

(No Model.)

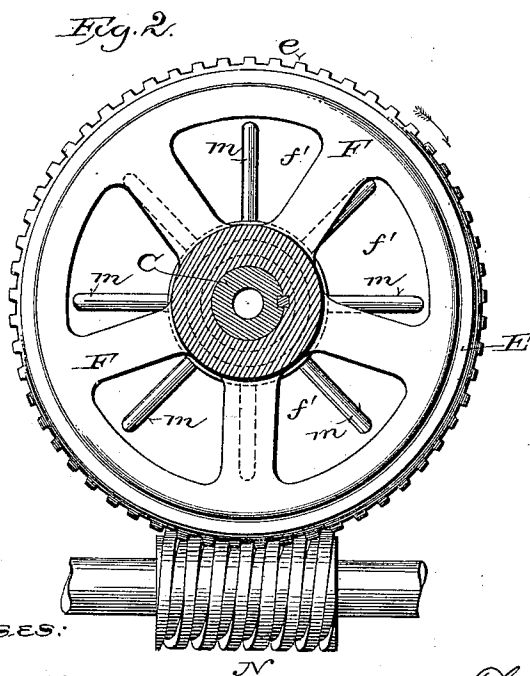
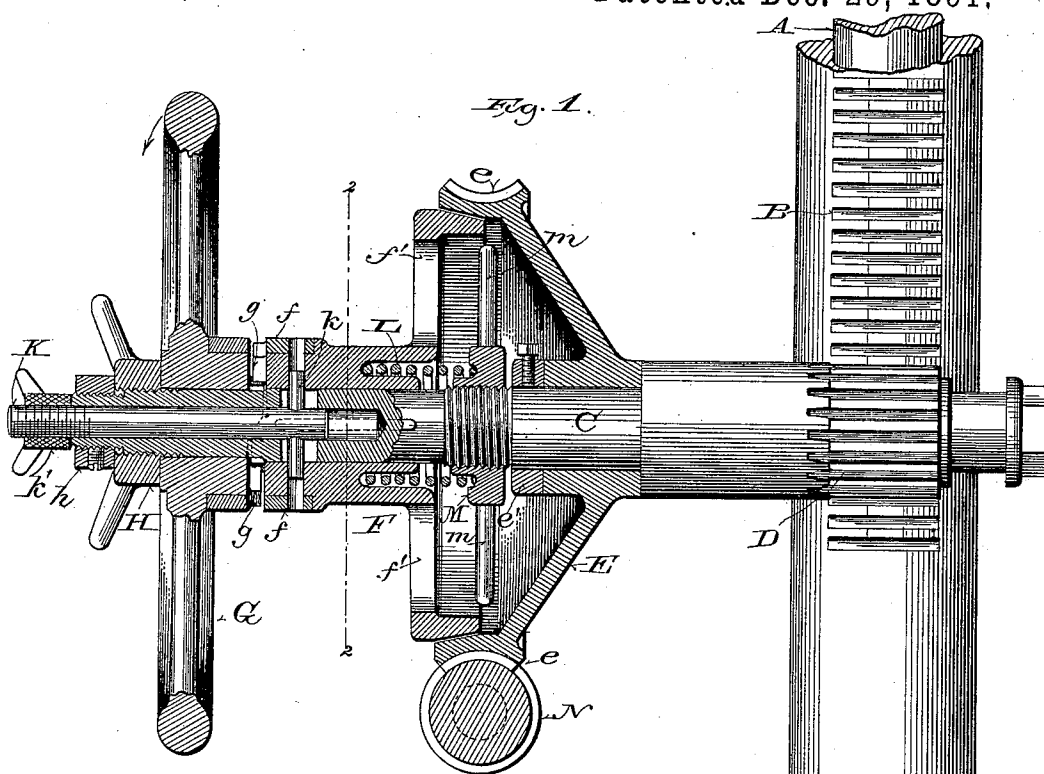
3 Sheets—Sheet 1.

T. L. SMITH.

FEED CONNECTION FOR DRILL PRESSES AND OTHER MACHINES.

No. 465,892.

Patented Dec. 29, 1891.



WITNESSES:

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(No Model.)

