



No. 622,312.

Patented Apr. 4, 1899.

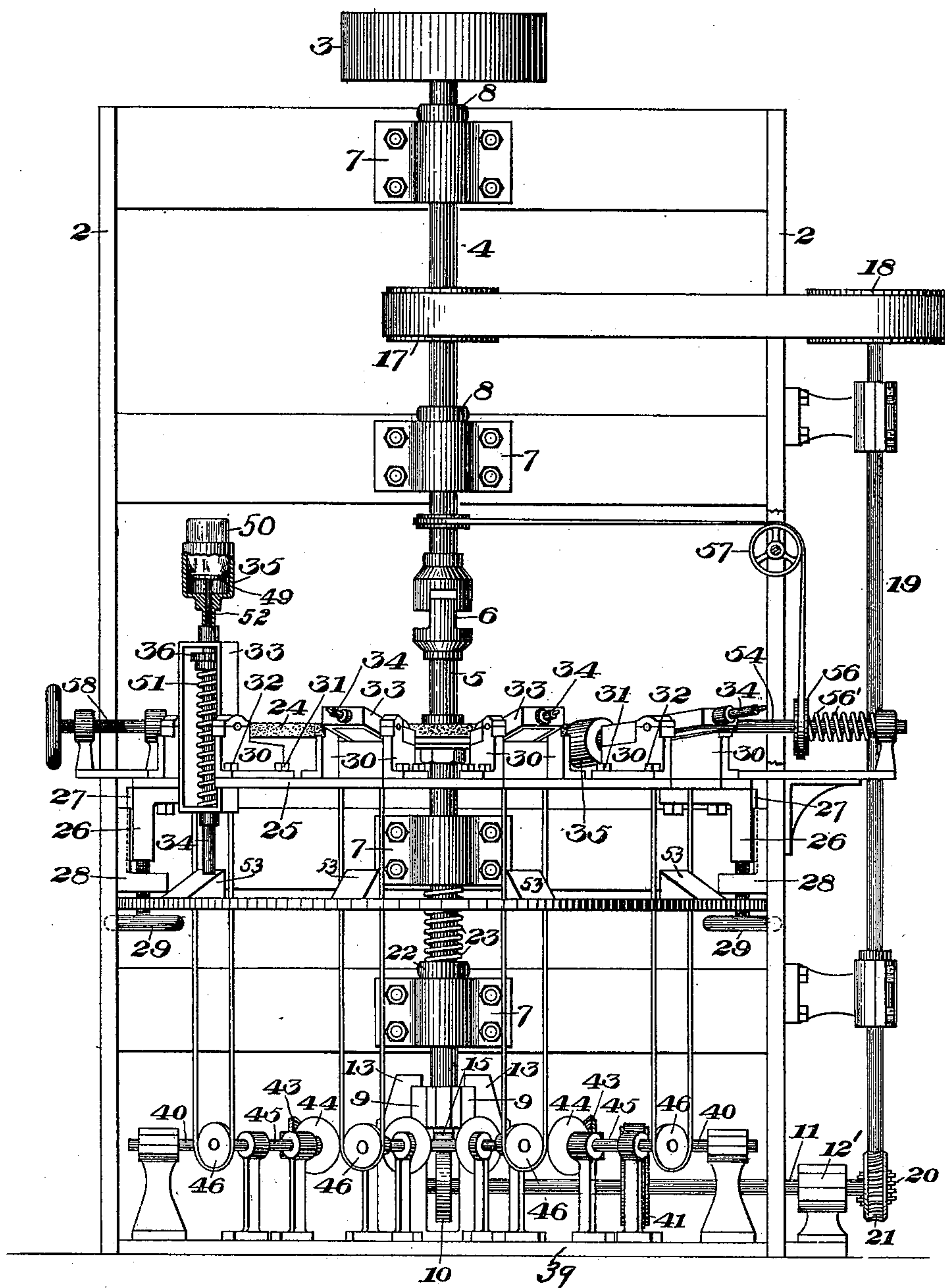
F. WOODRUFF.  
GRINDING GLASSWARE.

(Application filed June 3, 1897.)

(No Model.)

4 Sheets—Sheet 2.

Fig. 2.



