E. A. CUNNINGHAM.

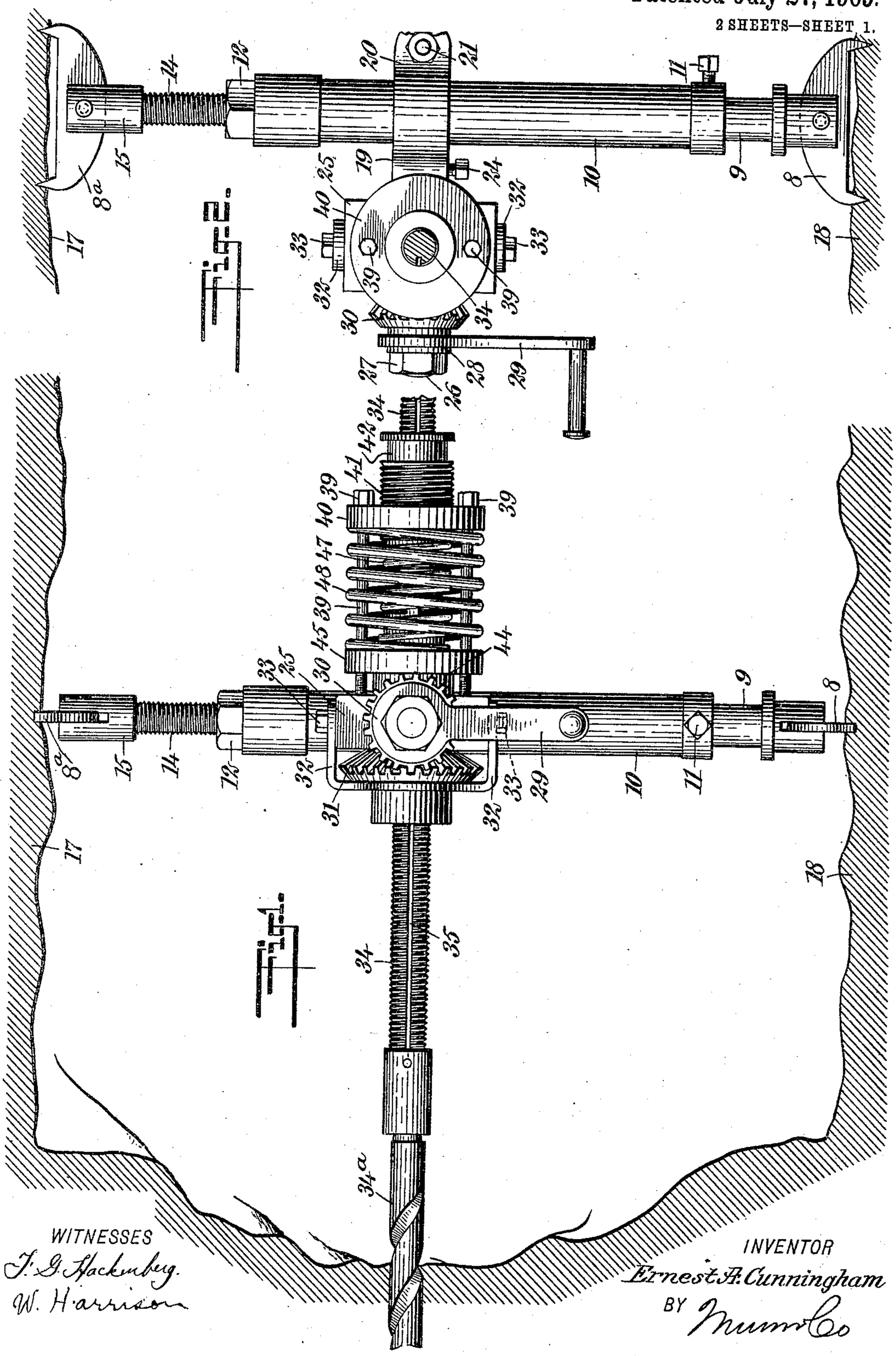
DRILL AND CUTTING MACHINE.

APPLICATION FILED OCT. 21, 1908.

929,399.

