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RADIAL DRILL.

No. 496,273. Patented Apr. 25, 1893.

Fig. 1.

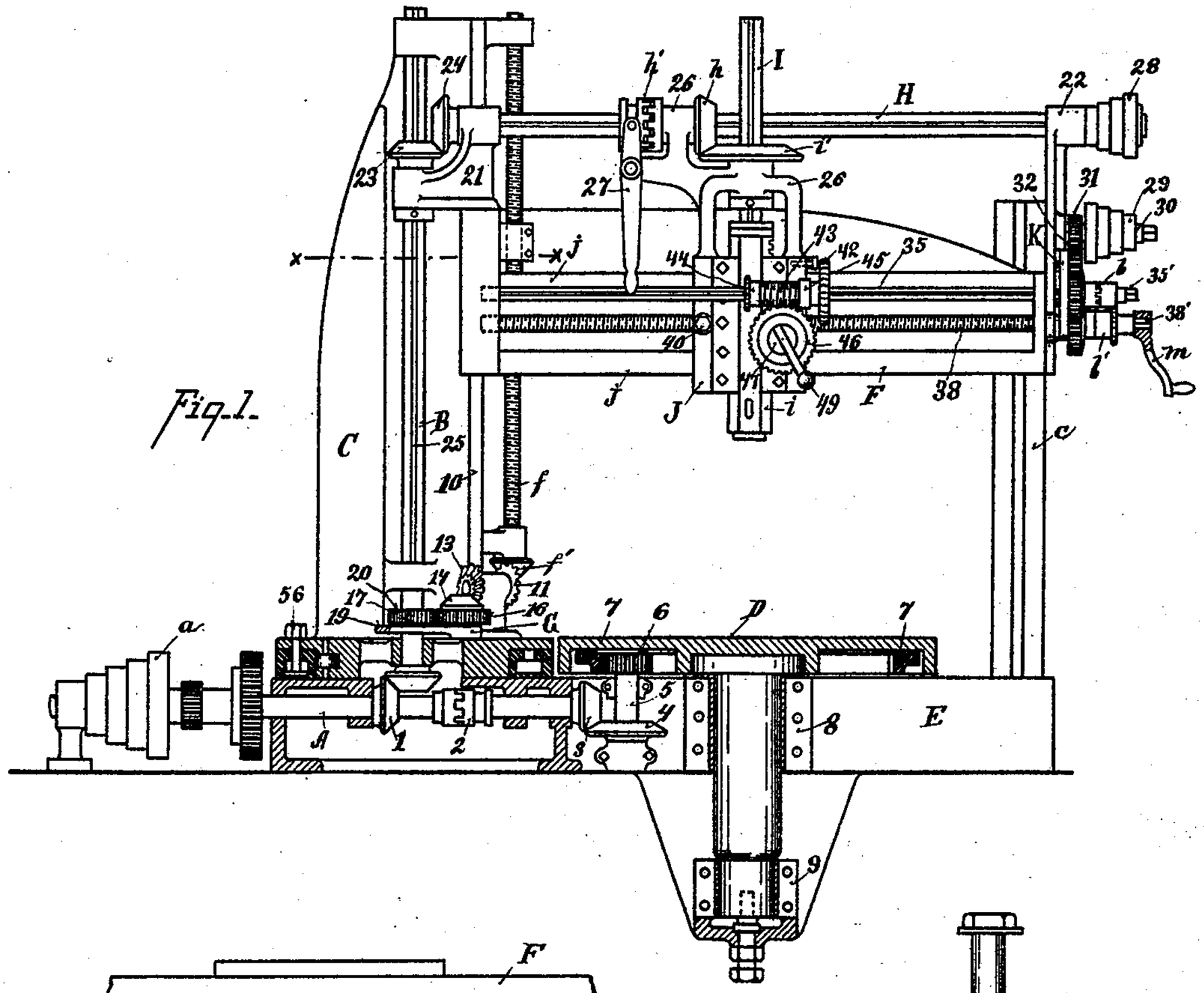


Fig. 5.

