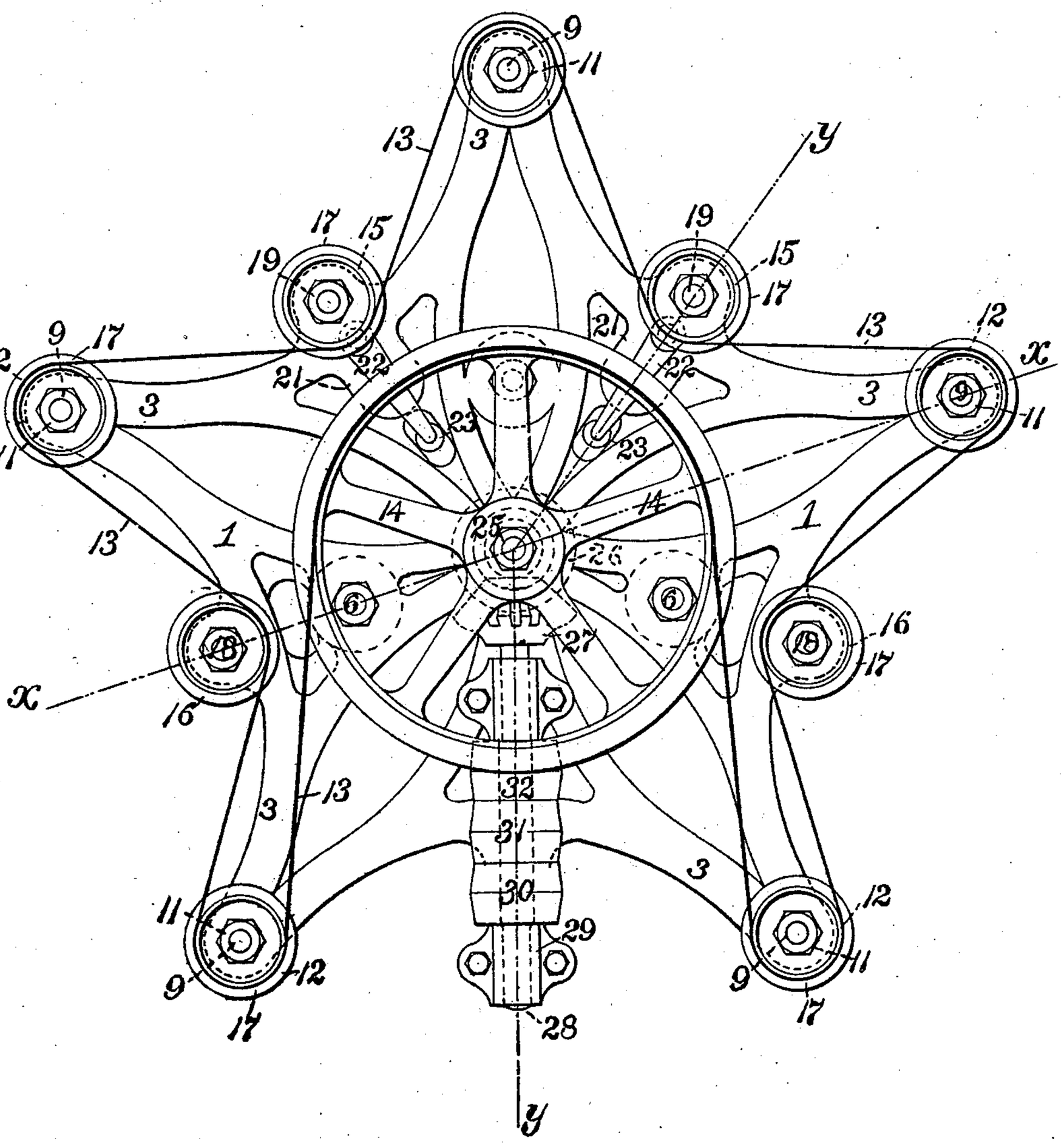
(No Model.) 5 Sheets—Sheet 1.

J. COYNE.

GRINDING MACHINE.

No. 554,480. Patented Feb. 11, 1896.

FIG. 1.



WITNESSES:

Damon S. Wolcott

F. E. Gaither

INVENTOR,

John Coyne

by George H. Christy

Att'y.

(No Model.)

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J. COYNE.

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FIG. 2.