3 Sheets—Sheet 2.

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Fig. 3.

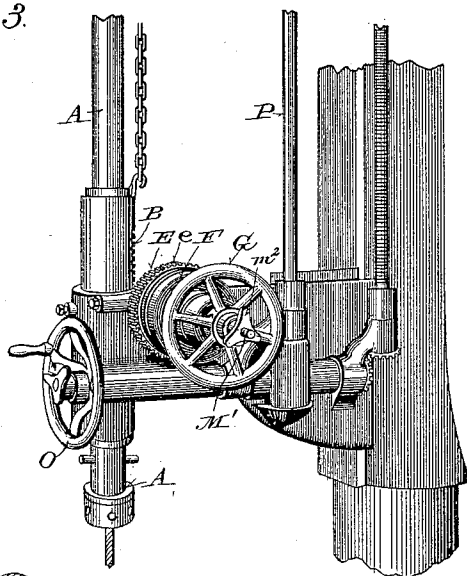


Fig. 5.

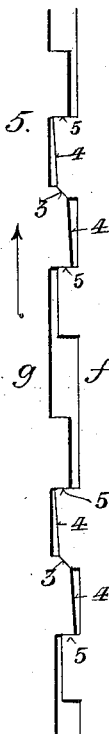
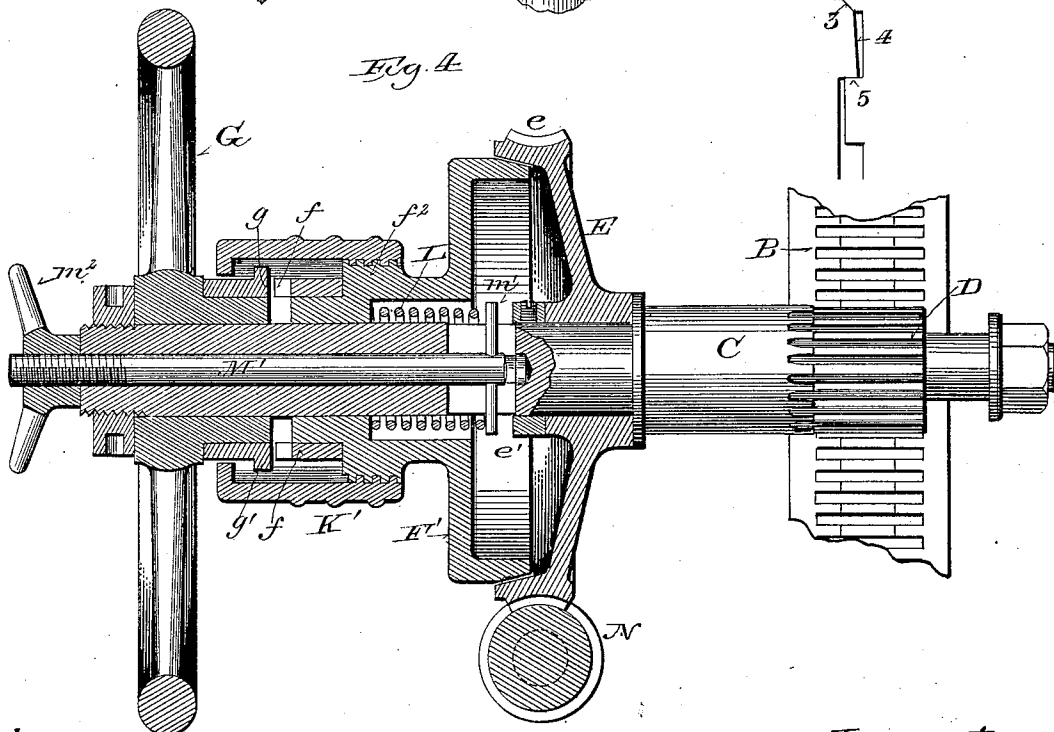


Fig. 4.



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(No Model.)

