No. 833,787. PATENTED OCT. 23, 1906.

A. JOHNSTON.

GRINDING MACHINE.

APPLICATION FILED NOV. 9, 1905.

3 SHEETS—SHEET 1.

FIG. 1.

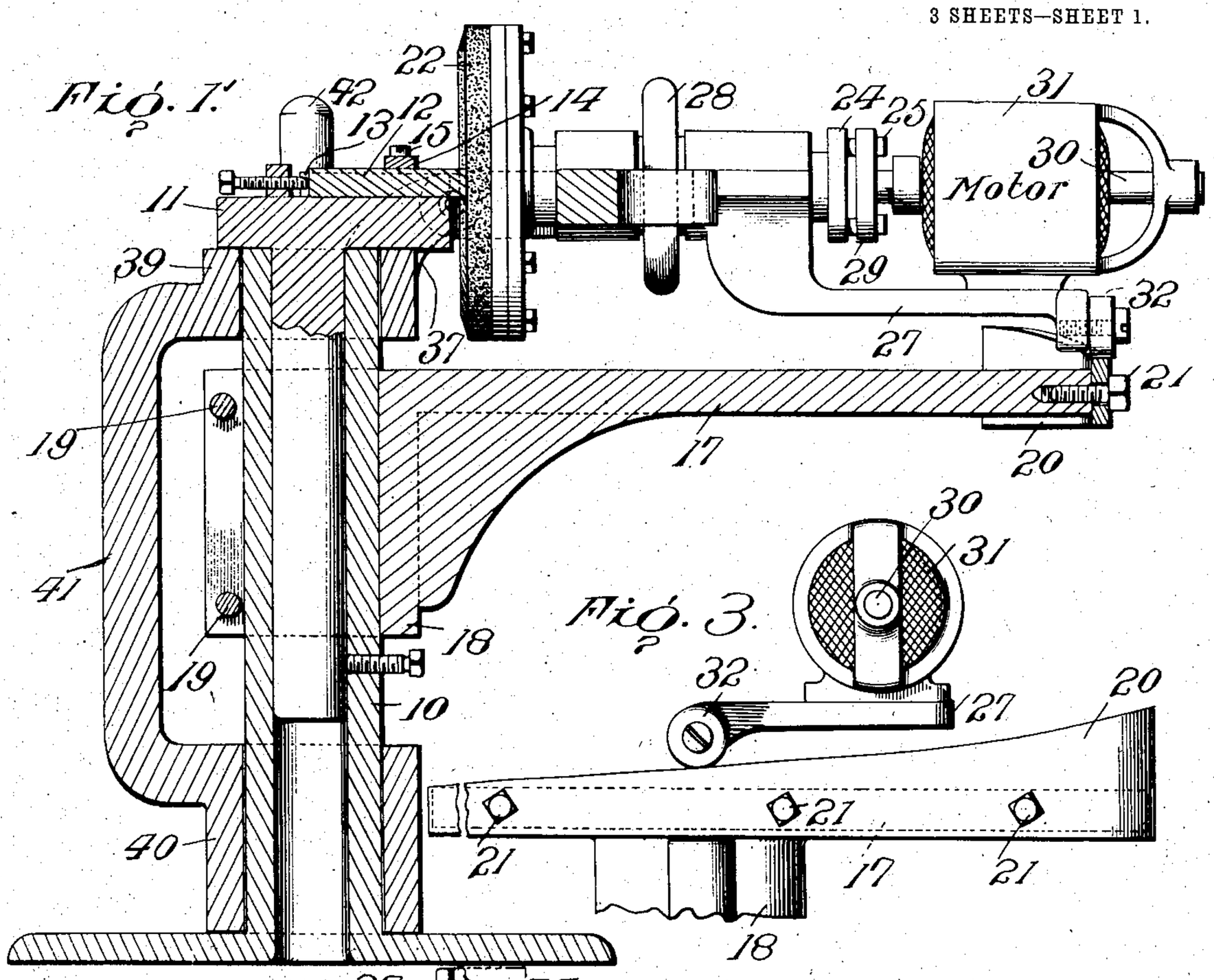
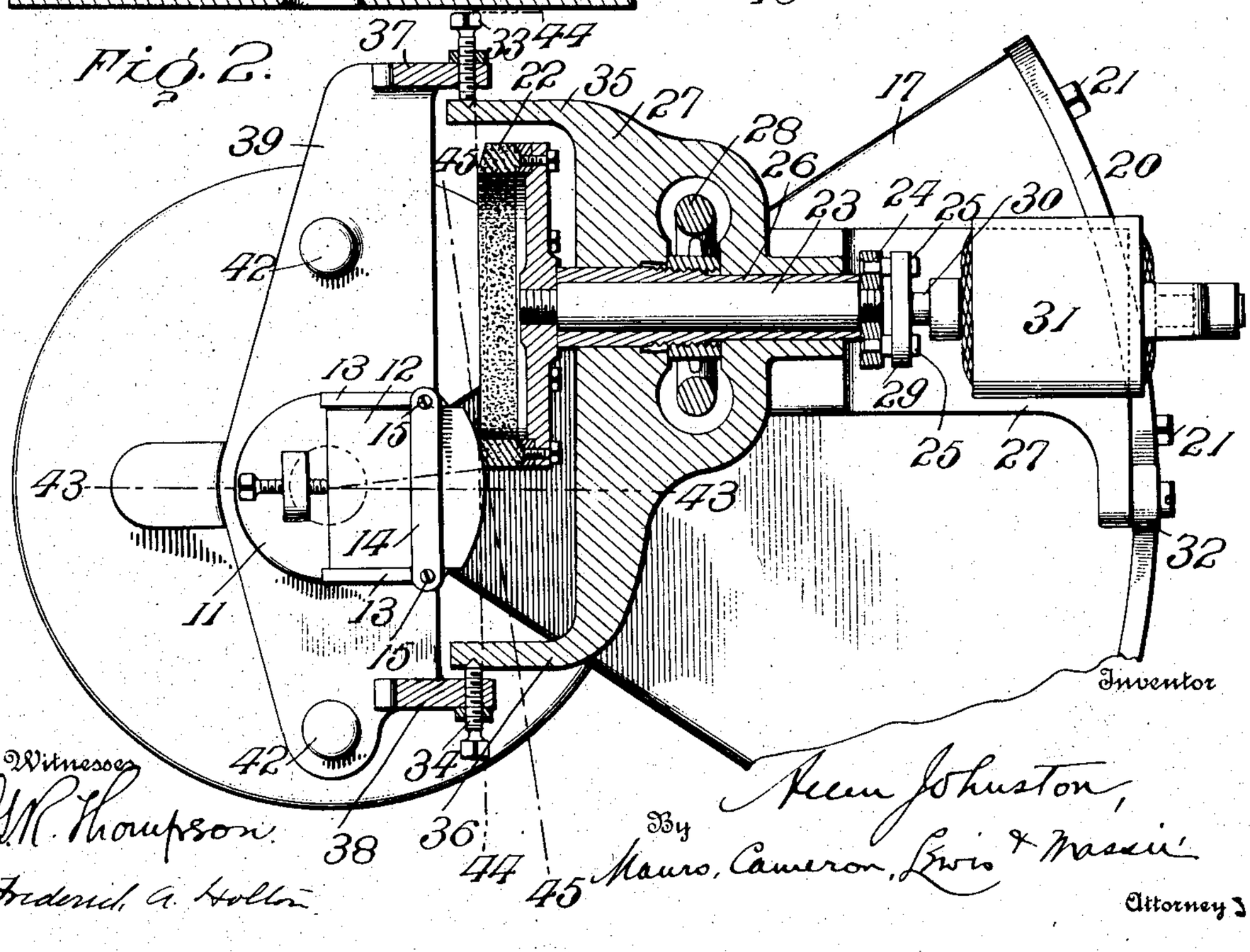