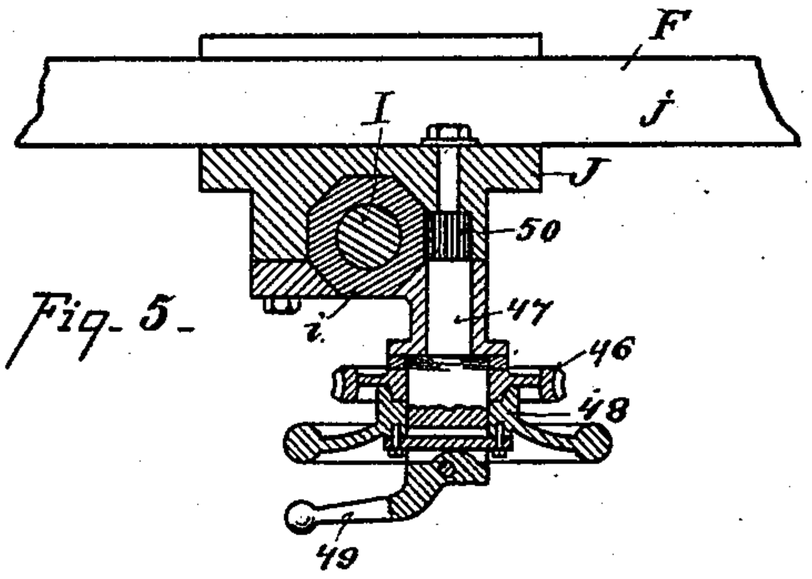
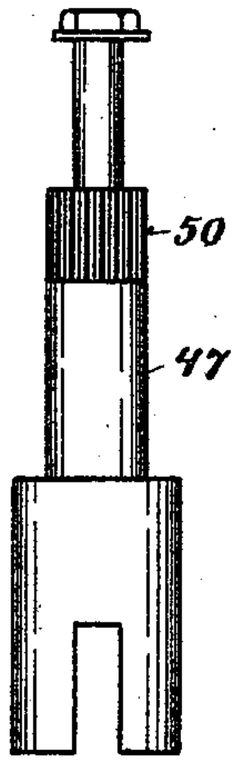


Fig. 6.



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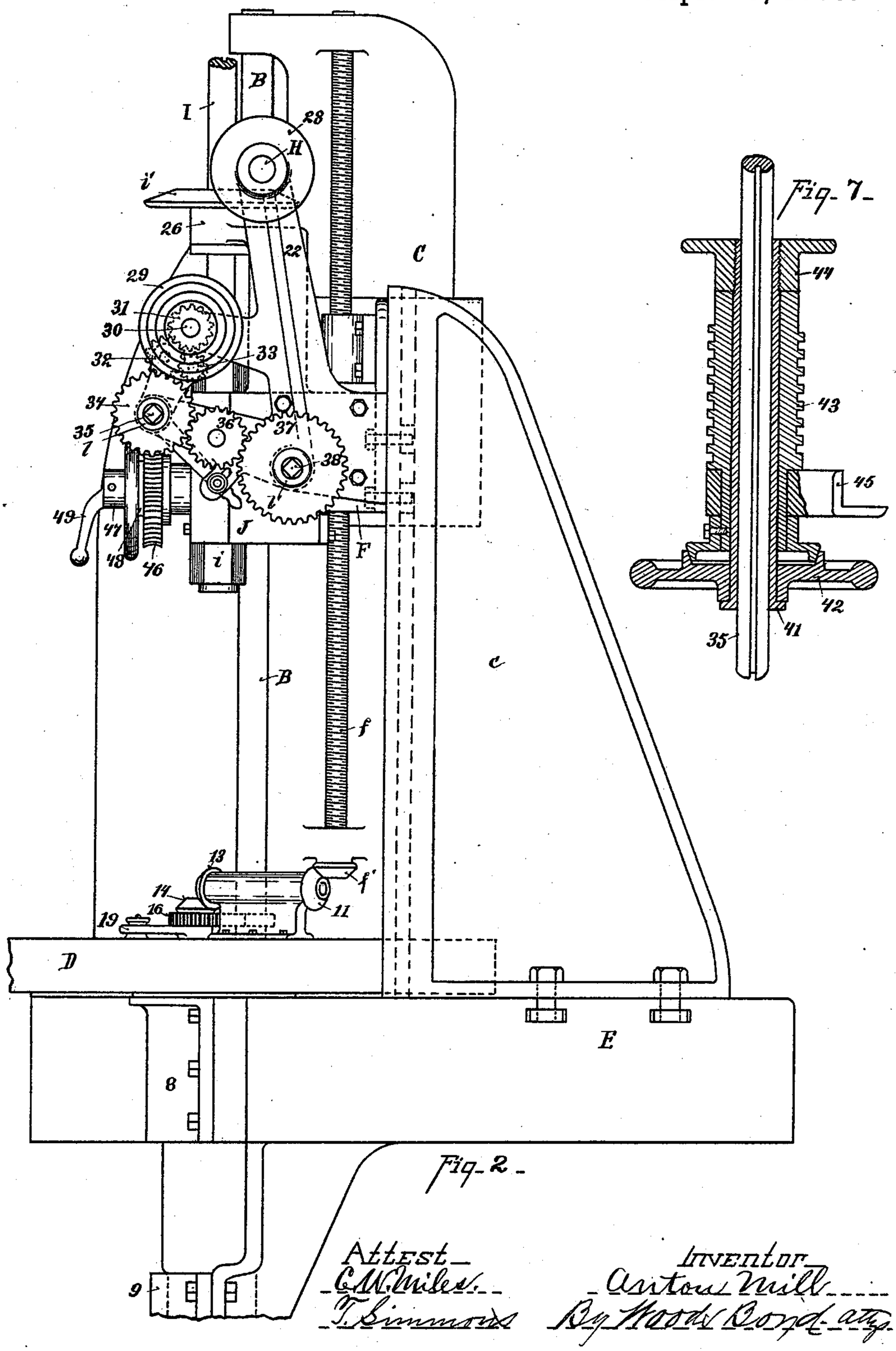

Fig. 2.

