March 3, 1942. C. F. OSGOOD 2,274,728

ROCK DRILL

Filed June 22, 1940 2 Sheets-Sheet 1

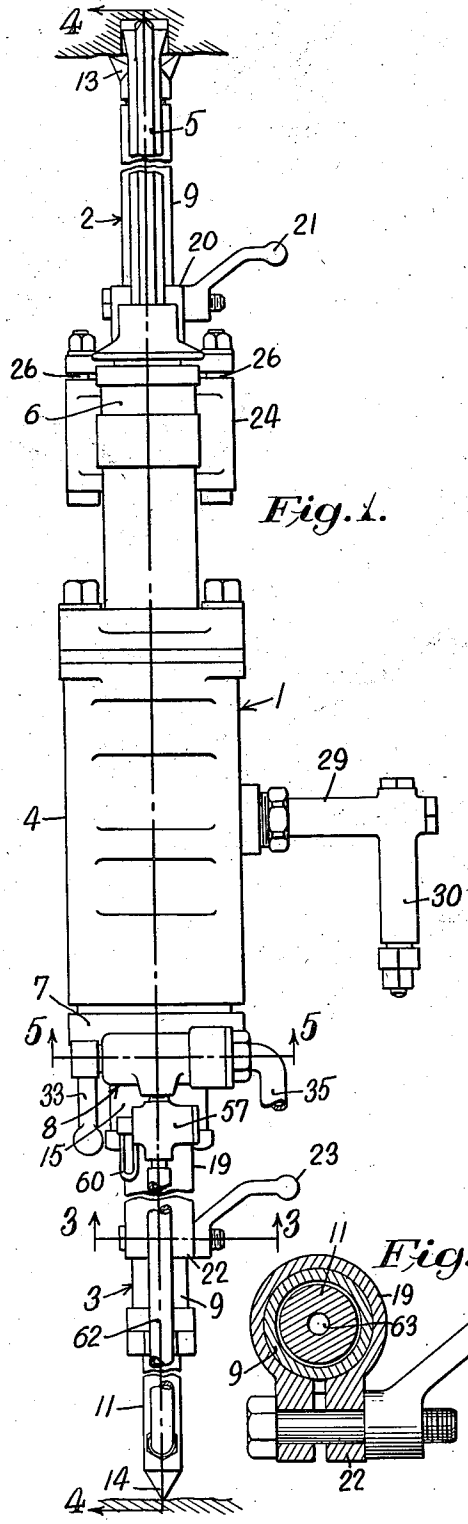


Fig. 1.

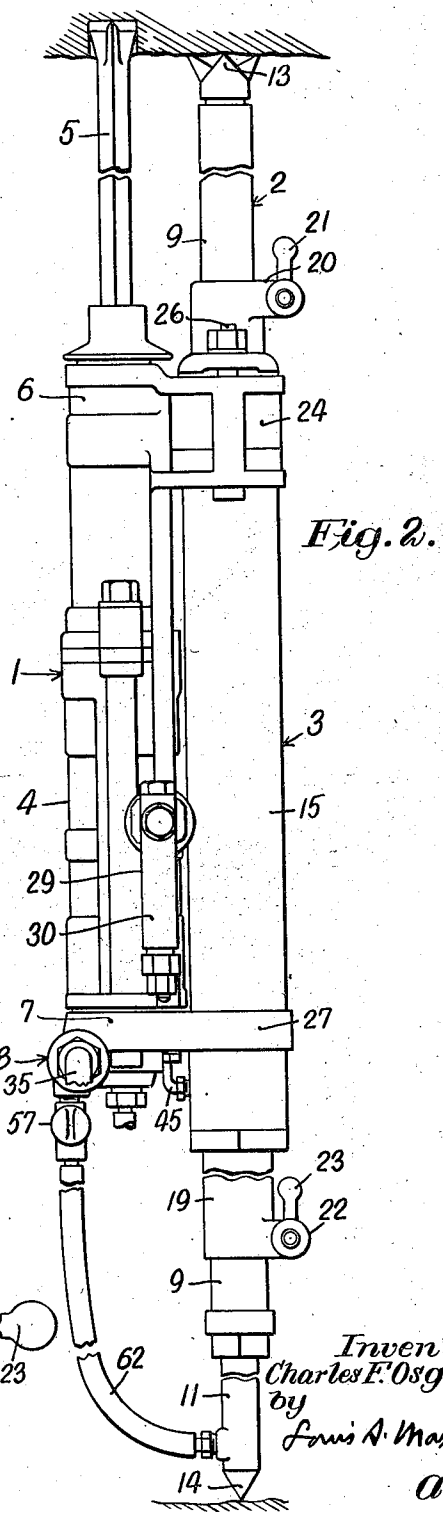


Fig. 2.