WITNESSES

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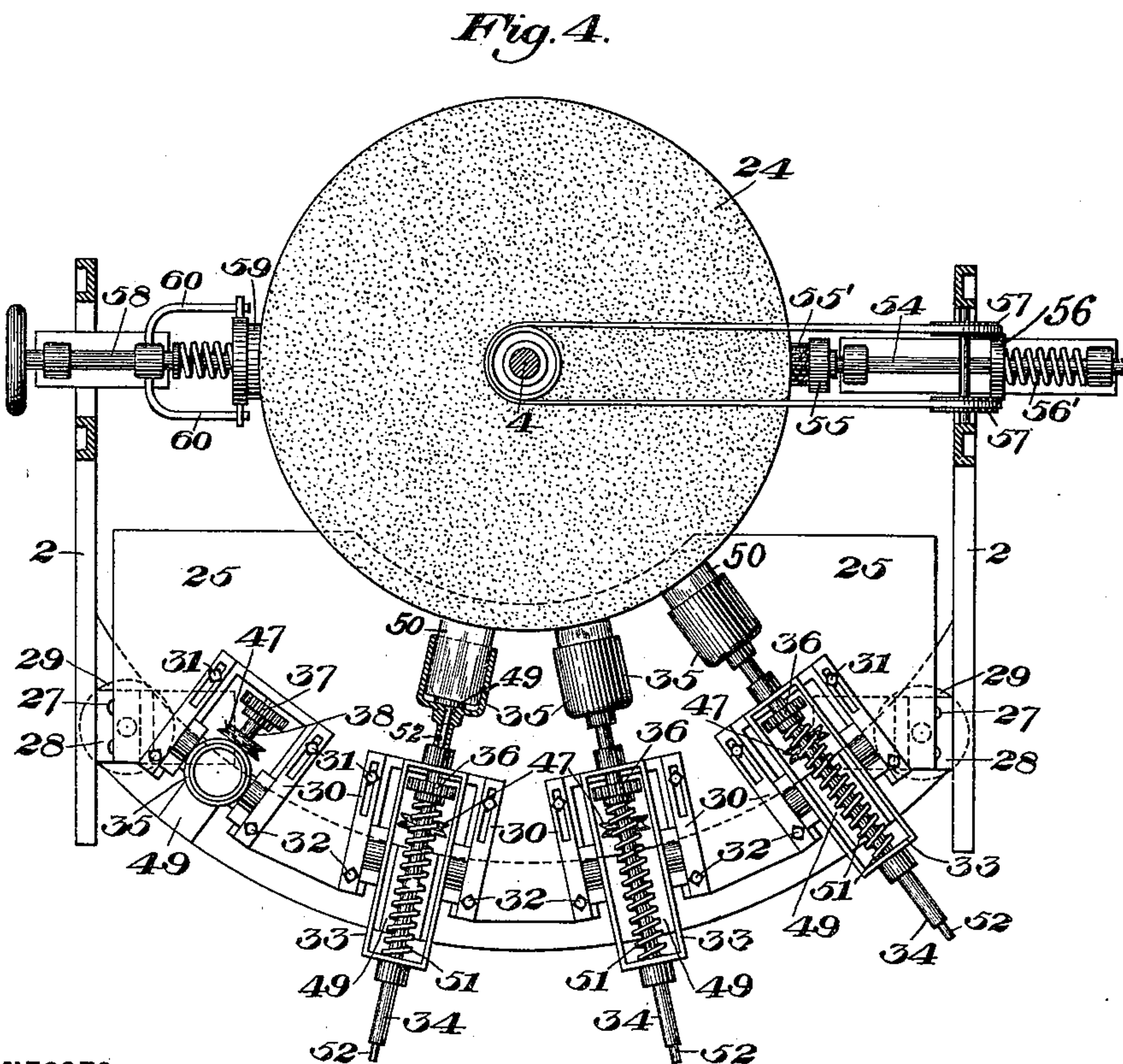
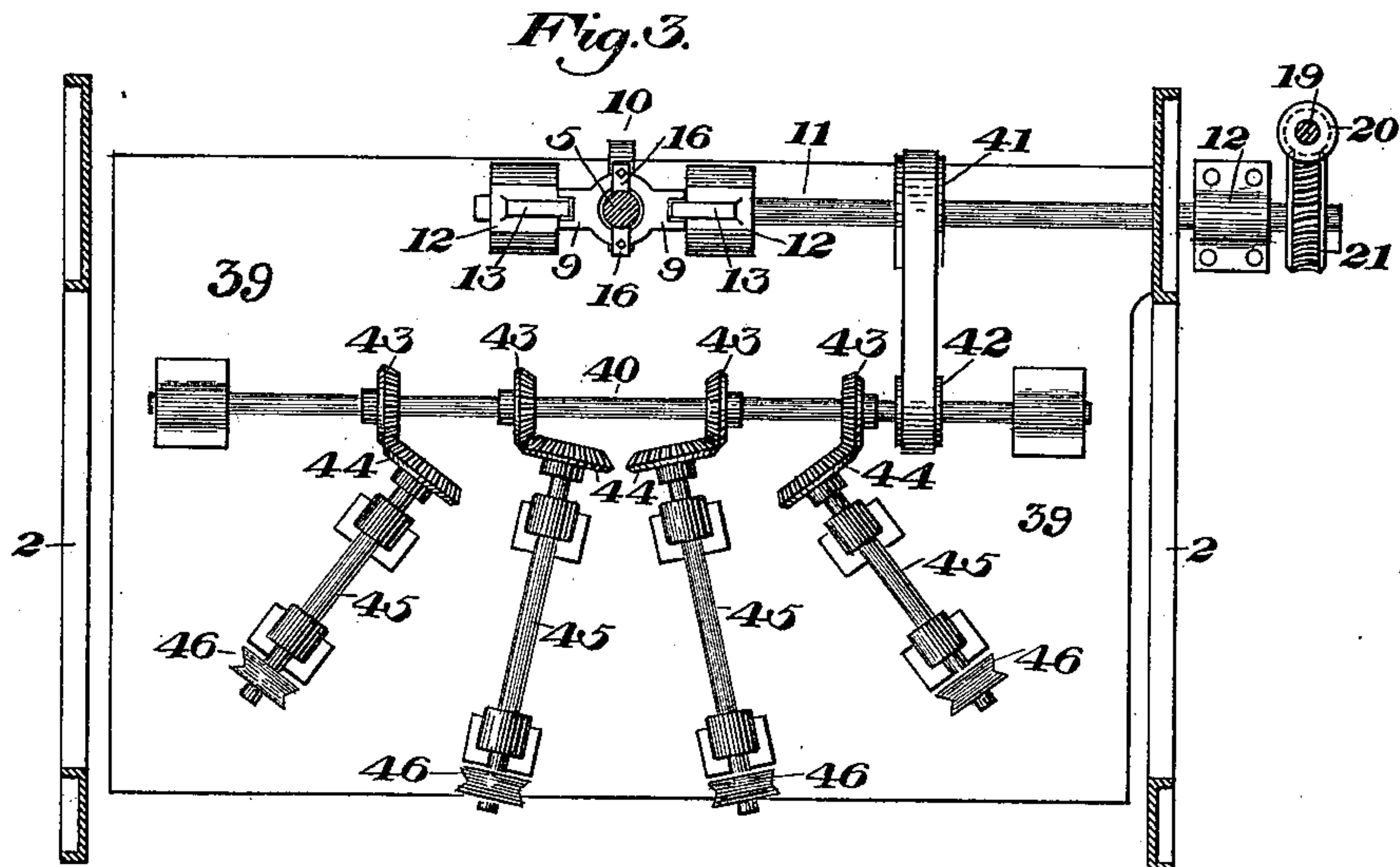
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Fig. 5.