FIG. 3.

FIG. 2.



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3 SHEETS—SHEET 2.

Fig. 4.

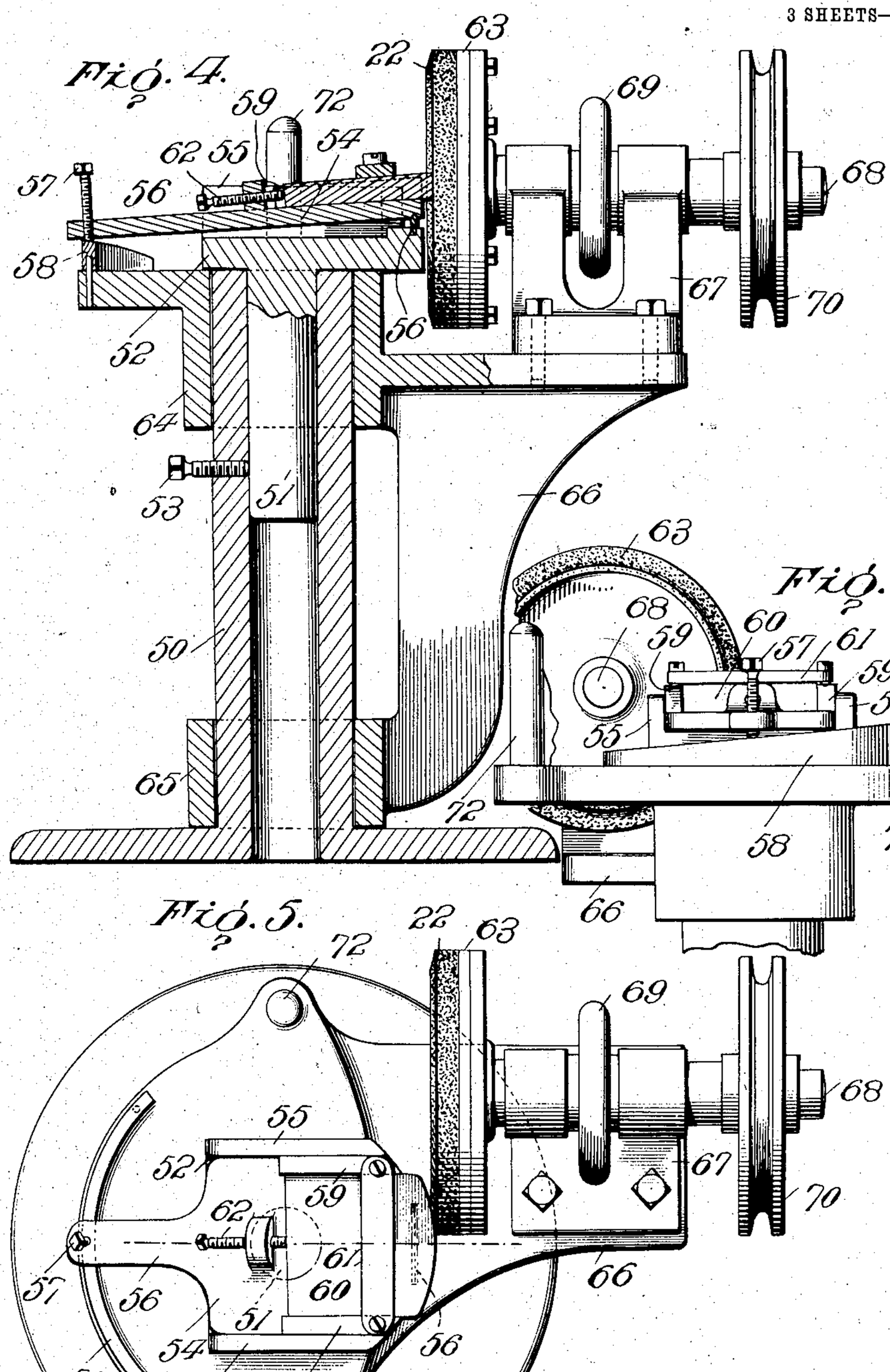

Fig. 6.

Fig. 5.

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3 SHEETS—SHEET 3.

Fig. 8.

