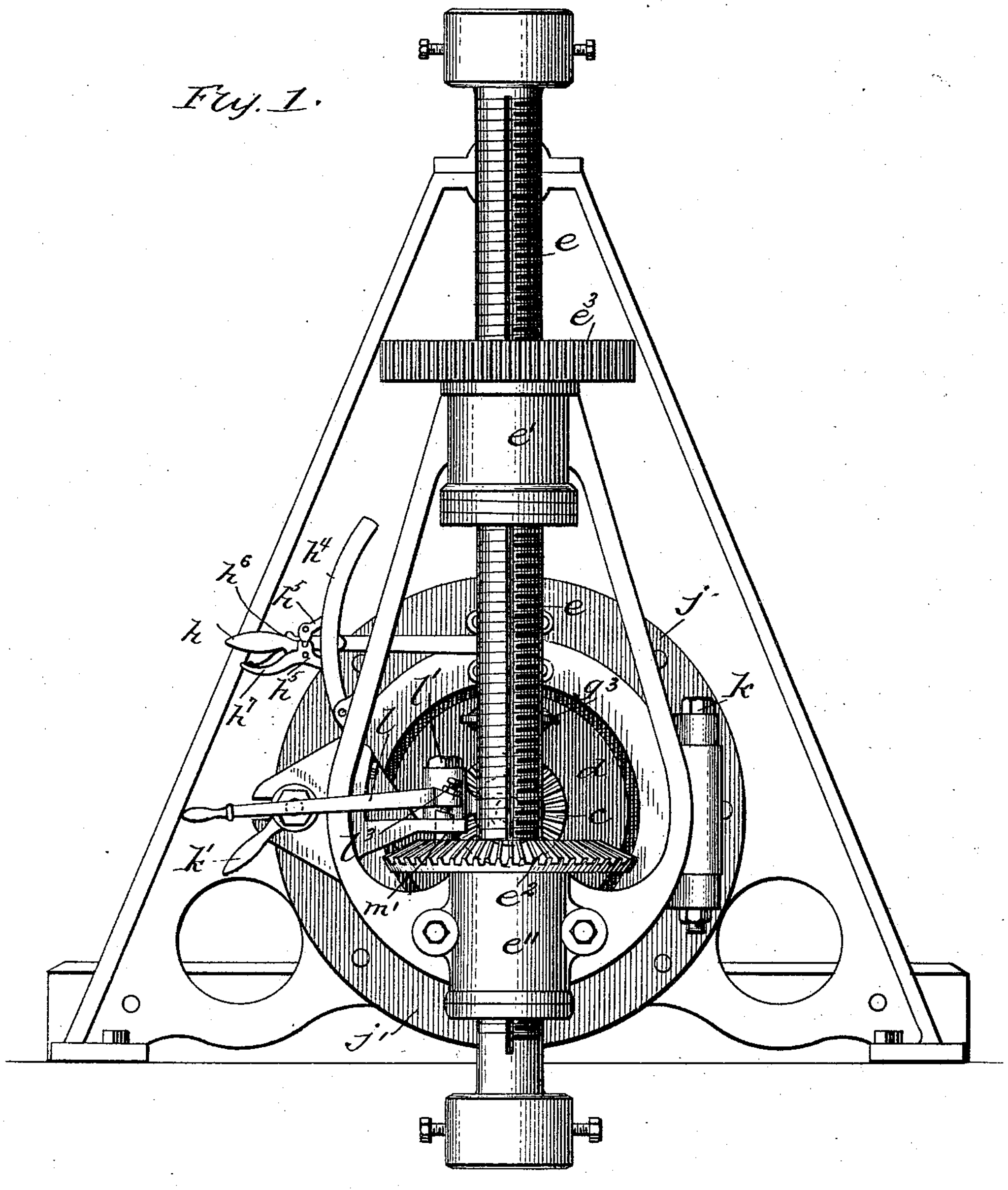
(No Model.) 3 Sheets—Sheet 1.

# S. A. WORCESTER & W. A. MORGAN.

## DRILLING MACHINE.

No. 492,567. Patented Feb. 28, 1893.

Fig. 1.

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(No Model.)

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DRILLING MACHINE.

