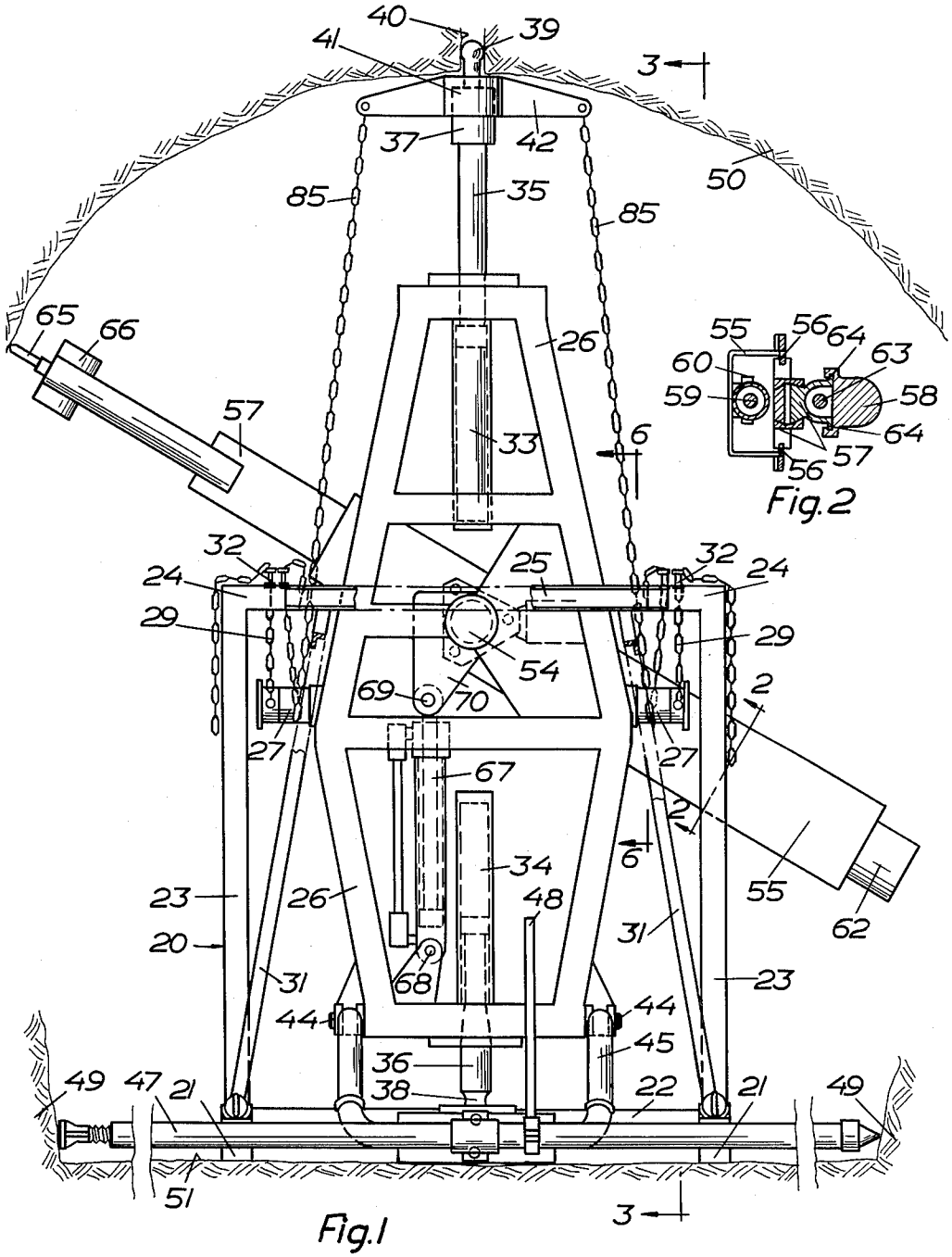
July 12, 1966 W. MEYER ETAL 3,260,317

RING DRILLING APPARATUS AND METHOD

Filed Sept. 16, 1963 4 Sheets-Sheet 1



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RING DRILLING APPARATUS AND METHOD

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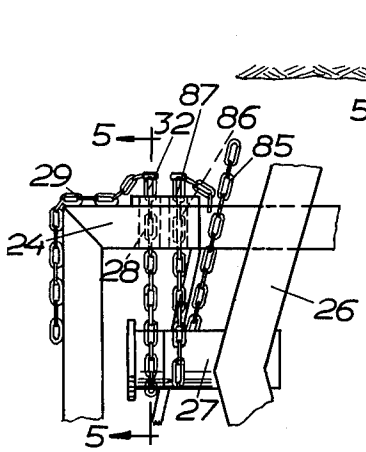


Fig.4

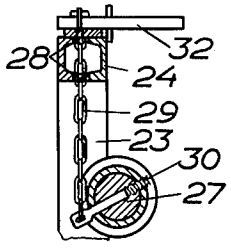


Fig.5

Fig.3

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RING DRILLING APPARATUS AND METHOD

