Dec. 22, 1942. J. C. CURTIS 2,306,040

ROCK DRILL

Filed July 31, 1940

2 Sheets-Sheet 1

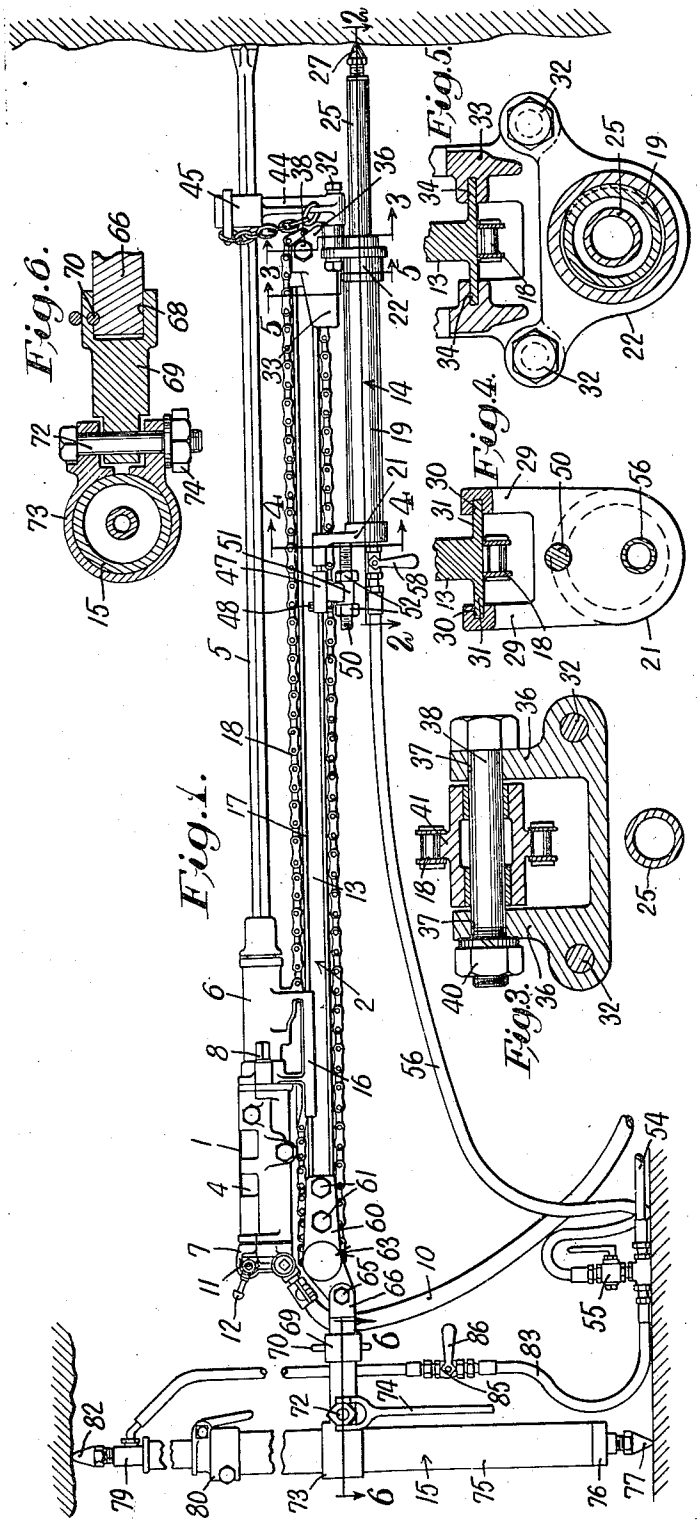


Fig. 1.

Fig. 6.

Fig. 5.

Fig. 4.

Fig. 3.