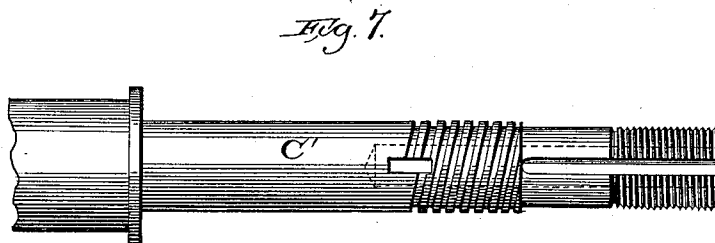
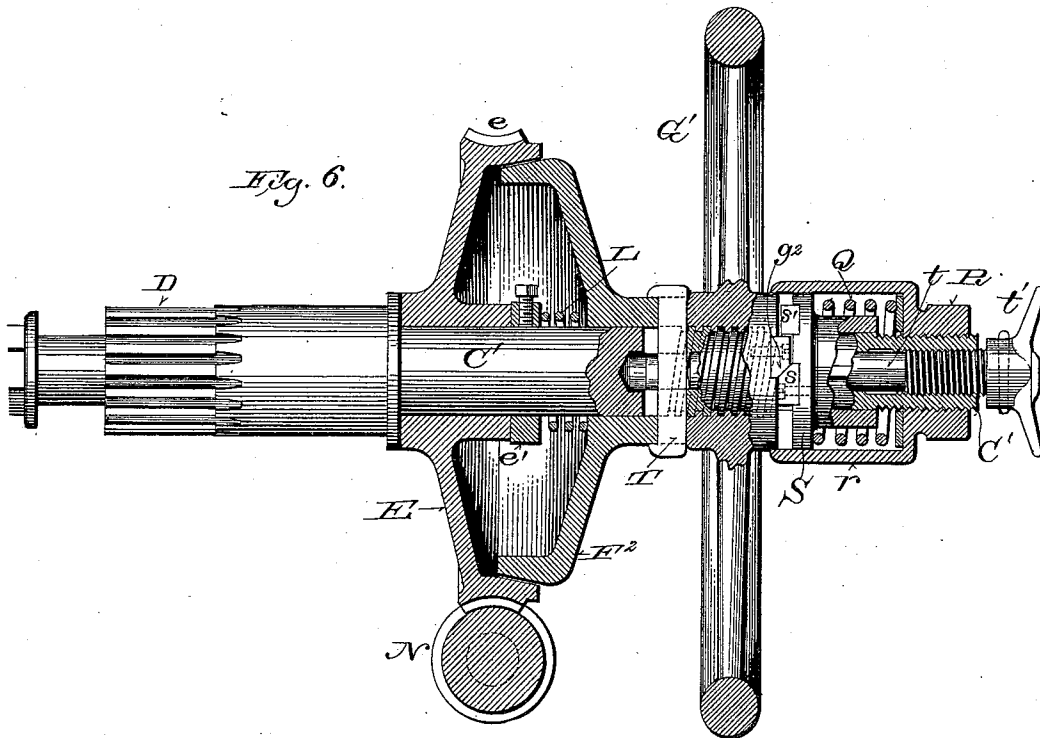
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UNITED STATES PATENT OFFICE.

THOMAS L. SMITH, OF MILWAUKEE, WISCONSIN.

FEED CONNECTION FOR DRILL-PRESSES AND OTHER MACHINES.

SPECIFICATION forming part of Letters Patent No. 465,892, dated December 29, 1891.

Application filed June 3, 1891. Serial No. 394,916. (No model.)

To all whom it may concern:

Be it known that I, THOMAS L. SMITH, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Feed Connections for Drill-Presses and other Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

The main objects of my invention are to facilitate the operation of the tool by automatically connecting and disconnecting the power-feed by the same movements of the hand-feed required to move the tool up to the work and withdraw the same therefrom, to expeditiously and by simple manipulations move the tool up to the work and to withdraw the same therefrom, to permit of the employment of either hand or power feed in the ordinary manner, and by simple manipulations to bring into operation or disconnect either the power or the hand feed, &c.

It consists of certain peculiarities of construction and arrangement, particularly in the hand and power feed connections, hereinafter specifically set forth, and pointed out in the claims.

In the accompanying drawings like letters and figures designate the same parts in the several figures.