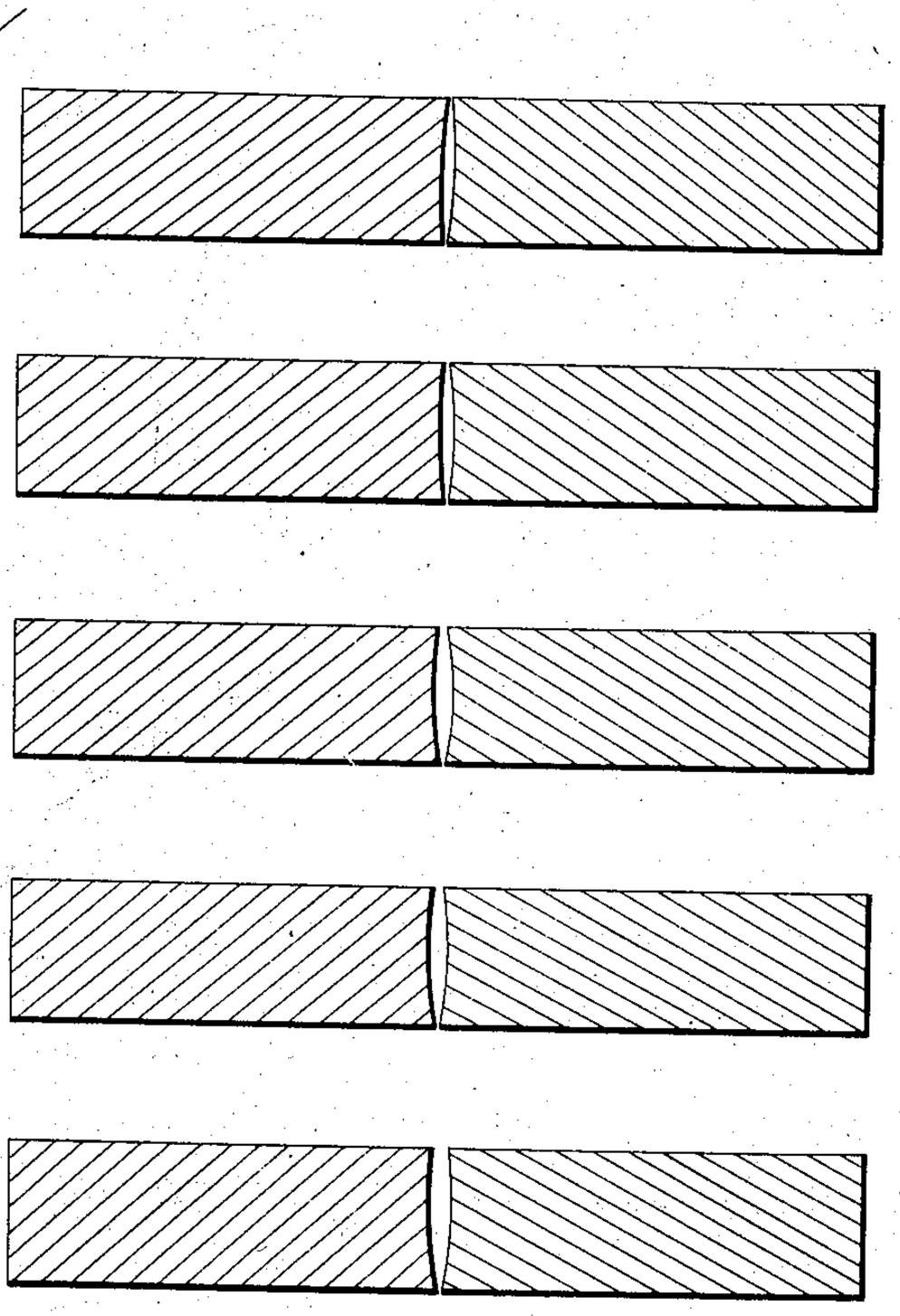
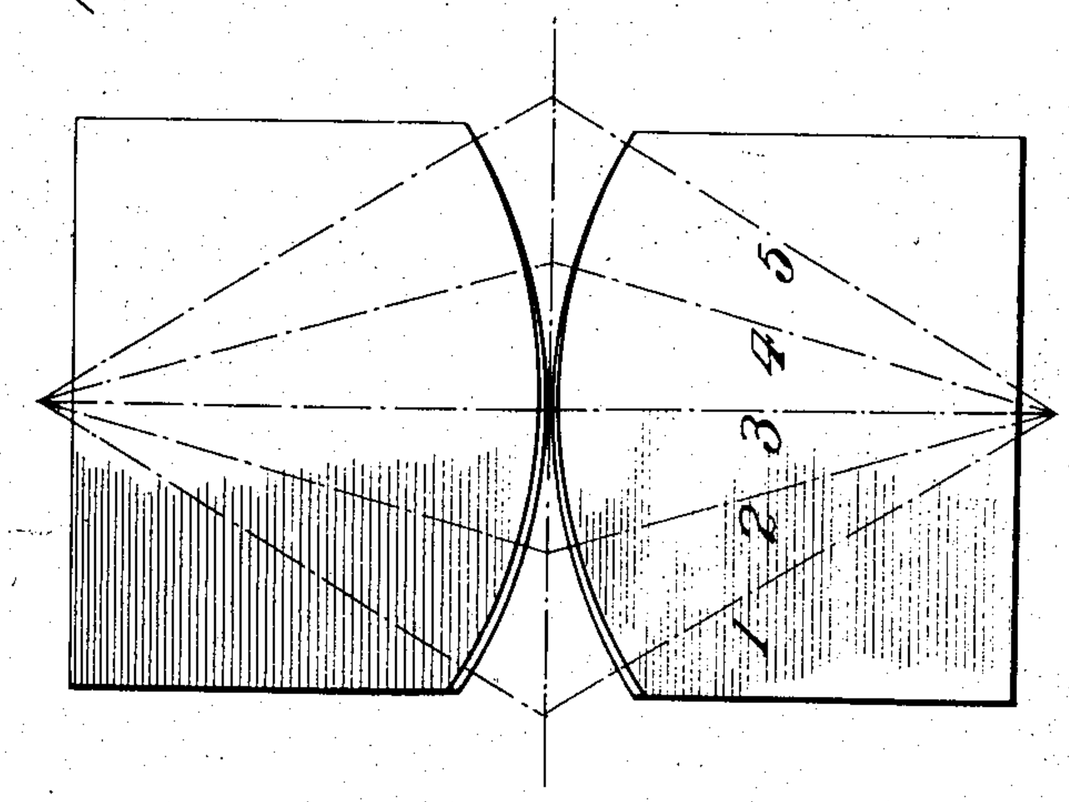


