

(No Model.)

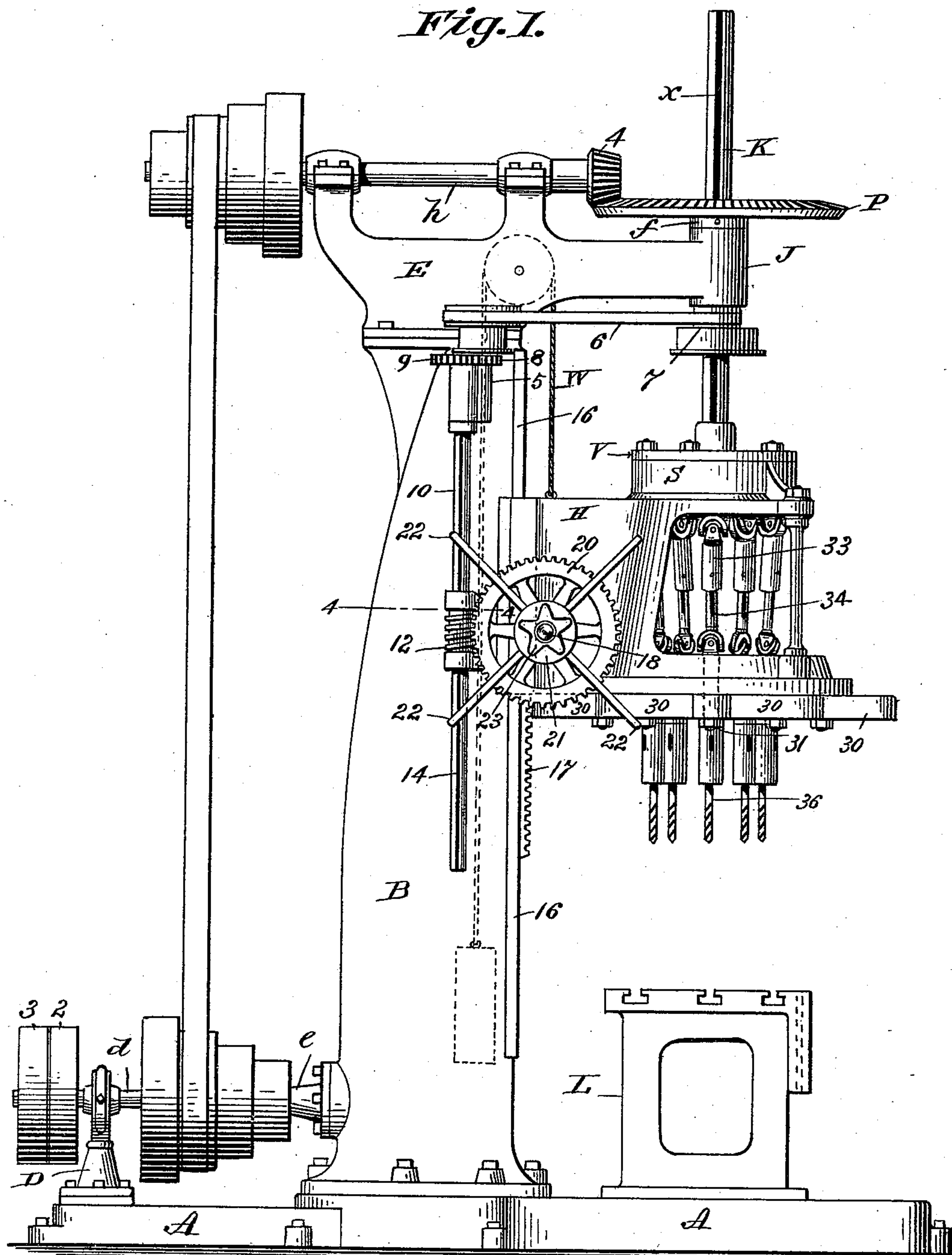
2 Sheets—Sheet 1.

C. H. BAUSH.
DRILLING MACHINE.

No. 563,545.

Patented July 7, 1896.

Fig. 1.



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Fig. 2.