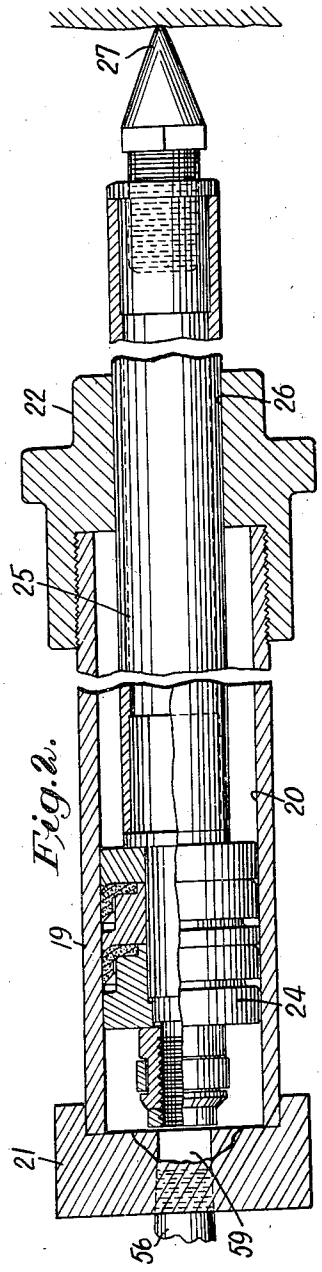


Fig. 2.

Inventor:
John C. Curtis.
by
Louis A. Maxson.
Atty.

Dec. 22, 1942. J. C. CURTIS 2,306,040

ROCK DRILL

Filed July 31, 1940 2 Sheets-Sheet 2

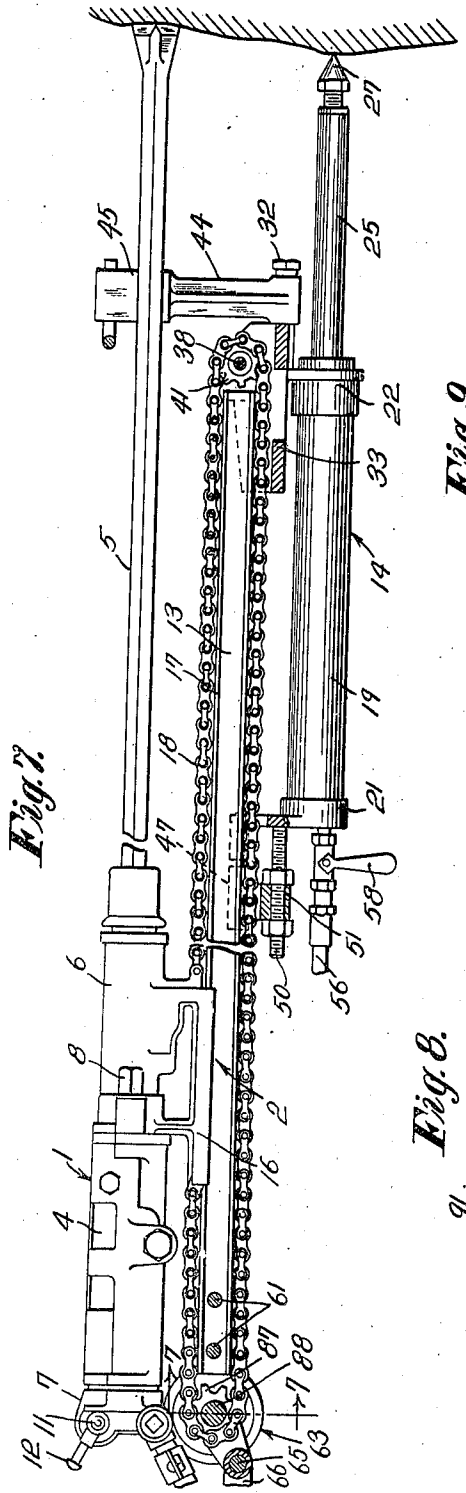


Fig. 7.

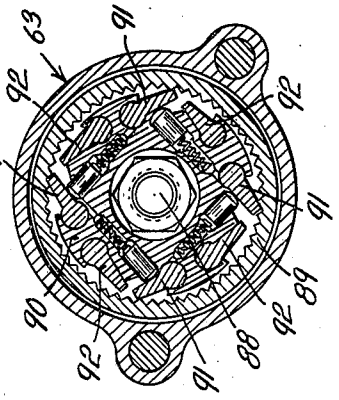


Fig. 9.