Fig. 7.

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Fig. 3.

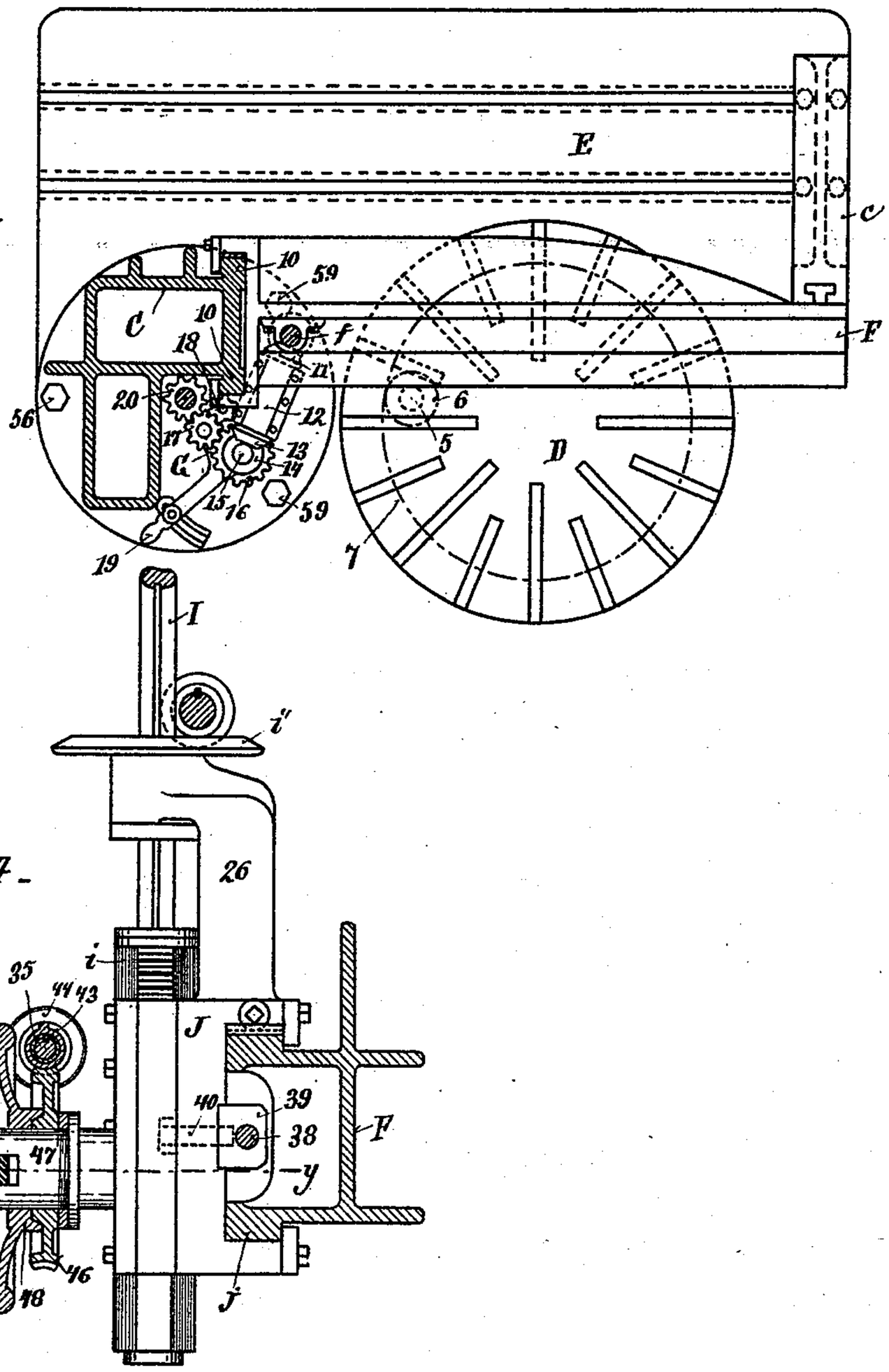

Fig. 4.

