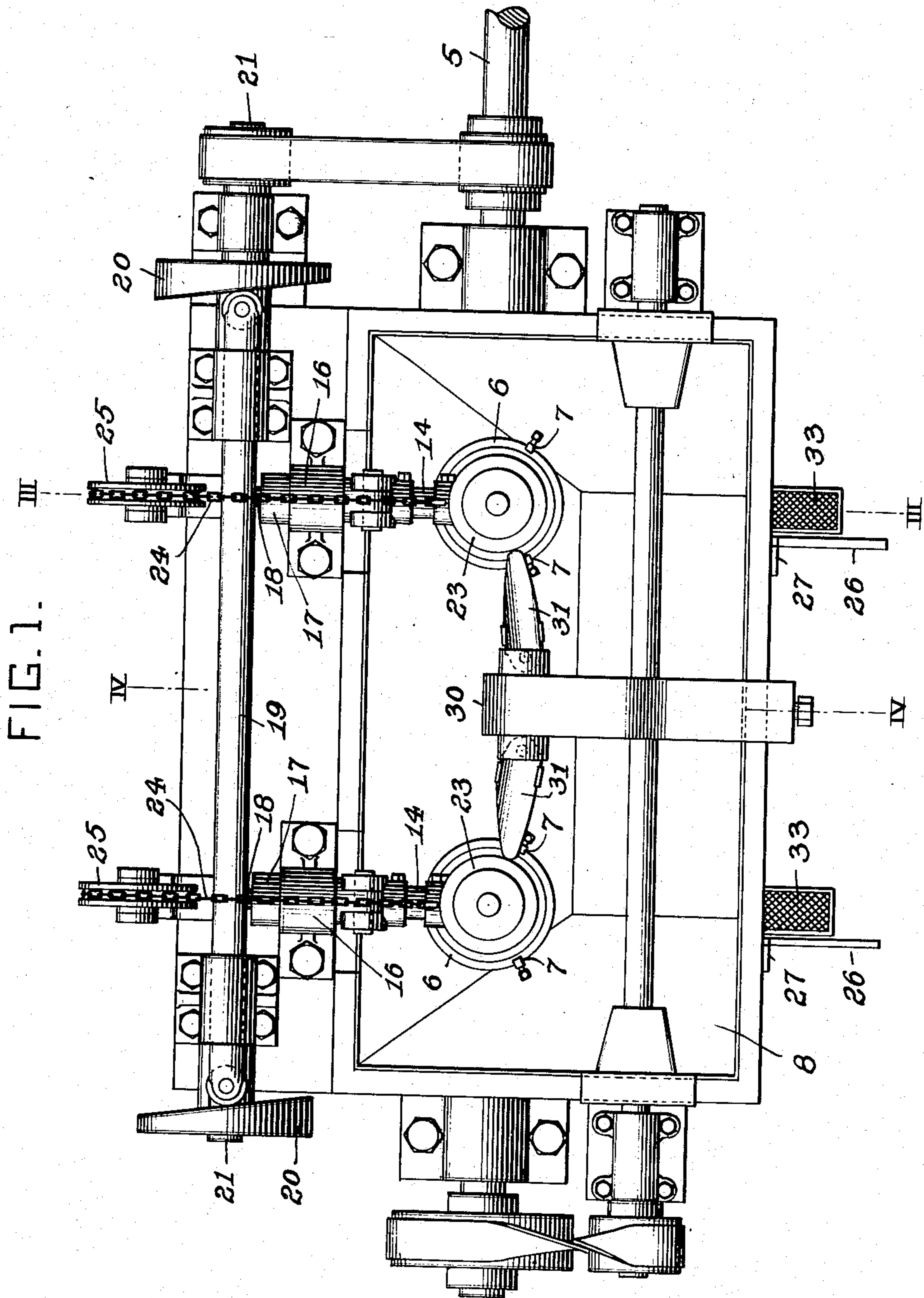


F. WOODRUFF.  
GRINDING MACHINE.  
APPLICATION FILED FEB. 10, 1909.

930,639.

Patented Aug. 10, 1909.

