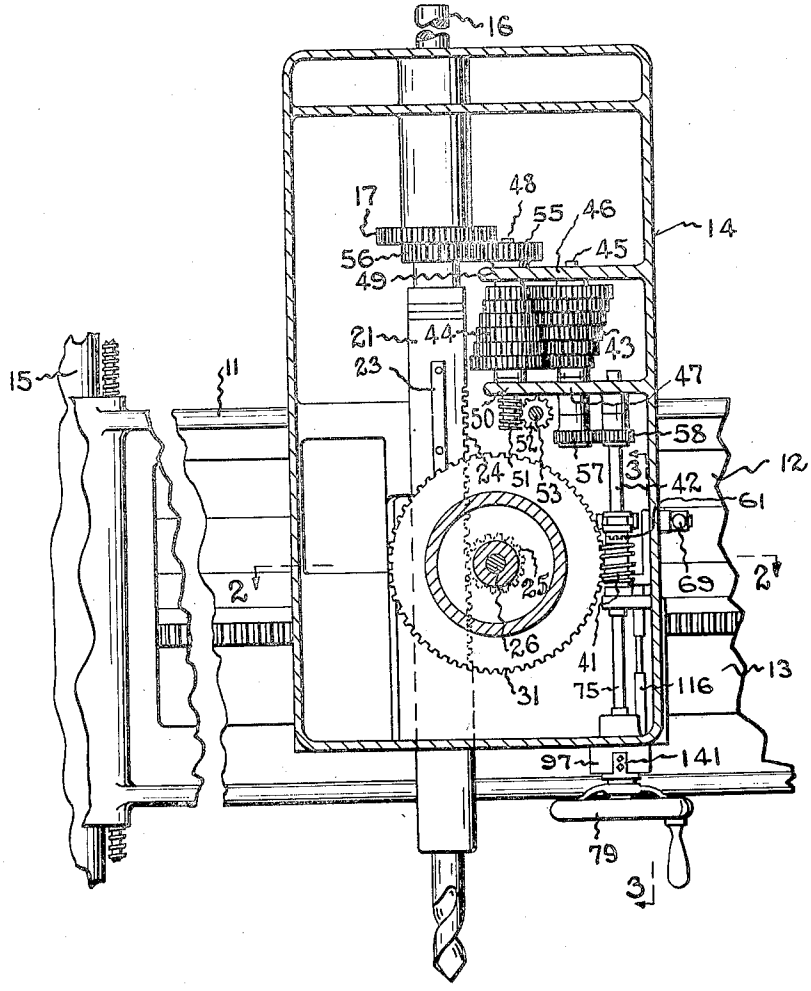
Jan. 15, 1929. 1,699,493

A. E. ROBINSON

FEEDING MEANS FOR DRILLING MACHINES

Filed Oct. 23, 1925 3 Sheets-Sheet 1

Fig. 1.



INVENTOR.

Albert E. Robinson,

by R. F. Herbst,

His Attorney.

Jan. 15, 1929. 1,699,493

A. E. ROBINSON

FEEDING MEANS FOR DRILLING MACHINES

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Fig. 2.

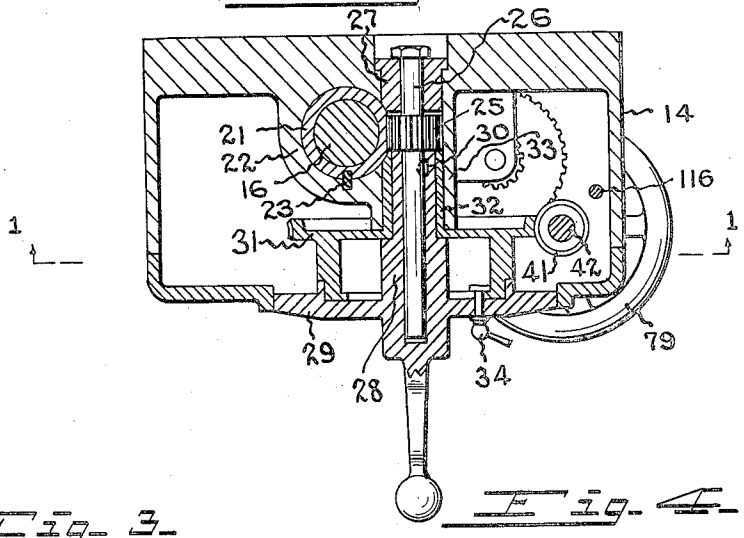


Fig. 3.