Patented July 27, 1909.

2 SHEETS—SHEET 1.



WITNESSES

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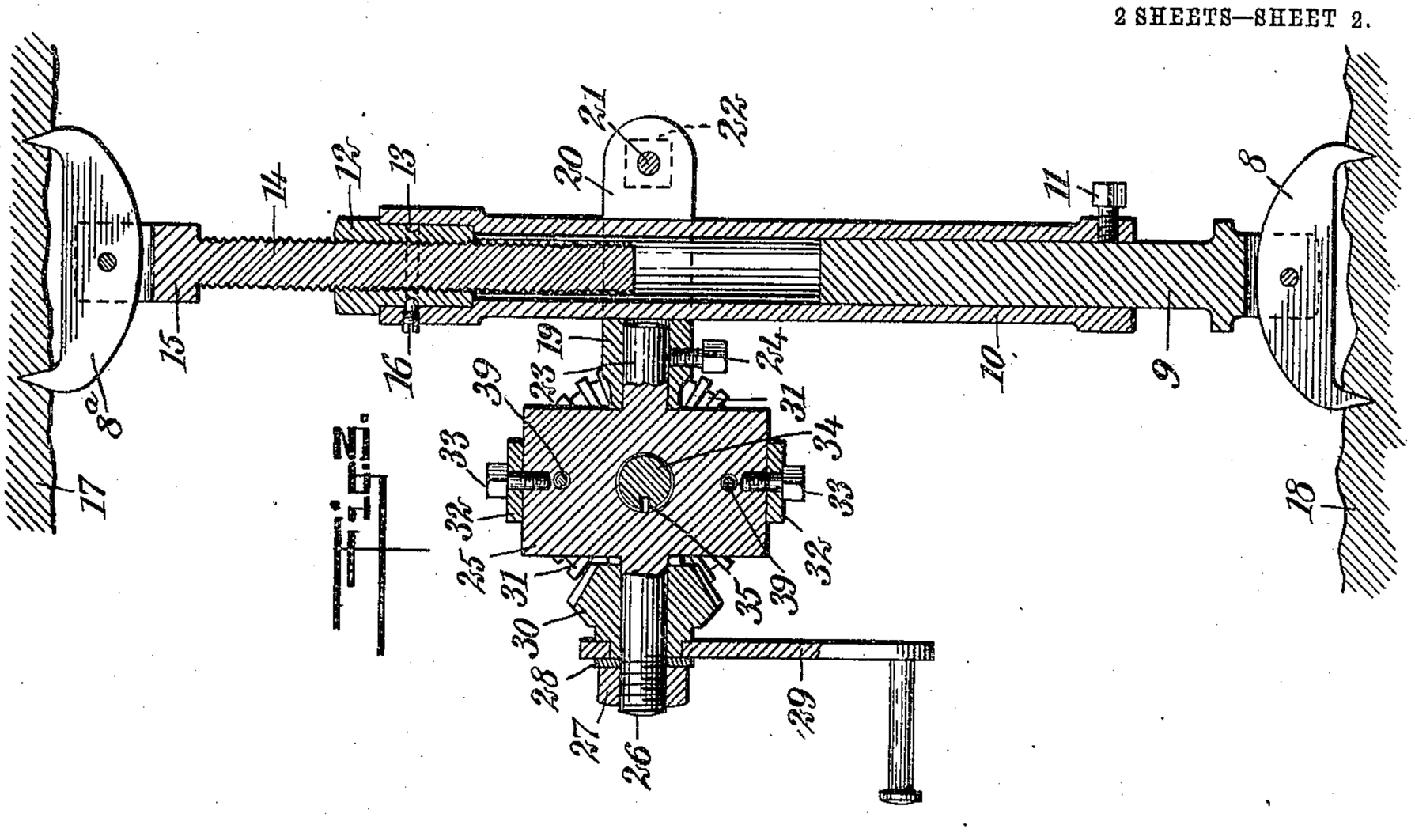


