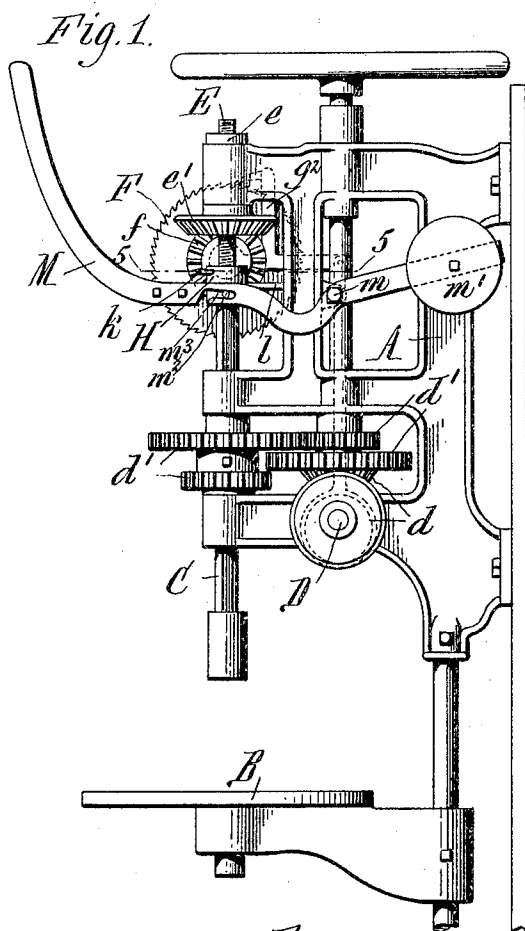
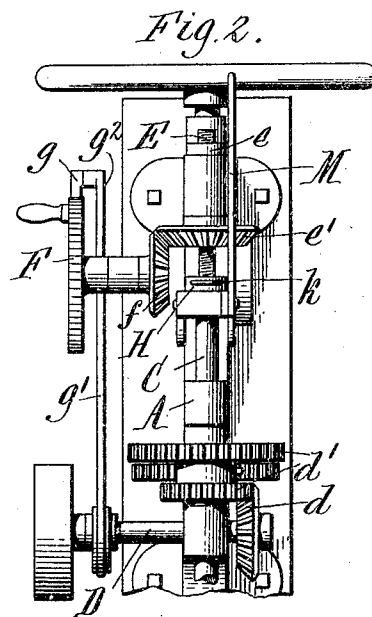
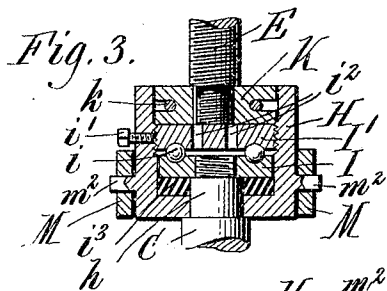
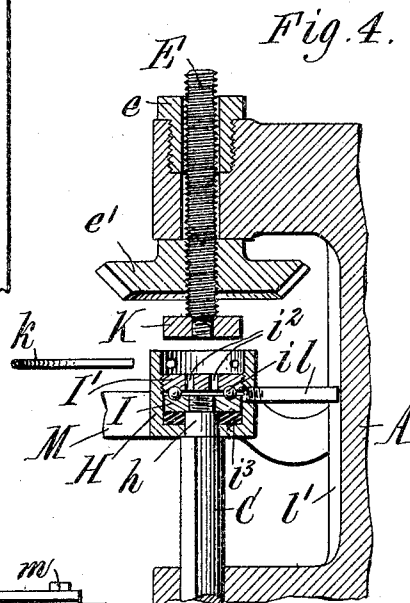


Witnesses:

E. A. Vock.

H. W. Rumer.

Inventor.

C. E. Stone

by *Wheeler, Perkins & Hard*  
Attorneys.

# UNITED STATES PATENT OFFICE.

CHARLES E. STONE, OF BUFFALO, NEW YORK, ASSIGNOR TO BUFFALO  
FORGE COMPANY, OF BUFFALO, NEW YORK.

## DRILL.

No. 802,060.

Specification of Letters Patent.

Patented Oct. 17, 1905.

Application filed March 6, 1905. Serial No. 248,690.