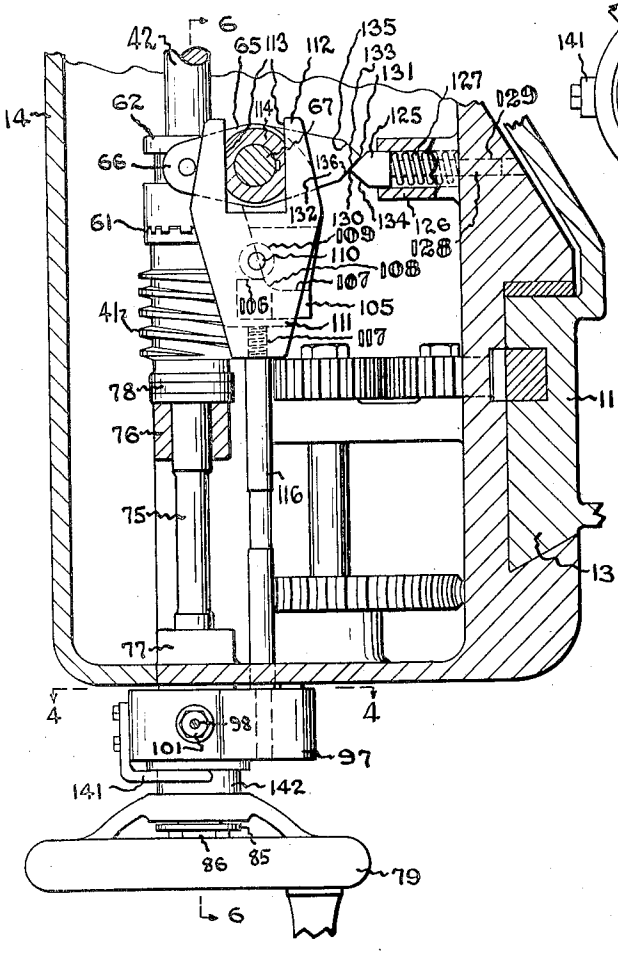


Fig. 4.

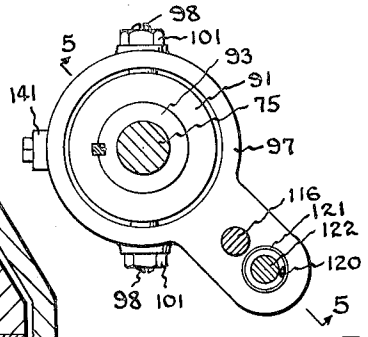
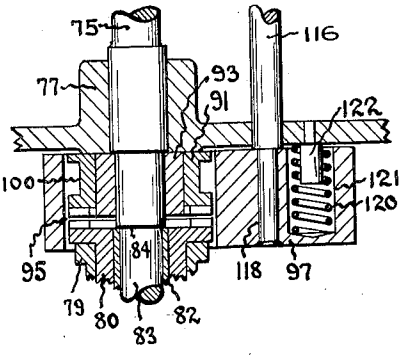


Fig. 5.



INVENTOR.

Albert E. Robinson

by H. E. Hedges

His Attorney.

Jan. 15, 1929. 1,699,493

A. E. ROBINSON

FEEDING MEANS FOR DRILLING MACHINES

Filed Oct. 23, 1925 3 Sheets-Sheet 3

Fig. 6.