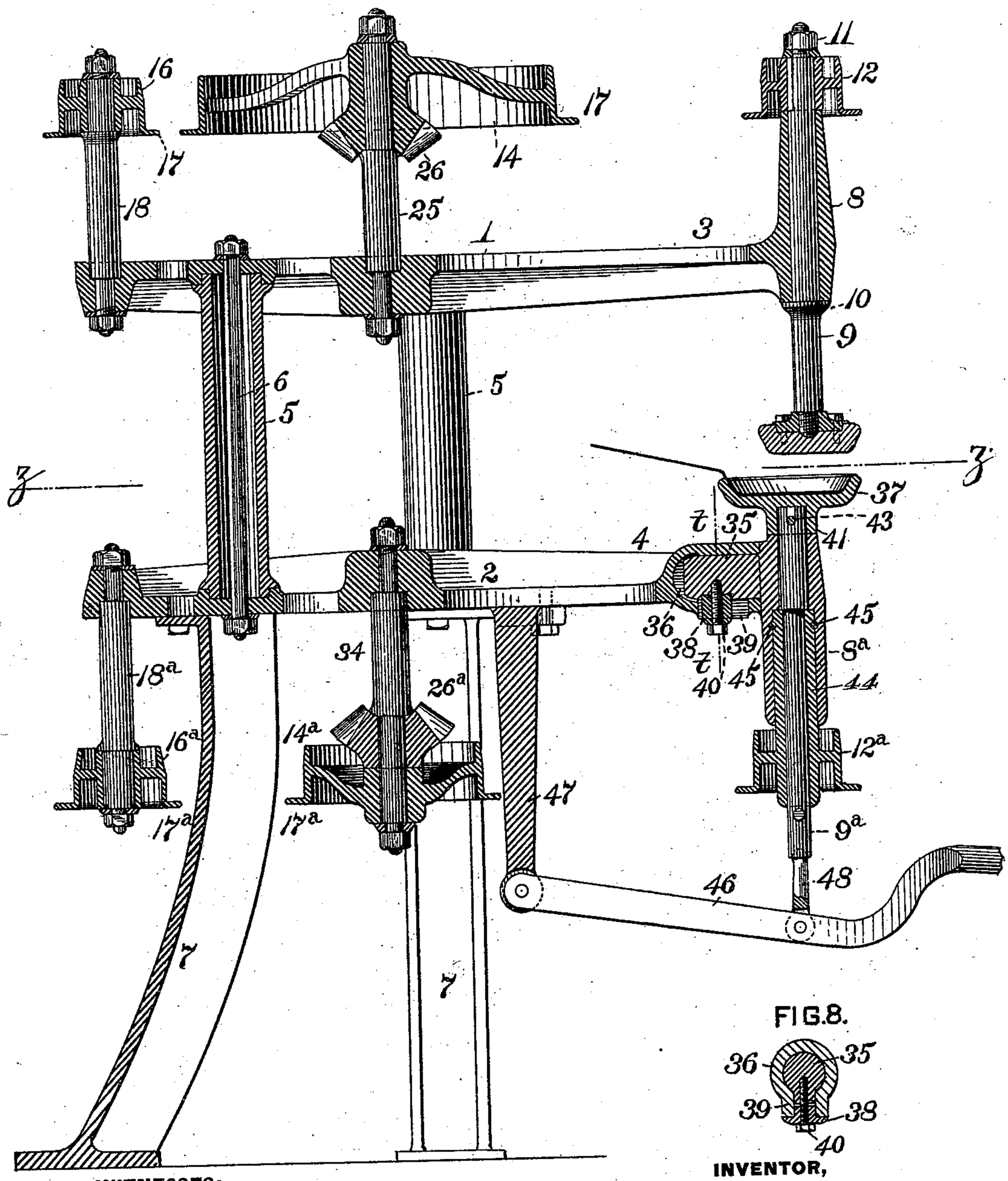

FIG. 8.

WITNESSES:

Darwin S. Wolcott

F. E. Gaither

INVENTOR,

John Coyne

by George A. Christy Att'y.

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J. COYNE.

GRINDING MACHINE.

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FIG. 3.