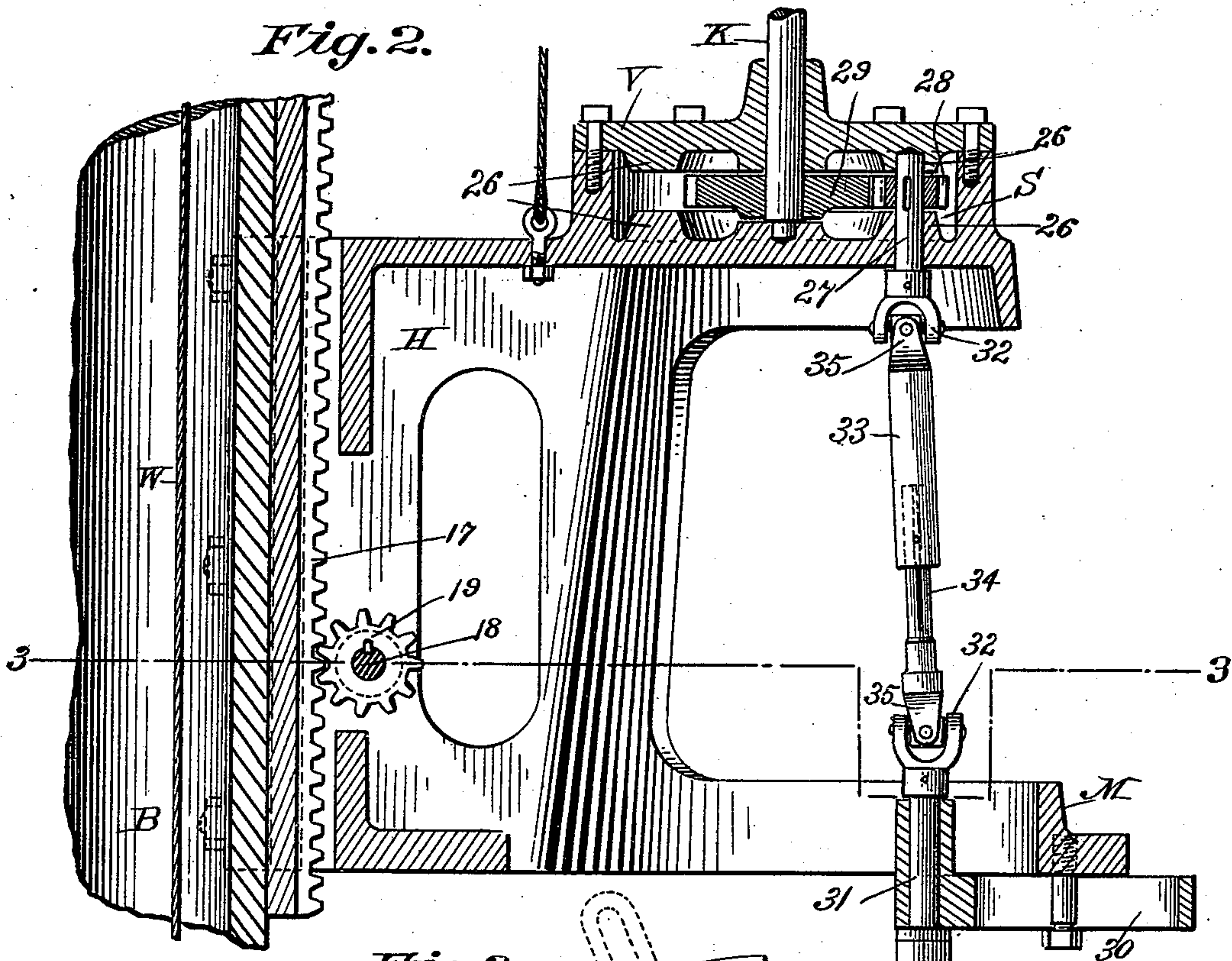


Fig. 3.

