Sept. 1, 1964 A. L. LEE 3,146,836

MINE DRILLING MACHINE

Original Filed June 22, 1950 8 Sheets-Sheet 1

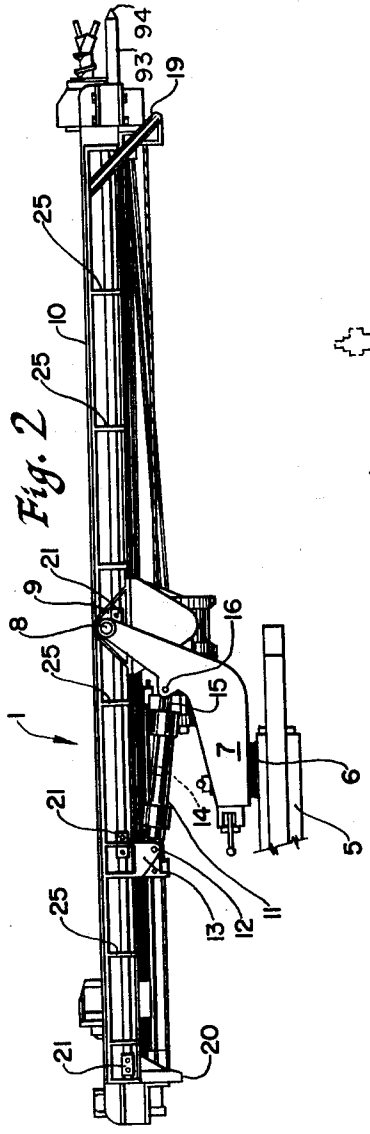

Fig. 2

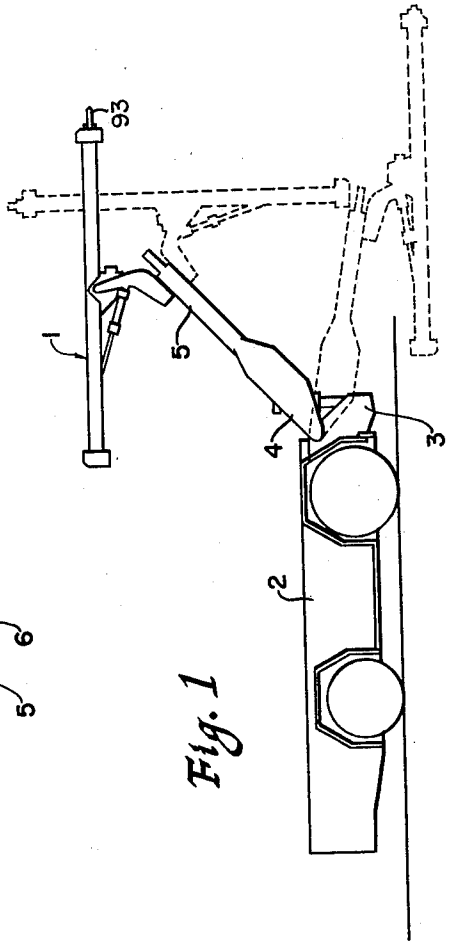

Fig. 1

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Sept. 1, 1964 A. L. LEE 3,146,836