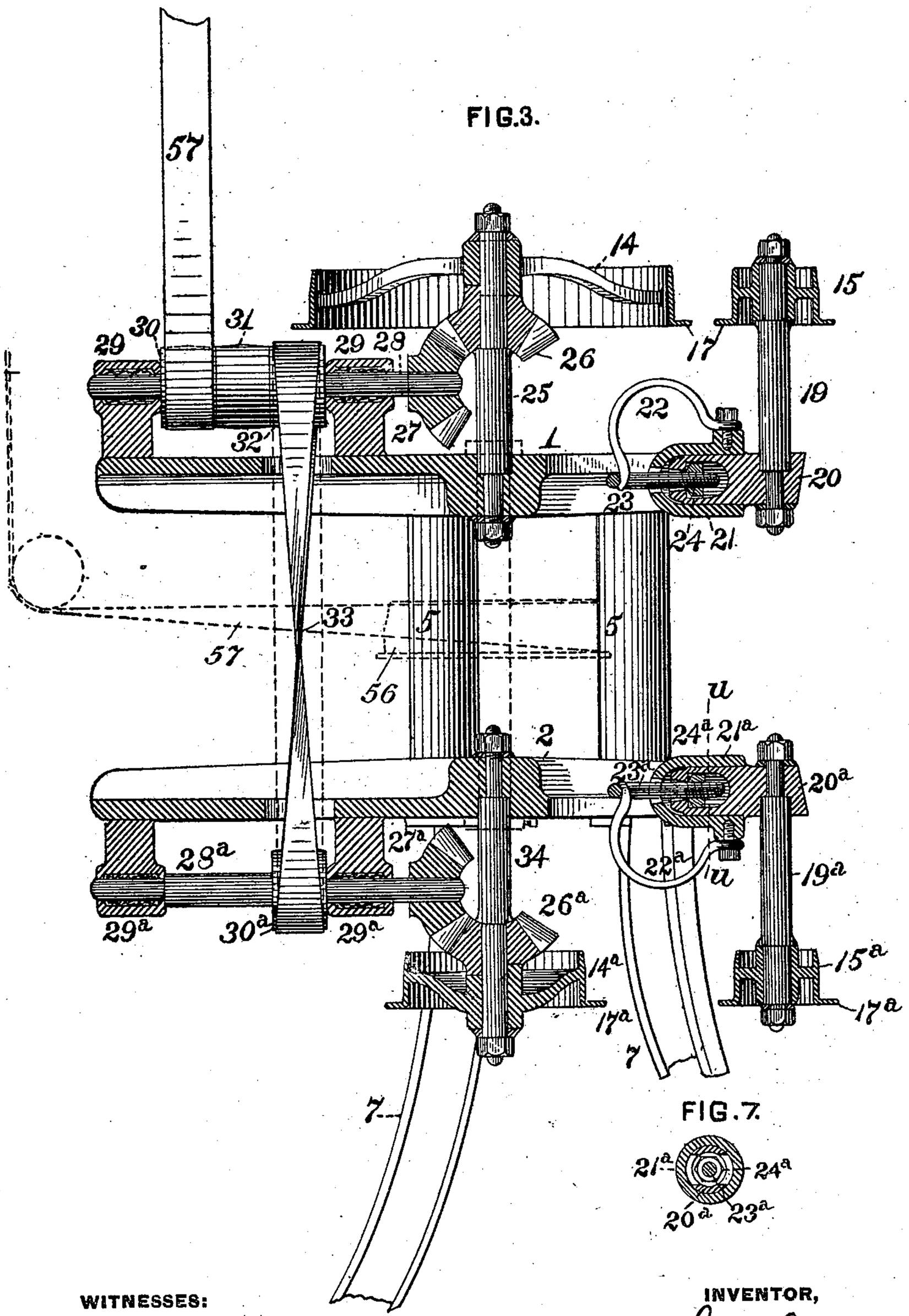

FIG. 7.

WITNESSES:

Damon B. Wolcott

F. E. Gaither

INVENTOR,

John Coyne

by George H. Christy Att'y.

(No Model.)

5 Sheets—Sheet 4.

J. COYNE.

GRINDING MACHINE.

