

(No Model.)

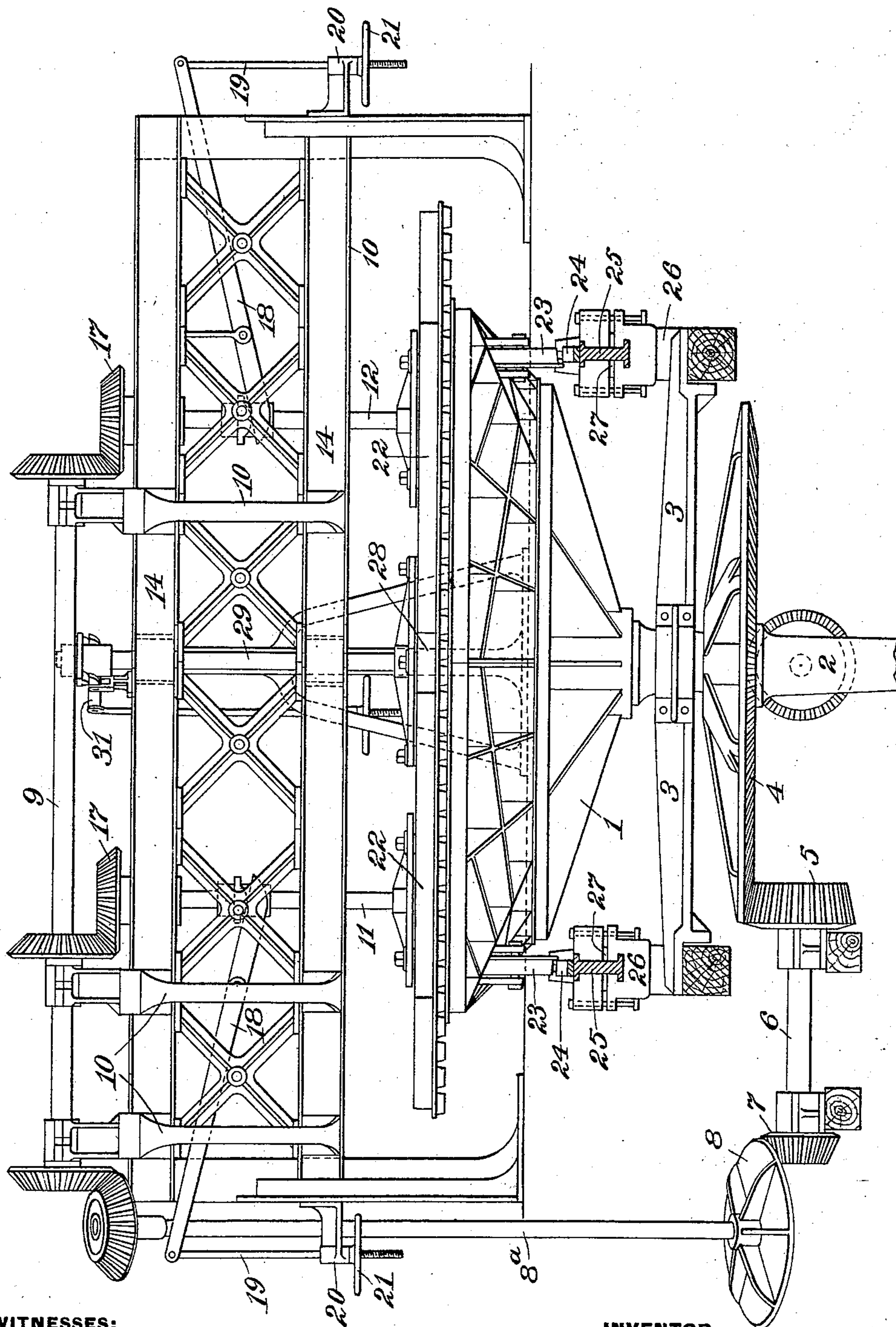
4 Sheets—Sheet 1.

E. FORD.  
GRINDING AND POLISHING MACHINE.

No. 552,058.

Patented Dec. 24, 1895.

FIG. 1.



WITNESSES:

*Chas. F. Miller*  
*J. E. Gaither*

INVENTOR,

*Edward Ford*  
*by Daniel S. Wolcott*  
Att'y.

