No. 891,197. PATENTED JUNE 16, 1908.

F. L. O. WADSWORTH.

APPARATUS FOR GRINDING AND POLISHING GLASS.

APPLICATION FILED NOV. 21, 1904.

4 SHEETS—SHEET 1.

Fig. 1.

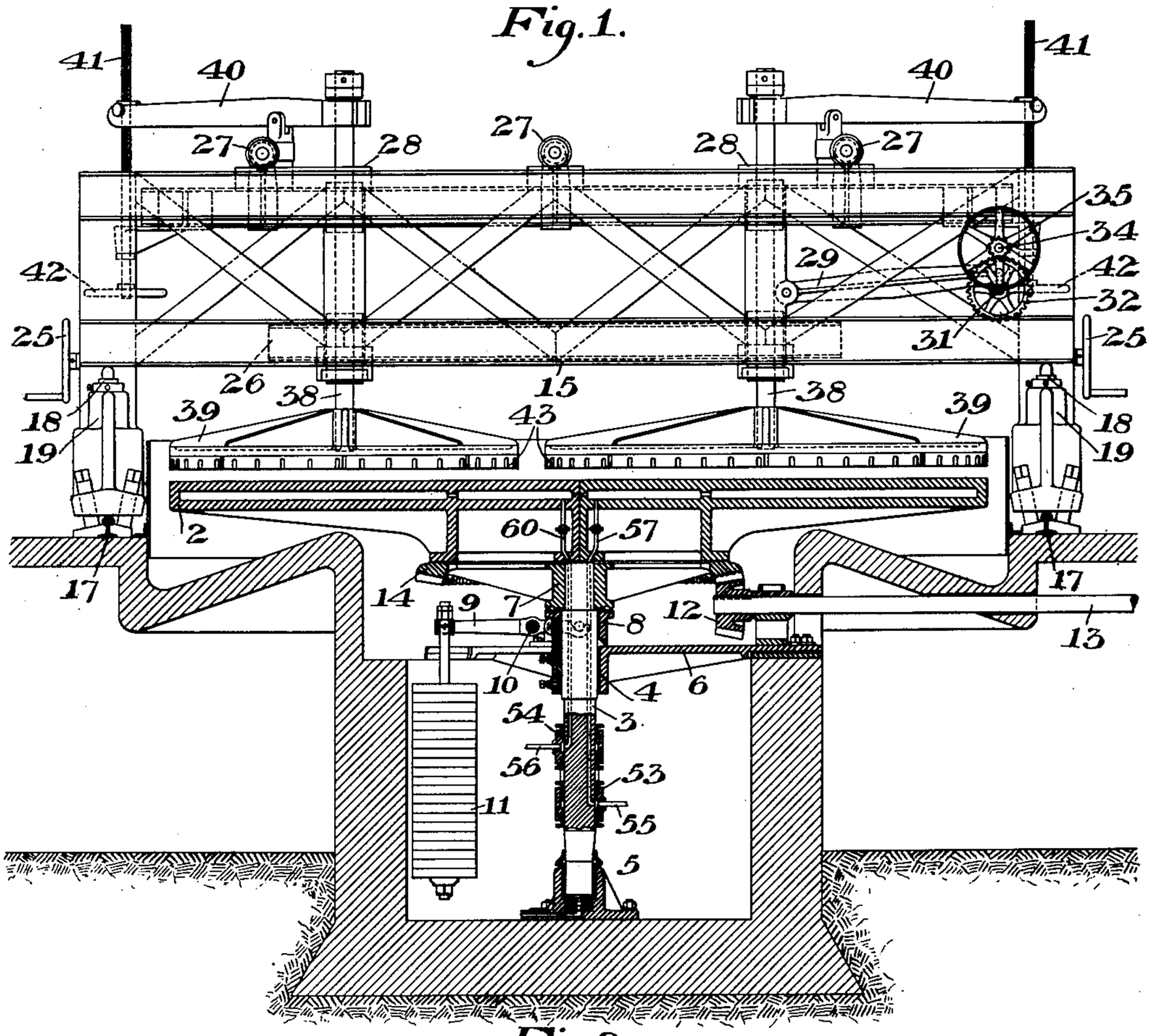
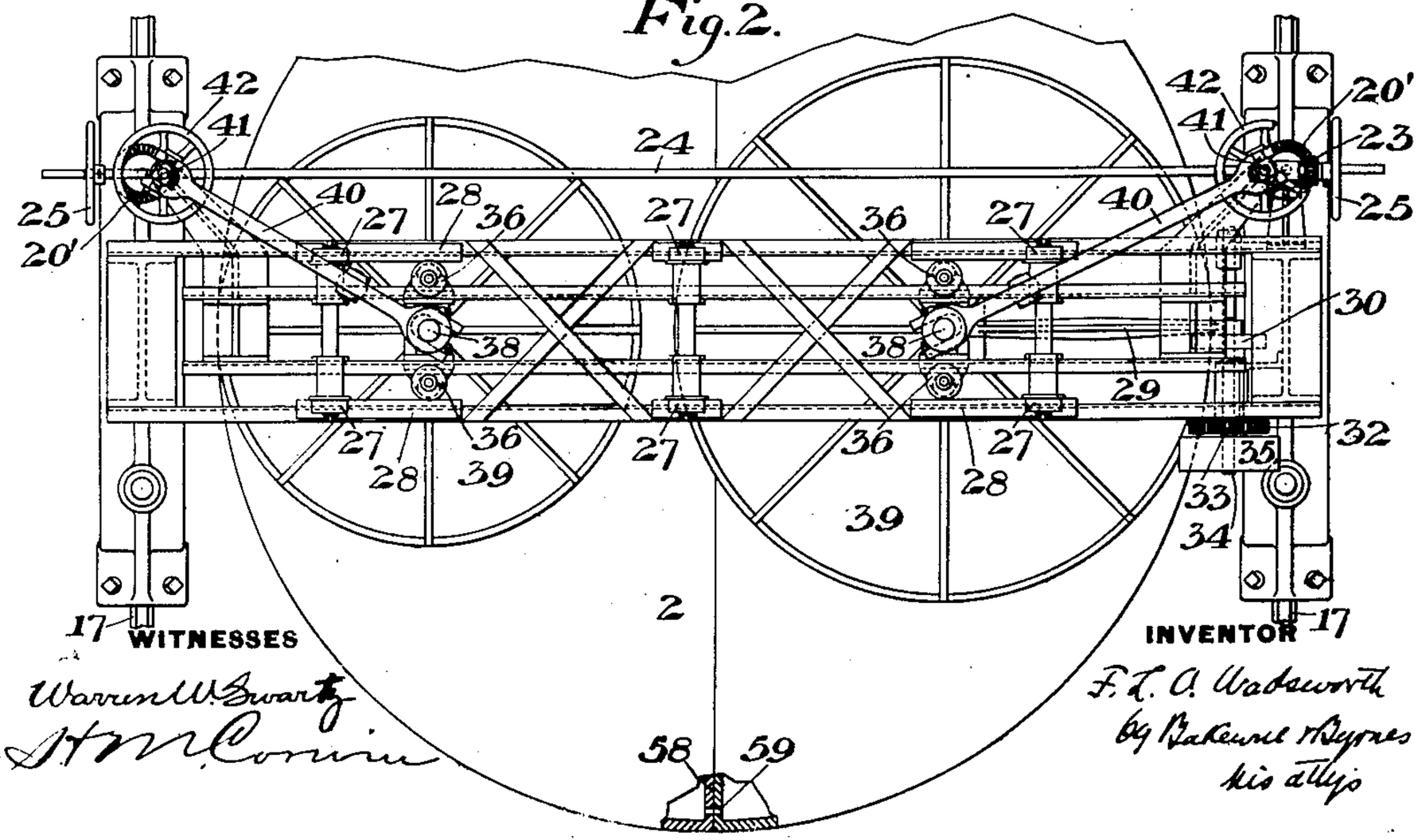


