

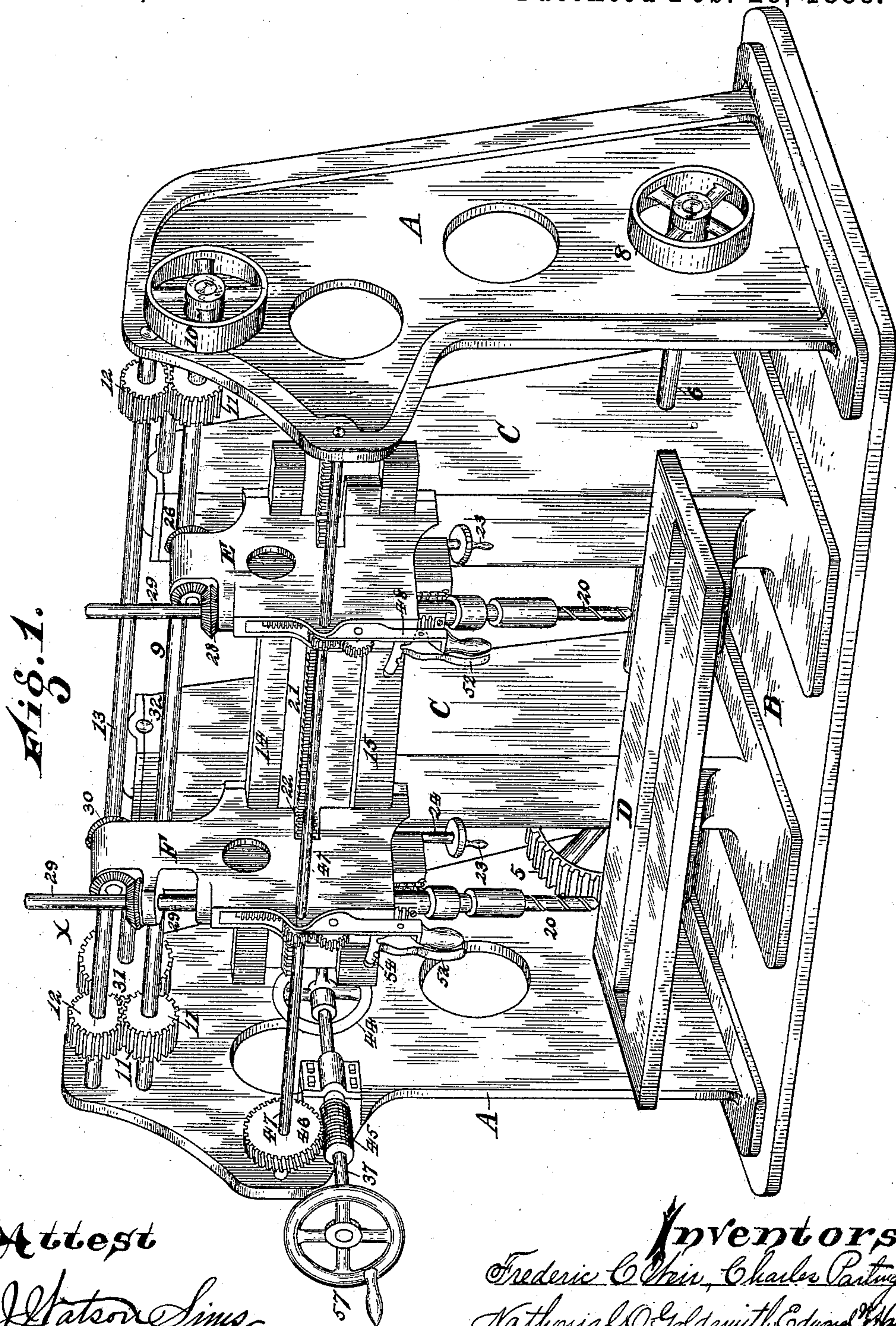
(No Model.)

3 Sheets—Sheet 1.

F. C. WEIR, C. PARTINGTON, N. O. GOLDSMITH  
& E. W. HARDEN.  
MULTIPLE DRILL.

No. 378,748.

Patented Feb. 28, 1888.



