No. 610,589. Patented Sept. 13, 1898.

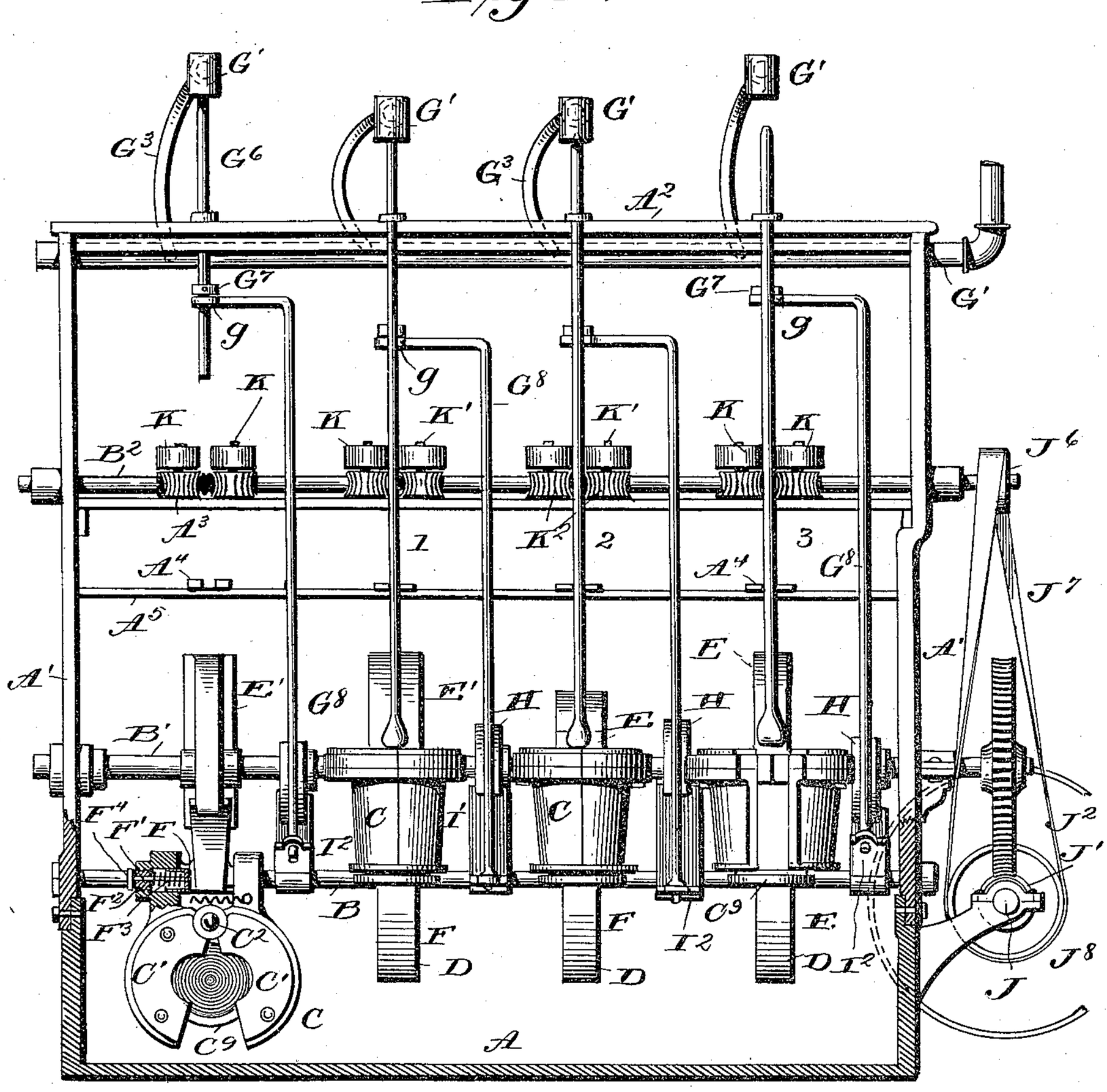
H. C. SCHRADER.

GLASS BLOWING MACHINE.

(Application filed Feb. 21, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses
L. C. Hills.
Alfred T. Gage.

Inventor;
Henry C. Schrader,
By E. B. Stocking
Attorney

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Fig. 2.