Fig. 7.



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UNITED STATES PATENT OFFICE.

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GRINDING-MACHINE.

No. 833,787. Specification of Letters Patent. Patented Oct. 23, 1906.

Application filed November 9, 1905. Serial No. 286,568.

To all whom it may concern:

Be it known that I, ALLEN JOHNSTON, of Ottumwa, Iowa, have invented a new and useful Improvement in Grinding-Machines, which invention is fully set forth in the following specification.

In my Patent No. 611,323, dated September 27, 1898, I have illustrated and described a grinding-machine particularly adapted to grind upon dies used for rolling or otherwise forging the blades of table-knife blanks a surface having a "twist" which is the counterpart of the twist to be imparted to each surface of the blade. The term "twist" is here used to designate those characteristics of the surfaces of the knife-blade resulting from, first, its taper along the back or non-cutting edge from the thickest part at the handle to the point of the blade; second, its cutting edge of uniform thickness from end to end, and, third, its transverse taper from its relatively thick back or non-cutting edge to its thinner cutting edge, this taper gradually decreasing from the handle end of the blade to the point thereof, in accordance with the longitudinal taper of the back edge. While the blade-surfaces having such twist are preferably slightly convex in a transverse direction, (requiring corresponding concavity in the die-surfaces,) they may also be straight. In said patent I have stated and claimed as one of the principal novel features of the invention means for tilting the work-holder with relation to the grinding-surface, or vice versa, the important thing being to give these parts such relative tilting and feed movements as to impart the desired twist to the surface ground irrespective of whether these relative movements are effected by moving only the work-holder, or by the equivalent plans of moving only the grinding-wheel, or of dividing the movements between the two.