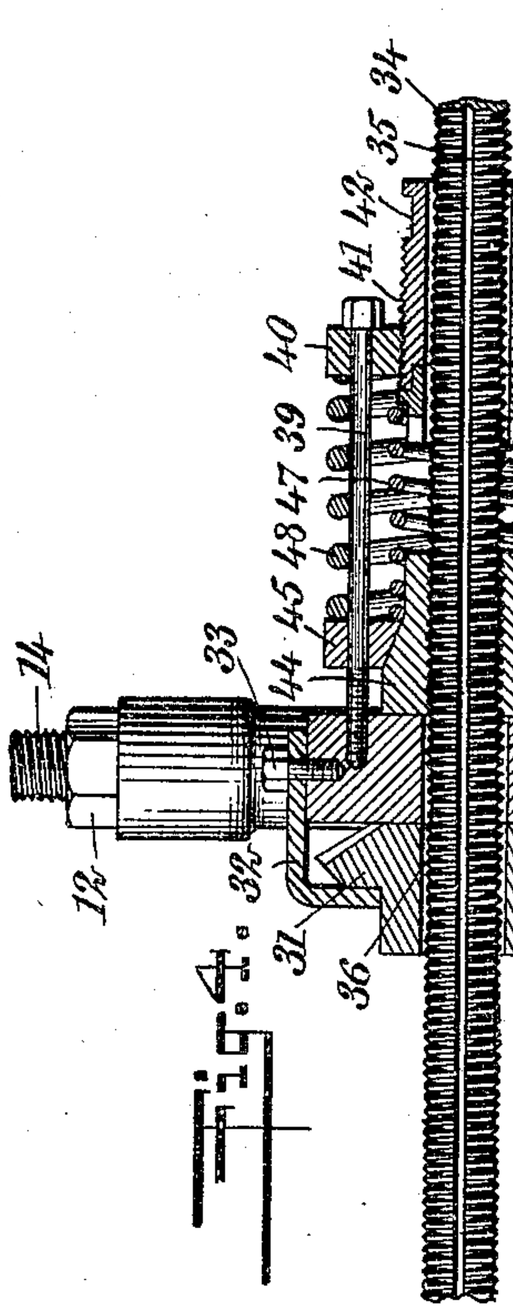


FIG. 4.

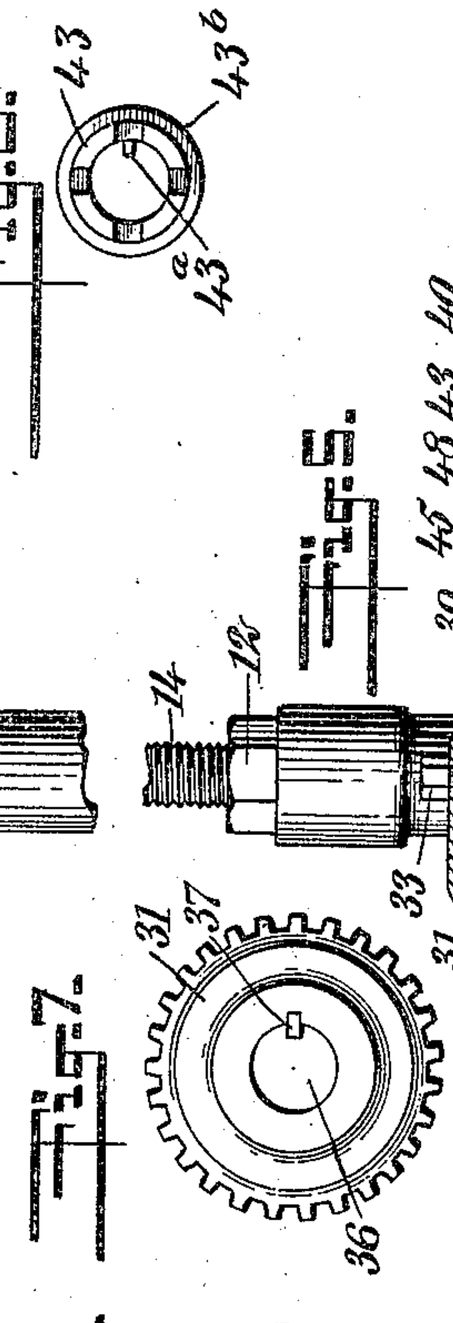
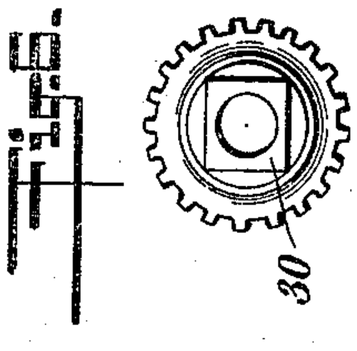


FIG. 7.