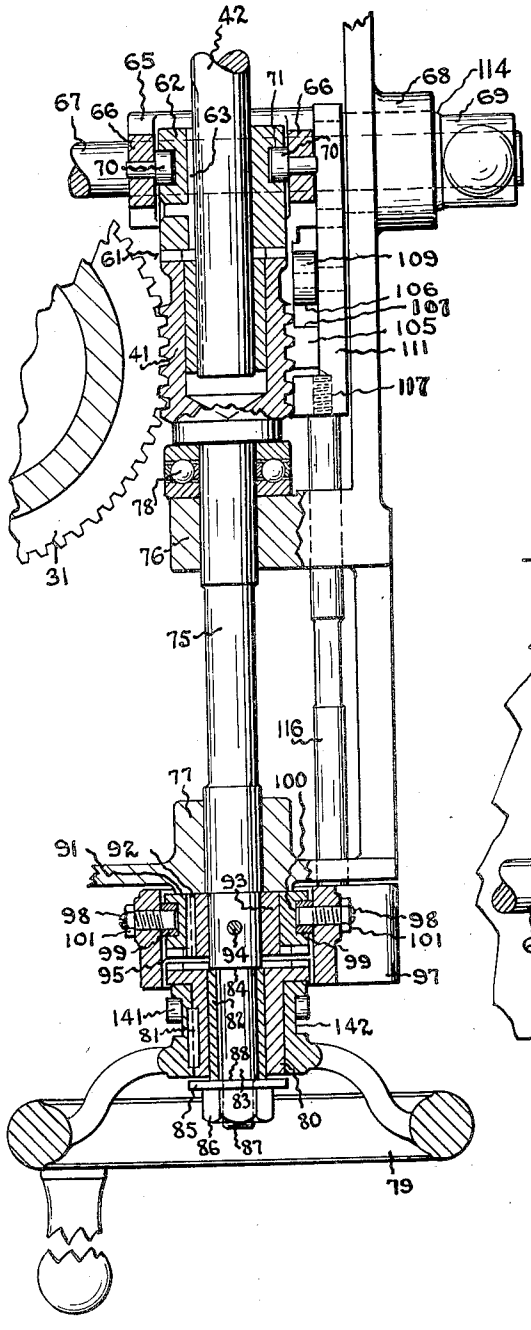


Fig. 8.

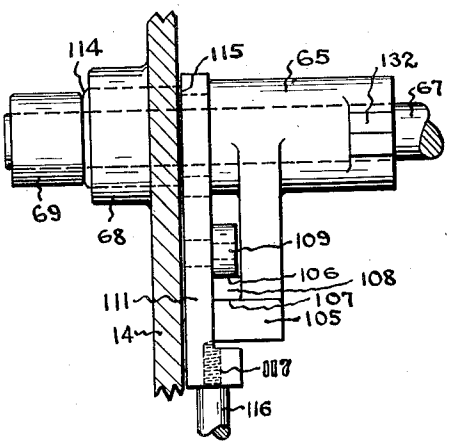
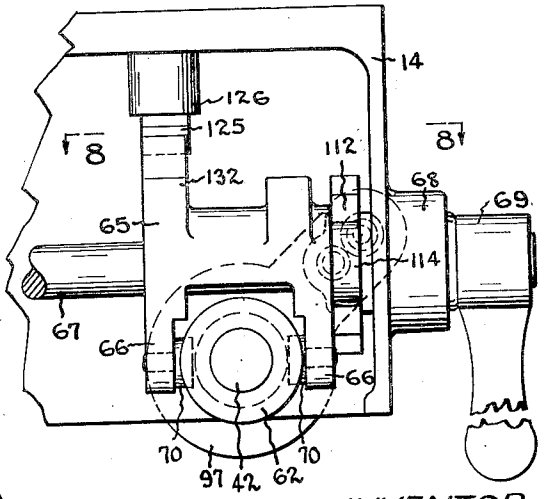


Fig. 7.