5 SHEETS—SHEET 1.



WITNESSES:

J. Herbert Bradley.  
Charles Burnett.

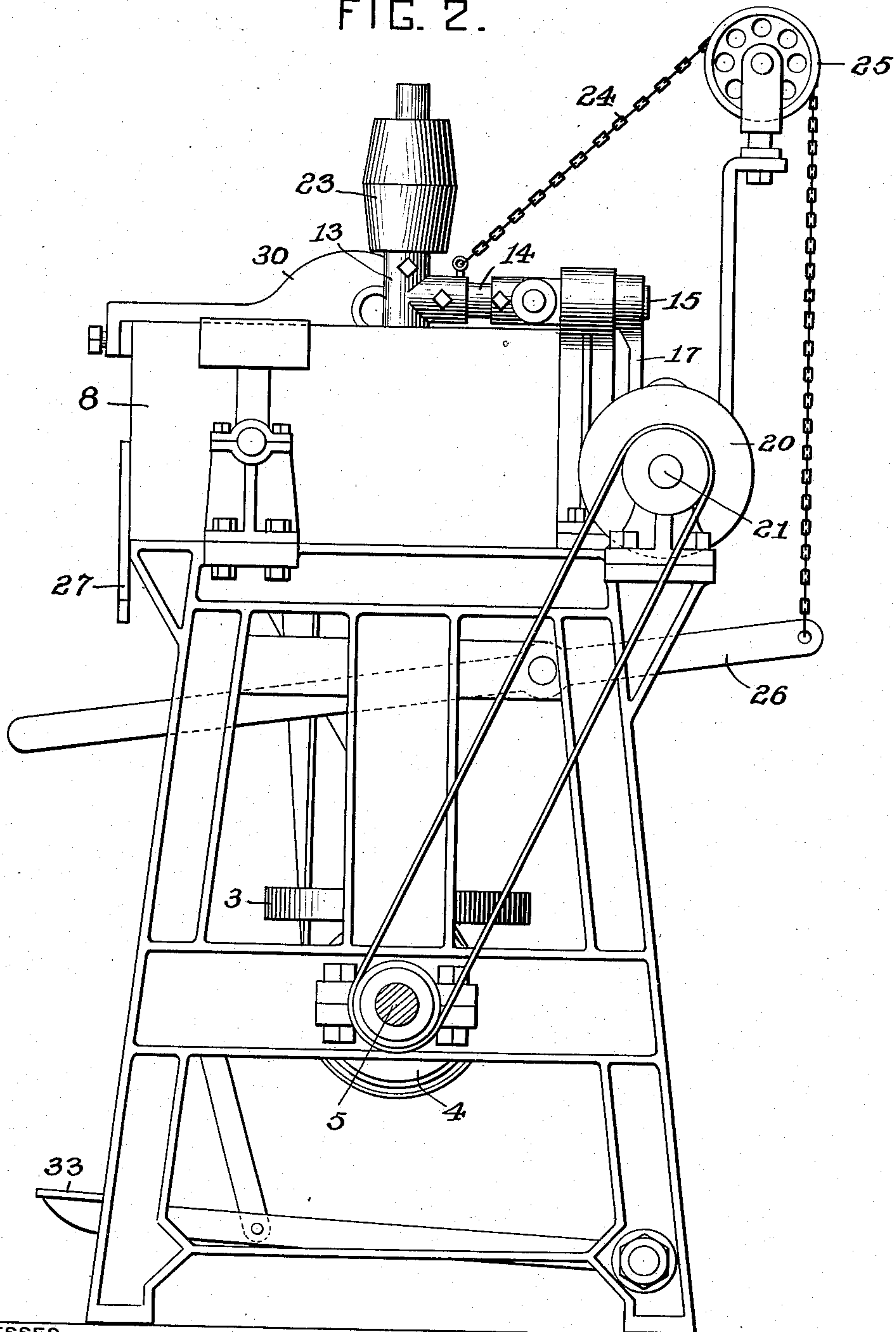
Frank Woodruff INVENTOR  
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FIG. 2.