Fig. 3.

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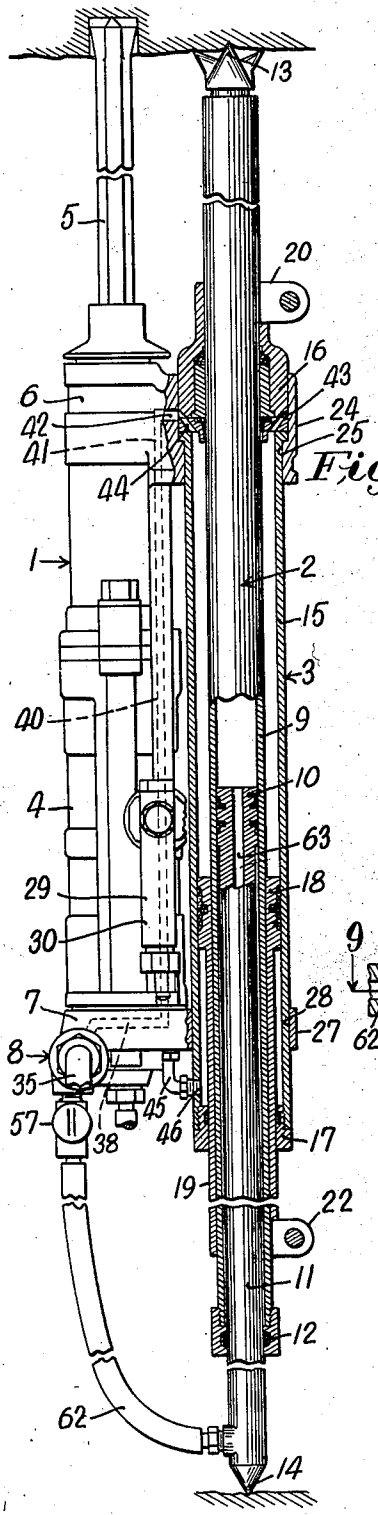


Fig. 4.

Fig. 5.

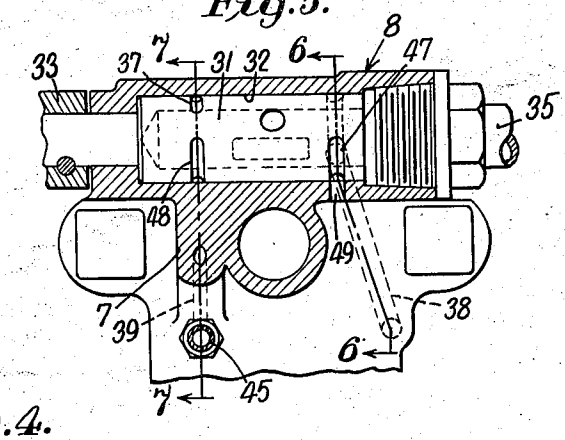


Fig. 6.

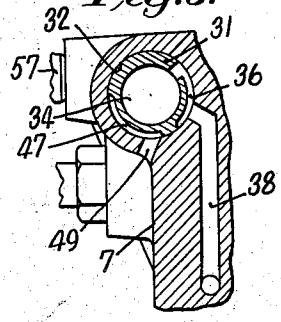


Fig. 7.

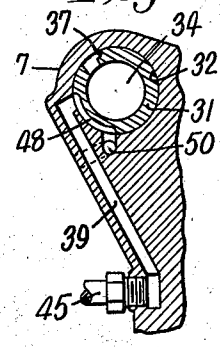


Fig. 8.