My present invention consists of certain improvements in grinding-machines of this character and embodying the invention of said patent in which the feed and tilting movements are imparted wholly to the grinding-wheel or partly to the grinding-wheel and partly to the work-holder. These improvements may be best explained and understood by reference to the accompanying drawings, in which—

Figures 1, 2, and 3 are views of a machine in which both the feed and tilting movements are imparted to the grinding-wheels, Fig. 1 being a vertical sectional view with parts in elevation, Fig. 2 a horizontal sectional view with parts in elevation, and Fig. 3 a detail view from the right of Figs. 1 and 2, showing only the inclined track and the end of the grinding-wheel carriage. Figs. 4, 5, and 6 are views of a machine in which the feed movement is imparted to the grinding-wheel and the tilting movement to the work-holder, Fig. 4 being a vertical sectional view with parts in elevation, Fig. 5 a top plan view, and Fig. 6 an elevation of part of the machine from the left of Fig. 5. Fig. 7 is a plan view of two dies such as used for rolling a knife-blade, said dies having a twist on their surfaces; and Fig. 8 represents five sectional views taken on dotted radial lines 1 to 5, respectively, of Fig. 7.

Referring first to Figs. 1, 2, and 3, 10 is a tubular pedestal or pillar supporting the work-holder 11, the latter having a flat top upon which rests the work (a die-block 12 in this instance) between parallel retaining-flanges 13 13. A cross-bar 14, secured to flanges 13 by screws 15, tightly clamps the work in the desired position to which it may be accurately adjusted by bolt 16. It will thus be seen that in this machine the work-holder, and consequently the work, are fixed. 17 is a fan-shaped bracket or table having a split sleeve 18 embracing pedestal 10 and adapted to be clamped at the proper elevation by bolts 19 19, which contract the sleeve at its split side, causing it to tightly grip the pedestal. A curved inclined track 20 is removably fastened to the edge of bracket 17 by bolts 21, the center of curvature of the track being the axis of pedestal 10. Tracks of different inclination may be employed, according to the degree of twist to be imparted to the surface ground. 22 is a ring-shaped grinding-wheel, the shaft 23 of which carries at its end a plate 24, having projecting pins 25. Shaft 23 is free to turn in a sleeve 26, but cannot move longitudinally therein. This sleeve is supported in a carrier 27, in which it is longitudinally adjustable by means of a hand-wheel 28 engaging a screw-thread on the sleeve to move the grinding-wheel to compensate for wear in its grinding-surface. Pins 25 enter openings in a disk 29 on the end of the driving-shaft 30 of an electric motor 31 and permit the necessary adjustment of the grinding-wheel without disconnecting it from the motor. The motor is mounted upon and movable with carrier 27,

its flexible conductors not being shown in the drawings. At the motor end the carrier 27 has a wheel 32, by which it is movably supported upon track 20. At its other end the carrier is supported to turn upon a horizontal axis through the conical bearing-points of two bolts 33 34, engaging arms 35 36, respectively, of carrier 27. These bolts pass through and are supported by arms 37 and 38 of a table 39, rotatably sleeved on pedestal 10, which table may properly be called a part of the carrier. A bridge-bar 41 connects plate 29 with a sleeve 40, rotatably bearing on pedestal 10 near its base, thus adding rigidity to the support of plate 29, and consequently of the grinding-wheel end of the carrier. 42 42 are handles on table 39, by which said table, the carrier 27, and the parts mounted thereon may be rotated about the axis of the pedestal 10, the wheel 32 traveling along inclined track 20 and the table 39 turning on the pedestal as its pivot. In this rotation of the parts the wheel 32 in traveling up and down the track tilts the carrier 27 on the axis of pivots 33 and 34 from a position of minimum inclination at the lower end of the track to a position of maximum inclination at the higher end thereof. This produces a corresponding tilting of the grinding-wheel, which in turn gradually varies the inclination of the surface ground, as shown in Figs. 7 and 8, thus producing the desired twist.

As shown in Figs. 1 and 2, the work-holder is so mounted that a line 43, Fig. 2, drawn through the axis on which the grinding-wheel turns about the work (which is the axis of the pedestal) and at right angles to the plane of the face of the grinding-wheel (represented by dotted line 44) intersects said plane at a point outside the periphery of said wheel. In this relation of the parts the line of feed of the grinding-wheel with reference to the work will be approximately in the direction of line 45, forming an angle of less than ninety degrees with the plane of the surface of th egrinding-wheel. A slightly-concave surface will therefore be ground upon the die-block, as shown in Fig. 8. When it is desired to grind a transversely-convex surface, the parts are so related that the line 43 intersects the plane 44 within the inner periphery of the grinding-wheel. Also by so relating the parts that line 43 intersects the grinding-surface a transversely straight surface may be ground.