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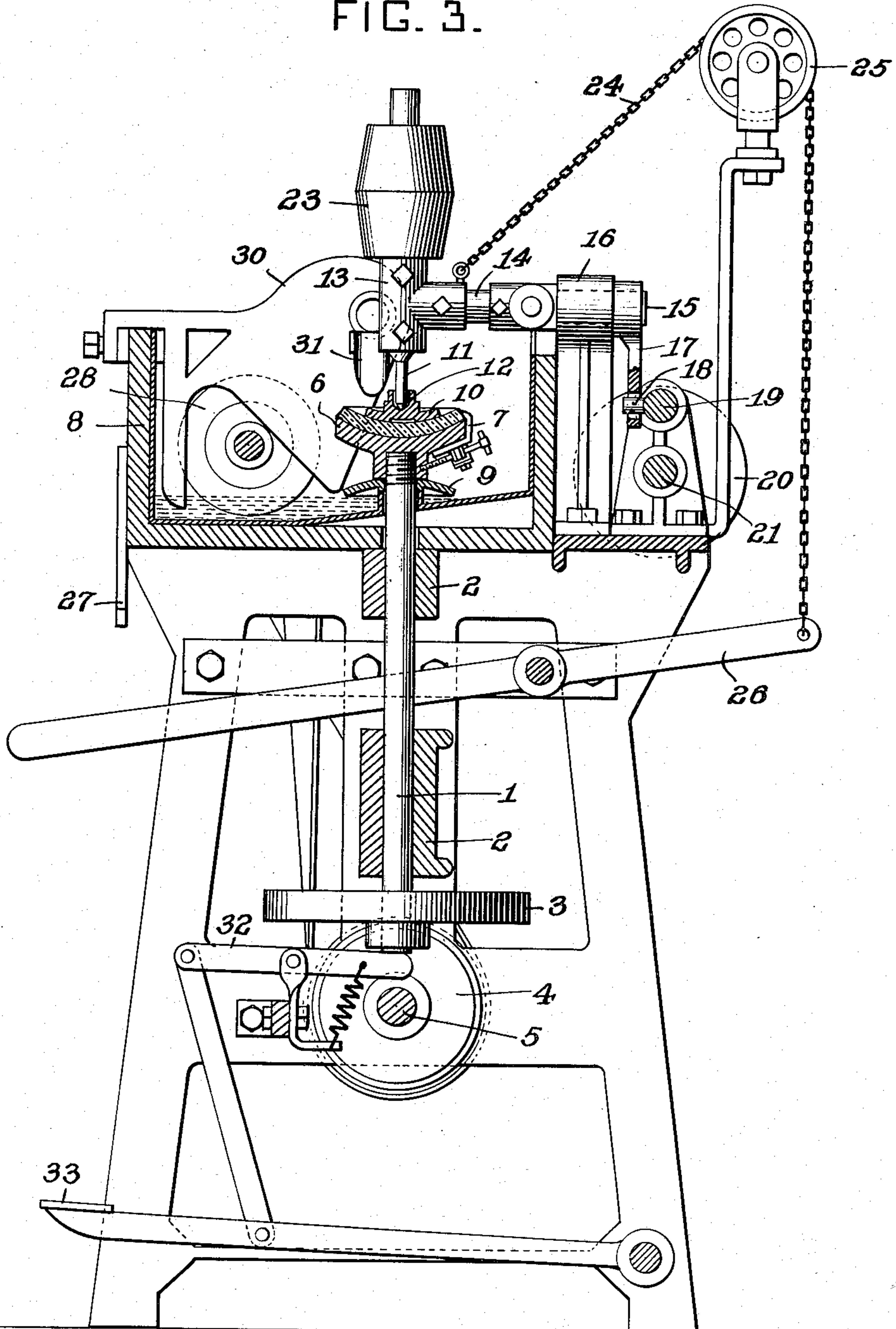
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5 SHEETS—SHEET 3.

FIG. 3.