*To all whom it may concern:*

Be it known that I, CHARLES E. STONE, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Drills, of which the following is a specification.

This invention relates to drills of that kind in which the rotary drill-spindle is advanced or moved longitudinally by an automatic or hand-operated feed-screw arranged in line with and connected to the drill-spindle.

The objects of the invention are to provide a desirable detachable coupling for the drill-spindle and feed-screw of this type of drills whereby the spindle can be readily disconnected from the feed-screw and advanced and retracted by hand to enable rapid operation upon light work and to construct said detachable coupling with an antifriction-bearing, which receives the end thrust of the drill-spindle both when the latter is operated by the feed-screw and by hand.

In the accompanying drawings, Figure 1 is a side elevation of a drill provided with a coupling and bearing embodying the invention. Fig. 2 is a fragmentary front elevation of the drill. Fig. 3 is a sectional elevation, on an enlarged scale, of the coupling and bearing. Fig. 4 is a fragmentary sectional elevation of the drill, on an enlarged scale, showing the drill-spindle and feed-screw disconnected. Fig. 5 is a fragmentary horizontal sectional plan, on an enlarged scale, in line 5-5, Fig. 1. Like letters of reference refer to like parts in the several figures.

The invention is illustrated as applied to a well-known type of upright power-drill, in which the drill-spindle is arranged vertically and power-driven and is advanced to the work by a combined automatic and hand-operated screw-feed mechanism; but the improvements are equally applicable to other types of drills.

The known features of the drill shown in the drawings may be briefly described as follows: A represents the upright stationary frame; B, the vertically-adjustable work support or table; C, the vertical drill-spindle, which is journaled to rotate and move longitudinally in bearings in the frame above the work-support; D, a horizontal drive-shaft, which may be either hand or power operated and rotates the spindle through bevel-gears  $d$  and change-speed gears  $d'$ ; E, the non-rotary feed-screw, which is connected to the spindle

and extends up through a guide-bearing  $e$  on the frame and works in the screw-threaded hole of a rotary gear-wheel  $e'$ , and F a feed-screw-operating wheel, which is secured to a horizontal shaft provided with a gear-wheel  $f$ , meshing with the screw-threaded gear-wheel  $e'$ . By rotating the wheel F the screw-threaded wheel  $e'$  is rotated and the feed-screw E moved longitudinally to advance or retract the spindle, according to the direction of rotation of the screw-operating wheel F. The latter can be operated by hand and also automatically by a pawl  $g$ , engaging ratchet-teeth on the wheel F and operated from the drive-shaft D by a pitman  $g'$  and pawl-lever  $g''$ . The machine as thus far described is of well-known construction and operation.

The drill-spindle C is detachably connected to the feed screw or device E by the combined coupling and thrust-bearing now to be described, whereby the spindle can be quickly and with little trouble disconnected from and operated independently of the feed screw or device.

H represents a hollow shell or box, which is loosely connected to the upper end of the drill-spindle in such manner that the spindle can turn in the shell, which is held from rotation. As shown in the drawings, (see Fig. 3,) the reduced upper end  $h$  of the spindle extends into the shell through a hole in its lower end and has fixed on its end in the shell a bearing member or disk I, between which and a bearing-disk I', fixed in the shell H, are rolling bearing balls or devices  $i$ . The rotary bearing-disk I is preferably secured on the spindle by a left-hand screw-thread or a thread so directed as to cause the bearing-disk to tighten thereon in the rotation of the spindle, and the other or stationary bearing-disk is preferably threaded and screwed into an internal thread in the shell and is fixed against rotation by a set-screw  $i'$ . The stationary bearing-disk is provided with holes  $i''$ , adapted to receive a tool for inserting and removing the disk and which also serve as oil-holes to enable the lubrication of the bearing. An antifriction-washer  $i'''$  of fiber or other suitable material is preferably interposed between the rotary bearing-disk I and the end of the shell to reduce the wear on these parts.

Fixed in any suitable manner to the lower end of the feed-screw is a head K, which fits loosely in the open upper end of the shell H, in which it is detachably held by a removable

key *k*, of any desired form, capable of ready removal. A U-shaped key is shown, which enters pairs of registering holes in the head K and shell H. When the key is inserted, as shown in Figs. 3 and 5, the spindle is coupled to the feed-screw and moved longitudinally therewith, and when the key is removed, as shown in Fig. 4, the spindle is disconnected from the feed-screw and can be advanced and retracted independently of the screw.