Fig. 2.



WITNESSES

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4 SHEETS—SHEET 2.

Fig. 4.

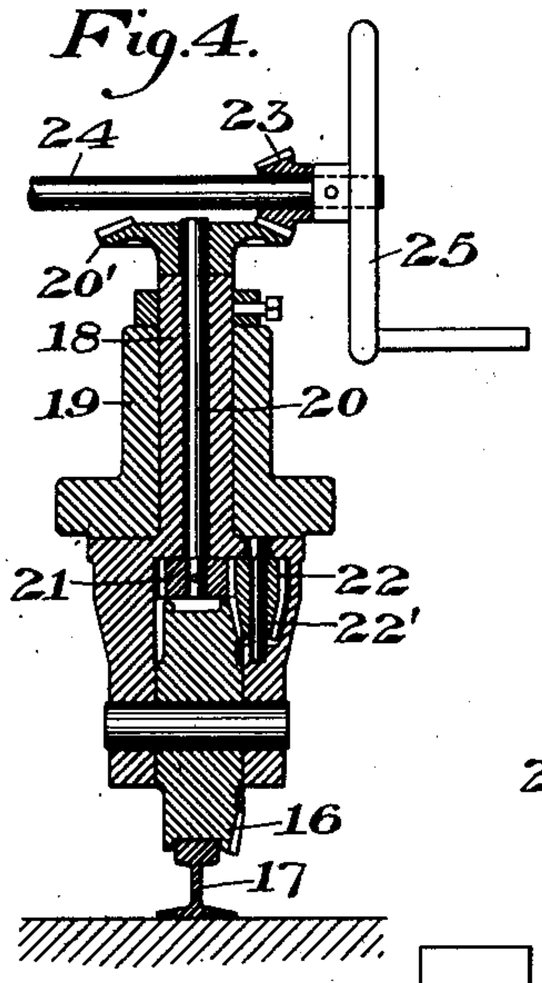
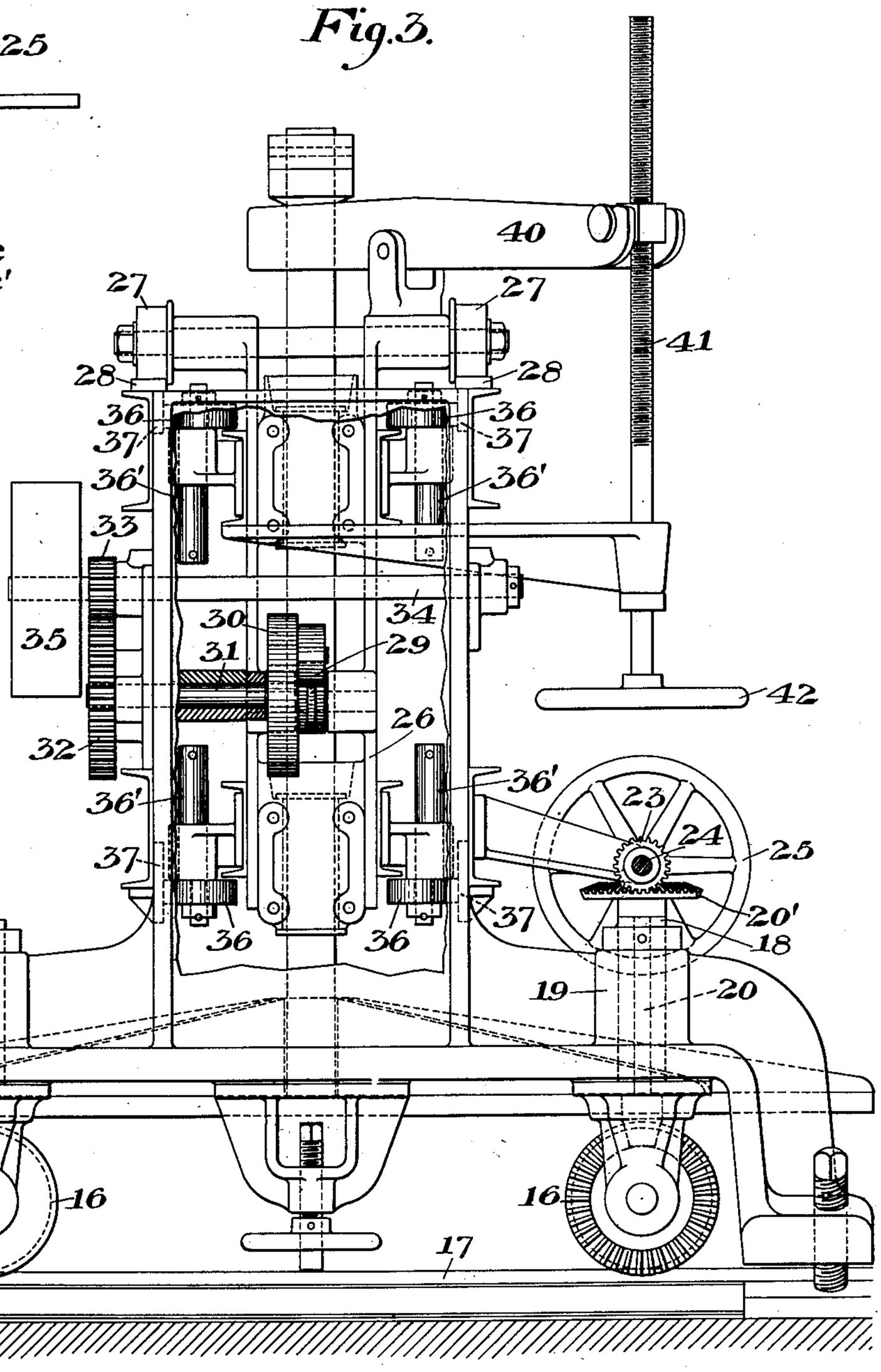


Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 5.