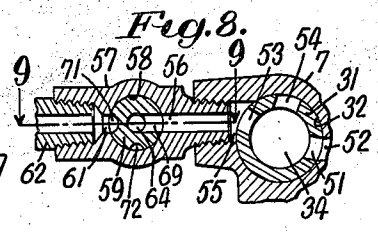


Fig. 9.

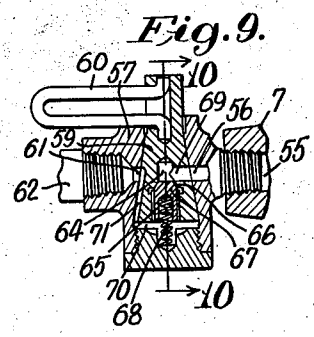
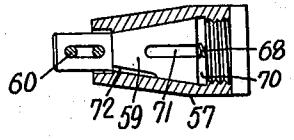


Fig. 10.



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UNITED STATES PATENT OFFICE

2,274,728

ROCK DRILL

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Application June 22, 1940, Serial No. 341,919

6 Claims. (Cl. 255—51)

This invention relates to rock drills, and more particularly, but not exclusively, to improvements in the supporting, guiding and feeding means for a hammer rock drill of the self-supporting stoper type.

An object of this invention is to provide an improved rock drill having improved means for supporting and guiding the drill hammer motor. Another object is to provide an improved means for feeding the hammer motor relative to the supporting and guiding means. Still another object is to provide an improved feeding means for a hammer rock drill whereby with a relatively compact feeding structure a relatively long range of feed may be obtained. A further object is to provide an improved extensible feeding means for a hammer rock drill wherein the feeding elements may be adjusted into different feed-effecting positions with respect to the supporting and guiding means so that when the limit of relative feeding movement of the feeding elements is reached they may be adjusted into a different feed-effecting position. A still further object is to provide an improved rock drill of the self-supporting stoper type whereby manual support of the drill during the drilling operation is eliminated. Yet another object is to provide an improved extensible feeding means associated with the supporting and guiding means and embodying relatively reciprocable feed cylinder and piston elements each having a releasable clamp whereby the same may be adjusted and clamped in different feed-effecting positions with respect to the supporting and guiding means. A further object is to provide an improved extensible feeding means of the fluid actuated type wherein adjustment of the feeding elements into their different feed-effecting positions may be effected under the action of pressure fluid. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings:

Fig. 1 is a front elevational view of a rock drill constructed in accordance with an illustrative embodiment of the invention.

Fig. 2 is a side elevational view of the rock drill shown in Fig. 1.

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

Fig. 4 is a view in longitudinal section taken substantially on line 4—4 of Fig. 1, with parts shown in side elevation to facilitate illustration.

Fig. 5 is an enlarged cross sectional view taken substantially on line 5—5 of Fig. 1.

Fig. 6 is a detail sectional view taken on line 6—6 of Fig. 5.

Fig. 7 is a detail sectional view taken on line 7—7 of Fig. 5.

Fig. 8 is a detail sectional view illustrating the auxiliary control valve.

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

Fig. 10 is a detail sectional view, with parts shown in full, taken on line 10—10 of Fig. 9.

In this illustrative embodiment of the invention the improved rock drill is of the self-supporting stoper type especially designed for use underground in mines, although it will be evident that various features of the invention may be embodied in rock drills of various other types. The rock drill disclosed generally comprises a hammer motor, generally designated 1, supporting and guiding means, generally designated 2, and feeding means, generally designated 3.

The hammer motor 1 is of the conventional pressure fluid actuated, reciprocating piston type comprising a motor cylinder 4 containing a reciprocatory hammer piston for delivering impact blows to the shank of a drill steel 5 suitably supported within a front chuck housing 6 secured to the front end of the motor cylinder. The motor cylinder has secured to its rear end a rear head block 7 containing a throttle valve mechanism, generally designated 8. As the structure of the hammer motor and its mode of operation are well known to those skilled in the art, further illustration and description thereof are herein unnecessary.