Attest  
*Watson Sims*  
*M. E. Milligan*

*Inventors,*  
*Frederic C. Weir, Charles Partington,*  
*Nathaniel O. Goldsmith, Edward W. Harden*  
*by Wood & Bond their Attorneys*



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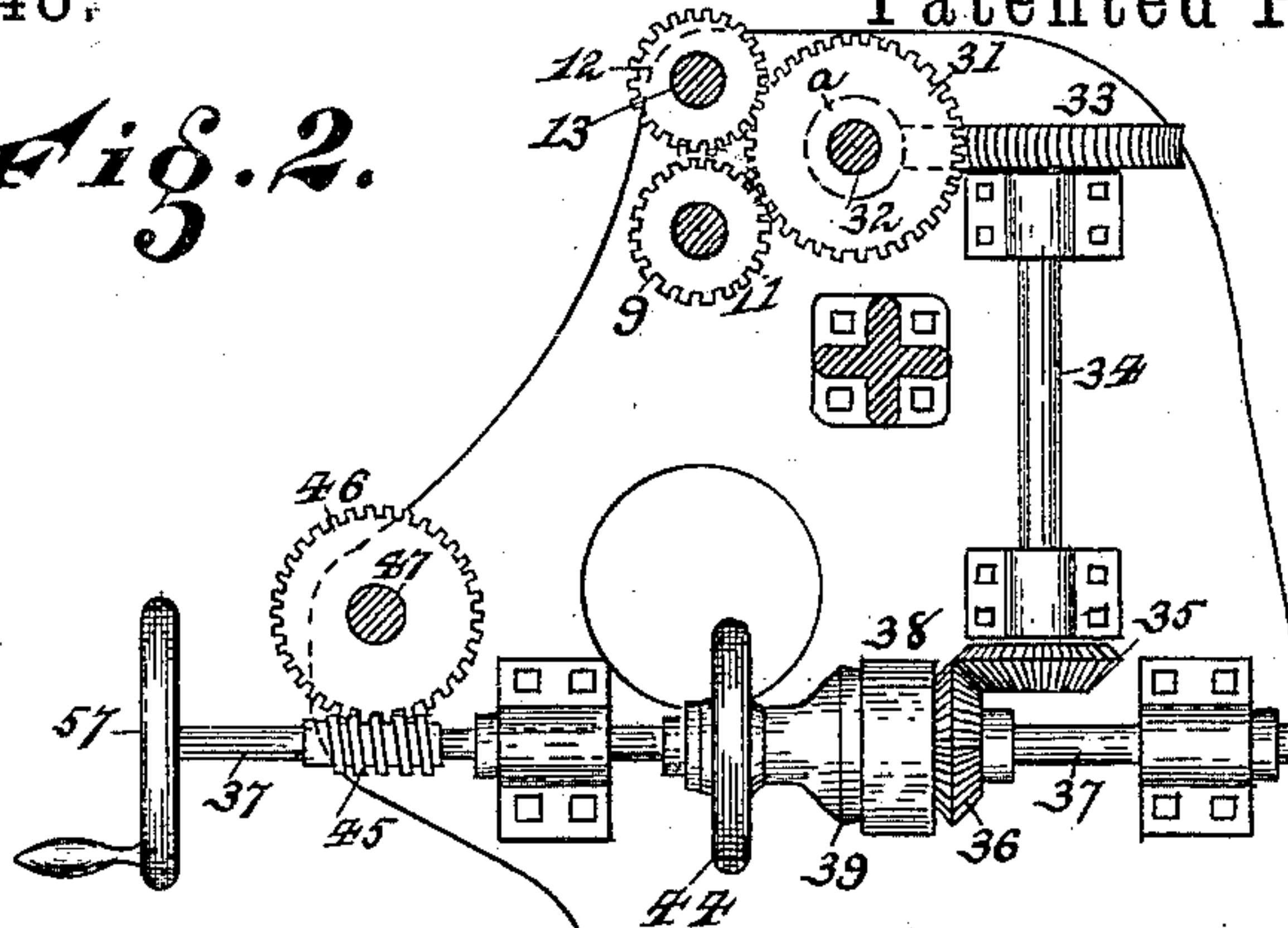
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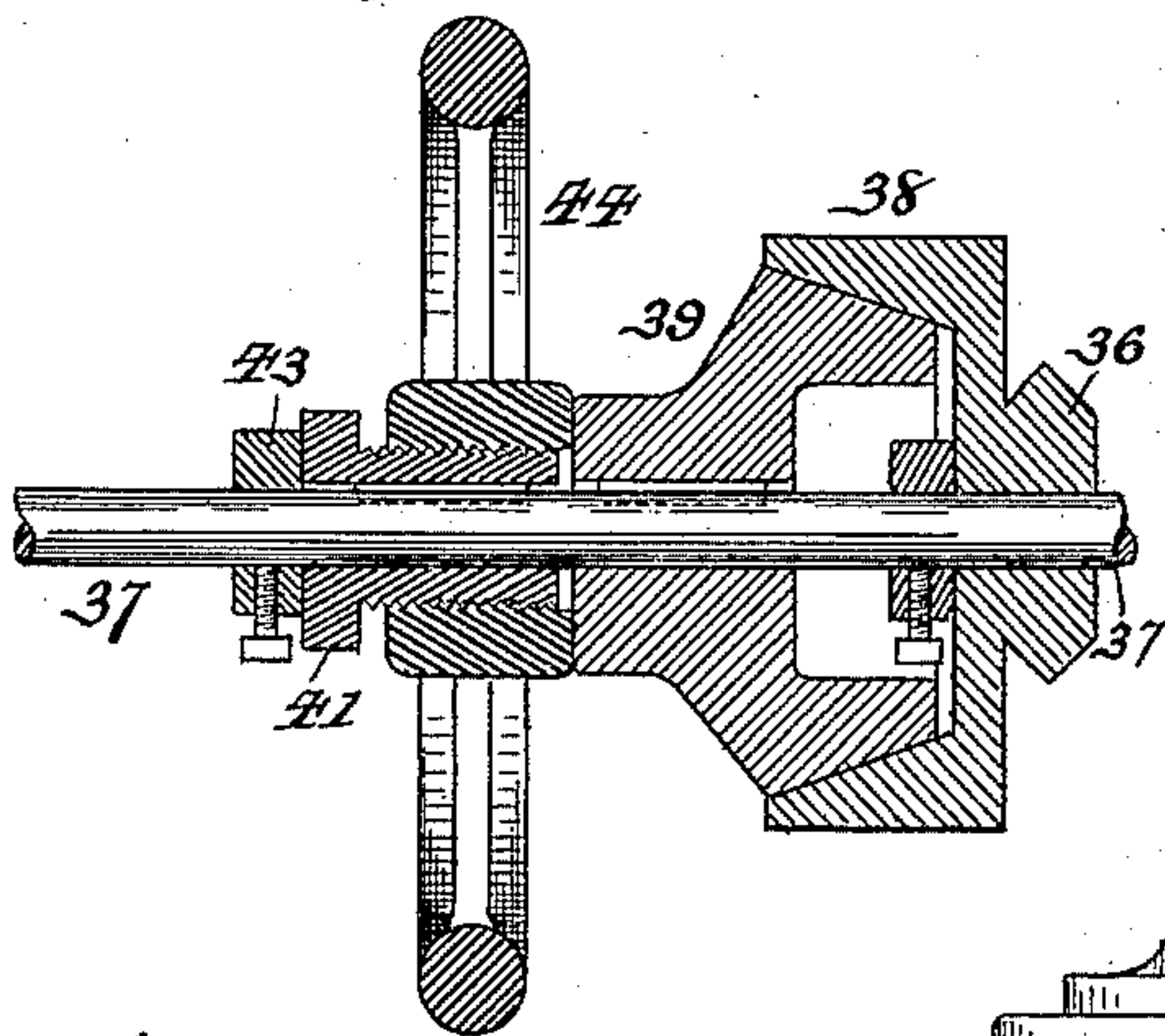
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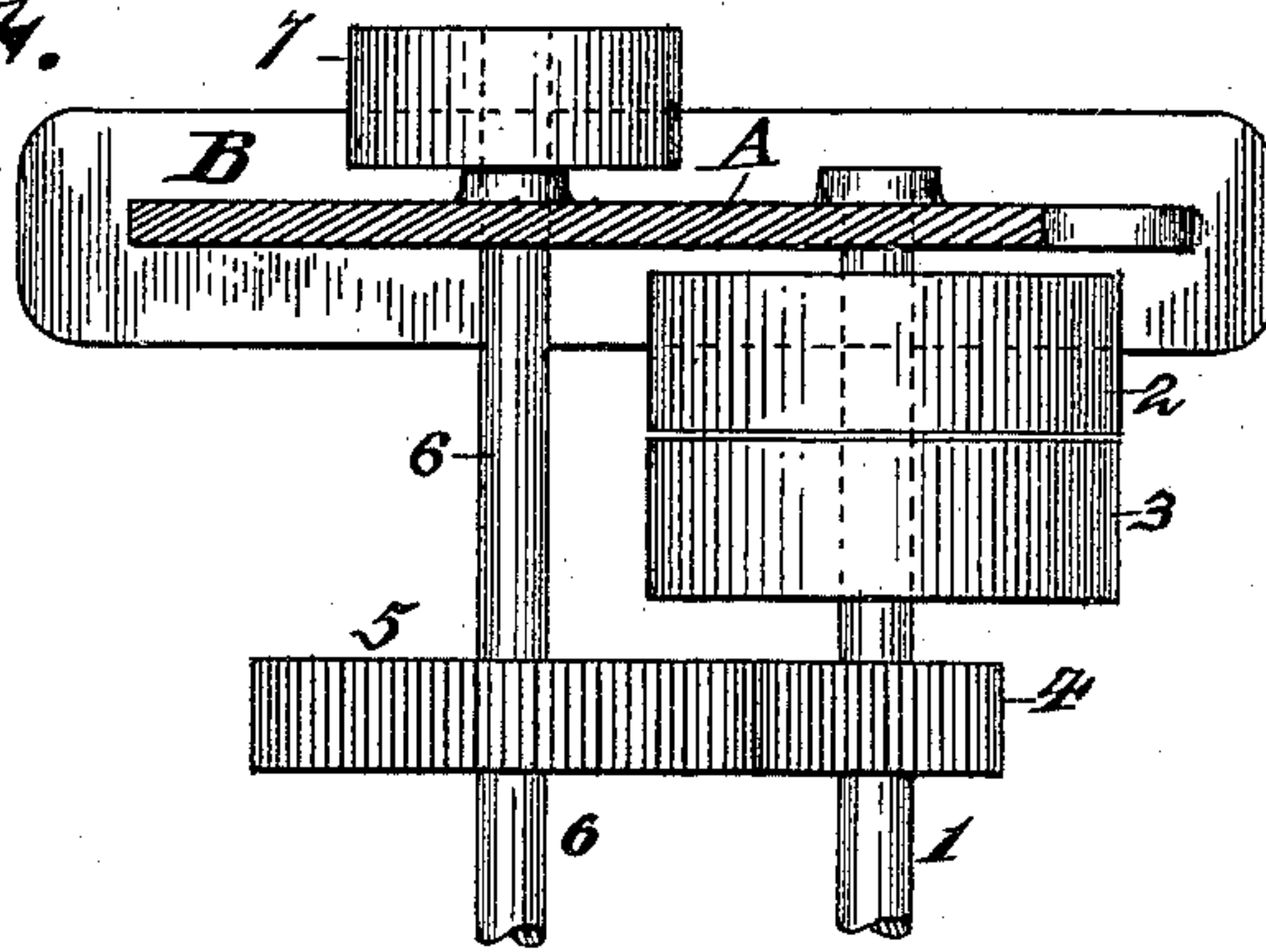
*Fig. 2.*



