May 1, 1923. 1,453,803

J. A. MILLIKEN

GLASSWORKING APPARATUS

Filed June 30, 1921 7 Sheets-Sheet 1

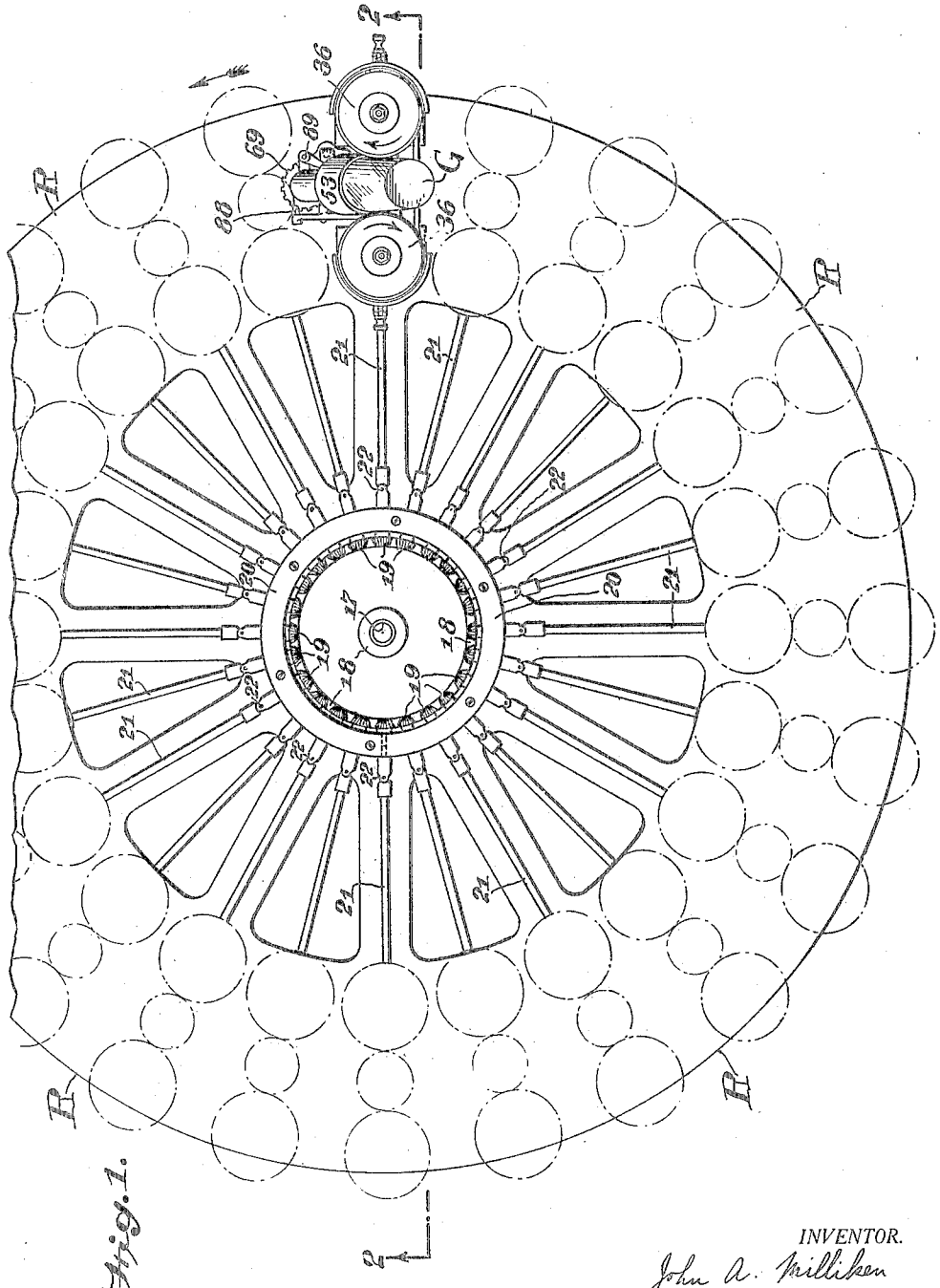


Fig. 1.

INVENTOR.
John A. Milliken
BY Cornelius D. Ehret
his ATTORNEY.