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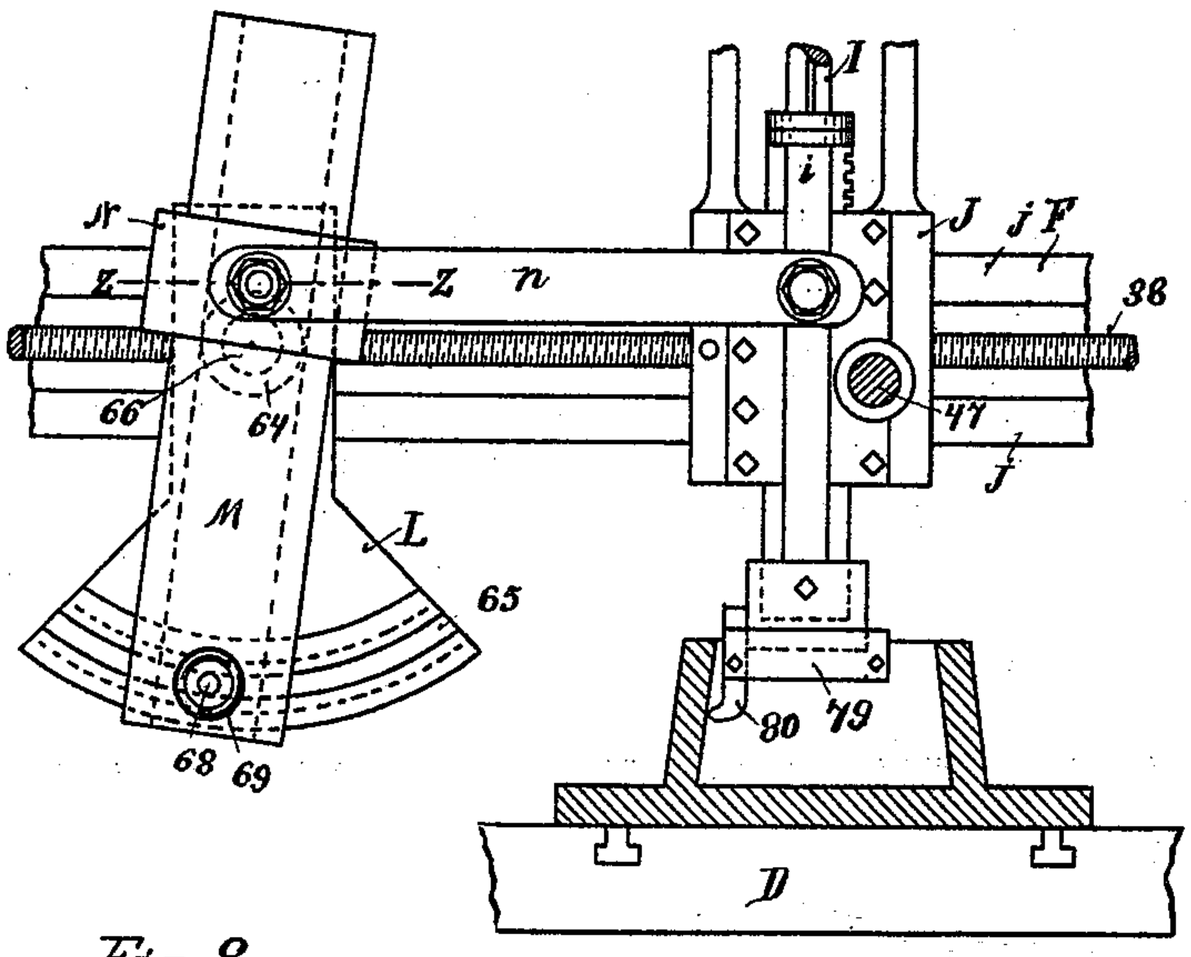


Fig. 8.

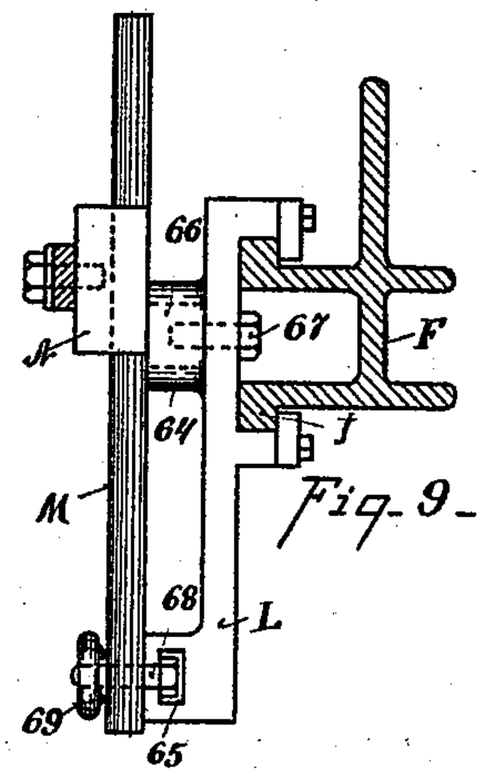


Fig. 9.

