and enter said matrix, and adjustable means in said shaft to determine the position of said plunger when returned.

18. In combination with a revoluble platform, having matrices thereon, and carrying an arch-beam thereover, of plungers for said

matrices, tubular shafts in said beam, carrying the shanks of said plungers, and having means thereon to contact stationary members provided in the path of revolution of said arch-beam, during a portion of the revolution of said platform, to rotate said shafts, plungers, and matrices at right angles to said revolution.

19. In combination with a tubular shaft, having end movement in a supporting member adapted to revolve and carry said shaft, of means for locking said shaft from movement during said revolution.

20. In combination, with a tubular shaft, having end movement in a supporting member, adapted to revolve and carry said shaft, of automatic means for locking said shaft from end movement during said revolution, and to release same at a predetermined point.

21. In combination with a tubular shaft, supported in a revoluble member adapted to carry same, of means to engage said shaft for end movement, when said member is stationary.

22. In combination with a tubular shaft, supported in a revoluble member, of means to engage said shaft for end movement, when said member is stationary, and means to lock said shaft during said revolution, and to release same at a predetermined point.

23. In combination with a tubular shaft, supported in a revoluble member, at right angles thereto, of means on said shaft to engage stationary members for rotation, during a portion of the revolution of said support.

24. In combination with a tubular shaft, supported in a revoluble member, at right angles thereto, of gearing on said shaft and support, one of said gears adapted to engage a rack-segment provided in the path of revolution thereof with said support, to rotate said shaft.

25. In combination with a tubular shaft, having suitable support, a matrix thereunder, and a plunger, with a shank adapted to reciprocate in said shaft, of means to lock said shaft and shank for simultaneous lifting thereof, and adapted to release said plunger to drop in said matrix.

26. A glass-blowing machine, comprising a main frame, a platform trunnioned therein, and carrying matrices thereon and blowpipes thereunder, and means to reciprocate said pipes, to control compressed fluid to said matrices, by, and during a revolution of said platform.

27. A glass-blowing machine, comprising a main frame, a platform trunnioned therein, carrying matrices thereon, an arch-beam thereover, blowpipes thereunder, and means on said beam to enter and compress molten metal in said matrices, and on said platform to enter said pipes to inflate said metal, and return said compression means to a predetermined point, by, and during a revolution of said platform.

28. A glass-blowing machine, comprising a main frame, a platform trunnioned therein, carrying matrices thereon, an arch-beam thereover, blowpipes thereunder, and means on said beam to enter and compress molten metal in said matrices, and on said platform to enter said pipes to inflate said metal, and return said compression means to a predetermined point, and means to rotate said matrices or portions thereof, by, and during a revolution of said platform.

29. A glass-blowing machine, comprising a main frame, a platform trunnioned therein carrying matrices thereon, an arch-beam thereover, blowpipes thereunder, and means on said beam to enter and compress molten metal in said matrices, and on said platform to enter said pipes, to inflate said metal and return said compression means to a predetermined point, for rotation thereof, in or with said matrices, or portions thereof, by, and during portions of a single revolution of said platform.

In testimony whereof I affix my signature in presence of two witnesses.

DANIEL MURRAY.

Witnesses:

JOHN WOTHERSPOON,

GEORGE S. LOGAN.