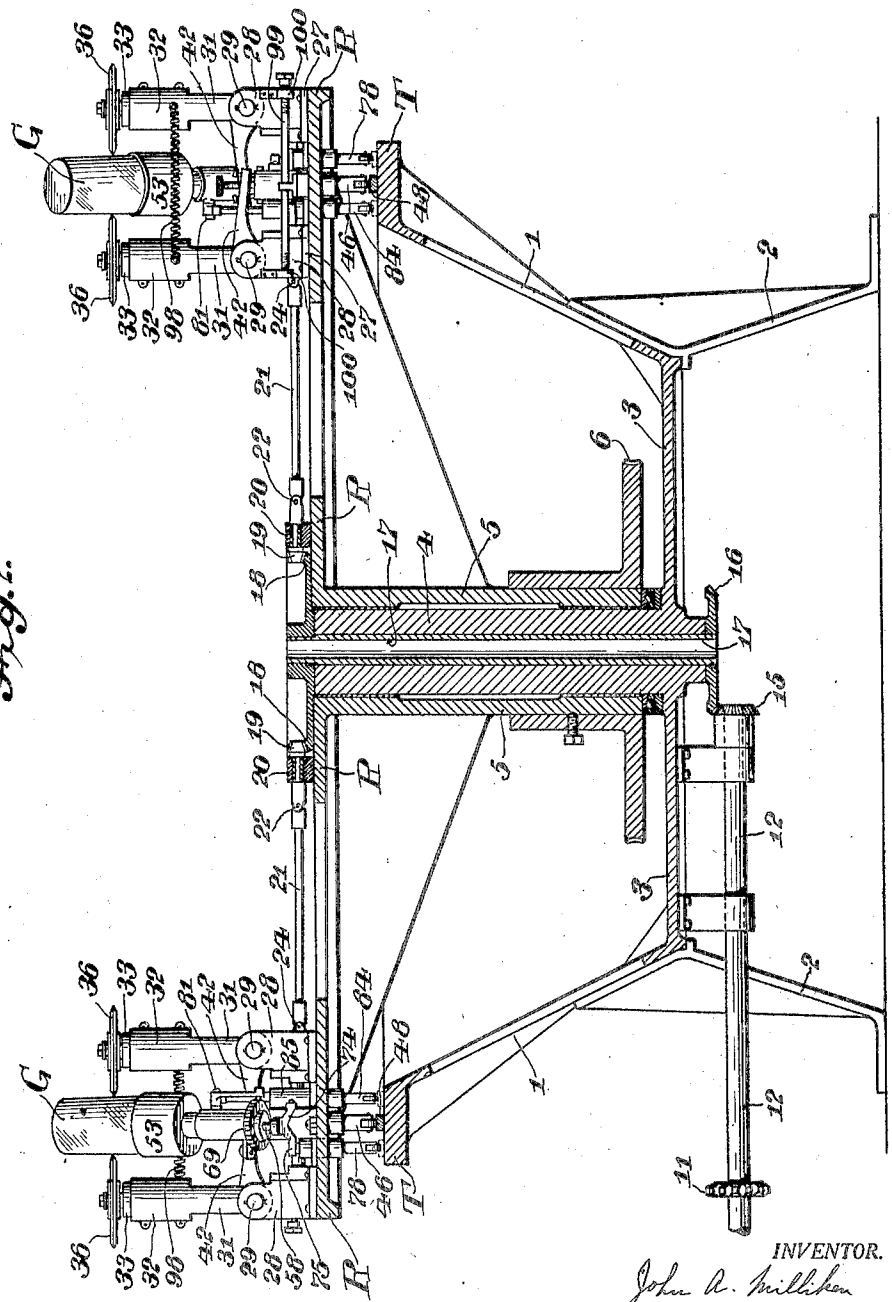
May 1, 1923. 1,453,803

J. A. MILLIKEN

GLASSWORKING APPARATUS

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Fig. 2.



INVENTOR.
John A. Milliken
BY Cornelius D. Ehret
his ATTORNEY.

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J. A. MILLIKEN

GLASSWORKING APPARATUS

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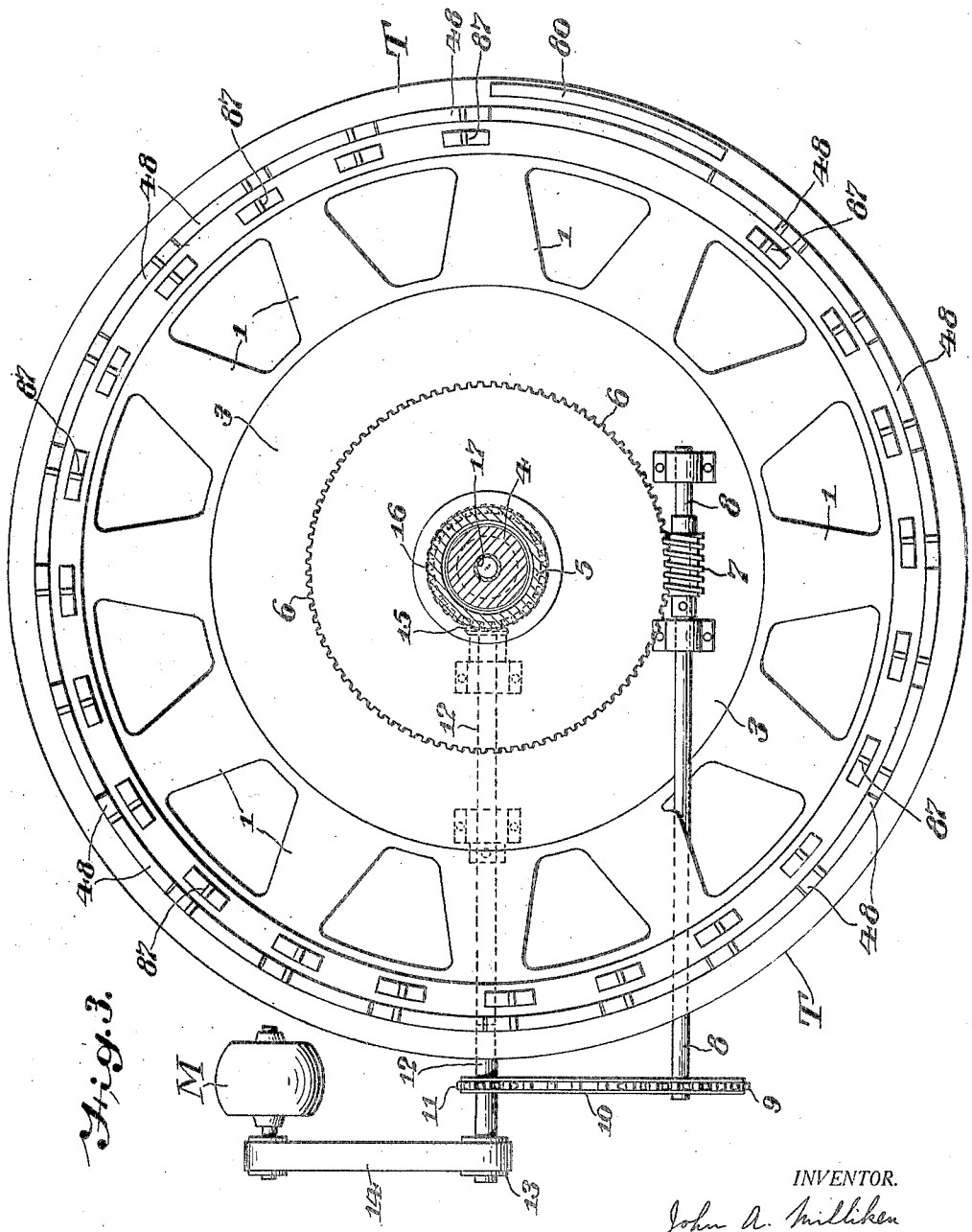


Fig. 3.

INVENTOR.

John A. Milliken

BY Cornelius L. Ehret

his ATTORNEY.

