(No Model.) 2 Sheets—Sheet 1.

A. J. SMART & C. E. MARTIN.

DRILLING MACHINE.

No. 534,180. Patented Feb. 12, 1895.

FIG. 1.

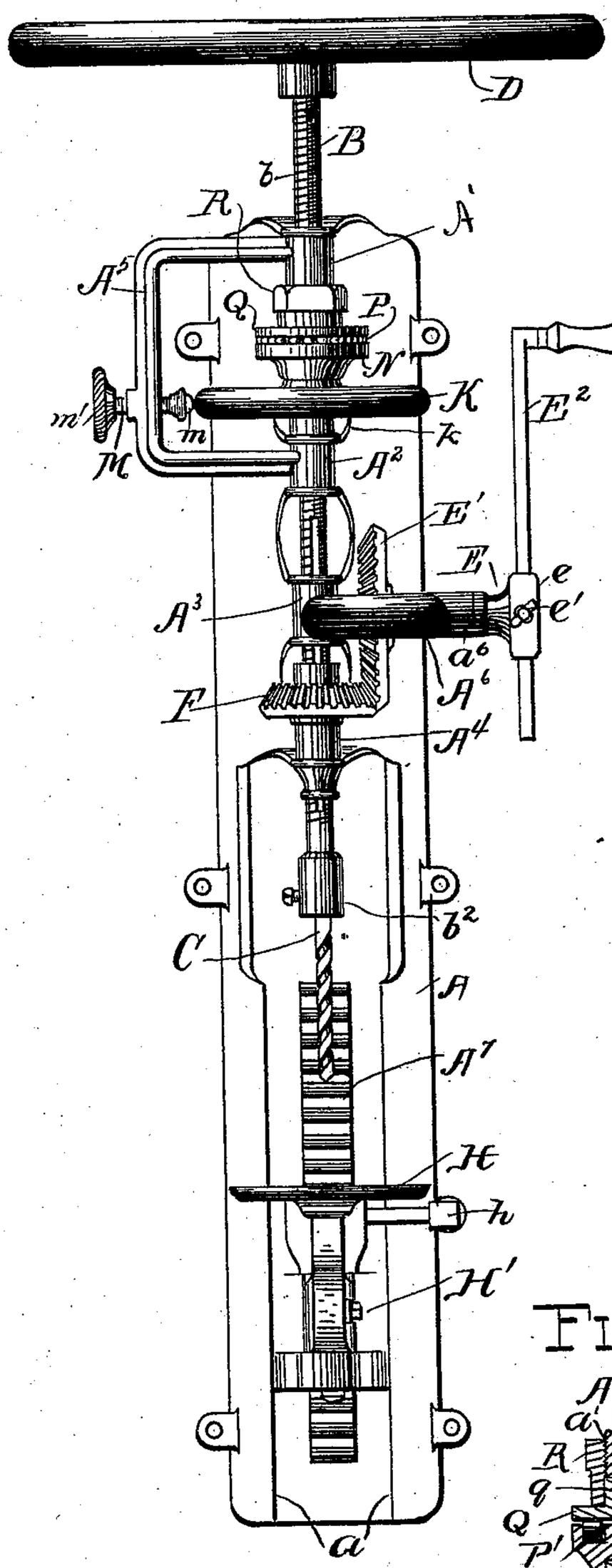


FIG. 2.

