A. R. PAULUS.

TRACK DRILL.

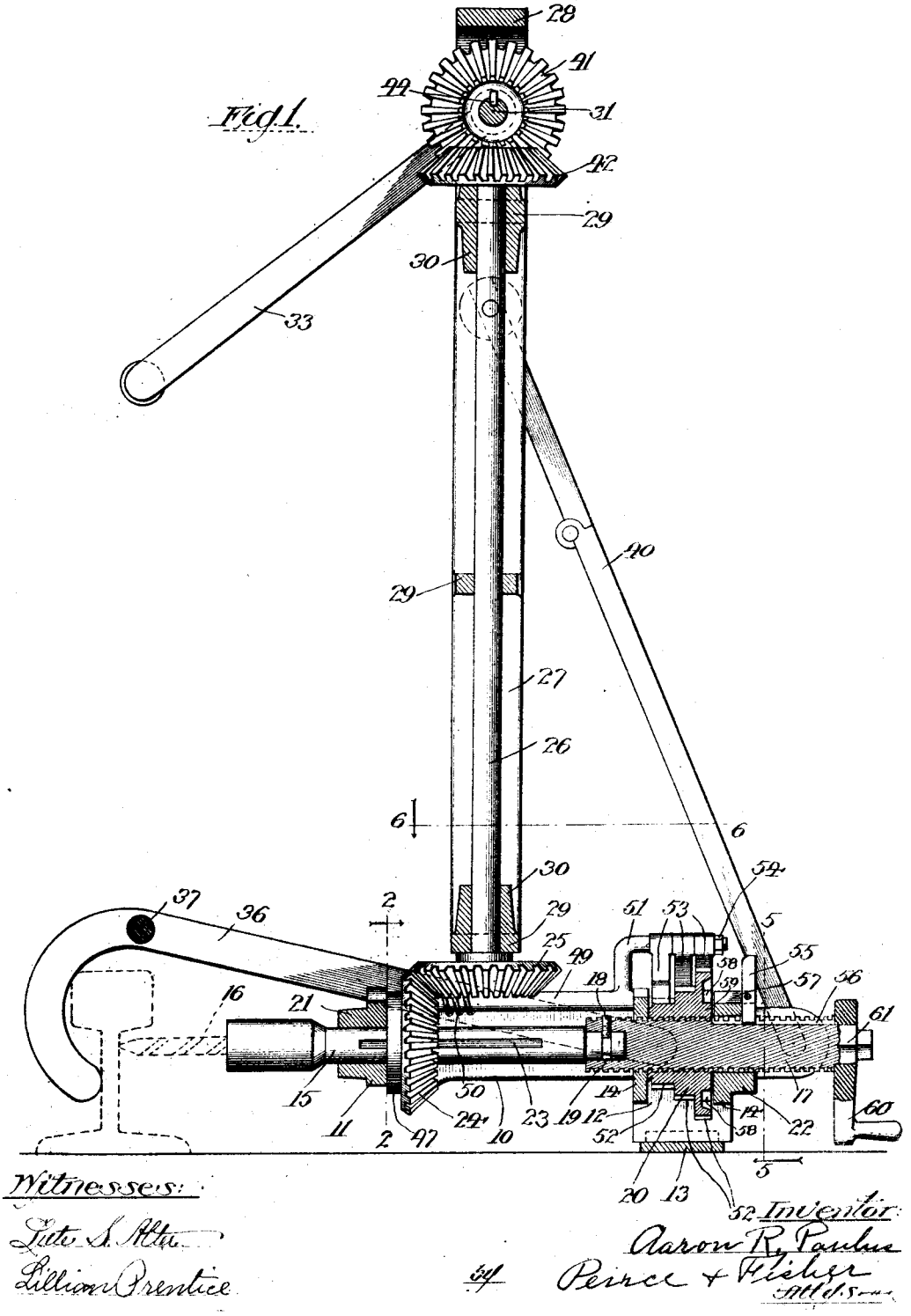
APPLICATION FILED SEPT. 7, 1905.

1,034,825.

Patented Aug. 6, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

Lulu S. Reed

Lillian Prentice

Inventor

Aaron R. Paulus

by Peirce & Fisher

Attys.

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3 SHEETS—SHEET 2.

Fig. 2.