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J. A. MILLIKEN

GLASSWORKING APPARATUS

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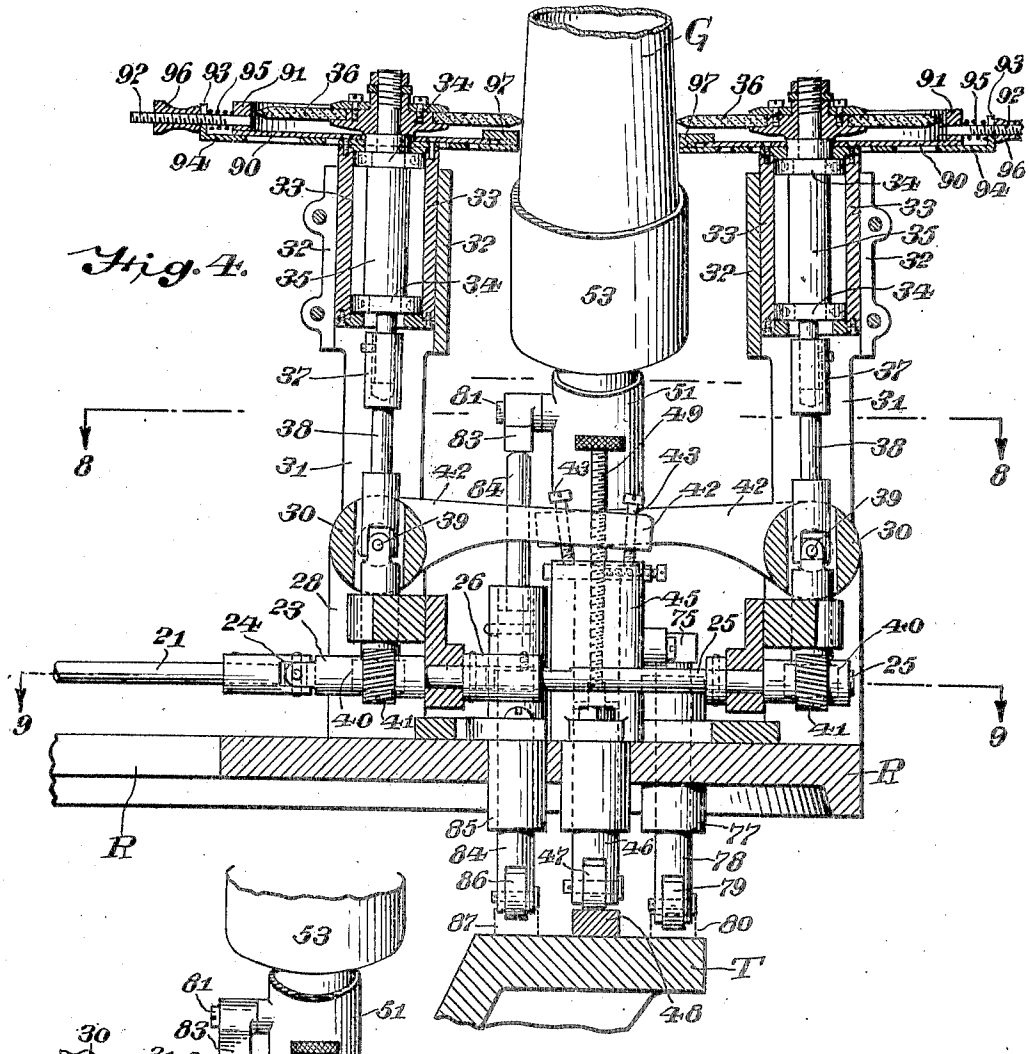


Fig. 4.

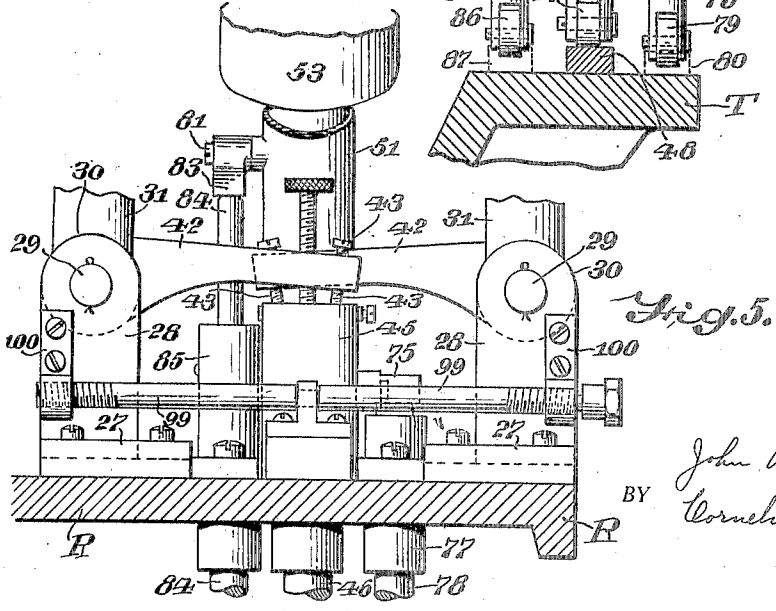


Fig. 5.

INVENTOR.
John A. Milliken
BY Cornelius L. Ehret
his ATTORNEY.

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J. A. MILLIKEN

GLASSWORKING APPARATUS

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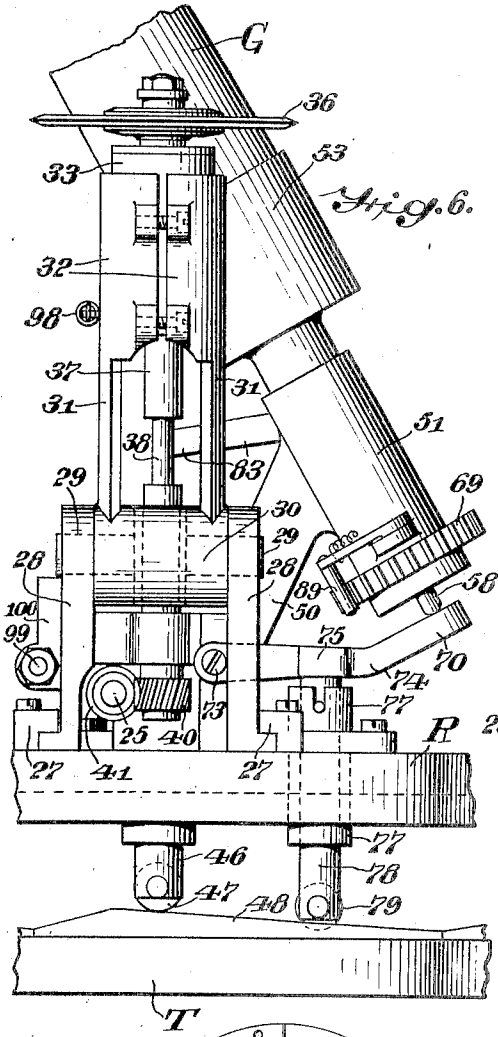


Fig. 6.

