April 5, 1966 G. A. RAGNARSSON 3,244,240

DRILL RIGS

Filed June 18, 1962 4 Sheets-Sheet 1

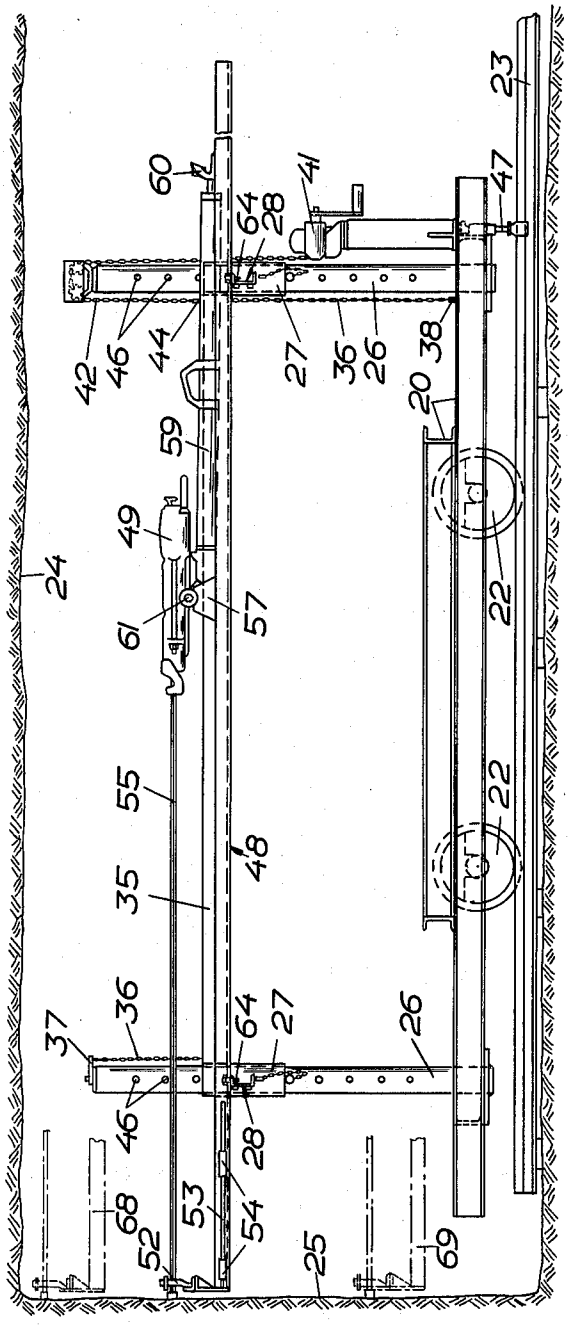


Fig.1

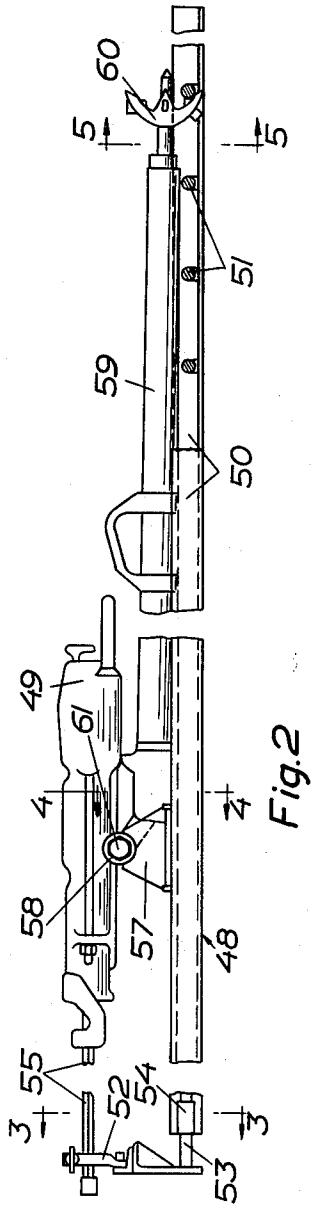


Fig.2

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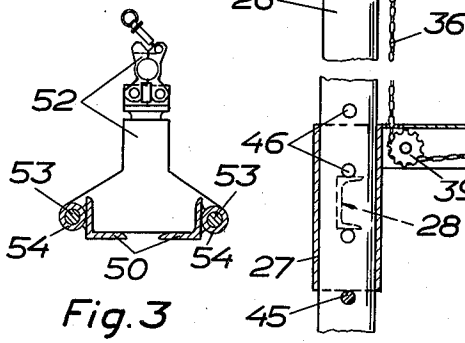