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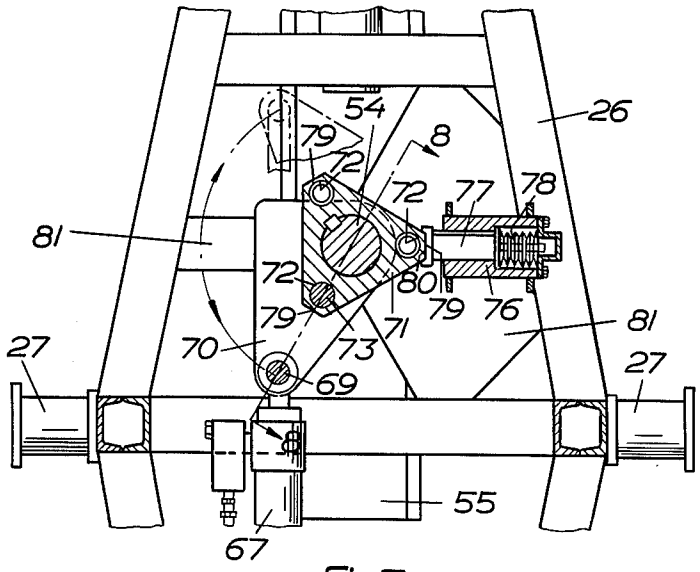


Fig.7

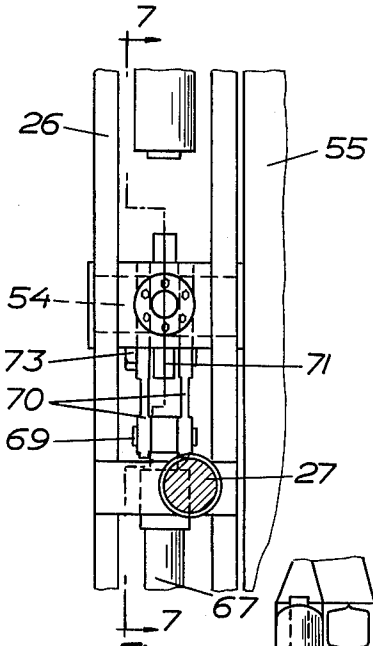


Fig.6

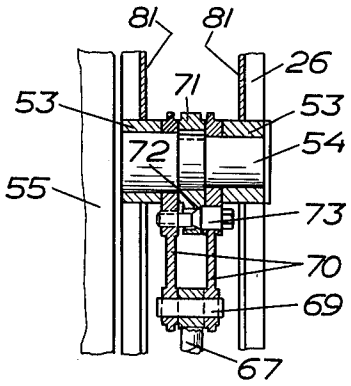


Fig.8

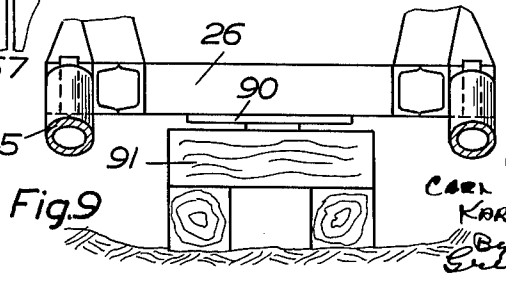


Fig.9

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RING DRILLING APPARATUS AND METHOD

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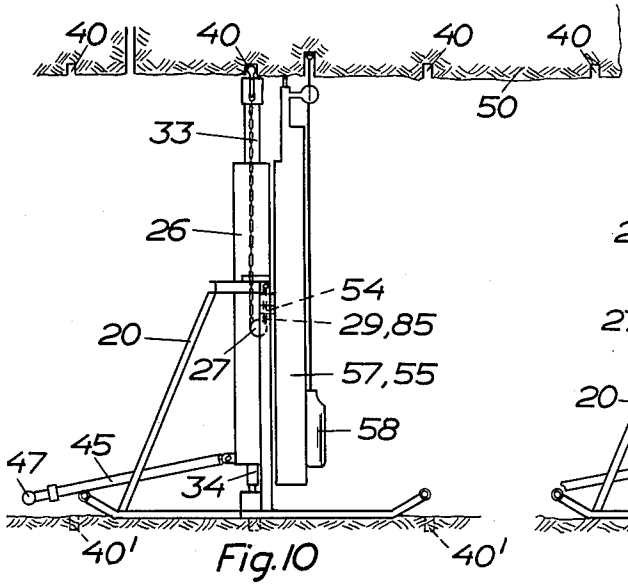


