May 26, 1959 H. G. MILLER 2,887,909

RAIL DRILL FEED MECHANISM

Filed Nov. 19, 1956 2 Sheets-Sheet 1

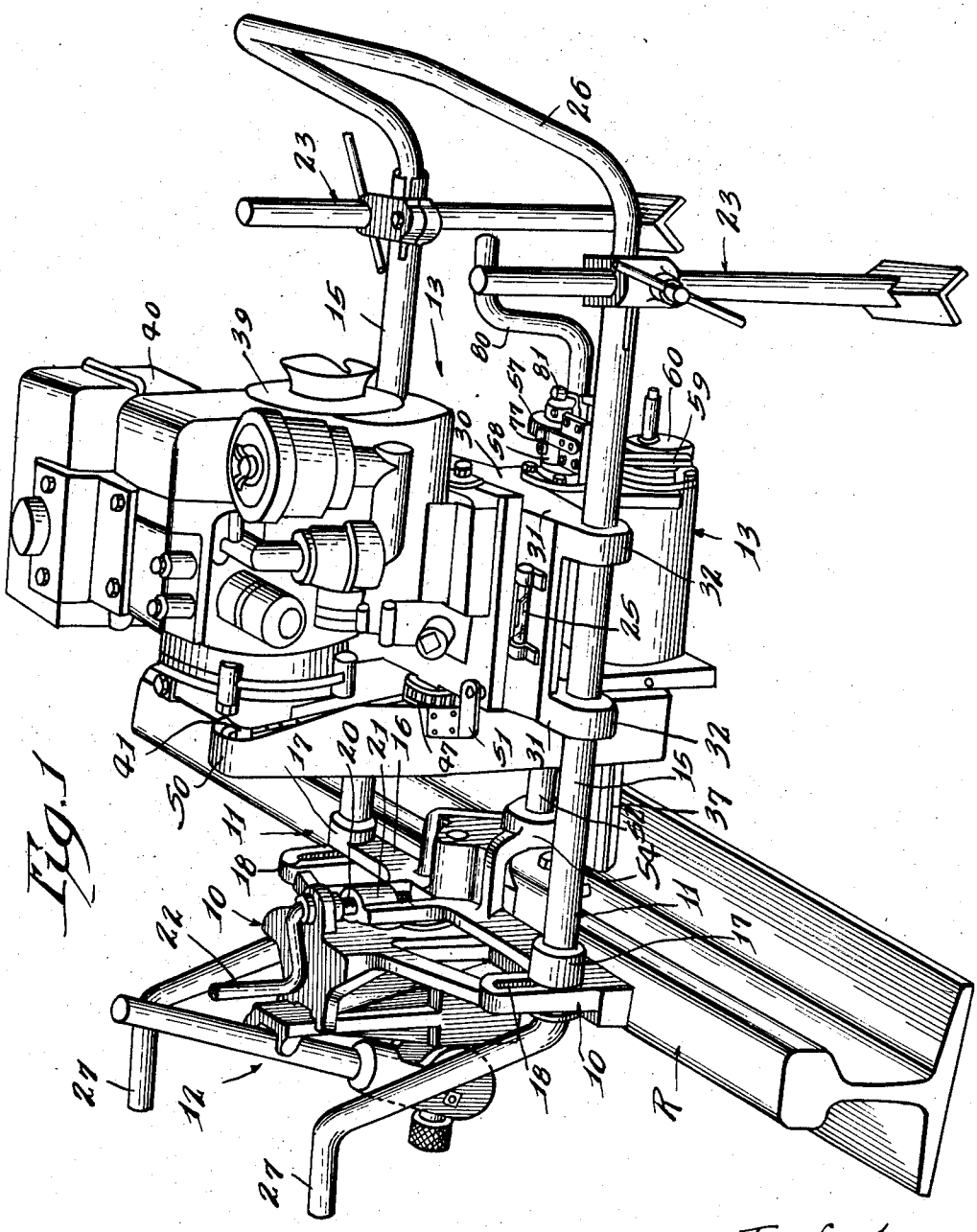


Fig. 1

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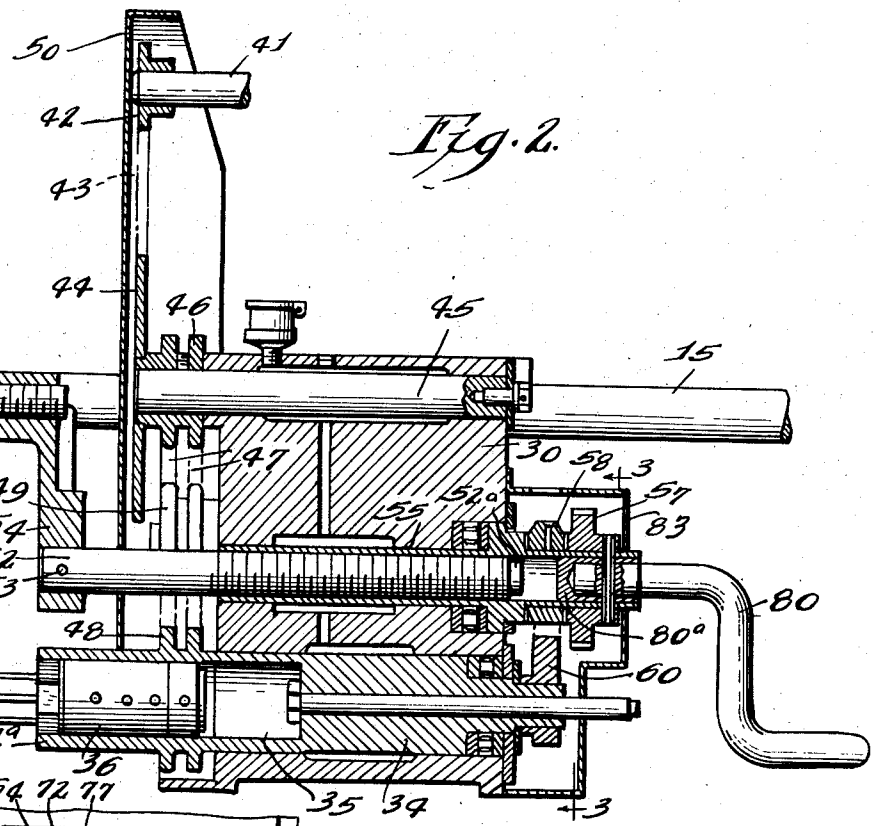


Fig. 2.

Fig. 4

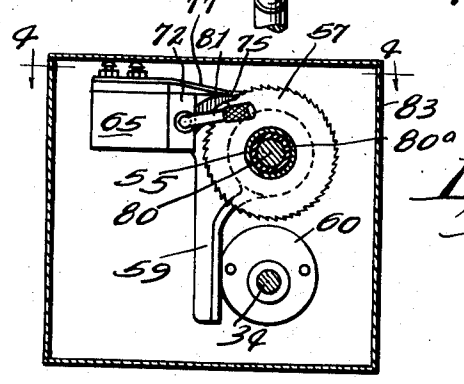


Fig. 3

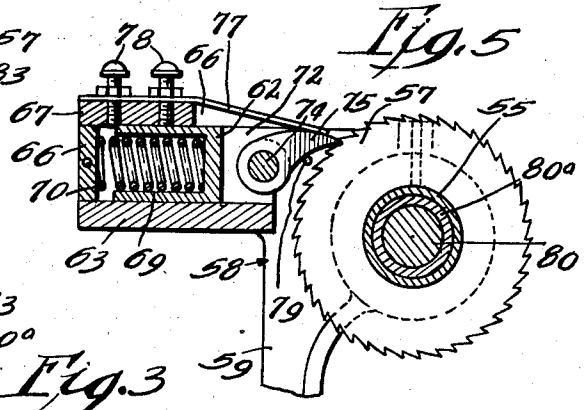


Fig. 5

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RAIL DRILL FEED MECHANISM

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Application November 19, 1956, Serial No. 623,073

7 Claims. (Cl. 77—11)

This invention relates to drills and particularly to rail drills for drilling holes in the webs of rails of railroad tracks.

It is a general object of the invention to provide, in drills of the type having a movable drill head carrying a rotatable drill bit, new and improved feeding mechanism for advancing the drill head to feed the drill bit relative to the work.