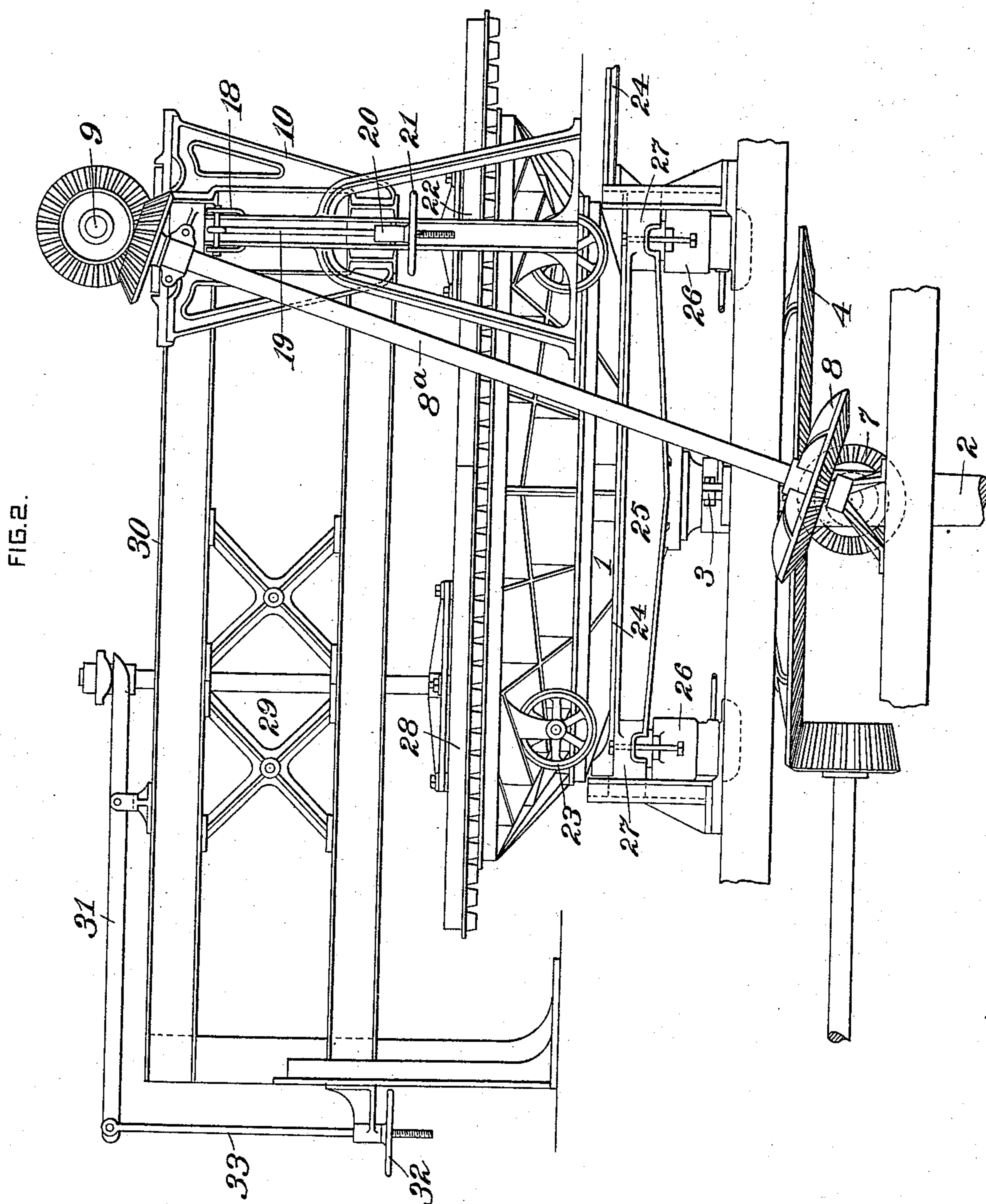
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E. FORD.  
GRINDING AND POLISHING MACHINE.

No. 552,058.

Patented Dec. 24, 1895.



WITNESSES:

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(No Model.)

4 Sheets—Sheet 3.

E. FORD.  
GRINDING AND POLISHING MACHINE.

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Patented Dec. 24, 1895.