The supporting and guiding means 2 comprises an elongated supporting and guiding cylinder 9 in which is reciprocable a supporting piston 10 having its piston rod 11 extending rearwardly through the packed rear cylinder head 12. The front end of the cylinder 9 has an abutment-engaging point 13 engageable with the face of the work, while the rear end of the piston rod 11 has an abutment-engaging point 14 engageable with the mine floor. Fluid under pressure may be supplied to the cylinder 9 to effect movement thereof relative to the supporting piston, thereby to hold the abutment-engaging points firmly in engagement with their extraneous abutments, as will later be described.

The feeding means 3 comprises a reciprocable feed cylinder 15 arranged coaxially with and surrounding the supporting and guiding cylinder 9 and having front and rear cylinder heads 16 and

17, the former slidably guided on the exterior surface of the cylinder 9, in the manner shown in Fig. 4. The feed cylinder 15 contains a reciprocable feed piston 18 having a tubular piston rod 19 extending rearwardly through the rear head 17 of the feed cylinder. The feed piston rod 19 is arranged externally of and has sliding telescopic relation with the supporting and guiding cylinder 9. The rear feed cylinder head 17 is slidably guided on the exterior surface of the piston rod 19. The means for supplying fluid under pressure to the feed cylinder 15 to effect reciprocation of the feed cylinder and the feed piston will be hereinafter described. In this improved construction the front head 16 of the feed cylinder carries a releasable gripping device, herein a split clamp 20, provided with an operating handle 21 for clamping the feed cylinder 15 against movement with respect to the supporting and guiding cylinder 9, while the rear end of the feed piston rod 19 carries a similar split clamp 22 provided with an operating handle 23 for clamping the feed piston 18 against movement with respect to the supporting and guiding cylinder 9.

The hammer motor 1 is arranged in parallel side by side relation with respect to the feed cylinder 15, in the manner shown, and the feed cylinder and hammer motor are substantially coextensive to obtain extreme compactness. The chuck housing 6 of the hammer motor has a laterally located boss 24 provided with a bore 25 for receiving the forward end portion of the feed cylinder 15, and the front head 16 of the feed cylinder is rigidly secured, as by bolts 26, to this boss. The rear head block 7 of the hammer motor has a lateral projection 27 provided with a bore 28 for receiving the rearward portion of the feed cylinder 15. It is accordingly evident that the hammer motor is firmly mounted on the feed cylinder for movement in unison therewith. As is usual in stoper rock drills, projecting laterally from the motor cylinder is a supporting handle 29 having a grasping portion 30 whereby the operator may position the rock drill with respect to the work.

The throttle valve mechanism 8 comprises a throttle valve 31 (Fig. 5) rotatably mounted in a transverse bore 32 in the rear head block 7 of the hammer motor. The throttle valve has a usual manual control handle 33 and is made hollow at 34, and pressure fluid may be supplied to the hollow interior of the throttle valve through a usual supply connection 35. Formed on the exterior of the throttle valve are circumferentially extending grooves 36 (Fig. 6) and 37 (Fig. 7) connected to the hollow valve interior and respectively communicable with forward and reverse feed passages 38 and 39 formed in the rear head block and respectively leading to the opposite ends of the feed cylinder. The forward feed passage 38 is connected through passages 40 and 41 in the motor cylinder and front chuck housing with a port 42 communicating with an annular space 43 in the front head of the feed cylinder, this space being connected by passages 44 with the front end of the feed cylinder bore at the forward side of the feed piston 18. The reverse passage 39 is connected by a conduit 45 with a port 46 communicating with the rear end of the feed cylinder bore at the rear side of the feed piston. Formed on the exterior of the throttle valve in the planes of the grooves 36 and 37, respectively, are circumferential grooves 47 and 48 for connecting the forward and reverse feed passages 38 and 39 with vent ports 49 and 50, respectively. It will thus be seen that when one end of the feed cylinder is connected to the source of pressure supply, the opposite end may be connected to exhaust. A port 51 (Fig. 8) in the throttle valve connects the fluid supply with a motor supply passage 52 for conducting pressure fluid to the ports and passages of the cylinder of the hammer motor to effect reciprocation of the hammer piston, in a well known manner.