Fig.10

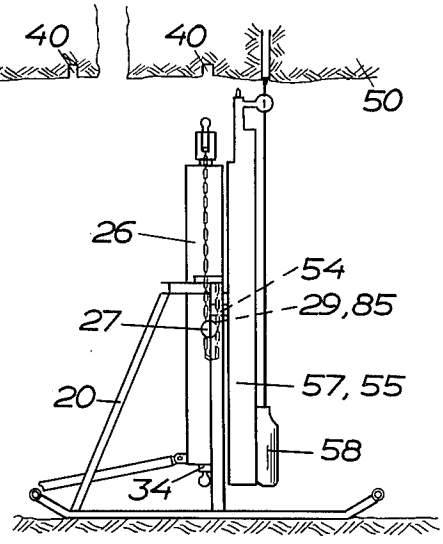


Fig.11

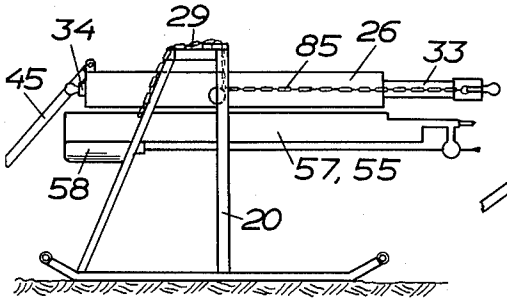


Fig.12

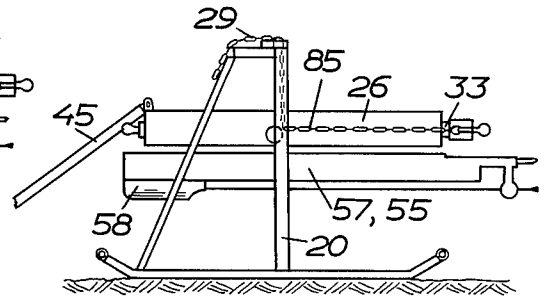


Fig.13

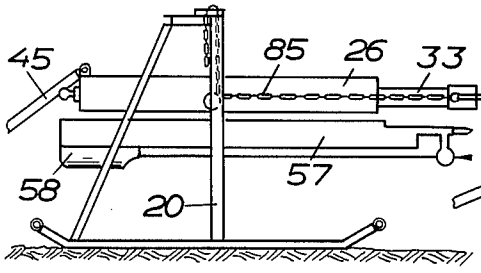


Fig.14

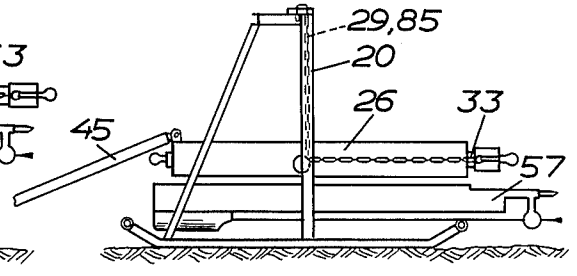


Fig.15

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RING DRILLING APPARATUS AND METHOD

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16 Claims. (Cl. 173—35)

This invention relates to a drilling apparatus particularly adapted to drill a ring or fan of drill holes transversely of and in a row peripherally around an underground drift. It is an object of the invention to provide a drilling apparatus of the above character in which the rock drill in successive ring drilling locations of the drilling apparatus can easily be set in correct drilling position and centered in the drift without corresponding exact adjustment of the support on which the drilling apparatus is mounted. Another object of the invention is to provide a drilling apparatus of the above character in which the rock drill and its feeding and pointing devices for purposes of easy adjustment are freely suspended on the support for the drilling apparatus and may be immobilized in adjusted position by direct engagement with extraneous abutments in the drift. A further object of the invention is to provide a drilling apparatus of the above character which can be assembled and disassembled in the drift with relative ease and in a simple manner without the use of special external lifting and handling devices. A still further object of the invention is to provide in a drilling apparatus of the above character an indexing device including a single power jack associated with the drill feeding and pointing devices, by means of which indexing device and single jack the ring or fan of drill holes may be drilled over a wide angle covering a full turn or more.

The invention is especially but not exclusively suited for performing a method of drilling at spaced intervals along an underground drift parallel rings or fans of drill holes transversely of the drift with each ring or fan formed by a row of drill holes peripherally around the drift, the drilling being performed by the aid of a drilling apparatus movable along the drift and including upper and lower expansible and contractible means for bracing the drilling apparatus between the roof and floor of the drift.

The above and other objects of the invention will become obvious from the following description and from the accompanying drawings in which one embodiment of the invention is illustrated by way of example.