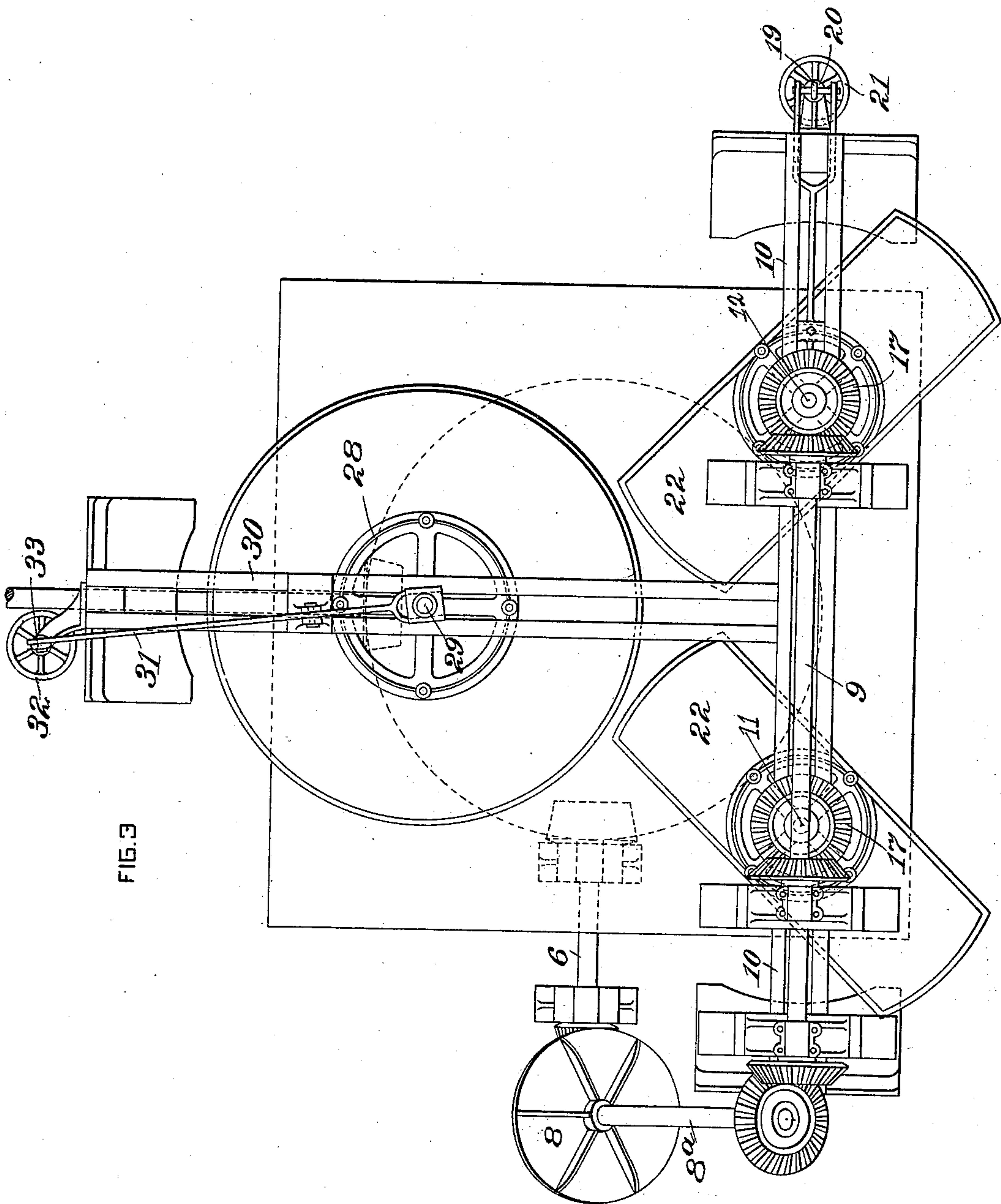


FIG. 3

WITNESSES:

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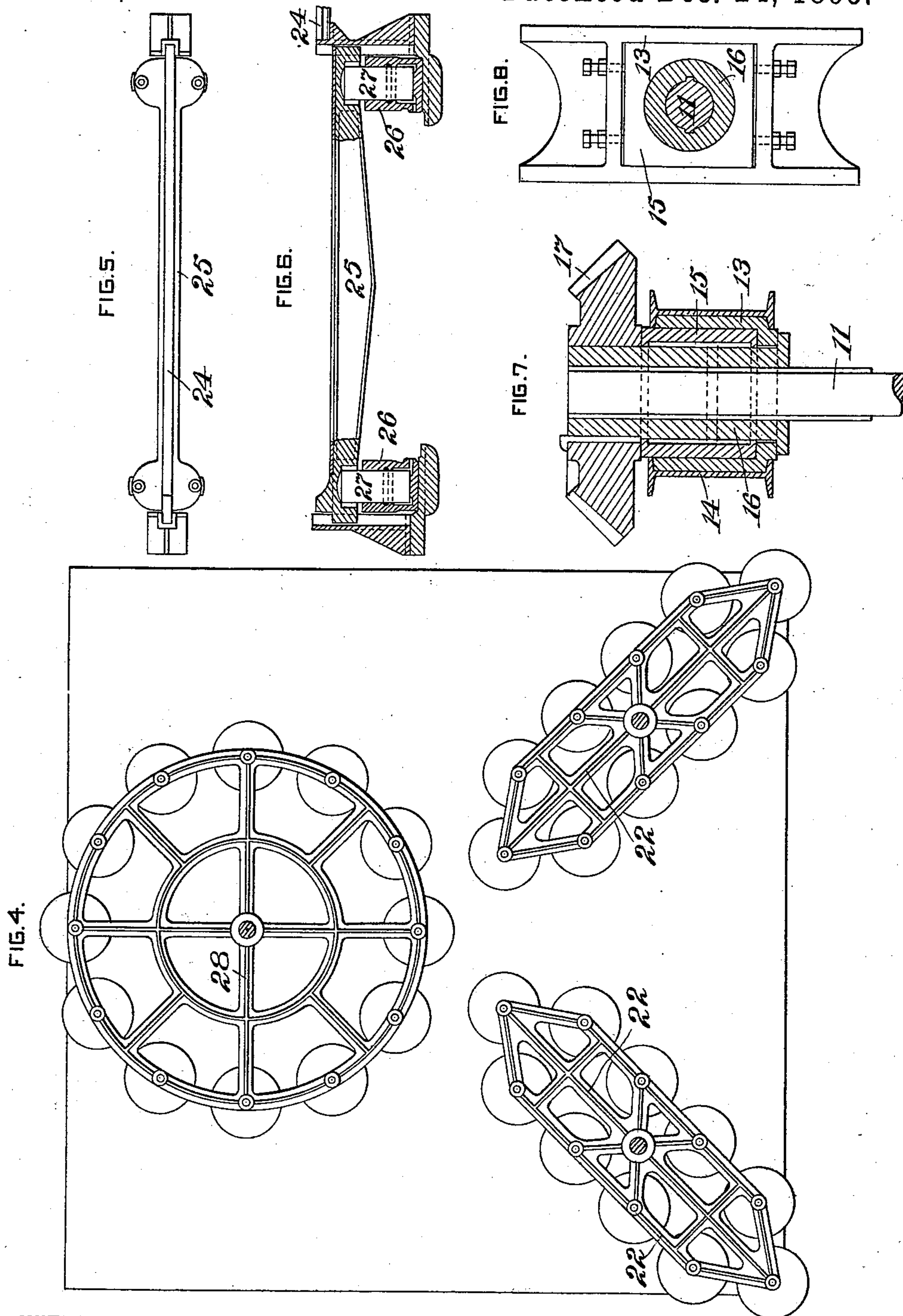
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E. FORD.  
GRINDING AND POLISHING MACHINE.

No. 552,058.

Patented Dec. 24, 1895.



WITNESSES:

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INVENTOR,

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# UNITED STATES PATENT OFFICE.

EDWARD FORD, OF CREIGHTON, PENNSYLVANIA, ASSIGNOR OF ONE-HALF  
TO THE PITTSBURG PLATE GLASS COMPANY, OF SAME PLACE.

## GRINDING AND POLISHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 552,058, dated December 24, 1895.

Application filed March 29, 1895. Serial No. 543,657. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD FORD, a citizen of the United States, residing at Creighton, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Grinding and Polishing Machines, of which improvements the following is a specification.

