

June 30, 1942.

J. C. CURTIS ET AL

2,288,544

ROCK DRILLING APPARATUS

Filed June 25, 1940

2 Sheets-Sheet 1

Fig. 1.

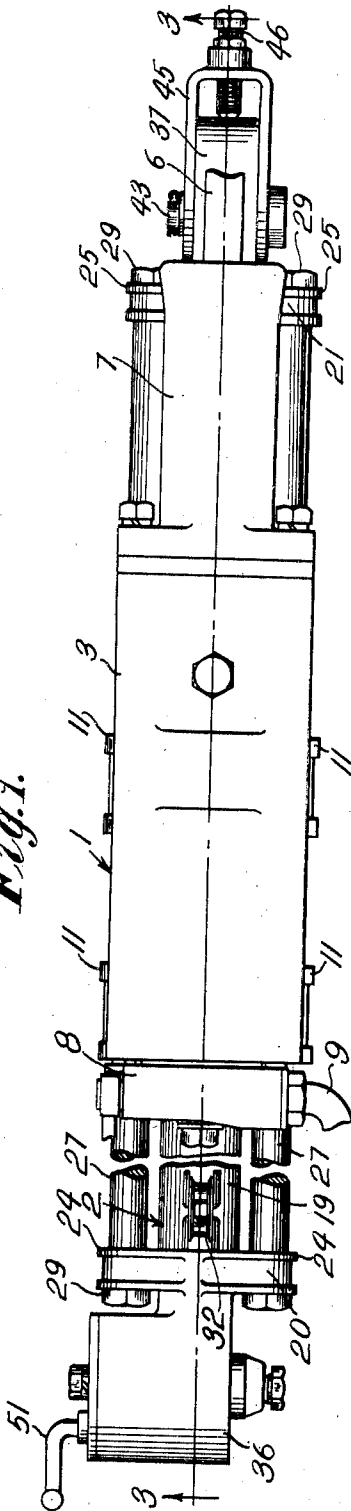
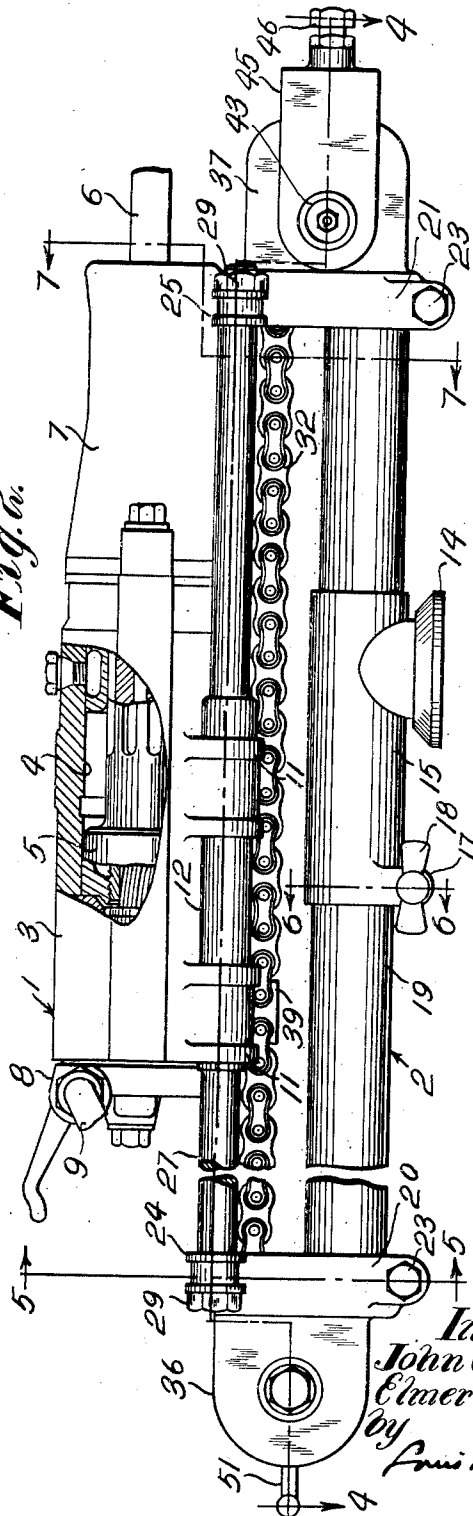


Fig. 2.



