No. 677,593. Patented July 2, 1901.

H. PEARSE.

GRINDING MACHINE.

(Application filed Nov. 13, 1900.)

(No Model.) 4 Sheets—Sheet 1.

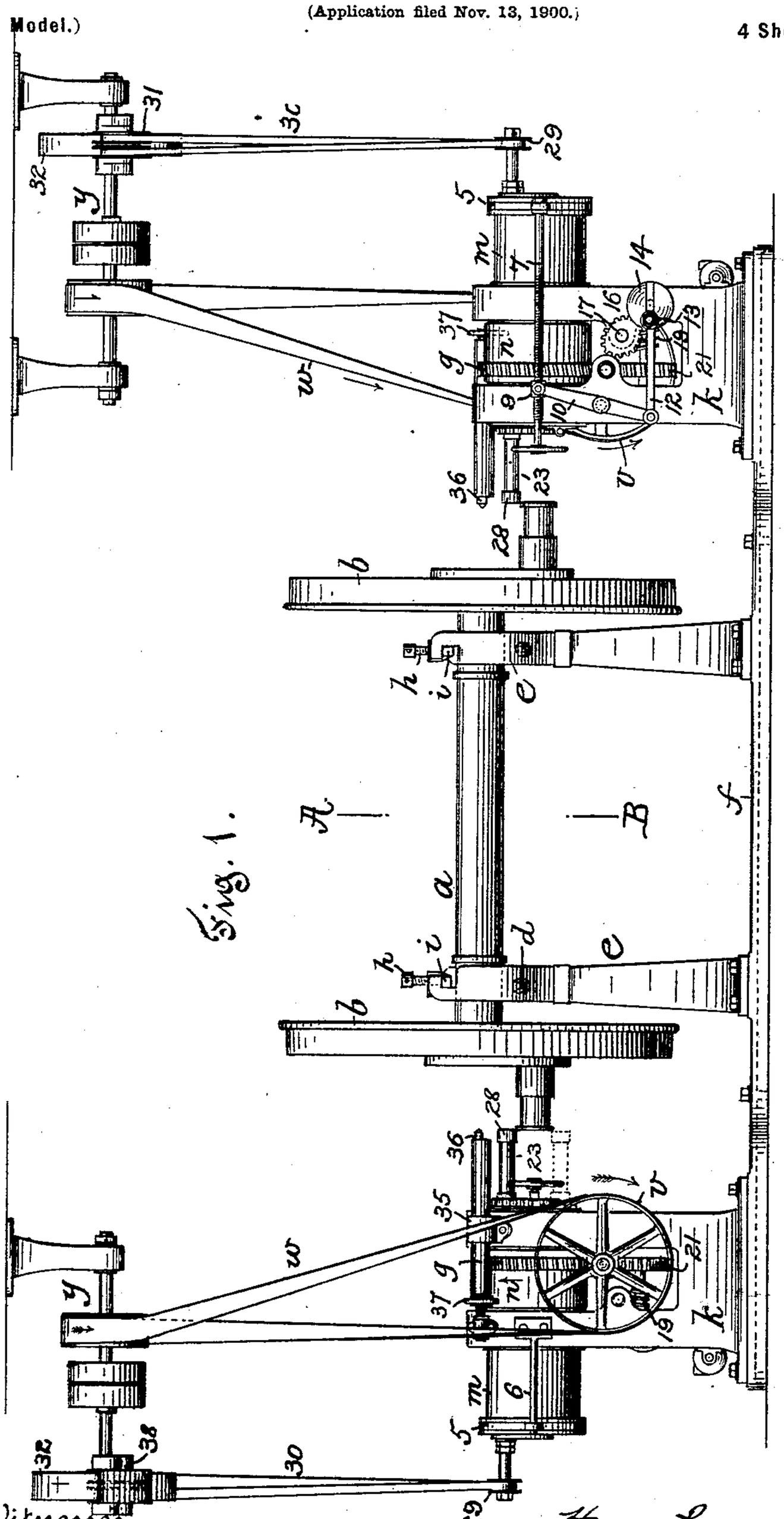

Fig. 1.