INVENTOR.

Albert E. Robinson,
by A. A. Herbsleb,
His Attorney.

Patented Jan. 15, 1929. 1,699,493

UNITED STATES PATENT OFFICE.

ALBERT E. ROBINSON, OF CINCINNATI, OHIO, ASSIGNOR TO THE AMERICAN TOOL WORKS COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

FEEDING MEANS FOR DRILLING MACHINES.

Application filed October 23, 1925. Serial No. 64,460.

My invention relates to feeding means including power means and manual means for feeding the drill-spindle axially.

In mechanism of this character as heretofore usually employed it has been the practice to leave the manually operated hand-wheel for manually feeding the drill-spindle in operative relation when feeding the drill-spindle by power, with the result that when the drill-spindle was being fed by power the hand-wheel was also rotating. This has been found to be an objectionable feature in mechanism of this character.

It is the object of my invention to provide novel means for automatically disconnecting the manual operating part for manual feed of the drill-spindle when the power train of gearing for feeding the drill-spindle by power is in operative relation; further, to provide novel means whereby to connect the manually operated part for effecting axial feeding of the drill-spindle when disconnecting the power feed; further, to provide a rotatable part for effecting axial feed of the drill-spindle and clutches respectively for a power train of gearing and a manual operating part, and a single manual operating element whereby to place said clutches in opposite relations for automatically connecting the power clutch and disconnecting the manual clutch, and vice versa; further, to provide novel means for automatically controlling opposite relations in clutches in mechanism of the character mentioned; and, further, to provide novel means for maintaining the manual operative part in non-rotative relation.

The invention will be further readily understood from the following description and claims, and from the drawings, in which latter:

Fig. 1 is a front elevation of so much of a drilling machine as is necessary to illustrate my invention, the drill-head being shown in vertical section in the plane of the line 1—1 of Fig. 2.

Fig. 2 is a horizontal section of the drill-head, taken in the plane of the line 2—2 of Fig. 1.

Fig. 3 is a vertical section of my improved device, taken in the plane of the line 3—3 of Fig 1.

Fig. 4 is a horizontal section of the same, taken on the line 4—4 of Fig. 3.

Fig. 5 is a vertical section of a detail of the same, taken in the plane of the line 5—5 of Fig. 4.

Fig. 6 is a vertical axial section of my improved device, taken in the plane of the line 6—6 of Fig. 3.

Fig. 7 is a plan view of the same, partly broken away, and,

Fig. 8 is a vertical section of a detail of the same, taken on the line 8—8 of Fig. 7.

The exemplification of drilling machine which I have preferred to show includes an ordinary drill-arm 11, having horizontal guideways 12 and 13, along which a drill-head 14 is arranged to be laterally adjusted by any ordinary and suitable means, for adjusting the distance relation between the drill-head and the column 15 of the drilling machine, about the vertical axis of which column the drill-arm is usually adjusted for radially positioning of the drill-arm.

The drill-head carries a usual drill-spindle 16, which is rotated by suitable mechanism, exemplified as including a gear 17, which is suitably mounted in the drill-head, and has usual spline groove and key connection with the drill-spindle, for rotating the latter, the gear 17 being rotated by a suitable train of gearing, which may include reversing mechanism and speed changing mechanism of desirable types for imparting various speeds to the drill-spindle and for rotating the drill-spindle in reverse directions, not shown because well known. A sleeve 21 is received about the drill-spindle, this sleeve being usually non-rotative and having axial feeding movements imparted thereto. It is shown slidable in a bearing 22 in the drill-head, with which it has spline groove and key connection 23. The sleeve is provided with a rack 24, with which a pinion 25 meshes, the pinion being fixed to a suitable feed-shaft 26, rotatable in a bearing 27 in the drill-head, and further located in a hub 28 of a usual rotatable face-plate 29, being fixed to rotate with said hub by a key 30. A worm-wheel 31 has a hub 32 rotatable in a bearing 33 in the drill-head, and received bearingwise about the hub of the face-plate. A usual clamp 34 is arranged to connect the worm-wheel with the face-plate, whereby the worm-wheel is operatively connected with the pinion 25, for the drill-spindle, for feeding the drill-spindle axially by rotation of the worm-wheel. A worm 41 meshes with the worm-wheel.