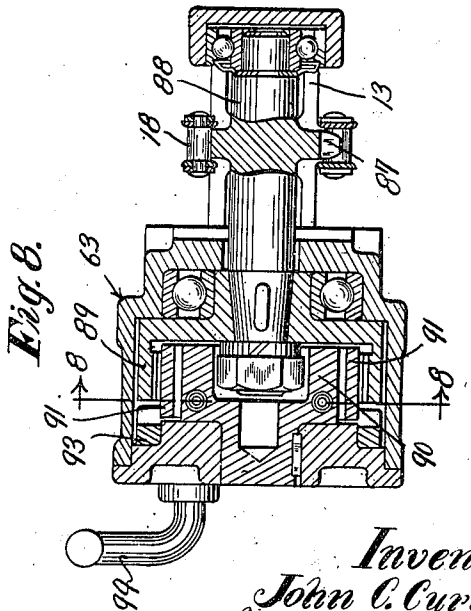


Fig. 8.

Inventor:
John C. Curtis.
by Louis A. Mason.
Atty.

Patented Dec. 22, 1942

2,306,040

UNITED STATES PATENT OFFICE

2,306,040

ROCK DRILL

John C. Curtis, Claremont, N. H., assignor to Sullivan Machinery Company, a corporation of Massachusetts

Application July 31, 1940, Serial No. 348,759

7 Claims. (Cl. 255—51)

This invention relates to rock drills, and more particularly to improved supporting and guiding means for the drill steel actuating motor of a hammer rock drill.

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 structure for supporting and guiding a drill steel actuating motor relative to its work. Still another object of this invention is to provide an improved rock drilling apparatus of the type in which a portion of the support is furnished by the face in which a hole is being drilled. A still further object of this invention is to provide, in a supporting and guiding structure for a drill steel actuating motor of the chain fed type, an improved support member adjustable for controlling the tension of the feed chain. Still another object is to provide, in a rock drilling apparatus of the type above mentioned, an improved supporting structure having an adjustable, fluid actuated member for supporting the drill at one of its ends. Still another object is to provide, in a supporting structure for a drill steel actuating motor, a fluid actuated means slidably adjustable along a motor guide member for adjusting the tension on a feed chain for the motor and operative for engaging an abutment to support the drill. Other objects and advantages of the invention will hereinafter more fully appear in the course of the following description and as more particularly pointed out in the appended claims.

In the accompanying drawings, in which there is shown for purposes of illustration one embodiment of the invention,

Fig. 1 is a view, in side elevation, of a drill mechanism in which the illustrative embodiment of the invention is incorporated.

Fig. 2 is an enlarged horizontal sectional view, with a portion broken away, taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged cross sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is an enlarged view, with parts in elevation and parts in section, taken on the plane of the line 4—4 of Fig. 1.

Fig. 5 is an enlarged cross sectional view taken on the line 5—5 of Fig. 1, with parts omitted.

Fig. 6 is an enlarged horizontal sectional view taken on the line 6—6 of Fig. 1.

Fig. 7 is an enlarged view in longitudinal vertical section taken through the improved drill mechanism shown in Fig. 1.

Fig. 8 is an enlarged cross sectional view taken on line 8—8 of Fig. 7, illustrating the feed control device.

Fig. 9 is a detail sectional view taken on line 9—9 of Fig. 8.

In this illustrative embodiment of the invention there is shown a drill steel actuating motor 1 of the drifter type mounted upon an improved supporting and guiding structure, generally designated 2.

The drill steel actuating motor 1 is of the pressure fluid actuated type of a standard and well known design, and comprises a motor cylinder 4 in which there is reciprocable a usual hammer piston adapted to actuate percussively a drill steel 5 supported in a usual manner within a front chuck housing 6. The cylinder 4 is provided with a rear head block 7, and the motor parts, including the cylinder, chuck housing and rear head block, are held in assembled relation by usual side rods 8. Pressure fluid is supplied to the motor cylinder from a supply line 10 under the control of a usual throttle valve mechanism 11 having an operating handle 12.

