June 12, 1956 V. H. NIXON 2,750,155

HYDRAULIC JIB ARM FOR DRILLING MACHINES

Filed Feb. 18, 1952 3 Sheets-Sheet 1

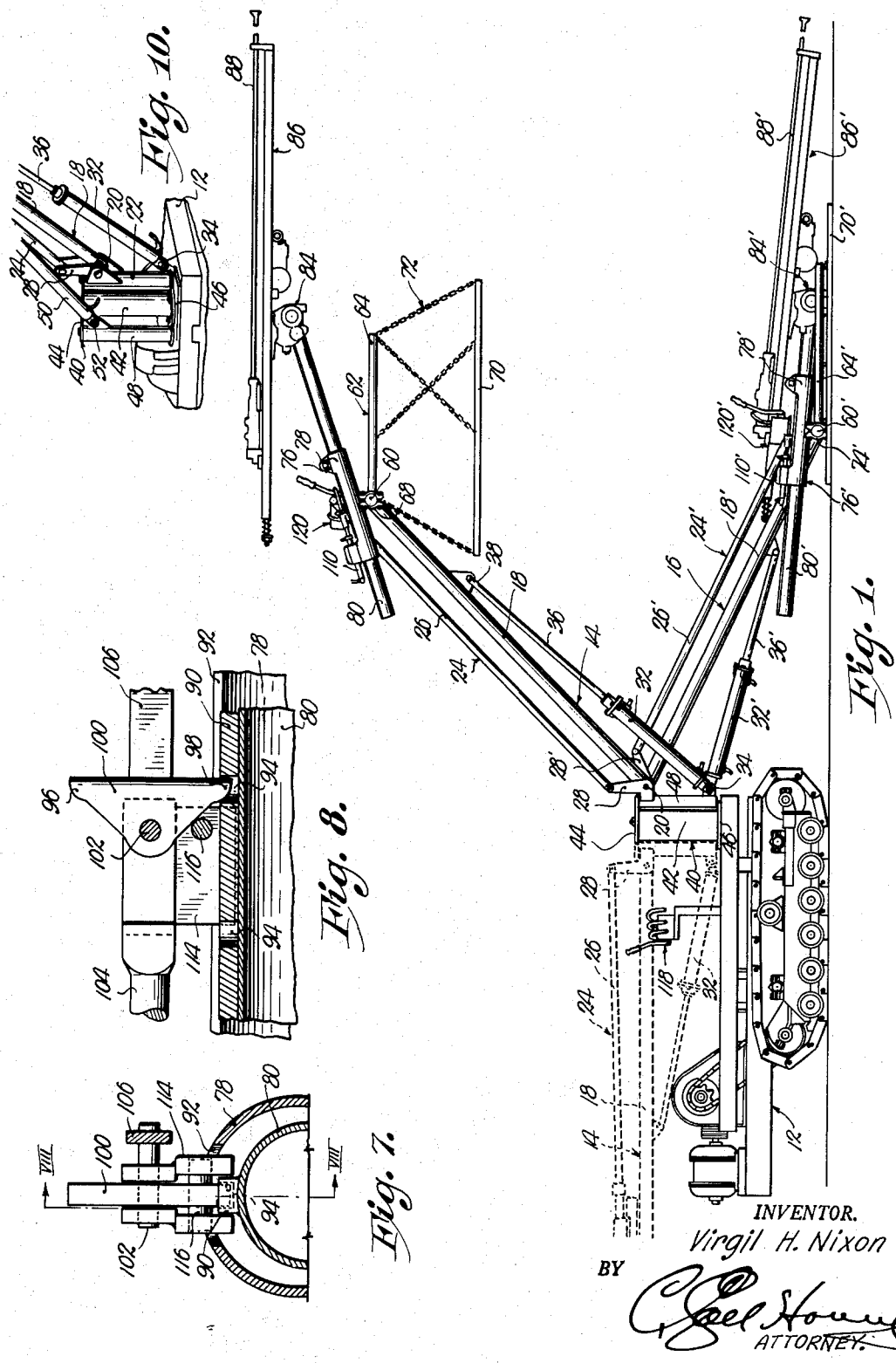


Fig. 1.