The invention described herein relates to certain improvements in the grinding and polishing machine described and claimed in Letters Patent No. 521,953, granted to me June 26, 1894.

During the practical operation of the machine described and shown in said patent, it has been ascertained that except when attended by a skilled workman grooves will be formed by the grinders in the surface of the glass, especially in those parts contiguous to the axial center of the surface, where only one of the runners is operative.

The object of the present invention is to provide an additional or auxiliary grinding or polishing runner which, by its operation in conjunction with the grinders described in said patent, will produce a smooth uniform surface without requiring any especial degree of skill on the part of the attendant.

The invention is hereinafter more fully described and particularly claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a front elevation of a grinding and polishing machine having my improvements applied thereto. Fig. 2 is a side elevation of the same. Fig. 3 is a top plan view. Fig. 4 is a sectional plan view, the plane of section being just above the runners which in this view are provided with polishing-disks. Fig. 5 is a top plan and Fig. 6 is a vertical section of the movable rail-section for removing and placing the auxiliary tables on the main or driving table. Fig. 7 is a sectional elevation, and Fig. 8 is a top plan view illustrating the construction of the bearings for the shafts carrying the grinding and polishing runners, the bevel gear-wheel being removed in Fig. 8.

In the practice of my invention, the table 1 is secured to the upper end of a vertical shaft 2, which is supported in proper position by a frame 3 and a step or bearing, (not

shown,) as fully described and shown in the patent referred to. On the vertical shaft is keyed the miter-wheel 4, with which a corresponding wheel on the power-shaft intermeshes. A miter-wheel 5 on one end of shaft 6 also intermeshes with the wheel 4, and on the opposite end of said shaft is keyed a bevel gear-wheel 7, engaging a corresponding wheel 8 on the lower end of a vertical shaft 8<sup>a</sup>, which transmits motion by a similar gearing to the horizontal shaft 9, mounted in suitable bearings on the frame 10, arranged over the table 1. In the horizontal portion of the frame are secured bearings for the vertical shafts 11 and 12, which are driven by the shaft 9 through suitable gearing.

The bearings for the shafts 11 and 12 (clearly illustrated in Figs. 7 and 8) consist of plates 13, secured between beams 14, forming the horizontal member of the frame 10, and provided with sockets for the reception of the blocks 15, which are adjustable in the sockets by means of set-screws for bringing the shafts into proper alignment. In each bearing a sleeve 16, provided with a collar at its lower end, is passed up through the block 15, and on the upper end of the sleeve is keyed the bevel gear-wheel 17. Through the sleeve is passed the vertical shaft 11 or 12, which is provided with a feather engaging a groove in the sleeve, whereby the shaft is caused to rotate with the sleeve, while free to move longitudinally through the latter, which is held from movement in one direction by the wheel 17 and in the opposite direction by its collar. The bearing for the shaft 12 is similar to that described. The shafts are raised and lowered by means of levers 18, pivoted on the frame 10, and provided with forks at their inner ends for engagement with collars on the shafts. To the outer ends of the levers are attached threaded rods 19, which pass through sockets 20, attached to the frame 10, and on the rods are screwed wheel-nuts 21, adapted to bear against the sockets and by their rotation effect the vertical movements of the shafts 11 and 12.

As described in said patent, runners 22, adapted to carry the grinding-blocks or polishing-disks, are attached to the lower ends of the shafts 11 and 12. These runners are



constructed and operated so that their field of operation will cover, without extending materially beyond, a square surface, as described and claimed in said patent. Stated generally, the runners have a greater length than breadth or are elongated, and the driving mechanism of the runners is so proportioned that the latter will make two complete revolutions to each revolution of the table 1.

While it is possible to perform both the grinding and polishing operations on one machine by substituting polishing-disks for the grinding-blocks, and vice versa, it is preferred to employ two similar machines, one having grinding-blocks and the other polishing-disks attached to the runners of the respective machines. In order to facilitate the transfer of the glass from one machine to the other and avoid the delay incident to "bedding" and removing the glass from the table, the glass is "bedded" in the usual manner on auxiliary tables 34, subjected to the grinding operation in one machine, and the auxiliary table with the glass attached is then transferred to the polishing-machine. After one side of the glass plate has been ground and polished it is lifted and rebedded with the unfinished side up. The table is then returned to the grinding-machine, and after the second surface has been ground the table is again transferred to the polishing-machine and finished.

