(No Model.) 3 Sheets—Sheet 1.

H. THOMPSON.

DRILLING MACHINE.

No. 303,073. Patented Aug. 5, 1884.

Fig. 1.

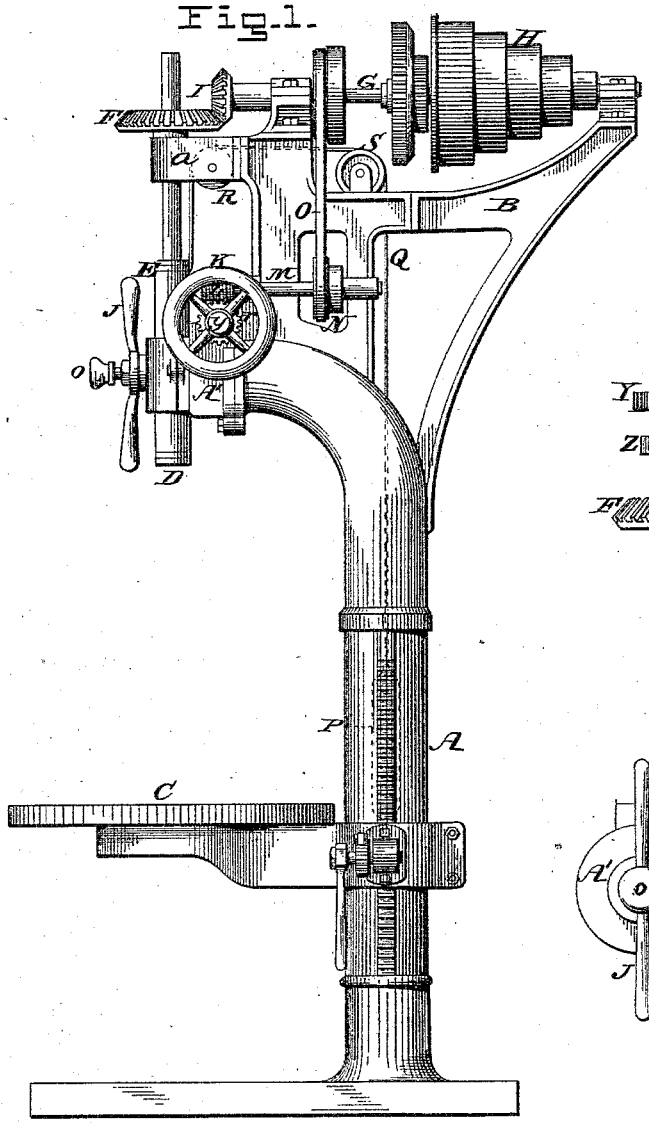


Fig. 6.

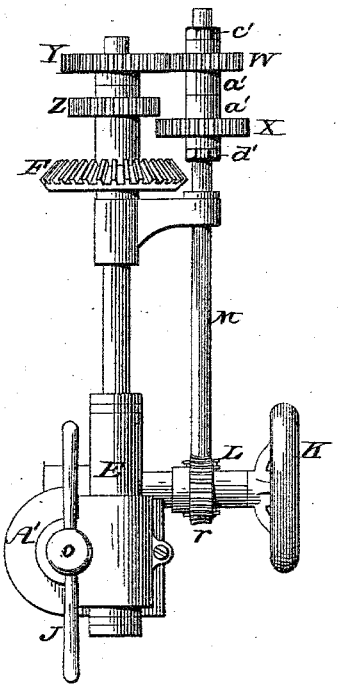
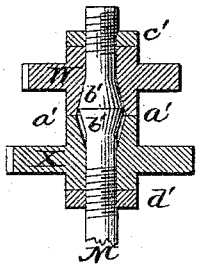


Fig. 7.



WITNESSES:

Jas. F. DeHamel

Walter S. Dodge

INVENTOR:

Hiram Thompson,

by Dodger Son,

Attys.

(No Model.) 3 Sheets—Sheet 2.

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Fig. 2.