Fig. 10.

Fig. 8.

Fig. 7.

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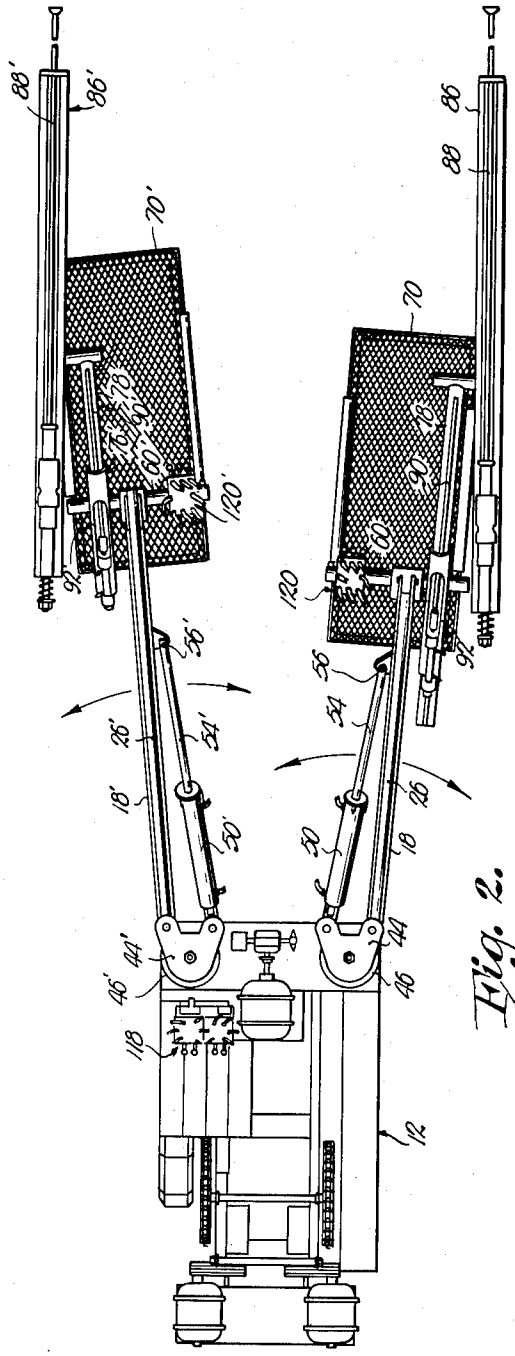


Fig. 2.