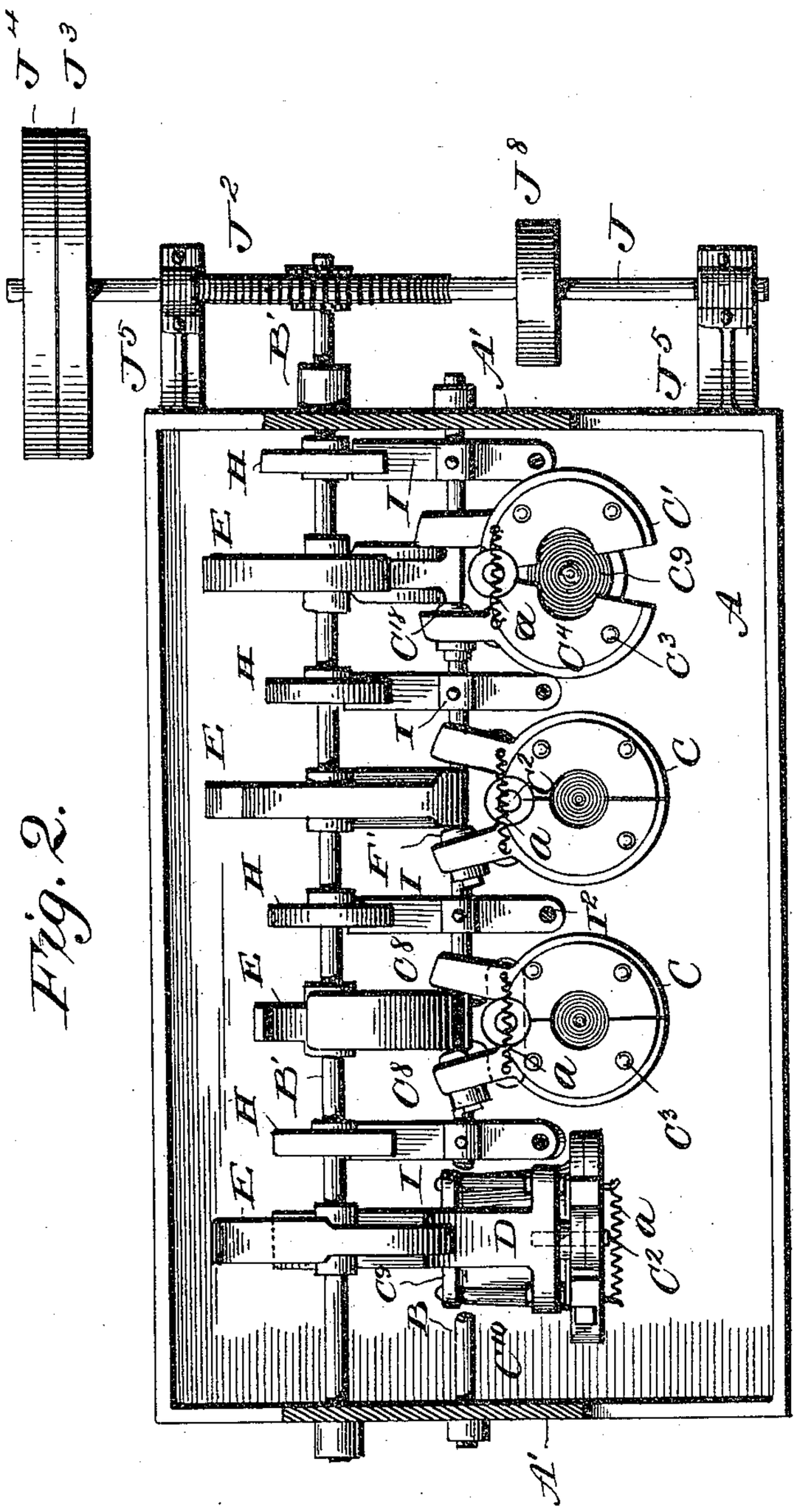

Fig. 3.

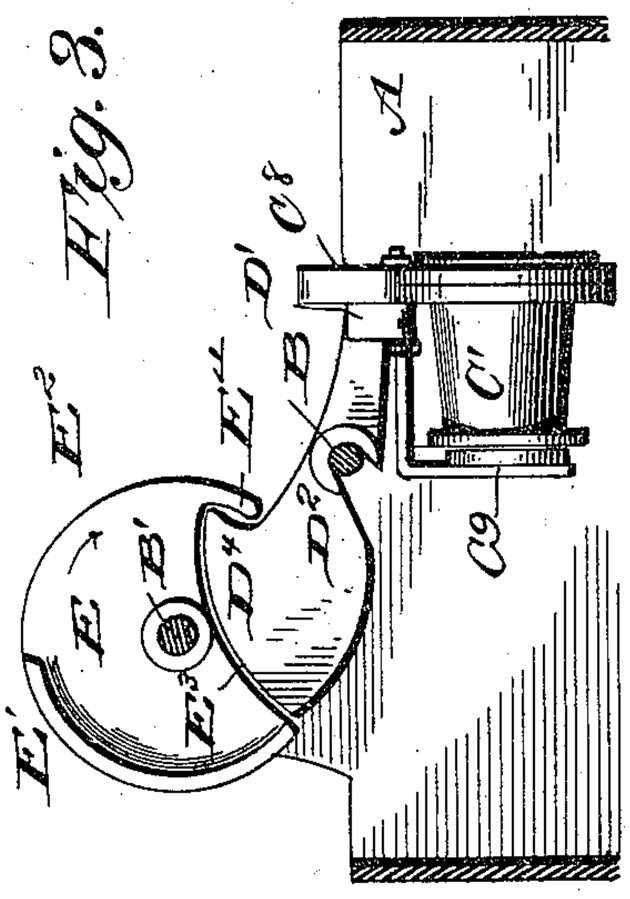

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Fig. 5.