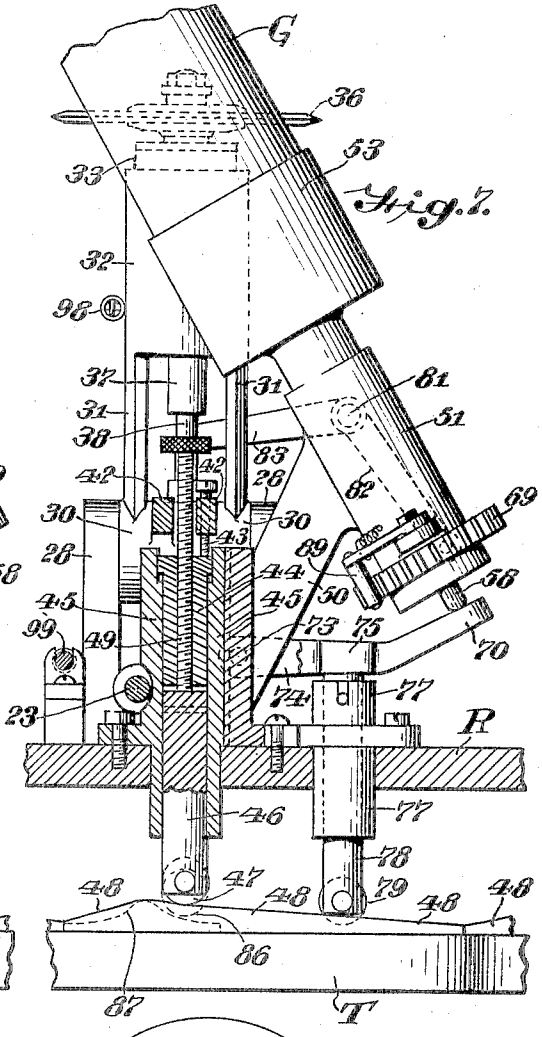


Fig. 7.

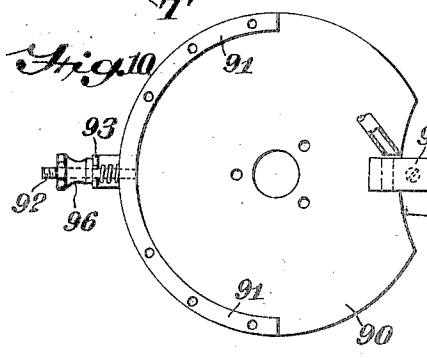


Fig. 10

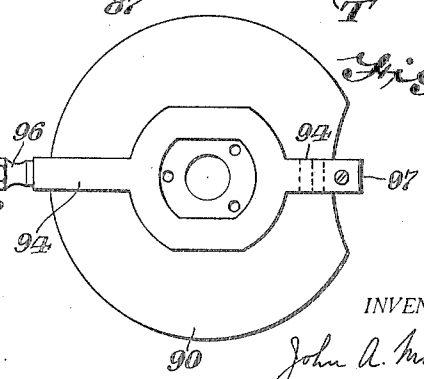


Fig. 11.

INVENTOR.
John A. Milliken
by Cornelius L. Ethret
his ATTORNEY.

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J. A. MILLIKEN

GLASSWORKING APPARATUS

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Fig. 8.

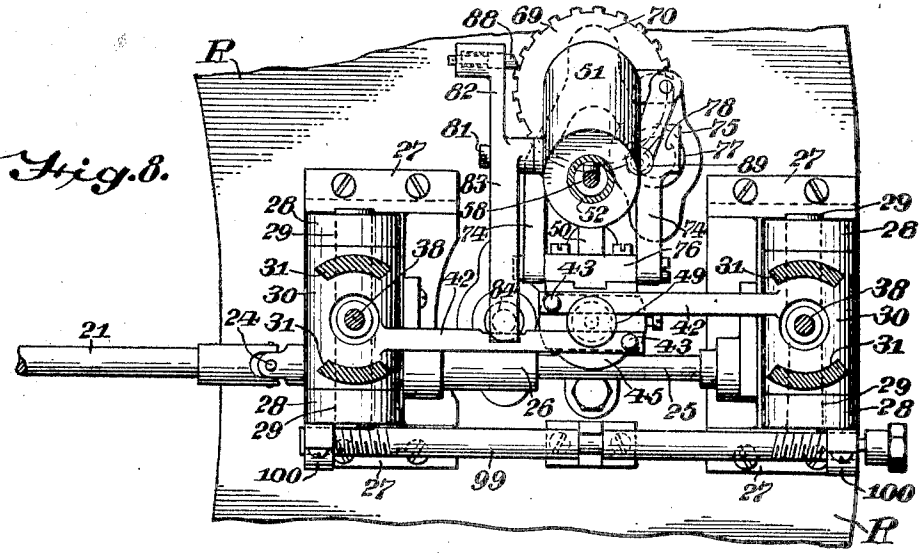
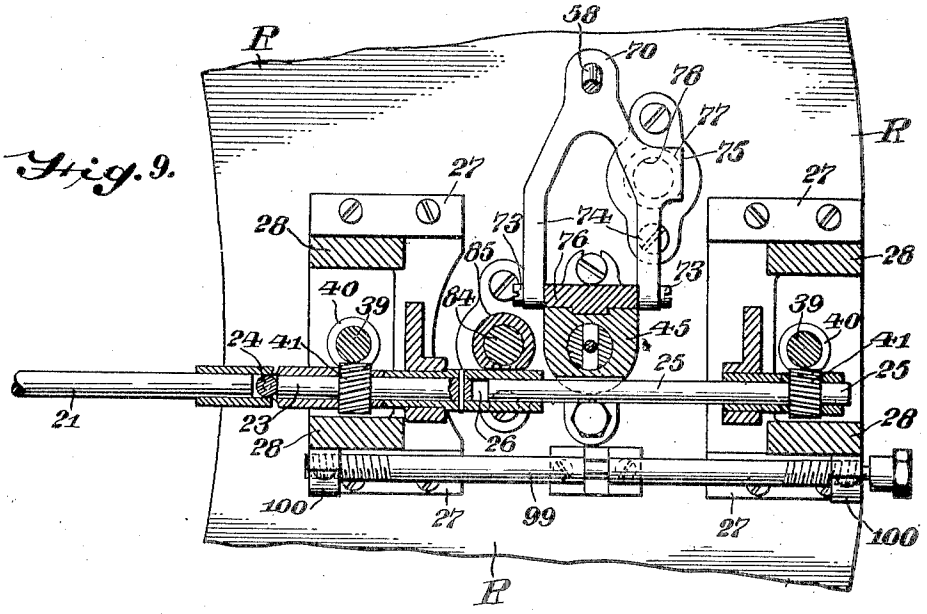


Fig. 9.