MINE DRILLING MACHINE

Original Filed June 22, 1950 8 Sheets-Sheet 2

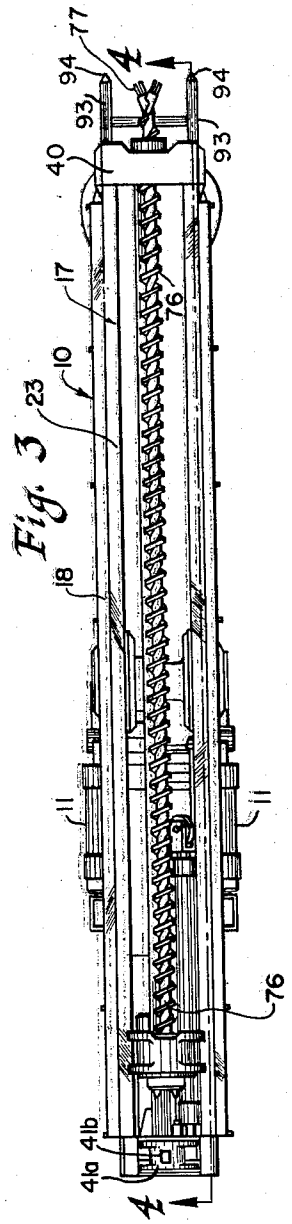

Fig. 3

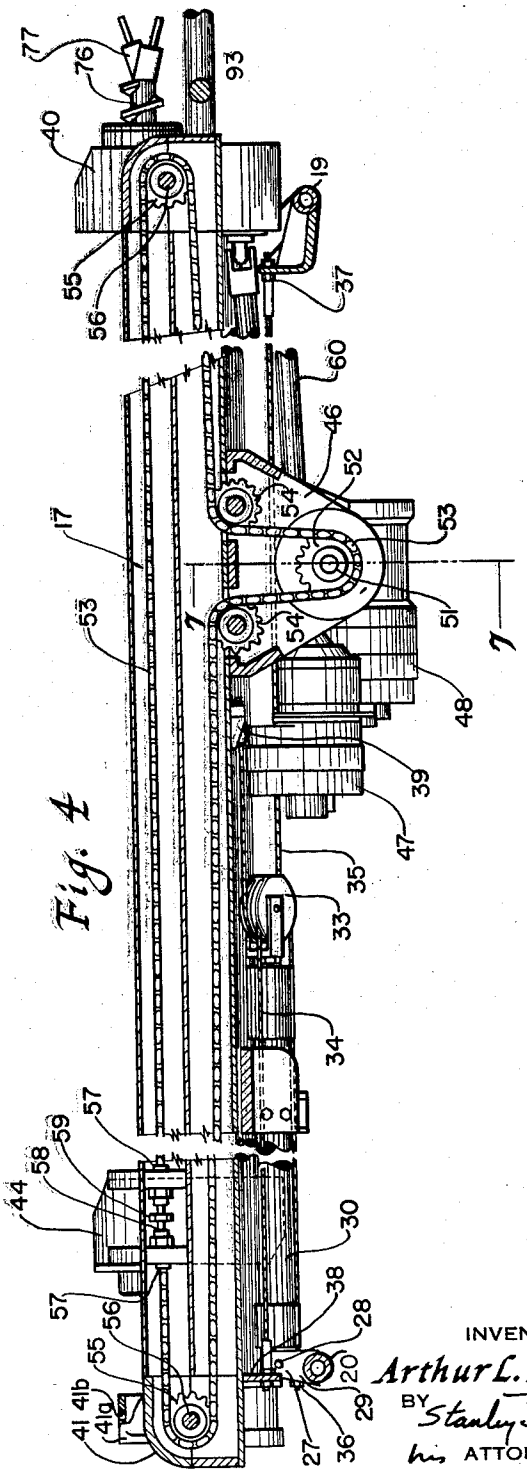

Fig. 4

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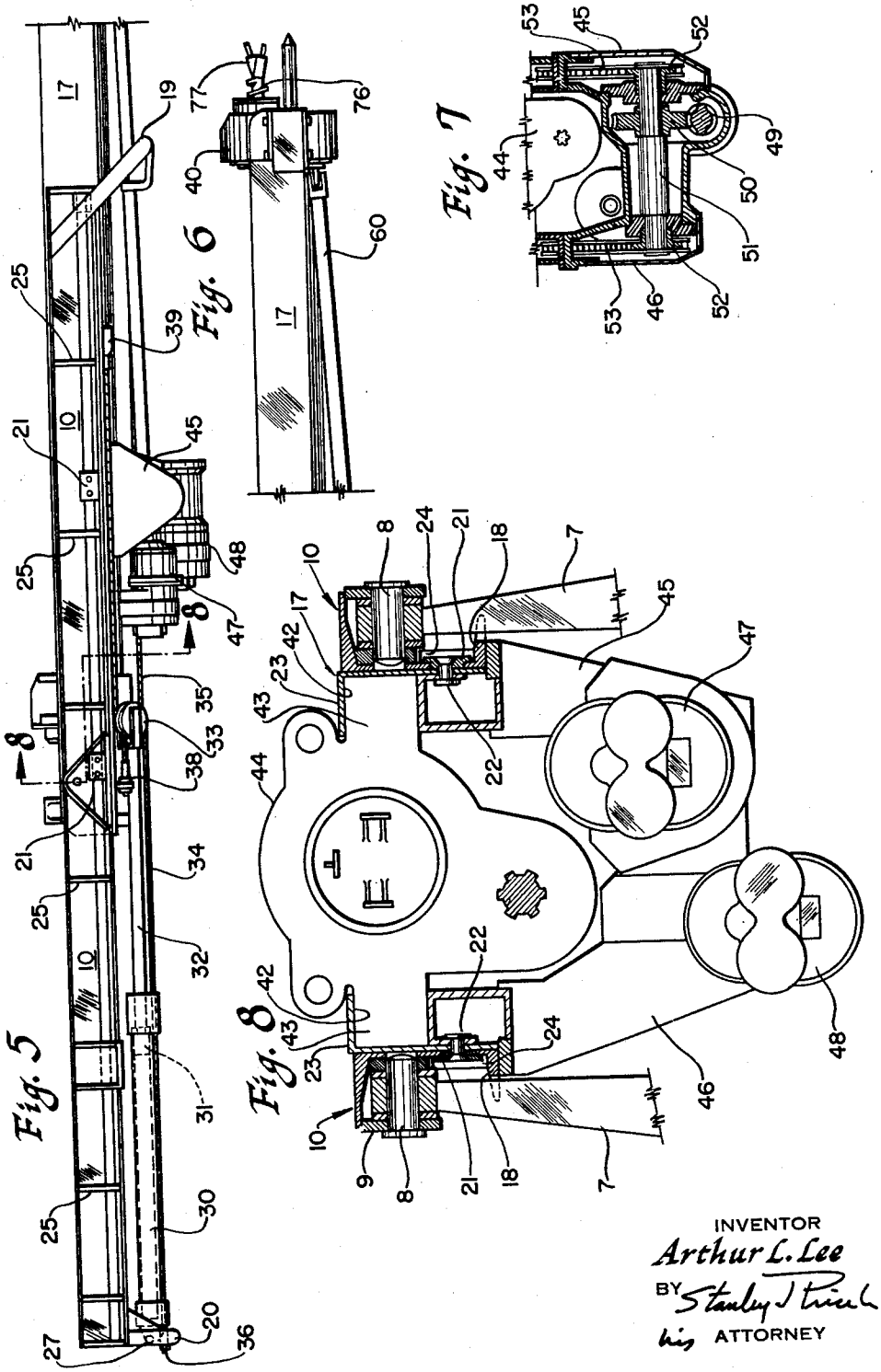
MINE DRILLING MACHINE