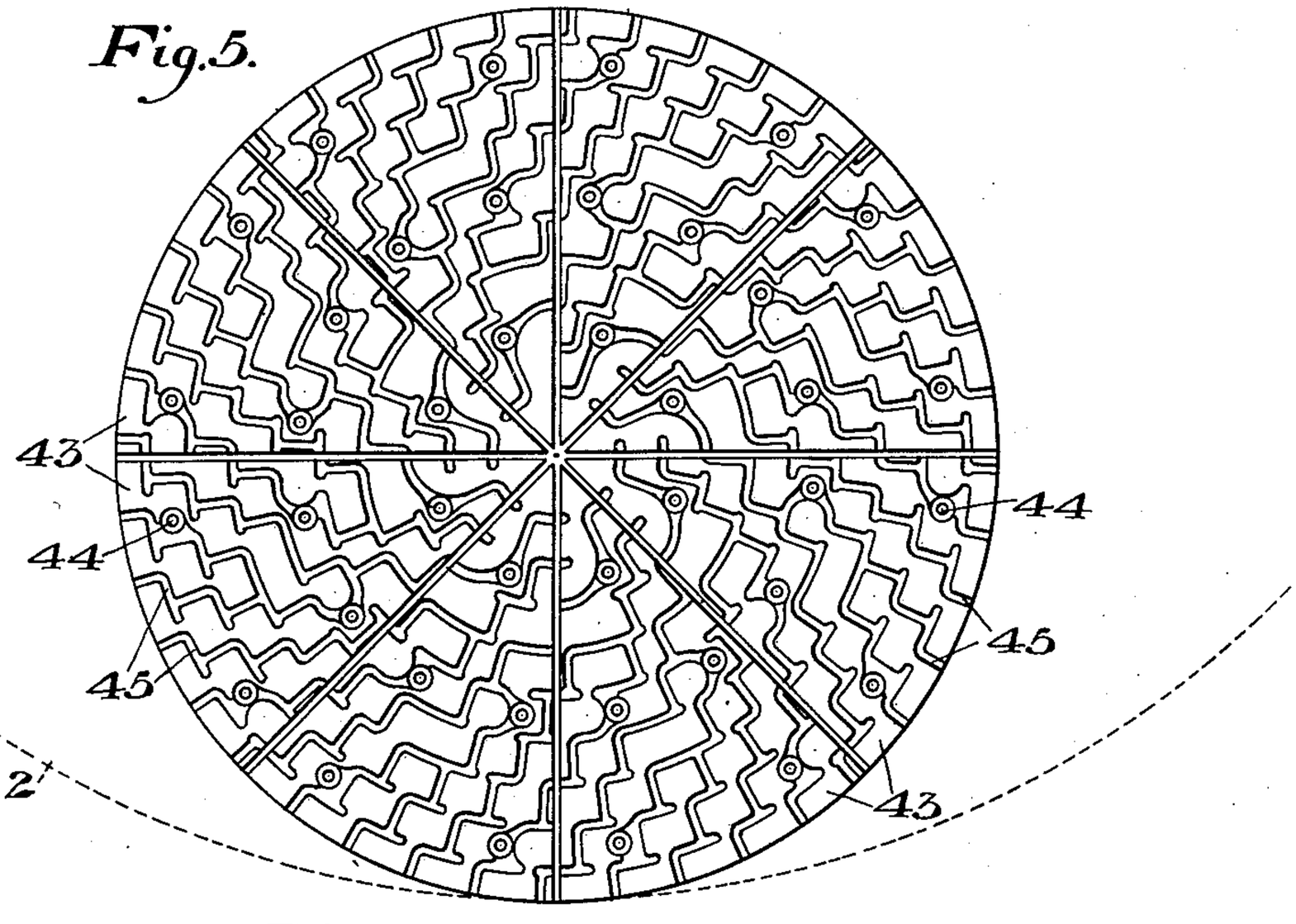


Fig. 6.

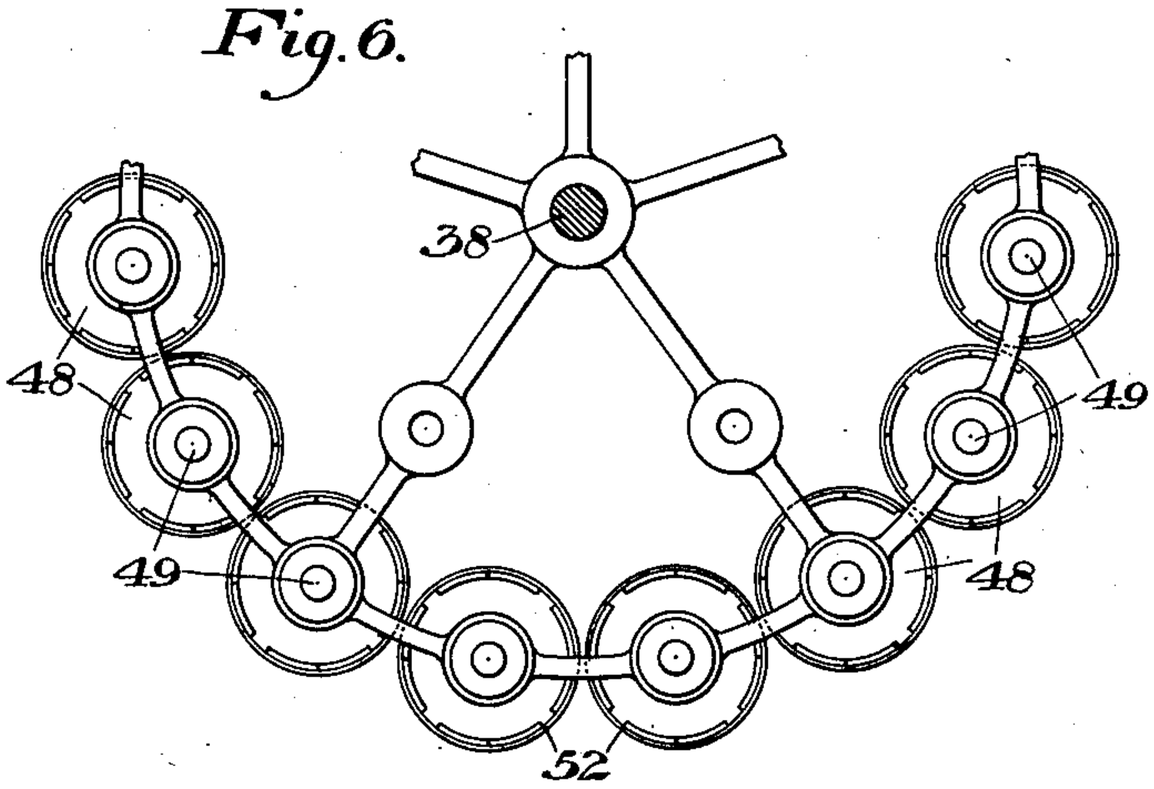


Fig. 7.