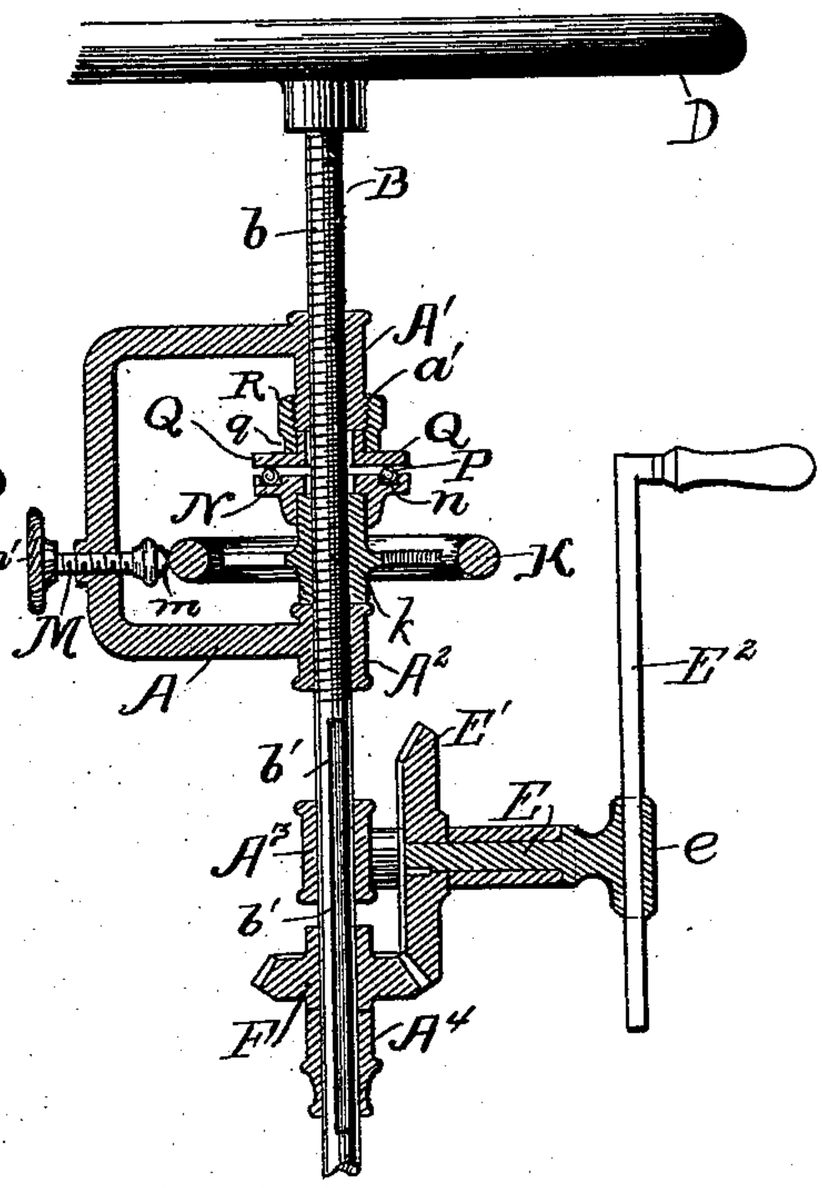


FIG. 3.

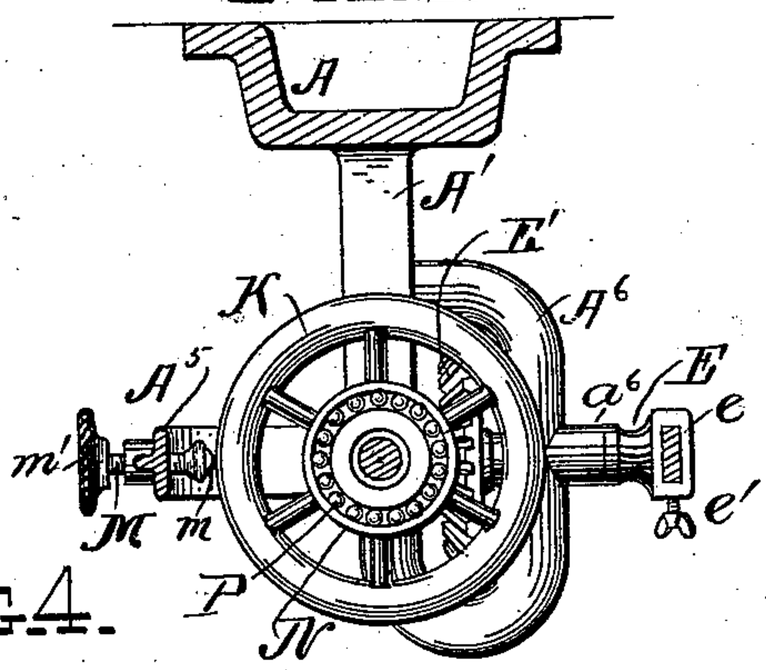
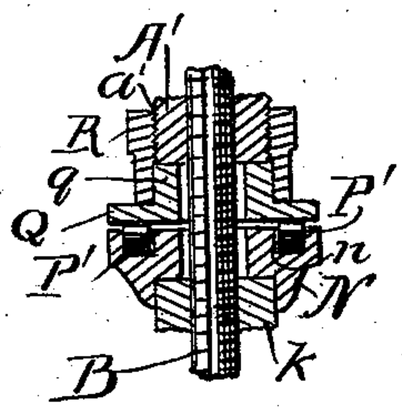


FIG. 4.