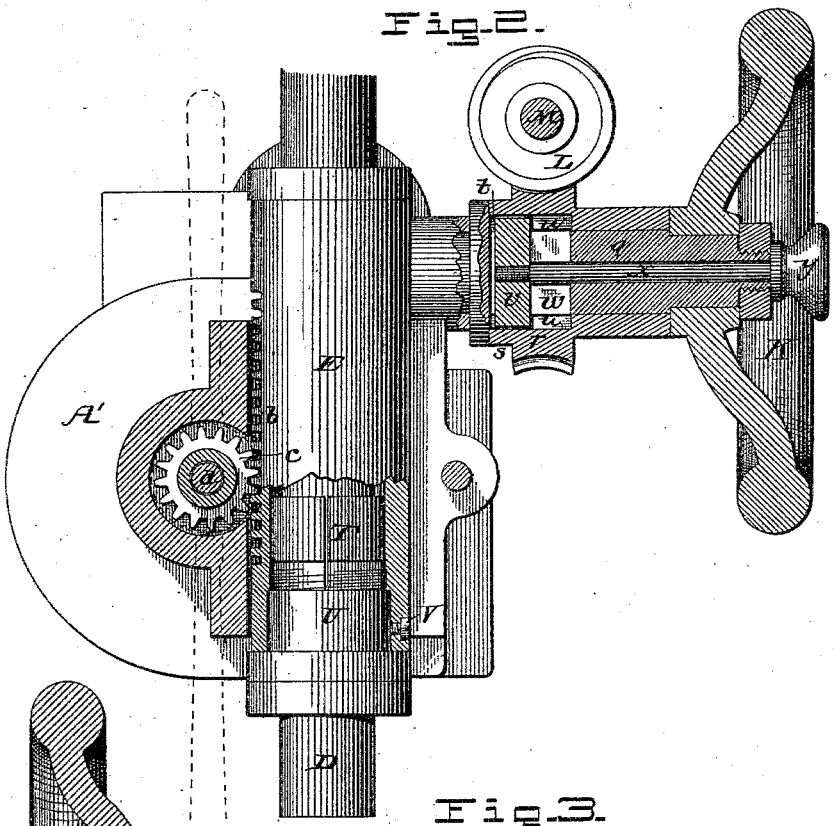
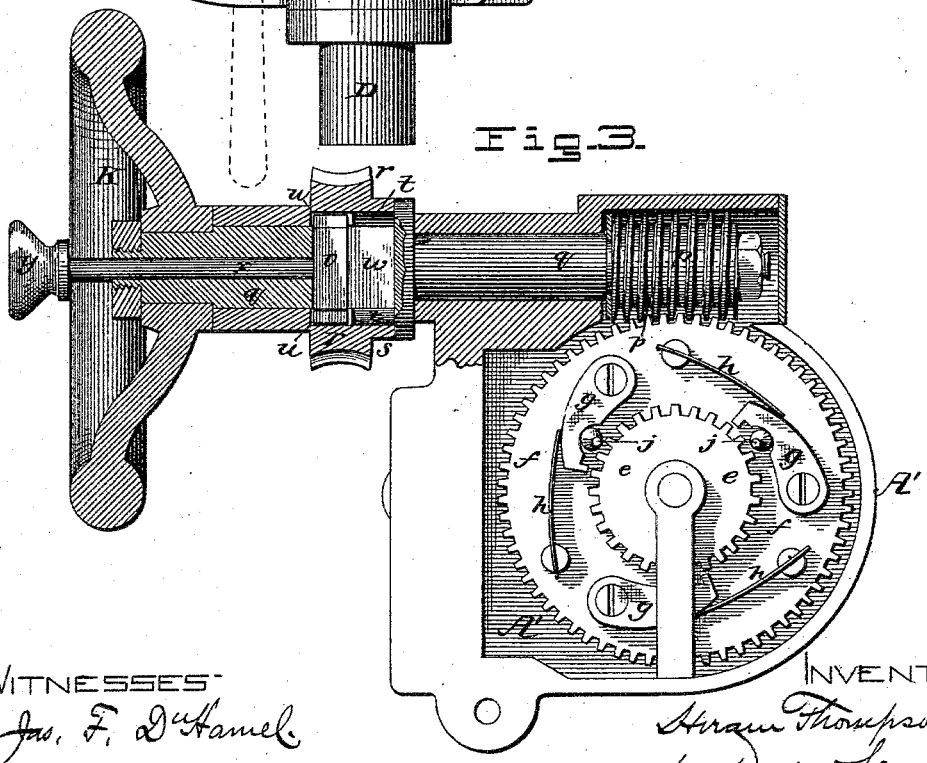


Fig. 3.