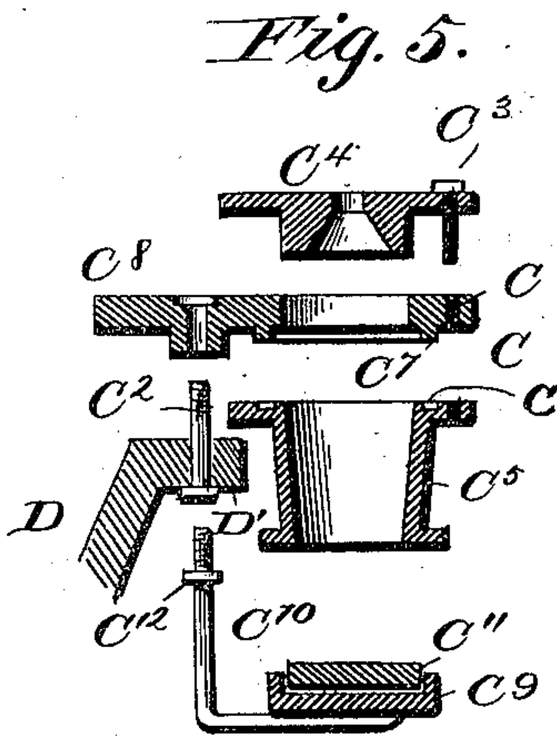


Fig. 6.

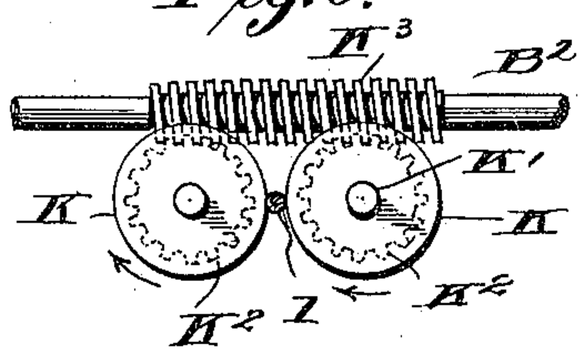


Fig. 4.