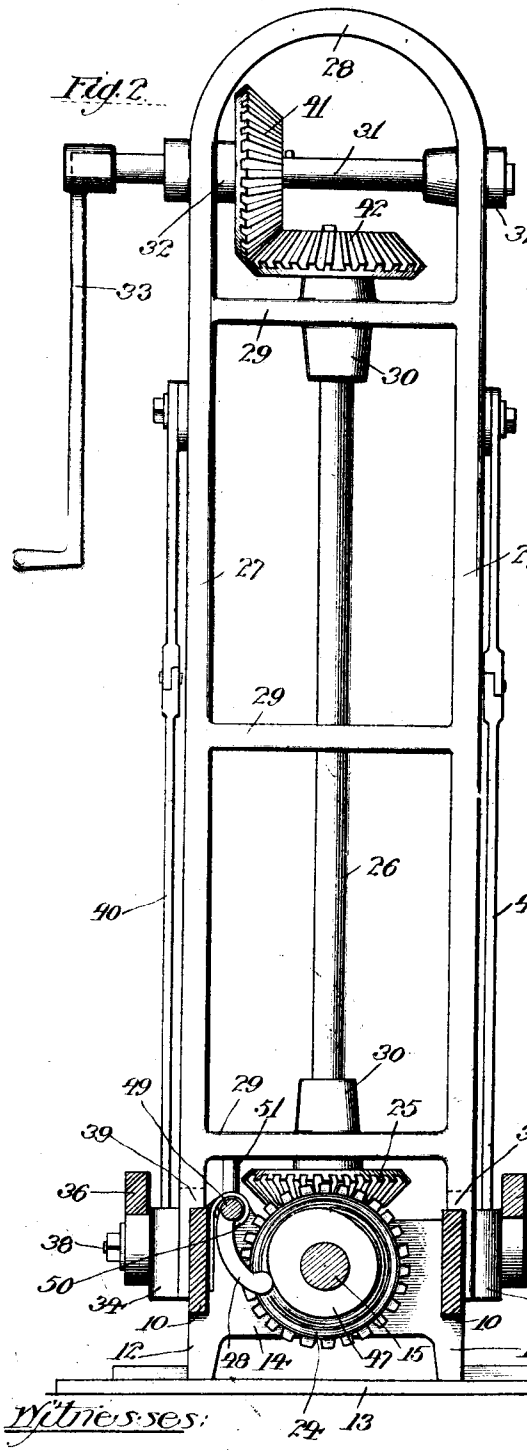


Fig. 3.

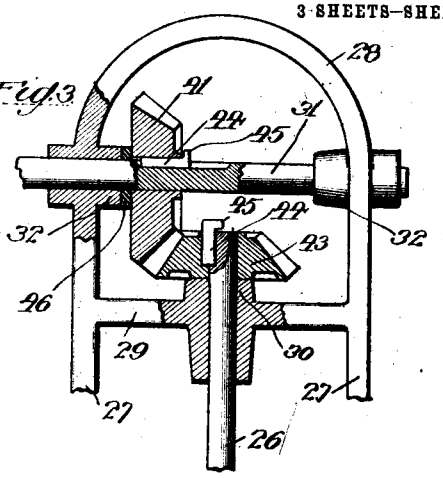


Fig. 4.

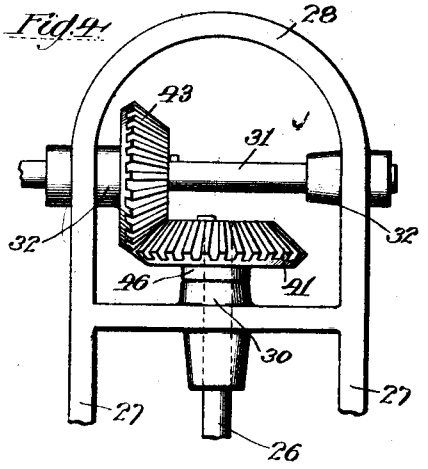
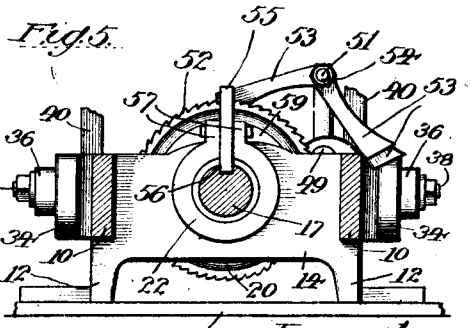


Fig. 5.