Fig.3

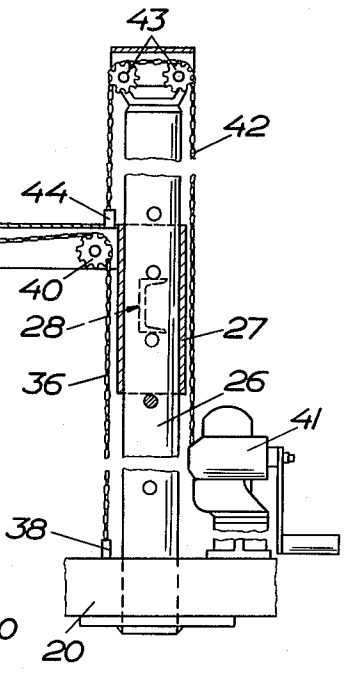


Fig.6

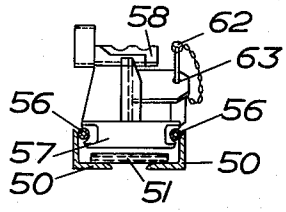


Fig.4

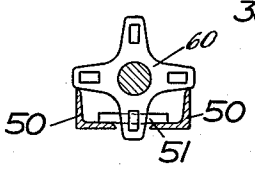


Fig.5

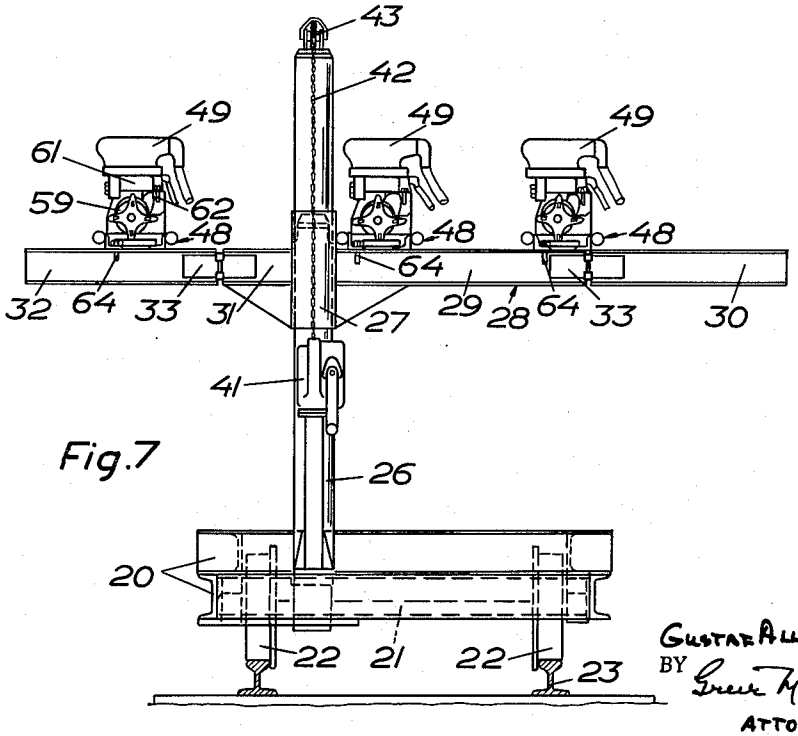


Fig.7

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DRILL RIGS