INVENTOR.
John A. Milliken
BY Cornelius L. Ehret
his ATTORNEY.

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J. A. MILLIKEN

GLASSWORKING APPARATUS

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Fig. 12.

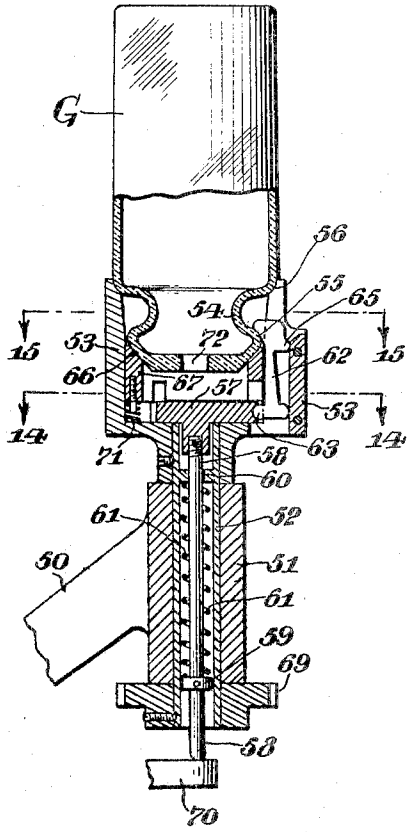


Fig. 14.

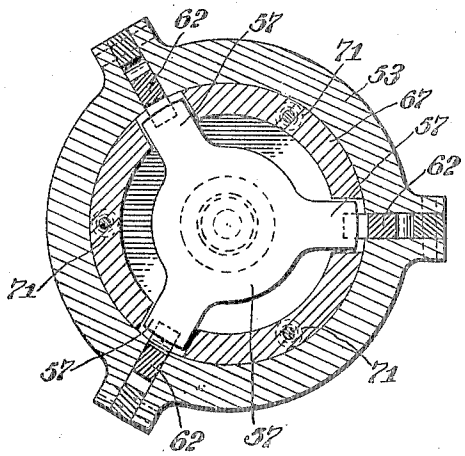


Fig. 15.

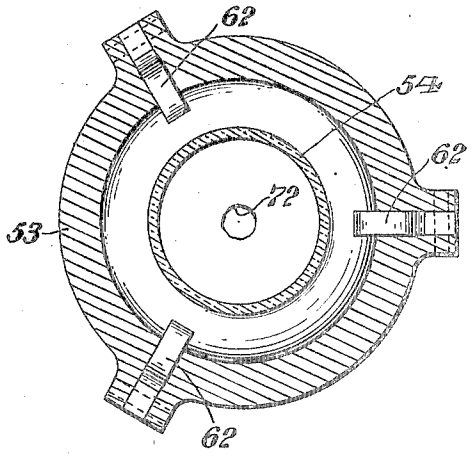
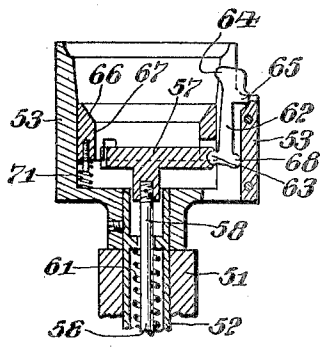


Fig. 13.



INVENTOR.

John A. Milliken

BY Cornelius L. Ehret

his ATTORNEY.

Patented May 1, 1923. 1,453,803

UNITED STATES PATENT OFFICE.

JOHN A. MILLIKEN, OF BAYONNE, NEW JERSEY, ASSIGNOR TO JOHN E. MARSDEN, OF EGG HARBOR CITY, NEW JERSEY.

GLASSWORKING APPARATUS.

Application filed June 30, 1921. Serial No. 481,501.

To all whom it may concern:

Be it known that I, JOHN A. MILLIKEN, a citizen of the United States, residing in Bayonne, county of Hudson, State of New Jersey, have invented certain new and useful Improvements in Glassworking Apparatus, of which the following is a specification.

My invention relates to apparatus for performing operations upon glass or glassware, and especially for cutting or ornamenting glassware, such as drinking glasses, tumblers and the like.

My invention resides in features of structure and combination hereinafter described and claimed.

For an illustration of one of various forms my apparatus may take, reference is to be had to the accompanying drawings, in which:

Fig. 1 is a plan view of apparatus embodying my invention.

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a plan view of the stationary table and associated parts.

Fig. 4 is a view on enlarged scale, partly sectional and partly elevational, of part of the apparatus shown in Figs. 1 and 2.

Fig. 5 is a fragmentary elevational view of part of the apparatus shown in Fig. 4.

Fig. 6 is a side elevational view of the apparatus shown in Fig. 4.

Fig. 7 is a side elevational view, partly in vertical section, of apparatus shown in Fig. 4.

Fig. 8 is a horizontal sectional view, partly in plan, taken on the line 8—8 of Fig. 4.

Fig. 9 is a similar view taken on the line 9—9 of Fig. 4.

Figs. 10 and 11 are, respectively, top and bottom plan views of part of the apparatus shown in Fig. 4.

Fig. 12 is a longitudinal sectional view of structure for holding a glass article.

Fig. 13 is a sectional view constituting part of the apparatus illustrated in Fig. 12 in a different position.

Fig. 14 is a horizontal sectional view, on enlarged scale, taken on the line 14—14 of Fig. 12.

Fig. 15 is a horizontal sectional view, on enlarged scale, taken on the line 15—15 of Fig. 12.