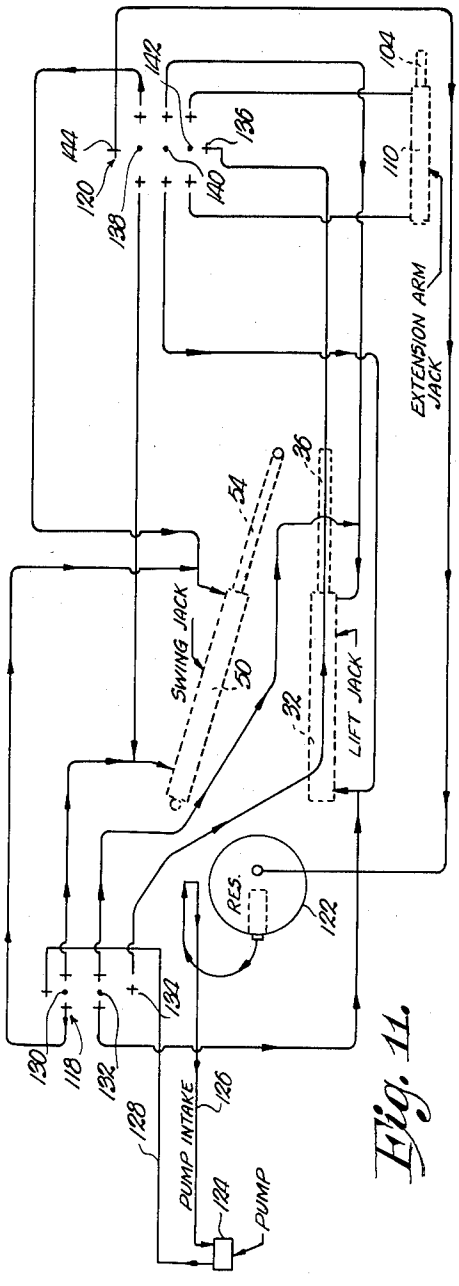


Fig. 11.

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HYDRAULIC JIB ARM FOR DRILLING MACHINES

Filed Feb. 18, 1952 3 Sheets-Sheet 3

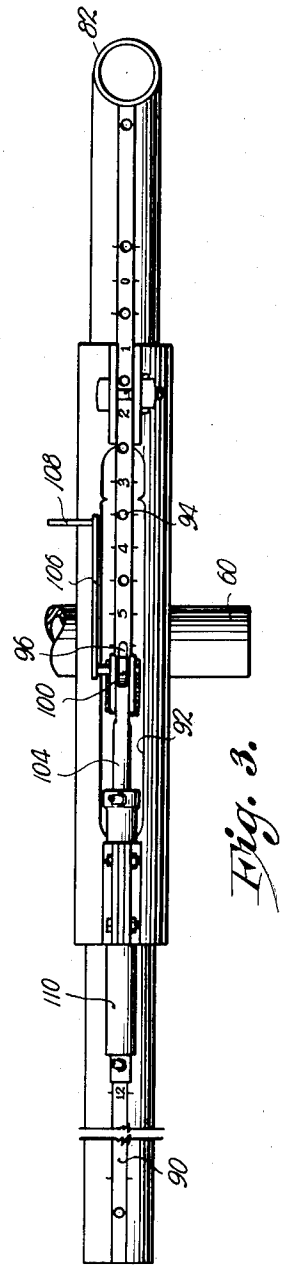


Fig. 3.

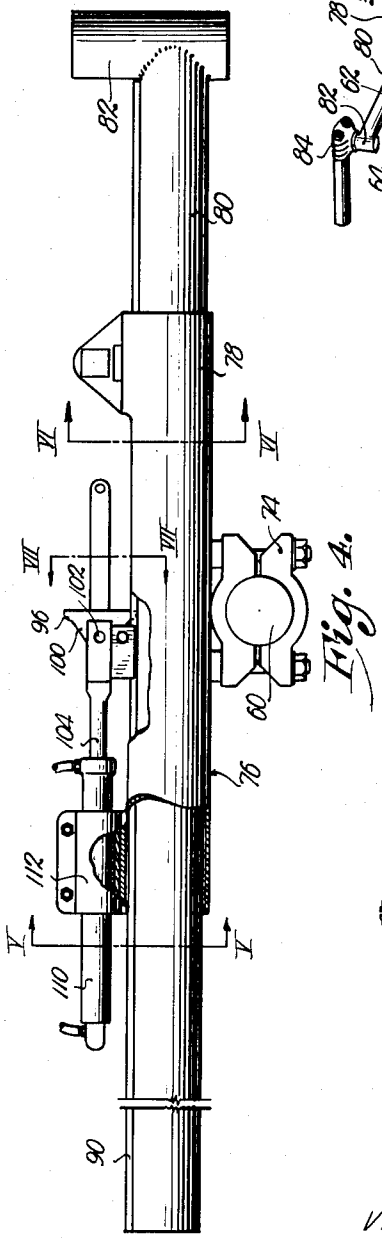


Fig. 4.

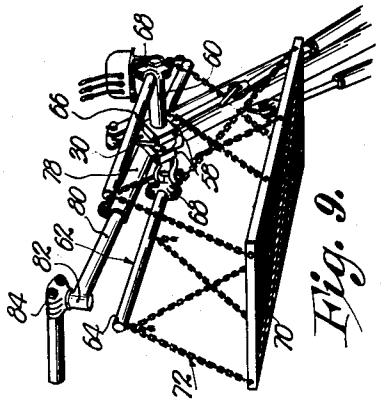


Fig. 9.