WITNESSES:

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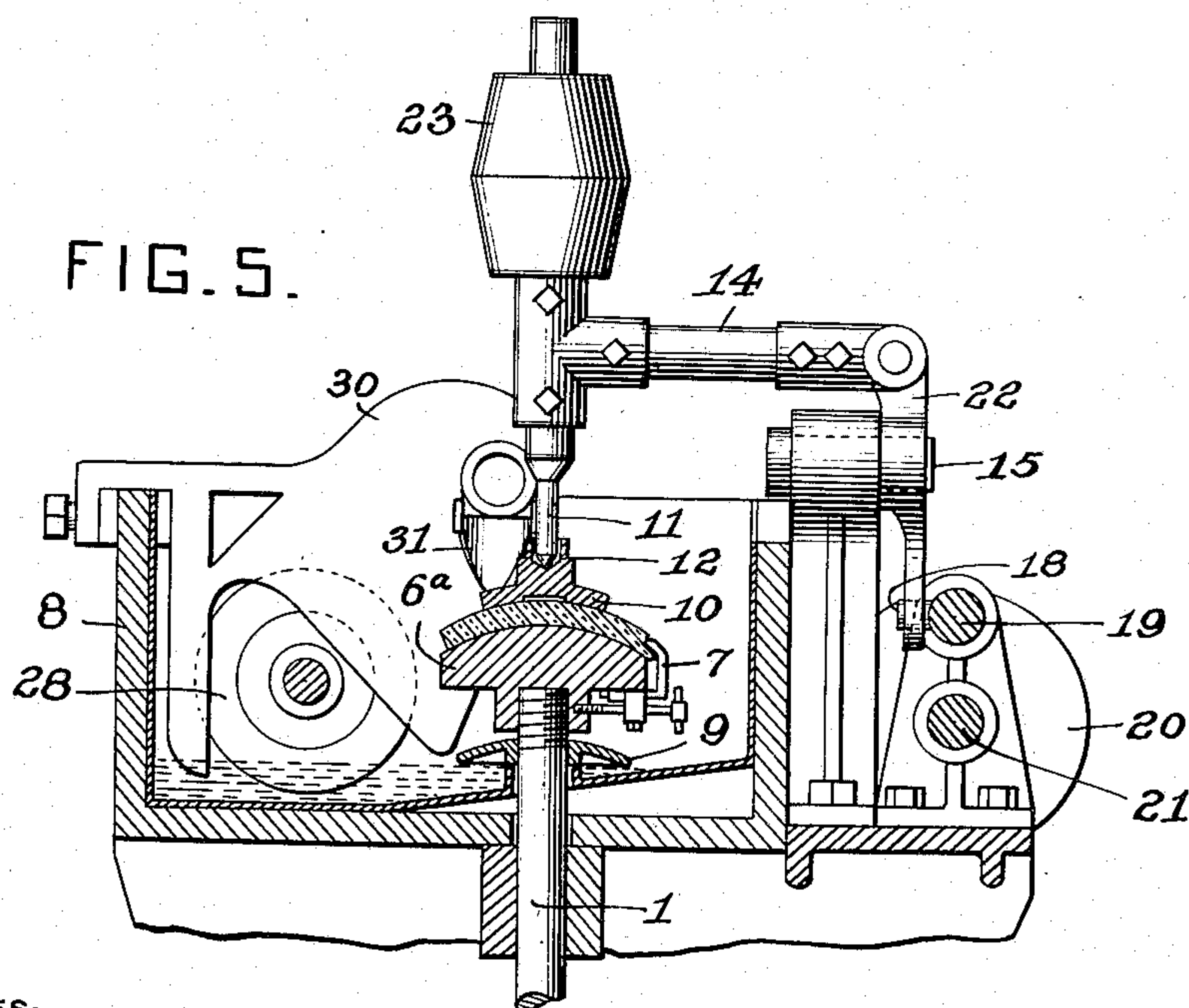
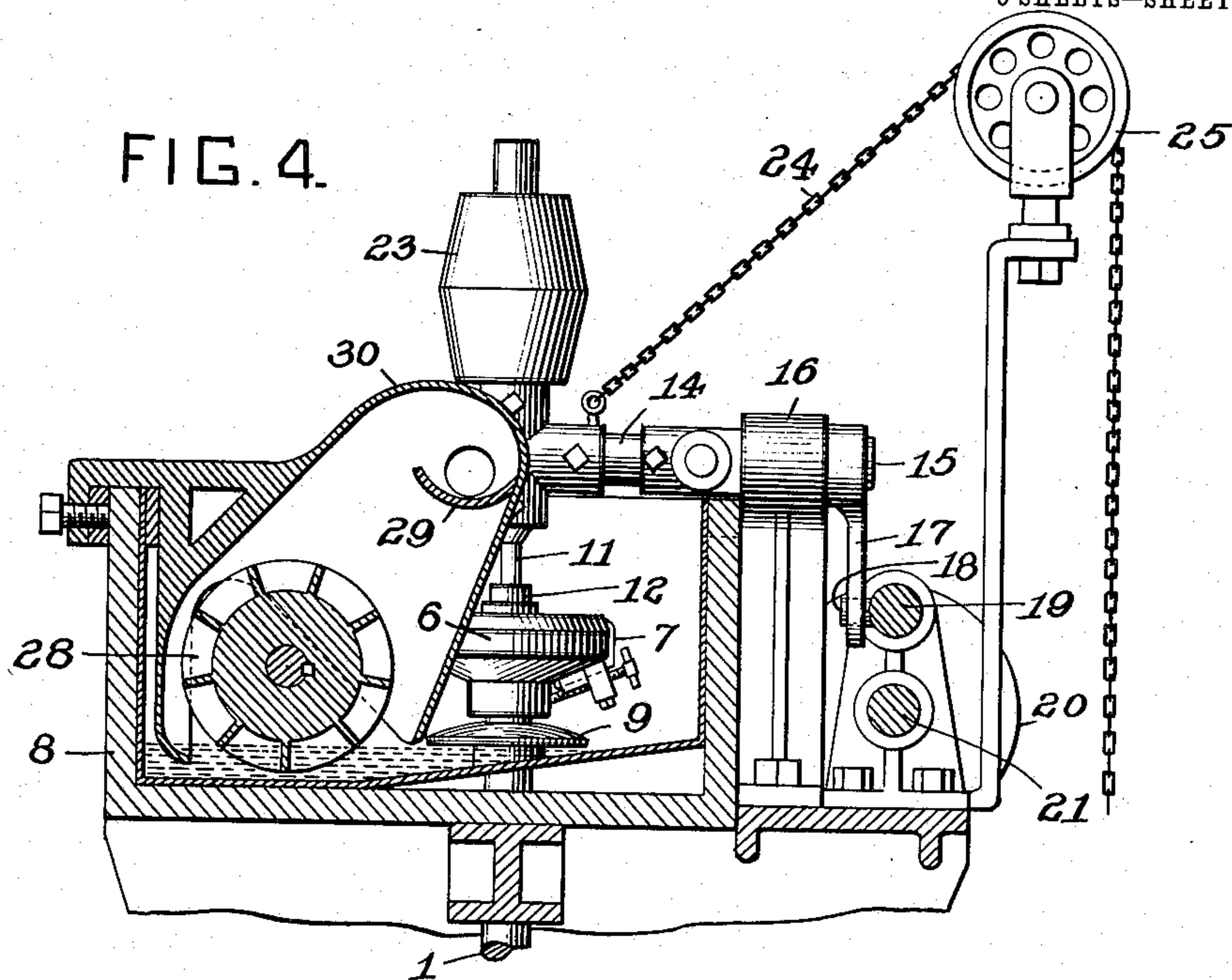