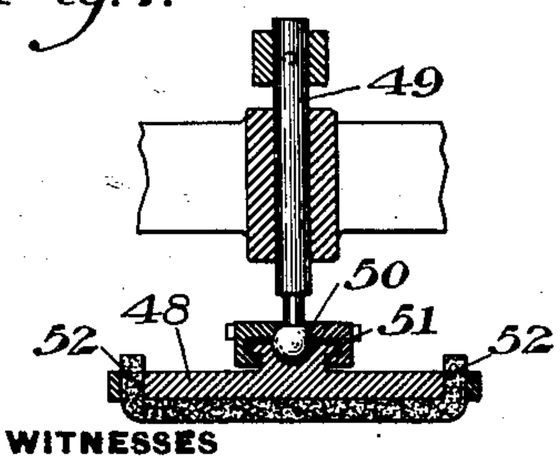
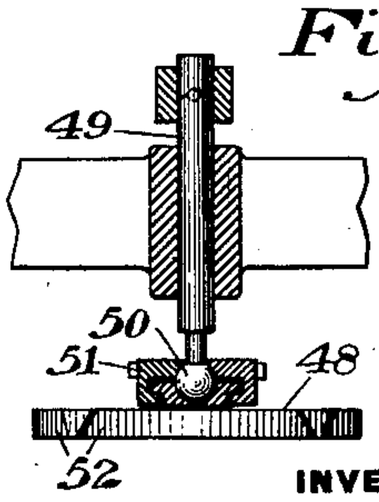


Fig. 8.



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No. 891,197. PATENTED JUNE 16, 1908.

F. L. O. WADSWORTH.

APPARATUS FOR GRINDING AND POLISHING GLASS.

APPLICATION FILED NOV. 21, 1904.

4 SHEETS—SHEET 4.

Fig. 9.

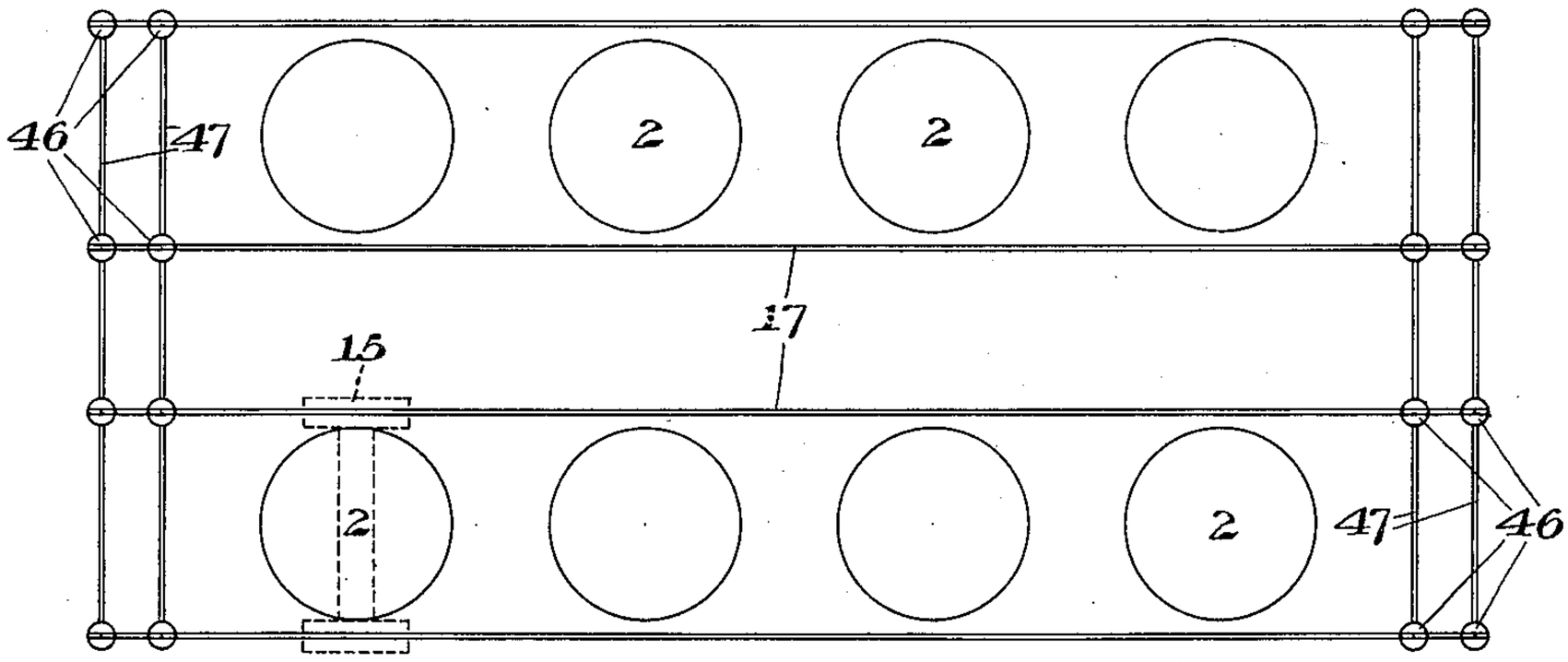
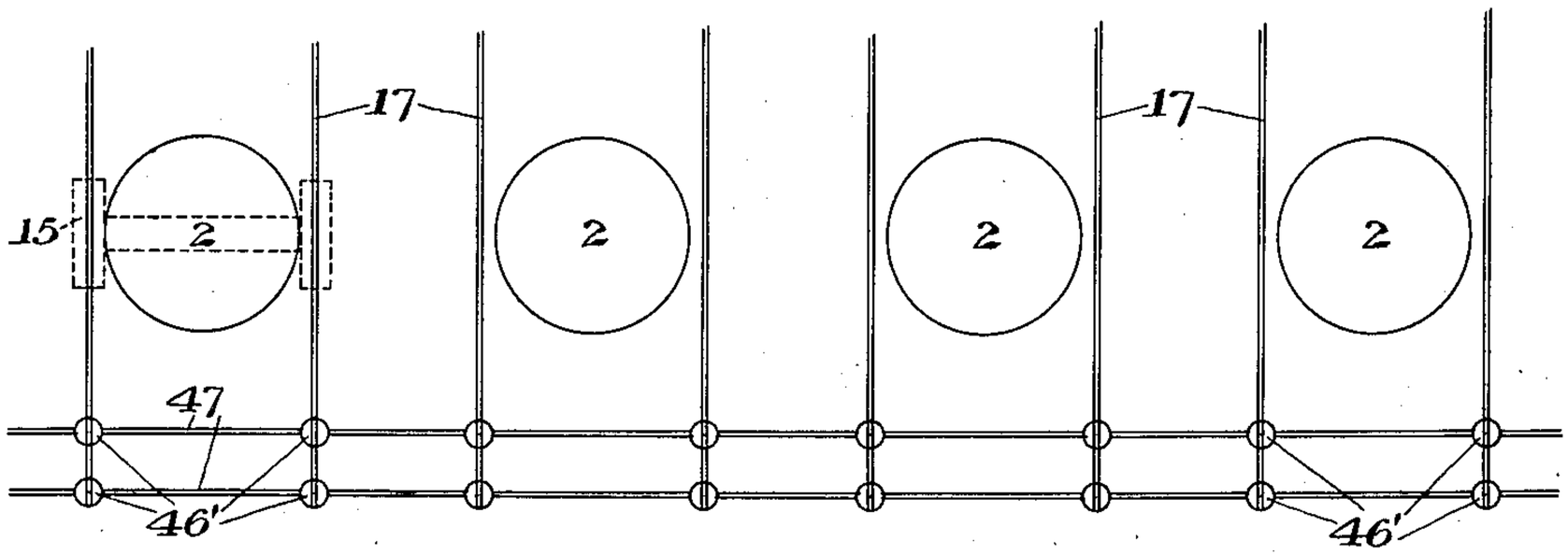