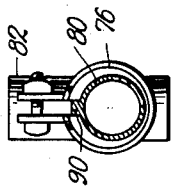


Fig. 6.

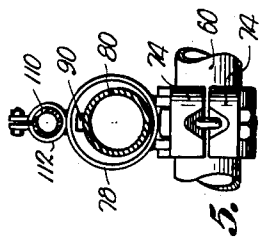


Fig. 5.

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2,750,155

HYDRAULIC JIB ARM FOR DRILLING MACHINES

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Application February 18, 1952, Serial No. 272,151

4 Claims. (Cl. 255—51)

This invention relates generally to mining equipment and has to do more specifically with mobile apparatus including boom-like jib arms that are highly maneuverable to facilitate the proper positioning of drills and other tools carried thereby and permitting therefore, the coverage of a relatively large area by the operator without need of frequent readjustment of the drill itself.

Equipment of this character, commonly referred to as a "Drill Jumbo," is normally used in underground mining and quarry operations to provide a portable means for mounting and transporting tools for drilling holes preparatory to shooting of ore or rock in the face of a mine or quarry. Machinery of this character therefore, must be highly flexible in order to handle various drilling problems that may be encountered and it is therefore, the primary object of this invention to provide a jib arm having an operator's platform thereon, together with a suitable drill and drill sash, the jib arm being controlled by such operator and movable to virtually any position that may be desired, all without effecting a predetermined positioning of the drill itself or the platform upon which the operator works.

Another important object hereof is to provide an assembly of this character whereby the jib arm thereof is capable of being raised or lowered within a vertical plane or swung within a horizontal plane in order to afford complete coverage of a predetermined area or face of the mine or quarry, thereby permitting accurate control and location of the holes to be drilled.

A further object of this invention is to provide a jib arm that may be maneuvered as just above set forth and having the drill, as well as the operator platform, mounted thereon in a manner to maintain a predetermined angularity in both as the jib arm itself is shifted in the two planes.

A still further object of this invention is the provision of novel mounting of the drill itself upon the jib arm permitting adjustment of the drill to various positions and including means for actuating the drill so far as extending or retracting the same toward and away from the face being drilled.

Other important objects will be more easily understood after perusal of the following specification, reference being had to the accompanying drawings, wherein:

Figure 1 is a side elevational view of a hydraulic jib arm for drilling machines made according to the present invention and illustrating a pair of such arms mounted on a crawler-type support and showing various positions thereof.

Fig. 2 is a top plan view thereof.

Fig. 3 is an enlarged, top plan view of the extension jack forming a part of each of the jib arms.

Fig. 4 is a side elevational view of the said jack, parts being broken away and in section for clearness.

Fig. 5 is a transverse, cross-sectional view taken on line V—V of Fig. 4.

Fig. 6 is a detailed, cross-sectional view taken on line VI—VI of Fig. 4.

Fig. 7 is a fragmentary, enlarged, detailed, cross-sectional view taken on line VII—VII of Fig. 4 looking in the direction of the arrows.

Fig. 8 is a fragmentary, detailed, cross-sectional view taken on line VIII—VIII of Fig. 7.

Fig. 9 is a perspective view of the uppermost end of one jib arm.

Fig. 10 is a perspective view of the lowermost end of a jib arm assembly; and

Fig. 11 is a schematic flow chart illustrating the hydraulic hook-up of the assembly.

It is obvious that the machine forming the subject matter hereof may be rendered portable or mobile by mounting the same on any suitable chassis and accordingly, the crawler-type of support shown in Figs. 1 and 2 and broadly designated by the numeral **12**, is for purposes of illustration only.