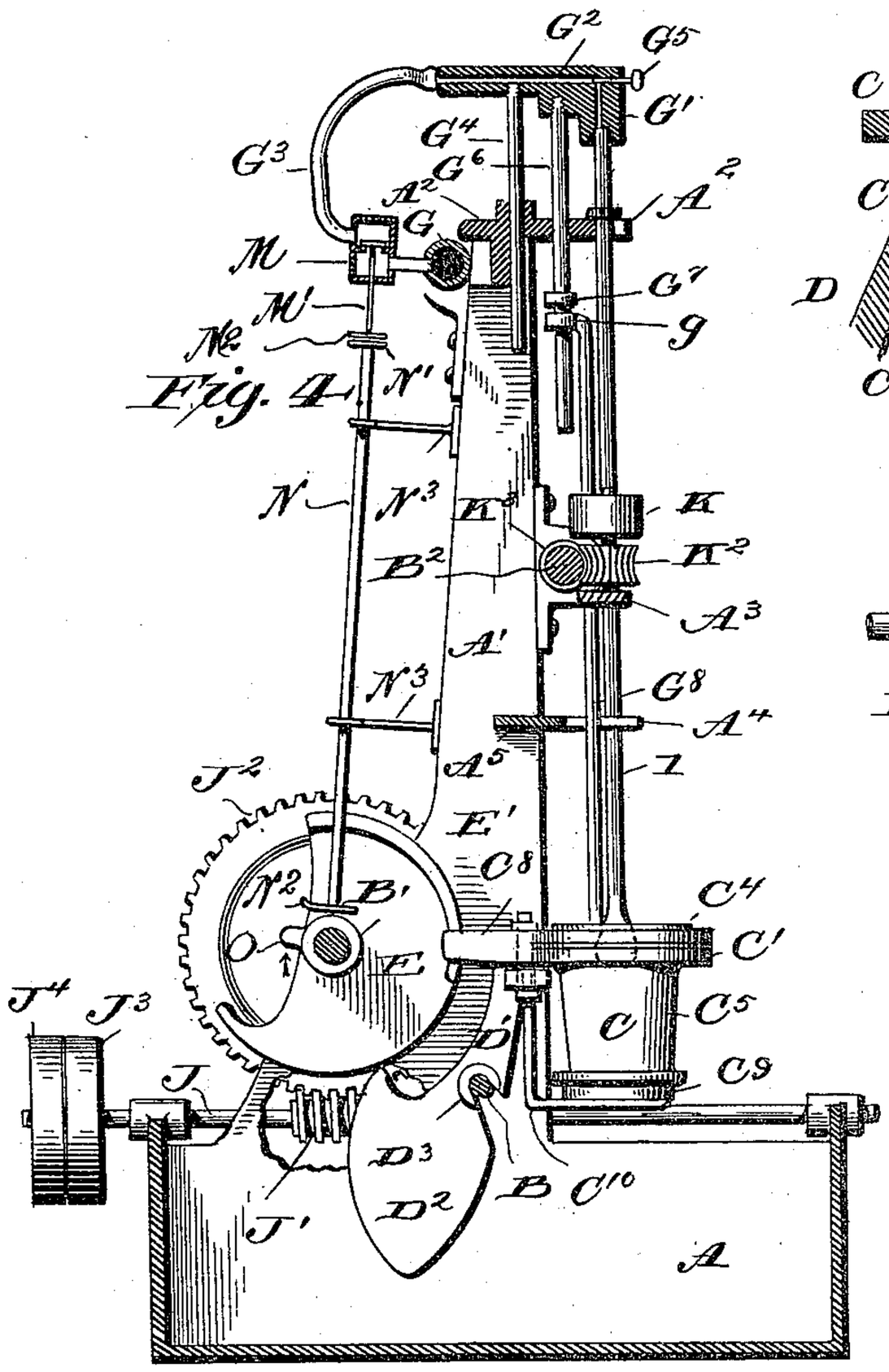


Fig. 7.

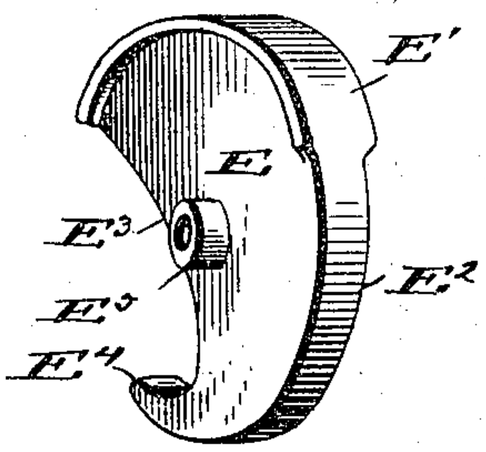
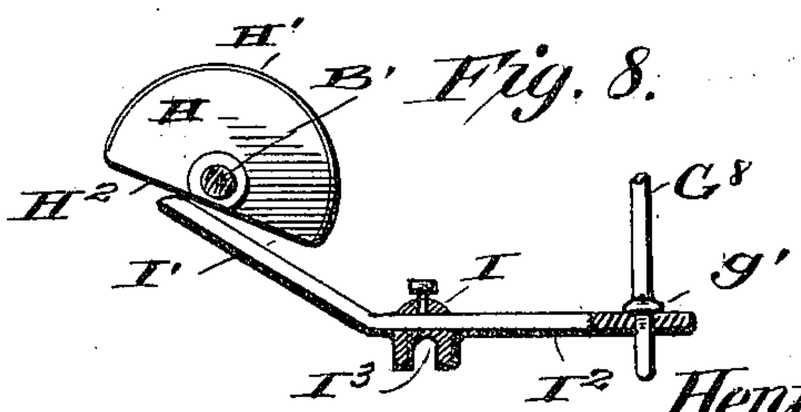


Fig. 8.



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Inventor:
Henry C. Schrader,
by E. B. Stocking
Attorney

UNITED STATES PATENT OFFICE.

HENRY C. SCHRADER, OF MOUNT PLEASANT, PENNSYLVANIA.

GLASS-BLOWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 610,589, dated September 13, 1898.

Application filed February 21, 1898. Serial No. 671,127. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. SCHRADER, a citizen of the United States, residing at Mount Pleasant, in the county of Westmoreland, State of Pennsylvania, 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.

This invention relates to glass-blowing machines, and more particularly to a machine for automatically operating molds in connection with blow-irons.

The invention consists in an improved means for successively operating the several molds of a series, so that when one mold is accomplishing a predetermined function the adjacent molds are at different stages of the operation, whereby a single operator can supply the blow-irons to the blowing-machine.

The invention also consists in novel means for raising and lowering the molds and opening and closing the same, and, further, in the operation of the connection with the air-pipe to the blow-iron.

Other objects and advantages of the invention will hereinafter appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a front elevation with parts in section. Fig. 2 is a plan view of the molds and operating mechanism with the upper portions of the apparatus omitted. Fig. 3 is a detail side elevation of one of the molds and the cam-operating mechanism therefor. Fig. 4 is a vertical cross-section through the machine, showing a controller for the air-pressure. Fig. 5 is a detail vertical cross-section through one of the molds with the parts separated. Fig. 6 is a detail plan of the device for supporting and rotating the blow-irons. Fig. 7 is a detail perspective of the operating-cam for the molds, and Fig. 8 is a detail side elevation of the connections for operating the air-pipe connection.

Like letters and numerals of reference indicate like parts throughout the several figures of the drawings.

The letter A designates a tank or receptacle adapted to contain a body of water within which the mold may be submerged to cool the same. At opposite ends of the tank there are located vertical standards A′, connected together at their upper ends by a cross-piece A^2. These standards A′ are adapted to receive and support the journals for the several operating parts.