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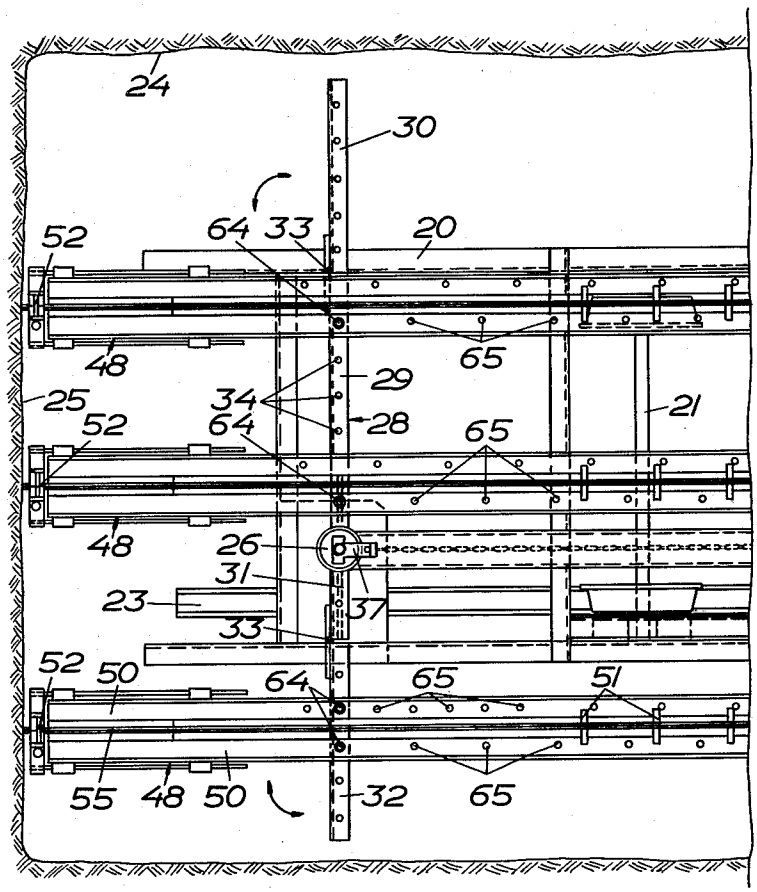


Fig.8

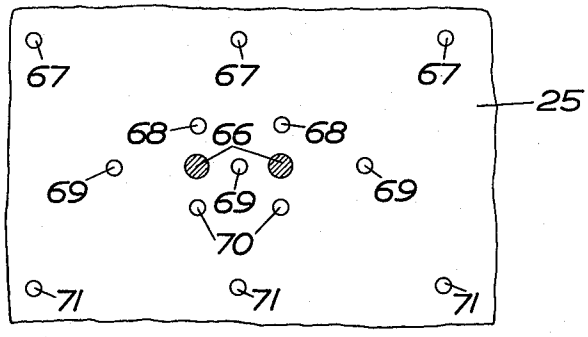


Fig.9

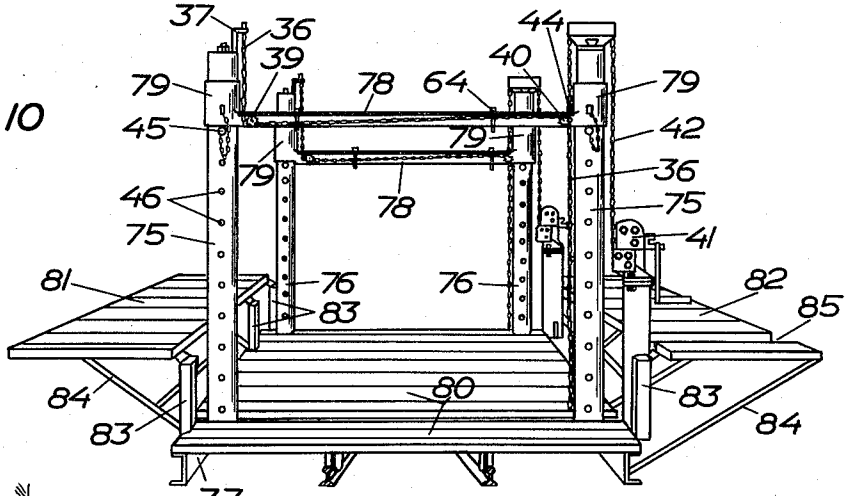
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DRILL RIGS