Original Filed June 22, 1950 8 Sheets-Sheet 3



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MINE DRILLING MACHINE

Original Filed June 22, 1950 8 Sheets-Sheet 4

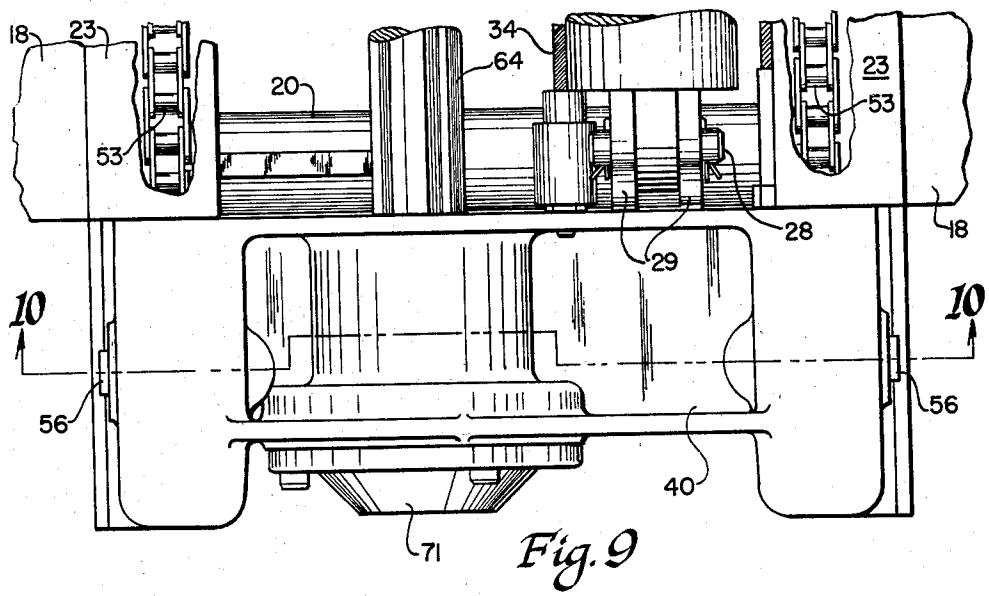

Fig. 9

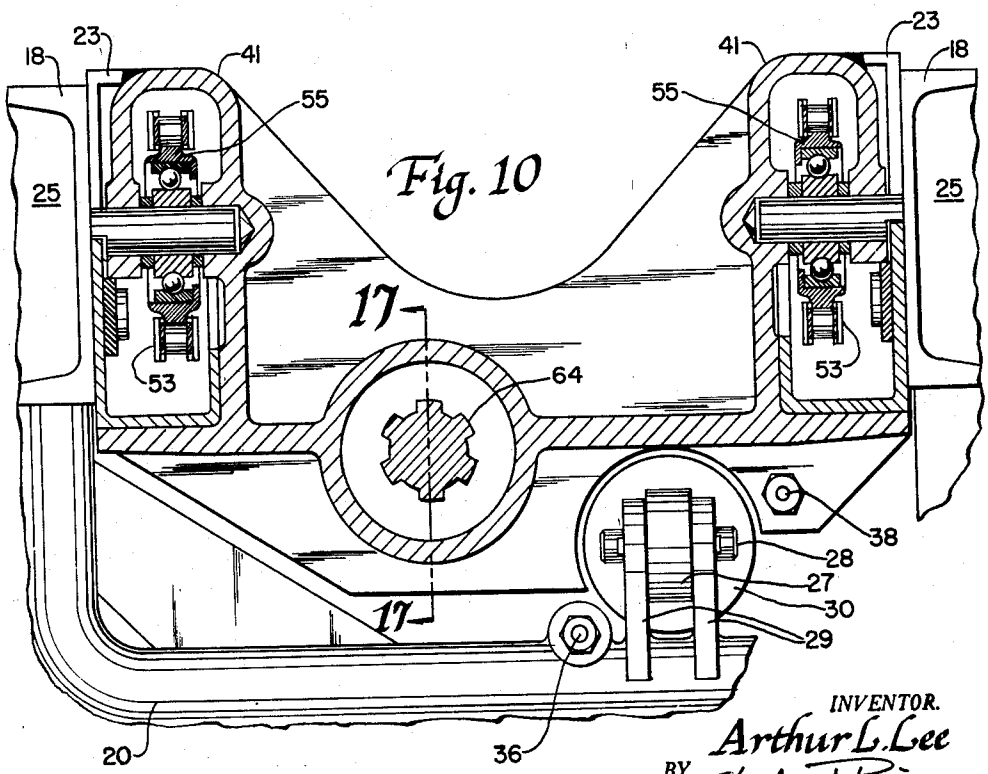

Fig. 10

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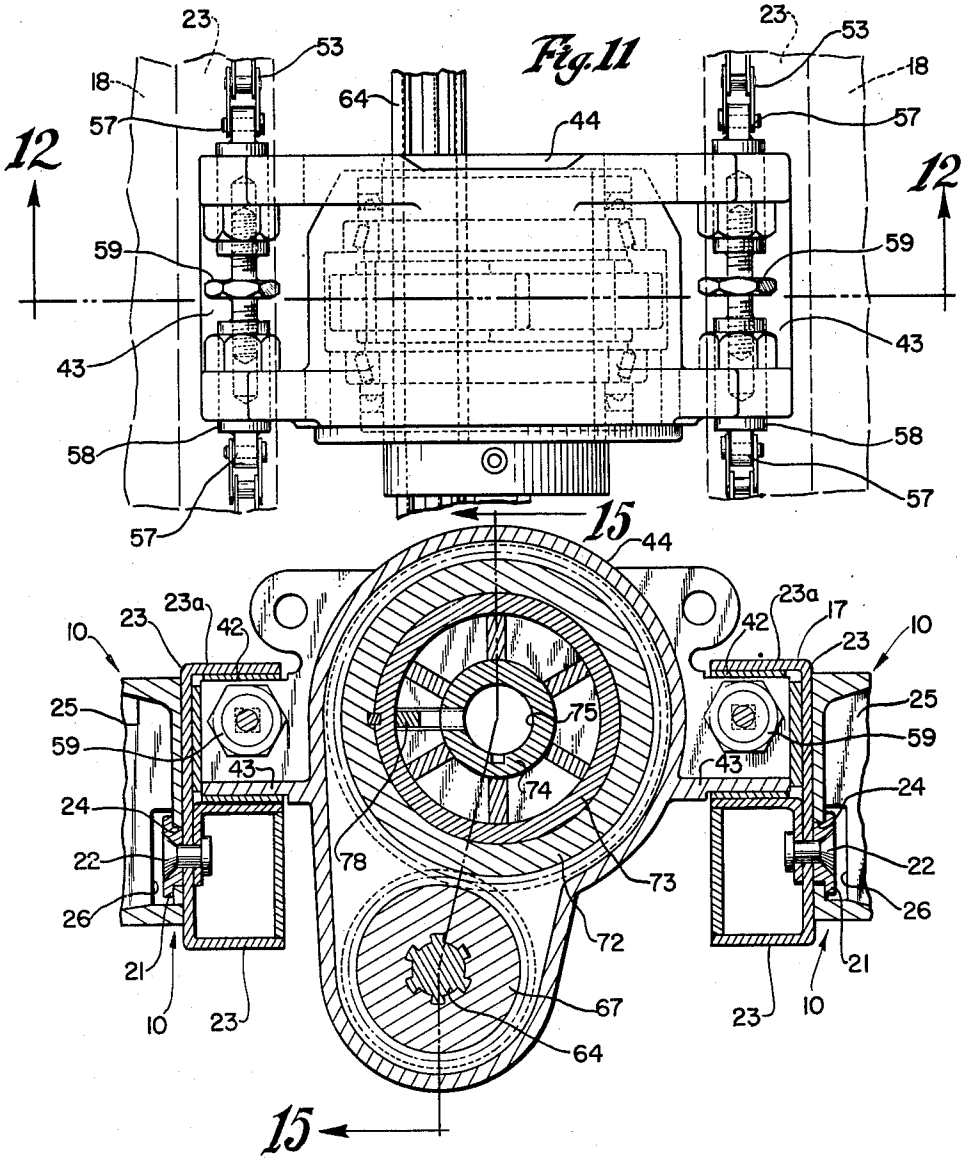

Fig. 12

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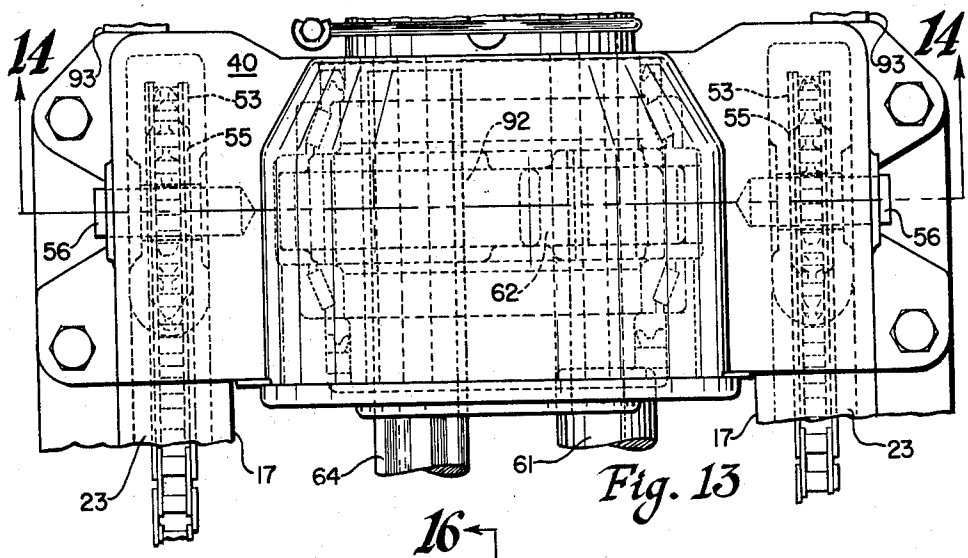