Fig. 10.



WITNESSES

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UNITED STATES PATENT OFFICE.

FRANK L. O. WADSWORTH, OF MORGANTOWN, WEST VIRGINIA, ASSIGNOR TO PRESSED PRISM PLATE GLASS COMPANY, OF NEW YORK, N. Y., A CORPORATION OF WEST VIRGINIA.

APPARATUS FOR GRINDING AND POLISHING GLASS.

No. 891,197. Specification of Letters Patent. Patented June 16, 1908.

Application filed November 21, 1904. Serial No. 233,582.

To all whom it may concern:

Be it known that I, FRANK L. O. WADSWORTH, of Morgantown, Monongalia county, West Virginia, have invented a new and useful Apparatus for Grinding and Polishing Glass, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front elevation partly in section of a grinding machine constructed in accordance with my invention; Fig. 2 is a partial top plan view of the same; Fig. 3 is an end elevation; Fig. 4 is a detail view of the wheel bearings and connections; Fig. 5 is a bottom plan view of one of the grinding shoes; Fig. 6 is a partial top plan showing the arrangement of the polishing blocks; Fig. 7 is a detail view showing the joint between the polisher and its shaft; Fig. 8 is a sectional side elevation showing the means for securing the felt. Fig. 9 is a plan view showing one arrangement of the tracks and turn-tables, and Fig. 10 is a partial plan view showing another arrangement of the same.

My invention relates to the class of grinding and polishing machines for plate glass, and is designed to increase the speed of the operation and at the same time improve the action of the grinding or polishing surfaces upon the glass.

The invention consists in the following features:—The use of a floating support for the table spindle, which will allow the table to accommodate itself as the disks move over raised and depressed portions of the glass being ground. Further, in the use of a reciprocating carriage carrying freely rotating grinders which is moved across the table during its rotation. Also in means for applying a heating medium to the table, in the peculiar arrangement of the grinding shoes, in doing away with the heavy turn-tables for shifting the bridges.

It further consists in the combinations hereinafter described and claimed.

In the drawings, 2 represents a circular table which may be of ordinary form, and is mounted upon a vertical spindle 3. The spindle 3 is provided with cylindrical bearing surfaces 4 and 5, the lower one being mounted in a step bearing of any suitable type. The surface 4 fits within a bearing in the stationary frame 6 mounted in a pit. Above the bearing 4 a ring 7 secured to the driving spindle rests on a ball-bearing, the ball-race of which is formed in a bearing 8 mounted upon a forked lever 9. This lever is pivoted at 10, and is provided with a weight 11 which acts against the weight of the table so as to give a lifting pressure. This counterweight therefore affords a yielding support for the table which will allow it to yield slightly as the grinders move over the raised and depressed portions of the plates. This avoids breakage and also gives a more even grinding action. The spindle will move up and down through the cylindrical bearings as the table yields during its rotation. The amount of the counterweight may be varied, but should be sufficient to afford the yielding action. The table may be rotated by a bevel pinion 12 on a driven shaft 13, which engages a bevel wheel 14 secured to the lower part of the table.