In the drawings FIG. 1 shows a transverse sectional view of a drift in which a drilling apparatus according to the invention is mounted. The drilling apparatus is shown in erect position from the rear. FIG. 2 is a sectional view on line 2—2 in FIG. 1. FIG. 3 is a view substantially on line 3—3 in FIG. 1. FIG. 4 is an enlarged fragmental view substantially on line 4—4 in FIG. 3. FIG. 5 is a view on line 5—5 in FIG. 4. FIG. 6 is an enlarged fragmental view substantially on line 6—6 in FIG. 1. FIG. 7 is a partly sectional view on line 7—7 in FIG. 6. FIG. 8 is a sectional view on line 8—8 in FIG. 7. FIG. 9 is a fragmental view of a modification of the floor supported portions of the drilling apparatus in FIG. 1. FIG. 10 is a diagrammatic side view on a smaller scale of the drilling apparatus in drilling location in a drift. FIG. 11 is a view corresponding to FIG. 10 but showing the opposed bracing members in retracted position. FIGS. 12–15 are views corresponding to FIGS. 10 and 11 showing various stages during lowering of the elongated frame of the drilling apparatus.

The drilling apparatus illustrated in the drawings incorporates a support 20 which may be mounted on ground engaging means such as wheels or skids 21 or may be mounted in other ways. The skids 21 are interconnected by two transverse bars 22 and are provided with parallel upstanding rigid bars 23 carrying at their upper ends aligned horizontal brackets 24 which point in the direction of each other. The opposed ends of the brackets 24 are interconnected by an U-shaped rearwardly extending horizontal frame 25 bridging the space between the brackets 24 and supported at its opposite corners by bars 31 fixed to the rear portion of the skids 21. The U-shaped frame 25 and the transverse bars 22 may be suitably divided and provided with bolt connections, not shown, in order to make possible easy disassembling and transportation.

The support 20 carries an elongated frame 26 having a pair of coaxial trunnions 27 in opposed transverse disposition centrally thereon. Each bracket 24 is provided with a through vertical hole 28 through which a flexible suspension member such as a chain 29 is passed. The lower ends of the chains 29 are connected to pins 30 firmly anchored in each trunnion 27 by suitable means such as threads. The other end of each chain 29 is free and in one of the intermediate links thereof there is inserted a supporting wedge 32 resting on the upper flat surface of the corresponding bracket 24. Between the wedges 32 and the pins 30 the number of links in the two chains 29 will usually be equal and the trunnions 27 will thus be kept hanging in horizontal position when the skids 21 are horizontal. The chain suspension provides swingability of the frame 26 on a horizontal axis and since the center of gravity of the elongated frame 26 preferably is chosen to lie in proximity to the axis of the trunnions 27 and to the vertical plane defined by the suspension chains 29, swinging of the elongated frame 26 from vertical to horizontal position and vice versa may be performed manually.

At the opposite ends of the frame 26 there are provided double acting fluid pressure operated power jacks 33 and 34 in coaxial disposition carrying engaging members 37 and 38 at the outer ends of their piston rods 35 and 36. In the vertical position of the frame 26 the engaging member 37 of the upper power jack 33 by extension of its piston rod 35 may be braced against the roof of the drift 50. Preferably the engaging member 37 includes a projection 39 insertable for centering purposes into a hole 40 in the roof when the power jack 33 is extended. Simultaneously herewith the socket portion 41 of a yoke 42 carried by the engaging member 37 firmly contacts the roof around the centering hole 40. In analogy herewith the lower power jack 34 may be extended to bring the engaging member 38 on its piston rod 36 into firm contact with a floor supported piece of timber 43 or some other suitable intermediate support.

The lower end of the frame 26 carries a pair of horizontally spaced pivots 44 to which an U-shaped frame 45 is swingably connected. To the base of the frame 45 there is bolted a bracket 46 which in its turn is bolted to a horizontally disposed conventional screw brace 47. In a manner well known in the art and therefore not shown

in detail here the brace 47 by manipulation of a handle 48 may be extended to engage the opposite walls of the drift 50 or may be contracted. By bracing the brace 47 between opposed abutments 49 in the drift the U-frame 45 and thereby the elongated frame 26 may be firmly anchored to the drift against being turned about the axis defined by the power jacks 33, 34.

Centrally on the elongated frame 26 there are provided pivot means including axially spaced coaxial bearings 53 in which a pivot 54 is rotatably journalled. The pivot 54 extends at right angles to the longitudinal axis of the frame 26 and also to a plane through said axis parallel to the trunnions 27. The pivot 54 also forms part of a guide frame 55 extending in parallel relation to the elongated frame 26. Reciprocably arranged on guides 56, FIG. 2, along the guide frame 55 is a feed bar 57 for a rock drill 58. A double acting power cylinder 59 is pivotally connected at one end 60 to the guide frame 55 and at the other end 61 to the feed bar 57 and serves to move the feed bar 57 longitudinally relative to the guide frame 55. 62 indicates diagrammatically a drill feed motor which for example over a feed screw 63 or in other ways serves to feed the rock drill steel 58 together with a drill 64, preferably being an extension drill steel, towards the rock face. The rock drill 58 is guided for reciprocation on the feed bar 57 along suitable guideways 64'. The feed bar 57 may carry at its forward end a spur 65 and a power operated drill steel guide 66. The details of the rock drill, the extension drill steel equipment, the drill steel guide, the feed bar, and the feed motor are not illustrated in detail since they may be carried out in any conventional manner suitable for the drilling of long holes and well known to those familiar with the art.