FIG. 6.

FIG. 5.

FIG. 8.



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UNITED STATES PATENT OFFICE.

ERNEST ALBERT CUNNINGHAM, OF OSKALOOSA, IOWA, ASSIGNOR OF ONE-HALF TO ARTHUR DAVIS, OF OSKALOOSA, IOWA.

DRILL AND CUTTING-MACHINE.

No. 929,399. Specification of Letters Patent. Patented July 27, 1909.

Application filed October 21, 1908. Serial No. 458,777.

To all whom it may concern:

Be it known that I, ERNEST ALBERT CUNNINGHAM, a citizen of the United States, and a resident of Oskaloosa, in the county of Mahaska and State of Iowa, have invented a new and Improved Drill and Cutting-Machine, of which the following is a full, clear, and exact description.

My invention relates to drills and cutting machines, my more particular purpose being to provide a machine of this general character adapted to do more than one kind of work.

My invention further relates to mechanism including a rotating bit and so constructed and arranged that the rotating bit is normally free to travel forward slowly as it turns, but is stopped or checked automatically in its forward travel whenever it encounters an obstacle unusually hard to penetrate, yet the bit being free to travel forward rapidly when the boring through the unusually hard obstacle is complete.

My invention also comprehends mechanism whereby the bit just mentioned may at will be arranged for continuous cutting without being advanced in the general direction of its length.

My invention further relates to certain devices whereby the machine may be slightly changed or adjusted, for adapting it to different kinds of work varying greatly in character.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a fragmentary side elevation, showing the machine ready for drilling through coal or rock, as, for instance, in a mine; Fig. 2 is a view somewhat similar to Fig. 1, but showing the mechanism as it would appear to an observer located at the right of Fig. 1; Fig. 3 is a central vertical section through the supporting post and a part of the gearing; Fig. 4 is a fragmentary section showing the parts whereby the machine is adjusted automatically by back pressure exerted upon the revoluble bit. Fig. 5 is a view somewhat similar to Fig. 4, but showing certain movable parts occupying abnormal positions, caused by undue pressure backward upon the revoluble stem, so that the stem now turns without moving rapidly ahead; Fig. 6 is a plan view of one of the gear wheels removed from its mountings; Fig. 7 is a plan view of another of the gear wheels likewise removed; and Fig. 8 is a plan view of a clutch member adapted under proper conditions to slip relatively to its mountings, for the purpose of allowing the revoluble stem to turn without advancing.

The general mechanism is supported by aid of feet 8, 8ª. The foot 8 is pivotally mounted upon a bar 9, and telescopically encircling this bar is a sleeve 10; a bolt 11 extends through the sleeve 10 and engages the bar 9. By aid of the bolt 11, the bar 9 and the sleeve 10 may be adjusted relatively to each other. An annular nut 12 is fitted loosely into the upper end of the sleeve 10 and is provided with an annular groove 13. A rod 14 is threaded externally and extends through the annular nut 12, which is threaded internally for this purpose. This rod 14 is provided with a head 15 integral with it, this head being pivotally connected to the foot 8ª. A bolt 16 extends through the sleeve 10 and into the groove 13, for the purpose of enabling the nut 12 to be turned relatively to the sleeve 10 and yet prevent the disengagement of the sleeve and nut. The feet 8, 8ª respectively engage the earth at 18, 17, so as to hold the various parts above mentioned in proper position. A bracket 19 is provided with jaws 20 and extending through the latter is a bolt 21 provided with a nut 22 for the purpose of drawing the jaws 20 toward each other and of releasing them from each other, in order that the bracket 19 may be adjusted to different positions relatively to the sleeve 10. The bracket 19 has a general tubular form, and extending into it is a boss 23 held in position by aid of a bolt 24. Integral with this boss 23 is a head 25, and extending outwardly from the latter is a threaded boss 26. A nut 27 is threaded and fitted upon the boss 26. A washer is shown at 28 and a hand crank at 29, this hand crank being secured to a small gear 30 and held in proper working relation thereto by the pressure of the nut 27. The small gear 30 meshes with a larger gear 31, the latter being revolubly mounted in relation to a stirrup 32. This stirrup is held upon the head 25 by aid of bolts 33. A threaded stem 34 is provided throughout practically its length with a