Fig. 13

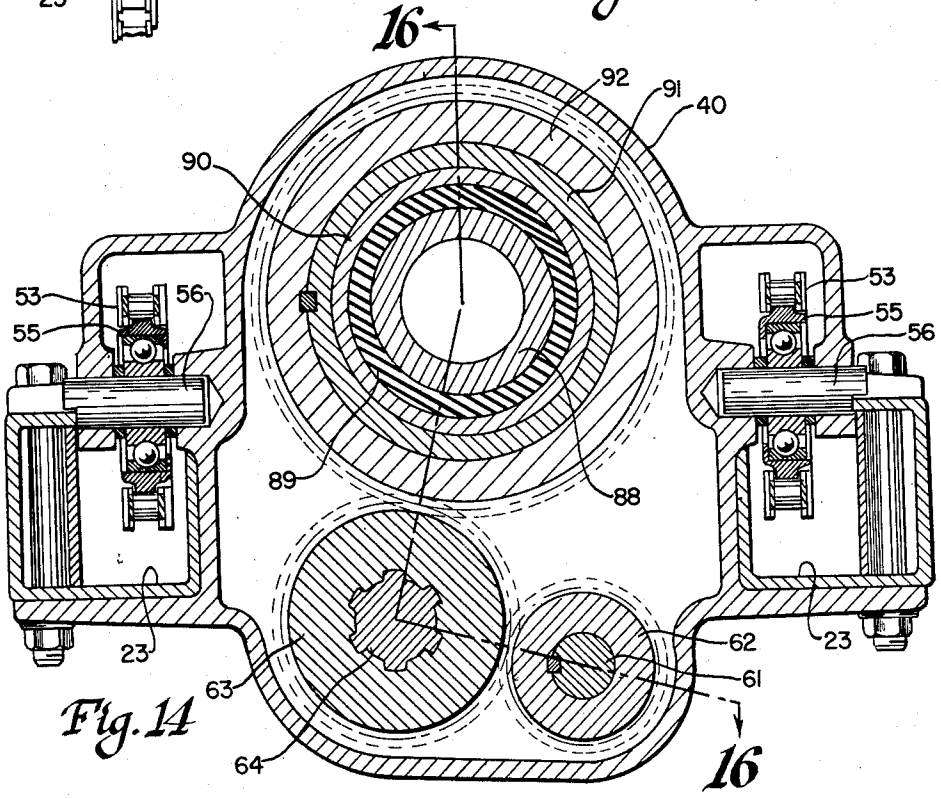

Fig. 14

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Fig 15

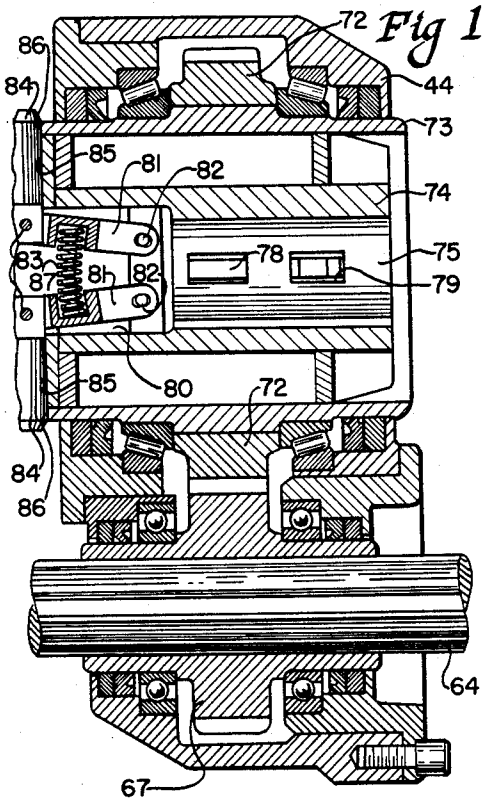
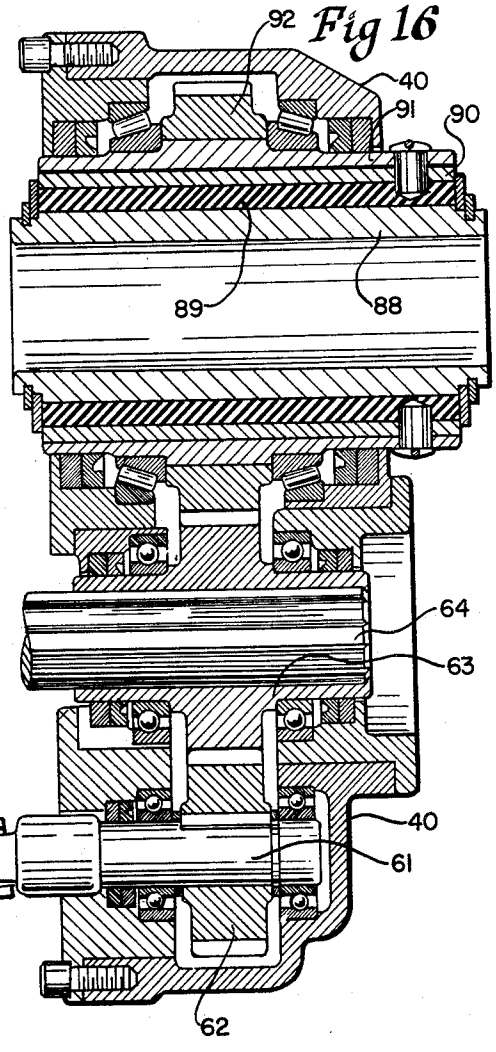