For successive mechanized positioning of the rock drill for ring drilling purposes the guide frame 55 together with the feed bar 57 are rotatable a full turn or more on the bearings 53 by means of an indexing mechanism. Said mechanism, FIGS. 6–8, includes a double acting pressure fluid operated power jack 67 one end of which is pivoted on a pivot 68 carried by the elongated frame 26, while the other end is connected to a pivot 69 on a coupling member 70. The coupling member 70 consists of two parallel plates which are freely swingable on the pivot 54. By extension or contraction of the power jack 67, coupling member 70 may be swung to and fro from the one end position illustrated by full lines in FIG. 7 to the other indicated by dotted lines in the same figure. Centrally between the plates of the coupling member 70 there is keyed to the pivot 54 an indexing plate 71 having a number of angularly spaced positions or holes 72 circumferentially around the pivot 54. In the example shown the holes are three in number having a 120 degree angular spacing. A removable threaded plug 73 extends between the plates in the coupling member 70 and may be inserted in any of the holes 72 in the coupling member or index plate 71. The angle of swing of the coupling member 70 is slightly larger than the angular spacing between the holes 72, and it is readily seen that by moving the coupling member 70 to and fro by the aid of the power jack 67 and by removing the plug 73 during one of the strokes of said jack 68 while connecting it with successive holes 72 in the indexing plate during the other stroke, there is effected a stepwise rotation of the guide frame 55 and a positioning of the feed bar 57 in any desired angular position of a full turn. The guide frame 55 and its pivot 54 should be arrested in their position during each idle stroke of the power jack 67. To this end there is affixed to the frame 26 a housing 76 from which a plunger 77 projects inwardly in radial direction towards the indexing plate 71. The housing 76 also contains Belleville springs 78 providing an inward bias on the plunger 77. The indexing plate 71 has radial ridge portions 79 corresponding to each hole 73 and cooperating with the plunger 77 in such way that when two of the holes 72 are in positions corresponding to the end positions of the coupling member 70, the radial ridge portion adjacent the third hole 73 will be engaged by a notch 80 in the plunger 77 thus forming a means for arresting rotation of the indexing plate 71 as well as the guide frame 55 and feed bar 57 connected thereto. As soon as the coupling member 70 is in driving engagement with the indexing plate 71 and is moved away from the arrested position, the plunger 77 will slide off the ridges 79 and will be kept in maximally projected position until being engaged by the next ridge 79. As a safety precaution, spaced parallel plates 81 are fixed to the opposite sides of the frame 26 axially of the indexing mechanism and serve to block off access to the plug 73 except in the two end positions in which the plunger 77 is active to prevent unintentional rotation of the guide frame 54.

The pressure fluid for operation of the different power jacks, the feed motor, and the drill of the illustrated drilling apparatus is supplied from suitable sources, not illustrated, and the various hoses for conveying pressure fluid have been omitted since they would make the drawings rather congested and since the provision of such hoses is obvious to those skilled in the art.

To the yoke 42 on the engaging member 37 there are connected flexible members, preferably chains 85, which are passed one under each of the trunnions 27 and are drawn through holes 86 in the brackets 24 adjacent the holes 28. A wedge 87 is passed through one of the links in the chains 85 with the chains taut between the brackets 24 and the yoke 42. The chains 85 are used as a lifting means for the trunnions 27 during assembling or disassembling of the drilling apparatus in a manner to be described hereinafter.

In FIG. 10 the drilling apparatus is illustrated diagrammatically in position for drilling a ring of drill holes transversely of an underground drift 50. In the position illustrated the elongated frame 26 is immobilized in the drift 50 firstly by the extended power jacks 33, 34 firmly bracing the frame 26 in the desired erect position and height between the drift roof and floor, and secondly by the screw brace 47 extending between opposite abutments 49 on the walls of the drift 50. By fixation of the bracket 46 in various positions along the screw brace 47, the angle of the frame 26 relative to the longitudinal axis of the drift may be altered. With the frame 26 immobilized in the desired position, which usually will be a position with the pivot means 53, 54 coaxial with the desired ring or fan center axis of the holes to be drilled and with the frame in vertical position at right angles to said center axis, drilling of the ring of drill holes may begin. For each new hole the guide frame 55 together with the feed bar 57 is positioned by means of the power jack 67, and indexing by means of the coupling member 70, the pin 73 and the plate 71 is performed each time the positioning angle exceeds the stroke of the power jack 67. In each new drilling position the spur 65 of the feed bar 57 is pushed against the rock face for steadying purposes by manipulation of the power jack 59 prior to drilling and similarly the feed bar 57 and spur 65 are retracted from the rock face prior to being turned to the next angular position. With the ring of drill holes completed the feed bar 57 is again retracted from the rock face and thereupon the power jacks 33, 34 are retracted as shown in FIG. 11. Retraction of the lower jack 34 causes the frame 26 to sink somewhat until the two chains 29, which are kept nearly taut by the wedges 32, have taken over the weight of the frame 26 keeping it suspended on the support 20. Finally the screw brace 47 is removed.