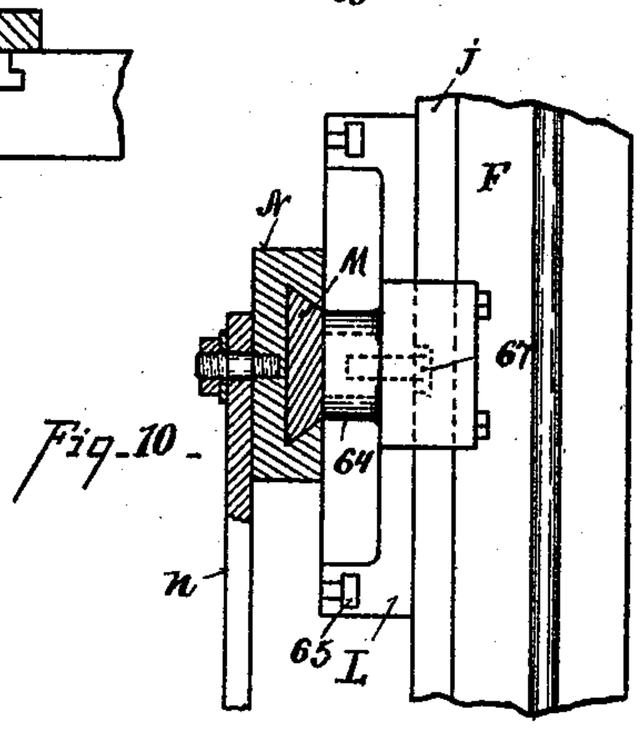
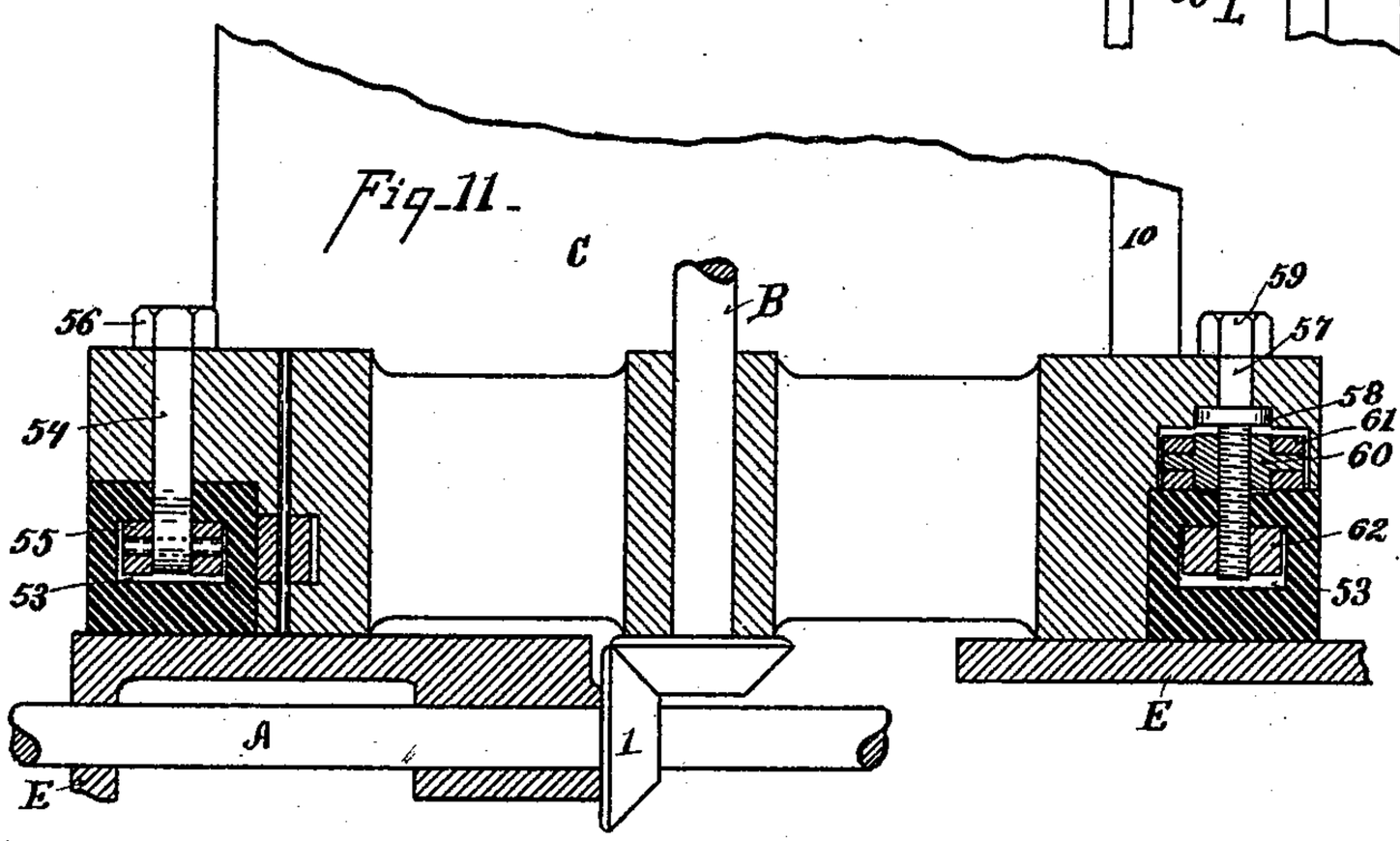


