No. 663,778. Patented Dec. 11, 1900.

H. O. NIENSTAEDT.

DRILLING MACHINE.

(Application filed Dec. 30, 1897.)

(No Model.) 4 Sheets—Sheet 1.

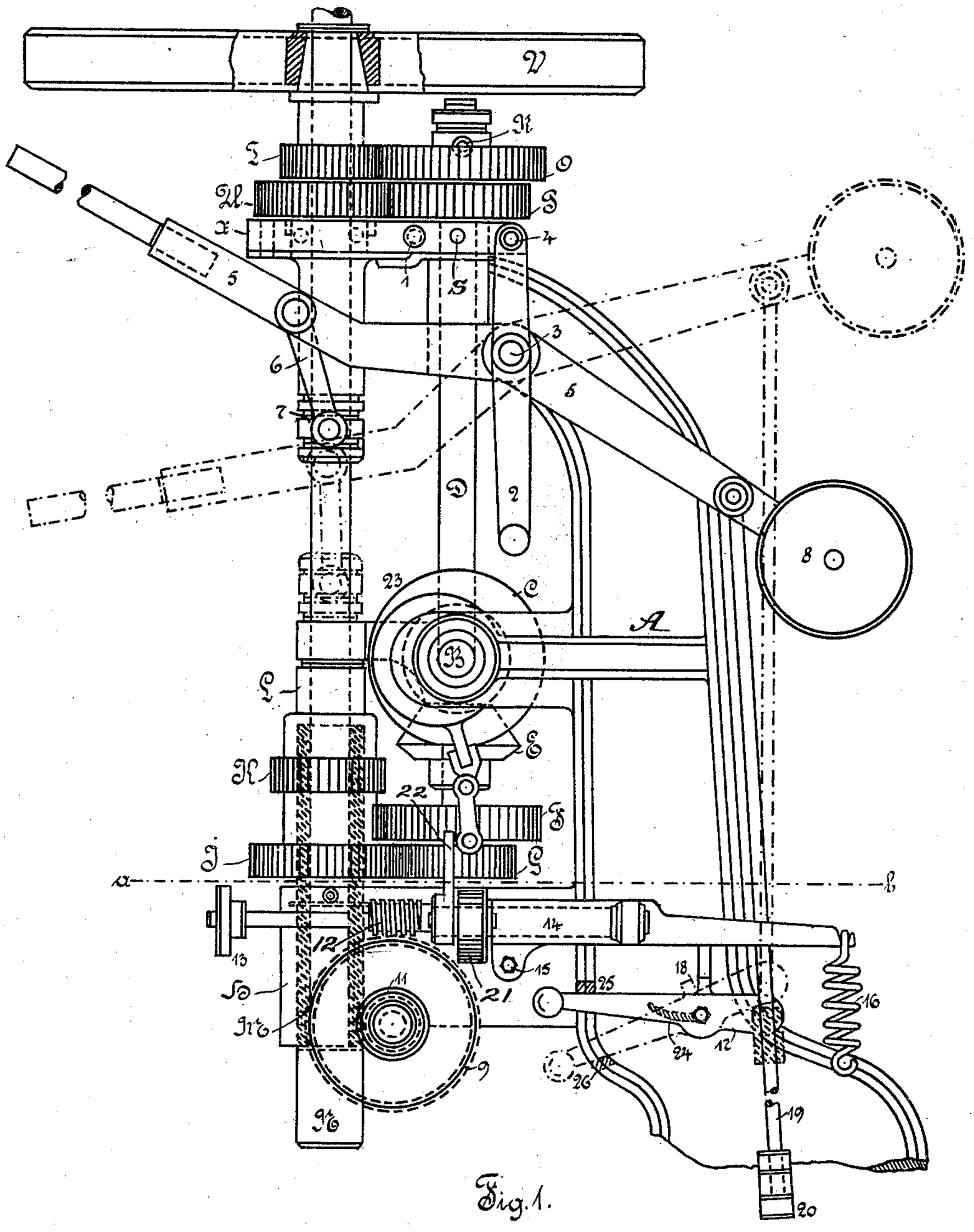

Fig. 1.