Now referring to the improved supporting and guiding structure, it will be noted that there is provided an elongated guide member 13, shown herein as an I-beam, and mounted on the forward end of the guide member for adjustment longitudinally thereof is an extensible, fluid actuated, supporting device, generally designated 14, while attached to the rear end of the guide member is an adjustable supporting structure, generally designated 15. The motor 1 is provided with depending side portions 16 which are slidably guided upon the upper flanges 17 on the I-beam guide member, and a feed chain 18 connected to the drill motor passes around the ends of the guide member and is guided and controlled in a manner that will shortly be described more in detail. Referring to the forward supporting device 14, it will be noted that it comprises a cylinder 19 arranged beneath the guide member in a plane parallel to the longitudinal axis of the latter and having a bore 20 which is closed at its ends by cylinder heads 21 and 22. Reciprocably mounted in the cylinder bore is a piston 24 carrying a piston rod 25 which extends through an opening 26 in the cylinder head 22 and has threadedly secured to its forward end an abutment-engaging point 27. Formed integrally with the cylinder head 21 are projecting arms 29 having grooves 30 for slidably receiving lower flanges 31 on the guide member 13, as shown in Fig. 4. Attached to the cylinder head 22, as by bolts 32, is a block 33 which is provided with grooves 34

also slidably receiving the lower flanges on the guide member, as shown in Fig. 5. The block 33 is provided with portions 36 extending upwardly about the sides of the guide member 13, and formed in the portions 36 at the forward end of the block are openings 37 which receive a bolt 38 extending transversely of the guide member in advance of its forward end. The bolt is secured in position by a nut 40 threaded upon its end, and rotatably mounted upon the bolt is a chain sprocket 41 about which the feed chain 18 passes. Mounted on the bolts 32 in advance of the block 33 are arms 44 carrying a guide member 45 for guiding the forward end of the drill steel while the hole is being started. Means are provided for moving the supporting device 14 and the chain sprocket 41 therewith forwardly along the guide member to increase the tension on the feed chain to the desired amount and to hold the device 14 in its adjusted position. This means comprises a block 47 adjustably mounted upon the lower flanges 31 on the guide member and held in any desired position by clamping bolts 48. A threaded rod 50, fixed to the cylinder head 21 as by welding, extends rearwardly through an opening in a depending portion 51 of the block 47 and has threaded upon it nuts 52 at opposite sides of the depending portion 51 for adjusting the device 14 relative to the block 47 and for locking it in its adjusted position. The piston 24 is moved forwardly in its cylinder bore to force the abutment-engaging point 27 firmly against a forward abutment, usually the working face, by pressure fluid supplied from a main supply line 54, under the control of a manually operated valve 55, to a flexible conduit 56 which conducts the pressure fluid, under the control of a three-way throttle valve 58, through an opening 59 in the cylinder head 21 to the rear end of the cylinder bore. To release the point 27 from its abutment the throttle valve 58 is moved to cut off the flow of pressure fluid in the conduit 56 and to vent the cylinder bore 20 to atmosphere.

At the rear end of the guide member 13 are plates 60 attached to the sides of the guide member by bolts 61; and supported by the plates is a device, generally designated 63, for controlling the motion of the feed chain 18. This device as hereinafter described is operative to cause the hammer motor to advance along the guide bar step by step or to cause it to retract at will. Attached to the rearward ends of the plates 60 by a bolt 65 is a member 66 having a rearward portion fitting within a recess 68 in a connecting member 69, as shown in Fig. 6. A pin 70 extends through an opening in the member 69 and fits within a groove in the portion of the member 66 extending into the recess 68, for locking together the members 66 and 69. The member 69 is pivotally connected to a pivot-forming bolt 72 carried by a clamping device 73 adjustably mounted on the supporting structure 15, and a handle 74 on the bolt 72 effects clamping engagement of the clamping device with the supporting structure in its various adjusted positions.