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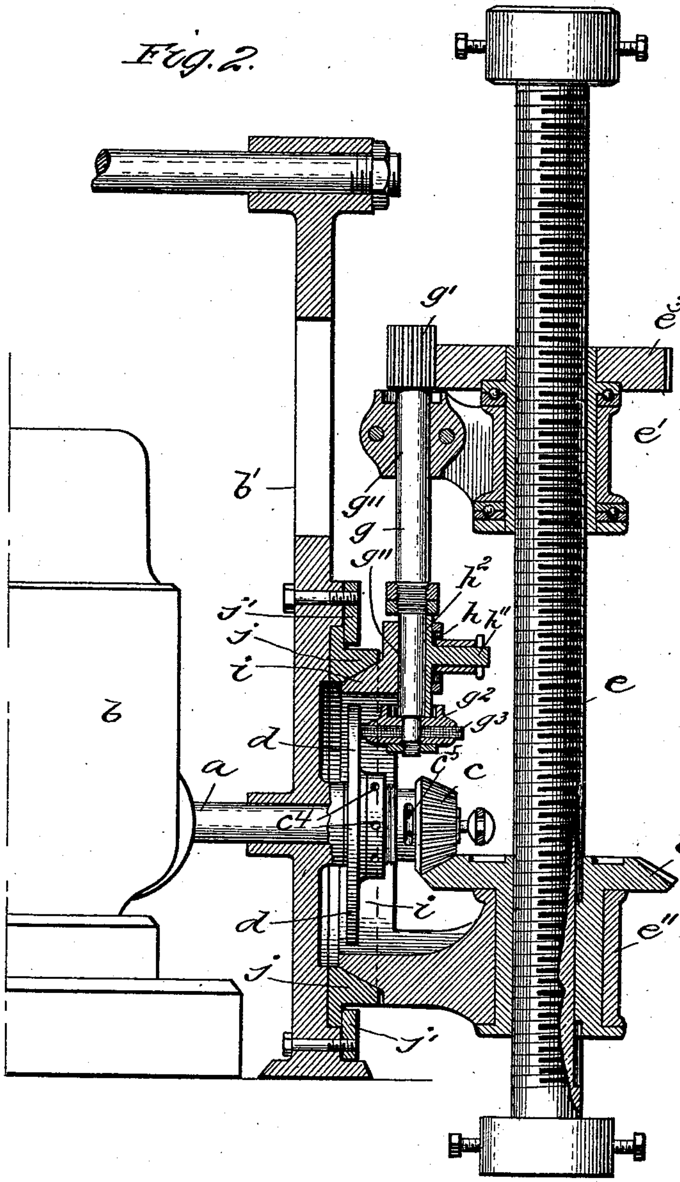
Fig. 2.

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3 Sheets—Sheet 3.