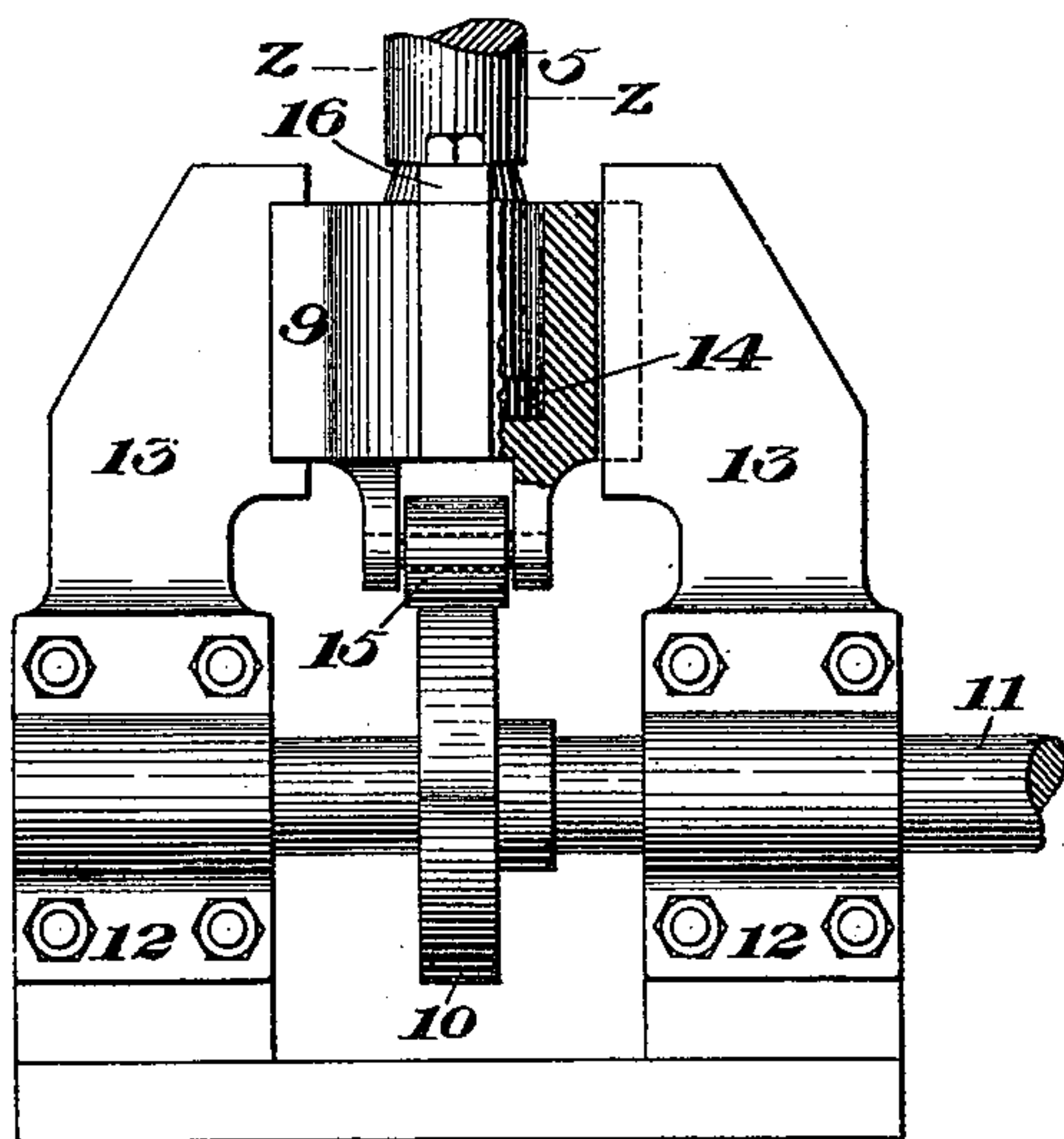


Fig. 6.