Witnesses:

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Inventors

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Attorneys.

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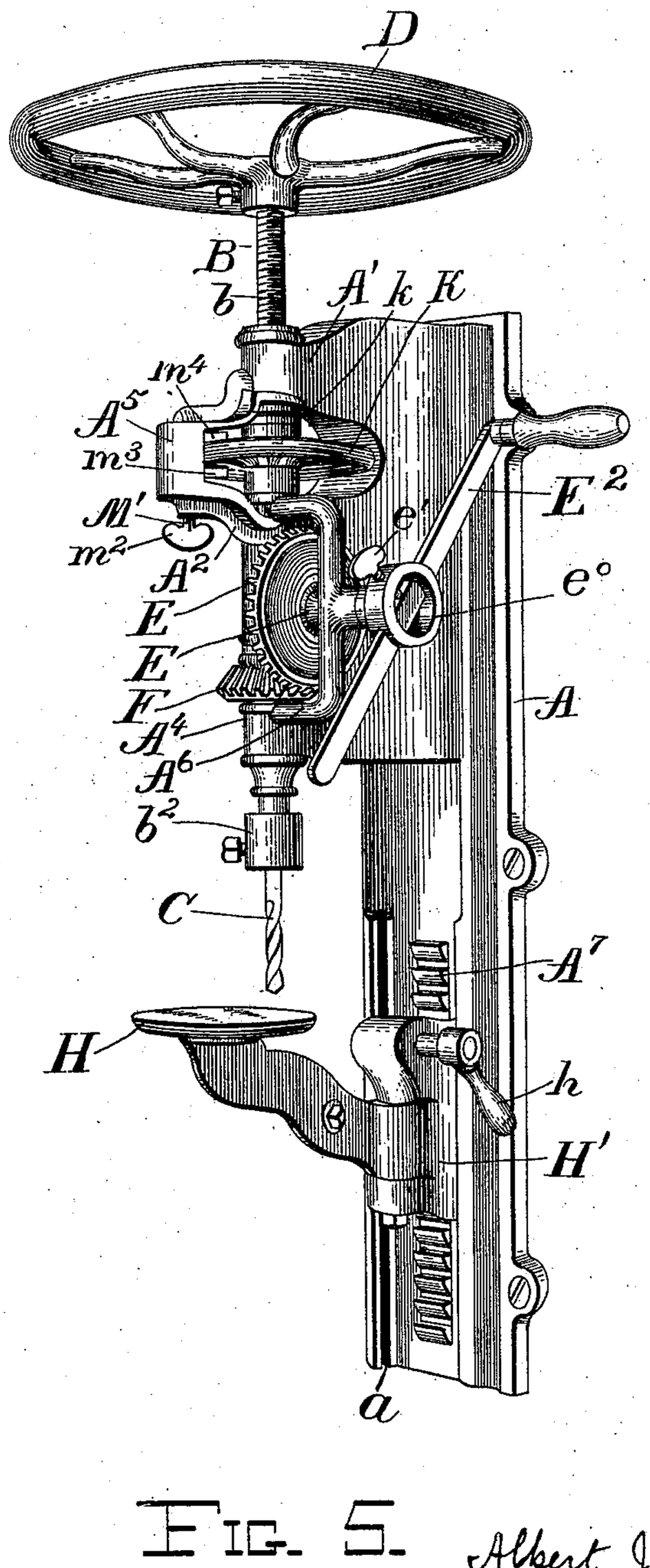

FIG. 5.

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UNITED STATES PATENT OFFICE.

ALBERT J. SMART AND CLIFFORD E. MARTIN, OF GREENFIELD, MASSACHUSETTS, ASSIGNORS TO THE WILEY & RUSSELL MANUFACTURING COMPANY, OF SAME PLACE.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 534,180, dated February 12, 1895.

Application filed December 13, 1894. Serial No. 531,670. (No model.)