# S. A. WORCESTER & W. A. MORGAN.

## DRILLING MACHINE.

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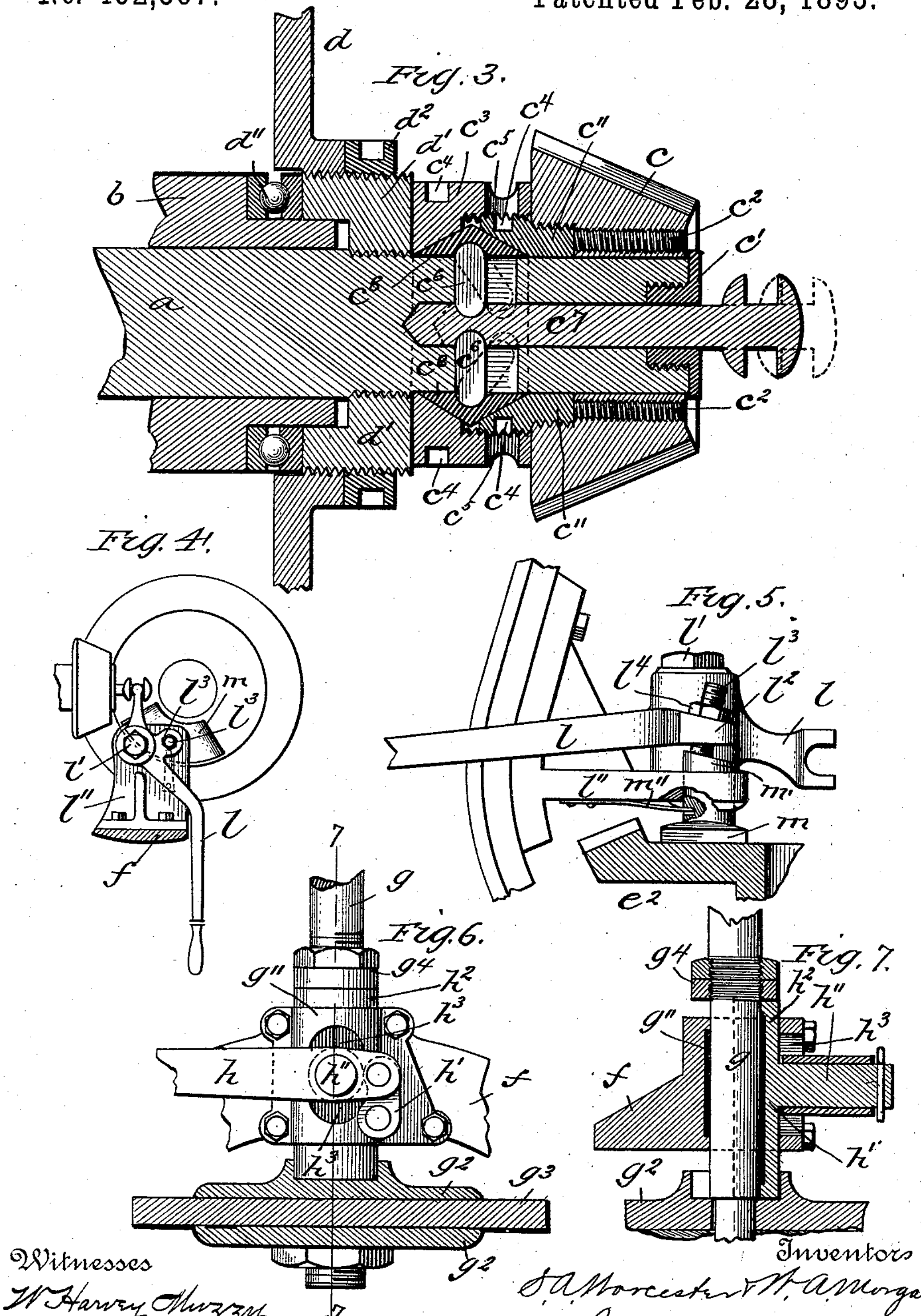


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# UNITED STATES PATENT OFFICE.

SAMUEL A. WORCESTER, OF LEADVILLE, AND WILLIAM A. MORGAN, OF GREEN MOUNTAIN FALLS, COLORADO.

## DRILLING-MACHINE.

**SPECIFICATION** forming part of Letters Patent No. 492,567, dated February 28, 1893.

Application filed August 29, 1892. Serial No. 444,468. (No model.)

*To all whom it may concern:*

Be it known that we, SAMUEL A. WORCESTER, residing at Leadville, in the county of Lake, and WILLIAM A. MORGAN, residing at Green Mountain Falls, county of El Paso, State of Colorado, citizens of the United States, have invented certain new and useful Improvements in Drilling-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 represents a front elevation of our improved drill; Fig. 2 a vertical sectional view thereof; Fig. 3 a vertical longitudinal sectional view of a portion of the driving-shaft, showing the manner of mounting the friction-disk and driving pinion thereon; Figs. 4 and 5, detail views showing the construction of the brake more clearly, and Figs. 6 and 7 detail views showing the manner of journaling the lower end of the counter-shaft.

This invention relates to that class of rock-drilling machines, called "diamond-core drilling machines," wherein the drill rods pass down through and are adjustably held in a hollow vertical screw, mounted upon a suitable machine and adapted to be rotated and moved up and down during the operations of drilling; and the present invention has for its objects, mainly, the provision of extremely simple means whereby the feed may be more readily started, and stopped and reversed or accurately adjusted and governed by the operator, as more fully hereinafter appears.