WITNESSES:

Jas. F. DuHamel.

Walter S. Dodge.

INVENTOR:

Hiram Thompson,

by Dodgerton,

Attys.

(No Model.) 3 Sheets—Sheet 3.

H. THOMPSON.

DRILLING MACHINE.

No. 303,073. Patented Aug. 5, 1884.

Fig. 4.

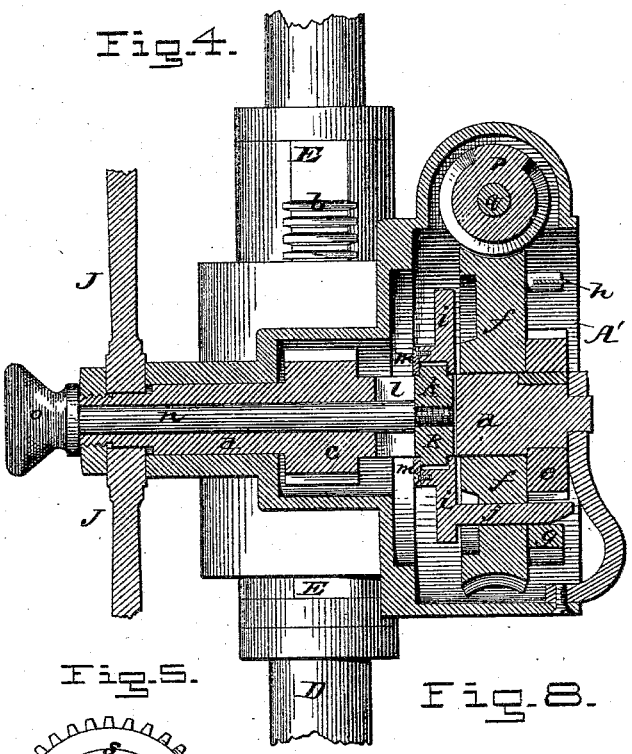


Fig. 5.

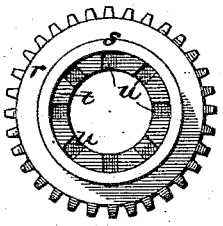
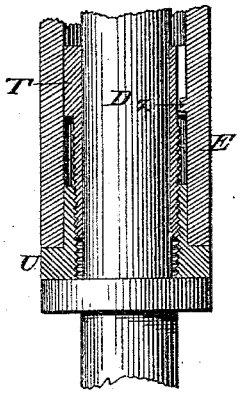


Fig. 8.



WITNESSES:

Jas. F. Duhamel.
Walter S. Dodge.

INVENTOR:

Hiram Thompson,
by Dodger Lon,
Attys.

UNITED STATES PATENT OFFICE.

HIRAM THOMPSON, OF WORCESTER, MASSACHUSETTS.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 303,073, dated August 5, 1884.

Application filed September 17, 1883. (No model.)

To all whom it may concern:

Be it known that I, HIRAM THOMPSON, of Worcester, in the county of Worcester and State of Massachusetts, have invented certain Improvements in Vertical Drilling-Machines, of which the following is a specification.

My invention relates to vertical drilling-machines, and is designed, primarily, to secure the location of the feed hand-wheel at the right-hand side of the machine, and of the quick-return lever at the front, where said devices can be most conveniently operated.

The invention therefore consists in a peculiar construction and arrangement of parts, whereby such location is permitted; and it further consists in novel means for connecting and disconnecting the power-feed, so that the drill may feed automatically and uniformly or be fed by hand; in a clutch for connecting and disconnecting the feed-gear with and from the sliding drill-stock bearing or head; in means for changing the rate of feed; in a bushing adapted to compensate for wear of and by the drill stock or spindle, and in various features and details hereinafter set forth.

In the accompanying drawings, Figure 1 represents a side elevation of my improved machine; Figs. 2 and 3, sectional views illustrating the feed hand-wheel clutch, and partially showing the quick-return lever-clutch; Fig. 4, a sectional view showing the construction of the quick-return lever-clutch; Fig. 5, an end view of the pinion on the hand feed-shaft; Figs. 6 and 7, views illustrating the variable feed-gear; Fig. 8, a view showing the bushing employed in the drill-stock bearing.