Upon the support B, mounted in the standards A′, there are located a series of molds C, all of which are of similar construction, and therefore only one of the same will be described in detail. The mold is composed of two members C′, pivoted together by means of a pin C^2, passing through a projection D′, formed upon one end of a supporting-lever D, the opposite end D^2 of which is enlarged and suitably shaped to permit the operation of the mold, as hereinafter described. In order that the parts of the mold may be separated when found desirable for the removal of the blown ware, they are connected to the pivoted members C′ by means of bolts C^3, which pass through a flange formed upon the upper or collar portion C^4 of the mold and a similar flange upon the body portion C^5. This latter portion is provided with a suitable groove C^6, adapted to receive a flange C^7 upon the lower portion of the pivoted member C′, and thus hold the parts of the mold against any displacement when the parts are connected together. The portions C′ have rearwardly-extending arms C^8, which are adapted to be acted upon by a cam, as hereinafter described. The bottom of the mold is composed of a socket C^9, supported upon vertical standards C^{10}, which are adjustably mounted in suitable recesses in the portion D′ of the supporting-lever D, so that the same can be adjusted in its relation to the other parts of the mold. If desired, a die-block C^{11} of any preferred configuration may be seated in the socket C^9, so as to produce upon the base of the article molded the desired configuration. The vertical adjustment of the standard C^{10} may be effected by nuts C^{12}, which can be arranged above and below the socket in the lever D, said lever being journaled upon the support B by means of an open bearing D^3 to permit the removal of the lever from the support when desired.

Slightly above and at the rear of the support B a driving-shaft B′ is located, which carries a series of operating-cams E, corre-

sponding in number to the molds carried by the support B and so located upon the shaft as to act successively upon the series of molds. By this arrangement a single operator can attend to a series of molds, as only one mold of the series will be opened for the removal of the blown ware at a time, and subsequently the next successive mold will be brought into position for the reception of the molten glass upon the blow-iron. This cam E is shown in detail in Fig. 7 and is provided with a flange E′, extending substantially one-third of the circumference of the same. This flange merges into a reduced portion E^2, which is of the width of the body of the cam and extends for substantially a third of its circumference, while the remaining third is cut away to form a recess E^3. At a point where the portion E^2 terminates a hooked end E^4 is provided, which in the rotation of the cam is adapted to engage the projection D^4 of the supporting-lever D. The cam is supported upon the shaft by means of a bearing-collar E^5, by which means it may be adjusted to the desired position and then firmly secured against rotation.

When the mold is submerged into the water, the parts lie in the position shown in Fig. 3 and at the left of Fig. 2. In the rotation of the cam the hooked end E^4 engages a projection D^4 upon the supporting-lever D, so as to swing this lever upon its support B, and thus raise the mold into a vertical position, the mold at this time being held in an open position by means of the spring *a*, extending to the opposite sides of the pivots of the mold-section. During this interval the blow-iron may be placed above the mold, and the continued rotation of the cam brings the flange E′ thereof between the rearwardly-extending arms C^8 of the mold-sections, forcing these arms in opposite directions, so as to close the molds against the tension of the spring. The mold is thus held closed by the contact with the flange E′ of the cam and is prevented from swinging downward by the contact of the projection D^4 with the face of the cam. When the molding operation is completed, the recessed portion E^3 of the cam comes into alinement with the projecting portion of the lever, so that said portion of the lever will drop into the recess and permit the depression of the mold into the water to cool the mold. Before this depression is completed and at the initial stage thereof the mold is opened by the spring *a*, and the blow-iron may be removed therefrom. One member of the extended arms C^8 of the mold-sections has been provided with a yielding contact-point for engagement with the flange E′ of the cam E. This is not regarded as an essential element; but should any clogging or other reason cause the mold to stick or catch the yielding projection F would give and prevent any injury of the parts caused by the flange E′ coming into contact therewith. This projection F is provided with a guide-pin F′, seated in a threaded block F^2 and surrounded by a coil-spring F^3. The expansion of this spring is limited by means of a stop F^4.

At the upper portion of the supports A′ and adjacent to the cross-piece A^2, I locate the wind-pipe G, which will be connected with any suitable device for securing a desired pressure of air within the same to perform the blowing operation. Above the cross-piece is located a series of caps G′, having therein a suitable passage G^2, which passage is connected by a flexible connection G^3 with the air-pipe G. The vertical reciprocation of this head is guided by a downwardly-projecting pin G^4, operating in a recess formed in cross-piece A^2. For the purpose of regulating the amount of air escaping from this cap G′, I provide a valve G^5 of any suitable construction, as shown in Fig. 4. This cap G′ is adapted to be automatically raised and lowered in its relation to the blowpipe when the same is removed and replaced in the machine. For this purpose a downwardly-extending arm G^6 is provided, having thereon an adjustable collar G^7. Upon the shaft B′, between the cams E, are located a series of segmental cams H, having a face H′ describing the arc of a circle and a face H^2 describing a diameter of a circle. This cam H operates upon a shifting lever I, one arm I′ of which extends adjacent to the journal B′ of the cam, and the opposite arm I^2 extends toward the front of the machine and is provided with a suitable recess to receive the lower end of the shifting rod G^8, the upper member of which rod is provided with a sleeve *g*, which surrounds and lies upon the part G^6, extending downward from the cap G′. The lower end of the shifting rod G^8 is provided with a lug or stop *g*′ to limit the downward movement thereof through the arm I^2. This arm is journaled upon the support B by means of an open bearing-box I^3. It will be obvious that when the circular portion of this segmental cam bears upon the arm I′ of the shifting lever the outer arm I^2 thereof will be elevated and the cap G′ raised from contact with the blow-iron through the medium of the connections G_8 and G^6. This occurs when the iron is to be removed from or placed in position above the mold, as shown at the opposite sides of Fig. 1. By adjusting the collar G^7 upon the portion G^8 the limit of throw or movement given the cap G′ can be regulated.