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Fig. 2.

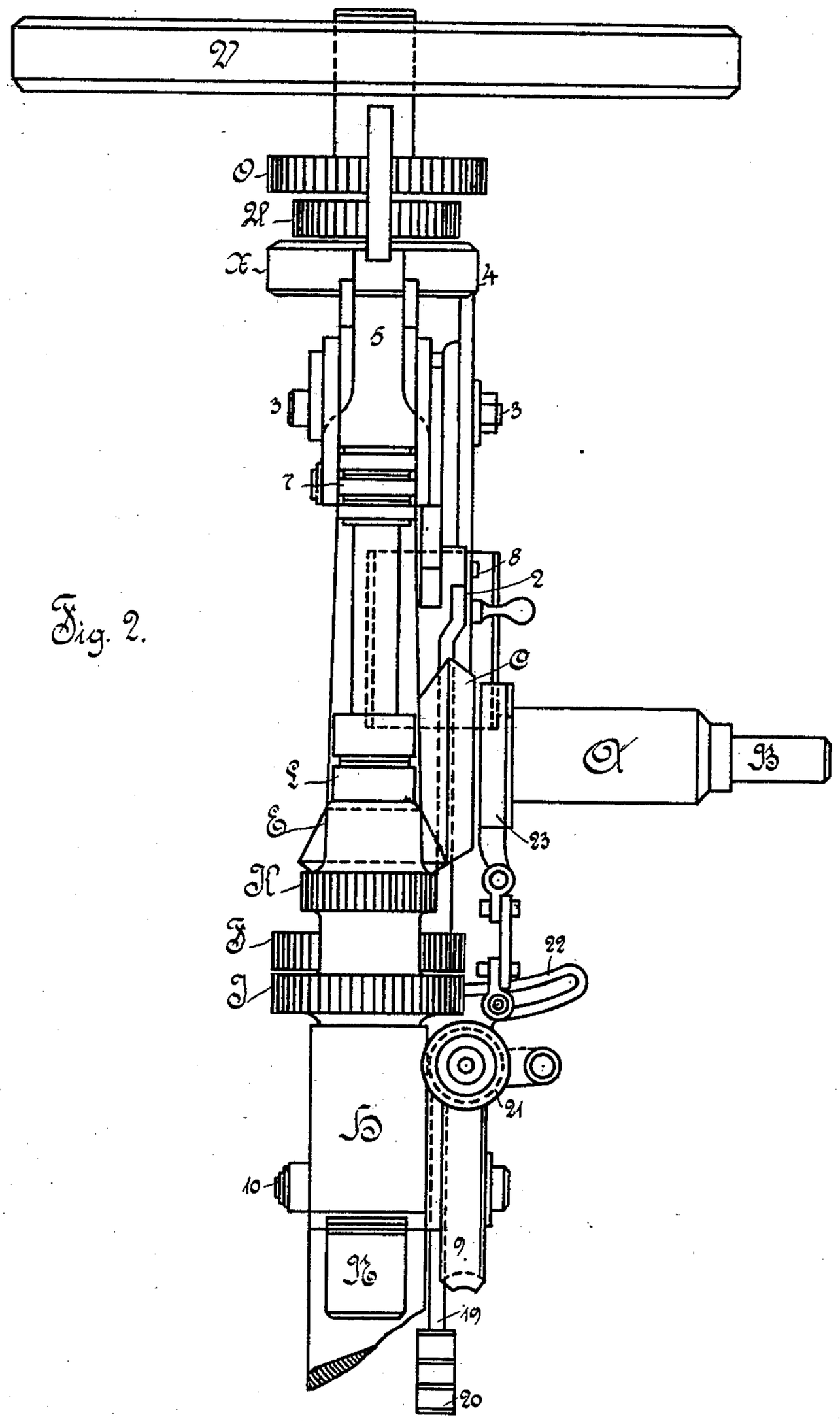

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Fig. 3.