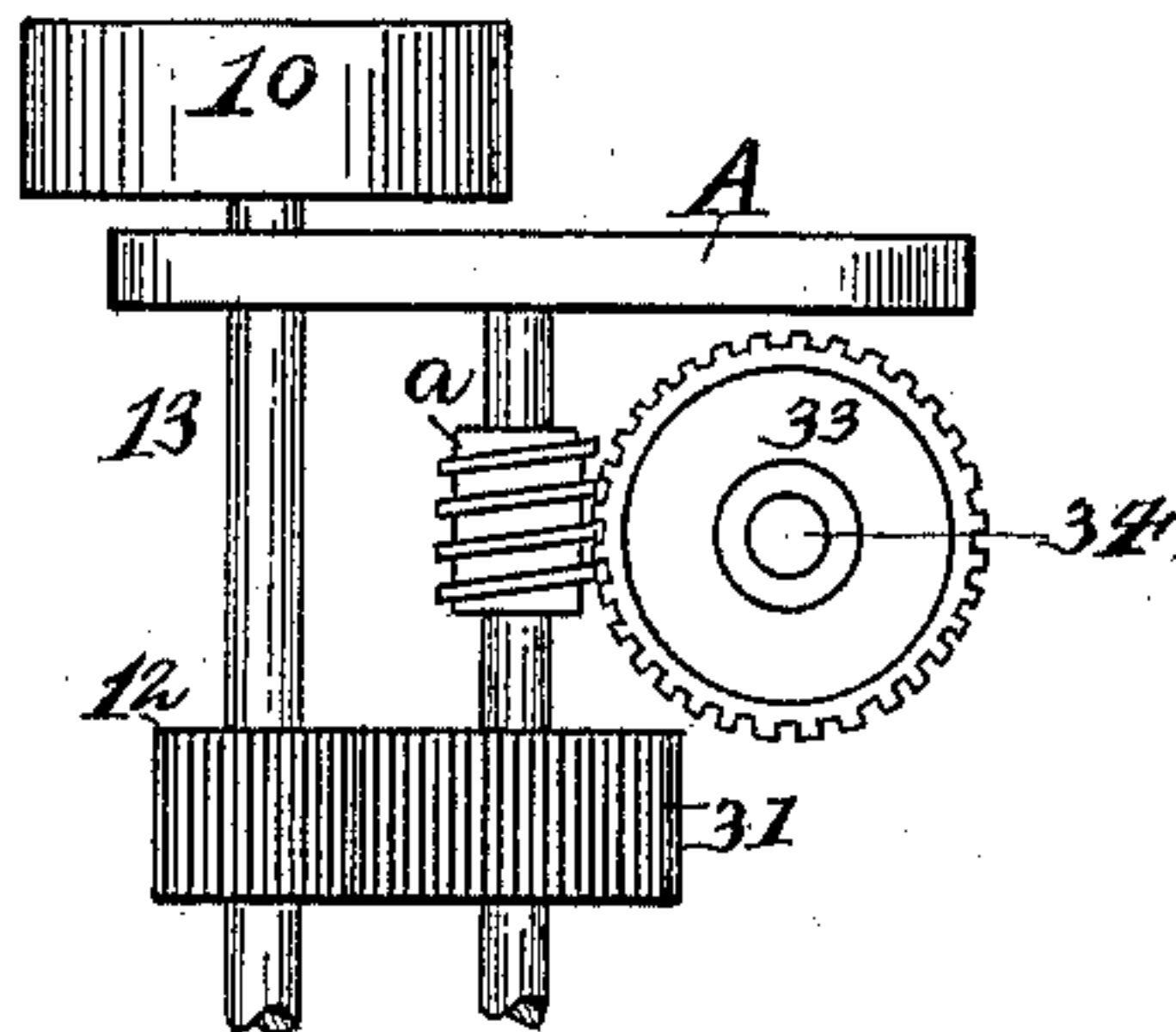
*Fig. 3.*



*Fig. 4.*



*Fig. 5.*



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(No Model.)