The driving-shaft B′, which carries and rotates the cams E and H, may be driven by any suitable mechanism. For instance, a power-shaft J may be provided with a worm-gear J′, which will mesh with a gear-wheel J^2, carried upon one end of the shaft B′. At the outer end of the shaft J suitable fast and loose pulleys J^3 and J^4, respectively, may be provided, and the shaft J is supported by brackets J^5 at its opposite end portions.

A series of three blow-irons have been illustrated, numbered, respectively, 1, 2, and 3, although it is obvious that any desired num-

ber may be used. These irons when placed above the molds are adapted to be rotated during the blowing operation, as is customary in this class of machines. This rotation is effected by means of oppositely-located friction-rollers K, which are mounted upon a cross-piece A^3 of the framework of the machine by means of journals K′. The friction-rollers may be of any desired material; but I have found the use of rubber to be very desirable for this purpose, as it prevents friction when in contact with the metallic blow-irons. Upon the shaft K′, below the friction-rollers K, are located opposite gear-wheels K^2, meshing with a worm-gear K^3, carried upon the driving-shaft B^2, journaled at opposite ends in the standards A′. This shaft is provided with a band-pulley J^6 at its outer end and is driven by means of a belt J^7, extending from a suitable band-wheel J^8, secured upon the main driving-shaft A. By the gearing just described the opposite friction-wheels will be driven in the same direction and the blowpipe 1 thus held between the same and rotated or spun upon its axis during the blowing operation. For the purpose of guiding the operator in the location of the blowpipe at the center of the molds a series of guide-lugs A^4 have been provided upon a cross-bar A^5, carried upon the frame, and by placing the blowpipe between these lugs the same will be centered above the mold and between the driving-rollers K.

It is believed the foregoing description will make clear the operation of the machine; but for the purpose of explaining the same fully it may be stated that when the parts are in the position shown in Fig. 1 an operator will place a charged blow-iron above the open mold when the same has risen to a vertical position. The mold is then closed by the action of the flange E′ upon the cam E, as heretofore described, and the cap from the air-pipe lowered upon the top of the blow-iron by reason of the flattened surface H^2 of the cam H coming into contact with the arm I′ of the shifting lever I. At this time the rotating device will be operating upon the blow-iron to rotate the same, and the parts will be in the relation illustrated at the blow-iron numbered 1 in Fig. 1. This operation continues as illustrated at the blow-iron numbered 2, the cam E in the meanwhile having rotated a certain distance forward. When this cam reaches the recessed portion E^3, the mold will open, and simultaneously therewith the cap from the air-pipe will be raised by means of the cam H, and the operator will remove the blowpipe and blown object from the mold. Subsequently to the opening of the mold by the spring *a*, as before described, the mold begins its downward swing or movement into the water-tank for the purpose of cooling the same and assumes the position shown at the left of Fig. 1, where the blowpipe has been removed. The blow-irons are each provided with a suitable collar at the upper portion to limit the downward movement thereof in relation to the mold. It will be obvious that a single operator can replace the blowpipes when it is necessary in a machine embodying a number of molds, and thus effect a great economy in the operation of glass-molding with a structure simple in construction and operation, the parts of which are so positively located to each other that the several operations of the molds are automatically performed by a unitary device without danger of derangement of the parts or injury to the article operated upon.

The means so far described for supplying air to the blow-irons contemplate a continuous supply, the pressure being such that the escape from the cap when disconnected from the iron is not of material importance. It is, however, desirable in this art to increase the air-pressure upon the blow-iron after the initial blow is accomplished in order to produce the fully-blown article within the mold. The glass at the beginning of the blowing operation is so soft in character that a heavy air-pressure will produce a streaked and imperfect article. For the purpose of automatically controlling the air-pressure supplied to the blow-iron I introduce between the flexible pipe G^3 and the main G a pressure-reducing valve M, the stem of which is provided at its lower end with a plate M^2, which constitutes a weight and also a surface for engagement with a valve-lifting device. This pressure-reducing valve is constructed so as to suitably reduce the pressure of air for the initial step in the blowing operation. When it is desired to increase the pressure to complete the blown article, the valve is lifted from its seat by means of a striker N, provided with a plate N′ at its upper end and a striker-plate N^2 at its lower end. The rod N is suitably guided by supports N^3, located upon the standards A′, and the opening of the valve is effected by a movement of the striker-rod N, produced by a cam O, suitably located upon the driving-shaft B′ to properly time the operation. When the pressure-reducing valve is opened by the striker-rod, the full pressure of air is permitted to pass to the blow-iron, and thus the complete blowing operation performed. The structure of parts just described has been illustrated in Fig. 4, but for the sake of clearness is omitted from Figs. 1 and 2.