The supporting structure 15 may be of a type similar to that disclosed in my copending application Serial No. 325,490, filed March 23, 1940, and herein comprises a cylinder 75 having a lower cylinder head 76 to which there is attached an abutment-engaging point 77. Reciprocably contained within the cylinder is a piston, not shown, having a tubular-shaped piston rod 79 extending through an opening in an upper cylinder head 80 and carrying an abutment-engaging point 82. Pressure fluid is supplied from the supply line 54 to a flexible conduit 83 which connects to the piston rod 79 adjacent the abutment engaging point 82, and pressure fluid flowing from the conduit 83 is delivered through the tubular piston rod to the cylinder beneath the piston for moving the abutment-engaging points 77 and 82 firmly into engagement with extraneous abutments. A three-way valve 85, having a control handle 86, is provided for controlling the flow of pressure fluid through the conduit 83 to the cylinder or for cutting off pressure fluid supply and venting the cylinder to atmosphere to effect a release of the abutment-engaging points from their abutments.

Now referring to the specific structure of the feed control device 63, it will be noted that the rearward portion of the feed chain 18 passes around a chain sprocket 87 fixed to a control shaft 88 (Fig. 8). Also fixed to the shaft 88 is a rotatable ratchet ring 89, while keyed to the casing of the control device and arranged centrally within the ratchet ring is a non-rotatable pawl carrier 90 carrying sets of oppositely acting spring-pressed pawls 91 and 92. A conventional rotatable control ring 93 provided with an operating handle 94 is engageable with the pawls for throwing out either set of pawls from engagement with the ratchet ring, while the other set engages the ratchet teeth. Thus the pawls may effect control of the direction of rotation of the sprocket 87. As the hammer piston of the drill steel actuating motor is operated percussively to actuate the drill steel, longitudinal vibrations in opposite directions are set up within the motor, and these vibrations create a jumping tendency of the drilling motor. This jumping action, either forwardly or rearwardly, effects feed of the drill motor along the guide and the direction of feed is under the control of the pawls of the ratchet mechanism. The feed chain 18, under the control of the ratchet mechanism, permits feed of the drill motor step by step along the guide in one direction while movement of the motor in the reverse direction is prevented. As this control device is of a well known form and as the mode of operation thereof is well known to those skilled in the art, further description is herein unnecessary.

The mode of operation of the improved rock drill is as follows: The cylinder 75 of the rear supporting structure 15 is placed in any desired position and pressure fluid is supplied to the cylinder from the supply line 54 and the flexible conduit 83 to effect movement of the points 77 and 82 into engagement with suitable abutments. The clamping device 73 is moved into the desired position along the cylinder and is clamped in that position by operating the handle 74 to tighten the bolt 72. The supporting device 14 at the forward end of the guide member 13 is then moved forwardly, if this adjustment has not, as would usually be the case, been taken care of, by adjusting the nuts 52 on the threaded rod 50, to increase the tension on the feed chain 18 to the desired amount. The guide member 13 is swung about the pivot-forming bolt 72 at its rear end to bring the drill motor into the desired drilling position, and then pressure fluid is supplied through the conduit 56 to the cylinder bore 20 at the rear end of the piston 24 for moving the abutment-engaging point 27 firmly

against the face of the work. The throttle valve 11 is then opened to supply pressure fluid from the supply line 10 to the drill motor to effect reciprocation of the hammer piston in a manner well known to those skilled in the art. The reversals of the hammer piston tend to produce jumps of the drill motor and this jumping tendency is transmitted to the feed chain 18. The motion control device 63 permits the feed chain to be moved by the jumps of the drill motor in one direction while holding the feed chain against movement in the opposite direction, thereby effecting feed of the drill motor in one direction or another depending on the adjustment of the motion control device.

As a result of this invention, it will be noted that an improved rock drill having an improved adjustable supporting structure for supporting the drill motor in various positions relative to its work is provided. It will further be noted that the supporting structure is not only rugged in construction, but is simple in design and composed of parts which may be inexpensively constructed and easily applied.