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Fig. 10



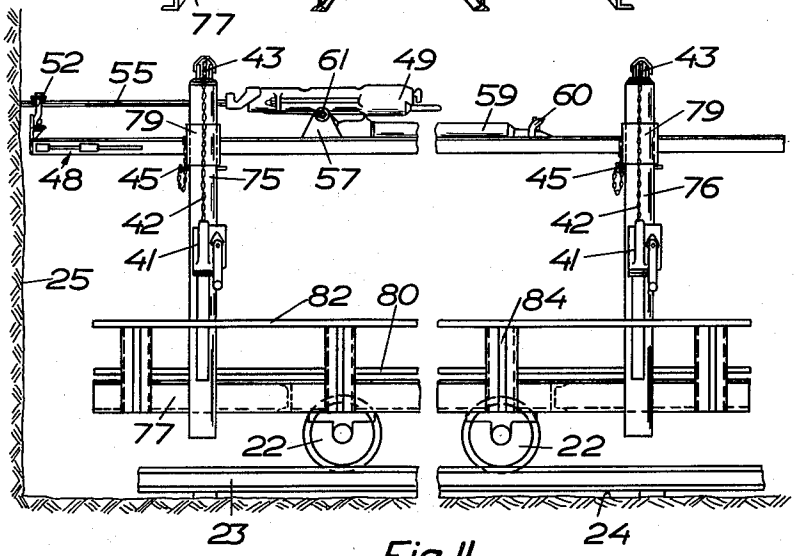


Fig. 11

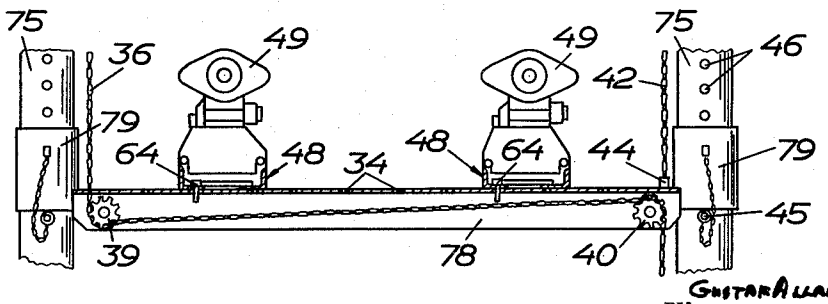


Fig. 12

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United States Patent Office 3,244,240
Patented Apr. 5, 1966

3,244,240

DRILL RIGS

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Filed June 18, 1962, Ser. No. 203,209
Claims priority, application Sweden, June 21, 1961, 6,452/61; Oct. 24, 1961, 10,553/61
5 Claims. (Cl. 173—43)

This invention relates to drill rigs and more specifically to movable drill rigs for drilling tunnels or drifts according to a predetermined drilling pattern. It is a primary object of the invention to provide a drill rig especially suited for drilling small area tunnels, for example having a cross section between 4 m.² and 12 m.² (45 and 130 sq. ft.) and intended for drilling instead of the usual V-cut drilling pattern a parallel drill hole pattern. Another object of the invention is to provide a drill rig for applying the ladder drilling method for drilling a parallel-hole cut. In this method lightweight standard rock drill and retractable pusher leg units are slidably and removably mounted on feed ladders and are advanced or retracted along the feed ladder by means of the retractable pusher legs which are placed in engagement with one of the rungs on the feed ladder. A further object of the invention is to provide a drill rig for drilling a parallel-hole cut for driving small area tunnels in which the drilling pattern for the cut is fully defined by predetermined fully defined positions of the rock drills on the drill rig.

The above and other objects of the invention will become obvious from the following description and from the accompanying drawings in which two embodiments of the invention are illustrated by way of example.