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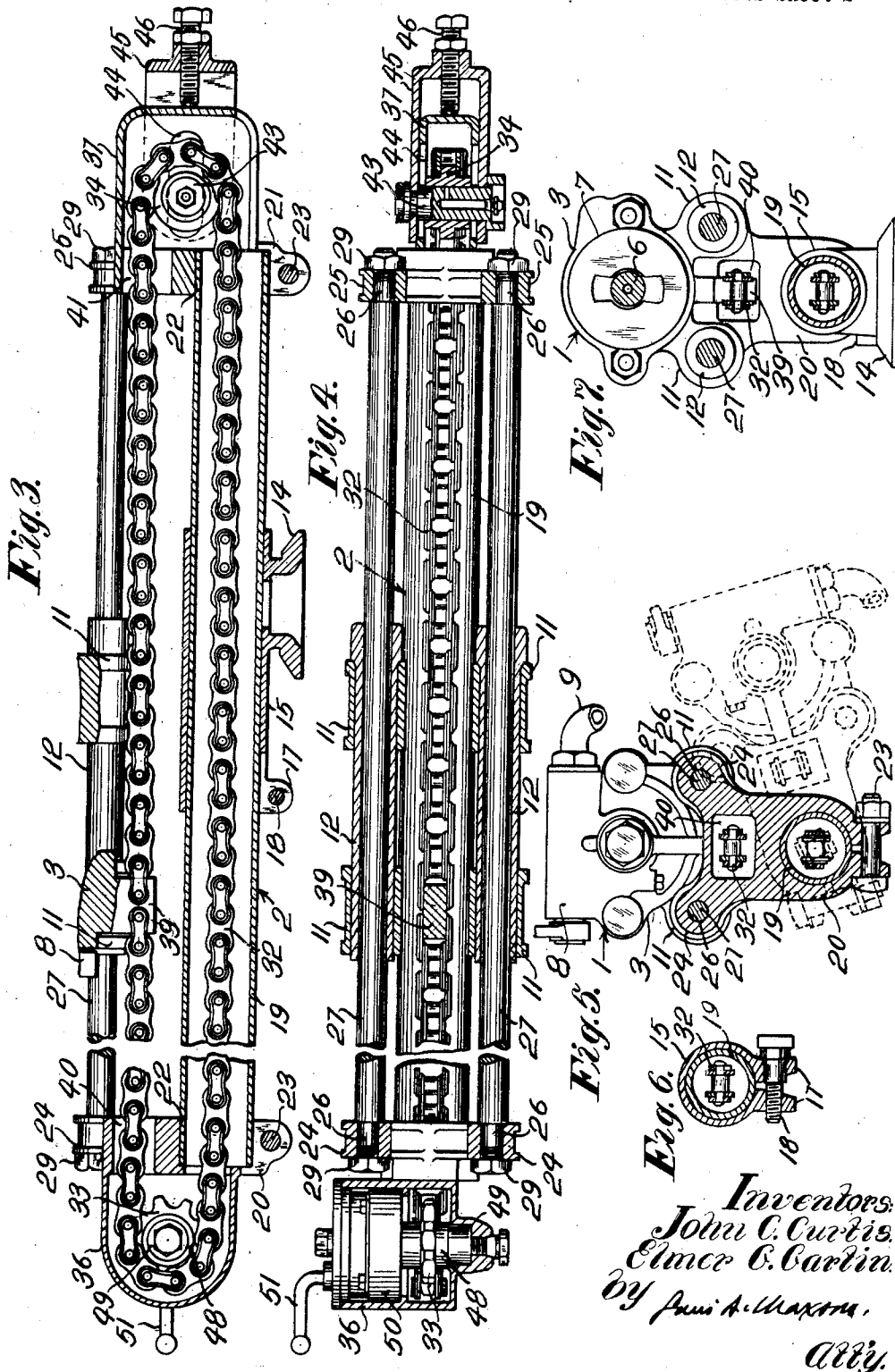
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UNITED STATES PATENT OFFICE

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ROCK DRILLING APPARATUS

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Application June 25, 1940, Serial No. 342,326

17 Claims. (Cl. 255—45)

This invention relates to rock drilling apparatus, and more particularly to improvements in the supporting, guiding and feeding means for a hammer rock drill of the mounted drifter type.