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5 SHEETS—SHEET 4.



WITNESSES:

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5 SHEETS—SHEET 5.

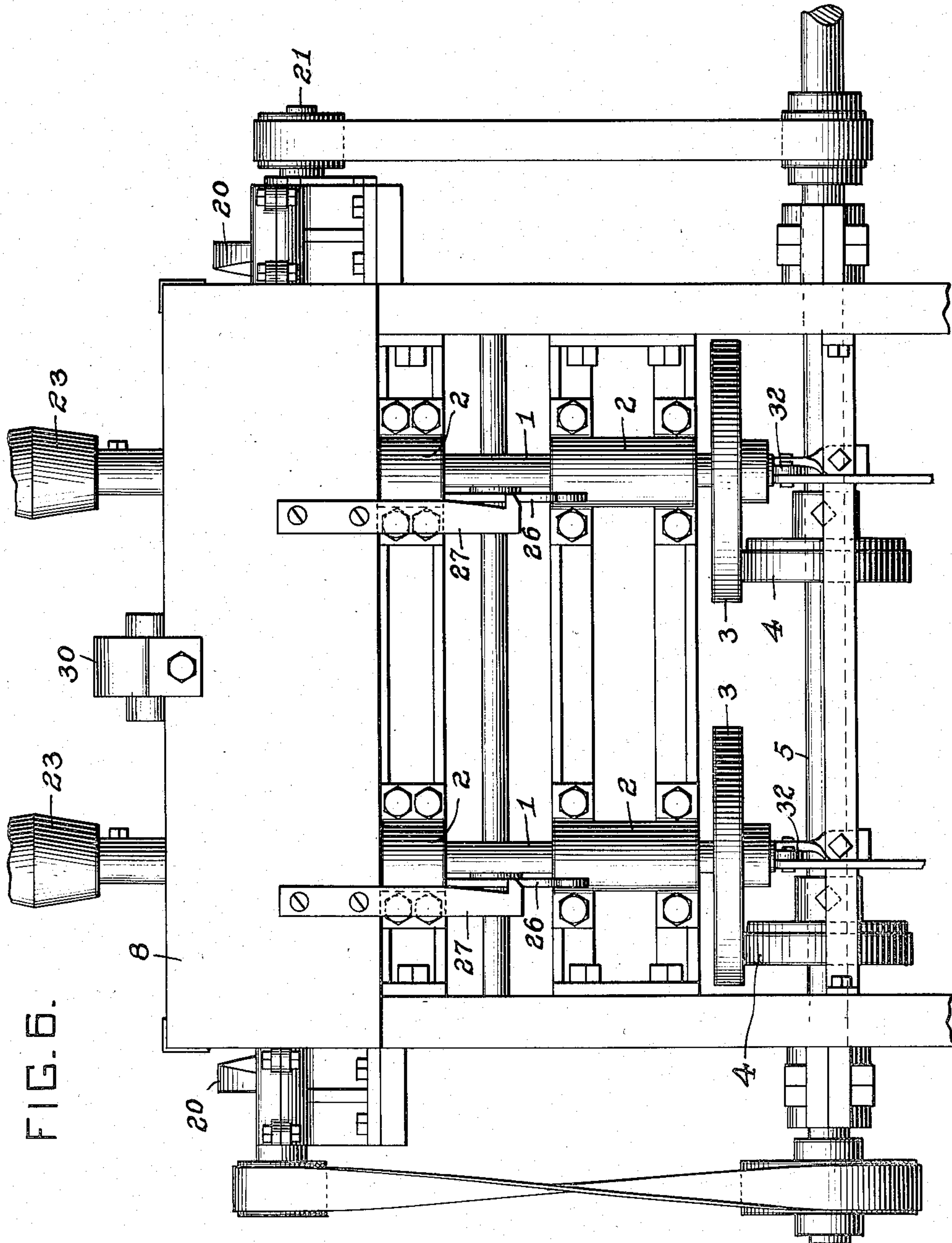


FIG. 6.

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# UNITED STATES PATENT OFFICE.

FRANK WOODRUFF, OF ROCHESTER, PENNSYLVANIA, ASSIGNOR TO H. C. FRY GLASS COMPANY, OF ROCHESTER, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## GRINDING-MACHINE.

No. 930,639.

Specification of Letters Patent.

Patented Aug. 10, 1909.

Application filed February 10, 1909. Serial No. 477,177.

*To all whom it may concern:*

Be it known that I, FRANK WOODRUFF, a citizen of the United States, residing at Rochester, in the county of Beaver and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Grinding-Machines, of which improvements the following is a specification.

In the accompanying drawings forming a part of this specification Figure 1 is a top plan view of my improved grinding machine; Fig. 2 is an end elevation of the same; Fig. 3 is a sectional elevation on a plane indicated by the line III—III Fig. 1; Fig. 4 is a sectional elevation of the upper portion of the machine on a plane indicated by the line IV—IV Fig. 1; Fig. 5 is a view on the same plane as Fig. 3, illustrating the construction devised for grinding convex surfaces, and Fig. 6 is a front elevation of the machine.