These parts are of usual or ordinary construction, and are illustrated as an exemplification for imparting axial feed to the drill-spindle by means of a rotatable element, which latter may be exemplified as the worm 41. It is to be understood, however, that my invention is not limited to the mechanisms thus exemplified, but other mechanisms may be employed for effecting axial feed of the drill-spindle within the spirit of my invention and the scope of the appended claims.

The power drive provided for the rotatable element is exemplified as including a power shaft 42, to which rotations are imparted at various speeds, as by means of a pair of nests of gears 43, 44, one of said nests of gears being fixed to a shaft 45 journaled in bearings 46, 47, of the drill-head, and the other of said nests of gears rotating loosely about a shaft 48 journaled in bearings 49, 50, of the drill-head, and arranged to be selectively operatively connected with said shaft by suitable spline groove and key connection, the key of which is a jump-key shifted by a rack 51, with which a pinion 52 meshes, the latter being on a hand controlled shaft 53. These parts may be of usual and ordinary construction.

The shaft 48 has a gear 55 fixed thereto, which meshes with a gear 56 rotatively fixed to the gear 17. A gear 57 is fixed to the shaft 45, and meshes with a gear 58 fixed to the shaft 42. This train of gearing imparts rotations to the power shaft 42 at various speeds, dependent on the adjusted connection in the nests of gears, and selectively in reverse directions. It is obvious of course that other speed changing means may be employed within the spirit of my invention and the scope of the appended claims.

There is a clutch 61 between the power shaft 42 and the rotative member 41. This clutch is shown as a tooth-clutch, and comprises a movable member 62, shown as a collar, having spline groove and key connection 63 with the power shaft. The teeth of the clutch are respectively on this collar and on the worm 41.

A rockable member 65, which includes a fork 66, is fixed to a rock-shaft 67, journaled in a bearing 68 in the drill-head, and having a manual operating part, shown as a handle 69, fixed thereto. This fork is provided with shoes 70, received in an annular groove 71 in the clutch-collar 62, for moving the clutch 61 into or out of engagement, for connecting the power drive for axial feeding movements of the drill-spindle, or disconnecting said power drive.

A shaft 75 is journaled in bearings 76, 77, in the drill-head, and is shown rigid with the worm 41, and is supported axially by a bearing 78. A manual operating part, exemplified as a hand-wheel 79, is at the lower end of this last-named shaft. The hand-wheel is fixed to a collar 80, as by a key 81, the collar being journaled on a bushing 82 on a reduced lower end 83 of the shaft 75, the bushing being held between a shoulder 84 on said shaft and a washer 85. The washer is held in place by a nut 86 threaded to the threaded end 87 of said shaft. The nut clamps the washer against a shoulder 88 on said shaft. The collar 80 has slight axial movement on the bushing 82.

A second collar 91 has spline groove and key connection 92 with a bushing 93, fixed to the shaft 75 by a pin 94. A clutch 95 is between the collars 80 and 91, this clutch being shown as a tooth-clutch, the teeth thereof being on said respective collars.

A shiftable block 97 is received about the clutch and has operative connection with the movable member of said clutch, for shifting the same, as by providing the block with threaded pins 98, about the inner ends of which shoes 99 are received, these shoes being located in an annular groove 100 in the clutch-collar 91. Jam nuts 101 secure the shifting pins in place.

Connecting means are provided between the clutches 61, 95. The connecting means are manually operated, and may be provided with automatically operating means, so that when one of the clutches is in engagement the other is in release relation, and vice versa.