In drills of the character described, resistance to movement of the drill head may be encountered, for example, when the drill bit becomes dull or a hardened spot is encountered in the work, or when parts on the movable head abut immovable parts either on the drill frame or outside the drill. As a result, damage may occur unless special precautions are taken.

Accordingly, with the above considerations in mind, it is a more specific object to provide a new and improved feed mechanism of the type described including a resilient drive adapted to yield when the movable drill head encounters a predetermined resistance to movement so as to avoid damage to the parts.

Another object is to provide a new and improved feeding mechanism of the type described which is simple in construction, economical to manufacture, and durable and reliable in operation.

Other objects and advantages will become readily apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a perspective view of a rail drill embodying the principles of the present invention;

Figure 2 is an enlarged fragmentary vertical sectional view taken along the longitudinal axis of the drill illustrated in Figure 1, with parts omitted for simplicity;

Figure 3 is a fragmentary elevational view taken at about the line 3—3 of Figure 2;

Figure 4 is a fragmentary top plan view taken at about the line 4—4 of Figure 3; and

Figure 5 is a sectional view, partly in elevation, taken at about the line 5—5 of Figure 4.

While an illustrative embodiment of the invention is shown in the drawings and will be described in detail herein, the invention is susceptible of embodiment in many different forms, and it should be understood that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawings, and particularly to Figure 1, as illustrated, the invention is embodied in a rail drill which consists generally of a vertically disposed base or frame member 10 adapted to rest upon the top of a rail R, a framework generally designated 11 vertically adjustable on the frame member 10, clamping mechanism generally designated 12 for securely clamping the frame member 10 and the framework 11 to the rail R, and a drill head or housing generally designated 13 mounted for movement on the framework 11 toward and away from the frame member 10 and thus relative to the rail R.

The framework 11 comprises a pair of spaced parallel horizontally disposed rods 15 which extend in a direction transverse to the frame member 10 and transverse to the length of the rail R. Adjacent the frame member 10, the rods 15 are rigidly connected by a transversely extending brace 16 having at opposite ends a pair of collars 17 which receives the rods 15 and are secured thereto by means such as set screws (not visible). The ends of the rods 15 adjacent the brace 17 are slidably mounted for vertical adjustment in vertically elongated slots 18 in the frame member 10. The cross brace 16 slidably engages the vertical face of the frame member 10.

Vertical adjustment of the framework 11 is obtained by means of a screw threaded shaft 20 rotatably mounted in the frame member 10 and threaded into a central upstanding post 21 on the cross brace 16. The threaded shaft 20 may be rotated by means of an integral manually accessible crank handle 22 to effect vertical adjustment of the framework 11 relative to the frame member 10.

After the vertical adjustment of the framework 11, the frame member 10 and the framework 11 may be securely clamped to the rail by the clamping mechanism 12. Adjacent the ends of rods 15 away from the cross brace 16, each of the rods is provided with a vertically adjustable ground engaging support generally designated 23. Adjustment of the ground engaging supports 23 may be effected to level the drill head 13, and the head may be provided with an air bubble level tube 25 to indicate when the head is level.

Adjacent the adjustable ground engaging supports, the rods 15 are connected by means of a generally U-shaped handle 26, which may be separated and secured to the rods or which may be integral with the rods 15. At the opposite ends, the rods 15 are each provided with a separable handle 27. The handles 26 and 27 are accessible for use in moving the entire drill structure from one place to another.

The clamping mechanism 12 and the general arrangement of parts described thus far form no part of the present invention but form the subject matter of my co-pending application filed November 19, 1956, as Serial No. 622,929, and are described more in detail therein.

Referring now to Figures 1 and 2, the drill head 13 comprises a block 30 having on each of two opposite sides a pair of laterally spaced projecting arms 31 which terminate in integral collars 32 which are slidably mounted on the rods 15. In this manner the block 30 and the drill head 13 are mounted for advance and return movement toward and away from the frame member 10 and the rail R.

As seen best in Figure 2, a drill bit spindle 34 is rotatably mounted in the block 30 with its axis parallel with the rods 15. At opposite ends, the spindle projects from opposite ends of the block 30. Adjacent the left end of the spindle, as viewed in Figure 2, it is formed with a generally cylindrical opening or recess 35 adapted for receiving suitable chuck means 36 for holding a drill bit such as that illustrated at 37, the bit thereby being mounted for rotation with the spindle.