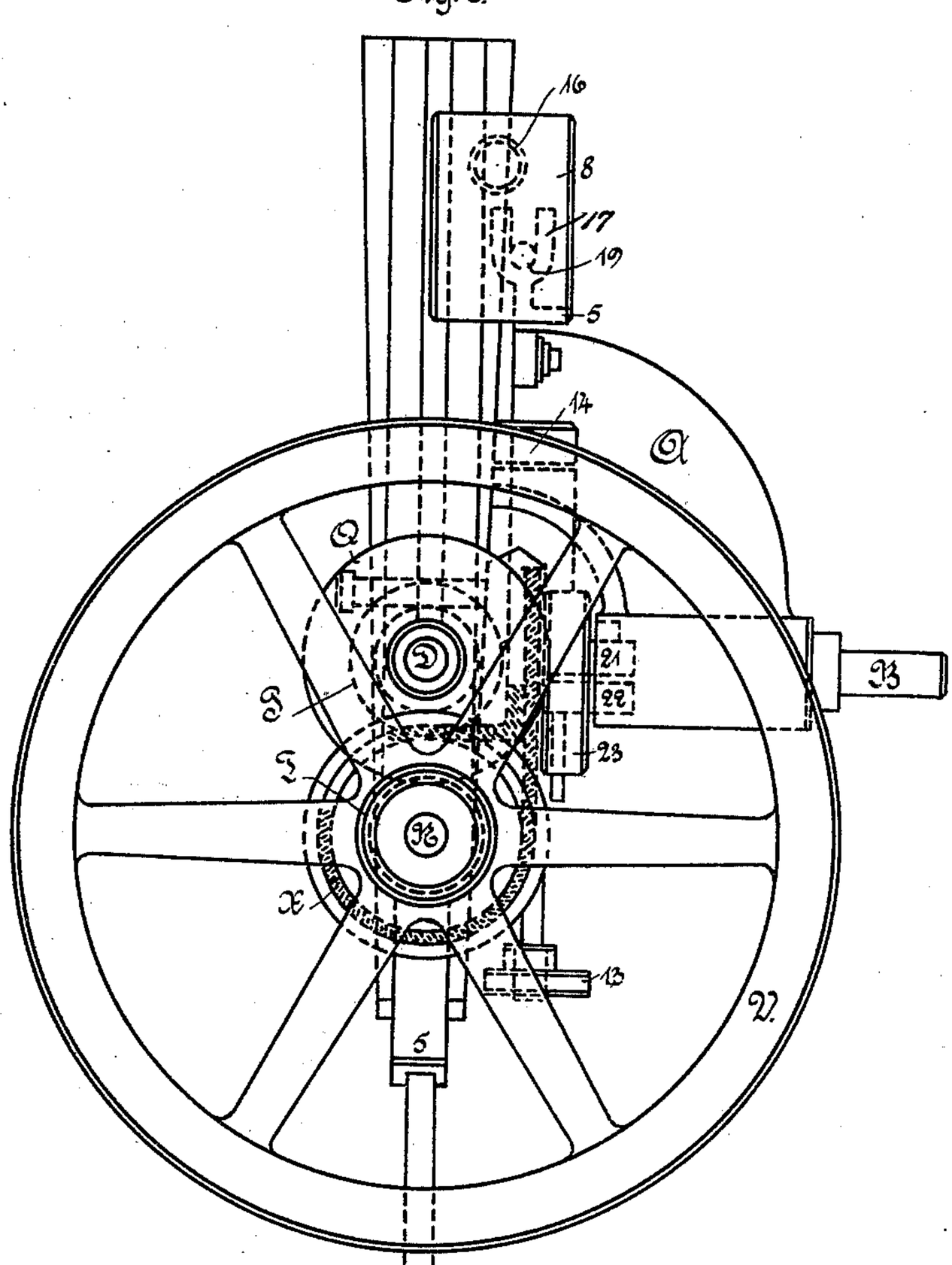