In its general appearance and mode of operation this machine resembles others already in use—that is to say, it is provided with a vertical column or standard, A, having an overhanging upper end, a suitable frame, B, to support the driving-gear, and a vertically-adjustable table or bed, C, to support the work. There is also the usual vertical drill stock or spindle, D, passing through a vertically-moving sleeve, E, a loose bevel-gear, F, having a feather or spline to enter a longitudinal groove in the drill stock or spindle, and a countershaft, G, carrying a band-pulley or cone-pulleys, H, and a bevel-pinion, I, to mesh with and give motion to gear F, which latter rests upon the upper face of a horizontal arm, *a*, the spindle or stock D being arranged to slide freely through the gear and arm, as usual, to permit the proper rise and fall of the drill.

For the purpose of effecting the elevation and depression of the drill stock or spindle, it is carried in a close-fitting sliding sleeve, E, provided on one side with a toothed rack, *b*, in which meshes a pinion, *c*, formed upon or carried by a spindle, *d*, extending from the front of the machine inward by the side of the sliding sleeve E and to the rear thereof, where it is furnished with a ratchet-wheel, *e*, and a loose worm-gear wheel, *f*, for a purpose presently to be seen. The outer end of the spindle is furnished with a cross bar or handle, J, by which it may be rotated and caused to speedily raise or lower the sleeve E and with it the spindle D. This hand-lever is used in bringing the drill down to the work and in raising it therefrom after the hole is drilled, which movements are made quickly to save time. The worm-gear wheel *f* is furnished with one or more dogs or pawls, *g*, preferably three, pivoted upon its rear face and normally pressed inward by springs *h*, to engage with the teeth of ratchet-wheel *e*, the ends of the dogs being formed with a square tooth or projection, and the teeth and intervening spaces of the ratchet-wheel being of like form, in order that when the pawls are engaged between the teeth there shall be no danger of their riding up on the teeth and becoming accidentally disengaged therefrom.

For the purpose of disengaging the pawls from the ratchet-wheel I provide a disk or plate, *i*, provided with a series of horizontally-projecting prongs *j*, corresponding in number and arrangement with the dogs or pawls *g*, said prongs being tapered at their outer ends and arranged to pass through holes or perforations in the worm gear-wheel *f*, and when forced outward, to pass beneath the dogs *g* and to raise them out of the teeth of ratchet-wheel *e*, as will be readily understood by referring to Figs. 3 and 4. The disk *i* is formed with a circular central opening to fit the spindle *d*, which opening is enlarged through the greater part of the thickness of the disk to receive a cross piece or block, *k*, which passes through an elongated slot, *l*, in the spindle, and projects past the sides thereof into the enlarged openings, as shown. An annular face-plate or band, *m*, screwed or bolted to the front face of the disk *i*, and having an in-

terior opening of a size to closely fit the spindle *d*, serves to retain the cross piece or block *k* within the circular opening of the disk, and also to give an additional bearing and support for the disk upon the spindle. A sliding rod or stem, *n*, passes centrally through the spindle *d*, and at its inner end screws into the cross-piece *k*, while its outer end extends beyond the outer end of the spindle, and is furnished with a knob, *o*, as shown. Under the above arrangement it will be seen that if the knob *o* be pressed inward the disk *i* will be forced close up against the worm gear-wheel *f*, and its prongs *j*, being forced through said wheel and made to pass beneath the dogs *g*, will raise them up and disengage the worm gear-wheel from the ratchet-wheel *e*, and consequently from spindle *d*, permitting them to turn while the worm gear-wheel stands still, or permitting the worm gear-wheel to turn while they stand still. Hence, as the worm gear-wheel is driven by power, as presently explained, it will be seen that the spindle may be rotated by power, and its pinion *c* be thus caused to feed down the sleeve E and spindle D; or the spindle may be made free from the power-driving mechanism, which ordinarily continues in motion, and the sleeve elevated and lowered quickly manually by turning the cross-handle J.