Fig 16



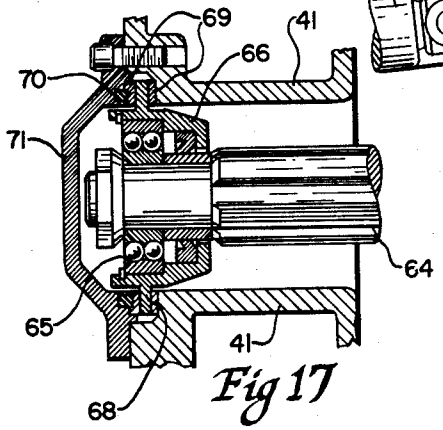


Fig 17

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MINE DRILLING MACHINE

Original Filed June 22, 1950 8 Sheets-Sheet 8

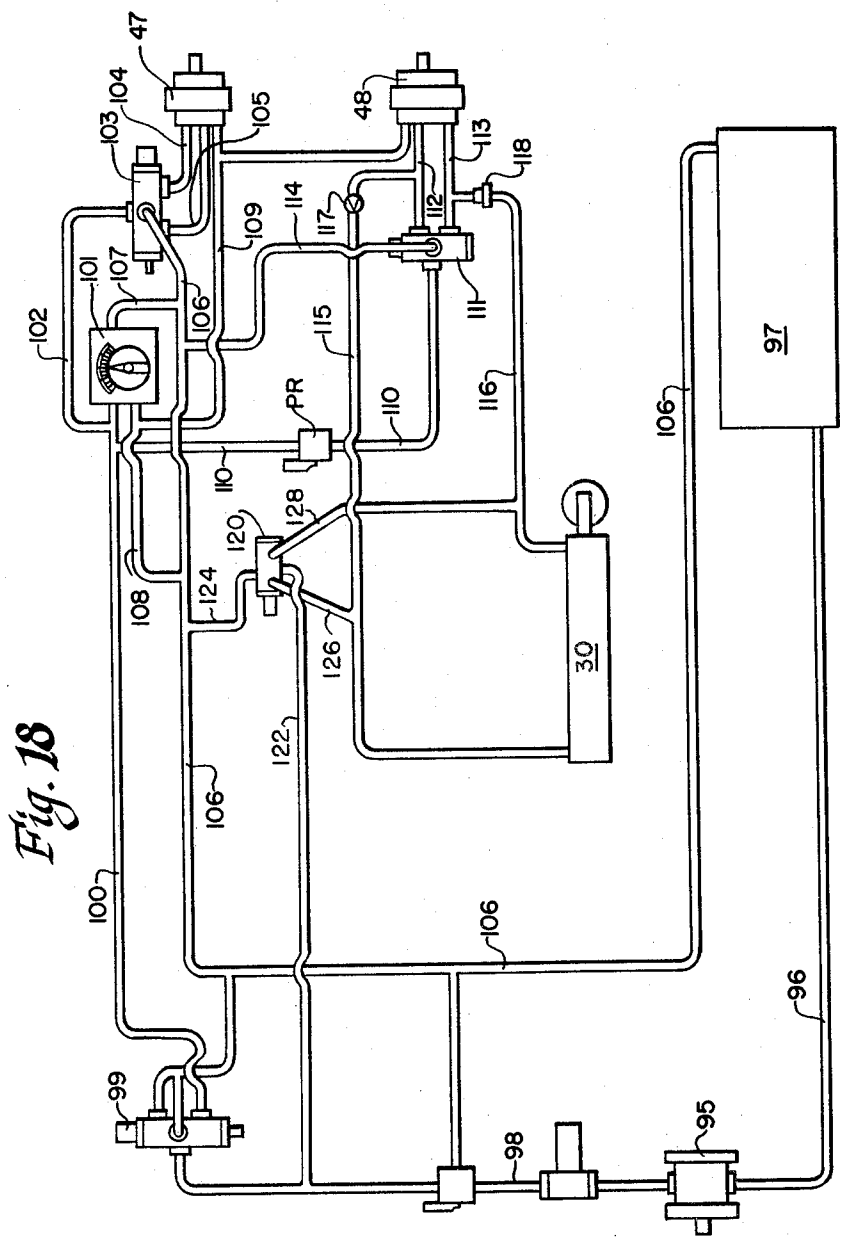

Fig. 18

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United States Patent Office 3,146,836 Patented Sept. 1, 1964

3,146,836
MINE DRILLING MACHINE

Arthur L. Lee, Columbus, Ohio, assignor to Consolidation Coal Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application Apr. 19, 1956, Ser. No. 579,254, which is a division of application Ser. No. 169,752, June 22, 1950. Divided and this application Dec. 16, 1959, Ser. No. 859,864

8 Claims. (Cl. 173—147)

This invention relates to mining machines and more particularly to a drilling machine especially designed for use in underground mines or tunnels for drilling holes at various locations in the mine or tunnel walls and roof.

This application is a division of my copending application Serial Number 579,254, filed April 19, 1956, now abandoned, which is a division of my application Serial Number 169,752, filed June 22, 1950, now abandoned.

In conventional mining drills of the mobile type the drilling tools are usually mounted on adjustable supporting structures such as swingable booms. As a result of the substantial overhang of the boom structure in front of the base, considerable vibration is set up within the machine during the hole drilling operation. The present invention contemplates improvements over such known types of drilling machines in that the drilling function is effected by a unitary self-contained machine. There is also included a novel guiding and supporting structure for a drilling tool wherein the drill guide frame is firmly held against the working face during the drilling operation thereby minimizing vibration and rendering the entire machine relatively steady. The machine of the present invention is flexible in operation having a wide range of adjustment and is relatively simple and rugged in design, and well adapted for its intended purpose.

An object of the present invention is to provide an improved mining machine which is readily mobile and which has relatively great universality in adjustment.

Another object is to provide an improved supporting and guiding structure for a work supporting element and improved feeding and adjusting means therefor.

A further object is to provide an improved adjustable support for a drilling tool including a guide frame for the tool which is firmly held against the working face during the drilling operation to thereby hold the supporting structure steady.

A still further object is to provide improved means for feeding the drilling implement toward the work and for constantly urging the drill guiding frame against the face of the work during the drilling operation.

Yet another object is to provide an improved drill guiding frame along which a drill carriage is mounted for movement back and forth with respect to the work.

Still another object is to provide an improved driving means for a drilling tool and improved means for guiding the drilling tool during the drive thereof.

A further object is to provide an improved mining machine having improved fluid operated and adjusted supporting and guiding elements and embodying an improved fluid system.

Yet another object is to provide an improved mining machine having novel arrangements and combinations of parts.

These and other objects and advantages of the invention will, however, hereinafter more fully appear.

The invention will be described with reference to the accompanying drawings in which:

FIGURE 1 is a diagrammatic side view showing the drilling implement comprising the supporting structure and guide frame mounted on a boom structure of a

mobile mining machine and showing in dotted lines various positions of adjustment of the drilling implement.

FIGURE 2 is a side elevational view of the drilling implement illustrating the adjusting supporting structure and guide frame with the guide frame in retracted position.

FIGURE 3 is a top plan view of the supporting structure and guide frame, with the guide frame in retracted position.

FIGURE 4 is an enlarged vertical section taken along the line 4—4 of FIGURE 3, illustrating a portion of the feeding means.

FIGURES 5 and 6 taken together, constitute a side elevational view of the supporting and guiding frame structure, with the guiding frame in fully extended position and illustrating the means for constantly holding the guide frame against the work during drilling operation.

FIGURE 7 is a cross section taken on line 7—7 of FIGURE 4 showing the drive for the sprocket shaft.

FIGURE 8 is an enlarged cross section taken on the line 8—8 of FIGURE 5, showing details of the guide frame and the mounting for the driving motor.

FIGURE 9 is an enlarged fragmentary view of the rear portion of the supporting frame along which the guiding frame is guided.

FIGURE 10 is a cross section taken on line 10—10 of FIGURE 9.

FIGURE 11 is an enlarged detail view showing the sliding carriage.

FIGURE 12 is a cross section taken on the line 12—12 of FIGURE 11.

FIGURE 13 is an enlarged detail view showing the forward portion of the supporting frame, illustrating the front bearing mounting for the drilling implement.

FIGURE 14 is a cross sectional view taken on the line 14—14 of FIGURE 13.

FIGURE 15 is a longitudinal section taken on the line 15—15 of FIGURE 12.

FIGURE 16 is a developed vertical section taken on line 16—16 of FIGURE 14.

FIGURE 17 is a detail vertical section taken on line 17—17 of FIGURE 10, illustrating the flexible bearing mounting for the splined drive shaft.

FIGURE 18 is a diagrammatic view illustrating the hydraulic system.

As shown in FIGURE 1 the drill assembly generally designated by the numeral 1 may be carried by a mobile self-propelled mining machine or carriage 2 having a swiveled support 3 at its forward end and on which an adjustable supporting structure generally designated 4 is pivotally mounted to swing in vertical planes relative to the swiveled support 3 and to swing in horizontal planes with the swiveled support 3 relative to the carriage 2. The adjustable supporting structure 4 includes an elongated boom or arm 5 having a swiveled supporting yoke 6 at its outer extremity (FIGURE 2).

The yoke 6 has forwardly and outwardly projecting arms 7 which at their outer extremities pivotally engage transverse pivot pins 8 supported by brackets 9 secured to the outer sides of the elongated frame like supporting member hereinafter referred to as a supporting frame 10.