3 Sheets—Sheet 3.

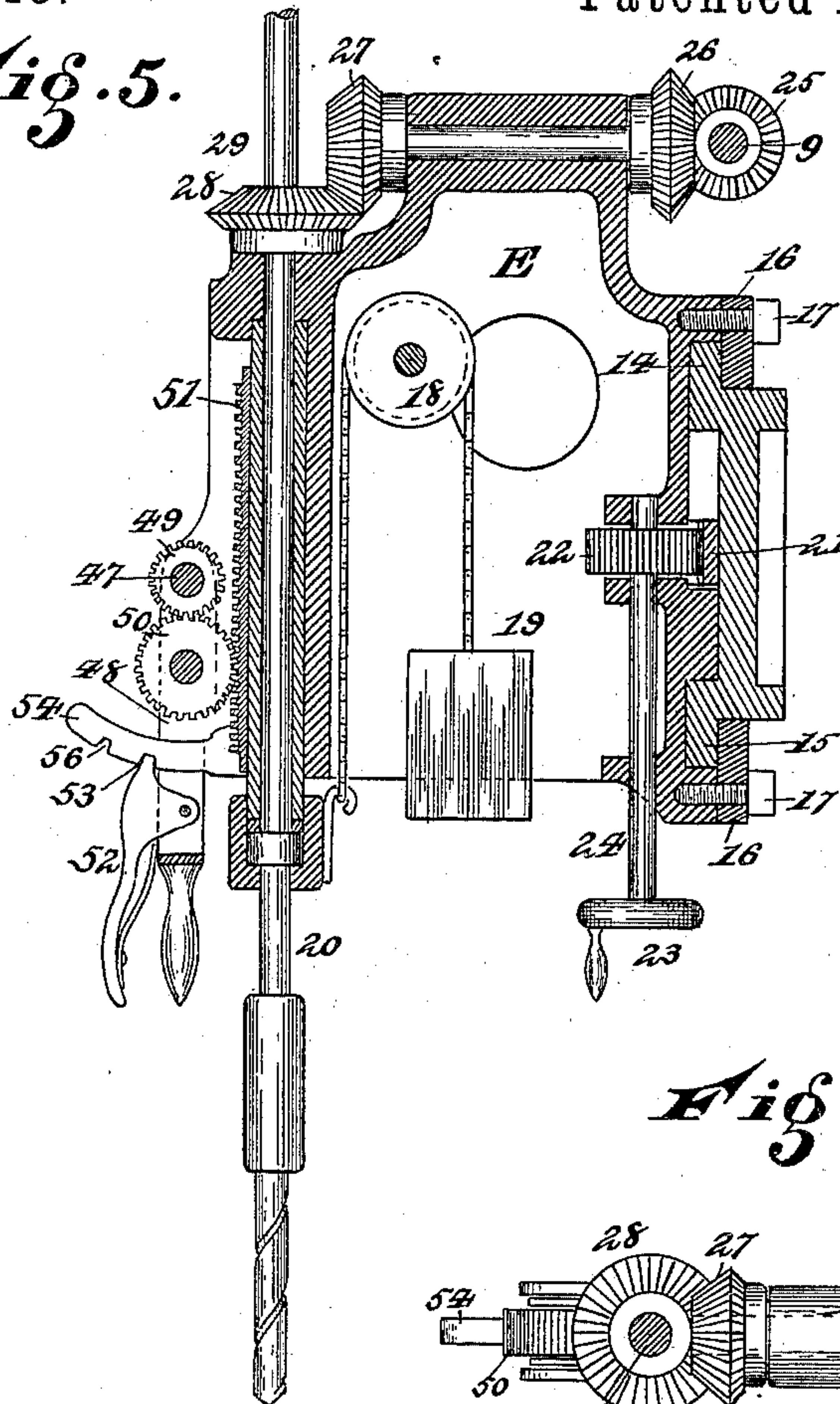
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