To all whom it may concern:

Be it known that we, ALBERT J. SMART and CLIFFORD E. MARTIN, citizens of the United States, residing at Greenfield, in the county of Franklin and State of Massachusetts, have invented certain new and useful Improvements in Drilling-Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to improvements in drilling machines and it consists of certain novel features hereinafter described and claimed.

Reference is had to the accompanying drawings, in which the same parts are indicated by the same letters throughout the several views.

Figure 1 represents a front view of the improved drilling machine as detached from its standard or support. Fig. 2 represents a central vertical section through the upper portion of the machine. Fig. 3 represents a section along the broken line *x x* of Figs. 1 and 2, and looking down. Fig. 4 represents an enlarged sectional view of a modified form of anti-frictional bearing, having rollers instead of the balls shown in the other figures; and Fig. 5 represents a perspective view of a slightly modified form of drilling machine.

A represents the bed plate or frame in which the drill is mounted, and is provided with bearings A', A^2, A^3, and A^4 in which the drill spindle is journaled so as to revolve freely. The said bed plate is also provided with a frame A^5 for the feed brake, a frame A^6, for the driving shaft E, and also with a rack A^7 for the purpose of adjusting the height of the table H.

The drill spindle B is screwthreaded as at *b*, slotted longitudinally as at *b'*, and carries at its lower end a chuck b^2 for holding the drill C. At the upper end of the drill spindle B is a fly wheel D.

The drill spindle and drill are revolved by means of the driving shaft E journaled in the frame A^6, and carrying the bevel gear E', which meshes in the bevel gear F splined on the drill spindle B, and supported above the bearing A^4. This shaft E is revolved by means of a hand crank E^2 which slides in the sleeve *e* transverse to the said shaft E and integral therewith, as shown in Figs. 1 to 3, or in the ring e^0 fast to the shaft E as shown in Fig. 5, and the said hand crank is clamped at any desired position by means of the clamp screw *e'*, whereby the desired adjustment for power may be attained.

It will be obvious that the driving shaft may be driven by any suitable gearing other than by hand, if desired.

The table H for supporting the article to be drilled slides up and down between the guides *a* of the bed plate A, being held therein by the tail piece H', which is dovetailed into the said guides. The position of the said table is regulated by the hand lever *h* which operates a pawl engaging in the rack A^7, as is well known in drilling machines of this character.

The feed motion is given to the drill by means of the hand wheel K which has a screwthreaded hub *k* which acts as a nut on the screwthreads *b* of the drill spindle. This hub *k* bears on its lower face against the bearing A^2, and on its upper face against the grooved collar N which is grooved as at *n* to receive a plurality of balls P. (Rollers P' as shown in Fig. 4 may be used instead of the said balls, if preferred.) This collar N is free from contact with the spindle B.

Above the balls or rollers P or P' is a flanged collar Q having a flange *q* projecting up against the upper bearing A', and preferably held in place by a ring R screwed to the bearing A' as at *a'*.

The feed wheel K while ordinarily operated by hand may also be braked by means of the brake screw M, (shown in Figs. 1 to 3) provided at one end with a knurled head *m'*, and at the other with a brake shoe *m* which is caused to bear more or less firmly on the feed wheel K, according to the quality of the feed desired.

In the modification shown in Fig. 5, the hand wheel may be braked either by hand, or by the plates m^3 and m^4, of which the plate m^3 is pressed upward by the screw M' with the flat head m^2. Thus it will be necessary to brake harder when a quick feed is

desired, and also when the drill is boring into hard material. It will ordinarily be preferable, however, to operate the feed wheel entirely by hand without using the brake. Thus the feed wheel may be held or even turned backward by hand, or allowed to revolve slowly under the pressure of the hand of an operator. This hand-feed is particularly important in starting countersinks the points of which are delicate and easily broken.