Referring to Figs. 1, 2 and 3, T is a stationary member or table having legs or supports 1 by which it is supported upon a subbase or frame 2. Secured to or integral with the member 3 is the vertical cylindrical bearing member 4, upon which is rotatable the vertical sleeve 5 carrying at its upper end the rotatable member or table or platform R driven by the gear 6 secured upon the sleeve 5 and in turn driven by the worm or pinion 7 secured upon the shaft 8 driven by the sprocket wheel 9 driven by a sprocket chain 10 driven by a sprocket wheel 11 upon the shaft 12 carrying the pulley 13 driven by belt 14 from the electric or other motor M. Upon the shaft 12, which preferably rotates slower than the shaft 8, particularly when the latter drives a worm 7 for driving the gear 6, is secured a bevel gear 15 driving the bevel gear 16 secured upon the shaft 17 extending through the bearing member 4 and secured at its upper end to the bevel gear 18 driving the series of bevel pinions 19 secured upon shafts having horizontal bearings in the bearing ring 20 secured upon and rotating with the rotary table R. Each pinion 19 drives a shaft 21 through a universal coupling 22. Each shaft 21 drives a shaft 23, Fig. 4, through a universal joint 24.

Referring to Figs. 4 to 9 inclusive, the shaft 23 drives a shaft 25, the driving sleeve 26 permitting adjustment of the shafts 23 or 25 toward or away from each other when suitable or desirable to move the cutters or cutting wheels, hereinafter described, toward or away from each other.

Secured upon the table R are the slides 27, by which are held the vertical standards 28 carrying the horizontal pivot shafts 29 upon which are pivoted the cylindrical members 30 having the upwardly extending standards or arms 31 carrying at their upper ends the sleeve members 32, between which are held and capable of vertical adjustment the sleeves 33, within which are disposed the bearings 34 for a rotary shaft 35, upon whose upper end is secured the cutter or grinding wheel 36. The shaft 35 is driven through the sleeve 37, which is longitudinally adjustable with respect to the shaft 35, the sleeve 37 being driven by the shaft 38, in turn driven through the universal joint 39, driven by the gear 40, in turn driven by the gear 41, the gears 41 being secured, respectively, upon the shafts 23 and 25.

Secured to or integral with each member

30 is a laterally extending arm 42 carrying at its end an adjusting screw 43 bearing upon the upper end of the member 44 slidable vertically in the member 45 secured upon the table R. Vertically slidable in the member 45 is the plunger or cam follower 46 in whose lower end is pivoted a roller 47 engaging the cams 48 disposed in a circumferential series upon the stationary table T, as indicated in Fig. 3. An adjustable screw 49 threaded in the member 44 abuts against the upper end of the member 46, adjustment of the screw 49 serving to adjust the vertical throw of the member 44 by the cam 48.

Disposed between the two cutter structures of a pair carried by member 76 and vertically adjustable therewith with respect to the table R is a bracket 50 carrying a sleeve 51.

Referring to Figs. 12 to 15 inclusive, there is disposed within the sleeve 51 the sleeve or bushing 52, upon the upper end of which is secured the body 53 of a chuck or holder for the glass article G which, in the example illustrated, is a tumbler or drinking glass blank having formed integral therewith the extension or neck 54 having at 55 a bead or equivalent formation and truly concentric with the axis of the article G which with its extension 54 is preferably formed in a mold, whereby the shoulder 56 and the bead 55 are truly concentric with the body or tumbler proper. Within the chuck body 53 is longitudinally movable the member 57 secured upon the rod 58, to which is secured the collar 59, between which and the abutment 60 within the sleeve 32 is disposed the helical spring 61, which normally thrusts downwardly upon the collar 59 to move the member 57 to the position indicated in Fig. 12, upward movement of the rod 58 moving the member 57 upwardly to the position indicated in Fig. 13. Pivoted upon the member 57 at a plurality of circumferentially spaced points are the fingers 62 pivoted at 63 and having the shoulder 64 adapted to engage the aforesaid bead or shoulder 55 upon the extension 54 of the article G. Each finger 62 has a lug 65 adapted to engage with the upper inclined edge of the body member 53 for movement therealong axially of the article G. Each finger 62 also has a lug or bearing point 68 for slidingly engaging the interior surface of the body member 53. As indicated in Fig. 12, the extension 54 of the article G preferably has formed thereon a conical surface adapted to engage the conical surface 66 of the cup member 67.

With the parts in the position indicated in Fig. 12, the article G is firmly held with its axis co-incident with the axis of the sleeve 52, which is rotatable within the sleeve 51 by the notched wheel or indexing wheel 69. When the rod 58 is forced upwardly in opposition to spring 61 by member 70, hereinafter described, the member 57 is moved upwardly, thereby tilting the fingers 62 to the position shown in Fig. 13, freeing the bead or shoulder 55 therefrom and allowing removal of the article G with its attached extension 54. Upon removing the article G, the springs 71 move the cup member 67 upwardly with respect to member 57. Upon inserting another article G, it is pressed downwardly, its conical shoulder engaging the conical surface 66 of the member 67, pushing it downwardly in opposition to springs 71, this movement also forcing the member 57 downwardly in opposition to spring 61 and causing the upper ends of the fingers 62 to move inwardly and engage by their shoulder 64 upon the bead or shoulder 55 of the extension 54, thus holding the article in the position indicated in Fig. 12.

In the examples illustrated, but to which my claims shall not be limited except where so expressly stated, the article G has the extension 54 formed thereon in a mold or otherwise, as described in my co-pending application Ser. No. 459,651, the blowing being accomplished through the lower end of the neck or extenscion 54, as at the hole 72, where the blow-pipe is attached during the blowing or molding operation.

It will be understood, however, that my present invention contemplates also holding a glass article, as a tumbler, by any other suitable means than that herein described, as for example, a chuck structure entering the tumbler itself and expanded therein, the tumbler or other article in such case being free of the extension 54 or the like.

The member 70 is upon the end of a bifurcated lever 74 (Figs. 4 to 9 inclusive), pivoted at 73 and having a lug 75. The pivots 73 are carried by the member 76 vertically adjustable in the member 45 secured upon the table R, the member 76 carrying also the bracket 50. Beneath the lug 75 is disposed in the sleeve 77 carried by the table R the vertically movable plunger or cam follower 78 carrying at its lower end a roller 79 adapted to be engaged and actuated by the cam 80 on the stationary table T, Fig. 3, the roller 79 rolling up upon the cam 80 once per revolution of the table R, moving the plunger 78 upwardly, and thereby actuating the lever 74, which in turn moves the rod 58 upwardly to actuate the chuck to free the article G, which is removed and replaced by another, the holder or chuck gripping the article as the roller 79 again passes off of the cam 80.