My improved grinding or polishing machine is formed with a vertical shaft 1 which is so mounted in bearings 2, as to have a small vertical movement as hereinafter described. A disk 3 is secured on this shaft in such manner that the side of the disk will rest upon the periphery of a disk 4 on the power shaft 5. As shown the disk 4 is adjustable along the shaft to permit of the regulation of the rate of rotation of the shaft 1, to the upper of which is secured the block or chuck 6 or 6<sup>a</sup>. The chuck is made with a concave or convex surface dependent upon the character of the surface to be formed. The chuck is provided with suitable gripping jaws 7 adjustably mounted for the purpose of securing the articles to be ground, in position.

The shaft 1 projects up through the bottom of a box or trough 8 preferably metal lined and having its bottom inclined so that the abrading material will flow toward the front or other side of the box, as shown in Figs. 3, 4 and 5. The escape of material through openings for the shaft is prevented by a disk 9 fitting sufficiently tight on the shaft 1 as to rotate therewith and throw off abrading material lodging thereon. The abrading disk 10 is held in contact with the article by pin 11 projecting into a socket 12 on the back of the disk and adjustably secured in a sleeve 13 carried by an extensible arm 14. This arm is given an oscillatory movement in order to change the position of the abrading disk on the lens or other article. In the con-

struction shown in Figs. 2 and 3 the arm is pivotally connected to a shaft 15 mounted in a suitable bearing 16 and having an arm 17 which is shifted to oscillate the shaft 15 and parts carried thereby. Any suitable means can be employed for shifting the arm 17, as for example in the construction shown a pin 18 on the bar 19 engages a slot in the arm 17, and the bar 19 is reciprocated by means of cams 20 oppositely arranged on the driven shaft 21. This construction is adapted to grind concave surfaces and the parts employed for moving the disk 10 are so constructed and arranged that the disk will move in the arc of a circle whose center is above the surface operated on. For grinding convex surfaces as shown in Fig. 5, the arm 14 is pivotally connected to an upwardly extending arm 22 on the shaft 15. In this construction the abrading tool or disk moves in the arc of a circle whose center is below the surface operated on. The abrading disk is yieldingly held in operative relation to the lens preferably by means of a weight 23 slipped onto an upward extension of the pin 11. The arm 14 and parts carried thereby can be raised for placing lenses on the chuck by any suitable means, as for example by a cord 24 passing over a pulley 25 and connected to a lever 26, which is locked by a hook 27 when the arm has been raised.

The abrading material which is generally mixed with some liquid as water is poured into the box or trough 8, and by the operation of a rotating paddle wheel 28 is thrown up into a gutter 29 in the hood 30, the gutter connects with nozzles in the sides of the hood and to these nozzles are pivotally connected spouts 31 which will direct the abrading material down onto the lens.

It is preferred to arrange two grinding machines in the same box or trough, although they may operate independently. In such case abrading material can be fed to both machines by the same means.

When it is desired to stop the rotation of the chuck or block 6, the shaft 1 is raised until the disk 3 no longer contacts with the periphery of disk 4. This movement of the shaft can be conveniently effected by a lever 32 connected by a link to the treadle 33.

I claim herein as my invention:

1. In a grinding machine, the combination of a vertical shaft, a chuck or workholder carried by said shaft, a horizontal os-



cillating shaft, an arm having a pivotal connection to the shaft, so constructed as to permit of the vertical movement of the arm, a pin carried by said arm, an abrading disk  
5 engaged by the pin and movable thereby.

2. In a grinding machine, the combination of a vertical shaft, a chuck or work-holder carried by said shaft, a horizontal oscillating shaft, an arm pivotally connected to the  
10 shaft at a point above its axis, the pivotal connection being constructed to permit of the vertical movement of the arm, an abrading disk, a pin carried by the arm and loosely engaging the disk and yielding means for hold-  
15 ing the disk to its work.

3. In a grinding machine, the combination

of a vertical shaft, a chuck or work-holder carried by the shaft, a horizontal oscillating shaft, an arm pivotally connected to the shaft, the pivotal connection being con- 20 structed to permit of the vertical movement of the arm, an abrading disk, a pin carried by the arm and engaging the disk, a longitudinal movable bar and connections therefrom to oscillate the shaft, and cams for 25 shifting the bar.

In testimony whereof, I have hereunto set my hand.

FRANK WOODRUFF.

Witnesses:

CHARLES BARNETT,  
J. HERBERT BRADLEY.