Rotation of the spindle is obtained by drive means supported atop the block 30 and including a drive motor which as illustrated comprises a gasoline engine 39 (Figure 1) which may be supplied with fuel from a tank 40 supported on the engine. The engine has been omitted in Figure 2. The engine 39 includes a drive shaft 41 parallel with the spindle 34 and projecting from the engine toward the frame member 10.

Power is transmitted from the drive shaft 41 to the spindle 34 by means of a sprocket 42 (Figure 2) fixed on

the drive shaft 41 and having a chain 43 trained thereover and also passing over a sprocket 44 secured on an intermediate shaft 45 rotatably supported in the block 30. Drive from the intermediate shaft 45 to the spindle 34 is through a double sprocket 46 secured to the shaft 45 and having a pair of chains 47 trained thereabout and passing over a double sprocket 48 integral with the spindle 34. If desired, the chains 47 may be passed about idler tightener sprockets 49 adjustably supported on the front of the block 30. The chain and sprocket drive just described is substantially enclosed by a chain guard 50 supported on the block 30 by means of brackets such as that illustrated at 51 (Figure 1).

Advance and return movement of the head 13 on the rods 15 is obtained by means of a screw and threaded sleeve mechanism. This feed mechanism includes a stationary screw threaded shaft 52 which is fixed on the framework 11. As illustrated, the shaft 52 is pinned at 53 in a central depending support arm 54 extending from cross brace 16. The shaft 52 projects rearwardly from the support arm 54 and extends into an opening provided therefor in the block 30. The block is provided with a rotatably mounted sleeve 55 which is held against axial movement in the block and threaded onto the shaft 52. Thus, rotation of the sleeve 55 on the screw threaded shaft 52 will effect movement of the block 30 on the rods 15 toward or away from the frame member 10 and the rail R.

Rotation of the sleeve 55 is obtained by means of a pawl and ratchet mechanism including a ratchet wheel 57 fixed on the sleeve 55 and a pawl carrier 58 which is oscillatable on the sleeve adjacent the ratchet wheel 57. The pawl carrier 58, as seen in Figures 3 and 5 includes a depending arm 59 which is actuatable to effect oscillation of the pawl carrier. The arm 59 is engageable with a rotary cam 60 which is fixed on the rearwardly projecting end of the spindle 34 for rotation therewith. Thus, on rotation of the spindle, the cam 60 is rotated and engages the depending arm 59 to oscillate the pawl carrier 58.

According to the invention, the pawl for engagement with the ratchet wheel 57 is mounted to yield relative to the pawl carrier on the advance stroke of the carrier when the drill head encounters a predetermined resistance to movement. To this end, the pawl is supported by means of a pawl block 62 slidably mounted on the carrier 58. The carrier, as seen in Figure 5, is provided with a laterally projecting slide base 63 having spaced upstanding side walls 64 (Figure 4) and 65 (Figure 3) and an upstanding rear wall 66. The base 63 and the side walls 64 and 65 form a slideway in which the block 62 is slidably mounted for movement toward and away from the ratchet wheel 57. The block 62 is retained in the slideway by means of a top cover member 67 secured to the side walls by means such as the screws illustrated at 68. The block 62 is cored out at 69 to receive a coil spring 70 which bears against the rear wall 66 and against the block in order to bias the block toward the ratchet wheel 57.

Adjacent the end of the block 62 nearest the ratchet wheel 57, the block is formed with a pair of spaced vertically disposed ears 72 which rotatably support a transversely extending pin 74 which has fixed thereon a pawl 75 engageable with the teeth on the ratchet wheel 57. The pawl 75, which is thereby pivotally mounted on the block 62 is normally biased downwardly to maintain its engagement with the ratchet teeth by a flat leaf spring 77 secured to the top wall 67 by means of screws 78. Movement of the pawl 75 in a clockwise direction (Figure 5) is limited by means of a pin 79 on the pawl carrier 58. Thus, it will be seen that the spring 77 normally biases the pawl to maintain its engagement with the ratchet teeth, and on movement of the pawl carrier in a clockwise direction (Figure 5) the pawl will effect rotation of the ratchet wheel 57 and the sleeve 55. On return movement of the carrier 58 in a counter clockwise direction the pawl will slide over the ratchet teeth.