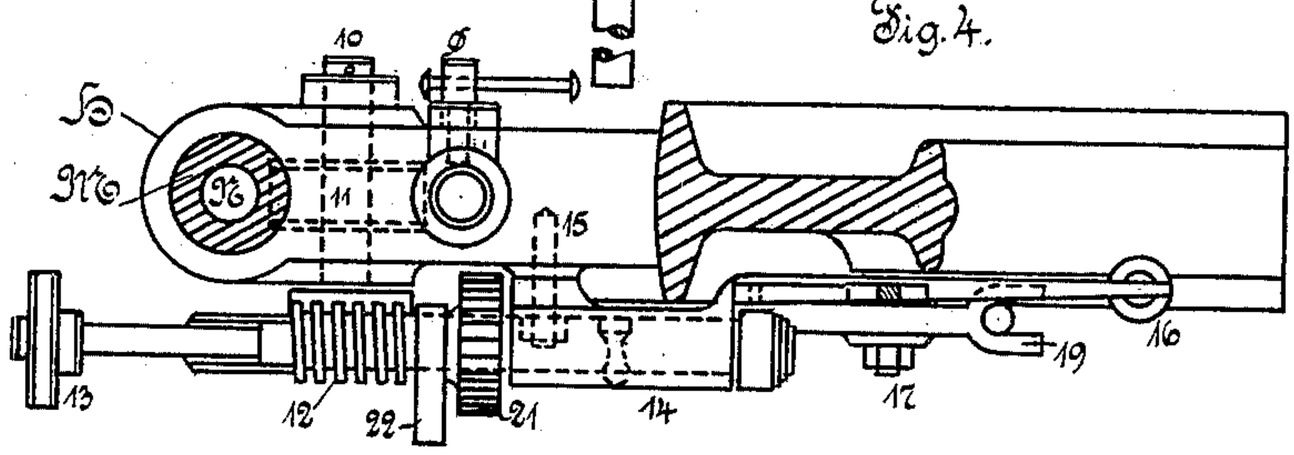