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Fig. 3.

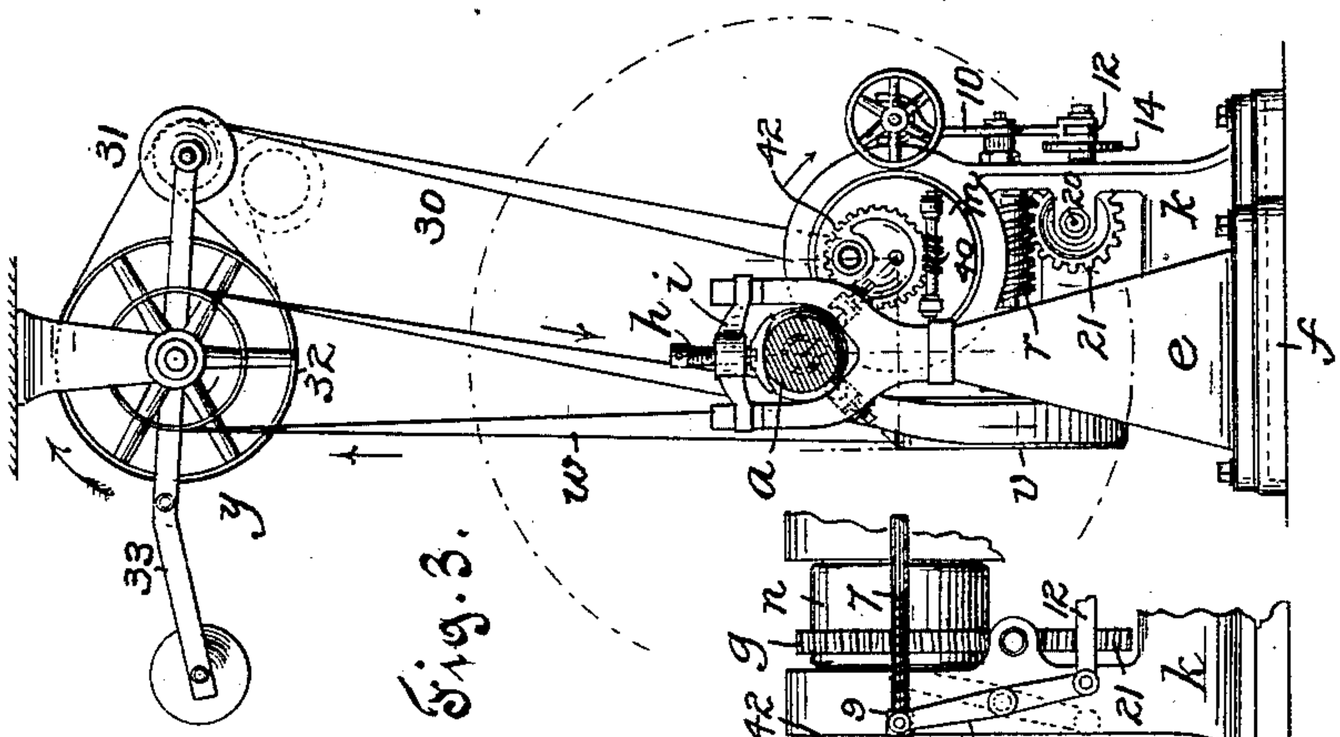
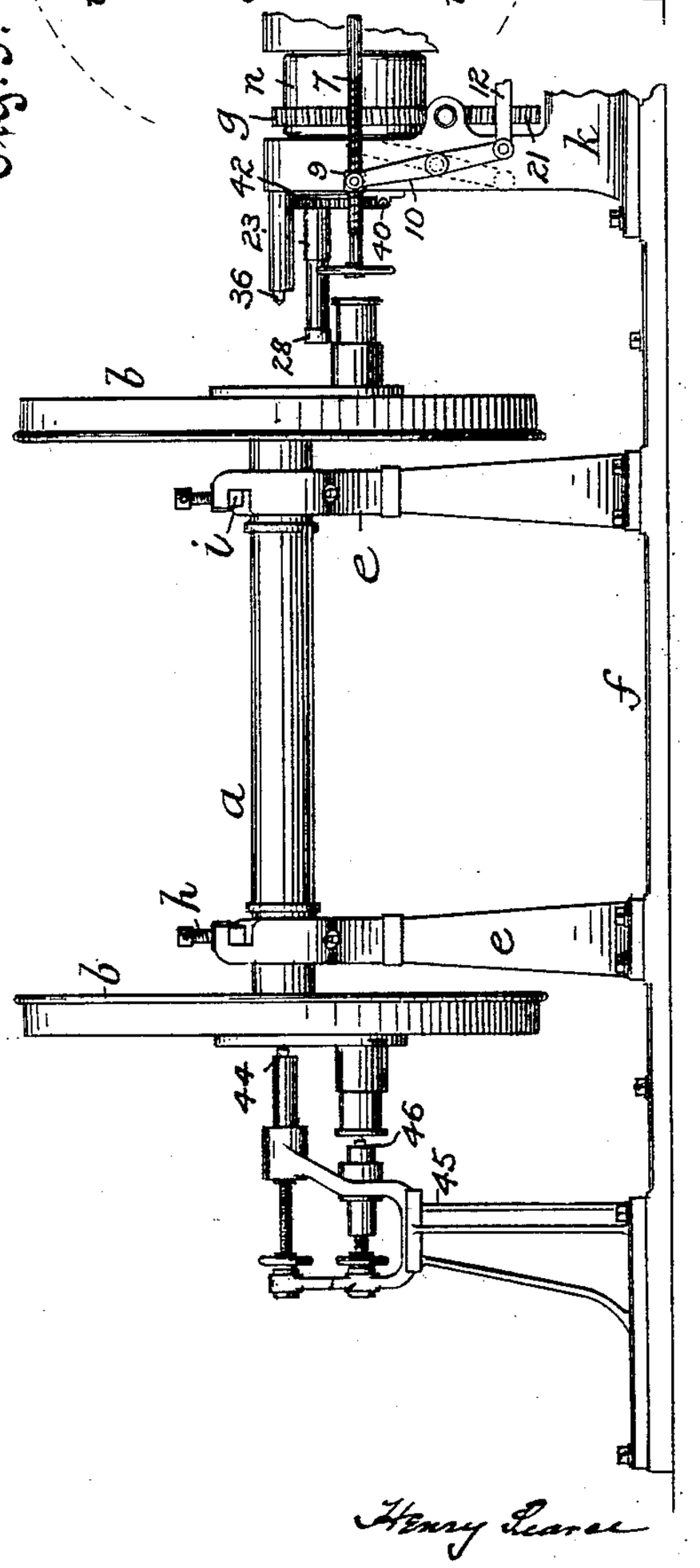