In the drawings, *a* designates the driving-shaft of a suitable motor *b*, said shaft being journaled in a portion of the frame *b′* of the drilling-machine, and carrying at its end a bevel driving-pinion *c*, and between its end and the frame *b′* a friction disk *d*. The disk *d* is left-threaded and screwed upon a bushing *d′* screwed upon the shaft *a*, so that the disk always revolves with the shaft and is capable of adjustment thereon to enable it to be brought into contact with the friction disk on the counter-shaft hereinafter described. The disk is locked in its adjusted position by a right-threaded ring or nut $d^2$ also screwed on the bushing and adapted to abut against the outer side of the disk, and a roller bearing *d″* is interposed between the revolving bushing and the stationary frame *b′* to reduce the friction between the parts and receive the end thrust of the friction feed, hereinafter described. The bevel-pinion *c* is journaled loosely on the end of the shaft, being prevented from slipping off by a flanged plug *c′* screwed in the end of the shaft, and has adjustably screwed in its inner end a nut *c″* which is held against rotation by the set-screws $c^2$, tapped through the pinion and pressing upon the outer end of the nut. The inner projecting end of the nut *c″* is externally threaded and has screwed over it an internally threaded nut $c^3$, which abuts against the inner side of the pinion and holds the parts tight. The adjacent portions of the interior of the nuts *c″* $c^3$ are correspondingly beveled to fit the opposite beveled sides of the exterior of an expansible friction ring or shoe $c^8$, which is confined between the shaft and nuts, and always rotates with the shaft. This friction ring when expanded is brought into frictional engagement with the nuts $c^3$ *c″*, and causes them, together with the pinion, to rotate with the shaft. The ring is preferably expanded by means of the toggle devices shown, which consist of a longitudinally movable rod $c^7$ working in a central longitudinal recess in the shaft and provided with a head on its projecting end, and two or more radial levers $c^6$, having their outer rounded ends resting in recesses in the expanding ring, and their inner rounded ends resting in similar recesses formed in the rod $c^7$, these levers working in suitable radial slots in the shaft. When this rod is forced inwardly, the levers $c^6$, are straightened, as shown in full lines in Fig. 3, and the friction-ring is expanded; and when the rod is drawn out these levers are allowed to assume an oblique position and permit the contraction of the friction ring—as shown in dotted lines in Fig. 3.

The nuts *c″* and $c^3$, are rotatively adjusted by inserting suitable tools in the holes $c^4$, suitable slots $c^5$ being formed in the outer nut $c^3$ to permit access to the holes in the inner nut *c″*, as shown most clearly in Fig. 3.

The drill-screw *e* is of the usual construction and is supported and passed through the feed-nut *e′* and driving wheel *e″*, journaled on the swiveled frame *f*, one above the other. The lower, or driving wheel *e″* is connected to the screw in the usual manner (by a spline and feather) so as to always revolve with it, and has formed or secured on it a bevel-gear $e^2$, which meshes with the pinion on the driving shaft, and the upper or feed nut $e'$ is internally threaded and adapted to rotate independently of the screw, and it has formed on or secured to it a gear-wheel $e^3$, which constantly meshes with and receives its motion from an elongated pinion $g'$ secured on the upper end of a vertical counter-shaft $g$ journaled in two bearings $g''$ in the frame $f$. This counter-shaft has a limited vertical movement in its bearings and has securely clamped on its lower end below its lower bearing, by means of suitable clamping-disks $g^2$, a horizontal friction disk $g^3$, which bears against the outer face of the disk $d$, and is preferably constructed of raw-hide, or other tough material to insure a good frictional engagement with the metal disk $d$. The shaft $g$ is limited in its downward movement by nuts $g^4$, tapped on it above its lower bearings and adapted to come in contact with the upper end of the same, and in its upward movement by the clamping-plate $g^2$ on the upper side of the disk $g^3$. It is adjusted vertically by means of a lever $h$ connected at its extreme inner end, by a pivotal link $h'$ to the lower bearing $g''$, and pivotally connected near its end to a horizontal pin $h''$, which projects out through a vertical slot $h^3$ formed in the bearing $g''$, and is formed integrally with a non-rotatable half-box or semi-cylindrical plate $h^2$, which partly surrounds the shaft between the nuts $g^4$ and plate $g^2$ and is held in place by the cap of the bearing. The outer end of the lever $h$ is held against movement up or down by means of a smooth segment $h^4$, secured on the frame $f$, and a pair of friction dogs $h^5$ $h^5$ pivoted on the lever and adapted to bear on the adjacent edge of the segment on opposite sides of the lever, as shown most clearly in Fig. 1. One of these dogs is provided with a lug on its inner end, which fits and works in a similarly-shaped recess in the inner end of the other dog, whereby the two dogs are caused to operate in unison and exert the same degree of pressure on the segment; and the other dog is provided with an operating handle $h^7$ by which the operator releases the two dogs from the segment when it is desired to adjust the lever. A spring interposed between the handle of the lever and the handle-extension $h^7$ of one of the dogs, serves to keep the dogs normally pressed against the segment. With this arrangement of dogs the segment need not be toothed and the angle of the dogs will hold the lever securely in the exact position it is adjusted to.