Fig. 4.



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(No Model.) 4 Sheets—Sheet 4.

Fig. 5

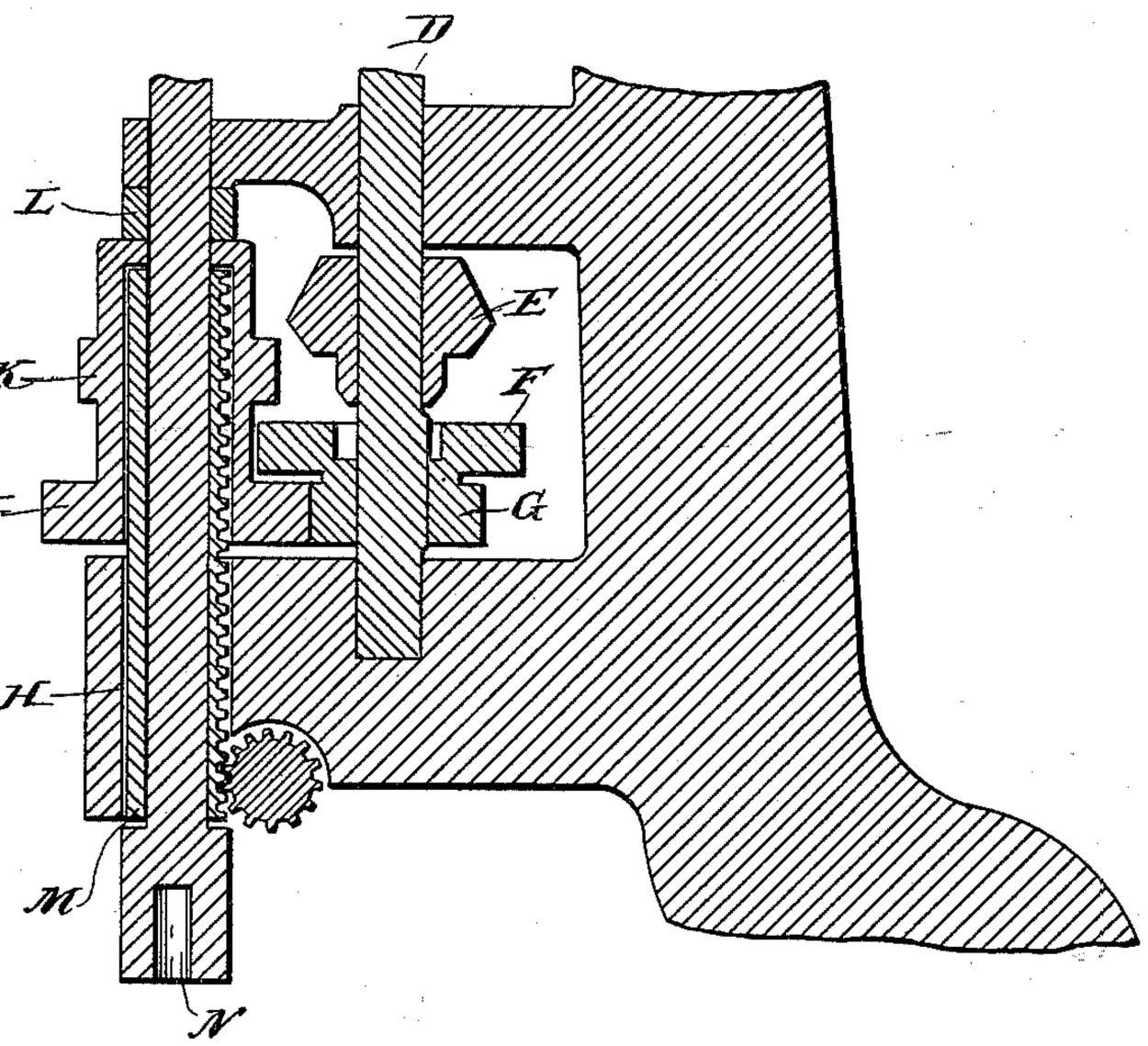
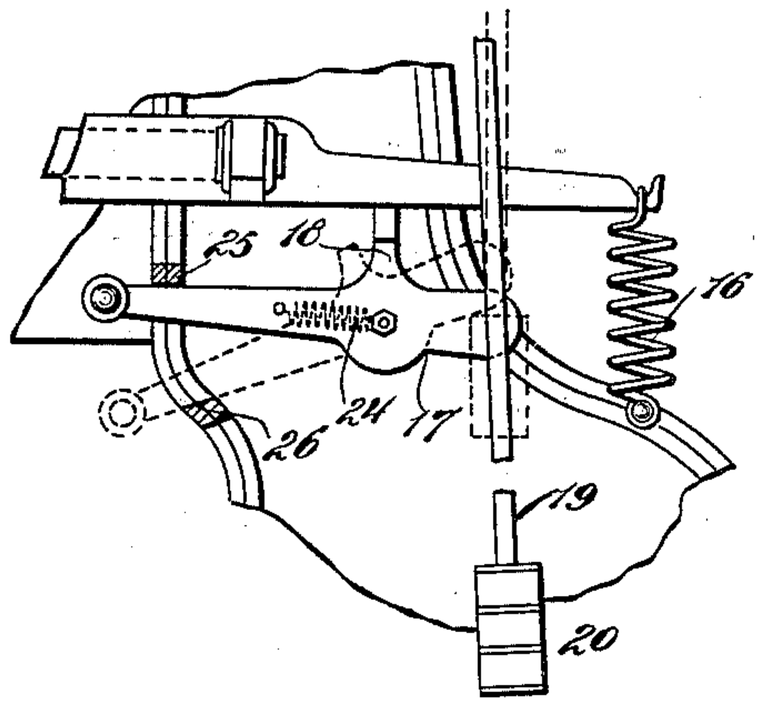


Fig. 6



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UNITED STATES PATENT OFFICE.