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

1. In a rock drill, in combination, a fluid actuated percussive type drill motor, means for supporting and guiding said drill motor for movement relative to its work comprising an elongated guide member, adjustable means for supporting the rear end of said guide member, a fluid-actuated abutment-engaging device adjustably mounted on the forward end of said guide member, a feed control chain attached to said drill motor and extending around the ends of said guide member, a motion control device at the rear end of said guide member for controlling movement of said feed control chain, means attached to said abutment-engaging device and arranged at the forward end of said guide member for guiding the movement of said feed control chain, means for adjusting the position of said abutment-engaging device and said feed control chain guiding means attached thereto for regulating the tension on said feed control chain, and means for supplying pressure fluid to said abutment-engaging device for effecting engagement of the latter with a forward abutment.

2. In a rock drill, in combination, a fluid actuated percussive type drill motor, means for supporting and guiding said drill motor for movement relative to its work comprising an elongated guide member, adjustable means for supporting the rear end of said guide member, a cylinder adjustably mounted on the forward end of said guide member and extending longitudinally thereof, a piston reciprocably mounted in said cylinder and carrying an abutment-engaging point extending toward the forward end of said guide member, a feed control chain attached to said drill motor and extending around the ends of said guide member, means arranged at the rear end of said guide member for controlling movement of said feed control chain, means attached to said cylinder and arranged at the forward end of said guide member for guiding the movement of said feed control chain, means for adjusting the position of said cylinder and said feed control chain guiding means attached thereto for regulating the tension on said feed control chain, and means for supplying pressure fluid to said cylinder for moving said abutment-engaging points into engagement with a forward abutment.

3. In a rock drill, in combination, a drill motor, means for supporting and guiding said drill motor for movement relative to its work comprising an elongated guide member having spaced parallel guide portions extending longitudinally thereof, said drill motor being slidably guided upon certain of said guide portions, adjustable means for supporting one end of said guide member, a fluid actuated abutment-engaging device at the opposite end of said guide member and slidably mounted on said guide portions spaced from the portions guiding said drill motor, a flexible feed control element attached to said drill motor and extending around the ends of said guide member, a motion control device for controlling movement of said flexible feed control element, means attached to said abutment-engaging device for guiding the movement of said flexible feed control element, means for adjusting the position of said abutment-engaging device and said control element guiding means for regulating the tension on said flexible feed control element, and means for supplying pressure fluid to said abutment-engaging device for effecting engagement of the latter with a forward abutment.

4. In a rock drill, in combination, a guide, a drill steel actuator movable along said guide, means for feeding said actuator along said guide toward the work including a flexible feeding element, a support adjustably mounted on said guide and having means attached thereto for guiding the movement of said flexible feeding element, said support being adjustable to vary the tension of said flexible feeding element, an abutment-engaging element carried by said adjustable support and adapted for engagement with the face of the work for supporting one end of said guide, and adjustable means for supporting the other end of said guide.

5. In a rock drill, in combination, a guide, a drill steel actuator movable along said guide, means for feeding said actuator along said guide toward the work including a flexible feeding element, means carried by said guide and adjustable relative thereto for varying the tension of said flexible feeding element, a projecting abutment-engaging element carried by said last mentioned means and adjustable relative thereto for engaging an extraneous abutment for supporting one end of said guide, and means for supporting the other end of said guide.

6. In combination, an elongated guide, a drill steel actuator movable along said guide, means for feeding said actuator along said guide including a flexible element, a bracket attached to the front end of said guide and with which said flexible element is operatively engaged, said bracket having a depending portion extending laterally beyond one side of said guide, and an extensible support adapted for engagement with the face of the work for supporting the forward end of said guide, said extensible support including an element secured to said depending bracket portion and extending longitudinally

along one side of said guide, and said extensible support also including an extensible portion guided on said element and projecting forwardly in advance of the forward end of said guide.

7. In combination, an elongated guide, a drill steel actuator movable along said guide, means for feeding said actuator along said guide including a flexible feeding element, a support carried by said guide and with which said flexible element is operatively engaged, means for adjusting said support relative to said guide to vary the tension of said flexible element, and an abutment engaging device secured to said adjustable support and having a portion projecting longitudinally into engagement with an extraneous abutment for supporting said guide.

JOHN C. CURTIS.