Manual positioning of the drill head may be effected by means of a crank handle 80 (Figure 2) secured to the sleeve 55. The handle 80 may be utilized to initially position the head for drilling by rotation of the sleeve 55 in the same direction as is effected by the pawl and ratchet mechanism. Normally, feed movement of the head during drilling is effected by the pawl and ratchet mechanism which affords a power feed whenever the spindle 34 is rotating.

In order to withdraw the drill head when drilling is complete, the handle 80 may be rotated in a reverse direction. To permit the latter operation, the pawl 75 is disengaged from the ratchet wheel 57. To permit such disengagement of the pawl 75, the pin 74 which carries the pawl is provided with a manually accessible handle 81 (Figures 3 and 4) which may be utilized to rotate the pawl in a counterclockwise direction to an over center position beneath the leaf spring 77 (Figure 5), where it is held by the spring. With the pawl thus disengaged, reverse rotation of the handle 80 may be utilized to withdraw the head.

If desired, the yieldable pawl and ratchet drive may be enclosed in a suitable housing 83 through which handles 80 and 81 project, as illustrated in Figure 4. The housing has been omitted in Figure 1.

The yieldable mounting of the pawl 75 on the pawl carrier by means of the slidable block 62 serves to provide a resilient drive adapted to yield on the advance stroke of the pawl carrier when the head encounters a predetermined resistance to movement. Such resistance to movement of the drill head may occur when, for example at the end of a power feed stroke the end 52*a* (Figure 2) of the screw shaft 52 is abutted by the plug 80*a* for mounting the handle 80. Resistance to movement of the head may also occur if the drill bit 37 is positioned too far into the spindle 34 so that the spindle end 34*a* (Figure 2) abuts the rail R before the hole has been completed. In either of these cases, movement of the head is positively prevented and on continuing oscillation of the pawl carrier, the block 62 will yield on each advance stroke so that no rotation of the sleeve 55 is effected. Damage to the various parts is thereby prevented.

Resistance to movement of the drill head may also occur when the drill bit becomes dull, or when hard spots are encountered in the work. In either of these cases, the movement of the head may not be positively prevented, but only slowed. In this case, assuming the normal stroke of the pawl encompasses four ratchet teeth, the ratchet wheel may be rotated through a distance of two teeth, and the pawl may yield a distance of two teeth. This yieldable drive insures uniform pressure and greatly increased drill life, eliminating the uncertain production of hand feed. Long curled chips are produced without undue heat or damage to the drill.

I claim:

1. In a rail drill having a drill spindle, means mounting the spindle for rotation and for axial feed movement, and means for rotating the spindle, in combination therewith, means for advancing the spindle axially, comprising, cooperating, relatively rotatable feed screw and nut elements, a pawl and ratchet drive for relatively rotating the elements to advance the spindle, drive means including a prime mover for oscillating the pawl to rotate the ratchet, and said drive means including resilient means yieldable automatically to interrupt advance of the spindle when the spindle encounters a predetermined resistance to axial movement.

2. In a rail drill having a drill spindle, means mounting the spindle for rotation and for axial feed movement, and means for rotating the spindle, in combination therewith, means for advancing the spindle axially comprising, cooperating relatively rotatable feed screw and nut elements, a ratchet for relatively rotating the elements to advance the spindle, an oscillating pawl carrier adjacent the ratchet, a ratchet engaging pawl on the carrier, drive

means including a prime mover for oscillating the carrier to rotate the ratchet, and means mounting the pawl on the carrier to yield automatically to interrupt advance of the spindle when the spindle encounters a predetermined resistance to axial movement including, a pawl block slidable on the carrier toward and away from the ratchet, means pivotally mounting the pawl on the block, and a spring bearing against the carrier and the block urging the block toward the ratchet and yieldable when the spindle encounters a predetermined resistance to axial advance to permit oscillation of the carrier without rotating the ratchet.