It is an object of this invention to provide an improved rock drilling apparatus. It is another object of this invention to provide an improved supporting and guiding means for a rock drill of the mounted drifter type. It is still another object of this invention to provide an improved rock drill supporting and guiding structure having improved means for adjusting the position of the rock drill relative to the work. Still another object of this invention is to provide an improved supporting and guiding structure for a rock drill adapted for adjustment to support the drill in various positions for guided movement relative to its work, and having associated therewith a feeding means arranged in an improved manner to provide a compact structure. Other objects and advantages will hereinafter more fully appear.

In the accompanying drawings, in which, for purposes of illustration, one embodiment which the invention may assume in practice has been shown,

Fig. 1 is a plan view of a rock drilling apparatus in which the illustrative form of the invention is incorporated.

Fig. 2 is a side elevational view, with parts broken away, of the rock drill shown in Fig. 1.

Fig. 3 is a vertical sectional view of the rock drill supporting and guiding structure taken on the line 3—3 of Fig. 1.

Fig. 4 is a horizontal sectional view of the supporting and guiding structure taken substantially on the planes of the line 4—4 of Fig. 2.

Fig. 5 is a cross sectional view taken substantially on line 5—5 of Fig. 2, showing the rock drill in the position of Fig. 2 in full lines and in a different position in dotted lines.

Fig. 6 is a cross sectional view taken on the line 6—6 of Fig. 2.

Fig. 7 is a vertical sectional view, with parts in elevation, taken substantially on the planes of the line 7—7 of Fig. 2.

In the present illustrative disclosure of the invention there is shown a rock drilling apparatus generally comprising a drill hammer motor 1 mounted upon an improved supporting and guiding means 2.

The hammer motor 1 is of a conventional design and comprises a motor cylinder 3 having a bore 4 within which a hammer piston 5 reciprocates to deliver impact blows to the shank of a

drill steel 6 suitably supported in a front chuck housing 7. A rear head 8 has connected thereto a supply connection 9 for supplying pressure fluid to the bore of the motor cylinder. Depending from each side of the motor cylinder and herein shown as formed integral therewith are boss-like projections 11 having alined openings for receiving sleeve-shaped members 12, said sleeve-shaped members being held in any suitable manner in fixed position relative to the motor and arranged parallel to the longitudinal axis of the latter.

Referring to the improved supporting and guiding means, it will be noted that there is provided a base element, herein in the form of a swivel plate 14 adapted for mounting in the clamp of a conventional saddle mounting, and formed integral with the swivel plate and herein with its axis perpendicular to the axis of the swivel plate is a sleeve portion 15. One end of the sleeve portion is split and is provided with laterally projecting portions 17 having openings for receiving a clamping bolt 18 provided with a suitable operating handle, as shown in Fig. 6. A tube 19 has a sliding fit in the sleeve portion 15, and is rotatable in the latter when the clamp is released, and may be clamped in any desired position by tightening the clamping bolt 18. Arranged at the ends of the tube 19 are blocks 20 and 21 having openings 22 through them for receiving the ends of the tube, and the blocks are split below the openings and provided with projecting portions having clamping bolts 23. Formed at the upper ends of the blocks are projecting portions 24 and 25 having openings for receiving reduced threaded ends 26 of guide rods 27. The guide rods extend through the sleeves 12 to support the motor for rectilinear movement and have nuts 29 threaded upon their ends for holding them securely in the blocks 20 and 21.

Associated with the supporting and guiding means is an automatic feeding mechanism comprising a feed control chain 32 of the conventional block type, guided by vertical guide rolls 33 and 34 arranged for rotation within housings 36 and 37 formed integral with and extending from the outer sides of the blocks 20 and 21. The cylinder of the drill hammer motor has a depending lug 39 projecting downwardly between the guide rods 27 and has fastened thereto the ends of the chain 32. The chain extends from the depending lug horizontally between the guide rods 27 and passes through openings 40 and 41 in the blocks 20 and 21, passes around the guide rolls 33 and 34 and