The frame $f$ has formed integrally with it an exteriorly beveled ring $i$ which fits within a similarly beveled ring $j$, which is rotatively clamped to its seat, formed in the frame $b'$ concentrically with and around the drive-shaft, by a stationary ring $j'$ bolted to the frame and over-lapping a flange on the rotatable ring. Thus securing the machine to a ring rotatively seated concentrically with the drive-shaft, enables the frame $f$ and its parts to be swung around or adjusted at any desired angle, as is evident. To enable the frame $f$ to be swung to one side to permit the drill-rods to be readily removed from the holes, the ring $i$ is hinged—by the vertical bolt $k$—to the ring $j$ and is held at its opposite side by an ordinary hand-bolt $k'$, as shown most clearly in Fig. 1.

To operate the sliding-rod $c^7$, a hand lever $l$ is pivoted on a vertical bolt $l'$ supported on a bracket $l''$, secured on an adjacent part of the frame, and has its inner bifurcated end in engagement with the projecting headed-end of said rod. This lever, near its pivotal point is provided with a lateral arm $l^2$ through which is tapped a screw $l^3$, said screw being secured against unscrewing by an ordinary jam-nut $l^4$. Working in an opening formed through the bracket $l''$ directly under the arm $l^2$ is a vertically movable pin or block $m'$, whose upper end is beveled and bears against the lower end of the screw $l^3$, and whose lower end carries a brake-shoe $m$, adapted to bear upon the upper side of the bevel-gear $e^2$ when the pin $m'$ is forced down, which is done by throwing the lever $l$ around and causing the set-screw to impinge against and bear down upon the beveled upper end of said pin, as shown in Figs. 4 and 5. A leaf-spring $m''$ is secured on the lower side of the bracket $l''$, and held in engagement with the pin $m'$, whereby the brake-shoe will be normally held up out of contact with the bevel-gear.

The operation and advantages of this machine, so far as has not already been set forth, are as follows:—In order to raise or feed the screw backward, the operator simply adjusts the counter-shaft so as to bring its friction disk near the periphery of the main friction disk, whereupon the feed-nut $e'$ will have imparted to it a faster motion than the drive-screw and lower wheel, which will cause the screw to be drawn upward. If the small friction wheel is adjusted in toward the center of the main-disk the feed nut will have imparted to it a slower speed than the screw and will therefore cause the screw to descend, and when the counter-shaft is so adjusted that the small disk is about midway between the upper and lower limits of its movement, the rate of motion of the feed-nut is the same as the screw, and there is consequently no endwise movement thereof. Thus it will be seen that by a single lever, used for moving the counter-shaft up and down, the rapidity and direction of the endwise movement of the screw may be readily varied. This friction device is an essential feature of this invention, as is evident. When it is desired to rapidly "run back" the screw for a new grip on the drill-rod, the operator simply shifts the lever $l$ so as to draw the rod $c^7$ out and release driving pinion $c$ and simultaneously apply the brake $m$ to the bevel gear $c^2$ on the driving-nut, whereupon the driving-nut will remain stationary and the continued revolution of the feed-nut will cause the screw to be rapidly run back or raised, as is evident.