In advance of the drilling apparatus there have previously been drilled centering holes 40 in spaced disposition along the roof of the drift 50 and at intervals therein substantially equal to the magnitude of the burden. The support 20 with the freely hanging frame 26 can now be moved on the skids 21 along the drift by some suitable pulling means, not shown, to the next drilling location, which is defined by the position of the next centering

hole **40** in the roof. As soon as the power jacks are vertical and correctly aligned with the centering hole **40**, which aligned position is found with relative ease thanks to the chain suspension and the resulting free movability of the frame **26**, the power jacks **33**, **34** are again extended to brace the engaging members **37**, **39** and **38** of the power jacks **33**, **34** between the rock adjacent the roof hole **40** and a suitable support on the floor. By manipulation of the two jacks **33**, **34** subsequently herewith there is performed a final correction of the height of the frame **26** which usually relieves the chains **29** from load. As a safety measure the other two chains **85** may be adjusted by their wedges **87** as to their active length and kept substantially taut under the trunnions **27**. In case of an unintentional reduction of fluid pressure in the lower jack **34** when the wedges **32** are removed from the chains **29**, the upper jack **33** will thus be able to alone provide the necessary holding power and will carry the frame **26** by means of the chains **85**. By adjustment and fixation of the U-frame **45** by means of the bracket **46** and the screw brace **47**, the frame **26** is turned into correct angular position about the axis of the jacks **33**, **34**, whereupon the ring drilling operations may be resumed.

In drifts which can be kept free of debris and provide a clean floor, the above drilling method can be simplified further by drilling centering holes **40**[1], FIG. 10, in the floor of the drift as well, and forming with the roof holes **40** pairs of correctly aligned and positioned centering holes along the drift. The correct vertical position of the frame **26** will then be found simply by inserting the projection **39** of the upper power jack **33** in one of the holes **40** and the opposed projection **38** of the lower power jack **34** in the corresponding aligned hole **40** and by bracing subsequently thereto of the power jacks **33**, **34** between the roof and floor.

For transportation purposes to new locations under ground through drifts of reduced cross sectional area the drilling apparatus will usually be divided into units suitable for transportation. To this end the frame **26** can be lowered by the aid of one of its own power jacks **33**, **34**, in the example shown by the upper power jack **33**. Such lowering is depicted in FIGS. 12–14 and as a first step, the frame **26** is swung on the trunnions **27** while hanging on the chains **29** from the position of FIG. 11 to horizontal position. Thereupon the power jack **33** is extended to such an extent that the chains **85** become tensioned between the yoke **42** and the wedges **87** lifting the trunnions **27**. The lift slackens the chains **29** allowing free removal of the wedges **32**. As a next step the power jack **33** is successively contracted, FIGS. 12, 13, which causes the trunnions **27** and the entire frame **26** to be lowered to an extent corresponding to the stroke of the jack **33**, and the chains **29** connected to the trunnions **27** will be drawn freely downwardly through the holes **28** since the wedges **32** are missing. In the nearly fully contracted position of the power jack **33**, FIG. 12, the wedges **32** are reinserted in one of the links of the chains **29** with the chains taut between the brackets **24** and the trunnion **27**, and after a slight further contraction of the power jack **33** the weight of the trunnions **27** and frame **26** will be taken over by the chains **29** while the chains **85** will be slackened. Thereupon the wedges **87** are removed and subsequently the power jack **33** is again extended drawing the chains **85** freely through the holes **86**. Just prior to full extension of the power jack **33**, the wedges **87** are reinserted into suitable links on the chains **85** and after a full extension of the power jack **33** the weight of the frame **26** is again taken over by the chains **85**. This slackens the chains **29**, whereupon the wedges **32** are removed and a final lowering of the frame **26** may be performed, FIGS. 13, 14. In FIG. 14 a suitable wagon, not shown, may be used for receiving the frame **26** and after removal of the wedges **32**, **87** the four chains **29**, **85** may be drawn out through the holes **28**, **86** and placed on the wagon. After disassembly of the bars **22** and **25** of the support **20** the entire drilling apparatus is ready for transportation. The U-frame **45**, which in the positions of FIGS. 12–15 may rest freely on the floor, can be swung over the frame **26** as soon as the frame **26** and its wagon have been moved away from under the support **20**.