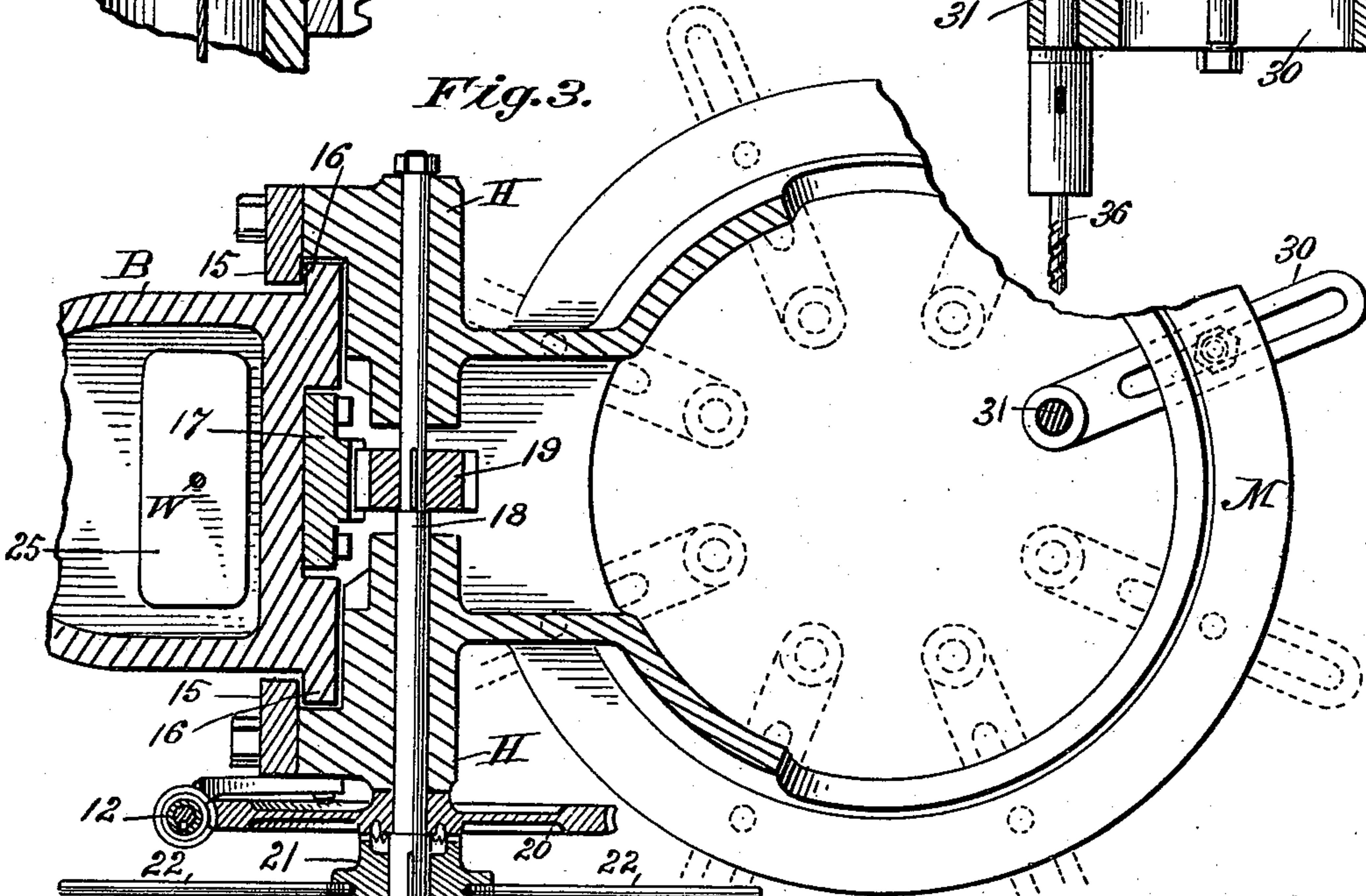
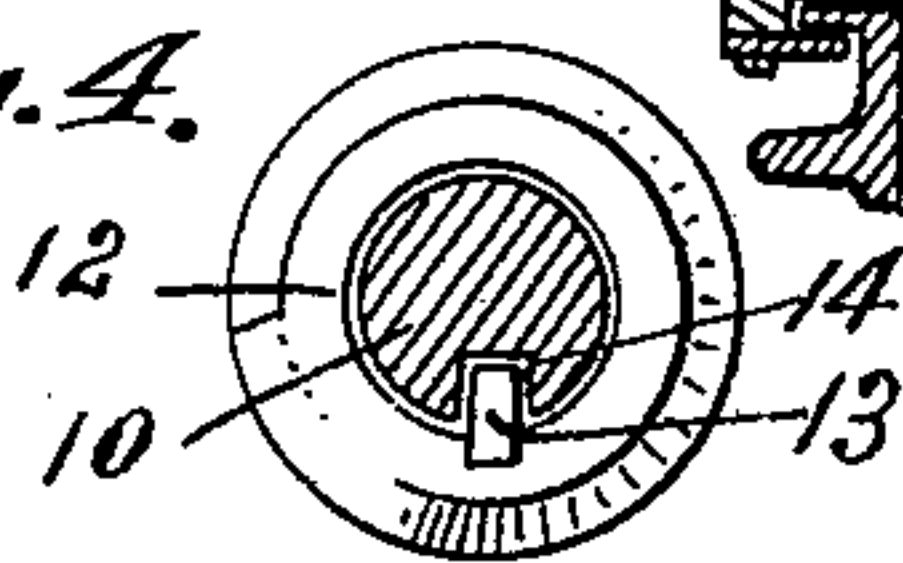