Fig. 2.



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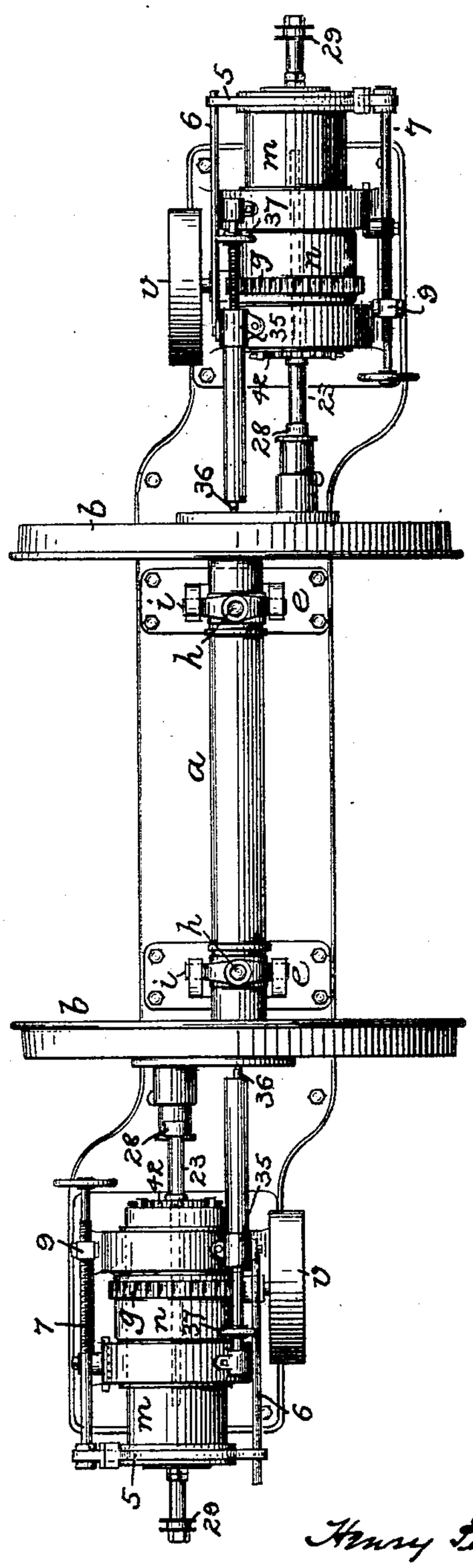
(No Model.) 4 Sheets—Sheet 3.

Fig. 4.



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No. 677,593. Patented July 2. 1901.

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GRINDING MACHINE.

(Application filed Nov. 13, 1900.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 7.

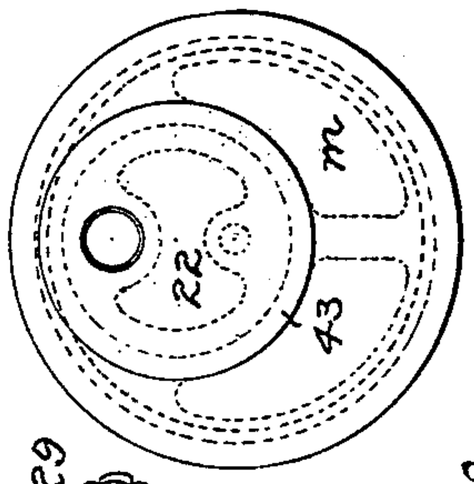


Fig. 8.