Having thus fully described our invention, what we claim as new is—

1. The combination with a stationary frame $b'$ and a drive-shaft journaled therein, a friction disk $d$ secured on the drive-shaft, and a pinion secured on the end of the shaft, of a swinging-frame mounted on the stationary frame, a drill-screw carried by the swinging-frame, a feed-nut mounted on the swinging-frame and provided with a gear-wheel, a driving-wheel journaled on the frame and provided with a gear-wheel meshing with the pinion on the drive-shaft, a counter-shaft $g$ journaled in this swinging-frame and carrying a gear meshing with the gear on the feed-nut, a friction-wheel carried by the counter-shaft and bearing on the face of the disk on the main-shaft, and means for positively adjusting this latter friction-wheel on the face of the main-disk, as and for the purpose herein described.

2. The combination of a frame, a main driving-shaft, a friction-disk and a pinion secured on the main-shaft, a drill-screw, a driving-wheel and a feed-nut engaging the screw and supported in the frame said driving wheel and feed-nut each carrying a gear-wheel, a vertically movable counter-shaft journaled in the frame at right angles to the main-shaft and carrying a pinion at its upper end which engages the gear on the feed-nut, a friction disk on the lower end of the counter-shaft, bearing against the face of the main-disk, and means for positively adjusting and holding the counter-shaft, as and for the purpose described.

3. The combination of a frame, a driving-shaft, carrying a driving pinion and a friction-disk, a feed-nut and a driving-wheel, a drill-screw supported thereby, a vertically-movable counter-shaft journaled in the frame parallel with the screw and carrying a pinion meshing with a gear on the feed-nut, a friction-disk secured on the lower end of the counter-shaft and bearing on the main-disk, a non-rotatable plate (as at $h^2$) embracing the counter-shaft, nuts holding this plate endwise in place, a lever engaging a projection on this plate, and means for positively holding the lever in its adjusted position, substantially as described.

4. The combination of a segment, a pivoted lever, and means carried by the lever for gripping the segment, said means consisting of two dogs $h^5$ $h^5$ pivoted on the lever and projecting out therefrom in opposite directions and having their outer ends bearing on the adjacent edge of the segment, one of the dogs being provided with an inwardly-projecting lug engaging and working in a recess in the inwardly-projecting end of the other dog, a spring for keeping the dogs against the segment, and a handle for operating them, substantially as described.

5. The combination of a frame, a drive-shaft carrying a loose pinion on its outer end, a friction-clutch carried by the shaft and adapted to frictionally engage the pinion, a longitudinally movable rod for operating the clutch, a drill screw, a driving-wheel and a feed-nut for operating the drill-screw, the feed-nut and driving-wheel carrying gears, means for variably driving the feed-nut, a brake supported in close proximity to the gear on the driving-wheel and a lever for simultaneously applying the brake and operating the clutch-releasing rod, whereby the screw may be run back without rotating it, substantially as described.

6. The combination of a frame, a driving-shaft carrying a loose driving pinion $c$, a clutch carried by the shaft for engaging said pinion, a movable rod for operating the clutch, a drill-screw, a feed-nut and a driving-wheel for operating the screw, said driving-wheel being provided with a gear meshing with the driving-pinion, means for driving the feed-nut a brake $m$ mounted in close proximity to the gear on the driving-wheel and normally held away from the same, a lever $l$ pivoted on the frame and provided with two arms or extensions, one engaging the clutch-rod and the other the brake $m$, as and for the purpose described.

7. The combination of a shaft, a loose gear thereon, a part $c''$ carried by the gear, a part $c^3$ screwed on the projecting end of said part $c''$, so as to be adjustable thereon, both said parts being interiorly beveled, an expansible friction-ring $c^8$ inclosed between the said parts and the shaft, and means for expanding said friction ring, substantially as described.

8. In a drilling-machine, the combination of a frame, a driving-shaft, a bushing $d'$ removably secured thereon and externally threaded, a friction disk screwed on the bushing, a nut $d^2$ screwed up against the friction-disk, a drill-screw and means for driving it, and means driven from the friction disk for feeding the screw, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

SAMUEL A. WORCESTER.
WILLIAM A. MORGAN.

Witnesses to Worcester's signature:
O. P. BASSETT,
OLIVER ADAMS.

Witnesses to signature of Morgan:
T. W. MORGAN,
GILBERT WESSON.