Figure 1 is an elevation of the drill-spindle and a vertical axial section of the power and hand feed connections embodying my improvements. Fig. 2 is a cross-section on the line 2 2, Fig. 1, showing the clutch, worm, and worm-gear of the power-feed in side elevation. Fig. 3 is a perspective view, on a reduced scale, of a portion of a drill-press, showing the construction and arrangement of parts embodying my improvements as adapted to a vertical drill. Fig. 4 is an axial section of a modification of the power and hand feed connections shown in Fig. 1. Fig. 5 is a developed view of the cams employed in connection with the hand-wheel and clutch shown in Figs. 1 and 4. Fig. 6 is an axial section of still another

modification of the power and hand feed connections of the drill, and Fig. 7 is a detached side elevation of the clutch-spindle employed in the construction illustrated in Fig. 6.

A represents the drill-spindle; B, a rack formed on a sleeve mounted upon said spindle or otherwise connected therewith, so as to afford means for imparting a longitudinal movement to the drill, both of the usual or any suitable construction and arrangement.

C is the clutch and hand-wheel shaft or spindle, preferably arranged at right angles to the drill-spindle A and provided with a pinion D, engaging with the rack B.

E represents a part of a friction-clutch loosely mounted upon the shaft C and formed or provided with a worm-gear *e*, which is engaged and driven by the worm N, mounted on a shaft arranged transversely to the clutch-shaft C and in turn geared with and driven by a shaft P, as shown in Fig. 3. The worm-shaft is provided at the end nearest the operator with a hand-wheel O, by which a slow hand-feed is provided. The several parts hereinbefore mentioned may be such as are ordinarily employed in machines of this class.

The female section of the clutch E, with its worm-gear *e*, is restrained from endwise movement on the clutch-shaft C by a collar *e'* in the usual manner.

F represents the male section of the clutch, which is feathered or keyed upon the clutch-shaft C so as to permit of its free lateral movement thereon into and out of engagement with the clutch-section E, but so as to cause it to turn with the clutch-shaft.

G represents a hand-wheel similar to those heretofore employed for a quick hand-feed and withdrawal or return movement of the drill. It is loosely mounted upon the outer end of the clutch-shaft C next to the outwardly-projecting hub of the male portion F of the clutch. The adjacent ends of the hubs of the clutch-section F and hand-wheel G are formed or provided with annular cam and clutch formations *f* and *g*, a developed exterior view of which is shown in Fig. 5. The hand-wheel is loosely mounted upon the clutch-shaft, and is retained thereon by nuts H and *h*, the former being provided for the purpose of locking the clutch-sections E and

F in engagement and the latter for the purpose of retaining said lock-nut and the hand-wheel in place upon the clutch-shaft.

The end of the shaft C upon which the hand-wheel G is mounted is formed with an axial bore, in which is inserted a longitudinally-movable rod K, having a screw-thread at its outer projecting end and provided at its inner end with a cross pin or key *k*, which passes through a transverse slot in shaft C and engages with perforations formed for the purpose in the hub of section F of the clutch. A nut *k'* is provided on the projecting threaded end of the rod K, so as to abut against the end of the shaft C and afford means for holding section F out of engagement with section E of the clutch whenever it is desired to permanently disconnect the power-feed and employ the quick hand-feed.

A spiral spring L, interposed between the laterally-movable section F of the clutch and an adjusting-nut M, screw-threaded on the clutch-shaft C, tends to force and hold the clutch-sections out of engagement with each other. The nut M is formed or provided on its periphery with radial projections or arms *m*, which are accessible through apertures *f'* in the clutch-section F and afford means of turning said nut for the adjustment of the tension of spring L.

The cams *f* and *g* are formed with corresponding steep or sharp inclines, as at 3, and with inclines of less pitch, as at 4, and with square or abrupt engaging projections, as at 5 in Fig. 5, which shows the cams in the position they assume when no resistance is encountered by the drill. In moving the drill toward the work the hand-wheel and cam *g* are turned in the direction indicated by the arrow, Fig. 5. The inclines 3, made of such pitch as to overcome the resistance to the longitudinal movement of the drill-spindle when the drill is not in engagement with the work, acting through the hub of the clutch-section F, turn the spindle and the clutch-shaft C, on which it is feathered or keyed, and through the pinion D and rack B move the drill-spindle toward the work. As soon as the drill encounters the work the resistance to the further advance movement of the drill-spindle presented thereby temporarily arrests the clutch-shaft and the cam *f*, and the continued movement of the hand-wheel G in the same direction causes the sharp incline 3 on the cam *g* to ride over the corresponding incline on the cam *f*. The inclines 4 on said cams are thus brought into engagement and force and hold the clutch-section F in engagement with the clutch-section E, thereby automatically connecting the clutch-shaft C with the power-feed through the worm-gear *e* and worm N. When the hand-wheel G is turned in the opposite direction, the inclines 4 of cam *g* are moved out of engagement with the corresponding inclines of cam *f*, thereby automatically releasing the clutch-