The throttle valve 31 has ports 53 and 54 for connecting a passage 55 with the hollow interior of the throttle valve. As shown in Figs. 8 and 9, the passage 55 communicates with a passage 56 in a valve casing 57. The passage 56 is connected to a transverse bore 58 in the valve casing, and this bore contains an auxiliary control valve 59 having a manual operating handle 60. A passage 61 in the valve casing connects the valve bore 58 with a flexible conduit 62 leading to the rear end of an axial passage 63 in the piston rod 11 of the supporting piston 10, the passage 63 connecting the conduit 62 with the bore of the supporting and guiding cylinder 9 at the forward side of the supporting piston 10. The auxiliary control valve 59 has axial bores 64 and 65 (Fig. 9) of different diameters having therebetween a valve seat 66 on which a check valve 67 is adapted to seat. The valve 67 is reciprocably but loosely guided in the larger bore 65 and is urged constantly towards its seat by a coil spring 68. The bore 64 is communicable through a port 69 in the valve with the passage 56 which communicates with the passage 55. When the check valve is unseated, pressure fluid may flow from passage 55 through passage 56, passage 69, bores 64 and 65, to a space 70 formed in the valve casing at one end of the valve, and the valve has a longitudinal groove 71 which connects this space with the passage 61. Formed on the exterior of the valve 59 is an exhaust groove 72 for connecting the passage 61 to exhaust when the valve 59 is rotated into its other (closed) position.

The mode of operation of the improved rock drill is as follows. When the drill hammer motor is properly positioned with respect to the working face, the abutment-engaging point of the piston rod of the supporting piston 10 rests against the mine floor and pressure fluid may then be supplied from the supply connection 35 through the hollow interior 34 of the throttle valve 31, through port 54, passages 55, 56, past the plunger valve 67 and through space 70, groove 71, passage 61, conduit 62 and axial passage 63 in the piston rod 11 to the supporting and guiding cylinder 9 at the forward side of the supporting piston 10. Pressure fluid acting on the forward pressure area of the supporting piston 10 and the forward wall of the bore of the supporting and guiding cylinder 9 effects movement of the latter forwardly until the abutment-engaging point 13 engages the working face so that the rock drill is firmly supported at its ends against the working face and the mine floor. At that time the clamp 22, if it is not already applied, is applied to hold the feed piston 18 against movement with respect to the supporting and guiding cylinder 9, and the feed cylinder clamp 20 is released if it is clamped. The operator may then manipulate the control handle of the throttle valve 31 to move the latter into the position shown in Figs. 6 and 7 so that pressure fluid may then flow from the hollow interior of the throttle valve through groove 36, forward feed passage 38, passages 40

and 41, port 42, annular space 43 and passages 44 to the front end of the feed cylinder bore at the forward side of the feed piston. Pressure fluid acting on the rear pressure area of the front cylinder head 16 of the feed cylinder effects movement of the feed cylinder forwardly relative to the supporting and guiding cylinder 9, and the drill hammer motor mounted on the feed cylinder moves forwardly therewith to effect feeding of the drill steel toward the work. The throttle valve 31 may then be rotated into the position shown in Fig. 8 to bring the port 51 into communication with the motor supply passage 52 to effect reciprocation of the hammer piston so that the drill steel is percussively actuated. A pressure fluid supply is, of course, normally continuously maintained in the supporting and guiding cylinder during drilling, and the supply of pressure fluid to the supporting and guiding cylinder 9 may be cut off or regulated by the auxiliary control valve 59 in an obvious manner.

In the event of the failure of the pressure fluid supply to the supporting and guiding cylinder 9, the check valve 67, which closes as soon as the pressure builds up in the cylinder 9 thereby trapping the pressure fluid in the supporting and guiding cylinder 9 at the forward side of the supporting piston 10, prevents loss of fluid from cylinder 9 so that the drill is automatically prevented from dropping away from the work. The control valve 59 may be turned into its opposite position to effect venting of the supporting and guiding cylinder 9 at the forward side of the supporting piston 10 to atmosphere through the exhaust groove 72. During the forward feeding operation the rear end of the feed cylinder bore at the rear side of the feed piston is connected to exhaust through port 46, conduit 45, reverse feed passage 39, groove 48 and vent passage 50, and when the throttle valve 31 is rotated into its position opposite from that shown in Figs. 6 and 7, the feed cylinder bore at the forward side of the feed piston is connected to exhaust through passages 44, annular space 43, port 42, passages 41 and 40, forward feed passage 38, groove 47 on the throttle valve and vent passage 49, while pressure fluid is supplied to the rear end of the feed cylinder bore at the rear side of the feed piston through groove 37, reverse feed passage 39, conduit 45 and port 46 to effect reverse feed of the drill hammer motor.