It should be understood that these embodiments are only illustrative of the invention and that various modifications may be made within the scope of the claims without departing from the scope of the invention.

In the drawings:

FIG. 1 shows a side view of a drill rig according to the invention in working position in a tunnel.

FIG. 2 is an enlarged fragmentary side view of a feed bar arrangement forming part of the drilling apparatus in FIG. 1.

FIG. 3 is a sectional view on line 3—3 in FIG. 2.

FIG. 4 is a sectional view on line 4—4 in FIG. 2 with the rock drill removed.

FIG. 5 is a sectional view on line 5—5 in FIG. 2.

FIG. 6 is an enlarged fragmentary view of the standards along which the drilling apparatus in FIG. 1 can be displaced in upward or downward direction.

FIG. 7 is an enlarged rear view of the drill rig in FIG. 1.

FIG. 8 is an enlarged top view of the forward portion of the drill rig in FIG. 1.

FIG. 9 shows an example of a parallel-hole cut drilled in the rock face by the aid of the drill rig in FIGS. 1–8 according to a predetermined drilling pattern.

FIG. 10 is a perspective view of a modified drill rig according to the invention which is shown with the feed bars removed.

FIG. 11 is a fragmentary side view of the drill rig in FIG. 10 with the feed bars in place.

FIG. 12, finally, is an enlarged fragmentary front view of the drill rig in FIG. 10 and shows the standards and the slidable transverse support therebetween with two feed bars in place thereon.

Referring to the drawings the drill rig in the FIGURES 1–8 is provided with an underframe 20 having wheel axles 21 journalled therein. The axles 21 are provided with wheels 22 travelling on rails 23 laid out along the floor of the drift or tunnel 24 towards the rock face 25 to be drilled. As alternative ground engaging means for the underframe 20 may be contemplated tires or tracks resting directly against the tunnel floor. The underframe 20 supports at its front and rear two vertical standards 26, which are displaced sideways to an off-center position relative to the central longitudinal plane of the underframe. On and along each standard 26 there is slidably guided a sleeve 27 carrying an elongated transverse support 28 which is formed by aligned channel bar sections 29, 30, 31, 32 protruding in opposite directions from the sleeve transversely to the direction of travel of the underframe 20. The transverse supports 28 extend substantially over the full width of the tunnel 24. For providing free movability of the drill rig along the tunnel, the outermost bar sections 30, 32 are connected by means of hinges 33 to the ends of the bar sections 29, 31 and may as indicated in FIG. 8 be folded forwardly inwardly for reducing the width of the drill rig. The bar sections 29–31 are mounted in standing position and the upper flanges of the sections are provided with a series of holes 34.

The two sleeves 27 are rigidly interconnected by a longitudinal beam 35, whereby the sleeves 27 are forced to slide in unison along the standards 26. In order to safeguard parallel displacement of the longitudinal beam 35 during such sliding movement of the sleeves 27 a chain 36 is fixed at an anchoring plate 37 to the top of the front standard 26. The other end of the chain 36 is anchored at 38 to the underframe 20 adjacent the base of the rear standard 26. Between these fixed points the chain is drawn under a sprocket wheel 39 which is rotatably journalled at the forward end of the longitudinal beam 35 adjacent the front standard 26 and over another sprocket wheel 40 which is rotatably journalled at the rear end of the longitudinal beam 35 adjacent the rear standard 26. A winch 41 which, as shown, may be manually driven or may be driven in other ways, for example by a pneumatic motor, is arranged for winding up or paying out a chain 42.

The chain 42 passes over a pair of sprocket wheels 43 rotatably journalled on top of the rear standard 26 and is anchored to the longitudinal beam at 44 adjacent the sprocket wheel 40. As readily seen, actuation of the winch 41 brings about elevation or lowering of the longitudinal beam 35 together with the sleeves 27 and the transverse supports 28. During such elevation or lowering the chain 36 keeps the longitudinal beam 35 substantially horizontal. The sleeves 27 may be locked in a number of predetermined elevated positions by means of locking means such as pins 45 selectively insertable in horizontal through-holes 46 in the standards 26, FIG. 6, with their ends protruding from said holes 46 for forming a support for the sleeves 27.