Pivoted to the member 51 at 81 is a bell crank lever having the arms 82 and 83. Coacting with the arm 83 is the plunger or cam follower 84 movable vertically in the

sleeve 85 carried by the table R. The plunger 84 carries at its lower end a roller 86 adapted to ride upon the cams 87 disposed in a circumferential series upon the stationary table T, Fig. 3. When the roller 86 rolls up upon a cam 87, the plunger 84 is raised, thereby rotating the bell crank lever upon its pivot 81 and causing the pawl 88 resiliently mounted in the lower end of the bell crank arm 82 to step the aforesaid notched or indexing wheel 69 around one notch. The wheel 69 is locked after each actuation in the position to which actuated by a pin or dog 89, Figs. 6, 7 and 8, suitably mounted and biased by spring or equivalent means to the locking position.

Referring to Figs. 1, 10 and 11, there is secured upon the upper end of each sleeve 33 a plate 90 having the arcuate upstanding member 91 surrounding the cutter wheel 36 as a guard or shield. Secured to and extending radially outward from the member 91 is a threaded rod 92 extending through a slot or hole in the upstanding lug 93 upon the member 94, a spring 95 surrounding the rod 92 and disposed between the lug 93 and the member 91. Threaded upon the rod 92 is the thumb nut 96, which when turned causes radial movement of the member 94 to suitably adjust or position the stop 97 carried at the end of the member 94 and embracing the edge of the plate 90, the stop 97 serving to limit the movement of the cutter wheel 36 into or toward the article G, such movement of the cutter wheel 36 toward the article G being arrested when the stop 97 engages the article G.

The operation is as follows:

With the motor M in operation and the shafts 8 and 12 rotated thereby at suitable speeds, the worm 7 rotates the gear 6, which in turn rotates the table R carrying the numerous groups of cutter mechanisms disposed circumferentially thereof, as indicated in dotted lines, Fig. 1; and simultaneously the bevel gear 15 drives the bevel gear 16, rotating the bevel gear 18 at suitable speed and thereby driving the shafts 23 and 25 of each cutting unit. The cutters 36 of each unit are so rotated at desired speeds, cutting into the article G from opposite sides thereof and making cuts therein, in the example illustrated at different angles, due to the inclination of the axis of the article G. As the cutters rotate and cut into the glass, their supports 32, 32 are pulled toward each other by the spring 98, Fig. 2, the depth of cut being limited by the aforesaid stops 97, unless the cutters 36 are removed from the article G prior to reaching such depth. The table R is continuously rotating, and the wheels 36 cut the article G until the plunger or cam follower 46 is raised by the roller 47 rolling up to sufficient height upon a cam 48, whereupon the levers 42 are rotated, moving the supporting structure of the cutters 36 away from the article G.

While the cutters are so out of engagement with the article, the plunger or cam follower 84 is raised by the roller 86 rolling up upon a cam 87, Figs. 3 and 7, thereby raising the cam follower 84 which actuates the index wheel 69, thereby rotating the article G through suitable angle, and thereafter the cutters 36 again move toward each other and engage the article G as the follower 46 again descends as allowed by the cam 48. This operation continues, the cutter wheels 36 periodically engaging and departing from the article G, which latter is periodically stepped around until the design is cut completely around the circumference of the article, which occurs by the time the cam follower 78 co-acts with the cam 80, when the roller 79 rolls up upon the cam 80, actuating the rod 58 to open the holder or chuck, releasing the article G, which is then removed by the attendant or operator, and an uncut article placed in the chuck, which then grasps the article as the roller 79 passes off of the cam 80.

The foregoing is the cycle of operation for each cutting unit, and as each cutting unit comes to position corresponding with the cam 80, the cutting of the article is completed, and the attendant removes it and replaces it with another to be cut.

As the cutters 36 wear or decrease in diameter, they may be adjusted towards each other by rotating the adjusting screws 99, Figs. 5, 6 and 7, whereby the right and left hand threads on the member 99 engaging in blocks 100 on the standards 28 move those standards, and therefore the cutters carried thereby, toward and away from each other. This adjustment may be utilized also for accommodating articles G of different diameters, or for any other purpose.

For adjusting the cutters vertically to suitable positions longitudinally of the article G, the sleeves 33 are adjusted in their holders 32, and the coupling 37 between shafts 35 and 38 is correspondingly adjusted.

What I claim is:

1. Glass working apparatus comprising a rotating supporting member, a plurality of glass cutting units thereon, a shaft for each unit, and means common to the shafts of all the units for rotating the same during rotation of said supporting member.

2. Glass working apparatus comprising a rotating supporting member, a plurality of glass cutting units thereon, a shaft for each unit, and means common to the shafts of all the units for rotating the same while rotating with said supporting member.

3. Glass working apparatus comprising a rotating supporting member, a plurality of

glass cutting units thereon, a shaft for each unit, a gear common to all said shafts, and a gear driving each of said shafts and meshing with said first named gear.

4. Glass working apparatus comprising a rotating supporting member, a plurality of glass cutting units thereon, a shaft for each unit, a gear common to all said shafts, a gear driving each of said shafts and meshing with said first named gear, and means for rotating said first named gear independently of said rotating support.

5. Glass working apparatus comprising a rotating supporting member, a plurality of glass cutting units disposed in a circular series thereon, a shaft for each unit extending approximately radially of said supporting member, a gear disposed at the center of said supporting member, a gear driving each of said shafts and meshing with said first named gear, and means for rotating said first named gear independently of said supporting member for rotating said shafts as they rotate with said supporting member.

6. Glass working apparatus comprising a rotating supporting member, a plurality of glass cutting units carried by said supporting member, each of said units comprising a cutter and a holder for the article to be cut, a stationary member adjacent said rotating supporting member, and controlling means on said stationary member effecting control of said cutter and said holder.

7. Glass working apparatus comprising a rotating supporting member, a plurality of glass cutting units carried by said supporting member, each of said units comprising a cutter and a holder for the article to be cut, a stationary member adjacent said rotating supporting member, and means on said stationary member controlling movement of said cutter with respect to the article to be cut.