It is further apparent that while two jib arms or boom-like structures are shown in Figs. 1 and 2 of the drawings and mounted upon the mobile support **12**, one or more of such assemblies designated herein by the numerals **14** and **16** respectively, may be provided. Accordingly, since the component parts of the two jib arm assemblies **14** and **16** are identical, the designated numerals hereinafter used and referring to assembly **16** will each be marked with a (').

Each assembly **14—16** includes an elongated boom **18** pivotally secured at its lowermost end as at **20** on an upright standard **22** adjacent the uppermost end of the latter for swinging movement on a horizontal axis.

Linkage, broadly designated by the numeral **24**, includes an elongated rod **26** having links **28** and **30** pivotally secured to the uppermost and lowermost ends thereof respectively. The lowermost link **28** is in turn pivotally secured as at **20** to the standard **22**.

Means for imparting swinging movement to the boom **18** on horizontal axis **20**, constitutes a hydraulic extensible device having a cylinder **32** pivotally secured at its lowermost end as at **34** to the standard **22** adjacent the lowermost end of the latter for swinging movement on a horizontal axis parallel with the axis **20**. Cylinder **32** is provided with a reciprocable piston **36** having the outermost end thereof pivotally joined as at **38** to the boom **18** intermediate the ends of the latter for swinging movement relative to boom **18** on a horizontal axis.

A turntable assembly broadly designated by the numeral **40**, and including the standard **22**, has a hub **42** pivotally secured to the chassis **12** and having upper and lower plates **44** and **46** respectively that are swingable about the vertical, longitudinal axis of the elongated upright hub **42**. Standard **22**, as well as a second standard **48** extending between the plates **44** and **46**, are not only rotatable on their own vertical axes with respect to the plates **44** and **46**, but are capable of revolving together as a unit with the plates **44** and **46** about the aforesaid vertical axis of the hub **42**.

Means for swinging the boom **18** and accordingly, its linkage **24**, its raising and lowering means **32—36**, as well as the standard **22** and all component parts mounted on the uppermost end of the boom **18** hereinafter to be set forth, includes a hydraulic cylinder **50** pivotally joined to the rotatable standard **48** as at **52**. Cylinder **50** is provided with a reciprocable piston stem **54** having the outermost end thereof pivotally joined to the boom **18** as at **56**.

Any suitable means (not shown) may be provided to swing the entire unit **14** about the vertical axis of hub **42** to and from the position shown for instance by dotted lines in Fig. 1 of the drawings. Extension and retraction of the piston stem **36** raises and lowers the boom **18** with pivotal action taking place at **20**, **34**, **38** and **52**. Swinging movement is imparted to the boom **18** on the

vertical axis of standard 22 by extension and retraction of piston stem 54, pivotal action taking place in standards 22 and 48 and at 56.

Boom 18 has a pair of spaced pivot blocks or bearings 58 at the uppermost end thereof embracing the link 30 and pivotally receiving a bight or cross arm 60 forming a part of a platform supporting frame 62 that is additionally provided with a pair of parallel legs 64 and 66. Legs 64 and 66 are adjustably secured to the cross arm 60 at the outermost ends of the latter by means of releasable clamps 68. Platform 70 is suspended from the arms 64 and 66 by means of chains 72. Link 30, which as aforementioned, is pivotally secured to the uppermost end of rod 26, is affixed rigidly to the cross arm 60 midway between the ends thereof and between the bearing blocks 58. A releasable clamp 74 joined with the cross arm 60 between the arm 64 and the proximal bearing block 58, carries an extensible jack assembly 76 that in turn includes an elongated tubular support 78 rigidly secured to the clamp 74.

An elongated member 80 is telescoped within the support 78 for reciprocable movement on the longitudinal axis of the member 80. Member 80 has a head 82 on one end thereof for receiving a swivel 84 adapted to adjustably support a sash 86 for a drill 88. Swivel 84 may be of any suitable character adapted to permit swinging movement of the sash 86 and accordingly, the drill 88 thereon throughout a plurality of axes. The member 80 is provided with an elongated rib 90 calibrated as indicated in Fig. 3 of the drawings and registering with an elongated slot 92 formed in the tubular support 78, rib 90 having a plurality of spaced-apart holes 94 extending throughout the length thereof.