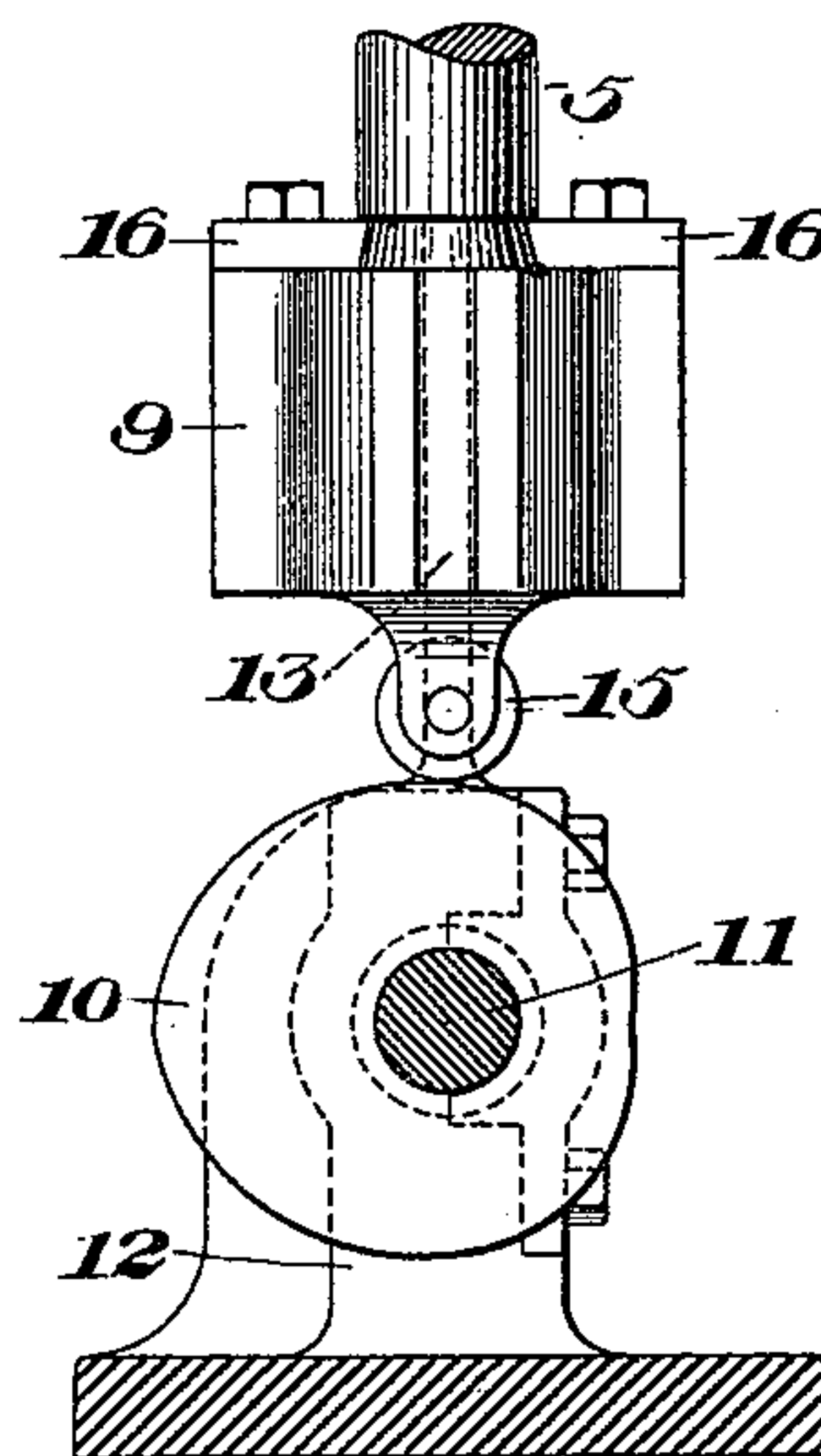
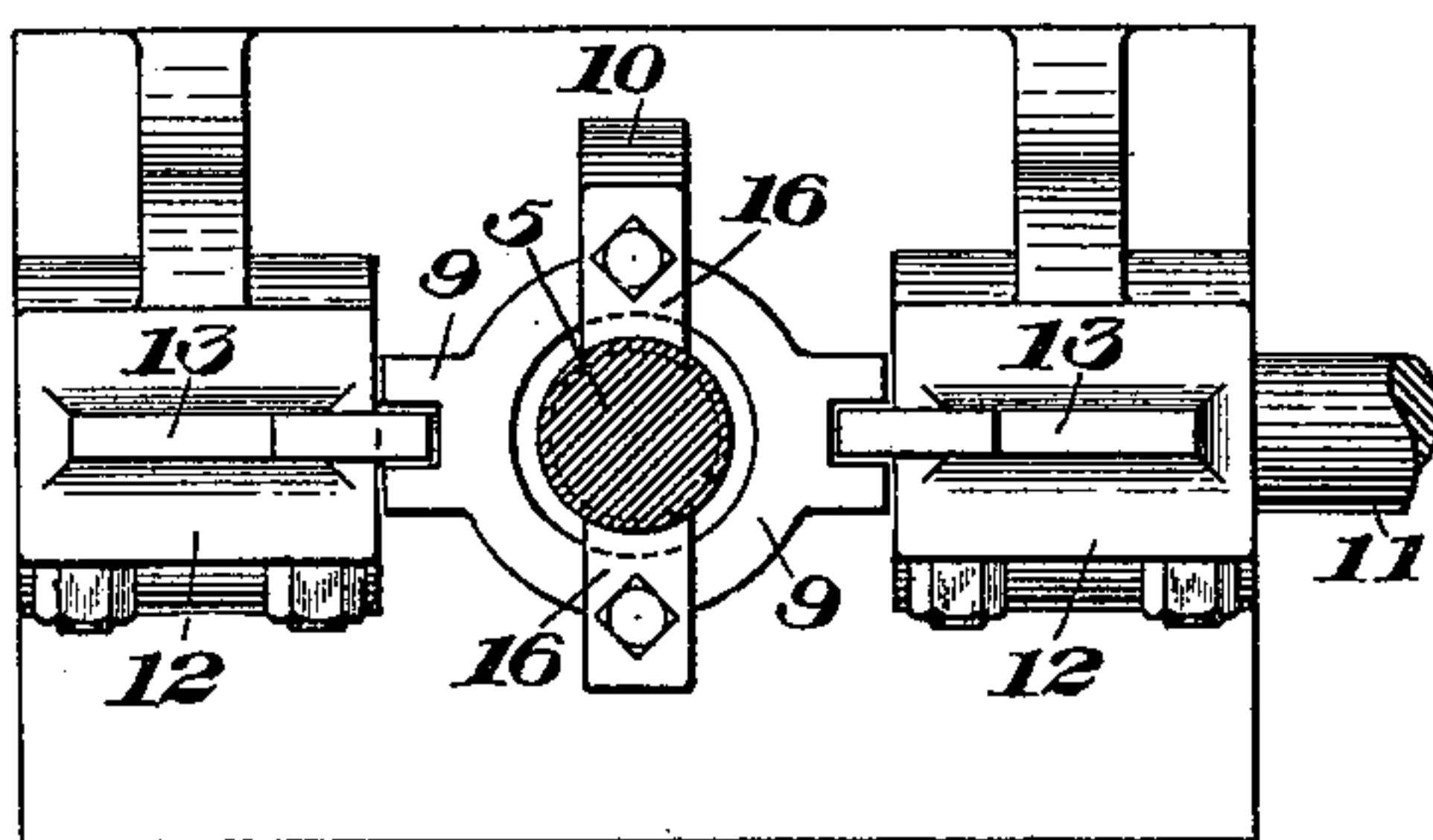