In the machine illustrated the coupling-shell H and the feed-screw to which it is secured are held from rotation by a finger *l*, projecting from the shell and slidably engaging in an upright slot *l'*, Fig. 4, in the frame. Any other means for holding the screw and shell from rotation could be employed.

M represents a hand-lever fulcrumed on the frame and connected to the coupling-shell for advancing and retracting the spindle by hand. The rear end of the lever is preferably forked and straddles the coupling-shell H and frame A, to which it is pivoted by bolts or pins *m*. One fork-arm is extended rearwardly beyond its pivot and provided with a counterbalancing-weight *m'*. The coupling-shell has lateral projections or pins *m<sup>2</sup>* working in slots *m<sup>3</sup>* in the fork-arms of the lever.

When the drill-spindle is coupled to the feed-screw, as shown in Figs. 1 and 2, it is fed to the work automatically by the ratchet-and-pawl mechanism F *g*, or it can be fed slowly by hand by throwing the pawl *g* out of engagement with the ratchet-wheel F and turning the latter manually in the usual manner. When the character of the work is such as to permit feeding of the drill by hand-pressure, or when a number of holes are to be drilled in light or thin stock, making rapid operation of the drill possible and desirable, the coupling-key *k* is removed to free the drill-spindle from the feed-screw, when the spindle can be advanced and retracted rapidly by the hand-lever. The coupling and uncoupling of the drill-spindle and feed-screw can be effected very rapidly and with little trouble or exertion by the coupling device described.

The ball thrust-bearing is also more efficiently located in the construction described than in the more common arrangement, where the ball-bearing is located between the threaded operating-wheel *e'* for the feed-screw and the frame, because there is much greater wear in the coupling between the rapidly-rotating spindle and the stationary feed-screw than there is between the more slowly-rotating wheel *e'* and its bearing. The combined coupling and bearing is exceedingly simple and inexpensive in construction. The ball thrust-bearing receives the thrust of the spindle both when the latter is coupled to the feed-screw and when disconnected therefrom and operated by the lever.

I claim as my invention—

1. The combination of a longitudinally-movable rotatable drill-spindle, means for rotating the same, a feed device and operating means for advancing the spindle, a coupling detachably connecting the spindle and feed device, and a hand-operating device for moving the spindle longitudinally independently of said feed device when the spindle is disconnected from the feed device, substantially as set forth.

2. The combination of a longitudinally-movable rotatable drill-spindle, means for rotating the same, a feed-screw and operating means for advancing the spindle, a coupling detachably connecting the spindle and feed-screw and comprising parts carried by the spindle and feed-screw, respectively, and a lever connected to that part of the coupling carried by the spindle for moving the latter longitudinally independently of the feed-screw when the spindle is disconnected from the feed-screw, substantially as set forth.

3. The combination of a longitudinally-movable rotatable drill-spindle, means for rotating the same, a feed-screw and operating means for advancing the spindle, a coupling device carried by the spindle and detachably connected to the feed-screw, an antifriction thrust-bearing between the spindle and said coupling device, and means connected to said coupling device for moving the spindle longitudinally independently of the feed-screw when disconnected therefrom, substantially as set forth.

4. The combination of a longitudinally-movable rotatable drill-spindle, means for rotating the same, a feed-screw and operating means for advancing the spindle, and a combined coupling and thrust-bearing connecting the spindle and feed-screw comprising a shell, cooperating bearing members carried by the spindle and said shell, and a movable device detachably connecting said shell to the feed-screw, substantially as set forth.

5. The combination of a longitudinally-movable rotatable drill-spindle, means for rotating the same, a feed-screw and operating means for advancing the spindle, and a combined coupling and thrust-bearing connecting the spindle and feed-screw, comprising a shell loosely connected to the spindle, cooperating bearing members fixed to the spindle and said shell, balls between said bearing members, a head fixed to the feed-screw and removably fitted in said shell, and a removable key connecting said shell to the feed-screw, substantially as set forth.

Witness my hand this 17th day of February, 1905.

CHARLES E. STONE.

Witnesses:

WM. BRAEMER,  
WM. L. FOX.