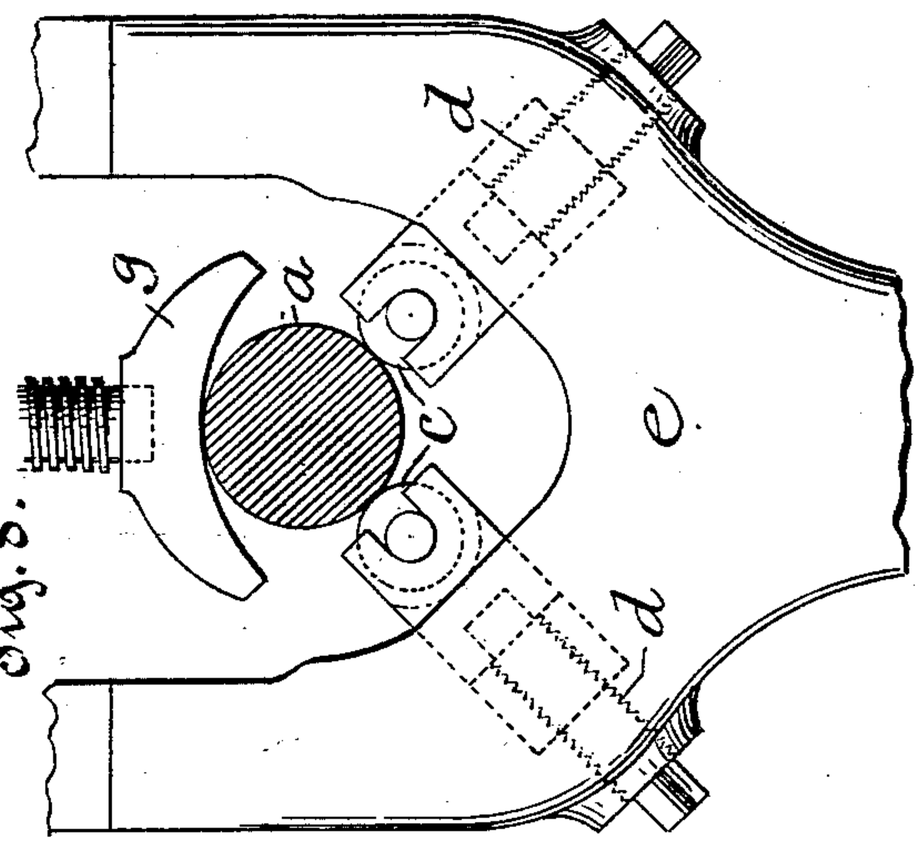


Fig. 9.

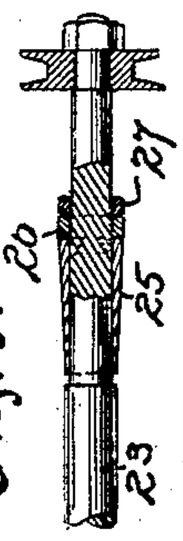
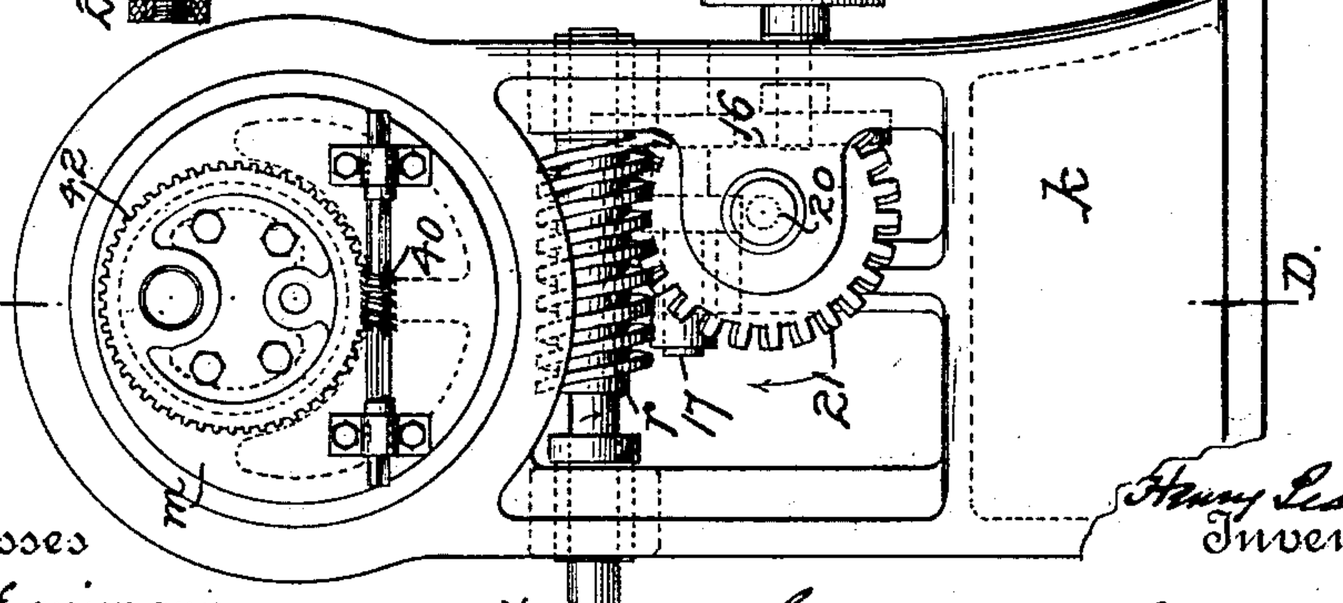


Fig. 6

Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY PEARSE, OF CAMPANA, ARGENTINA.

GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 677,593, dated July 2, 1901.

Application filed November 13, 1900. Serial No. 36,338. (No model.)

To all whom it may concern:

Be it known that I, HENRY PEARSE, a subject of the Queen of Great Britain, residing at Campana, in the Province of Buenos Ayres, Argentina, have invented certain new and useful Improvements in Grinding-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

The present invention relates to grinding and polishing machinery, more particularly to that kind for finishing cylindrical or other circuitous surfaces, such as crank-pins and the like.

Briefly stated, the improvements consist in an adjustable support for the crank-pin or other piece to be ground and a rotating grinding-tool having a circuitous or planetary movement about the piece and adjustable to different diameters or sizes of the piece and to the wear of the grinding-tool. Means are also provided for longitudinally moving the grinding-tool for variable distances, so as to grind the required length of the piece.

Although the improvements will be described as including a grinding-tool having a circular planetary motion and as operating upon crank-pins carried exteriorly by a pair of locomotive or other driving-wheels, the invention is not limited to this application, but may be employed where any circuitous or curved surface is to be ground or polished.

The accompanying drawings illustrate a practical embodiment of the invention.

In said drawings, Figure 1 is a side elevation of the improved grinding-machine with a pair of locomotive driving-wheels. Fig. 2 is a similar view showing a single grinding-machine. Fig. 3 is a cross-sectional view taken through the driving-wheel axle on the line A B of Fig. 1. Fig. 4 is a plan view of the machine shown in Fig. 1. Fig. 5 is an enlarged front end view of one of the grinding-machines. Fig. 6 is a longitudinal section of the same on the line C D of Fig. 5. Fig. 7 is a rear end view of the rotatable grinding-tool holder. Fig. 8 is an enlarged elevation of a portion of an adjustable support for the wheel-axle, the latter being shown in section; and Fig. 9 is an elevation, partially in section, of part of the grinding-tool spindle.

The improved machine consists of a suitable support for the work or other article to be ground, finished, or polished and a grinder or grinders adapted thereto. As illustrated, the axle *a* of the driving-wheels *b* is supported upon rollers *c*, adjustably mounted upon screws *d*, which are threaded into two forked standards *e*, secured to the base *f*. A clamping-block *g* is provided for securing the axle after adjustment and is held by a screw *h*, passing through a removable yoke *i*, which is supported in the forked end of the standard.

The base may support two grinding-machine frames *k*, one at each end of the wheel-axle, as in Fig. 1, or one grinding-machine frame, as in Fig. 2. Each frame supports a rotatable and longitudinally-movable cylinder *m*, mounted in two bearings and carrying between the bearings a sleeve *n*, which is splined to the cylinder. The sleeve is formed with worm-wheel teeth *g*, meshing into a worm *r* upon a cross-shaft *t*, supported in bearings in the frame and revolved by power applied to the pulley *v* through a belt *w*, running from the counter-shaft *y*. The rear end of the cylinder (see Fig. 6) is formed with a circumferential groove 4, carrying a band 5, which on one side loosely engages a guide-rod 6, attached to the frame, and on the other side is engaged by the end of a screw-threaded rod 7, having a traveling nut 9 connected to one end of a lever 10. The opposite end of the lever is connected through a pitman 12 to a wrist-pin 13, adjustable in a slotted crank-disk 14, which serves the function of longitudinally reciprocating the cylinder *m* and the grinding-tool. The disk 14 is supported upon a spindle having a bearing in the frame and is rotated by a pair of elliptical gears 16, one carried by said spindle and the other mounted upon a shaft 17, having also a worm-wheel 18, meshing into a worm 19, secured to a shaft 20, mounted in the grinding-machine frame. The shaft 20 carries a worm-wheel 21, which is revolved by the worm *r*, meshing therewith.