Arresting members 47 are fixed to the underframe 20 and are brought into locking engagement with the rails 23 so that the underframe 20 during drilling remains stationary relative to the tunnel 24.

Between the two transverse supports 28 there extends a number of elongated feed bars, in the example shown three feed bars 48, providing a support for rock drills 49 and resting at their opposed ends on said transverse supports 28. The feed bars 48 preferably incorporate simple steel ladders consisting of parallel channel or angle irons 50 which are interconnected by transverse welded-on rungs 51. A drill centralizer 52 is arranged forwardly on each feed bar or ladder 48 and carries rearwardly extending rods 53 which are slidably received in sleeves 54 on the forward end of the ladders 48 and may be locked in said sleeves for example by means of screws, not shown. Through longitudinal displacement and locking of the drill centralizer rods 53 in the sleeves 54 and the drill steel 55 may for purposes of starting a hole be

efficiently collared irrespective of unevenness of the rock face 25. The angle irons 50 carry at their upper edge welded-on runners 56, FIG. 4, which form guiding means along which there is slidably guided a slide 57 provided with an upstanding cradle 58 for supporting the rock drill 49. The rock drill 49 has a feed motor contained therein and is preferably hingedly connected to a retractable pusher leg 59 of per se well known construction which in conventional manner can be expanded or contracted at will by pressure fluid. The foot piece 60 of the retractable pusher leg 59 is in engagement with one of the rungs 51 of the ladder 48 while the hinge end 61 of the pusher leg 59 together with the rock drill 49 rests in the cradle 58 and is kept in place therein by a pin bolt 62 inserted in a vertical hole 63 in the cradle 58. Positioned by the operator to take hold against one of the rungs 51 or successively against one after the other of said rungs 51 the pusher leg during its expansion or contraction advances or retracts the slide 57 together with the rock drill 49 along the ladder 48. Through removal of the pin bolt 62 the rock drill 49 together with the pusher leg 59 may be lifted away as a single unit from the ladder 48 for being used as a separate hand-held unit.

The three ladders 48 are affixed to the transverse supports 28 by simple connecting means incorporating pins 64 engaging one of the holes in a line of perforations 65 in the angle irons 50 as well as a hole in the series of holes 34 in the transverse supports 28. The ladders 48 resting on the hinged bar sections 30 or 32 of the transverse supports 28 may be locked against longitudinal displacement by simultaneous use of two pins 64 inserted in adjacent holes 34 of one of the bar sections 30 or 32.

The drill rig according to the invention is especially suited for drilling a parallel-hole drilling pattern as exemplified in FIG. 9. The cut shown incorporates a number of strictly parallel holes including two large holes 66 arranged in a common row with a number of reduced holes 69 and a few additional rows of reduced holes 67, 68, 70 and 71. The small number of horizontal rows means that the number of vertical movements of the ladders 48 will be kept at a minimum. The horizontal distances between the holes are selected to permit two ladder mounted rock drills to be operated simultaneously side by side.

In use the drill rig is advanced to the rock face 25 and locked fixedly to the rails 23 by means of the arresting members 47. The winch 41 is then actuated for elevating or lowering the transverse supports 28 for bringing the rock drills 49 to a height corresponding to the height of the row of holes to be drilled accordinng to the drilling pattern. The sleeves 27 are then locked on the standards 26 by inserting the locking pins 45 in the holes 46 corresponding to the selected predetermined height. As seen in FIG. 1 elevating or lowering of the ladders 48 may be performed between the top position indicated by phantom lines close to the tunnel roof and designated 68 and the lowermost position indicated at 69. The bar sections 30, 32 of the transverse support 28 are then turned outwardly about the hinges 33 whereupon the ladders 48 are adjusted on and pinned to the transverse supports 28 to occupy the predetermined parallel positions corresponding to the distances between the holes in the row to be drilled. Finally, the drill centralizers 52 are adjusted longitudinally with respect to the rock face.