HANS OSKAR NIENSTAEDT, OF COPENHAGEN, DENMARK.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 663,778, dated December 11, 1900.

Application filed December 30, 1897. Serial No. 664,549. (No model.)

To all whom it may concern:

Be it known that I, HANS OSKAR NIENSTAEDT, engineer, a subject of the King of Denmark, and a resident of Copenhagen, Denmark, have invented certain new and useful Improvements in Drilling-Machines, of which the following is a specification.

This invention relates to improvements in drilling-machines.

The hand-power drilling-machine, which is in its various sizes an essential tool in engineering and other workshops, is subject to the disadvantage that the velocity of its fly-wheel is not variable. All such machines work with the same fly-wheel velocity whether small or large holes are to be drilled, and as the driving-crank is rotated more quickly when a small hole is being drilled than when a large hole is being drilled, on account of the different resistance of the material, the velocity of the fly-wheel is too high in the former and too low in the latter case. To obviate this disadvantage, the fly-wheel of the machine forming the subject of this invention is applied to the drilling-spindle, so that change-gear can be applied to the intermediate shaft, whereby the revolutions of the driving-crank can be so transmitted to the fly-wheel that the velocity of the latter when the crank is turned with its normal velocity can be increased when drilling large holes and reduced when drilling small holes.

To enable my invention to be fully understood, I will describe the same by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a drilling-machine constructed according to my invention. Fig. 2 is a front elevation of the machine. Fig. 3 is a plan thereof. Fig. 4 is a section on the line *a b*, Fig. 1; and Figs. 5 and 6 are views, the former in section and the latter in elevation, of certain details which will hereinafter be described.

The drilling-machine is driven by a crank or handle on the axle B, mounted in the frame A of the machine. By rotating this crank or handle the upright shaft D is revolved by means of the bevel-wheels C and E. The rotary motion is transmitted to the drilling-spindle N by four gear-wheels F, G, K, and I in the usual manner, except that the wheels K and I on the drill-spindle, the bosses of which form a long sleeve, are provided with a toothed bush or sleeve M, which slides in an arm or support H of the machine-frame and is supported at its lower end on the head of the drilling-spindle. The said two gear-wheels K and I are connected with the drilling-spindle, as shown at L. The fly-wheel, as shown in Figs. 1, 2, and 3, is mounted on a sleeve on the drilling-spindle and not, as ordinarily, upon the spindle or shaft D. The latter shaft is, however, provided with two independent toothed wheels O and P. Each of these wheels can be independently keyed to the shaft by means of a suitable pin or the like inserted in holes S and R, and the said two wheels gear with wheels T and U, which are formed in one and are provided at their upper end with a long boss upon which the fly-wheel is screwed and on their under side with a shorter boss or sleeve which is guided in the frame of the machine and runs in ball-bearings therein. The kinetic energy of the fly-wheel is therefore conveyed to the shaft D through the gear-wheels T O or U P and from this shaft to the drilling-spindle by the before-mentioned gearing. If now, for instance, the relation between the bevel-wheels C and E is as $1\frac{1}{2}$ to 1 and the relation between the wheels F and K and G and I is $\frac{2}{1}$ or $\frac{1}{2}$, the drilling-spindle if the shaft B makes fifty revolutions a minute will move with a velocity of $50\times\frac{3}{2}\times\frac{2}{1}=150$ or $50\times\frac{3}{2}\times\frac{1}{2}=37\frac{1}{2}$. If the relation between the wheels O and T and P and U is at the same time $\frac{2}{1}$ and $\frac{1}{1}$, the fly-wheel will rotate with a speed of $50\times\frac{3}{2}\times\frac{2}{1}=150$ or $50\times\frac{3}{2}\times\frac{1}{1}=75$. As, however, there are two changes both above and below, the velocity of the fly-wheel has the following ratios to that of the drilling-spindle, viz., thirty-seven and one-half revolutions of the drilling-spindle to one hundred and fifty revolutions of the fly-wheel; thirty-seven and one-half revolutions of the drilling-spindle, seventy-five revolutions of the fly-wheel; one hundred and fifty revolutions of the drilling-spindle, one hundred and fifty revolutions of the fly-wheel; one hundred and fifty revolutions of the drilling-spindle, seventy-five revolutions of the fly-wheel. The fly-wheel therefore receives four different velocities with respect to the drilling-spindle.