The rotating cylinder *m* is preferably made hollow and carries a tool-spindle holder 22 in the form of a hollow cylinder, situated longitudinally and eccentrically mounted in the larger cylinder. A rotary tool-spindle 23 is mounted longitudinally and eccentrically in

the holder and also eccentrically to the larger cylinder in bearings formed by the cones 24 25, the latter of which being adjustable along the spindle through a dovetailed nut 26 and lock-nut 27. (See Fig. 9.) At the front end the spindle 23 carries a grinding-disk 28, of abrasive or polishing material, and at the other end a pulley 29, driven by a belt 30, which travels over a pair of idlers 31 and around a pulley 32 on the counter-shaft *y*. The idlers are mounted on a balance-lever 33, weighted to maintain the belt 30 sufficiently tight during the planetary motion of the tool-spindle.

Each grinding-machine frame carries a bracket 35 for holding a centering-cone 36, which is provided with a hand-wheel 37, and is employed in this instance as a guide for adjusting the center of the axle and wheels.

The form of device shown in Figs. 1 and 4 is one in which the two grinding-machines are placed opposite each wheel, but sufficiently off the axle-center to be in alinement with the crank-pin centers when situated equal distances from the base. Having adjusted the axle to the correct position, the cylinder *m* is temporarily moved to its forward position, so that the crank-pin may be brought in alinement with a centering-cone 28, carried by the tool-holder 22 at the axle-center of the cylinder *m*, whereupon the driving-wheel axle is fixed in place by screwing down on the clamping-blocks *g*. The longitudinal position of the cylinder *m* and the grinding-tool with respect to the crank-pin may then be determined by rotating the rod 7 through its hand-wheel and the length of the reciprocations of the cylinder and tool adjusted at the slotted crank-disk 14.

Having adjusted the machine for work of a standard size, its operation becomes very simple, and the driving-wheels can be moved and replaced rapidly in succession. The tool-spindle 23 is adjusted to the surface of the crank-pin by rotating the holder 22 to move the tool nearer to or farther from the crank-pin center. This is done by means of a hand-operated worm 40, supported in bearings on the end of the cylinder *m* and engaging a worm-wheel 42, attached to the front end of the tool-holder 22. The rear end of the tool-holder is provided with a rim or flange 43, which, with the worm-wheel, serves to hold the cylinder in its bearings in the cylinder *m*.

It will be observed that the tool-spindle 23 and its tool will rotate rapidly about its axis, while the cylinder *m* revolves at a slower speed, carrying the rotating tool completely around the crank-pin. Simultaneously the reciprocating gear is moving the cylinder *m* and tool lengthwise, but at a much slower speed, the elliptical gears compensating for the slower motion at the end of the stroke which would otherwise occur by the constant speed of the slotted crank-disk. This insures the grinding effect being more evenly distributed over the surface of the crank-pin.

In Fig. 2, where one grinding-machine is employed, the other end of the axle is retained in position by the centering-cone 44, supported in a standard 45, and the corresponding crank-pin fixed by a centering-cone 46, also mounted upon the standard and serving to hold also the opposite wheel and pin rigidly in position during the operation of the tool on the other crank-pin.

What is claimed is—

1. In a grinding or like machine, the combination of a rotary tool, means for moving said tool in a circuitous, curved or planetary path about the piece to be acted on, and means for adjusting the tool to vary the extent of said path, as described.

2. In a grinding or like machine, the combination of a rotary tool, means for moving said tool in a circuitous, curved or planetary path about the piece to be acted on, means for reciprocating the tool in a direction at right angles to said path, and means for adjusting the tool to vary the extent of its path, as described.

3. In a grinding-machine, the combination of a rotating cylinder, a rotating tool-holder carried by said cylinder and a rotating tool mounted in said holder, as described.

4. In a grinding-machine, the combination of two rotating members, one eccentrically mounted with respect to the other, and a rotating tool carried by said eccentrically-mounted member, as described.

5. The combination of a grinding-machine, of a revoluble tool, means for reciprocating said tool and means for adjusting the extent of reciprocation, as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY PEARSE.

Witnesses:
J. A. MACURB,
H. MIDDLETON.