Holes 94 are adapted to receive opposed ears 96 or 98 forming a part of a triangular-shaped dog 100. A pin 102 pivotally secures the dog 100 to a reciprocable piston stem 104 and also mounts a counter-weight 106 having a handle 108. Any suitable means may be provided for reciprocating the stem 104 and in the instance illustrated, there is provided a hydraulic cylinder 110 mounted on the support 78 by means of a clamping bracket 112. A yoke 114 on the stem 104 extends through the slot 92 in partial embracing relationship to the rib 90 to hold the member 80 against rotation on its longitudinal axis and a cross pin 116 carried by the yoke 114, limits the extent of swinging movement of the dog 100 in either direction on pin 102.

Hydraulic valve control units 118 and 120 provided on the chassis 12 and on the cross-arm 60 respectively, permit maneuvering of the boom 18 either from the chassis 12 or from the platform 70 and as shown in Fig. 11 of the drawings, the control unit 120 also includes a valve for operating the extension arm jack that includes cylinder 110 and piston stem 104. The hydraulic assembly includes a reservoir 122 for hydraulic fluid as well as a pump 124 having intake line 126 connected with reservoir 122 and pressure line 128 joined with the control unit 118. Manual valve 130 forming a part of unit 118, controls the flow of hydraulic pressure from pump 124 to opposite ends of the cylinder 50, whereas valve 132 of unit 118 controls the flow of hydraulic fluid from pump 124 to opposite ends of the cylinder 32. Opening of valves 134 and 136 of units 118 and 120 respectively permits flow of hydraulic fluid under pressure from the pump 124 to the unit 120. Valves 138 and 140 for the unit 120 correspond to valves 130 and 132 respectively of the unit 118 and accordingly, control the piston stems 54 and 36 respectively.

A valve 142 in unit 120 controls the flow of fluid to opposite ends of the cylinder 110 and opening of a valve 144 in unit 120, permits return flow of fluid from the unit 120 to the reservoir 122.

In operation, the angularity of the sash 86 with respect to the horizontal and vertical, may be preset by adjustment of the swivel 84 and/or the bracket 74 for support 78 on the cross arm 60, it being noted in Fig. 1 of the drawings that the angularities of sash 86 and of the member 80 is different from the angularity of sash 86' and the member 80'. Irrespective of such adjustment, these angularities will remain the same as the boom 18 is raised and lowered and as the same is swung on the vertical axis of standard 22 or the vertical axis of hub 42. Likewise, the platform 70 for the operator will always remain horizontal regardless of its height. Such operation is the result of the connection between the cross arm 60 and the standard 22 afforded by linkage 24. In other words, as boom 18 is swung on the horizontal axis 20, the linkage 24 will impart corresponding rotative movement to the cross arm 60, thereby maintaining the platform 70 horizontal and maintaining the longitudinal axis of the member 80 as well as the sash 86 in their pre-selected positions.

The operator standing upon the platform 70 has full control of the boom 18 as well as the extension arm jack 110—104 through the control unit 120 mounted upon the horizontal cross-arm 60.

When hydraulic pressure is directed to one end of the cylinder 110 by operation of valve 136, stem 104 will be forced toward the head 82 and by virtue of ear 98 being disposed within one of the holes 94, the member 80 will be extended. When valve 136 is manipulated to cause fluid to be directed to the opposite end of the cylinder 110, the stem 104 will be retracted, whereupon dog 100 will swing on pin 102 away from the stop 116, moving ear 98 out of hole 94. On the next actuation of the stem 104, the ear 98 will be forced into another hole 94 by virtue of the counter-weight 106 on the pin 102.

In order to retract member 80, it is but necessary for the operator on platform 70 to grasp the handle 108, swing the counter-weight 106, 180 degrees and thereby rendering the ear 96 effective with respect to the holes 94. Cross-pin 116 serves as a limit of swinging movement of the dog 100 even during the operation of the assembly 76 in retracting the member 80 and accordingly, sash 86 and drill 88.