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHRISTIAN H. BAUSH, OF HOLYOKE, MASSACHUSETTS.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 563,545, dated July 7, 1896.

Application filed October 21, 1895. Serial No. 566,296. (No model.)

To all whom it may concern:

Be it known that I, CHRISTIAN H. BAUSH, a citizen of the United States of America, residing at Holyoke, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Drilling-Machines, of which the following is a specification.

This invention relates to improvements in drilling-machines, and more particularly to that description thereof containing what is termed a "gang" of drills; and the present improvements pertain to means in such drills for so arranging the drill-carrying head that the feeding of the drills is operated by the movement of the latter, and to means for governing the feed movement of the drills under the conditions of said construction; and the invention consists in the constructions and combinations of parts, all substantially as will hereinafter appear, and be set forth in the claim.

Reference is to be had to the accompanying drawings, in which similar characters of reference indicate corresponding parts in all of the views.

In the drawings forming part of this specification, Figure 1 is a side elevation of a drilling-machine constructed according to my invention. Fig. 2 is a vertical sectional view of the drill-carrying head and an adjoining part of the frame of the machine, all the operative parts of one of the drills being shown in this figure in side elevation. Fig. 3 is a sectional view on line 3 3 of Fig. 2. Fig. 4 is a sectional view on line 4 4, Fig. 1.

In the drawings, A indicates the base of the drill, which is adapted to be bolted solidly to the flooring of the place where the machine is located. B indicates the hollow pillar of the machine, the lower end of which is bolted to said base, as shown.

D indicates a pillar-block fixed on the rear portion of the base A and constituting a bearing-support for one end of a counter-shaft *d*, the opposite end of said shaft being supported in a suitable bearing *e* on the rear side of said pillar B. A bearing-head E is bolted to the upper extremity of the said pillar, on which are suitable bearings for the horizontal driving-shaft *h* of the drill, and in one end thereof is a suitable bearing J for

the hub of the bevel-gear P. The spindle K, which operates to rotate the gang of drills, as below described, has a spline-and-key connection with the hub *f* of said gear P, as shown by the groove *x* in said spindle, whereby said spindle is caused to rotate with said last-named gear and is free to slide vertically in the hub thereof. Said shaft *h* has a cone-pulley thereon, which has a belt connection with a like pulley on said counter-shaft *d*, and on the latter are the usual tight and loose pulleys 2 and 3, and a driving-belt applied to said tight pulley imparts the requisite variable rotary motion, through said cone-pulleys and uniting-belt, to shaft *h* and the spindle K, as below set forth. A bevel-pinion 4 is fixed on one end of the driving-shaft *h*, and engages with said bevel-gear P on spindle K. A short vertical counter-shaft 5 on pillar B is driven by a belt 6 from a pulley 7 on said spindle K, and a pinion 8 on said shaft 5 engages a gear 9 on the upper end of the vertical feed-shaft 10. This last-named shaft serves to mechanically operate the feed movement of the below-described gang of drills through a worm 12, which has a key 13, engaging with a spline-groove 14 (see Fig. 4) in said shaft 10, whereby said worm, while being rotated by said engagement with the last-named shaft, is free to move up or down thereon. The gang-drill head H of the machine has a sliding engagement with said pillar B by means of the strips 15, which are bolted to the rear side of said head (see Fig. 3) and which have a bearing against the laterally-projecting borders 16 on the sides of said pillar. A vertical rack 17 is provided on the side of said pillar adjoining the rear side of the head H, and a horizontal shaft 18, having a rotary movement in said head, has a gear 19 fixed thereon, which engages with said rack. Movement of said head H downwardly or upwardly is governed by the rotation of said shaft 18. A worm-gear 20 is loosely hung on said shaft 18, and engages with said worm 12. A hub 21, having the spoke-arms 22 projecting therefrom, is fixed on said shaft 18 by means of a spline or otherwise, as may be desired. Said hub has a sliding connection with said shaft 18, and has a serrated rear end engaging with a like surface on said worm-gear 20 (see Fig. 3) by means of a nut 23, screwing onto the