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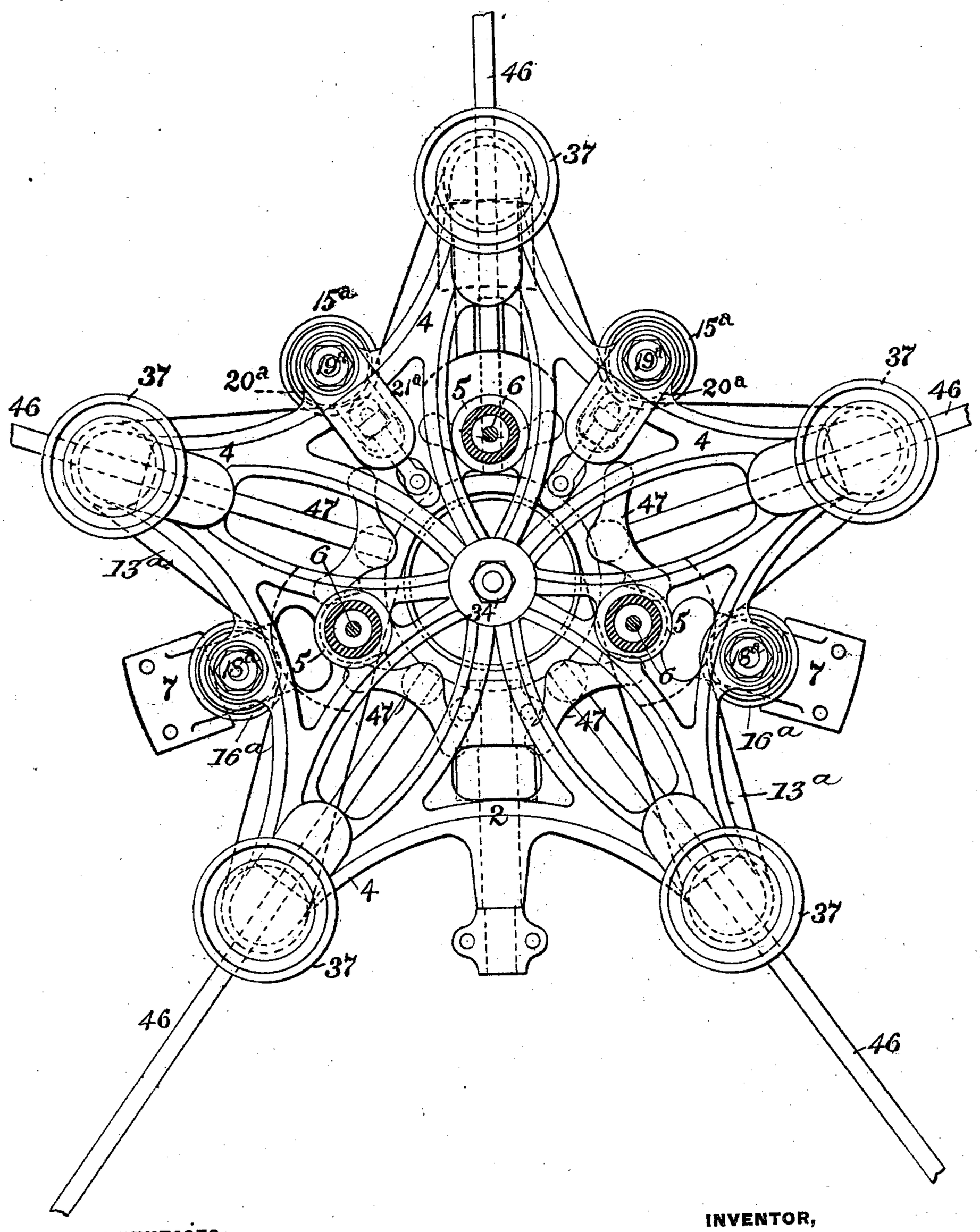
FIG. 4.



WITNESSES:

Dawin S. Wolcott

F. E. Gaither

INVENTOR,

John Coyne

by George H. Christy Atty.

(No Model.) 5 Sheets—Sheet 5.

J. COYNE.

GRINDING MACHINE.

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FIG. 5.