then through the tube 19. The guide roll 34 is journaled, as shown in Fig. 4, on a horizontal shaft 43 extending through slots 44 formed in the side walls of the housing 37 and carried by an adjustable member 45. A bolt 46 projects through a threaded opening in the member 45 and presses against the outer end of the housing 37 for adjusting the member 45 and the guide roll 34 longitudinally of the supporting means, thereby varying the tightness of the control chain. The guide roll 33 plays a chain movement controlling as well as a guiding function, and is in the form of a chain sprocket, and is fixed to a shaft 48 journaled at one end in a bearing 49 carried by a side wall of the housing 36 and journaled at its other end in a feed control means, generally designated 50, arranged within the housing. The feed control means, which is of the type adapted to utilize the longitudinal jumping of the motor to effect feed, comprises a manually controlled ratchet and pawl mechanism for controlling the rotation of the sprocket wheel 33. This control means is of a type well known to those skilled in the art, and the specific details of its construction form no part of the present invention. Detailed description of the control means structure is therefore considered unnecessary; and it will suffice to state that under a control of the handle 51 the mechanism 50 can be caused at will to preclude circulation of the control chain in either direction while allowing it to move in the other, thus enabling the jump of the hammer motor to effect step by step feed in either direction, and the motor may also be locked against movement in both directions.

The mode of operation will be clearly understood from the description given. The swivel plate 14 of the drill is clamped in its saddle mounting and the clamping bolt 18 is released so that the tube 19 of the supporting structure may be moved longitudinally through the sleeve 15 or partially rotated within it to adjust the drill in the desired position for drilling. The bolt 18 is then tightened to lock the supporting and guiding frame in a stationary position, and pressure fluid is supplied to the motor cylinder to effect reciprocation of the hammer piston. Sudden reversals in the direction of movement of the hammer piston cause alternating tendencies of movement of the drill motor forwardly and rearwardly along the guide rods 27 with respect to the supporting structure. The tendencies of movement are transmitted by the lug 39 to the feed control chain 32 and, if the feed control means 50 is adjusted to permit rotation of the chain sprocket 33 only in a clockwise direction, on each reversal from a forward to a rearward stroke of the motor piston the drill motor will move a short distance toward the work, but will be held by the chain and sprocket against movement in a rearward direction. To move the drill motor rearwardly on its guide rods the feed control means 50 is adjusted to permit rotation of the chain sprocket 33 only in a counterclockwise direction. To vary the tension on the feed control chain the position of the forward guide roll 34 is adjusted by turning the bolt 46 and thereby effecting or permitting, depending on the adjustment of the bolt, movement of the guide roll supporting member 45 longitudinally of the guide frame. When the limit of automatic feed is reached, the clamp 17 may be released to permit endwise movement of the guide structure into a new feeding posi-

tion relative to the swivel plate sleeve 15, and the guide structure may thereafter be firmly clamped in position. To facilitate changing of drill steels the clamp may be released to permit swinging of the hammer motor about the longitudinal axis of the tube 19 laterally relative to the drill hole in the manner indicated in dotted lines in Fig. 5, so that the drill steel may be withdrawn from the hole along the side of the motor. The steel shank is of course withdrawn from the drill motor chuck by retraction of the motor along the guide rods prior to such lateral swinging of the motor.

As a result of this invention it will be noted that an improved rock drilling apparatus of the mounted drifter type has been provided. It will further be noted that there has been provided an improved supporting and guiding means for a rock drill hammer motor adapted to permit adjustment of the motor angularly about an axis parallel to and spaced from the axis of the motor, and adapted to permit adjustment of guiding means longitudinally of the longitudinal motor axis. It will further be noted that there has been provided a feed control means for a drill motor associated with the supporting and guiding means in an improved manner to provide a compact drilling mechanism. It will still further be evident that by the provision of the improved mounting structure for the guiding means the drill hammer motor may be swung laterally relative to the drill hole to facilitate changing of drill steels, in an improved manner. Other uses and advantages of the present improved supporting and guiding means will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What we claim as new and desire to secure by Letters Patent is:

1. In a rock drill, the combination comprising a drill motor of the reciprocating hammer piston type in which longitudinal vibratory movements in opposite directions occur during running of the motor, guide members along which said drill motor is movable, means for supporting said guide members for rectilinear adjustment in a direction longitudinally of said drill motor and for angular adjustment about an axis parallel to and spaced from the longitudinal axis of said drill motor, and means controlled by said longitudinal vibratory movements of said drill motor for effecting feed of the motor along said guide members, said feed effecting means including a flexible control element connected to said drill motor and guided for circulation with a portion of its length lying in the axis about which said guide members are angularly adjustable.