In the present exemplification the rockable member 65 is provided with a shelf 105. This shelf has a supporting face 106, a supporting face 107, and a cam-face 108 between said supporting faces. A roller 109 is on a stub 110 of a slide 111. The slide comprises a fork 112 which has slide connection with slide faces 113 on a bushing 114, which forms part of the bearing for the rock-shaft 67. The fork is also guided between end faces 115 of said bushing and the end of the rockable member 65. The fork 112 is thus maintained in non-rotative relation. A stem 116 is secured to the fork at one end, as shown at 117, and to the block 97 at its other end, as shown at 118. A spring 120 is located in a socket 121 in the block 97, about a locating stub 122 in the drill-head, and acts to normally urge the block for engaged relation of the clutch 95.

A spring-pressed plunger 125 is operable in a socket 126 in the drill-head. A spring 127 surrounds a stem 128 of said plunger. The stem is guided in a bearing 129 in the drill-head. The plunger is provided with an apex 130 which coacts with an apex 131 of a lug 132 on the rockable member 65. The plunger and lug are provided with coacting slanting faces at the respective sides of said apexes, the plunger being provided with slanting faces 133, 134 and the lug with slanting faces 135, 136.

If it is desired to connect the power drive with the worm 41 to arrange the parts in the relations shown in the drawings, the handle 69 is depressed, whereby the clutch-

collar 62 is moved toward the worm, for engaging the clutch 61.

This movement of the handle rocks the lug 132, and causes its apex to move along the inclined face 134 of the plunger 125. When the apex 131 passes the apex 130, the clutch-teeth of the clutch 61 will be in position for engagement. Should however the ends of the clutch-teeth meet, the parts will be retained in position for clutch engagement, and the spring 127 will move the collar 62 for engaging the clutch upon rotation between the clutch-members.

The rockable movement of the rockable member, on which the fork 66 is located, also causes rocking of the shelf 105, whereby the supporting face 107, the cam-face 108 and the face 106 are shifted in arcuate direction under the roller 109, for raising the slide 111 and thereby raising the block 97, whereby the clutch-collar 91 is raised for disengaging the clutch 95 from the hand-wheel 79.

The engagement in the clutch 61 causes rotation of the worm 41 by power, for effecting axial feeding movement of the drill-spindle at the speed and in the direction determined by the adjustment of the speed changing mechanism and reversing drive connected therewith. The rotation of the worm 41 is also communicated to the shaft 26.

The hand-wheel is loose with relation to said shaft, so that the hand-wheel may be non-rotative while the power feed of the spindle is taking place. In order to further insure such non-rotative relation of hand-wheel, I prefer to raise the same off of the washer 85 during engaged relation of the power-clutch, effected in the present instance by a fork 141, secured to the block 97 and received in an annular groove 142 in the hub of said hand-wheel, and arranged to frictionally support the hand-wheel off of the washer 85 for maintaining the hand-wheel in non-rotative relation. The groove is sufficiently wider than the tines of the fork received therein to permit movement of the collar 91 for full engagement of the teeth of clutch 95.

If it is desired to cause axial feeding movement of the spindle by means of the hand-wheel, the handle 69 is raised, thereby rocking the fork 66, and raising the clutch-collar 62, for disengagement of the power clutch 61.

When the apex 131 passes the apex 130, the spring 127 automatically causes completion of disengaging movement of the clutch 61.

The rocking of the rockable member also rocks the shelf 105, for moving the supporting face 106 from under the roller 109, and shifting the cam-face 108 with relation to the roller, causing the roller to move downwardly without shock toward the face 107, thus permitting descent of said roller and downward movement of the slide 111, for causing engaging movement of the clutch-collar 91, for engaging the clutch 95, whereby the hand-wheel is operatively connected with the shaft 75 for rotating the worm 41 by hand.