Fig. 10.



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UNITED STATES PATENT OFFICE.

ANTON MILL, OF CINCINNATI, OHIO.

RADIAL DRILL.

SPECIFICATION forming part of Letters Patent No. 496,273, dated April 25, 1893.

Application filed June 6, 1892. Serial No. 435,750. (No model.)

To all whom it may concern:

Be it known that I, ANTON MILL, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Radial Drills, of which the following is a specification.

My invention relates to a combined drilling and turning machine.

Its object is to provide a tool which may be used interchangeably for drilling or turning preferably heavy castings, though it may be advantageously used for light work.

Its object is further the improvement of the various details of construction, all of which will be fully set forth in the description of the accompanying drawings making a part of this specification, in which—

Figure 1 is a front elevation partly in section. Fig. 2 is an end elevation. Fig. 3 is a section on line *x*, *x*, Fig. 1, with the traveling head removed. Fig. 4 is a detail side elevation partly in section of the traveling head and tool spindle. Fig. 5 is a section on line *y*, *y*, Fig. 4. Fig. 6 is an enlarged detail of the stud shaft for feeding the tool spindle vertically. Fig. 7 is a detail of another portion of the mechanism employed to effect the vertical feed of the drill spindle. Fig. 8 is a front elevation of an attachment for effecting a diagonal feed of the tool spindle. Fig. 9 is a side elevation of the same. Fig. 10 is a section on line *z*, *z*, Fig. 8. Fig. 11 is a detail section of the means for swiveling the upright supporting column.

As illustrated in the drawings the drill or tool spindle is adapted to be revolved or rotated in its bearings and is further provided with lateral and vertical feed while the table supporting the work may be rotated either to bring the work into position or continuously when used as a turning tool.

A represents the main or driving shaft. *a*, *a*, cone driving pulley.

1 represents a beveled pinion driving an upright shaft B supported on the column C.

2 represents a clutch by means of which the beveled pinion 3 may be engaged with and driven from the main shaft. This gear 3 drives beveled gear 4 upon shaft 5.

6 represents a spur gear secured to shaft 5 and driving the table D by means of the internal gear 7 on the under side of the table. The table D journals in bearings 8, 9, on the bed plate E.

F represents a lateral arm traveling vertically on ways 10 on the column C, and supported at its outer end by bracket *c*. This arm is vertically adjustable by means of the screw shaft *f* journaled in ears projecting from the column C. The screw shaft *f* is driven in the following manner: *f'* represents a beveled gear, at its lower end driven by pinion 11 on the shaft 12 at the opposite end of which is a beveled gear 13 driven by beveled pinion 14 on stud shaft 15. 16 represents a spur gear also on shaft 15.

G represents a tumbler plate carrying spur gears 17 and 18, and operated by hand lever 19 so as to throw either gear 17 or 18 into engagement with spur gear 20 on shaft B, or, to throw both gears out of engagement when desired. When gear 17 is in engagement screw shaft *f* is driven in the direction to raise arm F, and when gear 18 is in engagement arm F is lowered and when both gears 17 and 18 are out of engagement with gear 20 arm F is stationary.

Motion is transmitted to the drill spindle and feed mechanism by means of shaft H mounted in brackets 21, 22, secured to the lateral arm F. Shaft H receives motion from shaft B by means of beveled gear 23, 24, gear 23 also journaling in bracket 21 and carrying a feather which engages the spline 25 of the shaft B.

The drill spindle I journals in an octagonal sleeve *i* which is mounted in the traveling head J sliding on ways *j* on the arm F.

i' represents a beveled gear splined to the drill spindle and journaling in bracket 26 of the traveling head.

x represents a gear also journaling in the bracket 26.

h' represents a clutch splined to shaft H and operated by lever 27 to engage the gear *h* and drive the drill spindle. To the outer end of shaft H is secured a cone pulley 28 driving by means of a belt the cone pulley 29 on stud shaft 30 secured to bracket 22.