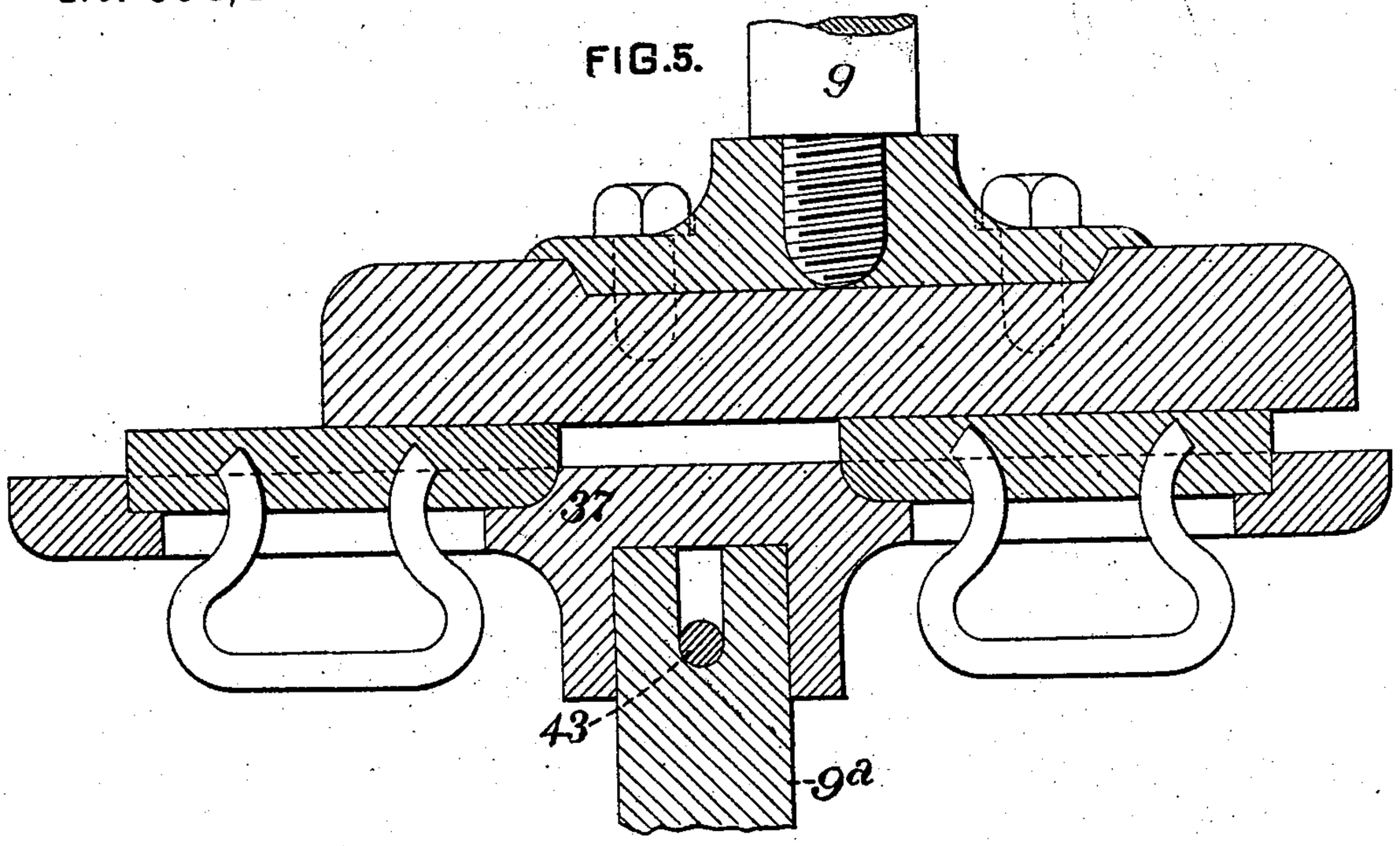

FIG. 6.