The operation of the device is as follows: When the driving shaft is turned in one direction the drill spindle will revolve, carrying with it the feed wheel K, which will also revolve freely, barring a slight retardation due to friction on its bearing, unless the wheel is slowed down or stopped by hand, or the brake is in operation, when the said wheel will be retarded or entirely stopped as the case may be. If the wheel is stopped, the feed will be a maximum either downward or upward, according to the direction in which the driving shaft is revolved, and thus by stopping the wheel it will be seen that a rapid feed or a quick withdrawal of the drill may be obtained. When the wheel K is simply slowed down, the feed will depend upon the difference in velocity of the drill spindle B and the wheel K. Now it will be evident that when the drill is boring into hard material, the friction of the nut *k* on the screwthreads *b* due to the upward pressure of the drill, will be greater than when the drill is boring into soft material, and therefore the same braking effect that would stop the wheel K when drilling in soft material, would only slow it down when drilling in hard material. Therefore the same amount of braking effect would give a rapid feed in soft material and a slow feed in hard material and would also insure the rapid withdrawal of the drill from the boring when the driving shaft is turned in the opposite direction, all of which advantages are greatly to be desired.

By the use of the ball or roller bearings to receive the upward pressure of the drill, any tendency of the drill to bind on its bearings is obviated, and the feed wheel K is entirely free to be regulated either by hand or by means of the brake. These, and the various other advantages of the herein described construction, will readily suggest themselves to any one skilled in the art.

Having thus described our invention, what we claim, and desire to secure by Letters Patent of the United States, is—

1. In a drilling machine, the combination with a bed plate with journal bearings therein for the drill spindle, of a spindle screwthreaded along a portion of its length and free to revolve in said journal bearings, a feed wheel provided with a screwthreaded hub engaging the screw threads on said spindle, and situated between two of said bearings, an antifriction bearing between said hub and the upper one of the said bearings on either side of said hub and in juxtaposition therewith, and a brake adapted to engage said friction wheel and slow down or stop the same, while the said spindle is revolving, substantially as described.

2. In a drilling machine, the combination with a fixed frame provided with a plurality of journals for the drill spindle, of a spindle screwthreaded along a portion of its length and free to revolve in said bearings, a drill secured to said spindle, and means for revolving said spindle with said drill, a feed wheel provided with a screwthreaded hub engaging the screw threads on said spindle, and situated between two of said bearings, the said hub being in contact with the lower one of said pair of bearings, a grooved collar loose on said spindle, above said hub, balls or rollers in said groove, and projecting above the top thereof, a flanged annular plate loose on said spindle and resting on said balls or rollers and bearing against the upper one of said pair of bearings, and a brake adapted to engage said friction wheel and slow down or stop the same while the said spindle is revolving, substantially as described.

3. In a drilling machine, the combination with a fixed frame provided with a plurality of journals for the drill spindle, of a spindle screw threaded along a portion of its length and free to revolve in said bearings, a drill secured to said spindle, and means for revolving said spindle with said drill, a feed wheel provided with a screw threaded hub engaging the screwthreads on said spindle, and situated between two of said bearings, the said hub being in contact with the lower one of said pair of bearings; a grooved collar loose on said spindle above said hub, balls or rollers in said groove, and projecting above the top thereof, a flanged annular plate loose on said spindle and resting on said balls or rollers and bearing against the upper one of said pair of bearings, a secondary frame fast to said fixed frame and inclosing said friction wheel, a screw passing through said secondary frame, and a brake shoe carried by said screw and adapted to engage said feed wheel, substantially as and for the purposes described.

4. In a drilling machine, the combination with a bed plate with journal bearings therein for the drill spindle, of a drill spindle screwthreaded along a portion of its length and free to revolve in said bearings, and a hand feed wheel provided with a screwthreaded hub engaging the screwthreads on said spindle, the said hub fitting snugly between two of said bearings, substantially as and for the purposes described.

5. In a drilling machine, the combination with a fixed frame provided with a plurality of journals for the drill spindle, of a spindle screwthreaded along a portion of its length and free to revolve in said bearings, a drill secured to said spindle, and means for revolving said spindle with said drill, a hand wheel

provided with a screwthreaded hub engaging the screwthreads on said spindle, and situated between two of said bearings, the said hub being in contact with the lower one of said pair of bearings; a grooved collar loose on said spindle, above said hub, balls or rollers in said groove, and projecting above the top thereof, and a flanged annular plate loose on said spindle and resting on said balls or rollers and bearing against the upper one of said pair of bearings, substantially as described.

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

ALBERT J. SMART.
CLIFFORD E. MARTIN.

Witnesses:
JOSIE M. BRIGGS,
JOHN D. BOUKER.