8. Glass working apparatus comprising a rotating supporting member, a plurality of glass cutting units carried by said supporting member, each of said units comprising a cutter and a holder for the article to be cut, a stationary member adjacent said rotating supporting member, and means on said stationary member controlling movement of said cutter toward and away from the article to be cut.

9. Glass working apparatus comprising a rotating supporting member, a plurality of glass cutting units carried by said supporting member, each of said units comprising a cutter and a holder for the article to be cut, a stationary member adjacent said rotating supporting member, and means on said stationary member effecting rotary movement of said holder.

10. Glass working apparatus comprising a rotating supporting member, a plurality of glass cutting units carried by said supporting member, each of said units comprising a cutter and a holder for the article to be cut, a stationary member adjacent said rotating supporting member, and means on said stationary member effecting rotary movement of said holder and movement of said cutter toward and away from the article to be cut.

11. Glass working apparatus comprising a rotating supporting member, a plurality of glass cutting units carried by said supporting member, each of said units comprising a cutter and a holder for the article to be cut, a stationary member adjacent said rotating supporting member, and means on said stationary member controlling said holder to engage or release the article to be cut.

12. Glass working apparatus comprising a rotating supporting member, a plurality of glass cutting units carried by said supporting member, each of said units comprising a cutter and a holder for the article to be cut, a stationary member adjacent said rotating supporting member, and means on said stationary member effecting movement of said cutter toward and away from the article to be cut and rotary movement of said holder, and controlling said holder to engage or release the article to be cut.

13. Glass working apparatus comprising a movable support, a rotary cutter carried thereby, an arm co-acting with said support for moving said support, a rotatable carrier for said support, and means operable at a predetermined point in the movement of said carrier for actuating said arm to move said cutter with respect to the work.

14. Glass working apparatus comprising a movable support, a rotary cutter carried thereby, an arm co-acting with said support, a rotatable carrier for said support, a stationary member, and means on the carrier co-acting with said stationary member for controlling movement of said cutter toward and away from the work.

15. Glass working apparatus comprising a rotating supporting member, a movable support thereon and rotating therewith, a rotary cutter carried by said support, means for rotating said cutter while rotating with said supporting member, and stationary means controlling movement of said movable support to move said cutter with respect to the work.

16. Glass working apparatus comprising a holder for holding the work, a rotary supporting member carrying said holder, actuating mechanism for the holder, and stationary means intermittently engaged by said actuating mechanism to rotate the work holder upon said supporting member.

17. Glass working apparatus comprising a holder for holding the work, a rotary supporting member carrying said holder, means for intermittently rotating said holder upon

said supporting members, and stationary means controlling said holder to release or engage the work.

18. Glass working apparatus comprising a plurality of rotary cutters, a movable support for each cutter, a rotating supporting member carrying said cutters, means rotating with said supporting member for rotating said cutters, and stationary means controlling movement of said movable supports to move said cutters with respect to the work.

19. Glass working apparatus comprising a holder for the work, movable supports, a rotary cutter carried by each of said supports, a spring biasing said supports toward each other and toward the work, a rotating supporting member carrying said supports and work, and stationary means for actuating said supports to move said cutters away from the work in opposition to said spring.

20. Glass working apparatus comprising a rotating supporting member, a holder for the work carried thereby, a movable support carried by said rotating supporting member, a rotary cutter carried by said movable support, a member carried by and movable with respect to said supporting member for moving said movable support to change the position of said cutter with respect to the work, and a stationary cam engaged by said last named member for actuating said movable support.

21. Glass working apparatus comprising a rotating supporting member, a holder for the work carried thereby, a member carried by and movable with respect to said supporting member for rotating said holder to rotate the work, and a stationary cam engaged by said last named member for rotating said holder.

22. Glass working apparatus comprising a rotating supporting member, a holder for the work carried thereby, a cutting tool, means controlled by movement of said supporting member for moving said tool into and out of engagement with the work, a member carried by and movable with respect to said supporting member for causing said holder to release or engage the work, when the cutting tool is out of engagement therewith, and a stationary cam engaged by said last member for moving said member to release or engage the work.

23. Glass working apparatus comprising a rotating supporting member, a series of glass cutting units carried thereby, each unit comprising a cutter and a holder for the work, a circular series of stationary cams for controlling the cutter and the work, and a stationary cam reached by each of said units in succession and operating to release the work from the holder of each unit.

24. Glass working apparatus comprising a rotating supporting member, a series of glass cutting units carried thereby, each unit comprising a cutter and a holder for the work, a circular series of stationary cams for controlling movement of the cutter toward and from the work and for rotating the work, and a stationary cam reached by each of said units in succession and operating to release the work from the holder of each unit.

25. Apparatus for cutting designs upon glassware comprising a rotatable supporting member, a member thereon and rotating therewith for holding the article of glass to be cut, a rotary cutter, means timed with respect to the movement of said supporting member for effecting relative movement of said holding member and said cutter toward each other a plurality of times per revolution of said supporting member for cutting a plurality of design elements, and means timed with respect to movement of said supporting member for releasing the article from said holding member.

26. Apparatus for cutting designs upon glassware comprising a rotatable supporting member, a member thereon and rotatable about its own axis for holding the article of glass to be cut, a rotary cutter, means timed with respect to movement of said supporting member for imparting intermittent rotative movements to said holding member, and means timed with respect to movement of said supporting member for effecting relative movement of the work and said cutter toward each other a plurality of times per revolution of said supporting member.

27. Glass working apparatus comprsing a rotatable supporting member, a rotary cutter, a work holder carried by said supporting member and rotating therewith, and means for effecting relative movement between said holder and said cutter in predetermined relation to the movement of said supporting member a plurality of times per revolution of said supporting member.

28. Glass working apparatus comprising a movable carrier, a plurality of glass-cutting units thereon, each including a grinder and a work holder, and means for operating said units in predetermined relation to the movement of said carrier.

29. Glass working apparatus comprising a rotatable carrier, a work holder thereon rotatable about its own axis and rotated by said carrier in a circular path only, a cutter for operating on an article to be supported by said holder, and means for causing intermittent rotative movement of said holder about its own axis in timed relation to movement of said carrier.

In testimony whereof I have hereunto affixed my signature this 28th day of June, 1921.

JOHN A. MILLIKEN.