Fig. 7.



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# UNITED STATES PATENT OFFICE.

FRANK WOODRUFF, OF ROCHESTER, PENNSYLVANIA.

## GRINDING GLASSWARE.

SPECIFICATION forming part of Letters Patent No. 622,312, dated April 4, 1899.

Application filed June 3, 1897. Serial No. 639,360. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK WOODRUFF, of Rochester, in the county of Beaver and State of Pennsylvania, have invented a new and  
5 useful Improvement in Apparatus for Grinding Glassware, of which the following is a full, clear, and exact description.

In the manufacture of blown glassware, such as tumblers, after the tumbler is blown  
10 there remains a portion to which the blow-pipe has been connected which is cut off in various ways, either by scoring it with a diamond and heating or by revolving the article rapidly and encircling it with a wire, which  
15 becomes so heated by the friction that when moisture or cold is applied to the glass the blow-over portion cracks off. These modes, however, leave a rough edge on the tumbler, which has ordinarily heretofore been removed  
20 by hand labor, the operator holding the edge of the tumbler against a revolving and moistened grindstone until the rough and sharp edge has been ground away. In a large factory many operators and grindstones are re-  
25 quired for this purpose, involving the expenditure of much labor and power.

The object of my invention is to provide an improved mechanism for grinding the edges of tumblers or other articles of glass-  
30 ware, so that the manual labor of holding the glassware against grindstones may be dispensed with; and to this end it consists in imparting to the stone a reciprocatory as well as a rotatory movement and also in imparting  
35 a rotatory movement to the article of glassware mechanically held against the grindstone, whereby a perfect grinding is produced on the glass and the grinding-face of the stone is kept even and smooth.