Below the wheel U, on the upper end of the drilling-spindle, there is provided a brake-

collar (see Figs. 1 and 3) having a rim upon which a brake-band rests, the said band being secured at one end to a bolt 1 and at the other end to a lever 2, by means of which it is tightened and which is pivoted on a bolt 3. By means of this brake the fly-wheel can be stopped easily and without danger without the necessity for holding back the handle or crank, which hitherto has been the only manner in which such machines can be stopped.

By rotating the driving crank or handle of the shaft B an eccentric 23, which is mounted on the said shaft B, is also rotated. The eccentric operates a pawl-lever 22 and a ratchet-wheel 21, whereby a feed-wheel 11 by means of a worm 12 and worm-wheel 9 moves the toothed sleeve M, which rests at its lower end upon the head of the drilling-spindle, and thereby also the said drilling-spindle, downward. A counterweighted lever 5, which is pivoted to the frame of the machine by the bolt 3, is connected to the drilling-spindle by means of connecting-links 6, having pins 7, which rotate freely between collars or rings rigidly secured to the said spindle. During the operation of the machine the front end of the counterweighted lever 5 is moved downward, whereby the counterweight 8 and a connecting-rod 19, attached to it, are pulled upward. As the connecting-rod 19 rests in a forked lever 17, Figs. 1, 2, and 3, and is provided with an adjustable stop 20, which can be arranged at a distance from the forked lever slightly less than the distance through which the drilling-spindle is to move, the said connecting-rod swings the forked lever upward, and thereby releases the feed mechanism shortly before the drilling-spindle reaches its lowermost position. The forked lever 17, which is pivoted on a bolt and which is maintained in a horizontal position by means of a spring 24, is provided at its upper part with a pin 18, which in this position maintains the feed mechanism in engagement with the worm-wheel 8. The said feed mechanism consists of a spindle 13, having a hand-wheel, worm 12, ratchet-wheel 21, and pawl-lever 22, and also of a sleeve 14, in which the worm-spindle is supported. The sleeve 14 terminates in a hook in which one end of a spring 16 is secured, the other end of the said spring 16 being secured to the frame of the machine. If now, as above described, the connecting-rod 19 swings the forked lever upward, the spring 16 pulls the sleeve 14 downward so as to free the worm 12 from engagement with the worm-wheel. At the same time the pin 18 on the sleeve 14 strikes against the forked lever. At the moment when the feed mechanism is disengaged by the above-described mechanism the counterweight 8 returns the drilling-spindle to its uppermost position. This automatic safety arrangement is always operative and cannot fail. The said arrangement can be employed both with hand-operated and with automatic feed devices and releases the spindle at any desired point in its movement and quickly returns the same to its uppermost position, while at the same time it prevents any injury to the parts of the machine. The drilling-spindle can besides being automatically controlled also be controlled at any time by hand by rotating the forked lever between two stops 25 and 26, fixed to the machine. The feed mechanism is again brought into operation after its disengagement by pressing the worm-spindle 13 toward the worm-wheel. At the same time the forked lever is automatically caused to assume its horizontal position by means of the spring 24. If the feed mechanism is not in operation, the pin of the sleeve, which in this position rests against the forked lever, prevents the latter from rising. By this means the feed mechanism cannot act without being controlled. The forked lever also serves as a stop when feeding by hand.