In the machine of Figs. 4, 5, and 6, 50 is the tubular pedestal, in the upper end of which the stem 51 of a plate 52 is held by set-bolt 53. 54 is a work-holder held against lateral movement by side flanges 55 on plate 52. At its end nearest the grinding-wheel the work-holder is fulcrumed to tilt on a knife-edge 56, while at its other end it has an arm 56, through which a bolt 57 is adjustably screw-threaded, said bolt bearing against a curved inclined track 58. Work-holder 54 has side flanges 59 59, between which the work 60 is held by a cross-bar 61. The position of the work may be adjusted by bolt 62. The grinding-wheel 63 is mounted upon a rotary carrier, which comprises sleeves 64 65, fitting about and rotatable on pedestal 50 and rigidly connected together by a bracket-arm 66, the latter supporting bearing-bracket 67 for the shaft 68 of the grinding-wheel. 69 is a hand-wheel operating to adjust the grinding-wheel in the manner described with relation to hand-wheel 28 of Figs. 1 to 3. A pulley 70 on shaft 68 is driven from a suitable source of power in a manner to permit rotary movement of the carrier without interfering with the driving connections. 71 is a table also forming part of the rotary carrier and supporting track 58. By grasping handles 72 72 on this table the operative may turn the carrier and parts mounted thereon about the axis of the pedestal. Thus while the grinding-wheel is rotating on its own axis it is also given a feed movement with relation to the work by rotation of the carrier. Rotation of the carrier also moves the inclined track 58, upon which one end of the work-holder is supported by bolt 57, thereby tilting said work-holder on the knife-edge 56 and giving the desired twist to the surface ground. In Figs. 4 to 6 the grinding-wheel and work have the same relative position as already explained with reference to Figs. 1 to 3, resulting in the grinding of a slightly transversely concave twisted surface. By altering the construction to change the positions of the parts, as already explained, a transversely-convex or transversely-straight surface may be ground.

What I claim is—

1. In a grinding-machine, the combination with a work-holder, of a grinding-wheel, a carrier on which the grinding-wheel is rotatably mounted, said carrier being movably supported to impart to the wheel a feed movement relative to the work-holder, and means for relatively tilting the wheel and work-holder during said feed movement to grind a twisted surface on the work.

2. In a grinding-machine, the combination with a work-holder, of a grinding-wheel, a carrier on which said wheel is rotatably mounted, said carrier being rotatable about a fixed axis to impart to the wheel a feed movement relative to the work-holder, and means for relatively tilting the wheel and work-holder during said feed movement to grind a twisted surface on the work.

3. In a grinding-machine, the combination with a work-holder, of a grinding-wheel, a carrier on which said wheel is rotatably mounted, said carrier being rotatable about a fixed axis to impart to the wheel a feed movement relative to the work-holder, and

means for tilting the carrier and grinding-wheel thereon relative to the work-holder during said feed movement to grind a twisted surface on the work.

4. In a grinding-machine, the combination with a work-holder, of a grinding-wheel, a carrier formed in two parts pivotally connected together, both parts being mounted to turn together about a common axis in effecting relative feed movement between the work and wheel, one part of said carrier supporting the grinding-wheel being pivotally connected to the other part to tilt relative thereto, and means for tilting said grinding-wheel-supporting part during said feed movement to grind a twisted surface on the work.

5. In a grinding-machine, the combination with a machine-pedestal, of a work-holder, a carrier journaled to turn about said pedestal as its axis or pivot, a grinding-wheel rotatably mounted in bearings on said carrier, and means for relatively tilting the grinding-wheel and work-holder during said turning movement of the carrier to grind a twisted surface on the work.

In testimony whereof I have signed this specification in the presence of the subscribing witnesses.

ALLEN JOHNSTON.

Witnesses:
FREDK. DIMMITT,
R. W. FUNK,
J. T. HACKWORTH.