In grinding the glass on the table I employ a movable bridge 15 carried upon wheels 16 movable upon tracks 17. The bearings for these wheels are formed in the lower parts of vertical hollow spindles 18 which extend up through suitable bearings in the castings 19 forming the end of the bridge. Within each hollow spindle is a driving shaft 20 carrying at its upper end a bevel wheel 20′an provided at its lower end with a pinion 21 driving a double-toothed wheel 22 having a toothed conical portion 22′ engaging teeth on the face of wheel 16. The wheels 20 are driven by bevel pinions 23 on a common shaft 24 extending across the bridge and having hand wheels 25 at each end. In this manner the bridge may be moved along its tracks, while at the same time casters or supporting wheels may be turned around on their axes for a purpose hereinafter explained.

The grinding disks are not supported directly upon the bridge, but are carried upon a reciprocating frame or carriage 26 having upper wheels 27 resting upon tracks 28 extending through the bridge. The grinder carriage hangs upon these rollers or wheels and is reciprocated by a pitman 29 extending to a crank 30 on a shaft 31 having gear wheel 32 driven by a pinion 33 on shaft 34 carrying the pulley 35 by which the shaft is driven. The belt for this pulley is arranged so that it will allow for the movement of the carriage.

The carriage is guided during its reciprocation by side rollers 36 movable upon guides

37 on the bridge. The rollers 36 are mounted upon small stub shaft ends which are eccentric to the shafts 36′, so that by turning the shafts I can adjust the guide rollers to make the face of the grinders parallel with the table. The spindles 38 for the grinding disks 39 are mounted in the ordinary manner upon the reciprocating carriage, being adjustable by the levers 40 engaged by the screw-shafts 41 having lower hand wheels 42.

The reciprocating of the grinder carriage makes the grinding more uniform, since any point on the face of the grinder constantly changes position relative to the axis of rotation of the table. Hence, the grinding does not tend to give a wedge shape, which is liable to happen with ordinary grinders where the bearings of the grinding disks are stationary. It also gives a smoother surface on the glass.

As shown in Fig. 5 the grinding shoes 43 consist preferably of segmental or wedge-shaped castings, which may be secured by bolts extending through five holes 44 in each shoe. These shoes may be cast interchangeably so that they can be removed and replaced without removing and turning over the grinding runners.

The lower face of the casting is provided with a series of grooves 45, the general direction of which is inclined both to the radius and circumference of the general circle of the disk. The grooves are also preferably made in zig-zag or sinuous form, as shown, so that the sand will travel through them at an uneven rate. It travels faster in those parts approaching circumferential lines, and slower in the parts approaching the radial lines. This retains the sand for short intervals of time, in the radial portions of the grooves, and makes the grinding action more rapid.

As the movement of the table is in the same direction as that of the disks and at a higher speed, the motion of the table will force the sand through the grooves at one side of the segment and suck it through the grooves on the opposite side, at any given moment. The movement of the sand through the grooves is therefore made positive and the grinding action more rapid.

Another feature of my invention lies in providing means for applying a heating medium to the table. When the glass is being polished its upper surface becomes heated and the difference in temperature between its upper and lower faces sometimes warps the glass and cracks it. Moreover, glass will not polish properly until its temperature has been raised and ordinarily this is done by the friction of the polishers themselves. This heating up consumes a considerable amount of time, in addition to the liability of cracking the glass.

I provide means for heating the table, preferably by introducing steam or hot water through the hollow supporting spindle, circulating it through the table, and then drawing it away through another passage in the hollow shaft or spindle. Thus, in Fig. 1 I show the spindle 3 as provided with two hollow stuffing boxes 53 and 54, into one of which steam or hot water is supplied through a pipe 55, while the steam passes out from the other through pipe 56. A vertical passage extends through the spindle from the box 53 and connects through pipe 57 with a cavity in the body of the table. This cavity preferably extends throughout the polishing surface of the table, and is divided by the central transverse partition 58, having holes 59 at opposite ends near the edge of the table. The steam entering through pipe 57 passes out in the chamber on one side and then flows through the holes 59 in the other chamber, and after thus circulating beneath the whole surface of the table it passes down through pipe 60 into another passage in the shaft 3 which leads to stuffing box 54. I can thus maintain a circulation of steam or other heating fluid through the table at the beginning of the polishing operation and thus heat the lower face of the glass and at the same time increase the speed of polishing. I may also apply this heating medium at any other desirable times in the operation.

In the ordinary systems where traveling bridges are used the entire bridge is moved out in front of one table onto a large turn-table and then turned around at right angles, moved laterally in front of the next table onto another large turn-table, and then turned around forward over this next table. In such systems the turn-tables are large and heavy and occupy a large amount of space. In some cases a grinding bridge and a polishing bridge are used for each table and part of these bridges were idle a large part of the time.

I have done away with the large, heavy turn-tables, and employ instead of them small turn-tables on which the supporting wheels of the bridge rest when run out in front of the table. Thus, I show in Fig. 9 four small turn-tables 46, which are arranged to receive the supporting wheels of the bridge. The bridge wheels being on rotary spindles, when the small tables are turned the wheels turn with them to bring them into alinement with the cross track 47. The bridges then run sidewise in front of the other table onto a similar four turn-table device, where the wheels are again shifted and the bridge then run forward over the next table. This system enables one grinding and one polishing bridge to supply several tables, thus reducing the cost of the system and economizing space, as the four small tables take up much less room than the single large table.