Drilling is then commenced with the foot piece 60 of the pusher legs 59 in engagement with some suitable rung 51 at the rear end of the ladders 48. Having fully utilized the initial feed stroke of each pusher leg 59 on the ladders 48 the operator after a slight elevation of the foot piece 60 successively retracts the pusher leg 59 in order to bring the foot piece 60 in engagement with a rung 51 positioned forwardly of the previous rung whereupon drilling is continued. With one row of holes completed the drilling machines are elevated or lowered by means of the winch 41 to the next row according to the drilling pattern. For drilling additional holes outside of the cut

in FIG. 9, for example the bottom holes, not shown, the operator attending the drill rig can easily remove the pin bolt 62 from the cradle 58 of one of the ladders 48 and thereupon remove the rock drill 49 and pusher leg 59 lying therein for drilling said additional holes in the usual hand held manner.

In the embodiment according to FIGS. 10–12 there are provided two front standards 75 and two rear standards 76 at the corners of a wheeled underframe 77. Horizontal transverse supports 78 extend between the front and the rear standards 75 and 76, respectively, and are affixed to sleeves 79 slidably arranged on said standards. The transverse supports 78 carry one or multiple ladders 48 each supporting rock drills 49 and pusher legs 59 and pinned to the transverse supports 78 by means of pins 64 inserted in holes 34 in the support 78 all in full analogy with the embodiment in FIGS. 1–8. The two ladders 48 illustrated in the figures together with the transverse supports may be lowered or elevated by means of two separate winches 41 each of them arranged in analogy with the winch arrangement for the longitudinal beam in FIG. 6. Winch chains 42 are thus connected to each transverse support while sprocket wheels 39, 40 and chains 36 are arranged for safeguarding parallel displacement of the transverse support 78 along the standards 75 or 76. The sleeves may be locked in a number of predetermined elevations by locking pins 45 which are selectively insertable in horizontal holes 46 in the standards 75, 76.

For convenience in operation there is provided a deck 80 on the underframe 77. Outside of the standards 75 there are provided deck flaps 81, 82 hingedly connected to the tops of upstanding members 83 on the underframe 77. The flaps 81, 82 may be secured in horizontal position by stays 84 and with the stays 84 inoperative the flaps may alternatively be raised to rest against the standards 75, 76 or be left hanging pointing downwardly. Openings 85 are provided in the flap 82 for the passage of the winches 41 when the flap 82 is raised. The different deck members 80–82 are preferably provided with transverse spaces or abutments for supporting the foot pieces of hand held pusher leg fed rock drills especially for drilling holes disposed outside the range of the ladders 48.

Operation of the drill rig in FIGS. 10–12 is analogous with the embodiment according to FIGS. 1–8. The lowering or elevating of the transverse supports 78 is performed in unison by two operators simultaneously actuating the winches 41.

The drill rigs above described and illustrated in the drawings should only be considered as examples and the invention may be modified in several different ways within the scope of the following claims.

What I claim is:

1. A drill rig comprising a movable underframe, ground engaging means on said underframe, a pair of elongated transverse supports spaced apart from each other in the longitudinal direction of said underframe and extending tranvsersely relative to said underframe, an elongated feed ladder having rungs, the opposed ends of said feed ladder resting on said transverse supports, a cradle slidably arranged along said ladder, a rock drill and pusher leg unit carried by said cradle and ladder, said pusher leg in position for engaging one of said rungs for slidably displacing said cradle and said rock drill along said ladder, locking means on said cradle for detachably connecting said unit to said cradle, connecting means between said transverse supports and said feed ladder for affixing said feed ladder in predetermined alternative positions on said transverse supports, spaced apart upstanding standards on said underframe, means for disposing said supports selectively along said standards, means for elevating or lowering said transverse supports in unison along said standards, and locking means between said transverse supports and said standards for

locking said transverse supports in predetermined alternative elevated positions on said standards.