40 It also has for its object to provide mechanism for keeping the grindstone true and clean.

I will now describe my invention, so that others skilled in the art may employ the same,  
45 reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an end elevation, partially in section, of my improved apparatus. Fig. 2  
50 is a front elevation. Fig. 3 is a horizontal sectional view on the line *xx* of Fig. 1. Fig. 4 is a like view on the line *yy* of Fig. 1. Fig.

5 is a detached view of the lower portion of the spindle and the cam. Fig. 6 is a side elevation of the same, and Fig. 7 is a sectional  
55 view on the line *zz* of Fig. 5.

Like symbols of reference indicate like parts wherever they occur.

In the drawings, 2 represents the frame by which the various parts of the apparatus are  
60 supported, and 3 represents the power-pulley, which is driven by suitable power and in turn drives the shaft 4 and also the shaft 5, which is coupled to the shaft 4 by a clutch 6, the purpose of which is to cause the two shafts  
65 to revolve together, while the lower shaft 5 is free to receive a vertical reciprocatory movement independently of the shaft 4. These two shafts are journaled in the bearings 7. The shaft 4 is held in a fixed position by the  
70 collars 8 above the bearings 7. The lower end of the shaft 5 has a bearing in the thrust-bearing 9. As already stated, the lower shaft 5 is adapted to receive a reciprocatory movement, and this movement is imparted by a  
75 cam 10, that is keyed to the horizontal shaft 11, which is journaled in the bearings 12 and 12'. The bearings 12 extend upwardly, forming the guides 13 to guide the thrust-bearing 9, which bearing is bored out some-  
80 what larger than the diameter of the shaft 5. At the bottom of the shaft 5 is a hard bushing 14, on which the shaft 5 is seated. To the thrust-bearing 9 is attached the roller 15, which rests on the periphery of the cam 10.  
85 In the shaft 5 is a groove, into which project gibs 16. These gibs are securely attached to the thrust-bearing 9. The shaft 11 is driven from the shaft 4 by means of a belt extend-  
90 ing from the pulley 17 to the pulley 18, which pulley is keyed to the vertical shaft 19. At the base of this shaft is a worm 20, that meshes with a wheel 21, that is keyed to the shaft 11. As the shaft 11 revolves, and with  
95 it the cam 10, an upward-and-downward motion is imparted to the thrust-bearing 9 and to the shaft 5, the roller 15 traveling on the face of the cam. In order to insure the shaft 5 moving downwardly with the cam, a collar 22  
100 is placed on the shaft 5 between the two bearings 7, which collar is firmly clamped to the shaft and moves with it, and between this collar 22 and the bearing 7 and surrounding the shaft 5 is a stout spiral spring 23, which



when the shaft 5 is raised by means of the cam 10 is compressed and by its tension keeps the roller 15 bearing on the face of the cam.

Rigidly attached to the shaft 5 is the circular grinding-stone 24, the plane of the stone being at right angles to the axis of the shaft 5, and this stone rotates and reciprocates with the shaft, the clutch 6 being of sufficient length to allow of this movement. As the best thickness of the stone 24 has been found to be about one and one-eighth inches, the vertical movement of the stone is one inch.

Referring to Figs. 1, 2, and 4, 25 is the bed-plate, to which are attached the lugs 26, which have projections 27, which fit in grooves in the lugs 28, which are firmly fastened to the frame 2. By means of the hand-wheels and screws 29, which work through the lugs 28, the lugs 26 and bed-plate 25 may be raised and lowered. This furnishes a means of adjusting the position of the bed-plate with reference to the grinding-stone. On this bed-plate a number of work-holders are arranged around the stone.

In Figs. 1, 2, and 4, 30 represents the brackets or carriages which support the tumbler-chucks. These carriages are fastened to the main bed-plate 25 by means of the set-screws 31, which work in a slot in the carriage. Thus by loosening the screws 31 the carriages 30 can be shipped in or out with regard to the stone 24 and firmly clasped in any position. The screws 32 pass through the carriages and simply bear on the main bed-plate, and by means of these screws 32 the back of the carriages may be raised or lowered, and thus the vertical angle of the chuck with reference to the grinding-stone may be altered. The rocker-frames 33 are trunnioned in the carriages 30, and they are free to revolve in a vertical direction. Slidably mounted in bearings on the frames 33 are the hollow shafts 34, having on their inner ends the tumbler-chucks 35, which are lined with felt or cork to closely fit the tumbler to be ground. On the shafts 34 are fixed the gear-wheels 36, which mesh with the gear-wheels 37. The gear-wheels 37 are fastened to the shaft 38, which has bearings in the carriage 30.

Referring to Fig. 3, 39 is the bed-plate for supporting the journals of the shafts 11 and 40 and 45. The shaft 40 is driven from the shaft 11 by means of a belt running over the pulleys 41 and 42. The shaft 40, through the bevel-gears 43 and 44, drives the shafts 45, which carry at their outer ends the pulleys 46.