2. In a rock drill, the combination comprising a drill motor of the reciprocating hammer piston type in which longitudinal vibratory movements in opposite directions occur during running of the motor, guide members along which said drill motor is movable, means for supporting said guide members for rectilinear adjustment in a direction longitudinally of said drill motor and for angular adjustment about an axis parallel to said guide members, said supporting means including a tubular shaped member hav-

ing its axis in the same straight line with the axis about which said guide members are angularly adjustable, and means controlled by said longitudinal vibratory movements of said drill motor for effecting feed of the motor along said guide members, said feed effecting means including a flexible control element connected to said drill motor and guided for circulation with a portion of its length extending through said tubular shaped member.

3. In a rock drill, the combination comprising a drill motor of the reciprocating hammer piston type in which longitudinal vibratory movements in opposite directions occur during running of the motor, guide members along which said drill motor is movable, means for supporting said guide members for rectilinear adjustment in a direction longitudinally of said drill motor and for angular adjustment about an axis parallel to and spaced from said guide members, said supporting means including blocks attached to the ends of said guide members and a tubular shaped member extending into openings in said blocks and having its axis in the same straight line with the axis about which said guide members are angularly adjusted, and means controlled by said longitudinal vibratory movements of said drill motor for effecting feed of the motor along said guide members, said feed effecting means comprising rotary guide elements journaled on said blocks for rotation about transverse axes and a flexible control element connected to said drill motor and passing around said rotary guide elements and through said tubular shaped member.

4. In a rock drill, the combination comprising a drill motor of the reciprocating hammer piston type in which longitudinal vibratory movements in opposite directions occur during running of the motor, parallel guide members along which said drill motor is movable, means for supporting said guide members for rectilinear adjustment in a direction longitudinally of said drill motor and for angular adjustment about an axis parallel to and spaced from said guide members, said supporting means including spacing members attached to the ends of said guide members and a tubular shaped member secured at its ends in openings in said spacing members and having its axis in the same straight line with the axis about which said guide members are angularly adjusted, and means controlled by said longitudinal vibratory movements of said drill motor for effecting feed of the motor along said guide members, said feed effecting means comprising rotary elements supported at the outer sides of said spacing members for rotation about transverse axes, adjustable means for controlling the direction of rotation of one of said rotary elements, and a flexible control element connected to said drill motor and passing around said rotary elements and through said tubular shaped member.

5. In a rock drill, the combination comprising a drilling motor for actuating a drill steel, an adjustable guiding and mounting structure for said motor comprising a pair of parallel guide rods along which said motor is slidably guided, a tubular member parallel to and substantially coextensive with said guide rods, end members secured to the ends of said tubular member and held in fixed spaced relation by said guide rods and a sleeve-like support for slidably receiving and supporting said tubular member, and means for effecting feed of said motor along said guide

rods including a flexible element secured to said motor and guided on said end members, said end members having rotary elements mounted thereon for guiding said flexible element and said flexible element extending longitudinally between said guide rods and passing around said rotary elements and through said tubular member.

6. In a rock drill, the combination comprising a drilling motor for actuating a drill steel, an adjustable guiding and mounting structure for said motor comprising a pair of parallel guide rods along which said motor is slidably guided, a tubular member parallel to and substantially coextensive with said guide rods, end members secured to the ends of said tubular member and held in fixed spaced relation by said guide rods and a sleeve-like support for slidably receiving and supporting said tubular member, and means for effecting feed of said motor along said guide rods including a flexible element secured to said motor and guided on said end members, said flexible element extending longitudinally between said guide rods and having a portion extending longitudinally through said tubular member.

7. In a rock drill, the combination comprising a drill motor for actuating a drill steel, guide members along which said drill motor is movable, means for supporting said guide members for adjustment about an axis parallel to and spaced from the longitudinal axis of said drill motor, and means for feeding said motor along said guide members, said feeding means including a flexible control element connected to said drill motor and guided for circulation with a portion of its length lying in the axis about which said guide members are adjustable.

8. In a rock drill, the combination comprising a drill motor for actuating a drill steel, guide rods along which said drill motor is movable, means for adjustably supporting said guide rods including a tubular shaped member arranged between said guide rods and having its axis spaced equally at all points along its length from a plane including the axes of said guide rods, and means for feeding said motor along said guide rods including a flexible control element connected to said motor, rotary guide members for said control element journaled on transverse axes extending parallel to the plane including the axes of said guide members and located at the opposite ends of said tubular shaped member, said control element extending in opposite directions from said motor around said rotary guide members and through said tubular shaped member.