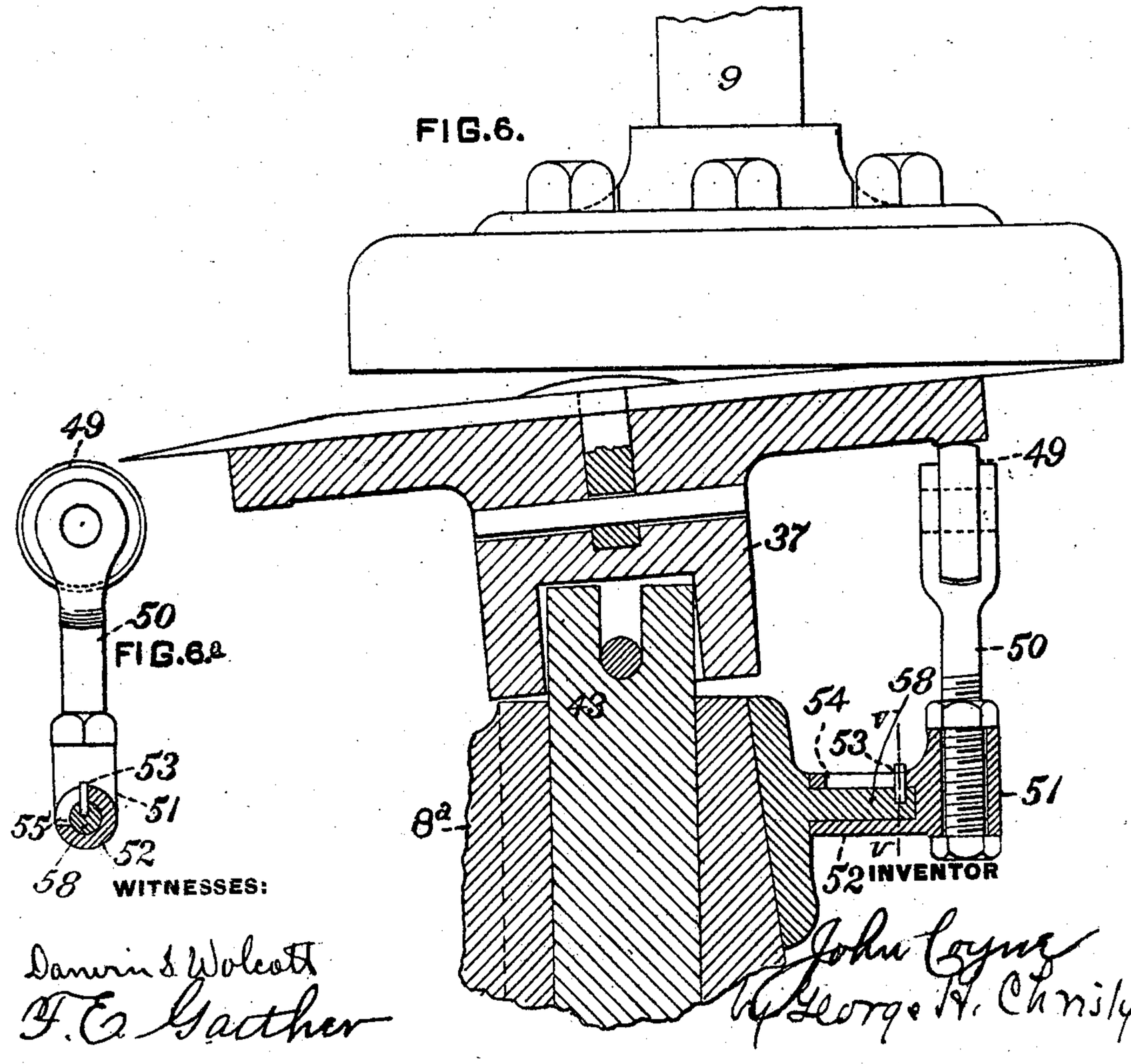

FIG. 6a

WITNESSES:

Damon & Wolcott

F. C. Gaither

INVENTOR

John Coyne

by George H. Christy Atty.

UNITED STATES PATENT OFFICE.

JOHN COYNE, OF PITTSBURG, PENNSYLVANIA.

GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 554,480, dated February 11, 1896.

Application filed February 24, 1890. Serial No. 341,430. (No model.)

To all whom it may concern:

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

The invention described herein relates to certain improvements in grinding-machines, and has for its object a construction and arrangement of mechanism whereby a large number of articles, whether alike or differing in shape, may be operated on simultaneously—as, for example, in my improved machine some of the tools may be employed in grinding or polishing hollow articles, as frying-pans, some in grinding or polishing colter-disks, and some in grinding or polishing glass or stone articles, the operations on the several articles being carried on simultaneously, or all the tools may be employed on the same articles, some for coarse grinding, some for smoothing, and some for polishing. In general terms the invention consists in the construction and combination of mechanical devices or elements, all as more fully hereinafter described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a top plan view of the upper frame or portion of my improved machine. Fig. 2 is a sectional elevation on the line *x x*, Fig. 1. Fig. 3 is a similar view, the plane section being indicated by the line *y y*, Fig. 1. Fig. 4 is a sectional plan view, the plane of section being indicated by the line *z z*, Fig. 2. Figs. 5 and 6 are sectional detail views, on an enlarged scale, of the work-holder and grinding-tool, showing the manner of securing and operating on different articles. Fig. 6ª is a detail section on the line *v v*, Fig. 6. Figs. 7 and 8 are sectional details on the lines *u u*, Fig. 3, and *t t*, Fig. 2, respectively.

In the practice of my invention I provide two frames 1 and 2, each having a series of radial arms 3 and 4. These frames are held in proper relation to each other by hollow pillars 5 and bolts 6, as shown in Figs. 2 and 4, and the machine is supported by legs 7. The outer ends of the arms 3 of the upper frame 1 are provided with tubular bosses 8, forming bearings for the vertical shafts 9, which are held in position by collars 10, bearing against the lower ends of the bosses, and nuts 11, screwing onto threaded studs on the ends of the shafts and bearing on one end of the hubs of the pulleys 12, keyed to the shafts, as shown in Fig. 2. Grinding or polishing tools suitable for the work to be performed are removably secured to the lower ends of the shafts 9. These shafts with their tools are rotated by means of a belt 13, passing around a central pulley 14, the pulleys 12, and the tension and guide pulleys 15 and 16, as shown in Fig. 1. This belt 13 passes outside the pulleys 12 and inside of the pulleys 15 and 16, one, two, or more of which, dependent upon the size of the machine, are so mounted as to maintain a tension upon the belt 13. In order to keep the belt in position, all the pulleys above referred to have flanges 17 on their lower edges, thereby preventing any slipping down of the belt. The guide-pulleys 16 are loosely mounted in Fig. 2 upon the upper ends of vertical posts 18, which are firmly secured at their lower ends to the frame 1, preferably at points midway between two adjacent arms carrying the grinding-tools.