spline-way 35. This stem extends directly through the head 25 and gear 31. For this purpose the gear 31 is provided with an opening 36 and the head 25 with an opening 38. The gear 31 carries a spline 37 (see Fig. 7), which fits slidably into the spline-way 35, so that rotation of the gear 31 turns the stem 34. Bolts 39 are tapped into the head 25. These bolts carry adjacent to their outer ends a thick plate 40. This plate is of annular form and is threaded internally. A sleeve 41 is threaded externally and extends through the plate 40. This sleeve is provided with a smooth annular portion 42 provided for the purpose of turning the sleeve in order to move it relatively to the plate 40. Mounted loosely upon the inner end of the sleeve 41 is a clutch member 43, provided externally with a flange 43^b, and provided internally with a spline 43^a. This spline is fitted slidably into the spline-way 35, so that the sleeve 43 turns with the stem 34. A conical nut 44 is threaded internally and fitted upon the threaded stem 34. A plate 45 is slidably mounted upon the bolts 39. This plate is of a general annular form and encircles the conical nut 44, as will be understood from Fig. 5. The conical nut 44 is provided with a clutch member 46 mating the clutch member 43, as will be understood from Fig. 5. A spiral spring 47 encircles portions of the clutch members 43, 46. This spiral spring is pressed in one direction against the flange 43^b and in the opposite direction against the plate 45, and through the latter presses indirectly against the conical nut 44. As another spiral spring 48 of a larger diameter than the spring 47, encircles not only portions of the clutch members but likewise portions of the bolts 39, the spring 48 presses the annular plates 40, 45 in opposite directions.

The operation of my device is as follows: The parts being assembled as above described, the crank 29 is caused to rotate, so as to turn the gears 30, 31. Rotary motion is communicated to the stem 34 by the gear 31 and its spline 37, as will be understood from Figs. 4 and 7. The stem 34 is in this manner fed forward a distance, represented by one thread for each revolution of the crank 29. The drill bit is thus advanced slowly as its cutting proceeds. Suppose, however, that the drill bit encounters some unusually hard obstruction, the stem 34 continues to rotate, but if unable to advance on account of the hardness of the obstruction, the conical nut 44 moves backwardly upon the stem 34, that is, to the right according to Fig. 4. Normally where the substance drilled is not unduly hard, the conical nut 44 does not move. To prevent it from moving, the pressure of the plate 45 against its conical surface is so adjusted that the conical nut is normally stationary in relation to this plate. When, however, the stem 34 is unable to advance for the reason stated and the nut 44 travels backwardly, the springs 47, 48 are compressed to a greater or lesser extent and this increases the friction between the plate 45 and the conical nut 44, so that the pressure of the stem 34 and the drill bit carried by it are increased in a measure. This may enable the drill bit to cut through the hard obstacle, but if not the nut 44 travels backwardly still farther, and the clutch member 46 engages the clutch member 43, and as the latter is loose relatively to the sleeve 41, the clutch members 46, 43 simply lock together, as indicated in Fig. 5, and now turn as a unit along with the stem 34. The backward travel of the conical nut 44 is thus stopped, and the application of power being continued, the stem 34 now simply turns without advancing to any great extent; that is, it advances only so fast as it cuts, and yet in doing this it throws no excessive strain upon any part. As soon as the drill bit passes through the hard obstruction and into softer material, the pressure of the springs 47, 48 forces the stem 34 forward, so that it soon attains its normal position, as indicated in Fig. 1, the conical nut 44 lodging against the head 25 and becoming stationary.