9. In a rock drill, the combination comprising a drill steel actuator, supporting and guiding means for said drill steel actuator including an elongated tubular member relative to which said actuator is movable in a longitudinal direction, means providing a guideway for said actuator extending substantially coextensive with and parallel to said tubular member and means for mounting said tubular member for pivotal movement about its longitudinal axis whereby said actuator may be swung laterally out of line with the drill hole, and means for effecting feed of said actuator along said guideway relative to said tubular member including a feeding element having a portion thereof extending through said tubular member and another portion extending alongside said tubular member.

10. In a rock drill, the combination comprising a drill steel actuator, guiding means providing a longitudinal guideway along which said

drill steel actuator is movable, means for supporting said guiding means for pivotal adjustment about an axis parallel to and spaced from the longitudinal axis of said actuator, and means for feeding said actuator along said guideway including a feeding element including a portion extending along said guide way and further having a portion thereof extending along the pivotal axis about which said guiding means is adjustable.

11. In a rock drill, the combination comprising a drill steel actuator, guiding means providing a longitudinal guideway along which said drill steel actuator is movable, means for supporting said guiding means including an elongated tubular member arranged longitudinally in parallelism with said guideway but spaced from the latter, and means for feeding said actuator along said guideway including a feeding element operatively connected to said actuator and having at least a portion thereof extending longitudinally through said tubular member.

12. In a rock drill, the combination comprising a drill steel actuator, guiding means providing a longitudinal guideway along which said drill steel actuator is movable, means for supporting said guiding means for angular adjustment about an axis parallel to and spaced from the longitudinal axis of said actuator, and means for effecting feed of said actuator along said guideway including a feeding element operatively connected to said actuator and having a portion of its length lying in the axis about which said guiding means is angularly adjustable and another portion of its length laterally offset from said first mentioned portion.

13. In a rock drill, the combination comprising a drill steel actuator, an adjustable mounting and guiding structure providing a longitudinal guideway along which said actuator is movable, a tubular member parallel to and substantially coextensive with said guideway, a support on which said tubular member is mounted for relative adjustment, and means for effecting feed of said actuator along said guideway including a feeding element operatively connected to said actuator and extending longitudinally in parallelism with said guideway and through said tubular member.

14. In a rock drill, the combination comprising a drill steel actuator, an adjustable mounting and guiding structure for said drill steel actuator comprising guiding means providing spaced parallel guideways along which said actuator is

guided, a tubular member parallel to and substantially coextensive with said guideways, a support on which said tubular member is mounted for relative adjustment, and means for effecting feed of said actuator along said guideways including a feeding element operatively connected to said actuator and extending longitudinally between said guideways and having a portion extending longitudinally through said tubular member.

15. In a rock drill, the combination comprising a drill steel actuator, supporting and guiding means for said actuator including three longitudinally extending parallel, spaced apart elements connected together in rigid relation and arranged substantially coextensively, two of said elements providing a longitudinal guideway for said actuator and the third being tubular and providing a support for said other two, and means for feeding said actuator along the guideway including a feeding element operatively connected to said actuator and extending longitudinally between said guideway-providing elements with a portion thereof extending longitudinally through said tubular element.

16. In a rock drill, the combination comprising a drill steel actuator, supporting and guiding means for said drill steel actuator including an elongated tubular member relative to which said actuator is movable in a longitudinal direction, means providing a guideway for said actuator extending substantially coextensive with and parallel to said tubular member and means for mounting said tubular member for pivotal movement about its longitudinal axis whereby said actuator may be swung laterally out of line with the drill hole, and means for effecting feed of said actuator along said guideway relative to said tubular member including a feeding element having at least a portion thereof extending through said tubular member.

17. In a rock drill, the combination comprising a drill steel actuator, guiding means providing a longitudinal guideway along which said drill steel actuator is movable, means for supporting said guiding means for pivotal adjustment about an axis parallel to and spaced from the longitudinal axis of said actuator, and means for feeding said actuator along said guideway including a feeding element having at least a portion thereof extending along the pivotal axis about which said guiding means is adjustable.

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