In this improved construction, when the parts are in the position shown in Fig. 4 and the limit of forward feeding travel of the feed cylinder is reached with the rear feed cylinder head 17 abutting the rear side of the feed piston 18 and it is desired to obtain additional feeding travel of the feed cylinder, this may be accomplished by applying the clamp 20 to hold the feed cylinder against movement with respect to the supporting and guiding cylinder 9 and releasing the feed piston clamp 22. When the feed piston clamp 22 is released, pressure fluid may be supplied to the rear end of the feed cylinder bore at the rear side of the feed piston to effect movement of the latter in a forward direction with respect to the supporting and guiding cylinder 9. When the feed piston has been moved forward the desired amount, the clamp 22 may be applied to hold the same against movement and the feed cylinder clamp 20 may be released, and pressure fluid may then be supplied to the front end of the feed cylinder bore at the forward side of the feed piston to again effect forward feeding movement of the drill hammer motor toward the work. By applying the feed cylinder clamp 20 and releasing the feed piston clamp 22 and supplying pressure fluid to the forward end of the feed cylinder bore, the feed piston may be moved into its retracted position.

During positioning of the rock drill with respect to the working face prior to the drilling operation and for removing the rock drill from the working face after the drilling operation has been completed, the operator may grasp the grasping portion 30 of the drill supporting handle 29 to facilitate handling of the drill.

As a result of this invention it will be noted that an improved rock drill is provided having improved supporting and guiding means for the drill hammer motor and improved means for feeding the drill hammer motor relative to the supporting and guiding means. It will further be evident that by the provision of the improved extensible feeding means the feeding elements may be adjusted into different feed-effecting positions with respect to the supporting and guiding means so that when the limit of relative feeding movement of the feeding elements is reached, they may be adjusted into a different feed-effecting position. It will further be evident that by the provision of the improved extensible feeding means a relatively long range of feed may be obtained in a feeding structure which is extremely compact. Other uses and advantages of the invention 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 I claim as new and desire to secure by Letters Patent is:

1. In a stoper type rock drill of the self-supporting type, the combination comprising a fluid actuated extensible support including cooperating relatively reciprocable supporting cylinder and piston elements having abutment engaging elements engageable with extraneous abutments at the remote extremities of said support, means for supplying pressure fluid to said support cylinder element to effect extension of said support, a hammer motor for percussively actuating a drill steel and arranged with its longitudinal axis parallel with the longitudinal axis of said support and movable along one side of said support during feeding movement thereof while said support remains stationary, fluid actuated means for feeding said motor longitudinally along said support while solely supported and guided by the latter including cooperating relatively movable feed piston and cylinder elements coaxial with and surrounding said support and movable bodily axially relative thereto in guided relation therewith, releasable means for locking said feed cylinder element against movement relative to said support, means for supplying pressure fluid to said feed cylinder element for moving the latter along said support when said locking means is released, releasable means for locking said feed piston element in adjusted positions to said support, said feed cylinder element being movable under the action of pressure fluid therein relative to said feed piston element when the latter is locked and said feed piston element being movable under the action of pressure fluid in

said feed cylinder element relative to the latter when its own locking means is released, and operative connections between one of said feed piston and cylinder elements and said hammer motor.