section F and allowing it to be moved out of engagement with the clutch-section E by spring L, and the faces 5, perpendicular to the plane of rotation of the hand-wheel, being thus brought into engagement, cause the continued reverse movement of the hand-wheel to turn the clutch-shaft C with it, and thereby to withdraw the drill-spindle and drill from the work. In case it should for any reason not be desirable to employ the automatic power-feed engagement the clutch may be engaged or disengaged, so as to connect or disconnect the power-feed, by means of the nut H. Whenever it is desired to disconnect the power-feed and employ a quick hand-feed, the clutch-sections may be held out of engagement by turning up the nut *k'* on the rod K, so as to lock the cams *f* and *g* in engagement in the position in which they are shown in Fig. 5, whereby the hand-wheel is made fast upon the clutch-shaft.

By means of the nut M the tension of the spring L is so adjusted as to offer sufficient resistance to the independent advance movement of the hand-wheel to cause the same to advance the drill-spindle without throwing the clutch-section F into engagement with the clutch-section E before the drill encounters the work.

Various changes in the details of construction and arrangement of the parts embodying my improvements and of the parts of the drill-press associated therewith may be made within the intended scope of my invention.

Referring to Fig. 4, which illustrates one of many such possible modifications, the tension of the spring L is adjusted by means of a rod M', inserted in an axial bore in the clutch-shaft C and provided at its inner end with a cross-pin projecting through a transverse slot in the clutch-shaft and affording bearings for the inner end of spring L and at its outer end with an adjusting-nut *m'*, which abuts against the outer end of the clutch-shaft. By turning the nut *m'* up more or less the tension of spring L is adjusted as desired. This device for adjusting the tension of the spring is similar to the device shown in Fig. 1 for holding the clutch-sections out of engagement, which is accomplished in the modification shown in Fig. 4 by means of a sleeve K', threaded upon the hub of the clutch-section F' and formed at its opposite end with an inwardly-turned flange, which is adapted to engage with an outwardly-turned flange *g'* on the cam *g* or hub of the hand-wheel G. This sleeve is preferably milled or knurled on the outside to facilitate turning the same by hand. When it is desired to lock the clutch-section F' out of engagement with the driving-section E, the sleeve K' is turned so as to bring the flange on its outer end into engagement with the flange *g'*, and thus draw and hold the cam *f* in engagement with the cam *g* in the relative positions in which they are shown in Fig. 5.

By this means the hand-wheel G is made fast upon the clutch-shaft and may be employed to feed and withdraw the drill by hand without the power-feed and the automatic engagement by which it is brought into operation.

Referring to Fig. 6, illustrating still another modification of which the device is susceptible, the hand-wheel G' is screw-threaded upon the clutch-shaft C', and a key T, passing through a transverse slot in the clutch-shaft, projects at the ends between the hub of section F² of the clutch and the hub of the hand-wheel. Instead of the spring L (shown in Figs. 1 and 4) and the various means of adjusting its tension to afford a variable resistance to the independent advance movement of the hand-wheel on the clutch-shaft, a yielding ring S, provided with inclined and square projections s s', is employed next to the outer end of the hub of the hand-wheel, which is provided with corresponding inclines g². The ring S is prevented from turning upon the clutch-shaft by a spline or feather, but is capable of a limited movement endwise of said shaft. A spring Q, interposed between the outer face of said ring and a nut R, threaded on the outer end of the clutch-shaft, holds the inclined projections s normally in engagement with the corresponding projections g² on the hub of the hand-wheel. This nut R is preferably formed or provided with a cylindrical housing r, which projects over and incloses the spring Q and ring S. By means of the nut R the tension of spring Q may be adjusted so as to afford the desired resistance to the independent advance movement of the hand-wheel G', by which the clutch-sections are automatically brought into engagement when the drill encounters the work. t is a rod inserted in an axial bore in the outer end of the clutch-shaft C', being screw-threaded therein and provided at its projecting end with a head or thumb-piece t'. By turning this screw-rod into the clutch-shaft it engages at its inner end with the key T, and through it forces and holds the clutch-section F² in engagement with the clutch-section E.