3. A rail drill, comprising, in combination, a frame, a drill head slidable on the frame, a drill spindle rotatable in the head, means for rotating the spindle, and means for advancing the head on the frame including cooperating feed screw and nut elements on the frame and head respectively, a ratchet on one of said elements for relatively rotating the elements to advance the head, an oscillatable pawl carrier on said one element adjacent the ratchet, a ratchet engaging pawl on the carrier, drive means including a prime mover for oscillating the carrier to rotate the ratchet, and means mounting the pawl on the carrier to yield automatically to interrupt advance of the head when the head encounters a predetermined resistance to movement.

4. A rail drill, comprising, in combination, a frame, a drill head slidable on the frame, a drill spindle rotatable in the head, means for rotating the spindle, and means for advancing the head on the frame including cooperating feed screw and nut elements on the frame and head respectively, a ratchet on one of said elements for relatively rotating the elements to advance the head, an oscillating pawl carrier on said one element adjacent the ratchet, a ratchet engaging pawl on the carrier, drive means including a prime mover for oscillating the carrier to rotate the ratchet, and means mounting the pawl on the carrier to yield automatically to interrupt advance of the head when the head encounters a predetermined resistance to movement including, a pawl block slidable on the carrier toward and away from the ratchet, means pivotally mounting the pawl on the block, a spring on the block yieldably maintaining the pawl in engagement with the ratchet, a spring bearing against the carrier and the block urging the block toward the ratchet and yieldable when the head encounters a predetermined resistance to movement to permit movement of the carrier in a feed direction without rotating the ratchet, and manually accessible means for pivoting the pawl on the block to an inoperable position.

5. A rail drill, compirsing, in combination, a frame, a drill head slidable on the frame, a drill spindle rotatable in the head, drive means including a prime mover for rotating the spindle, and means for advancing the head including cooperating feed screw and nut elements on the frame and head respectively, a ratchet on one element for relatively rotating the elements to advance the head, an oscillatable pawl carrier, a ratchet engaging pawl on the carrier, means driven on rotation of the spindle for oscillating the pawl carrier to rotate the ratchet, and means mounting the pawl on the carrier to yield automatically to interrupt advance of the head when the head encounters a predetermined resistance movement.

6. A rail drill comprising, in combination a frame, a drill head slidable on the frame, a drill bit spindle rotatable in the head, means at one end of the spindle defining a chuck receiving opening for mounting a drill bit, drive means including a prime mover for rotating the spindle, a feed screw fixed on the frame, a feed screw sleeve threaded on the feed screw and rotatable in the head, a ratchet on said sleeve, a pawl carrier pivoted on said sleeve adjacent the ratchet and having a depending arm, a cam on the spindle engageable with the pawl carrier arm to effect oscillation of the pawl carrier on rotation of the cam, a pawl on the pawl carrier engageable with the ratchet to advance the ratchet as the pawl carrier moves in one direction, and means mounting the pawl on the pawl carrier for yielding movement on the advance stroke of the carrier when the drill head encounters a predetermined resistance to movement including a pawl carrying block slidable on the pawl carrier and a spring acting against the carrier and the block to yieldably urge the pawl toward the ratchet.

7. A portable rail drill, comprising, in combination, a frame, a drill head slidable on the frame, a drill bit spindle rotatable in the head and extending therefrom at opposite ends, means at one end of the spindle defining a chuck receiving opening for mounting a drill bit, drive means including a prime mover for rotating the spindle, a feed screw fixed on the frame, a feed screw sleeve rotatable in the head and threaded on the feed screw, a ratchet wheel fixed on the sleeve, a pawl carrier oscillatable on the sleeve adjacent the ratchet and having a depending arm, a cam on the spindle adjacent the end opposite said opening engageable with the pawl carrier to effect oscillation of the carrier on rotation of the cam, a pawl mounted on the carrier and engageable with the ratchet to advance the ratchet as the carrier is moved in one direction, means defining a slidaway on the pawl carrier, a pawl supporting block slidably mounted in said slidaway for movement toward and away from the ratchet wheel and having a pair of spaced ears adjacent the ratchet wheel, a pin rotatably mounted in said ears on which the pawl is fixed, a spring engageable with the carrier and the block to yieldably urge the carrier and pawl toward the ratchet wheel, a spring engaging the pawl to normally maintain it in operative engagement with the ratchet, a handle secured to said pin for manually moving the pawl between operative and inoperative positions, and a handle secured to the sleeve for manually rotating the sleeve on the feed screw to move the head.

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