The tension-pulleys 15 are loosely mounted on the upper ends of vertical posts 19, which are secured at their lower ends to blocks 20, fitting in sockets 21, formed on or attached to the frame 1 at points midway between adjacent arms 3. The blocks 20 are yieldingly held within the sockets 21 by means of springs 22, which are preferably made in the form of leaf-spring, as shown, having one end secured to the frame 1 and the opposite end in engagement with the eyes of bolts 23, said bolts passing through the ends of the sockets and being adjustably attached to the blocks by means of nuts 24 in Figs. 3 and 7.

In placing the belt around the pulleys, it is made sufficiently tight to draw the blocks 20 outward, the belt, as before stated, passing behind the pulleys 15, and thereby insuring a sufficient tension on the belt. The central or driving pulley 14 is loosely mounted on a suitable journal formed on the upper end of a post or pillar 25, firmly secured to the frame 1, and on the same journal below the pulley 14 is loosely mounted a beveled pinion 26, which may be formed integral with the pulley;

or the hubs of the pulley and pinion may be interlocked by suitable recesses and projections, as shown in Figs. 2 and 3. The pinion 26 and pulley 14 are driven by means of a beveled pinion 27 on the power-shaft 28, which is mounted in suitable bearings 29, formed on the frame 1. This shaft 28 is provided with fast and loose pulleys 30 and 31, and is driven by a belt 57 from a suitably-arranged power-pulley. (Not shown.) A pulley 32 is also keyed to the shaft 28 and power is transmitted therefrom by means of a belt 33 to a pulley 30^a on the shaft 28^a, which is mounted in suitable bearings 29^a on the under side of the frame 2. On the inner end of the shaft 28^a is keyed a beveled pinion 27^a, intermeshing with a corresponding pinion 26^a, which together with a pulley 14^a is mounted on a suitable journal formed on the lower end of depending shaft 34, having its upper end secured to the frame 2. The pulley 14^a and pinion 26^a are either formed integral with each other or interlocked in the same manner as the pulley 14 and pinion 26. Power is transmitted from the pulley 14^a to driving-pulleys 12^a by means of a belt 13, passing around said pulleys and also around tension and guide pulleys 15^a and 16^a, as shown in Fig. 4. The tension and guide pulleys 15^a and 16^a are mounted in the same manner as the pulleys 15 and 16 except in an inverted position—*i. e.*, the pulleys are loosely mounted on the lower ends of pillars 18^a and 19^a, whose upper ends are secured to the frame 2 and to movable blocks 20^a, respectively. The tubular bosses 8^a, forming the bearings for the shafts 9^a, are formed on blocks 35, fitting in sockets 36, formed in the ends of the radial arms 4. This construction permits of the adjustment of the bosses and with them of the work-holders 37 on the upper ends of the shafts 9^a.

The blocks are held from removal from and rotation in their sockets 36 by blocks 38, fitting in the slots 39 and held in position by screws 40, or said blocks, as shown in Fig. 8, may be held in their adjusted positions by clamps consisting of bars 38, extending across the slots 39 in the walls of the sockets, and screws 40, passing through the bars and entering the blocks 35. The portion of the work-holders 37 on which the articles to be operated on are held may be of any construction suitable for securing the articles in position and are provided on their under sides with sockets 41, adapted to fit over the upper ends of the shafts 9^a, which are slotted, as shown in Figs. 2, 5 and 6, for the reception of pins or cross-bars 43, arranged transversely of the sockets 41, thereby insuring the rotation of the work-holders with the shafts and their easy removal and readjustment.

In lieu of securing the driving-pulleys 12^a directly upon the shafts 9^a they are keyed or otherwise fastened on sleeves 44, loosely surrounding the shafts 9^a, and held as against vertical movement while free to rotate within the tubular bosses 8^a by pins 45, as shown in Fig. 2. The shafts 9^a are so arranged as to be free to rotate within the tubular bosses and to permit of the independent rotation of the sleeves 44, and also to move vertically in order to move the work-holders toward and away from the grinding or polishing tools. The vertical movements of the tools are effected by means of levers 46, pivoted to hangers 47, attached, as shown in Fig. 2, to the under side of the frame 2. On the levers are arranged pins 48, having their upper ends rounded and fitting in holes in the lower ends of the shafts 9^a.

In grinding plane surfaces, as tiles or the faces of flat-irons, as shown in Fig. 5, it is preferred to arrange the axes of the shafts 9 and 9^a eccentrically by moving the tubular bosses 8^a outwardly so as to bring as great a portion of the faces of the grinding-tool as possible in contact with the article being ground, thereby preventing the cutting of grooves or an uneven wearing away of the tool. This outward adjustment of the work-holders is readily permitted by the yielding tension-pulleys 15 without changing the length of the belt or affecting its effective bearing on the pulleys 12^a.