It is obvious that numerous changes may be made in the details of construction of the several parts without departing from the spirit of this invention as defined by the appended claims.

Having described my invention, what I claim is—

1. In a glass-blowing machine, the combination with a tank, of a pivotally-supported sectional mold, unitary rotary device engaging the mold-support for swinging said mold

upon its pivot and for closing the parts of said mold by engagement therewith, means for automatically adjusting an air-pipe connection in relation to a blow-iron, and means for rotating said blow-iron; substantially as specified.

2. In a glass-blowing machine, the combination with a tank, of a pivotally-supported sectional mold, a unitary rotating cam adapted to engage and raise the support for the mold and to close the members of the mold by engagement therewith, means for automatically adjusting an air-pipe connection in relation to a blow-iron, and means for rotating said blow-iron; substantially as specified.

3. In a glass-blowing machine, the combination with a pivotally-mounted sectional mold, of a pivoted support for said mold, a cam rotatably mounted and adapted to engage the support for the mold to operate the same, and a track on the periphery of said cam adapted to engage the sectional members of the mold to close the same; substantially as specified.

4. In a glass-blowing machine, a sectional mold provided with arms extending beyond the pivotal point of the mold, and a rotating cam provided with a peripheral track adapted to engage said arms to operate the sections of the mold; substantially as specified.

5. In a glass-blowing machine, a sectional mold provided with arms extending beyond the pivotal point of the mold, a rotating cam adapted to engage said arms to operate the sections of the mold, and means carried by said arms to automatically open said mold; substantially as specified.

6. In a glass-blowing machine, a sectional mold provided with arms extending beyond the pivotal point of the mold, a rotating member adapted to engage said arms to operate the sections of the mold, means to automatically open said mold, and a yielding member located upon one of said arms; substantially as specified.

7. In a glass-blowing machine, a sectional mold provided with arms extending beyond the pivotal point of the mold, a rotating member adapted to engage said arms to operate the sections of the mold, means to automatically open said mold, and a spring-held member located upon one of said arms; substantially as specified.

8. In a glass-blowing machine, a sectional mold provided with arms extending beyond the pivotal point of the mold, a rotating member adapted to engage said arms to operate the sections of the mold, means to automatically open said mold, a projection located in a recess formed in one of said arms, a spring bearing upon said projection, and an adjusting-nut bearing upon said spring; substantially as specified.

9. In a glass-blowing machine, a sectional mold composed of pivoted members provided with laterally-projecting arms, separable mold-sections secured to said pivoted sections, and a base permanently located in relation to said movable members; substantially as specified.

10. In a glass-blowing machine, the combination with a support, of a sectional mold pivoted thereto, and a base to said mold secured against movement in said support relative to said pivoted sections; substantially as specified.

11. In a glass-blowing machine, a mold-support, a pivoted mold secured thereto, a projection formed upon said support, and a rotating cam adapted to bear upon said projection during a portion of its rotation; substantially as specified.

12. In a glass-blowing machine, a supporting-lever provided with an open bearing, a pivoted mold secured to one end of said lever, and a rotating cam adapted to bear against the opposite end of said lever; substantially as specified.

13. In a glass-blowing machine, a mold-operating cam provided with a flanged section extending along a portion of its periphery and a recessed portion opposite said flanged section; substantially as specified.

14. In a glass-blowing machine, the combination with an air-pipe, of a cap yieldingly connected thereto, a depending rod from said cap, a shifting rod for said cap, and a rotating cam adapted to actuate said shifting rod; substantially as specified.

15. In a glass-blowing machine, the combination with an air-pipe, of a cap yieldingly connected thereto, a depending rod from said cap, a shifting rod connected to said depending rod, a pivoted lever engaging at one end with said shifting rod, and a positively-driven cam adapted to act upon the opposite end of said lever; substantially as specified.

16. In a glass-blowing machine, the combination with a blow-iron, of oppositely-located friction-disks rotated in the same direction, gears below said disks on the shafts thereof, and a positively-driven shaft carrying driving means for said gears; substantially as specified.

17. In a glass-blowing machine, the combination with a blow-iron, of oppositely-located friction-disks positively rotated in the same direction and engaging said blow-iron, gears for driving said disks on the shafts thereof, and a positively-rotated worm-gear engaging each of said driving-gears; substantially as specified.

18. In a glass-blowing machine, the combination with the frame thereof, of a support, a mold-supporting lever located thereon, a sectional mold pivoted to the said lever, a power-shaft supported in said frame, a positively-driven cam located on said shaft, an air-pipe connection, a shifting rod and lever for operating said connection, and a cam located upon said power-shaft for operating said shifting lever; substantially as specified.