31 represents a spur gear also journaling on stud shaft 30 and driven by cone pulley 29.

K represents a tumbler plate similar in construction to tumbler plate G and carrying a

spur gear 32, 33. By means of this tumbler plate either forward or reverse motion is transmitted to spur gear 34 and its shaft 35. Gear 34 also transmits motion by means of spur gears 36, 37, to the screw shaft 38.

l represents a clutch on shaft 35, and *l'* a friction clutch on shaft 38 by means of which the gears 34 and 37 may be disconnected from either shafts at will and allowed to turn idle upon the same.

35' and 38' represent wrench seats by means of which the shafts may be turned by means of the crank arm *m* when out of engagement with the gears 34, 37. The lateral adjustment of the traveling head is effected by means of a nut 39 on shaft 38, which is clamped to the head by means of screw bolt 40.

In order to feed the drill to its work the octagonal sleeve is fed vertically backward and forward by the following instrumentalities: 42 Fig. 7 represents one member of a friction clutch splined to the forward end of the sleeve 41.

43 represents a worm sleeve journaling on the sleeve 41 and carrying at its forward end the opposite member of the friction clutch to engage the member 42.

44 represents a nut for forcing the two members into engagement.

45 represents a bracket secured to the traveling head and in which the worm sleeve journals. The worm 43 engages a worm wheel 46 loosely journaled on the stud shaft 47, which journals in the traveling head, see Figs. 5 and 6.

48 represents a friction clutch secured to the shaft 47 and engaging worm wheel 46.

49 represents a cam lever for throwing the clutch into engagement with the worm wheel.

50 represents a spur gear on shaft 47 which engages a rack on the octagonal sleeve *i* to drive it upward or downward.

The column C is adapted to be swiveled on its center in the following manner: 52, see Fig. 11, represents an annular ring secured to the bed plate, and upon which the base of the column normally rests.

53 represents an annular T-shaped groove in the upper face of the ring 52.

54 represents an eye bolt carrying friction rollers 55, and provided with nut 56 to adjust the rollers to the proper position.

57 represent two bolts upon the opposite side of the column, that is upon the side from which the lateral arm is suspended. These bolts are provided with a collar 58, a head 59, and screw threaded shank.

60 represents a nut provided with friction rollers 61 upon either side and through which the screw threaded shank or bolt 57 passes.

62 represents a second nut placed in the annular T-shaped groove and screw threaded to receive the shank of bolt 57. When it is desired to turn the column the bolt 57 is turned to the left forcing the rollers 61 against the upper face of ring 52, while the weight of the column rests upon the collar 58. As the weight of the lateral arm tends to tilt the column the opposite side of the base of the column is raised and the rollers 55 bear against the upper wall of the T-shaped groove 53. The column may now be turned to any desired position, when the bolts 57 are turned in the opposite direction until the base is clamped rigidly in position by the bolts 57 and nuts 62.

The mode of operation is as follows: For drilling the work is placed upon the table and the table turned by hand until the place marked to be drilled is in the horizontal path of the drill; the traveling head is then fed laterally until the drill comes into position above the place to be drilled by means of the screw shaft 38. The drill is then fed vertically by means of gear 50 driven in the manner heretofore described. When, however, the work is of large dimensions the arm F is detached from the bracket C, and the column rotated in the usual manner to bring the drill to the desired position. When it is desired to be used for turning, a head block 79 see Fig. 8, is secured to the sleeve *i* and the tool 80 secured to the head block. The tool is then fed into engagement with the work and the work and table rotated continuously while the tool is steadily fed either vertically or laterally according to the character of the work.

The attachment represented in Figs. 8, 9 and 10, is designed as indicated in Fig. 8, to be used in turning tapering or conical surfaces. When this attachment is in use the connection with screw shaft 38 is severed by unclamping the nut 40.

L represents a segment securely clamped to the arm F; this segment is provided with a raised socket 64, Fig. 9 and a T-shaped segmental groove 65 at its lower end.

M represents a guide plate provided with a boss 66 which enters the socket 64 and is held in place by a screw bolt 67.

68 represents a bolt engaging the groove 65 and passing through the guide plate M.

69 represents a set nut for clamping the plate M in the desired position.

N Fig. 9 represents a cross head sliding vertically on ways on the guide plate M. To the face of this cross head is clamped a link *n*, the opposite end of which is clamped to the face of sleeve *i*. The guide plate M being set at an angle it will be seen that as the sleeve *i* is fed upward or downward the traveling head J will be fed laterally by means of the sliding cross head N and link *n*, a distance corresponding to the angle at which the guide plate is set, and thus the tool will describe the same angle as that to which the guide plate may have been adjusted.