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

1. In a drilling-machine, the combination with a frame, of a primary-movement shaft, a drill-spindle, a balance-wheel mounted to turn around the drill-spindle, two gears connected with the balance-wheel and having different diameters, a counter-shaft driven from the primary-movement shaft, two gears mounted on the counter-shaft and respectively meshing with the two gears before mentioned, the gears of the counter-shaft being provided with means by which they may be rendered loose or fast upon the counter-shaft, the counter-shaft being geared with the drill-spindle to drive the drill-spindle, and feed devices for the drill-spindle.

2. The combination with an upright frame, of a horizontal primary-movement shaft mounted thereon, a vertical drill-spindle carried in the frame, a balance-wheel mounted to turn around the drill-spindle at a point above the frame, a vertical counter-shaft geared with the primary-movement shaft, two gear-wheels connected to the balance-wheel and having different diameters, two additional gear-wheels carried on the counter-shaft and being supplied with means by which they may be rendered fast or loose on said shaft, gearing for driving the drill-spindle from the counter-shaft, and feed devices for the drill-spindle.

3. The combination with an upright or vertical frame, of a horizontal or primary-movement shaft mounted therein, a vertical drill-spindle mounted in the frame, a balance-wheel carried at the upper portion of the drill-spindle above the frame, a sleeve encircling the drill-spindle and carrying the balance-wheel, a vertical counter-shaft carried in the frame parallel with the drill-spindle, gearing for driving the sleeve of the balance-wheel from the counter-shaft, a second sleeve encircling the drill-spindle and communicating movement thereto, a second vertical counter-shaft located below the primary-movement shaft

and geared with the same, gearing connecting the second counter-shaft with the sleeve of the spindle, and feed devices acting with the said sleeve of the spindle.

4. In a drilling-machine, the combination with a frame, of a drill-spindle mounted therein, a balance-wheel mounted to turn concentrically to the drill-spindle and independently thereof, a primary-movement shaft, means for driving the balance-wheel from said primary-movement shaft, and means for driving and feeding the drill-spindle, such driving means being in connection with the primary-movement shaft.

5. In a drilling-machine, the combination of a drill-spindle, means for driving the same, a worm-shaft having connections with the drill-spindle to feed the same, a swinging sleeve in which the worm-shaft is mounted, means for swinging the sleeve to normally raise the worm-wheel, and a lever mounted beneath the sleeve and serving normally to support the same against the action of said means.

6. The combination of a driven drill-spindle, a worm-shaft serving to transmit feeding movement thereto, a swinging sleeve in which the worm-shaft is mounted, means actuating the sleeve to throw the worm out of action, a fork-lever with a spring normally holding the sleeve against the action of said means, and devices engaging in the fork of the lever for tripping the lever so as to release the sleeve.

7. The combination of a worm-wheel, a worm-shaft coacting therewith, a swinging sleeve in which the worm-shaft is carried, means tending to throw the sleeve with the worm out of action, and a lever with a spring serving normally to hold the sleeve against the action of said means.

8. In a drilling-machine, the combination with a frame, of a hand-lever mounted to swing thereon, a link connected with the hand-lever and having a stop, a forked lever mounted on the frame and engaged by the stop, a spring-pressed swinging sleeve normally supported by the forked lever, a worm-shaft mounted in the sleeve and swinging with the same, a driven drill-spindle, and means connecting the drill-spindle with the worm-shaft to feed the drill-spindle.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 23d day of November, 1897.

HANS OSKAR NIENSTAEDT.

Witnesses:
CHARLIE HUDE,
JULES BLOM.