The supporting frame 10 may be provided with fluid cylinders 11 as shown in FIGURES 2 and 3. The fluid cylinders 11 are pivotally connected at 12 to brackets 13 secured to the opposite sides of the supporting frame 10 rearwardly of the pivotal mounting of the supporting frame on the yoke arms 7, and these cylinders contain reciprocal pistons 14 (FIGURE 2) having forwardly projecting rods 15 pivotally connected at 16 to the rear sides of the yoke arms 7. Thus, when fluid under pressure is properly supplied to the cylinders, the supporting frame

10 may be adjusted angularly or tilted about its pivotal mounting on the yoke arms 7 and when fluid is trapped in these cylinders the supporting frame 10 may be rigidly held in its adjusted position.

The supporting frame 10 has longitudinal guiding means in which an elongated frame like guide member hereinafter referred to as guide frame 17 (FIGURES 3, 4 and 8) is slidingly guided for longitudinal movement back and forth with respect to the supporting frame 10, as later described more in detail. The supporting frame 10 comprises beam-like side members 18 (FIGURES 3, 8 and 12) to which the brackets 9 are secured. The side members 18 are rigidly secured in parallel spaced relation by front and rear tubular cross connecting members 19 and 20 (FIGURES 2, 4 and 5) secured to the ends of the side members 18 likewise as by welding. This assembly provides a rigid, unitary, supporting frame structure 10 along which the sliding guide frame 17 may move.

The guiding means between the support and guide frames 10 and 17 comprises a series of longitudinally spaced guide blocks 21 (FIGURES 2, 5, 8 and 12) rigidly secured as by rivets 22 to parallel side frames 23 of the sliding guide frame 17. These guide blocks 21 are slidingly engaged in longitudinal guideways in the form of guiding slots 24 (FIGURES 8 and 12) formed in the supporting frame side members 18. The side members 18 are strengthened by reinforcing webs 25 spaced at intervals along their length and these webs are cut away at 26 to clear the sliding guide blocks as shown in FIGURE 12.

The rear cross connecting member 20 has a bracket 29 secured thereto (FIGURE 4). A pin 28 is carried by the bracket 29 and has a fluid adjusting cylinder 30 connected thereto at 27. The fluid adjusting cylinder 30 extends longitudinally beneath the supporting frame 10 and reciprocable in this cylinder is a piston 31 having a forwardly projecting piston rod 32 carrying a pulley or sheave block 33 at its forward end. A rear cable 34 and a front cable 35 each have their intermediate portions passing around the pulleys on the block 33. The rear cable 34 is secured at one end to the rear end of the supporting frame 10 at 36 and the front cable 35 is secured at one end to the front end of the supporting frame 10 at 37. The other end of the rear cable 34 is secured to a projecting lug 38 located adjacent the rear end of the sliding guide frame 17. The other end of the front cable 35 is secured to a lug 39 projecting from an intermediate portion of the sliding guide frame 17. Thus, when fluid under pressure is properly supplied to the adjusting cylinder 30 the piston may be actuated to move the sliding guide frame 17 along its guideways relative to the supporting frame 10 through a distance substantially twice the length of the working stroke of the piston. During the drilling operation fluid under pressure may be vented from the front end of the cylinder 30 with a restricted flow, in a manner to be later described, so that the sliding frame 17 is constantly urged in a forward direction with respect to the supporting frame 10.

The sliding guide frame 17 has its parallel side frame portion 23 rigidly secured in parallel spaced relation at its front and rear ends by a front cross frame 40 (FIGURE 4) and a rear cross frame 41. The front cross frame 40 is rigidly detachably secured to the forward ends of the side frame portions 23 as by screws (FIGURES 13 and 14) while the rear cross frame 41 is desirably rigidly secured to the side portions as by welding, as shown in FIGURES 9 and 10. Thus, a rigid unitary sliding guide frame is provided which may slide back and forth along its guideways relative to the supporting frame 10, and this sliding frame 17 in turn provides parallel longitudinal guideways 42 (FIGURES 8 and 12) which slidably receive the lateral guide portions 43 of a sliding cross head or carriage 44.

Mounted on depending brackets 45 and 46 (FIGURES 4, 5, 7 and 8) rigidly secured to the guide frame parallel side portions 23 are conventional hydraulic motors 47 and 48. The hydraulic motors 47 and 48 are operable in both directions, that is, they are reversible type motors.

The power shaft of the hydraulic motor 48 drives a worm gear 49 (see FIGURE 7) meshing with a worm wheel 50 secured to a transverse shaft 51 herein suitably journaled in bearings supported by the depending brackets 45 and 46. Secured to the projecting ends of the cross shaft 51 are chain sprockets 52 which engage the intermediate portions of parallel feed chains 53 which are guided with respect to the drive sprockets by parallel idler sprockets 54 (see FIGURE 4). The idler sprockets 54 are suitably supported within the depending brackets 45 and 46. The parallel feed chains 53 extend forwardly and rearwardly with respect to the idler sprockets 54 longitudinally within the sliding frame side portions 23 and pass around a pair of guide sprockets 55 each journaled on cross shafts 56. The cross shafts 56 are supported within the side of the front and rear cross frames 40 and 41 of the sliding guide frames 17 as shown in FIGURE 10. The parallel feed chains 53 are secured at their ends 57 to eye bolts 58 (FIGURE 4) which in turn are secured to the sliding cross head or carriage 44. Adjustable turnbuckle devices 59 are threadedly connected within the eye bolts 58 for effective relative adjustment thereof so that the tension of the chain sections may be properly adjusted. Thus, by properly operating the hydraulic motor 48, the sliding cross head or carriage 44 may be moved back and forth along its guideway 42 relative to the sliding guide frame 17.

The hydraulic motor 47 (FIGURES 4 and 8) has its power shaft connected by a universal drive shafting 60 which in turn is connected to and drives a longitudinally extending shaft 61 (FIGURE 16) journaled in bearings suitably supported within the front cross frame 40. Keyed to and driven by the shaft 61 is a spur gear 62 meshing with a spur gear 63. The spur gear 63 is journaled in bearings suitably supported within the front cross frame 40. A longitudinally extending splined shaft 64 is keyed to and driven by the gear 63. The shaft 64 extends longitudinally within the sliding frame 17 and is supported at its forward end within the hub of the gear 63 and at its rearward end within a bearing 65 (FIGURE 17). The bearing 65 is mounted in a bearing support 66 carried by the rear cross frame member 41.

A spur gear 67 (FIGURE 15) having its hub journaled in bearings supported by the carriage or sliding cross head 44, has sliding splined engagement with the longitudinally splined shaft 64. The spur gear 67, as later explained, rotates the rotary auger portion of the drilling implement. In order that this elongated longitudinally splined shaft 64 may be automatically maintained centered within limits with respect to the spur gears 63 and 67, the bearing support 66 has a radial flange 68 (see FIGURE 17). The radial flange 68 is frictionally engaged at its front and rear faces by annular friction plates or discs 69 which are tightly and yieldingly held in frictional contact with the radial flange 68 by a rubber like annulus or spring member 70. The spring member 70 is seated against a rear cap 71 secured as by screws to the rear end of the rear cross frame 41. Thus, the bearing support flange 68 may have limited lateral sliding movement with respect to the friction plates 69 while adequately frictionally supported in position. Thus, in effect, a "floating" or yieldable support is provided for the rear shaft bearing.