Rotary motion is imparted to worm gear-wheel *f* by a worm or screw wheel, *p*, carried by a spindle, *q*, which spindle is furnished with a hand-wheel, K, by which it may be rotated and caused to feed the sleeve and spindle E and D up or down, as desired. In order, however, to provide for automatically rotating the worm *p* by power, the spindle *q* carries also a loose pinion, *r*, which is formed with a neck or collar, *s*, having an annular space, *t*, encircling the spindle *q*, and provided with radial notches *u*, extending about one-half the length of the annular space, to receive the ends of a cross-piece or sliding block, *v*, passing through a slot, *w*, in the spindle, and extending through said spindle, as shown in Fig. 3. The block or dog *v* is provided with a stem, *x*, passing centrally through the spindle *q*, and furnished at the outer end with a knob, *y*, in the same manner as spindle or stem *n*. When the knob *y* is pressed inward, the block *v* is carried from the notches *u* into the free circular space *s*, where it becomes entirely free from the pinion *r*, which may then rotate upon the spindle *q* without giving motion thereto; but by drawing the stem *x* outward the block *v* is caused to enter the notches *u* and to lock the pinion to the spindle, so that the rotation of the pinion is caused to impart motion to the spindle, and through its worm *p* to the worm gear-wheel *f*, which, being locked to ratchet-wheel *e*, gives motion to spindle *d*, and through its pinion *c* to the sleeve E. Thus it will be seen that when the worm gear-wheel *f* is clutched to ratchet-wheel *e* and pinion *r* is locked to spindle *q* a rotation of pinion *r* will give motion to sleeve E at a regular and uniform rate; that if the pinion *r* be unclutched from spindle *q* the latter may be rotated by hand-wheel K, and thus manual feed be substituted for power feed; and, finally, that by disconnecting worm gear-wheel *f* from ratchet-wheel *e*, and turning the cross-handle J to rotate spindle *d*, the sleeve E may be quickly run up or down, as desired.

Motion is given to pinion *r* by a worm or screw, L, on a shaft, M, provided with band-pulleys N, which are driven by belt O from pulleys on counter-shaft G; or, if preferred, gearing may be employed, and, if so, it will preferably be arranged as in Fig. 6, as presently explained.

The sleeve E and drill-stock spindle D are counterbalanced by a weight, P, arranged within the hollow column or standard A, connection between the two being made by a flat steel strap or band, Q, passing over wheels or pulleys R S, as shown. This arrangement prevents all noise, jar, and jerky action common with chains, and prevents the twisting of the band and the occasional catching or locking of the weight, which sometimes occurs when chains or ropes are used. The kinking of chains, and consequent occasional dropping of the weight as the chain straightens, is found to be very injurious to the machine and its work. The pulleys should be sufficiently large to prevent any buckling or short bending of the strap or band calculated to destroy the integrity of the fiber of the metal. The constant rotation of the drill stock or spindle D causes considerable wear of the sleeve and of the spindle, from which it follows that undue play soon occurs. To compensate for this I provide the sleeve with an adjustable bushing. (Shown more plainly in Fig. 8.) This consists of a sleeve or collar, T, the inner end of which is turned to fit accurately within sleeve E, and is grooved to receive a guide pin or stud, *z*, which prevents the rotation of the collar or bushing T, the remaining portion of which is made of conical or tapering exterior form, and screw-threaded to receive a nut, U. The conical portion of the collar or bushing T is provided with a longitudinal slot, (one or more,) so that when the nut is screwed tightly thereon the bushing may be compressed or contracted and caused to fit snugly upon the spindle. When properly adjusted, the nut U is held in place by a set-screw, V, passing through the sleeve E, and bearing against the nut, as shown, or in some equivalent manner.

Referring now to Figs. 6 and 7, the manner of operating the feed mechanism by gearing instead of belts will be explained. Under this plan the worm L is arranged in a vertical instead of a horizontal position, and its shaft M is furnished at its upper end with two pinions or gear-wheels, W and X, to mesh with corresponding pinions or gear, Y Z, formed in one piece with or firmly secured to bevel-gear F. The pinions W and X are separate from the shaft M, and designed to be made fast thereto, one at a time, being of different

diameters, to mesh with the different-sized wheels Y and Z, for the purpose of giving the desired speed and consequent rate of feed to to the drill. Pinions or gears W X are each formed with a neck, a', bored out in a conical or tapering form inside, to fit upon a corresponding enlargement, b' of the shaft M. The enlargement b' is in the form of a double cone, or of two cones with their bases united, so that two conical faces are provided—one for each pinion or gear. The opposing faces of the necks a' of pinions W X are caused to come into contact, and the necks are of such length that when one is brought firmly to its seat upon the enlargement b' the other shall be held away therefrom. Above and below the respective pinions are nuts c' and d', by unscrewing one of which and screwing up the other either gear or pinion may be clamped firmly upon the shaft M. Thus it will be seen that the rate of rotation of shaft M may be readily varied. The nuts may obviously be omitted and the two pinions carried by a yoke, the movement of which will serve to simultaneously bring into action one pinion and throw out the other.