Witnesses:

Lute S. Alter

Lillian Prentice

Inventor:

Aaron R. Paulus

by Peirce & Fisher

Attys.

A. R. PAULUS.

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3 SHEETS—SHEET 3.

Fig. 6.

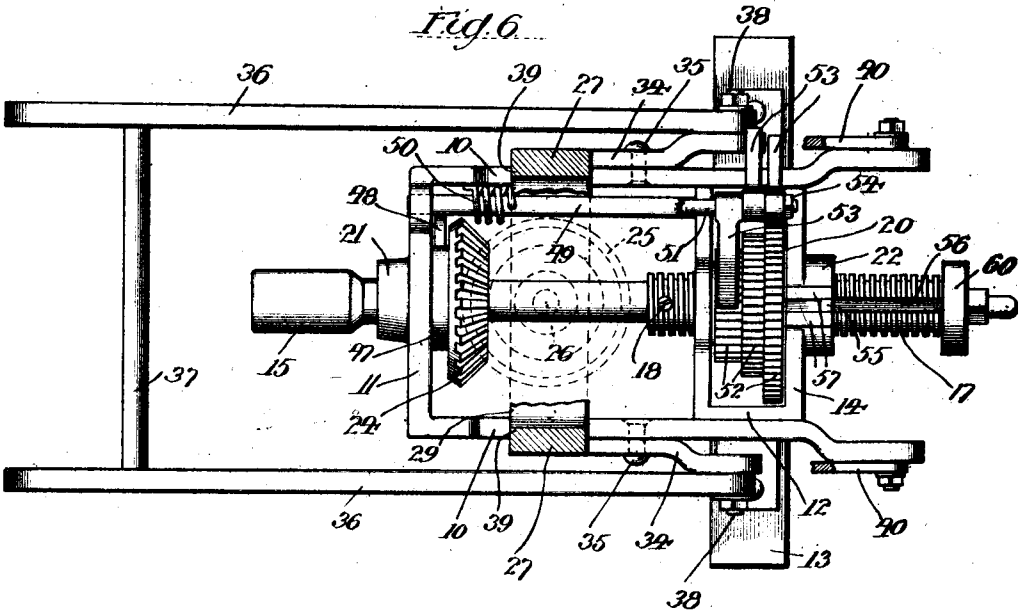


Fig. 8.

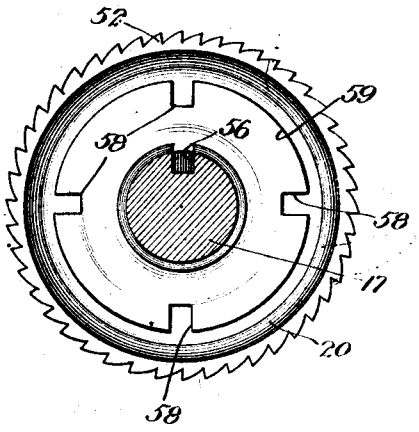
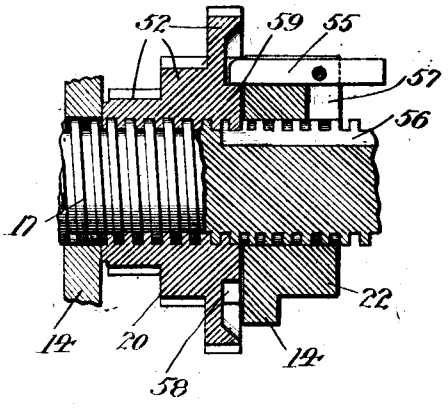


Fig. 7.



Witnesses:

Lulu S. Miller

Lillian Prentice

Inventor:

Aaron R. Paulus

by Pierce & Fisher

Attys.

UNITED STATES PATENT OFFICE.

AARON R. PAULUS, OF VILLISCA, IOWA.

TRACK-DRILL.

1,034,825. Specification of Letters Patent. Patented Aug. 6, 1912.

Application filed September 7, 1905. Serial No. 277,315.

To all whom it may concern:

Be it known that I, AARON R. PAULUS, a citizen of the United States, and a resident of Villisca, county of Montgomery, and State of Iowa, have invented certain new and useful Improvements in Track-Drills, of which the following is declared to be a full, clear, and exact description.