The sliding spur gear 67 (FIGURE 15) on the sliding cross head or carriage 44 meshes with and drives a spur gear 72 secured to a sleeve 73 journaled in bearings supported by the sliding cross head or carriage x44. A releasable adapter member 74 is fitted into the cylindrical bore of the sleeve 73 and has a socket 75 for the reception of the shank end of an auger drill or rotary drilling implement 76 which carries a conventional rotary drilling bit 77 (FIGURES 3 and 4) at its

front end. A manually operable spring pressed latch 78 has a portion extending through a side opening 79 in the adapter member 74 (FIGURE 15) and engages the steel shank for releasably locking the shank in the socket. The adapter member 74 is releasably locked in position within the drive sleeve 73 and has a rearwardly opening central recess 80 in which levers 81 are arranged with their inner ends loosely pivotally mounted on pivot pins 82 supported by the adapter member 74. The outer portions of these levers are pivotally connected by pivot pins 83 (FIGURE 15) to locking pins or plungers 84 slidingly guided in radial bores 85. Radial bores 85 are located in the rearward portion of the adapter member 74. The locking pins 84 extend through the radial bores 85 and are receivable in aligned radial openings 86 in the drive sleeve member 73. A coil spring 87 is arranged between the levers 81 for constantly urging the same apart to maintain the locking pins 84 in the sleeve openings 86, as shown in FIGURE 15. These levers have rearward handle portions (not shown) whereby the levers may be manually pressed together against the action of the spring 87 to withdraw the locknig pins 84 from the sleeve openings 86, thereby permitting a rearward axial withdrawal of the adapter member 74 from the bore of the drive sleeve 73.

A cylindrical adapter member keeper 41*a* (FIGURES 3 and 4) is fixed to the rear cross frame 41 to receive the adapter member 74 so that locking pins 84 (FIGURE 15) on adapter 74 may project into openings 41*b* (FIGURES 3 and 4) and thereby lock adapter member 74 to the rear cross frame 41. Thus, when the adapter member 74 is locked in its retracted position against the rear cross frame 41 the sliding cross head or carriage 44 may be advanced along the guideways of the sliding frame 17 relative to the then stationary auger drill steel. In this manner the sliding cross head or carriage 44 may be utilized for purposes other than the advancing of the drill steel.

As shown in FIGURE 3 the auger drill steel or drilling auger 76 extends lengthwise of the sliding frame 17 through the front cross frame 40. In doing so the drilling auger 76 passes forwardly through a guide bushing 88 (FIGURE 16). The guide bushing 88 provides an inner cylindrical bearing surface with which the outer peripheries of the auger drill steel spiral vanes may have sliding supported engagement. The guide bushing 88 is secured in a rubber like sleeve 89 which in turn is secured within the outer sleeve 90. The outer sleeve 90 is supported within the bore of a tubular shaft 91 journaled in bearings that are suitably supported within the front cross frame 40 of the sliding guide frame 17.

Secured to the tubular shaft 91 intermediate its bearings is a spur gear 92 which meshes with and is driven by the spur gear 63. The guide bushing 88 may thus be driven through the spur gears 62, 63 and 92 at the same angular speed as the speed of rotation of the drive sleeve 73 and, consequently, at the same angular speed as the auger drill steel so that no relative rotative movement between the guide bushing and the auger steel may occur. Thus, excessive wear of the parts is avoided. The rubber bushing 89 which surrounds and supports the guide bushing 88 enables slight freedom of lateral movement of the bushing 88 and thereby tends to reduce shock. Under certain conditions the rubber sleeve 89 may be eliminated and the guide bushing 88 may be supported directly within the metallic outer sleeve 90. Thus with the above described assembly, the hydraulic motor 47 drives the auger drill steel 76 through the splined shaft 64, spur gear 67 and spur gear 72. Due to the splined shaft 64 and the sliding spur gear 67 the auger drill steel 76 can be driven irrespective of the position of the sliding cross head or carriage 44 along the guideways on the sliding guide frame 17.

The sliding guide frame 17, as previously mentioned, is constantly urged in a forward direction during the drilling operation by the fluid adjusting cylinder 30 and the cables 34 and 35 (FIGURES 4, 5 and 6). The sliding guide frame front cross frame 40 carries abutment engaging elements in the form of forwardly projecting pins 93 at its opposite sides (see FIGURES 2, 3 and 6). The pins 93 project in advance of the drill bit 77 when the auger steel is fully retracted on the guide frame 17, and have pointed front ends 94 engageable with the face of the work, such as the walls, roof or working face of a mine or tunnel.

The auger drill steel 76 when positioned in the socket 75 of cross head 44 has its diametrical axis below the guide frame side inturned upper end portions 23*a*. The relative position of the socket 75 and the guide frame side inturned upper end portions 23*a* is illustrated in FIGURE 12. Thus the auger drill steel 76 extends longitudinally down between the parallel side frames 23 of the sliding guide frame 17. This assembly provides a rigid base structure for the auger drill steel so that the forces exerted when drilling are more evenly distributed over the remainder of the drilling structure.

Now referring to the hydraulic fluid system shown diagrammatically in FIGURE 18 the pump 95 has its suction side connected by conduit 96 to a fluid tank or reservoir 97 which desirably contains a liquid such as a light oil. The discharge side of the pump 95 is connected by a conduit 98 to a manually operable valve device 99. Leading from the valve device 99 is a supply conduit 100 which is connected to a conventional variable volume control device 101. A supply conduit 102 leads from the conduit 100 in front of the variable volume control device 101 to a manually operable valve device 103. Leading from the valve device 103 are supply and exhaust conduits 104 and 105 which are connected respectively to the inlet and discharge sides of the hydraulic drill motor 47. Also leading from the manually operable control device 103 is a return conduit 106 which is connected back to the tank or reservoir 97. A conduit 107 connects the variable volume control device 101 to the return conduit 106. Also leading from the variable volume control device 101 is a return conduit 108 which connects to the return conduit 106. A drain conduit 109 extends from the motor 47 to the return conduit 108.

Leading from the supply conduit 100 is a branch supply conduit 110 containing a pressure regulator and connected to a conventional manually operable control valve device 111. Supply and exhaust conduits 112 and 113 lead from the valve device 111 to the inlet and discharge sides of the reversible feeding motor 48. Also, leading from the valve device 111 is a return conduit 114 connected to the return conduit 106.

The conduits 112 and 113 leading from the feeding motor 48 are connected by conduits 115 and 116 respectively to the opposite ends of the fluid cylinder 30 for the sliding guide frame 17 and the conduit 115 contains a check valve 117 which permits fluid flow through the conduit 115 from the conduit 112 but prevents reverse flow. The conduit 116 contains a restricted orifice device 118 which permits a restricted flow of fluid from the front end of the cylinder 30 through the conduit 116 to the conduit 113 so that when the motor 48 is operating to effect a forward speed of the sliding frame 17 fluid is slowly vented from the front end of the cylinder 30 through the restricted orfice device 118. A manually operable valve device 120 has its supply and exhaust conduits 122 and 124 connected to conduits 96 and 106. The valve device 120 is connected by conduits 126 and 128 to the conduits 115 and 116 respectively leading to the opposite ends of the adjusting cylinder 30. The valve device 120 permits the adjustment of the guide frame 17 while the feeding motor 48 is deenergized.