In order to facilitate the shifting of the auxiliary tables, which are similar to those described and shown in the patent referred to, the latter are provided with wheels 23, adapted to ride on suitably-arranged tracks. The two lines of rails 24, forming the tracks, pass on opposite sides of the main table 1, and are arranged at such a height relative to the main table that the auxiliary table when supported by the rails will pass over the main table. In order to lower the auxiliary table onto the main table, sections 25 of the two lines of rails abreast the main table are arranged to be lowered until the auxiliary table rests upon the main table and to be dropped a farther distance until the wheels are entirely clear of the rail-sections 25.

The vertical movements of the rail-sections may be effected by any suitable construction of mechanism—as, for example, that shown in Figs. 1, 2, 5, and 6—consisting of fluid-pressure cylinders 26 and pistons 27, arranged under the rail-sections 25, and connected to a suitable source of fluid-pressure, so as to be operated simultaneously.

The machine thus far described is similar in its general features to the machine described and shown in Patent No. 521,953, but differs from said machine in the following particulars: The runners carrying the grinders and polishers are made of such a length that their operative areas are limited to the outer portions of the surface to be treated. In order to grind and polish the parts of the surface around the axial center thereof, and

also to remove any grooves which may be formed by the runners 22, a circular runner 28 is employed. This runner is attached to the lower end of a vertical shaft 29, which is mounted in bearings secured in a frame 30, arranged at or approximately at right angles to the frame 10. These bearings are preferably similar to those hereinbefore described except that a driving-sleeve 16 is not employed, as the runner 28 is rotated by the plate being ground or polished. The shaft 29, with the attached runner, is raised and lowered by means of a lever 31 engaging the shaft and opened by a hand-nut 32 and rod 33, as described in connection with the shafts 11 and 12.

The runner 28 is made of such a diameter that the outer grinding-blocks or polishing-disks carried by the runner will extend on one side of the runner beyond the axial center of the surface to be ground, while the diametrically-opposite blocks or disks will project slightly beyond the edge of the surface, but not to such an extent that the blocks or disks passing across the edges of the surface will break or in any manner injure such edges.

The runners 22 operate along the outer portions of the surface, their areas of operation extending over the corners of the surface, while the runner 28 operates, as stated, over the central portion of the surface, its area of operation extending over the edges of the surface along the sides thereof, but does not extend to the corners. Thus it will be seen that the portions of the surface at the corners are operated on by two runners, while the other portion, except contiguous to the axial center, is operated on by three runners, and the portion around the axial center by one runner. This arrangement and manner of operating the several runners will produce a smooth uniform surface, free from grooves, and that without the care and attention of a skilled operator.

While preferring to use two positively-driven elongated runners, it will be readily understood by those skilled in the art that only one can be used with good results, as both runners operate over substantially the same areas.

The grinding-blocks and polishing-disks may be of any desired shape or construction and are removably connected to the runners in the usual or any suitable manner.

I claim herein as my invention—

1. A grinding and polishing machine having in combination a rotating table, one or more elongated runners limited in their action to a square, or approximately square surface, and positively driven so as to make two revolutions to one revolution of the table, and a frictionally driven runner, limited in its action to a circular, or approximately circular surface inclosed by the square surface, the areas acted upon by the two runners overlapping, substantially as set forth.

2. A grinding and polishing machine having in combination a rotating table, one or



more elongated runners operative from the edges of a square surface inwardly, and positively driven so as to make two revolutions to one revolution of the table, and a frictionally driven runner having its operative face extending over the axial center of the surface toward the edges of the surface, the areas acted upon by the two runners overlapping, substantially as set forth.

10 3. A grinding and polishing machine having in combination a rotating table, two positively driven elongated runners limited in their action to a square or approximately square surface, a runner driven by frictional  
15 contact with the surface operated on and

limited in its action to a circular, or approximately circular, surface having a diameter approximately equal to one half the length of one of the sides of the square surface and mechanism for driving the table and the positively driven runner, adapted to maintain a constant ratio of speed between the table and runners, substantially as set forth.

In testimony whereof I have hereunto set my hand.

EDWARD FORD.

Witnesses:

DARWIN S. WOLCOTT,  
F. E. GAITHER.