2. In a stoper type rock drill of the self-supporting type, the combination comprising a fluid actuated extensible support including cooperating relatively reciprocable supporting piston and cylinder elements having abutment engaging elements engageable with extraneous abutments at the remote extremities of said support, means for supplying pressure fluid to said support cylinder element to effect extension of said support, a hammer motor for percussively actuating a drill steel and arranged with its longitudinal axis parallel with the longitudinal axis of said support and movable along one side of said support during feeding movement thereof while said support remains stationary, pressure fluid actuated means for feeding said motor along said support while solely supported and guided by the latter including cooperating relatively reciprocable feed cylinder and piston elements coaxial with and surrounding said support and movable bodily longitudinally relative thereto in guided relation therewith, releasable means for locking said feed piston element against movement relative to said support, releasable means for locking said feed cylinder element against movement relative to said support, means for controlling the supply of pressure fluid to said feed cylinder element for effecting movement of said feed cylinder element relative to said support when said feed piston element is locked against movement relative to said support and to move with said feed piston element along said support when said feed cylinder element is locked against movement relative to said support, and operative connections between one of said feed piston and cylinder elements and said motor.

3. A self-supporting stoper rock drill comprising, in combination, a fluid actuated extensible support comprising relatively reciprocable cylinder and piston elements having abutment engaging points at their remote extremities, a drill hammer motor arranged in parallel offset relation with respect to said support, and means for feeding said motor longitudinally along said support comprising relatively reciprocable feed cylinder and piston members coaxial with and surrounding said support elements, means for supplying pressure fluid to said feed cylinder member to effect movement of said members along said support, releasable means for securing either one of said feed cylinder and piston members to said support during movement of said other member relative to said support under the action of pressure fluid, and means for operatively connecting one of said feed cylinder and piston members to said motor.

4. A self-supporting stoper rock drill comprising, in combination, a fluid actuated extensible support comprising relatively reciprocable cylinder and piston elements having abutment engaging points at their remote extremities, a drill hammer motor arranged in parallel offset relation with respect to said support, and means for feeding said motor longitudinally along said support comprising relatively reciprocable feed cylinder and piston members coaxial with and surrounding said support elements, said feed piston member having a tubular piston rod slidably guided on said support cylinder element in telescopic relation therewith, means for supplying pressure fluid to said feed cylinder member to effect movement of said members along said support, releasable means for securing either one of said feed cylinder and piston members to said support during movement of said other member relative to said support under the action of pressure fluid, and means for operatively connecting one of said feed cylinder and piston members to said motor.

5. A self-supporting stoper rock drill comprising, in combination, a fluid actuated extensible support comprising relatively reciprocable cylinder and piston elements having abutment engaging points at their remote extremities, a drill hammer motor arranged in parallel offset relation with respect to said support, and means for feeding said motor longitudinally along said support comprising relatively reciprocable feed cylinder and piston members coaxial with and surrounding said support elements, said feed piston member having a tubular piston rod and said feed cylinder member being slidably guided at one end on the exterior of said support cylinder element and at its other end on the exterior of said tubular feed piston rod, means for supplying pressure fluid to said feed cylinder member to effect movement of said members along said support, releasable means for securing either one of said feed cylinder and piston members to said support during movement of said other member relative to said support under the action of pressure fluid, and means for operatively connecting one of said feed cylinder and piston members to said motor.

6. In a stoper type rock drill of the self-supporting type, the combination comprising a fluid actuated extensible support including cooperating relatively reciprocable supporting cylinder and piston elements having abutment engaging elements engageable with extraneous abutments at the remote extremities of said support, means for supplying pressure fluid to said support cylinder element to effect extension of said support, a hammer motor for percussively actuating a drill steel and arranged with its longitudinal axis parallel with the longitudinal axis of said support and movable along one side of said support during feeding movement thereof while said support remains stationary, fluid actuated means for feeding said motor longitudinally along said support while solely supported and guided by the latter including cooperating relatively movable feed piston and cylinder elements coaxial with and surrounding said support and movable bodily axially relative thereto in guided relation therewith, releasable means for locking said feed cylinder element against movement relative to said support, releasable means for locking said feed piston element in adjusted positions to said support, means for supplying pressure fluid to said feed cylinder element for moving either one of said feed cylinder and feed piston elements in either direction along said support relative to the other, said feed cylinder element being movable under the action of pressure fluid therein relative to said feed piston element when the latter is locked and said feed piston element being movable under the action of pressure fluid in said feed cylinder element relative to the latter when its own locking means is released, and operative connections between one of said feed piston and cylinder elements and said hammer motor.

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