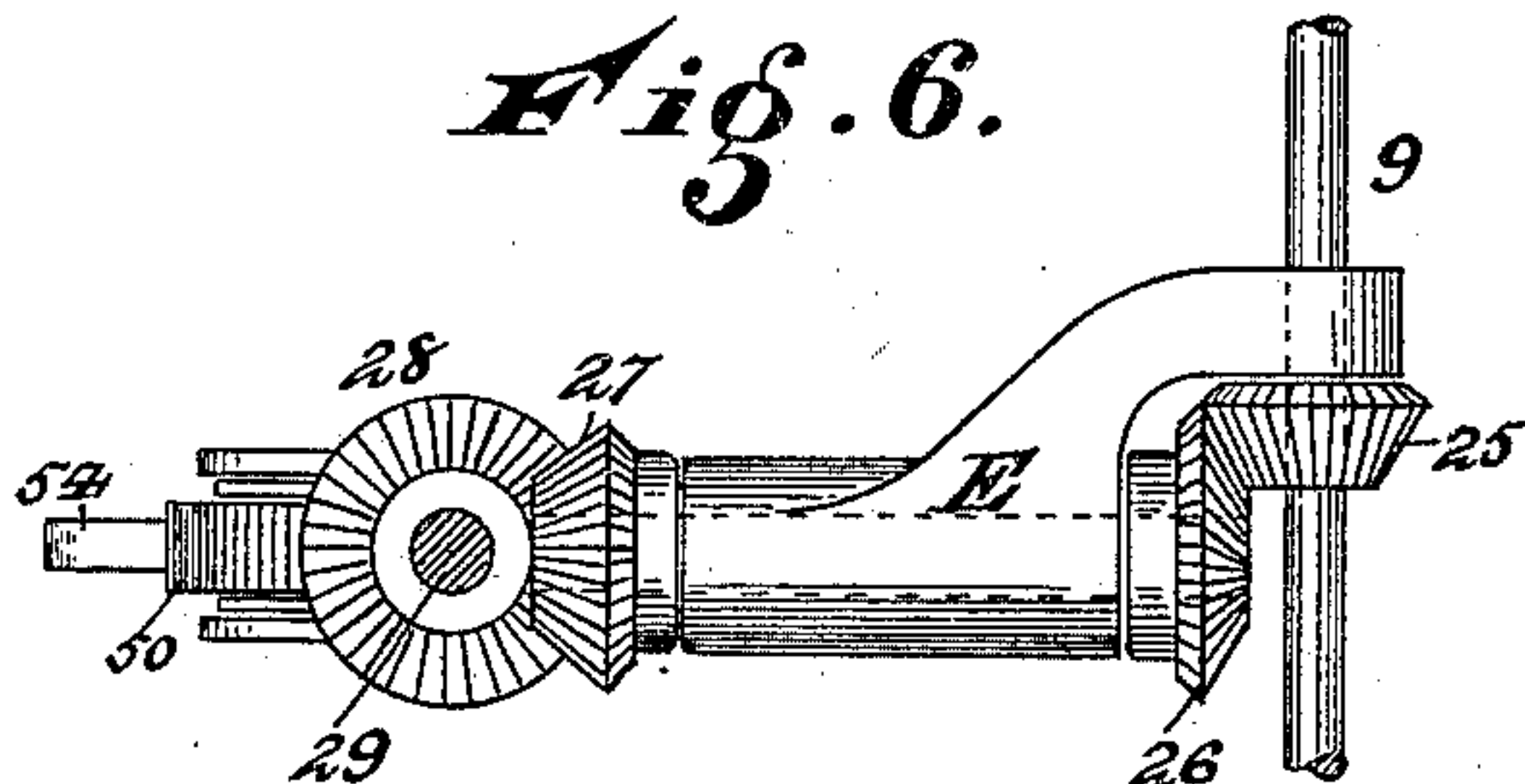
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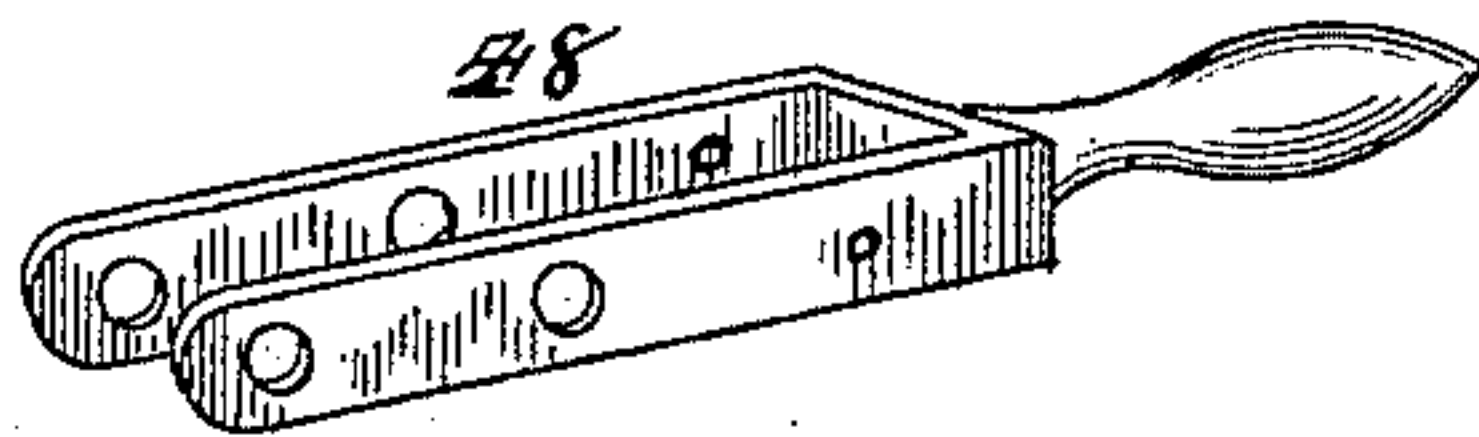
*Fig. 5.*