The invention relates to track drills and in particular, that style of drill set forth and claimed in my prior Patent No. 428,516, granted May 20, 1890.

The object of the invention is to improve the construction shown in said prior patent and to provide variable gear connections between the crank-shaft and drill-stock so that the latter may be driven at different speeds and with increased or diminished power in accordance with the size of hole to be bored.

A further object of the invention is to provide means whereby the feed of the drill-stock may be varied in accordance with the different speeds at which the latter is driven.

A third object of the invention is to provide simple and effective means whereby a quick feed may be imparted to the drill-stock for rapidly moving the drill up to the rail or withdrawing it therefrom.

With these and other objects in view, the invention consists in the features of construction, combinations and arrangements of parts hereinafter set forth, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a vertical longitudinal section of the improved drill. Fig. 2 is a front elevation thereof with parts shown in section on line 2—2 of Fig. 1. Fig. 3 and Fig. 4 are views of the upper portion of the upright frame of the drill illustrating different arrangements of the drive gearing. In Fig. 3, certain parts are shown in section. Fig. 5 is a detail section on line 5—5 of Fig. 1. Fig. 6 is a plan view with some of the parts shown in section on line 6—6 of Fig. 1, and with some of the parts broken away for the sake of clearness. Fig. 7 is a central, longitudinal section through the feed screw and ratchet nut. Fig. 8 is a rear face view of the ratchet nut showing the feed screw in cross section.

The base of the machine comprises a horizontal U-shaped portion (see Fig. 6) having side bars 10 and an end bar 11. The rear ends of the side bars 10 are connected to the upper ends of short standards 12, the lower ends of which are secured to a cross plate or bar 13 that is adapted to rest upon the ground or upon the end of the ties. A pair of parallel cross bars 14 are arranged between the rear ends of the side bars 10 and are secured to or cast in one piece with the standards 12. A drill stock 15, which carries the drill 16, extends through and is suitably journaled at its outer end in the end bar 11 of the U-shaped portion of the frame. The rear reduced end of the drill stock sets within a socket in the forward end of a feed screw 17. A pin or screw 18 extends through the feed screw 17 and into an annular groove 19 on the reduced end of the drill stock, so that the latter and the feed screw are connected to move together longitudinally, but the swiveled connection permits the rotation of the drill stock independently of the feed screw. The feed screw extends through and is suitably journaled within the parallel cross bars 14 and is threaded through a ratchet nut 20 that is held in place against longitudinal movement between the cross bars 14. The end bar 11 and the rear bar 14 are provided with central bosses 21 and 22 to provide bearings of sufficient length for the drill stock and feed screw.

The drill stock 15 is provided with a longitudinally extending key-way 23 by which it is connected to rotate with a beveled gear 24, but in such a manner that it is free to move longitudinally through the gear. Gear 24 meshes with a beveled gear 25 fixed on the lower end of a counter-shaft 26. The latter is carried in an upright frame that comprises the side bars 27 (see Fig. 2) connected, at their upper ends, by a U-shaped piece 28 and connected also by the upper, lower and intermediate cross bars 29. The upper and lower cross bars 29 are provided with central boss portions 30 within which the counter-shaft 26 is journaled. A horizontal crank shaft 31 is journaled in suitable boss portions 32 on the upper ends on the side bars 27 and is geared to the upper end of the vertical counter-shaft 26. A crank handle 33 for the shaft 31, is preferably removably fitted over the squared end of the shaft. A second crank handle may be

provided, if desired, upon the other end of the shaft.

The lower ends of the uprights 27 are provided with rearwardly extending portions 34 that are connected by pivot bolts 35 (see Fig. 6) to the side bars 10 of the base. A pair of hooks 36 for engaging the rail, are connected by a cross bar 37, and are pivotally connected at their rear ends by bolts 38 to the rearwardly extending portions 34 of the uprights 37. The upright frame and hooks are adapted to swing rearwardly upon their pivots 35 and 38 to permit the passage of trains without removing the drill from position. The lower ends of the side bars 27 are provided with shoulders 39 that rest upon the side bars 10 of the base when the upright frame is in operative position. This frame is also securely held in its upright position by a pair of jointed braces 40, the sections of which are pivoted to the side bars 27 of the upright frame and to the rear ends of the side bars 10 of the base.