On each of the shafts 38, Fig. 4, is fastened a pulley 47, which is driven by means of the belt from the pulley 46, as indicated in Fig. 1. It is evident that when the rocker-frame 33 is in the position indicated by the full lines in Fig. 1 the shaft 34, with the chuck 35, holding the tumbler 50, will be revolved by means of the gears 37 and 36; but when the chuck is elevated, as shown in the dotted lines in Fig. 1 and on the extreme left in Fig.

2, the shaft 34 and its gear-wheel 36 will be out of gear with the gear-wheel 37. It is evident that the chucks may be so adjusted that the upper edge of the tumbler 50 will meet the center of the grindstone 24 when it is in the middle of its upward-and-downward motion, and therefore the motion of the stone in a vertical direction will bring the edge of the tumbler to bear on the whole surface of the edge of the stone, and thus keep the wear of the stone practically the same over its entire grinding-surface. Surrounding the shaft 34 and located between a collar and the outer part of the rocker-frame 33 is a spiral spring 51, which tends to force the shaft 34, with the chuck 35, toward the grinding-stone 24, and thus the edge of the tumbler in the chuck is always kept in contact with the grinding-stone when the shaft 34 is in its lowered position. Within the hollow shaft 34 is a rod 52, which at its inner end, within the chuck 35, carries the head 49. This rod is somewhat longer than the hollow shaft 34 and projects beyond it, as is shown in Fig. 1. When the rocker-frame 33 is in a horizontal position, this head rests in the bottom of the chuck, and when the rocker-frame is elevated on its trunnions the rod 52 is pushed forward through the hollow shaft 34 by means of the inclined knock-out block 53, which is fastened to the frame 2, and thereby forces the tumbler partially out of the chuck, so that it may be easily removed therefrom.

Mounted in suitable bearings is a shaft 54, having at its inner end a chuck 55. Keyed to the shaft 54 is a pulley 56, which is driven from the main shaft 4 by a belt running over the guide-pulleys 57. In the revolving chuck 55 is a grinding-stone 55', which is caused to be pressed against the grinding-face of the stone 24 by the spring 56', and thereby, the two grinding-stones working on each other, the grinding-surface of the stone 24 is kept smooth. On the opposite side of the stone 24 is a screw-shaft 58, which by means of the spring 61 exerts a spring-pressure against a stone rubber or polisher 59', held in the chuck 59, the purpose of the screw being to regulate the pressure of the polisher against the face of the stone 24. It should be noticed that this rubber or polisher is held by the arms 60, so that the rubber does not revolve. The object of this rubber is to keep the surface of the grinding-stone 24 smooth and clean.

The operation is as follows: Power being applied to the main shafts 4 and 5, the grinding-stone is caused to revolve, at the same time a vertical reciprocatory motion being imparted to the shaft 5 and stone 24 by the cam 10, which is driven by the shafts 11 and 19. Although I have shown the cam 10 and thrust-bearing 9, other equivalent devices may be employed for imparting a uniform reciprocatory movement to the grinding-stone. By means of the shafts 11 and 40 and the shafts 45 and 38 a rotatory movement is imparted to the shafts of the chucks 35, this



movement being in an opposite direction to the rotation of the stone 24. The rocker-frame 33 being brought to its elevated position, as shown in the dotted lines in Fig. 1, the tumbler is placed in the chuck 35, and the rocker-frame is then lowered, and the spring 51 then pushes the chuck toward the grinding-stone 24, causing the tumbler to press against the face of the same at the same time the gear-wheels 36 mesh with the wheels 37, causing the chuck to resume its rotatory movement.

It should be noted that the chucks 35 and also the chucks 55 and 59, holding the grinding-stone 55' and the rubber or polisher 59', should be set at a slight angle to the stone 24 to allow for what is known as the "drag," this inclination being just sufficient to prevent the drag of the stone from carrying the tumblers off of the center. The tumblers having their rough edges pressed against the grinding-stone, the roughness is rapidly ground away, and as soon as this is done the rocker-frames carrying the chucks are elevated, whereby the rods 52 are brought into contact with the incline 53, lifting the tumblers in the chucks, so that they may be readily removed.

It has been found in practice that one girl can easily take care of four chucks, and eight or more chucks can be arranged with each grinding-stone.

The chucks containing the grinder 55' and rubber 59' may be adjustable, so that the angles of the grinder and rubber with relation to the grindstone may be varied.

The object of the screws 29, whereby the plate 25 is raised or lowered, is to adjust the position of the chucks 35 for larger or smaller tumblers.

The advantages of my invention will be apparent to those skilled in the art. It supplies a want long felt and enables the work to be done by machinery as efficiently as by hand and much more rapidly.

Although I have described mechanical means by which the various movements can be readily and effectively applied, I do not desire to limit myself to the same, nor do I desire to limit myself to a grinding-stone having a reciprocatory movement, as such movement may be imparted to the table or frame supporting the chucks.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In apparatus for grinding articles of glassware, the combination of a grinding-surface and devices for imparting a combined rotatory and reciprocatory movement thereto, a chuck for holding the article of glassware in contact with the grinding-surface, and devices for imparting a rotatory movement to the chuck while the article is held against the grinding-surface.