19. In a glass-blowing machine, the combi-

nation with the frame thereof, of a support, a mold-supporting lever located thereon, a sectional mold pivoted to the said lever, a power-shaft supported in said frame, a positively-driven cam located on said shaft, an air-pipe connection, a shifting rod and lever for operating said connection, a cam located upon said power-shaft for operating said shifting lever, and means for rotating a blow-iron; substantially as specified.

20. In a glass-blowing machine, the combination with the frame thereof, of a support, a mold-supporting lever located thereon, a sectional mold pivoted to the said lever, a power-shaft supported in the said frame, a positively-driven cam located on said shaft, an air-pipe connection, a shifting rod and lever for operating said connection, a cam located upon said power-shaft for operating said shifting lever, means for rotating a blow-iron, and guides for centering said blow-iron within a mold; substantially as specified.

21. In a glass-blowing machine, the combination with the frame thereof, of a support, a mold-supporting lever located thereon, a sectional mold pivoted to said lever, a power-shaft supported in the said frame, a positively-driven cam located on said shaft, an air-pipe connection, a shifting rod and lever for operating said connection, a cam located upon said power-shaft for operating said shifting lever, means for rotating a blow-iron, guides for centering said blow-iron within a mold, a gear located upon said power-shaft, a main driving-shaft provided with a gear engaging the gear on said power-shaft and with a band-pulley, and a belt extending from said pulley to the driving-shaft for the rotating means acting upon the blow-irons; substantially as specified.

22. In a glass-blowing machine, the combination with a framework, of a support located therein, a series of mold-supporting levers pivoted upon said support, a series of sectional molds pivoted upon said levers and provided with projecting arms, a power-shaft, a series of operating-cams adapted to act upon the mold-supporting levers and upon the projecting arms from the molds, said levers being located upon said shaft in position to successively perform the functions of raising, closing and permitting the opening and depression of said molds; substantially as specified.

23. In a glass-blowing machine, the combination with a framework, of a support located therein, a series of mold-supporting levers pivoted upon said support, a series of sectional molds pivoted upon said levers and provided with projecting arms, a power-shaft, a series of operating-cams adapted to act upon the mold-supporting levers and upon the projecting arms from the molds, said levers being located upon said shaft in position to successively perform the operation of raising, closing and permitting the opening and depression of said molds, a series of air-pipe connections, and means for successively moving said connections in relation to a blow-pipe and corresponding position of the molds; substantially as specified.

24. In a glass-blowing machine, a power-shaft, a cam located thereon provided with a flanged section and a recessed portion terminating in a hooked end, a pivoted supporting-lever, a sectional mold secured to one end thereof and provided with arms to engage the flanged portion of said cam in its rotation, and a projection provided at the opposite end of said lever and adapted to ride upon the periphery of said cam during its rotation; substantially as specified.

25. In a glass-blowing machine, a power-shaft, a cam located thereon provided with a flanged section and a recessed portion terminating in a hooked end, a pivoted supporting-lever, a sectional mold secured to one end thereof and provided with arms to engage the flanged portion of said cam in its rotation, a projection provided at the opposite end of said lever and adapted to ride upon the periphery of said cam during its rotation, and means for automatically opening said mold-sections when the flange upon said cam has passed between the arms of the mold; substantially as specified.

26. In a glass-blowing machine, the combination with a blow-iron, of a mold, an air-main and connections with said iron, a pressure-reducing valve in communication with said main, and means acting upon said valve to increase the air-pressure upon said iron; substantially as specified.

27. In a glass-blowing machine, the combination with a blow-iron, of a mold, an air-main and connections with said iron, a pressure-reducing valve in communication with said main, and an automatically-operated striker for opening said valve; substantially as specified.

28. In a glass-blowing machine, the combination with a blow-iron, of a mold, an air-main and connections with said iron, a pressure-reducing valve in communication with said main, an automatically-operated striker for opening said valve, and a cam carried upon a power-shaft for engaging and opening said valve; substantially as specified.

29. In a glass-blowing machine, the combination with a tank, of a pivotally-supported sectional mold, unitary means for swinging said mold upon its pivot and for closing the parts of said mold, means for automatically adjusting an air-pipe connection in relation to a blow-iron, means for rotating said blow-iron, and means for increasing the air-pressure upon said blow-iron during the blowing operation; substantially as specified.

30. In a glass-blowing machine, the combination with a support, of a power-shaft, sep-

arable molds pivotally mounted adjacent thereto, means carried by said shaft for elevating said mold and for closing the members of the same, means for adjusting an air-pipe connection, means carried by said power-shaft for acting upon said air-pipe-adjusting device, an air-pressure-reducing device, and means carried by said shaft for controlling the operation of said air-pressure-reducing device; substantially as specified.

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

HENRY C. SCHRADER.

Witnesses:

J. W. FAUST, Jr.,

JNO. D. MCCALEB.