end of said shaft 18. This last-named nut has a circular flange around its rear end which engages under a collar 24, which is secured on the outer side of said hub 21. Said nut 23 provides means for engaging said hub 21 with, or disengaging it from, said worm-gear, and when engaged therewith shaft 18 is rotated by the worm-gear 12, acting on said worm-gear and through the latter and hub 21 on said shaft, and thereby the gear 19 on the latter so engages with the rack 17 as to produce an automatic feed motion in the head H, whereby the drills are carried against their work. Unscrewing nut 23 and separating the hub 21 from the worm-gear 20 permits of operating freely the shaft 18 by hand, applied to spokes 22, to move the head up or down for any desired purpose. The said automatic feeding operation is facilitated by the application to said head of counterweight devices, as below described, whereby it is easily moved upwardly or downwardly, as may be desired. A suitable counterweight 25 (see Fig. 3 and dotted-line indication in Fig. 1) is hung inside of said hollow pillar B by a suitable band or a wire-rope connection W with said drill-head H, whereby the latter is suspended in any desired position between the head E and the base A of the machine, and hence is easily adjusted to bring the drills to bear upon any piece thereunder which is to be operated upon.

In this machine it requires no movable work-table, for the reason that the drill-head and drills are capable of having any required feed movement imparted thereto while the work rests upon the base A of the machine or upon the floor. The object L (shown under the drills in Fig. 1) is an ordinary movable work-holding bed for holding small objects to be operated upon. The said drill-head H is constructed with a gear-box S on its upper side, provided with a cover V, bolted thereon, as shown. The opposite inner sides of said box and cover are provided with bosses 26, which form bearings for drill-driving shafts 27, one for each one of the gang of drills employed. The said spindle K extends through a hub on said cover V, and has its lower end stepped in a socket in the bottom of said box S, and has a spindle-driving gear 29 fixed thereon. A pinion 28 is fixed on each one of said shafts 27, engaging with the said central gear 29, and thereby the rotation of said spindle K causes a simultaneous rotation of all the drill-driving shafts of said gang.

Several brackets 30, one for each drill-spindle, are adjustably secured under the base M of head H, as shown in Figs. 2 and 3, and a drill-holding spindle 31 is fitted to run in each of said brackets. Each bracket consists of a

slotted plate, which can be moved endwise, or turned upon its pivot, and thus move each drill independently of the others in any desired relation to the center of the head. This enables the drills to be arranged into clusters or a circle, or a portion can be moved into a straight line while the others can be arranged into any desired relation to the line. The lower ends of said drill-driving shafts 27 and the upper ends of said spindles 31 are each provided with one member 32 of a universal joint of ordinary construction, and said shafts and spindles are united by a socket 33 and a piston 34, having a splined connection with each other, each of which is provided with a universal-joint member 35 for connection with said joint members 32, as shown. Said socket and piston parts 33 and 34 are capable of sliding movements relatively to each other, whereby, in adjusting the drill-spindles 31 and drills 36 at different distances from the axial line of the spindle K, the said connections will automatically become lengthened or shortened, as circumstances may demand.

By means of the above-described construction, wherein is provided a movable balanced head containing a gang of drills, deriving their movements from a single longitudinally-moving driving-spindle, provision is made for the operation of a large number of drills simultaneously upon a single piece of work, and for imparting a feed motion to said drills through the movement of the drill-head, and thereby dispensing with the usual work-holding table. The result of such provision is a great saving in the cost of machines of this class, and largely increased facilities for drilling many holes simultaneously in large pieces of material.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

In a drilling-machine, the driving-shaft *h* provided with a pinion upon its end, the wheel P, the vertically-adjustable shaft driven by said wheel; the head H, vertically adjustable upon the standard B, a series of drills mounted in the head and driven by the vertically-adjustable shaft, a series of radially-adjustable drill-brackets, through the inner ends of which the drills pass, and a counterweight for the head; combined with the belt 6, driven from the shaft K, the short counter-shaft, pinion 8, the gear 9, the feed-shaft 10, provided with a worm, and a mechanism operated by said worm for raising or lowering the head, substantially as shown and described.

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