This last-described modification of my invention operates as follows: When the hand-wheel G' is turned in the direction to carry the drill-spindle toward the work, the inclined projections g² on its hub, engaging with the corresponding inclined projections s on the yielding ring S, operate through the parts named to turn the clutch-shaft C', and through it to feed the drill up to the work. When the drill engages the work, the clutch-shaft is temporarily arrested, the inclines g² are forced past the inclines s, and the hand-wheel, being thus relieved of their resistance to its independent movement on the clutch-shaft, turns upon the threaded portion thereof and automatically carries the clutch-section F² into engagement with the driver E, and thus holds the power-feed in gear. When the hand-

wheel G' is turned in the reverse direction, it recedes on the screw-threaded portion of the clutch-shaft, allowing the clutch-section F² to be moved by the spring L out of engagement with the driving-section E. The inclined projections g², returning to their position in engagement with the corresponding inclines s on the yielding ring S, engage by their backs the square projections s on said yielding ring, and through them cause the clutch-shaft C' to turn with the hand-wheel, thereby withdrawing the drill from the work.

It will be observed that in the several modifications of my invention herein shown and described a hand-wheel or its obvious equivalent, a pilot-wheel, crank, or arm having a limited movement independent of the clutch-shaft and a yielding resistance to such movement sufficient to enable the hand-wheel to feed the drill up to the work without throwing the clutch into engagement and bringing the power-feed into operation are employed. These being essential distinguishing features of my invention, I desire to cover the same broadly herein, and do not wish to be understood as limiting myself to either of the constructions shown and described.

I have for convenience shown and described my improvements in connection with a drill-press; but they are applicable to other machines in which it is desirable to move the tool up to the work by hand, and, when the tool encounters the work, to automatically bring a power-feed into operation.

I claim—

1. In a drill-press or other machine, the combination, with a longitudinally-movable tool-spindle and power-feed, of a clutch for connecting the same, and a hand-wheel or its equivalent mounted upon and having a limited movement independently of the clutch-shaft, by which movement the clutch is automatically engaged and disengaged, substantially as and for the purposes set forth.

2. In a drill-press or other machine, the combination, with a longitudinally movable tool-spindle and power-feed, of a clutch for connecting the same and a hand-wheel or its equivalent mounted upon and having a limited movement independently of the clutch-shaft, by which movement the clutch is automatically engaged and disengaged, and resistance opposed to the independent movement of the hand-wheel sufficient to enable it to advance the tool-spindle without engaging the clutch until the tool encounters the work, substantially as and for the purposes set forth.

3. In a drill-press or other machine, the combination, with a longitudinally-movable tool-spindle and power-feed, of a clutch-shaft connecting the same and a hand-wheel mounted upon and having a limited movement independent of the clutch-shaft, by which movement the clutch is automatically engaged and disengaged, and variable resistance opposed to the independent movement of the hand-wheel

sufficient to enable it to advance the tool-spindle without engaging the clutch until the tool encounters the work, substantially as and for the purposes set forth.

5 4. In a drill-press or other machine, the combination, with a longitudinally-movable tool-spindle and power-feed, of a clutch for connecting the same, a hand-wheel or its equivalent mounted upon and capable of turning a
10 limited distance independently of the clutch-shaft, whereby the clutch is automatically engaged and disengaged, and inclines by which the independent advance movement of the
15 hand-wheel is opposed sufficiently to hold the clutch out of engagement until the tool encounters the work, substantially as and for the purposes set forth.