The construction of parts thus far described is similar to those of the prior patented construction and need not be more fully set forth here. In the prior construction however, the speed of the drill stock could not be varied relatively to that of the driving crank shaft. In drilling holes of different sizes, it is desirable that the speed and power applied should be varied; for example, for drilling large holes a low speed and high power is desirable while for drilling small holes, the drill should be driven at high speed and low power. For this purpose, I provide a set of interchangeable gears (see Figs. 2, 3 and 4) comprising the beveled gears 41 and 42, which are of the same size, and a third smaller beveled gear 43. These gears are removably held in place upon the upper end of the counter-shaft 26 and upon the driving or crank shaft 31 by keys 44 having off-set portions 45 on their ends by which they may be readily removed from position with a screw driver, or other suitable tool.

When the drill is to be driven at medium speed and with medium power for drilling medium sized holes, the beveled gears 41 and 42 that are of the same size, are fixed respectively to the drive shaft and to the upper end of the counter-shaft 26, as shown in Fig. 2. For driving the drill with low power and high speed, the small gear 43 is fixed upon the upper end of the counter-shaft 26 and one of the large gears 41 is fixed to the drive shaft (see Fig. 3). For low speed and high power for drilling large holes, the large gear 41 is fixed to the counter-shaft 26 and the same gear 43 to the driving or crank shaft 31, as shown in Fig. 4. In making the change from one set of gears to another, the keys 44 are removed to loosen the gears 41 and 43 and the crank shaft 31 may then be withdrawn end-wise and the gears easily removed. The desired set is then placed in position and the drive shaft 31 thrust end-wise back into place and the keys inserted to rigidly connect the gears to the driving and counter-shafts. Where gears 41 and 42 of equal size are employed, they abut in operative position against the bosses 30 and 32 as shown. When the small gear 43 is fixed to the end of the counter-shaft, it abuts against the boss 30, as shown in Fig. 3, then to bring the large gear 41 in proper relation to the small gear, a washer 46 is interposed between the large gear 41 and the boss 32. When the small gear 43 is mounted on the drive shaft (see Fig. 4) it abuts in operative position against the boss 32 and the washer 46 is interposed between the boss 30 and the large gear 41, so as to bring the latter in proper relation with the small gear. By thus providing three interchangeable gears and the interchangeable washer 46, the connecting gearing may be readily arranged to drive the drill at three different speeds and with three different powers.

With a machine of this sort, it is usual to drill a large number of holes of the same size so that the interchanging of the gears, while readily accomplished, need not be made except at infrequent intervals.

The hub of the beveled gear 24 (see Figs. 1 and 2) is provided with an eccentric 47 that is arranged to engage an arm 48 on a rock shaft 49. The latter is journaled in the end bar 11 and in the inner cross bar 14. A spring 50 (see Fig. 6) is coiled about the shaft 49 and is secured at one end to the shaft and at its other end to one of the side bars 10. This spring holds the arm 48 into engagement with the operating eccentric 47. The rear end of the rock shaft 49 is provided with a bent arm 51 that carries the operating pawl or pawls for driving the feed nut 20.

Three different feeds are preferably employed in accordance with the speed at which the drill stock is driven. For this purpose, the nut 20 is preferably provided with three sets of ratchet teeth 52 of different sizes. If desired, three separate ratchet nuts may be employed, but they should be connected to rotate together and preferably they are all formed in one piece, as shown. The arm 51 on the rock-shaft 49 carries three pawls 53 that are swiveled upon the horizontal portion of the arm 51 and held in place thereon by a nut 54. These pawls are of different lengths and arranged to cooperate with the three sets of ratchet teeth 52, the longest pawl being arranged to engage the smallest ratchet and the shortest pawl being adapted to engage the largest ratchet.