It can now be appreciated that a relatively large face within the mine or quarry can be easily drilled at any angularity that may be desired without the necessity of the operator moving from the platform 70 since virtually all controls for the machine are accessible to his reach. The entire unit is highly flexible and maneuverable in many planes and on a number of swinging pivotal axes. It is extremely important to note that as the boom 18 is raised and lowered and/or swung on a vertical axis, the angularity of the longitudinal axis of the drill 88 will remain the same. Accordingly, as the tool 88 is moved from point to point on the face being drilled by actuation of the boom 18, it is unnecessary for the operator on platform 70 to change the angularity of sash 86 either within the swivel 84 or on the cross-arm 60.

While a particular use of the assembly hereof has been herein specified, it is to be appreciated that machines of this character may well have other uses and accordingly, it is desired to be limited only by the spirit of the invention as defined by the scope of the appended claims.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. In apparatus of the kind described, a support; an elongated boom mounted at one end thereof on the support for swinging movement on a horizontal axis; an elongated cross-arm having a horizontal, longitudinal axis and mounted on the opposite end of the boom for rotation on said axis; a tool mount secured directly to the cross arm for rotation therewith; and linkage pivotally joining the cross arm and the support for rotating the cross arm and thereby maintaining the tool mount in a predetermined position relative to the horizontal as the boom is swung.

2. In apparatus of the kind described, a support; an

elongated boom mounted at one end thereof on the support for swinging movement on a horizontal axis; a U-shaped frame having an elongated bight provided with a horizontal, longitudinal axis and mounted on the opposite end of the boom for rotation on said axis; a horizontal platform suspended from the arms of said frame, said arms being rigid to the bight for rotation therewith; a tool mount secured directly to said bight for rotation therewith; and linkage joining said bight and the support for rotating the cross arm and thereby maintaining the platform horizontal and the tool mount in a predetermined position relative to the horizontal as the boom is swung.

3. In apparatus of the kind described, a support; an elongated boom mounted at one end thereof on the support for swinging movement on a horizontal axis; an elongated cross-arm having a horizontal, longitudinal axis and mounted on the opposite end of the boom for rotation on said axis; a tool mount secured directly to the cross arm for rotation therewith; linkage pivotally joining the cross arm and the support for rotating the cross arm and thereby maintaining the tool mount in a predetermined position relative to the horizontal as the boom is swung; extensible means interconnecting the boom and the support for swinging the boom; means mounting the support for rotation of the support, the boom, and the linkage and the extensible means as a unit on a vertical axis; a standard; extensible means interconnecting the standard and the boom for rotating the latter on said vertical axis; and means mounting the

support and the standard for rotation together as a unit on a common vertical axis.

4. In apparatus of the kind described, structure mounted for rotation on a vertical axis; a pair of standards, each mounted on the structure for rotation on a vertical axis; a boom secured to one of the standards for swinging movement on a horizontal axis; an arm pivotally secured to the boom; a tool mount on the arm; linkage pivotally joining the arm and said one standard for maintaining the tool mount in a predetermined position relative to the horizontal as the boom is swung relative to the one standard; extensible means pivotally interconnecting the boom and the one standard for swinging the boom relative to the standard; and extensible means pivotally joining the boom and the other standard for swinging the one standard and the boom thereon relative to the structure.

References Cited in the file of this patent

UNITED STATES PATENTS

1,564,642	Symons	Dec. 8, 1925
2,060,814	Lewis	Nov. 17, 1936
2,261,483	Nickels	Nov. 4, 1941
2,444,705	Keefer	July 6, 1948
2,468,484	Clark	Apr. 26, 1949
2,500,932	Curtis et al.	Mar. 21, 1950
2,571,861	Glenn	Oct. 16, 1951
2,581,667	Joy	Jan. 8, 1952
2,613,061	Hurd	Oct. 7, 1952