In order to support and protect the adjusting-gear, clutches, &c., a shell or case, A′, is formed directly in rear of sleeve E, as shown. In some cases the shell or head A′ is made to slide vertically with the drill-stock, and when this is done it is necessary to substitute bevel-pinions for the pinion r and worm L, the pinion r in that case being placed above the point indicated in the drawings and in a horizontal position. A vertical rod or spindle, carrying one of the bevel-pinions, passes centrally through pinion r, and is provided with a spline or feather, so that as the sliding head rises and falls the rod or spindle may move with it, and thus impart motion to spindle q at all times. The shell or head A′ is a hollow box or casting, within which the worm-wheel, gear-clutches, &c., are placed and shielded from dust and dirt. It is plainly shown in Figs. 1, 2, 3, 4, and 6 bolted to the overhanging arm of standard A.

Having thus described my invention, what I claim is—

1. The herein-described frame for drilling-machines, consisting of upright column A, provided with shell or case A′, substantially as and for the purpose set forth.

2. In a drilling-machine substantially such as described and shown, the combination of a vertically-moving sleeve carrying the drill-stock, a spindle provided with a pinion for raising and lowering said sleeve, and having a handle at the front of the machine for rotating the spindle, a worm meshing with a wheel on said spindle, and itself carried by a spindle having a hand-wheel at the right-hand side of the machine, by which it may be rotated, all substantially as shown and described.

3. In combination with frame A, drill-stock D, and sleeve E, spindle d, provided with handle J at the front of the machine, spindle q, provided with hand-wheel K at the right-hand side of the machine, and intermediate connecting-gear, substantially such as shown and described, between said spindles.

4. An organized vertical drilling-machine provided with mechanism, substantially such as shown and described, for raising and lowering the drill-spindle, and provided with a hand-lever at the front for speedily raising and lowering the drill-spindle, and at the right-hand side with a hand-wheel, by which the drill-spindle may be manually fed.

5. In combination with sleeve E, having a toothed rack, spindle d, provided with pinion c, ratchet-wheel e, and loose gear-wheel f, having dogs g, disk i, provided with prongs j, and stem n, all substantially as shown and described.

6. In a machine substantially such as described, the combination of a spindle provided with a fixed ratchet-wheel, a loose wheel mounted upon the spindle, and provided with one or more dogs to engage with the ratchet-wheel, a sliding plate provided with prongs to pass beneath the dogs, a cross-piece passing through a slot in the spindle and swiveled in the pronged plate, and a rod connected with said cross-piece and passing longitudinally through the spindle, substantially as shown and described.

7. In a machine substantially such as described, the combination of sleeve E, spindle d, provided with gear c, and ratchet-wheel e, wheel f, loosely mounted upon spindle d, and provided with dogs g, plate i, provided with prongs j, passing beneath the dogs g, block k, passing through a slot in the spindle and swiveled in the plate i, and rod or stem n, connected with the block, and passing longitudinally through the spindle, substantially as shown and described.

8. In combination with slotted spindle q, provided with sliding block v, having stem x, pinion r, provided with neck s, having annular space t and notches u, all substantially as shown and described.

9. In a drilling-machine substantially such as described and shown, the combination of sleeve E, provided with rack b, spindle d, provided with handle J, pinion c, and ratchet-wheel e, loose worm gear-wheel f, mounted upon the spindle, and provided with dogs g, plate i, provided with prongs j, and connected by a swivel-joint with sliding stem n, spindle q, provided with worm p, hand-wheel K, and loose pinion r, sliding block v, provided with stem x, worm L, meshing with pinion r, and means, substantially such as described and shown, for imparting motion to said worm.

10. The herein-described bushing for the drill-spindle, consisting of a sleeve having a tapered end provided with a slit, and a nut screwed upon said tapered end, substantially as set forth.

Witnesses: HIRAM THOMPSON.
HENRY L. PARKER,
H. M. ROGERS.