*Fig. 6.*



*Fig. 7.*



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# UNITED STATES PATENT OFFICE.

FREDRIC C. WEIR, CHARLES PARTINGTON, NATHANIEL O. GOLDSMITH, AND  
EDWARD W. HARDEN, OF CINCINNATI, OHIO, ASSIGNORS TO THE WEIR  
FROG COMPANY, OF SAME PLACE.

## MULTIPLE DRILL.

SPECIFICATION forming part of Letters Patent No. 378,748, dated February 28, 1888.

Application filed November 28, 1887. Serial No. 256,316. (No model.)

*To all whom it may concern:*

Be it known that we, FREDRIC C. WEIR, CHARLES PARTINGTON, NATHANIEL O. GOLDSMITH, and EDWARD W. HARDEN, residents of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Multiple Drills, of which the following is a specification.

The object of our invention is to provide means for a varying adjustment of the drills, so that they may be set very close together or at any desired distance apart.

The various features of our invention are shown in the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of our improvement. Fig. 2 is a vertical section at  $x$ , Fig. 1. Fig. 3 is a longitudinal section of the clutch mechanism. Fig. 4 is a section showing a top plan view of one end of the driving-shafts. Fig. 5 is a side elevation of the drill-stocks. Fig. 6 is a top plan view of the same, Fig. 7 is a perspective view of the swiveling unshipping gear-frame. Fig. 8 is a top plan view of main transmitters for the feed.

A A represent the end of the frame; B, the bed; C, the center posts; D, the table, which is usually made adjustable, but, for convenience of showing the other parts, is shown stationary.

The driving mechanism is shown in Fig. 4, and consists of a transmitter-shaft, 1, loose pulley 2, tight pulley 3, and spur-gear 4, transmitting motion to gear 5 on shaft 6.

7 8 represent transmitters at either end of shaft 6, for transmitting motion to shaft 9 by means of the pulleys 10 on each end of said shaft 9.

11 represents spur-gears on shaft 9, meshing with the spurs 31 on the shaft 32, transmitting power to spur 12 on shaft 13. These two shafts 9 13 are used to drive a different drill, as will be hereinafter explained.

E represents one drill-stock, and F another one, made of different heights. These stocks are hung on ways 14 15, to which they are secured by the slide-pieces 16 and screw-bolts 17. They are cast hollow or of shell form for lightness, and to allow the counterpoise-pulley 18 and weight 19 for balancing the drill-spindle 20 to be placed inside of the stocks and out of

the way. These carriages are longitudinally adjusted by means of a rack-bar, 21, and the spur-wheel 22, meshing therewith, which is driven by the crank 23, attached to shaft 24, on which the gear 22 is mounted. Thus the revolving of the crank 23 moves the carriage-stock E or F longitudinally on the drill-frame, so as to adjust the distance between the drills.

The drills are driven, as illustrated in Figs. 5 and 6, in the following manner:

25 represents a bevel-gear—say on shaft 9—meshing with bevel-gear 26, keyed upon a shaft journaled in a sleeve in the top of the stock E.