It is readily seen that the lower power jack **34** may equally well serve as a lifting means for the frame **26** in the horizontal position thereof, and in such case the chains **85** will be drawn between a suitable yoke on the rock engaging member **38** and the bracket **24**. The connection of the yoke **42** to the upper rock engaging member **37**, however, is preferred since a positive extra support is provided by the chains **85** underlying the trunnions **27** in braced position of the frame **26**.

Assembly of the drilling apparatus and lifting of the frame **26** to the desired height will obviously be performed in the reverse order to the lowering and disassembling operations described above.

In the exemplified arrangement the chains **29**, **85** may also be used as a means for adjusting the height of the trunnions **27** and the frame **26** in connection with the final adjustments of the frame prior to drilling. In cases where such relative coarse adjustment will be found sufficient, the lower power jack **34** may be omitted as shown in FIG. 9, in which case the lower end **90** of the frame **26** will be supported on suitable intermediate pieces of timber **91** on the floor of the drift and the height will be adjusted solely by manipulation of the power jack **33** and the two pair of chains **29**, **85** and wedges **32**, **87**.

The drilling apparatus above described and illustrated in the drawings should only be considered as an example and the invention may be modified in several different ways within the scope of the following claims.

What we claim is:

1. In a drilling apparatus particularly adapted to drill a ring or fan of drill holes transversely of and in a row peripherally around an underground drift, a support adapted to be moved along said drift to successive ring drilling locations, an elongated frame, a pair of coaxial trunnions in opposed transverse disposition centrally on said frame, a pair of brackets on said support each disposed substantially over one of said trunnions, a flexible chain connected between each said bracket and trunnion for swingably suspending said frame by said trunnions in said brackets with said trunnions in substantially horizontal position, the center of gravity of said elongated frame being disposed in proximity to the axis of said trunnions and the plane of suspension of said chains, means for adjusting the length of the portions of said chains providing said suspension, upper and lower engaging members disposed coaxially at the opposite ends of said frame and adapted to be braced in erect position of said frame between the roof and floor of said drift, a rock drill, an elongated feed bar for slidably carrying said rock drill, feeding means on said feed bar for feeding and retracting said rock drill along said feed bar, pivot means on said elongated frame for mounting said feed bar rotatably thereon in a plane substantially parallel with said trunnions, first and second fluid pressure operated power jacks mounted on said elongated frame and connected to said upper and to said lower engaging member, respectively, for expanding and contracting said engaging members axially of said frame, and fluid pressure operated means mounted on said frame and having operative connection with said feed bar for turning said feed bar in said parallel plane.

2. In a drilling apparatus as set forth in claim **1** lifting means in operative engagement with said trunnions for purposes of adjusting the height of said trunnions relative to said brackets and deriving their motion from one of said power jacks on said elongated frame.

3. In a drilling apparatus as set forth in claim **1** a pair of flexible chains taut between said first power jack and said brackets and each underlying one of said trunnions

for purposes of adjusting the height of said trunnions relative to said brackets.

4. In a drilling apparatus as set forth in claim 3 said upper engaging member having a projection adapted to engage a centering drill hole in the roof of said drift.

5. In a drilling apparatus particularly adapted to drill a ring or fan of drill holes transversely of and in a row peripherally around an underground drift, a support adapted to be moved along said drift to successive ring drilling locations, an elongated frame, a pair of coaxial trunnions in opposed transverse disposition centrally on said frame, a rock drill, an elongated feed bar for slidably carrying said rock drill, feeding means on said feed bar for feeding and retracting said rock drill along said feed bar, pivot means on said elongated frame for mounting said feed bar rotatably on an axis perpendicular to said trunnions and extending transversely to said frame, fluid pressure operated means mounted on said frame and having operative connection with said feed bar for turning said feed bar about said pivot means, flexible member means connected to said support and to said trunnions for carrying said frame by said trunnions with said trunnions suspended in substantially horizontal position thereby to give said frame a certain freedom of movement in all directions for adjusting purposes, and means on said frame adapted to engage in erect position of said frame portions of said drift for immobilizing said frame in adjusted erect position in said drift during drilling of said ring or fan of drill holes.

6. In a drilling apparatus as set forth in claim 5 upper and lower engaging members disposed coaxially at the opposite ends of said frame and adapted to be braced in erect position of said frame between the roof and floor of said drift, and a pair of power jacks mounted on said elongated frame and connected each to one of said engaging members for expanding and contracting said engaging members axially of said frame thereby to provide vertical adjustment of said frame and immobilization thereof in its adjusted erect position.

7. In a drilling apparatus as set forth in claim 6, there being provided engaging means on said frame additional to said engaging members and adapted to engage an extraneous abutment latterally spaced from said engaging members in said drift for preventing rotation of said frame about vertical axes when said frame is braced between the roof and floor of said drift.