Operation

The general mode of operation of the drilling implement may be as follows:

The drill assembly 1 is arranged on a boom structure as shown in FIGURE 1 and the mobile base or carriage 2 is advanced until the working place is reached. Then the drill assembly 1 is positioned in its desired location by adjustment of the swiveled support 3, adjustable supporting structure 4 and boom 5. When the drill assembly 1 is adjacent the working face, the guide frame 17 is adjusted and brought into position by operating the valve device 120 to move the guide frame 17 relative to the supporting frame 10. The guide frame 17 is moved forwardly so that the pins 93 are against the working face. This is accomplished by a separate fluid supply means to the adjusting cylinder 30 and the valve device 120 which independently move the sliding carriage 17 irrespective of operation of the remainder of the system.

The control valve device 99 is then operated to effect fluid supply from the pump 95 through the conduit 100 to the control valve device 103. The valve device 103 may be positioned to open the fluid supply through the conduit 104 to the drill rotating motor 47 to effect rapid rotation of the auger drill steel and drill bit. The control valve device 111 is then operated to effect fluid supply to the feeding motor 48 to thereby feed the auger drill steel 76 forwardly toward the working face and to hold the drill bit 77 against the hole bottom as the hole deepens. During running of the feed motor 48 fluid flows through the conduit 115 past the check valve 117 to the rear end of the adjusting cylinder 30 and concurrently fluid is vented in restricted quantity from the front end of the adjusting cylinder 30 through the conduit 116 past the restricted orifice device 118 so that the pressure acting on the rear pressure area of the feed piston urges the guide frame 17 forwardly. As a result, during the forward feeding operation of the auger 76 the sliding guide frame 17 and the abutment pins 93 are urged against the working face so that the rapidly rotating drill steel 76 is held steady during the drilling operation. The valve device 111 may be positioned to effect reversal of the feeding motor 48 to thereby retract the outer drill steel from the work. After the drilling operation is complete valve device 120 is actuated to reverse the piston of the adjusting cylinder 30 and retract the guide frame 17.

According to the provisions of the patent statutes, I have explained the principle, preferred construction, and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. In a drilling machine, the combination comprising an elongated guide frame providing longitudinal guiding means, a rotary drilling implement extending lengthwise of said guide frame for endwise movement along said guiding means, driving means for said drilling implement for rotating the latter, a rotary guide member rotatably mounted on said guide frame in spaced relation to said driving means to support said drilling implement and through which said implement extends and is axially movable, said rotary guide member being arranged in parallel relation to said drilling implement, and means coordinated with said driving means for rotating said guide member in the same direction and at the same angular speed as the speed of rotation of said drilling implement.

2. In a drilling machine, the combination comprising a guide frame, a carriage traversable longitudinally of said guide frame, an auger, rotatably driven auger-engaging means in said carriage, actuating means for traversing said carriage, driving means for rotating said auger, an auger supporting sleeve rotatably mounted at the forward end of said guide frame in spaced relation to said driving means, and driving connections arranged positively to rotate said auger supporting sleeve in the same direction and at the same rotational speed as that at which the auger is rotated.

3. In a drilling machine, the combination comprising a guide frame having parallel side members, front and rear cross members positioned between said side members thereby maintaining said side members in spaced parallel relation to each other and forming a longitudinal guideway therebetween, a carriage traversable longitudinally within said guideway, an auger extending lengthwise in said guideway, said carriage having means to engage the shank end portion of said auger, first gear means within said carriage operable upon rotation to rotate said auger, means for moving said carriage longitudinally in said guideway, rotatable auger supporting sleeve mounted on said guide frame front cross member, second gear means connected to said sleeve and operable upon rotation to rotate said sleeve, splined shafting operatively connecting said first named gear means with said second named gear means so that said supporting sleeve will rotate in the same direction and at the same rotational speed as that of said auger irrespective of the relative longitudinal position of said carriage in said guide frame guideway, and rotating means for said splined shafting.

4. In a drilling machine, the combination comprising a guide frame having parallel side members, front and rear cross members positioned between said side members adjacent the respective end portions of said side members thereby maintaining said side members in spaced parallel relation to each other and forming a longitudinal guideway therebetween, a carriage traversable longitudinally within said guideway, an auger extending lengthwise in said guideway, said carriage having means to engage the shank end portion of said auger, first gear means within said carriage operable upon rotation to rotate said auger, means for moving said carriage longitudinally in said guideway, a rotatable auger supporting sleeve mounted on said guide frame front cross member, second gear means connected to said sleeve and operable upon movement to rotate said sleeve, splined shafting rotatably supported by said front and rear cross members, a motor mounted on said guide frame intermediate its end portions, driving connections between said motor and said splined shaft and between said splined shaft and both of said first named and second named gear means so that said supporting sleeve will rotate in the same direction and at the same rotational speed as that of said auger irrespective of the relative longitudinal position of said carriage in said guide frame guideway, and means associated with said rear cross member to maintain said splined shafting operatively aligned with said driving connections between said shafting and said first and second gear means.

5. In a drilling machine the combination comprising a guide frame, a carriage traversable longitudinally of said guide frame, an auger, means for traversing said carriage, a rotatably driven adapter member removably secured to said carriage, means to nonrotatably secure said auger to said adapter member, means to disengage said adapter member from said carriage whereby said carriage is movable longitudinally over said auger when said adapter member is disengaged therefrom, and means for rotating said auger.

6. In a drilling machine the combination comprising a guide frame, a carriage traversable longitudinally of said guide frame, an auger, means for traversing said carriage, a rotatably driven adapter member removably secured in said carriage, means to nonrotatably secure said auger to said adapter member, a keeper on said guide frame for engaging said adapter member when

said adapter member is disengaged from said carriage for retention of said adapter member during traverse of said carriage over said auger, and means for rotating said auger.

7. In a drilling machine the combination comprising a guide frame, a carriage traversable longitudinally of said guide frame, an auger, means for traversing said carriage, a rotatably driven adapter member removably secured in said carriage, said guide frame having a keeper for engaging said adapter member to said guide frame when said adapter member is disengaged from said carriage for retention of said adapter member during transverse movement of said carriage over said auger, means to nonrotatably secure said auger to said adapter, means for rotating said auger, an auger supporting sleeve rotatably mounted at the forward end of said guide frame, and driving connections arranged to rotate said auger supporting sleeve in the same direction at the same rotational speed as that at which said auger is rotated.

8. In a drilling machine the combination of a supporting frame, a guide frame movable longitudinally on said supporting frame, a carriage traversable longitudinally on said guide frame, an auger, a rotatably driven adapter member in said carriage, means to disengage said adapter member from said carriage, a keeper for

engaging said adapter member to said guide frame when said adapter member is disengaged from said carriage for retention of said adapter member during traversing movement of said carriage, means for rotating said auger, means to nonrotatably secure said auger to said adapter member, an auger supporting sleeve rotatably mounted at the forward end of said guide frame, driving connections arranged positively to rotate said auger supporting sleeve in the same direction and at the same rotational speed as that at which said auger is rotating, and power operated means organized to propel said guide frame in its forward direction of travel relative to said supporting frame at a greater rate than said carriage relative to said guide frame so that said guide frame may be maintained in abutting relation with the working face during the drilling operation.

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