In order to adapt the machine for grinding plow-colters or other rotary cutters, as shown in Fig. 6, a work-holder having a socket somewhat larger than the end of the shaft 9^a is employed, so as to permit of a slight tipping of the work-holder, necessary for the presentation of the edge of the cutter at the desired angle to the operative faces of the grinding or polishing tools. This tipping or inclination of the work-holder is effected by means of a friction-roller 49, mounted in the upper end of a post 50, adjustably supported in a socket 51, formed on the end of a sleeve 52, which fits loosely over a finger 58, projecting outwardly from the tubular boss 8^a.

In order to hold the friction-roller in operative position and also permit of its being turned down out of the way, a pin 53 is passed through a slot 54, formed longitudinally of the sleeve, into the finger 58, and at the inner end of the slot 54 and at right angles thereto is formed a branch slot 55. By pulling the sleeve 52 outwardly along the finger until the pin is in line with the lateral or branch slot 55 the roller may be turned down out of engagement with the work-holder.

It will be readily understood by the skilled mechanic that the friction-roller may be supported in other ways than that shown and described and that other means for effecting the inclination of the work-holder may be employed.

In grinding or polishing the inner surfaces of hollow articles, as frying-pans, a suitable tool is attached to the shaft 9, and the pan is secured in one of the work-holders, and the latter raised until the tool is in operative position. During the grinding operation the inner walls of the pan will be held by the tension-pulleys 15^a, operating through the belt

13ª, against the edges of the tool, said belt passing inside of the pulleys 15ª, which are drawn in by their springs 22ª, and outside of the pulleys 12ª, where said pulleys and other shafts and connections, being free to move radially, are drawn inwardly.

Other adjustments or changes of the parts hereinbefore described will readily suggest themselves to those skilled in the art, whereby the machine may be adapted for operation on a large variety of articles.

While it is preferred to have the grinding-tools and work-holders rotate in opposite directions, they may be rotated in the same direction, the work-holders moving at a much slower speed than the grinding-tools, such slower movement being attained by making the pulley 14ª smaller than the pulley 14, or in any other of the many ways known in the art. In case it is desired to cause the tools and work-holders to rotate in the same direction, the shafts 25 and 34 may be formed integral with each other, as indicated in dotted lines in Fig. 3, and, if desired, said shaft may be driven by a pulley 56, secured thereto between the frames 1 and 2, as shown in dotted lines, the driving-belt 57 passing around suitably-arranged guide-pulleys.

I claim herein as my invention—

1. In a grinding-machine, the combination of centrally-arranged driving-pulleys, a series of radially-arranged grinding-tools provided with pulleys, a like series of work-holders also provided with pulleys and belts arranged around the driving-pulleys, and the pulleys on the shafts of the tools and work-holders, substantially as set forth.

2. In a grinding-machine, the combination of centrally-arranged guiding-pulleys, a series of radially-arranged grinding-tools provided with pulleys, a like series of work-holders also provided with pulleys, belts from the driving-pulleys passing around the pulleys on the tools and work-holders, and means for adjusting the tension of the belts, substantially as set forth.

3. In a grinding-machine, the combination of centrally-arranged driving-pulleys, a series of radially-arranged grinding-tools provided with pulleys, a like series of adjustable work-holders provided with pulleys, belts from the central pulleys passing around the pulleys of the tools and work-holders, and automatically-adjustable means for regulating the tension of the belts passing around the pulleys to the work-holders, substantially as set forth.

4. In a grinding-machine, the combination of centrally-arranged driving-pulleys, a series of radially-arranged grinding-tools, a like series of vertically-movable work-holders, the tools and work-holders being provided with pulleys, and belts extending from the central pulleys, and passing around the pulleys of the tools and work-holders, substantially as set forth.

5. In a grinding-machine, the combination of driving-pulleys, a series of grinding-tools provided with pulleys, a like series of work-holders also provided with pulleys and belts arranged around the driving-pulleys and the pulleys of the tools and work-holders, substantially as set forth.

6. In a grinding-machine, the combination of a rotating grinding-tool, a rotating shaft having its axis parallel or approximately parallel with the axis of rotation of the grinding-tool, a work-holder pivotally mounted on said shaft and rotatable therewith, and a support for holding the work-holder at an angle to its shaft, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOHN COYNE.

Witnesses:
DARWIN S. WOLCOTT,
W. B. CORWIN.