In operation, one of the feed pawls will

be thrown into engagement with its ratchet while two of the pawls are thrown back out of the way, as shown in Fig. 6. When the drill is driven at high speed and with low power, the largest pawl and smallest ratchet are employed for effecting a relatively quick feed. With the low speed and high power of the drill stock the largest ratchet and its pawl are employed for effecting a relative slow feed, and for medium speed and medium feed, the intermediate ratchet and pawl are used. During the operation of the machine in drilling a hole, the feed screw 17 is held against revolution by means of a dog 55 that is arranged to engage a longitudinal key-way 56 in the screw. Dog 55 is pivoted between parallel lugs or abutments 57 on the rear cross bar 14 and boss 22, and in its upright portion shown in Figs. 2 and 5, one end of the dog engages the key-way 56 to hold the screw against rotation, and as stated, this is the position in which the dog is placed during the drilling operation. When the dog is shifted to horizontal position shown in Fig. 7, it is thrown out of engagement with the screw and its other end is arranged to engage one of a series of notches 58 formed in the edge of the disk or boss 59 on the face of the ratchet nut 20, so that, in this position of the dog, the ratchet nut will be held against revolution. As shown in Fig. 7, the face of the ratchet nut having the notched disk 59 is recessed, but this is not essential as the notched disk may, if desired, project beyond the face of the nut. When the nut 20 is held against revolution by the dog 55, the screw 17 may be turned to quickly advance or retract the drill to and from the rail by means of a small crank handle 60 that is preferably removably fitted over the squared end portion 61 of the screw. It will be seen that the dog 55 forms a simple contrivance by which either the feed screw or nut may be held against revolution for the drilling operation, and for quickly advancing and retracting the tool from the rail, but the dog is so arranged that only one of these parts can be locked against revolution so that there is no danger of breaking any of the parts of the machine through the operation of the driving or crank shaft.

It is obvious that numerous changes may be made in the details of structure without departure from the essentials of the invention as set forth in the appended claims.

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

1. In track drills, the combination with the drill stock and operating crank-shaft and gearing connecting said shaft and stock, of a feed screw held against rotation and swiveled to said stock, a nut on said screw held against longitudinal movement and having a plurality of ratchets of different sizes, a plurality of pawls shiftable into and out of engagement with their respective ratchets, and means driven from said crank-shaft for actuating said pawls, substantially as described.

2. In track drills, the combination with the drill stock and crank-shaft, of a feed screw held against rotation and swiveled to said stock, a nut on said screw held against longitudinal movement and having a plurality of ratchets of different sizes, a plurality of pawls for said ratchets, and a pawl actuator driven from said crank shaft, said pawls being pivotally mounted upon said actuator to shift into and out of engagement with their respective ratchets, substantially as described.

3. In track drills, the combination with the drill stock, of a feed screw held against longitudinal rotation and swiveled to said stock, a nut on said screw held against longitudinal movement and having a plurality of ratchets of different sizes, a rock shaft, a cam on said drill stock for operating said rock shaft, an arm on said shaft and a plurality of pawls pivotally mounted on said arm to shift into and out of engagement with their respective ratchets, substantially as described.

4. In track drills, the combination with a drill stock, of a feed screw swiveled to said drill stock, a nut on said feed screw, means for positively locking either said nut or said screw against rotation and separate actuating devices for positively rotating said nut and said screw, substantially as described.

5. In track drills, the combination with a drill stock, of a feed screw swiveled thereto, a nut on said feed screw, a common locking device for said nut and said screw arranged in one position to positively lock one of said parts against rotation and leaving the other of said parts free to rotate and means for rotating the unlocked one of said parts, substantially as described.

6. In track drills, the combination with a drill stock and operating means therefor, of a feed screw swiveled to said stock, a nut thereon, a pivoted dog for locking either said screw or said nut against rotation and means for rotating the unlocked part and to effect the quick or slow feed of said drill stock, substantially as described.

7. In track drills, the combination with a drill stock and operating means therefor, of a feed screw swiveled to said stock having a longitudinal key-way, a nut on said screw having a notched disk or shoulder, a pivoted pawl arranged to engage either said key-way or said notched disk to lock either said screw or said nut against rotation, and means for rotating the unlocked part, substantially as described.

8. In track drills, the combination with a

drill stock and operating means therefor, of a feed screw swiveled to said stock and having a longitudinal key-way, a nut on said screw having a notched disk or shoulder, a pivoted dog arranged to engage either said key-way or said notched disk to lock either said screw or said nut against rotation, a pawl and ratchet mechanism for actuating said nut and an operating crank handle for said screw, substantially as described.

AARON R. PAULUS.

Witnesses:
LILLIAN PRENTICE,
HARRY L. CLAPP.