Sometimes it is desirable to use the machine as a cutting machine rather than a drill, that is to say, the operator may wish to have the stem 34 turned without being advanced. To accomplish this purpose the operator applies a wrench to the annular portion 42 of the sleeve 41 and turns the sleeve until the clutch member 43 is forced forwardly a sufficient distance to engage the clutch member 46. This being done, the power being applied so as to turn the stem 34, the conical nut 44 is unable to travel backwardly under any circumstances, so that the stem 34 is not advanced in its rotation. By aid of the sleeve 41 the sensitiveness of the machine may be controlled within certain limits. I find that, in using a drill for the purpose of cutting through coal, a pressure of 500 lbs. upon the stem 34 is very satisfactory. I prefer, therefore, to so adjust the sleeve 41 that the tension of the spring 47 together with the tension of the spring 48 shall equal 500 lbs., so that when a pressure greater than this is thrown upon the stem 34, the conical nut 44 will begin its travel backward.

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

1. The combination with a revoluble stem provided with a thread, a nut fitted upon said stem and adapted to normally feed the latter forward as said stem is rotated, means for turning said stem, mechanism engaging said nut and controllable by the pressure

thereof for normally preventing said nut from turning with said stem, means controllable at will for locking said nut and said stem together for the purpose of preventing further forward travel of said stem, and a cutting tool mounted upon said stem.

2. The combination of a revoluble stem provided with a thread, a nut provided with a thread and fitted upon said stem, means for turning said stem, a plate frictionally engaging said nut and normally preventing rotation thereof as said stem is turned, a clutch member connected rigidly with said nut, a second clutch member splined upon said stem, said clutch members mating each other and adapted to lock together so as to turn as a unit, spring mechanism normally holding said clutch members apart, and a cutting tool mounted upon said revoluble stem.

3. The combination of a head provided with an opening, a revoluble stem extending through said opening and provided with a splineway and also provided with a thread, a nut provided with a thread and fitted upon said stem, a plate frictionally engaging said nut, bolts extending loosely through said plate and engaging said head, a spring engaging said plate, a member engaging said spring and connected with said bolts for the purpose of retaining said spring under tension relatively to said stem, and means for turning said stem.

4. The combination of a revoluble threaded stem, a head provided with an opening, bolts engaging said head and disposed upon opposite sides of said stem, a plate slidably engaging said bolts and movable relatively to said head, a nut provided with a thread mating said thread of said stem, said nut being fitted upon said stem and engaging said plate, means for turning said stem so as to advance the same relatively to said nut, a spring engaging said plate, a clutch member connected with said nut, a second clutch member splined upon said revoluble stem, a sleeve engaging said last-mentioned clutch member and adapted to force it toward the other clutch member, so as to compress said spring, a plate engaging said sleeve, and means for adjusting said sleeve relatively to said last-mentioned plate.

5. The combination of a revoluble stem provided with a thread, a nut fitted upon said stem and adapted to normally feed the latter forward as said stem is rotated, means for turning said stem, mechanism engaging said nut and controllable automatically by the pressure thereof for normally preventing said nut from turning with said stem, and means independent of the pressure of said stem relatively to said nut for locking said nut rigidly upon said stem, in order to prevent further forward travel of said stem.

6. The combination of a cutting tool, a revoluble stem for turning the same, said revoluble stem being provided with a thread, a nut revolubly fitted upon said stem, means controllable by back pressure exerted upon said cutting tool and said stem for locking said nut and said stem together, and mechanism controllable at will independently of said back pressure for locking said nut and said stem together.

7. The combination of a cutting tool, a revoluble stem connected therewith for actuating the same, said stem being provided with a thread, a revoluble nut fitted upon said stem, means controllable automatically by back pressure exerted upon said cutting tool and said stem for automatically locking said nut upon said stem, and mechanism controllable at will and independently of the back pressure of said cutting tool and said stem for locking said nut and said stem together.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ERNEST ALBERT CUNNINGHAM.

Witnesses:
H. H. SHERIFF,
JOSEPHINE BOYER.