Having described my invention, what I claim is—

1. In a drilling machine, the combination of the tool spindle I, the vertically movable radial arm F, the traveling head J moving on said arm, the upright driving shaft B, the horizontal shaft H, the bracket 26 mounted

on the traveling head and provided with a driving gear *h* which is splined on said horizontal shaft and transmits motion to the tool spindle, the clutch *h'*, the clutch-operating lever 27 journaled on the said bracket of the traveling head and engaging the clutch, and mechanism for adjusting the radial arm vertically by the power of the machine, substantially as described.

2. In combination with the vertically feeding tool spindle I, the vertically adjustable radial arm F, the horizontal shafts H and 35 mounted upon and moving with the radial arm, the bracket 26, the clutch *h'*, splined upon shaft H, cone pulley 28 mounted upon said shaft, cone pulley 29 transmitting motion to the shaft 35 in front of the tool head, and the feeding mechanism consisting of the worm 43, and worm wheel 46 supported upon the radial arm F, substantially as specified.

3. In a drill press, in combination with the vertically movable radial arm F and the shafts H, 35, 38, mounted thereon, the tool spindle and tool head supported upon the radial arm F, the vertically feeding mechanism consisting of the worm 43, and worm wheel 46, the clutch mechanism 48 mounted upon the shaft 47, and the cam lever 49 for operating the clutch, whereby the spindle may be fed automatically by the machine and disengaged and turned back by hand, substantially as specified.

4. In a drill, in combination with the vertically movable radial arm F, the shafts H, 35, 38 mounted thereon, and the cone pulleys 28, 29, for transmitting motion to said shafts 35 and 38, the clutch mechanism *l* on shaft 35, and the crank arm *m*, whereby when the shaft 35 is thrown out of gear the lateral feeding of the tool spindle and head is accomplished by the crank arm, substantially as specified.

5. In a radial drill, the combination of the vertically movable radial arm F, the shafts H, 35, 38 mounted in brackets thereon, the tool spindle and tool reversing mechanism, the worm shaft *f*, driving and clutch mechanism connected with said worm shaft, and the bracket 21 carrying the cone gears 23, 24, whereby said arm and its contained driving shafts and feed mechanism are raised and lowered by the power of the machine, substantially as specified.

6. In a drill press, the upright column C with its base supported upon an annular ring 52, having an annular T-shaped groove 53, the frictional rollers 55, supported upon the eye-bolt 54, and nut 60 provided with friction rollers 61, the nut 62, the collar 58, and bolt 57, whereby the overhanging arm is balanced against strains at the base and swiveled upon the friction roller mechanism, substantially as specified.

7. In a drill press, the upright column C with its base supported upon an annular ring 52, having an annular T-shaped groove 53, the frictional rollers 55, supported upon the eye-bolt 54, and nut 60 provided with friction rollers 61, the nut 62, the collar 58, the bolt 57 whereby the overhanging arm is balanced against strains at the base and swiveled upon the friction roller mechanism, the adjusting bolts 54 and 57 being provided with nut mechanism for shifting the weight from the friction rollers 61 direct to the ring 53, whereby the said column is frictionally held in place by the weight thereof, substantially as described.

8. In a radial drill, in combination with the vertically movable radial arm F, the shafts H, 35, 38 mounted thereon, and the reversing mechanism mounted upon a bracket at the end of said arm and consisting of the tumbler plate K carrying spur gears 32, 33, shaft 30 having spur gear 31, the gear 37 on the shaft 38 and the intermediate gears 34, 36, substantially as specified.

9. In combination with a radial drill having the vertically movable radial arm F, the horizontal tool driving shaft H, and feeding shafts 35, 38, mounted on said arm, the bracket 26, and tool spindle I, and driving mechanism also mounted thereon, mechanism for driving said tool and moving said spindle consisting of the clutch shaft A, the vertical shaft B, the horizontal shaft H, and clutch shipping mechanism for throwing in and out of gear the shafts B and H, whereby both the tool spindle and revolving table may be employed for performing work simultaneously or individually, substantially as specified.

10. In a radial drill and turning machine, the combination with a cross head F, and a laterally and vertically traveling tool head having a sleeve *i*, of a segment L secured to the cross head, a swiveled guide plate M having a set nut 69 for clamping it to the segment, a cross head N sliding vertically on the swiveled guide plate, and a link *n* pivotally connected to the vertically sliding cross head and to the said sleeve, whereby the upward or downward movement of the sleeve will cause the tool head to be fed laterally, substantially as described.

In testimony whereof I have hereunto set my hand.

ANTON MILL.

Witnesses:
T. SIMMONS,
C. W. MILES.