8. In a drilling apparatus as set forth in claim 5 a swingable coupling member journalled on said frame to swing between end positions substantially coaxially with said pivot means, means for selectively connecting said member to said feed bar in a number of separate angular coupling positions of said feed bar with respect to said member, said coupling positions being distributed around the axis of said pivot means and spaced from each other by an angle smaller than the angle between the end positions of said member, and said fluid pressure operated means being a power jack mounted on said frame and having operative connection with said member for swinging said member to and fro between said end positions with said connecting means in successive connection with one coupling position after the other for effecting successive rotation of said feed bar.

9. In a drilling apparatus particularly adapted to drill a ring or fan of drill holes transversely of and in a row peripherally around an underground drift, a support adapted to be moved along said drift to successive ring drilling locations, an elongated frame, a pair of coaxial trunnions in opposed transverse disposition centrally on said frame, the center of gravity of said elongated frame being disposed in proximity to the axis of said trunnions, means on said support for swingably carrying said frame by said trunnions with said trunnions in substantially horizontal position, upper and lower engaging members disposed coaxially at the opposite ends of said frame and adapted to be braced in erect position of said frame between the roof and floor of said drift, a rock drill, an elongated feed bar for slidably carrying said rock drill, feeding means on said feed bar for feeding and retracting said rock drill along said feed bar, pivot means on said elongated frame for mounting said feed bar rotatably thereon in a plane substantially parallel with said trunnions, first and second fluid pressure operated means mounted on said elongated frame and connected each to one of said engaging members for expanding and contracting said rock engaging members axially of said elongated frame, and third fluid pressure operated means mounted on said frame and having operative connection with said feed bar for turning said feed bar in said parallel plane.

10. In a drilling apparatus as set forth in claim 9 said fluid pressure operated means being an expansible and contractible power jack, there being provided coupling means between said power jack and said feed bar for transforming successive expansions and contractions of said power jack into stepwise rotation of said feed bar through at least a full turn thereof.

11. In a drilling apparatus as set forth in claim 9 a guide frame extending along said feed bar and supporting said feed bar movably longitudinally of itself, said pivot means on said elongated frame carrying said guide frame rotatably thereon in a plane substantially parallel with said trunnions, a first swingable coupling member journalled on said frame to swing between end positions substantially coaxially with said pivot means, a second coupling member associated with said guide frame and coaxial with said pivot means, said second coupling member having a number of coupling positions distributed circumferentially around the axis of said pivot means and spaced from each other by an angle smaller than the angle between the end positions of said first coupling member, means for selectively connecting said first coupling member to any of said coupling positions of said second coupling member, said third fluid pressure operated means being power jack mounted on said frame and having operative connection with said first coupling member for swinging said first coupling member to and fro between said end positions with said connecting means in successive connection with one coupling position after the other of said second coupling member for effecting stepwise rotation of said guide frame and thereby of said feed bar in said parallel plane and an additional fluid pressure operated power jack mounted on said guide frame and having operative connection with said feed bar for moving said feed bar longitudinally of itself.

12. In a drilling apparatus as set forth in claim 11 there being provided means on said frame for arresting the rotation said second coupling member and said guide frame in certain angular positions of said guide frame, said angular positions being the positions in which said connecting means in each of said end positions of said first coupling member are connectable to one of said coupling positions of said second coupling members.

13. In a drilling apparatus particaularly adapted to drill a ring or fan of drill holes transversely of and in a row peripherally around an underground drift, a support adapted to be moved along said drift to successive ring drilling locations, an elongated frame, a pair of coaxial trunnions in opposed transverse disposition centrally on said frame, means on said support for swingably carrying said frame by said trunnions with said trunnions in substantially horizontal position, lifting means on said frame cooperating with said trunnions for adjusting the position of said trunnions in upward or downward direction, means on said support for adjusting the effective height of said carrying means to correspond to the lift position of said trunnions, upper and lower engaging members disposed coaxially at the opposite ends of said frame and adapted to be braced in erect position of said frame between the roof and floor of said drift, a rock drill, an elongated feed bar for slidably carrying said rock drill, feeding means on said feed bar for feeding and retracting

said rock drill along said feed bar, pivot means on said elongated frame for mounting said feed bar rotatably thereon in a plane substantially parallel with said trunnions, a fluid pressure operated power jack mounted on said elongated frame and connected to said upper engaging member for expanding and contracting said upper engaging member axially of said elongated frame, and fluid pressure operated means mounted on said frame and having operative connection with said feed bar for turning said feed bar in said parallel plane.

14. In a drilling apparatus as set forth in claim **13** said lifting means deriving their motion from said power jack on said elongated frame.

15. In a drilling apparatus as set forth in claim **14** said lifting means including a pair of flexible members taut between said power jack and said support and each underlying one of said trunnions, said flexible members having adjustable length.

16. In a drilling apparatus as set forth in claim **13** said carrying means including a pair of flexible suspension members each between said support and one of said trunnions, said suspension members having adjustable length.

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