Should however the ends of the teeth on the clutch-collar engage the ends of the teeth on the collar 80, thus arresting descent of the roller 109 and the slide 111, the roller will be positioned in spaced relation above the retracted shelf 107, gravity of the parts aided by the spring 120 moving the clutch-collar 91 for engaged relation of its teeth with the teeth on the collar 80, as soon as relative rotation between said collars takes place.

My invention provides ready and simple means whereby either power feed or manual feed may be provided for the drill spindle without operative interference of one with the other whereby, further, the respective clutch engaging movements for either of said feeds are automatically completed after initiation, and whereby rest position of the manually operated feeding part is assured during power feeding movements.

While I have presented an exemplification of my invention it is to be understood that other embodiments thereof are within the spirit of my invention and the scope of the appended claims.

Having thus fully described my invention what I claim as new, and desire to secure by Letters Patent, is:

1. In a drilling machine, the combination with a rotatable member operable for lengthwise feeding of the drill spindle, of a power drive for said rotatable member including a clutch comprising a movable member, a manual drive for said rotatable member including a clutch comprising a movable member, a rockable member having operative connection with said first-named movable member, an axially movable part having operative connection with said second-named movable member, an extension for the latter, cam means between said rockable member and said extension constructed and arranged for positively moving said axially movable part for clutch release in said second-named clutch and for releasing said extension for spaced relation in the train for clutch engagement of said second-named movable member, and resilient means for reducing the space in said spaced relation for completing said last-named engagement.

2. In a drilling machine, the combination with a rotatable member operable for lengthwise feeding of the drill spindle, of a power drive for said rotatable member including a clutch comprising a movable member, a manual drive for said rotatable member including a clutch comprising a movable member, a rockable member having operative connection with said first-named movable member, resilient means urging rocking of said rockable member in both directions, an axially movable part having operative connection with said second-named movable member, an

extension for the latter, cam means between said rockable member and said extension constructed and arranged for positively moving said axially movable part for clutch release and for releasing said extension for clutch engagement of said second-named movable member, and resilient means for completing said last-named engagement.

3. In a drilling machine, the combination with a rotatable member operable for lengthwise feeding of the drill spindle, of a power drive for said rotatable member including a clutch comprising a movable member, a manual drive for said rotatable member including a clutch comprising a movable member, a rockable member having operative connection with said first-named movable member, an axially movable part having operative connection with said second-named movable member, an extension for the latter, cam means between said rockable member and said extension constructed and arranged for positively moving said axially movable part for clutch release and for releasing said extension for clutch engagement of said second-named movable member, resilient means for completing said last-named engagement, said manual drive including a hand-wheel, and means for supporting said hand-wheel from said axially movable part.

4. In a drilling machine, the combination with a rotatable member operable for lengthwise feeding of the drill spindle, of a power drive for said rotatable member including a clutch comprising a movable member, a manual drive for said rotatable member including a clutch comprising a movable member, a rockable member comprising a fork for said first-named movable member, spring means urging actuated movement of said fork, a slide having operative connection with said second-named movable member, said rockable member including a shelf provided with a cam, said slide provided with a part coacting with said cam, means normally urging clutch engagement in said second-named clutch, and said cam arranged for shifting said second-named movable member for clutch release.

5. In a drilling machine, the combination with a rotatable member operable for lengthwise feeding of the drill spindle, of a power drive for said rotatable member including a clutch comprising a movable member, a manual drive for said rotatable member including a hand-wheel and a clutch comprising a movable member, a rockable member comprising a fork for said first-named movable member, spring means urging actuated movement of said fork, a slide, a block supported thereby and having operative connection with said second-hand movable member, spring means urging said block in clutch-engaging direction, said rockable member including a shelf provided with a cam, said slide provided with a part coacting with said cam, said cam arranged for shifting said block for clutch release, and supporting means between said block and said hand-wheel for friction relief of said hand-wheel from said rotatable member.

In testimony whereof, I have hereunto signed my name.

ALBERT E. ROBINSON.