2. In apparatus for grinding glassware, the combination of a grinding-stone, a shaft hav-

ing a combined rotatory and reciprocatory movement to which the stone is attached, and a power-shaft having a direct connection with the grindstone-shaft, the connection between the two shafts being such as to permit a reciprocatory movement to be given to the grindstone-shaft without interfering with the rotatory movement imparted to it by the power-shaft; substantially as described.

3. In apparatus for grinding glassware, the combination of a grinding-stone, a shaft having a rotatory and reciprocatory movement to which shaft the stone is attached, and a power-shaft, the said shafts being connected together by a mortise-and-tenon joint so that a rotatory movement may be imparted to the first-named shaft without interfering with its reciprocatory movement.

4. In apparatus for grinding glassware, the combination of a grinding-stone, a shaft having a rotatory and reciprocatory movement, to which shaft the stone is attached, said shaft being seated at its lower end in a movable bearing, and devices for imparting a reciprocatory movement to said bearing.

5. In apparatus for grinding glassware, the combination of a grinding-stone, a shaft having a rotatory reciprocatory movement, to which shaft the stone is attached, said shaft being seated at its lower end in a movable bearing, and a cam for imparting a reciprocatory movement to said bearing.

6. In apparatus for grinding glassware, the combination of a grinding-stone, a shaft having a rotatory and reciprocatory movement, to which shaft the stone is attached, said shaft being seated at its lower end in a movable bearing, said bearing having a roller connected thereto, and a cam for engaging with said roller and thereby imparting a reciprocatory movement to said bearing.

7. In apparatus for grinding glassware, the combination of a grinding-stone, a shaft having a rotatory and reciprocatory movement, to which shaft the stone is attached, said shaft being seated at its lower end in a movable bearing, a cam for imparting a reciprocatory movement to said bearing, and a spring for keeping said bearing and cam in operative engagement with each other.

8. In apparatus for grinding articles of glassware, a grinding-stone having a combined rotatory and reciprocatory movement, a chuck for holding the article of glassware in contact with the grinding-surface, and a revolving grinder held against the grinding-surface of the stone.

9. In apparatus for grinding articles of glassware, a grinding-stone having a combined rotatory and reciprocatory movement, a chuck for holding the article of glassware in contact with the grinding-surface, a stationary rubber or polisher and a spring for holding the rubber in contact with the grinding-surface of the stone.

10. In apparatus for grinding glassware, the combination of a reciprocatory stone, a car-



riage carrying a chuck, said carriage having slots and bolts whereby its position in relation to the stone may be regulated.

11. In apparatus for grinding glassware, the combination of a reciprocatory rotatory stone with a chuck and devices for adjusting the chuck at an angle with the radius of the stone so as to allow for the drag.

12. In apparatus for grinding glassware, the combination of a reciprocatory rotatory stone, a pivoted revoluble frame, a rotary spindle mounted in said frame, and a chuck at the end of the spindle.

13. In apparatus for grinding glassware, the combination of a reciprocatory rotatory stone, a pivoted revoluble frame, a hollow rotary spindle mounted in said frame, a chuck at the end of the spindle, an ejector-rod within the hollow spindle, and a knock-out block.

14. In apparatus for grinding glassware, the combination of a reciprocatory rotatory stone, a spindle mounted in a pivoted revoluble frame, a chuck at the end of the spindle, and a spring for pressing the chuck toward the stone.

15. In apparatus for grinding glassware, the combination of a reciprocatory rotatory stone, a spindle slidably mounted in a frame, a gear-wheel secured to the spindle, and a gear-wheel keyed to a shaft and meshing with the gear-wheel on the spindle.

16. In apparatus for grinding glassware, the combination of a rotatory reciprocatory stone, a stationary frame or table, a carriage carrying a work-holding chuck mounted on the ta-

ble, and set-screws connecting the table or frame with the carriage, whereby the carriage may be moved toward or away from the stone as desired.

17. In apparatus for grinding glassware, the combination of a rotatory reciprocatory stone, a stationary frame or table, a carriage carrying a work-holding chuck mounted on the table, and set-screws for varying the angle at which the chuck is presented to the stone.

18. In apparatus for grinding glassware, the combination of a rotatory reciprocatory stone, a stationary frame or table, a carriage mounted on said table, a shaft having gearing mounted in said carriage, a revoluble frame having bearings in said carriage, a rotary spindle mounted in said frame carrying a chuck, and gearing on said spindle adapted to engage with the gearing mounted in the carriage.

19. In apparatus for grinding glassware, mechanism for imparting to the grinding-stone a combined reciprocatory and rotatory movement, mechanism for holding the article of glassware in contact with the grinding-surface of the stone, and mechanism for imparting to the holding mechanism and to the article of glassware held therein a rotatory movement in an opposite direction to that of the stone.

In testimony whereof I have hereunto set my hand.

FRANK WOODRUFF.

Witnesses:

E. W. ARTHUR,  
JAMES K. BAKEWELL.