In the preferred form of Fig. 10, the pol-

ishing tables are arranged in two or more series, each series having its own track. The small turn tables 46′ are used at the ends of each track and I can thus use each bridge successively for a series of tables without shifting it for each table as in the form of Fig. 9.

The polishing bridge may be of any ordinary type, except as to the features above named, and I have improved the polishing disk in two features. The first consists in the use of a ball and socket joint between the polishing disk and its stem, in combination with a disk-bearing which gives the disk a free rotation independent of the ball and socket joint. Thus, in Fig. 7 I show the polishing disk 48 as connected to its stem 49 by ball and socket joint 50. A bearing 51 is also provided for the disk which surrounds the ball joint and supports the disk so that the disk rotates on this bearing while the ball joint allows universal adjustment. The advantage of this feature lies in giving free rotation while the table is rotating. Where the ball and socket joint alone is used the disk is liable to bind under the pushing action of the table; but by combining the ball and socket joint with an independent bearing I obtain free rotation of the disk, while at the same time the disk can adjust itself to the table. The two half boxes for the disk bearing are clamped together edge to edge, their lower ends loosely engaging the hub of the disk.

Another feature in the polishing disk lies in the manner of securing the felt or cloth on the disk. Instead of using a plain edge on the disk, around which the felt is secured by the frictional action of a ring, I cut notches 52 in the edge of the disk as shown in Fig. 8, these notches being shaped to receive the corner portions of the felt. The notches are preferably of slightly less depth than the thickness of the felt so that as the ring is forced up over the disk it will bear only against the corner portions of the felt and force them into the notches. This gives a positive seating of the felt to prevent its turning around the disk, and also economizes space and gives a larger effective polishing area for the size of the polisher than heretofore.

The advantages of my invention will be understood by those skilled in the art, from the preceding description. The floating action of the table gives uniform action and avoids breakage. The reciprocating of the grinder also assists in giving uniform grinding and affords a smoother surface. The peculiar arrangement of the shoes increases the speed of grinding and gives more efficient action of the abrading medium. The heating of the table equalizes the temperature of the glass on both sides during the polishing operation and prevents liability to cracking; while it also facilitates the polishing action by bringing the glass more quickly to the temperature required for effective polishing action. The track system economizes space and original cost, as well as the time occupied in changing bridges. The peculiar bearing of the polishing spindle allows free rotation and also automatic adjustment, while the felt-securing means is simple and effective, and more secure than former devices.

Those features of the machine which are herein shown and described, but not claimed herein, form the subject of divisional applications which have been filed by me therefor. These applications are Serial No. 255,863, filed April 17th, 1905; Serial No. 266,696 filed June 24th, 1905; and Serial No. 332,203, filed August 27th, 1906.

Many changes may be made in the form and arrangement of the various parts without departing from my invention.

I claim:—

1. In grinding or polishing apparatus, a freely rotating and vertically moving grinding or polishing disk, a positively driven rotary table arranged to rotate the disk during the operation of grinding or polishing, and means for permitting automatic adjustment of said table to correspond to the vertical movements of the disk with respect to said disks during the grinding or polishing action so as to secure uniform pressure on the object being ground or polished; substantially as described.

2. In grinding or polishing apparatus, a freely rotating and vertically moving grinding or polishing disk, a table arranged to rotate the disk during the operation of grinding or polishing, means for rotating the table, and a counterweight for partially counterbalancing the table to permit its automatic adjustment towards and away from the freely rotating disk during the grinding or polishing action to correspond to the vertical movements of the disk so as to secure a uniform pressure upon the object being ground or polished; substantially as described.

3. In grinding or polishing apparatus, a table, means for rotating the same, a freely rotating grinding or polishing disk, means for permitting automatic adjustment of said table with respect to said disk, a reciprocable carriage carrying the disk, a bridge or support upon which the carriage is mounted and means for reciprocating the carriage during the rotation of the table; substantially as described.

4. In grinding or polishing apparatus, a table, means for rotating the same, a carriage having freely rotating disks, and means for reciprocating the carriage during rotation of the table; substantially as described.

5. In a grinding or polishing apparatus, a table, means for rotating the same, a bridge movable to and from the table, a carriage

movable along the bridge, and means for reciprocating the carriage during rotation of the table; substantially as described.

6. In a grinding or polishing apparatus, a rotary table, a bridge movable thereover, a carriage movable lengthwise of the bridge and carrying grinding disks, and connections for reciprocating the carriage when the bridge is in position over the table; substantially as described.

7. In grinding or polishing apparatus, a rotary table, a bridge movable thereover, a carriage movable along the bridge, and means for adjusting the carriage transversely; substantially as described.

8. In a grinding or polishing system, a traveling bridge having vertically extending rotary stems, and supporting wheels for the bridge carried upon said stems and means for positively actuating the said stems; substantially as described.

9. In a grinding or polishing system, a traveling bridge having vertically extending rotary spindles, supporting wheels for the bridge mounted in the spindles, and positive means for turning said wheels on their axes; substantially as described.

In testimony whereof, I have hereunto set my hand.

FRANK L. O. WADSWORTH.

Witnesses:
G. M. VIERS,
H M. CORWIN.