2. A drill rig comprising a movable underframe, ground engaging means on said underframe, two pairs of upstanding standards on said underframe, said pairs being spaced apart from each other in the longitudinal direction of said underframe, an elongated transverse support extending between each said pair transversely relative to said underframe, means for disposing each of said transverse supports selectively along its respective pair of upstanding standards, an elongated feed ladder having rungs, the opposed ends of said feed ladder resting on said elongated supports, a cradle slidably arranged along said ladder, a rock drill and pusher leg unit carried by said cradle and ladder, said pusher leg in position for engaging one of said rungs for slidably displacing said cradle and said rock drill along said ladder, locking means on said cradle for detachably connecting said unit to said cradle, connecting means between said transverse supports and said feed ladder for affixing said feed ladder in predetermined alternative positions on said transverse supports, means for elevating or lowering said transverse supports in unison along said standards, and locking means between said transverse supports and said standards for locking said transverse supports in predetermined alternative elevated positions on said standards.

3. In a support apparatus of the character described for supporting the movement and placement of rock drills and the like toward a working surface and for providing accessibility therefor in restricted working areas and having an elongated underframe, wheels disposed on said underframe for the movement and support thereof and at least one vertical standard disposed substantially at each end of said underframe, the combination which comprises a support disposed on said standards transversely of said underframe providing a substantially unobstructed working space between said standards and below said transverse supports disposed thereon, means for affixing said supports on said standards selectively in alternative positions therealong, means for elevating and lowering said supports in unison along said standards, an elongated feed bar extending longitudinally of said underframe for supporting a rock drill thereon with each end thereof disposed on one of said transverse supports, said feed bar including transverse stops for engagement with feeding mechanism on said rock drills for said moving of said drill toward said working surface to be drilled, and means for connecting said feed bar to said transverse supports for selectively affixing said feed bar thereon in alternative positions therealong transversely of said underframe.

4. In a support apparatus of the character described for supporting the movement and placement of rock drills and the like toward a working surface and for providing accessibility therefor in restricted working areas and having an elongated underframe, wheels disposed on said underframe for the movement and support thereof, and at least one vertical standard disposed substantially at each end of said underframe, the combination which comprises a support disposed on said standards transversely at each end of said underframe providing a substantially unobstructed working space between said

standards and below said transverse supports disposed thereon, means for affixing said supports on said standards selectively in alternative positions therealong, means for elevating and lowering said supports in unison along said standards, locking means between said supports and said standards for locking said supports on said standards in said selected alternative positions, at least two elongated feed bars for supporting said rock drills with each end thereof resting on one of said transverse supports, and connecting means disposed on said supports adjacent said bars for affixing said bars thereon selectively in alternative positions parallel to said elongated underframe.

5. In a support apparatus of the character described for supporting movement and placement of rock drills and the like toward a working surface and for providing accessibility therefor in restricted working areas and having an elongated underframe, wheels disposed on said underframe for the movement and support thereof, and at least one vertical standard disposed substantially at each end of said underframe, the combination which comprises an elongated support disposed on each of said standards trasnversely of said underframe providing a substantially unobstructed working space between said standards and below said transverse supports disposed thereon, means for affixing said transverse supports on said standards selectively in alternative positions therealong, means for elevating and lowering both said supports in unison along said standards, locking means between said supports and said standards for locking said supports on said standards in said selected alternative positions, an elongated feed bar with each end thereof resting on one of said transverse supports, said bar having parallel guides extending on each side thereof the entire length thereof with a series of longitudinally spaced transverse abutments therealong, connecting means disposed on said supports adjacent said bar for affixing said bar thereon selectively in alternative positions transverse to said elongated underframe, a cradle slidably disposed on said bar for sliding movement therealong, a rock drill and pusher leg unit disposed in said cradle with the end of said pusher leg away from said rock drill positioned for engaging alternatively and selectively one of said transverse abutments on bar for displacing said cradle and said rock drill along said feed bar, and securing means disposed on said cradle for detachably securing said unit to said cradle.

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