27 represents a bevel-gear on the opposite end of said shaft, meshing with the bevel 28, feathered upon the drill-shaft 29, which revolves the spindle and drives the drill 20. The drill sustained in stock F is driven in exactly the same manner by a bevel-gear upon shaft 13. It will be seen that by this arrangement of the shafts 13 and 9 their bevel-gears and stocks E and F can be adjusted close together, the bevel 30 on stock F passing above the stock E, so as to allow the two stocks to closely abut, and the bevel 26 passing below the bevel 30, allowing the two stocks E and F to abut, and still the drills be driven without interference of the gears. By this means we are enabled to drill holes within two inches and a half of each other by the multiple drill. Any desired number of these stocks may be used by being placed in alternate series and driven by the two shafts 9 and 13 in the manner herein illustrated.

The feed movement is obtained in the following manner:

31 represents a gear on shaft 32, taking motion from gears 11 and 12.

33 represents the worm-wheel on shaft 34, taking its motion from worm  $a$  on shaft 32.

35 represents a bevel keyed upon the bottom of shaft 34, meshing with bevel 36 on shaft 37.

38 represents one member of a cone-clutch, and 39 the other member, fitting therein and splined upon the shaft 37.

41 represents a screw-threaded sleeve splined upon said shaft 37.

43 represents a collar limiting the backward movement of the same.

44 represents the wheel-nut, the hub of



which is threaded, fitting upon the sleeve 41. As this wheel is turned it forces the cone 39 into the cone 38, and thereby transmits motion to the shaft 37.

5 45 represents a worm keyed upon said shaft 37 and driving the worm-gear 46, which is mounted and splined upon the feed-shaft 47. This feed-shaft extends from side to side of the frame and journals within the drill-stocks E F, as shown in Fig. 1.

10 48 represents a bifurcated frame for unshipping the feed-gear. The ends of the forks of this unshipping gear-frame swivel upon shaft 47 each side of the spur 49, which is keyed upon said shaft 47.

15 50 represents a spur-gear journaling in said unshipping-frame. When it is down in the position shown in Figs. 1 and 5, gear 50 is in mesh with the rack-bar 51, which is attached to the drill shaft 29. The driving of shaft 47 drives the spur 49, which in turn drives the spur 50, that engages with the feed-rack 51, thereby driving the gear-spindles forward or backward, as the case may be. In order to  
20 hold said spur 50 in mesh with the rack 51, we have provided a latch, 52, which engages with notch 53 on the lug 54, which projects from the carriage-stock out through the slotted unshipping-frame 48. When it is desired  
25 to unship or detach the feed, the latch 52 is released and the carriage 48 moved outward until the latch 52 engages in the notch 56, which throws the spur 50 out of engagement with the rack 51.

30 By means of the clutch arrangement we have provided a hand-feed. When the clutch 38 and 39 is released, the shaft 37 may be turned by the hand-crank 57, thereby driving the worm 45, the worm-wheel 46, and feed-shaft 47 by hand, when the unshipping-frame  
35 48 is locked in position for feeding. The drill may be adjusted, when the feed is detached, by the counterbalance-weight 18, in the usual manner, so as to lower and raise the drills to accommodate them to different sizes of work.

45 We claim—

1. The combination, with a drill-frame, of a drill-stock moving on ways and longitudinally adjustable by means of the rack-bar 21 and  
50 spur 22 on the rear of said stock, and mech-

anism mounted on the top of said stock and connected with a driving-shaft for driving the drill-shaft, substantially as specified.

2. In combination with a drill-stock, the drill-shaft driven by mechanism mounted on the top of said stock and fed by means of the rack-bar 51 and unshipping-gear 50, substantially as specified.

3. In combination with the drill-frame and drill-stocks E F, mounted thereon, the driving-shafts 9 and 13, for driving one drill by gear meshing with the upper shaft and another drill by gear meshing with the lower shaft, substantially as specified.

4. In combination with the drill having a series of stocks, E F, and driving-shafts 9 13, the feed-shaft 47, journaling in said stocks E F, and the unshipping-gear 50, for attaching and disconnecting the feed, substantially as specified.

5. In combination with the common feed-shaft, 47, and drill-stock, the unshipping gear-frame 48, swiveled upon said shaft 47 and carrying the unshipping-gear 50, substantially as specified.

6. In combination with the unshipping gear-frame 48, the latch 52, engaging in notches of lug 54, substantially as specified.

7. In combination with the feeding-shaft 47, the sectional shaft 37, for connecting and disconnecting the feed-shaft with the movement of the driving-gear, substantially as specified.

8. A multiple drilling-machine composed, substantially, of feed-stocks E F, mounted upon ways in the frame of said drill, one projecting above the other and driven by shaft 13, and the lower drill by shaft 9, with mechanism for longitudinally adjusting said drill-stocks on the plane of the frame, substantially as specified.

In testimony whereof we have hereunto set our hands.

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EDWARD W. HARDEN.

Witnesses:

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J. WATSON SIMS.