5 5. In a drill-press or other machine, the combination, with a longitudinally-movable tool-spindle and power-feed, of a clutch for connecting and disconnecting the same, comprising a driving-section loosely mounted upon the clutch-shaft and a section movable into and out of engagement therewith and feathered upon the clutch-shaft, a hand-wheel or its equivalent loosely mounted upon the clutch-shaft and capable of turning a limited
25 distance independently thereof, and inclines in connection with the hand-wheel and driven section of the clutch, arranged to engage with each other and oppose the independent advance movement of the hand-wheel sufficiently to prevent the engagement of the
30 clutch when the tool does not engage the work, substantially as and for the purposes set forth.

40 6. In a drill-press or other machine, the combination, with a longitudinally-movable tool-spindle and power-feed, of a clutch for connecting the same, comprising a driving-section loosely mounted upon the clutch-shaft and a driven section feathered upon the clutch-shaft and movable into and out of engagement with the driving section, a spring
45 tending to carry the driven out of engagement with the driving section of the clutch, a hand-wheel or its equivalent loosely mounted upon the clutch-shaft and capable of turning a limited distance thereon, and opposing inclines in connection with the hand-wheel and the driven section of the clutch, whereby sufficient resistance is afforded to the independent advance movement of the hand-wheel to hold
50 the clutch out of engagement until the tool encounters the work, substantially as and for the purposes set forth.

7. In a drill-press or other machine, the combination, with the tool-spindle and power-feed, of a clutch for connecting and disconnecting
60 the same, comprising a driving-section loosely mounted upon the clutch-shaft and a driven section with which the clutch-shaft turns, movable into and out of engagement with the driving-section, a hand-wheel or its equivalent mounted upon and capable of turning a
65 limited distance independently of the clutch-

shaft, and a spring acting in opposition to the independent advance movement of the hand-wheel, substantially as and for the purposes set forth.

8. In a drill-press or other machine, the combination, with the tool-spindle and power-feed, of a clutch for connecting and disconnecting the same, comprising a driving-section loosely mounted on the clutch-shaft, a driven section
75 with which the clutch-shaft turns, movable into and out of engagement with the driving-section, a hand-wheel or its equivalent mounted upon the clutch-shaft and capable of turning a limited distance independently thereof, whereby the clutch is automatically engaged and disengaged, so as to connect and disconnect the power-feed, a spring acting in opposition to the independent advance movement of the hand-wheel, whereby the clutch is held
85 out of engagement until the tool encounters the work, and means of adjusting the tension of said spring, substantially as and for the purposes set forth.

9. In a drill-press or other machine, the combination, with the drill-spindle and power-feed, of a clutch for connecting and disconnecting the same, a hand-wheel or its equivalent mounted upon the clutch-shaft and capable of turning a limited distance independently thereof, whereby the clutch is automatically engaged and disengaged so as to connect and disconnect the power-feed, and independent means of locking the clutch in engagement, substantially as and for the purposes set forth.

10. In a drill-press or other machine, the combination, with a drill-spindle and power-feed, of a clutch for connecting and disconnecting the same, a hand-wheel or its equivalent capable of turning a limited distance independently of the clutch-shaft, whereby the clutch is automatically engaged and disengaged, so as to connect and disconnect the power-feed, and means of locking the hand-wheel upon the clutch-shaft so as to prevent its independent movement, substantially as and for the purposes set forth.

11. In a drill-press or other machine, the combination, with a tool-holder movable toward and from the work, of a power-feed and means for connecting and disconnecting the same with the tool-holder, a hand-feed having a limited movement independently of the tool-holder, and an incline opposing the independent advance movement of the hand-feed and holding the power-feed out of operation until the tool encounters the work, substantially as and for the purposes set forth.

12. In a drill-press or other machine, the combination, with a tool-holder movable toward and from the work, of a power-feed and means for connecting and disconnecting the same with the tool-holder, a hand-feed having a limited movement independently of the tool-holder, and inclines of different

pitch, the more obtuse opposing the independent advance movement of the hand-feed and arranged to hold the power-feed out of operation until the tool encounters the work and
5 the less obtuse acting to connect the power-feed with the tool-holder when the tool encounters the work, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of 10 two witnesses.

THOMAS L. SMITH.

Witnesses:

CHAS. L. GOSS,
E. G. ASMUS.