

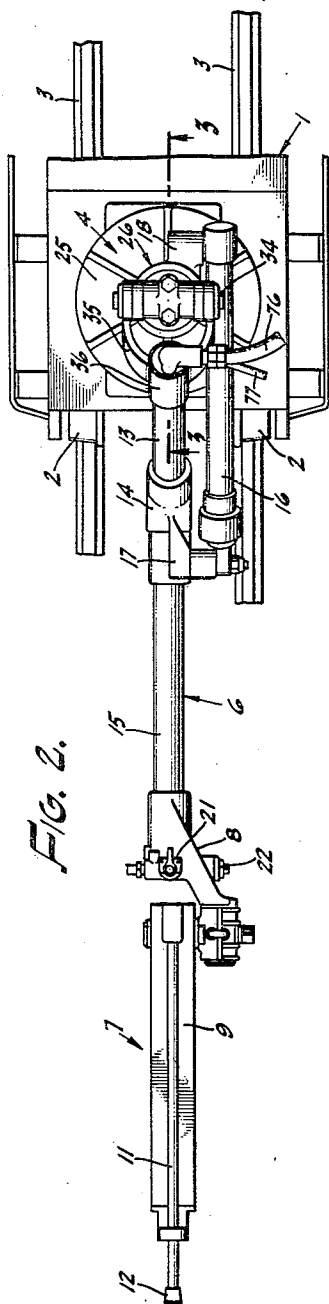
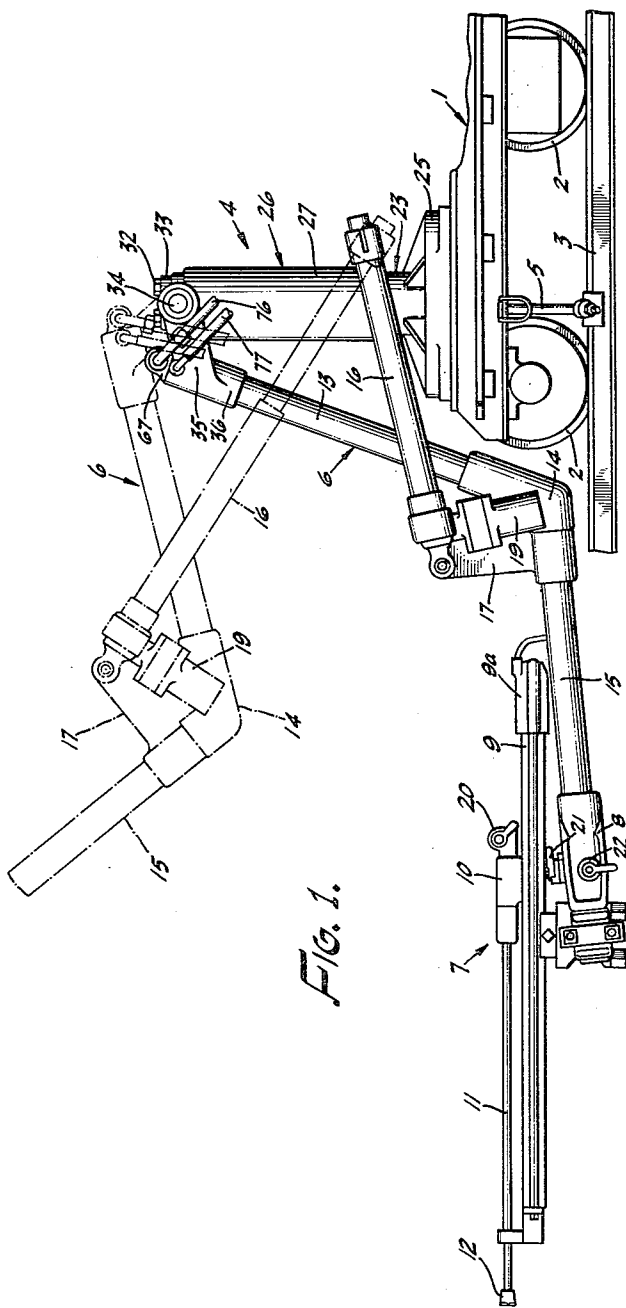
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G. H. FUEHRER
DRILLING APPARATUS

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4 Sheets-Sheet 1



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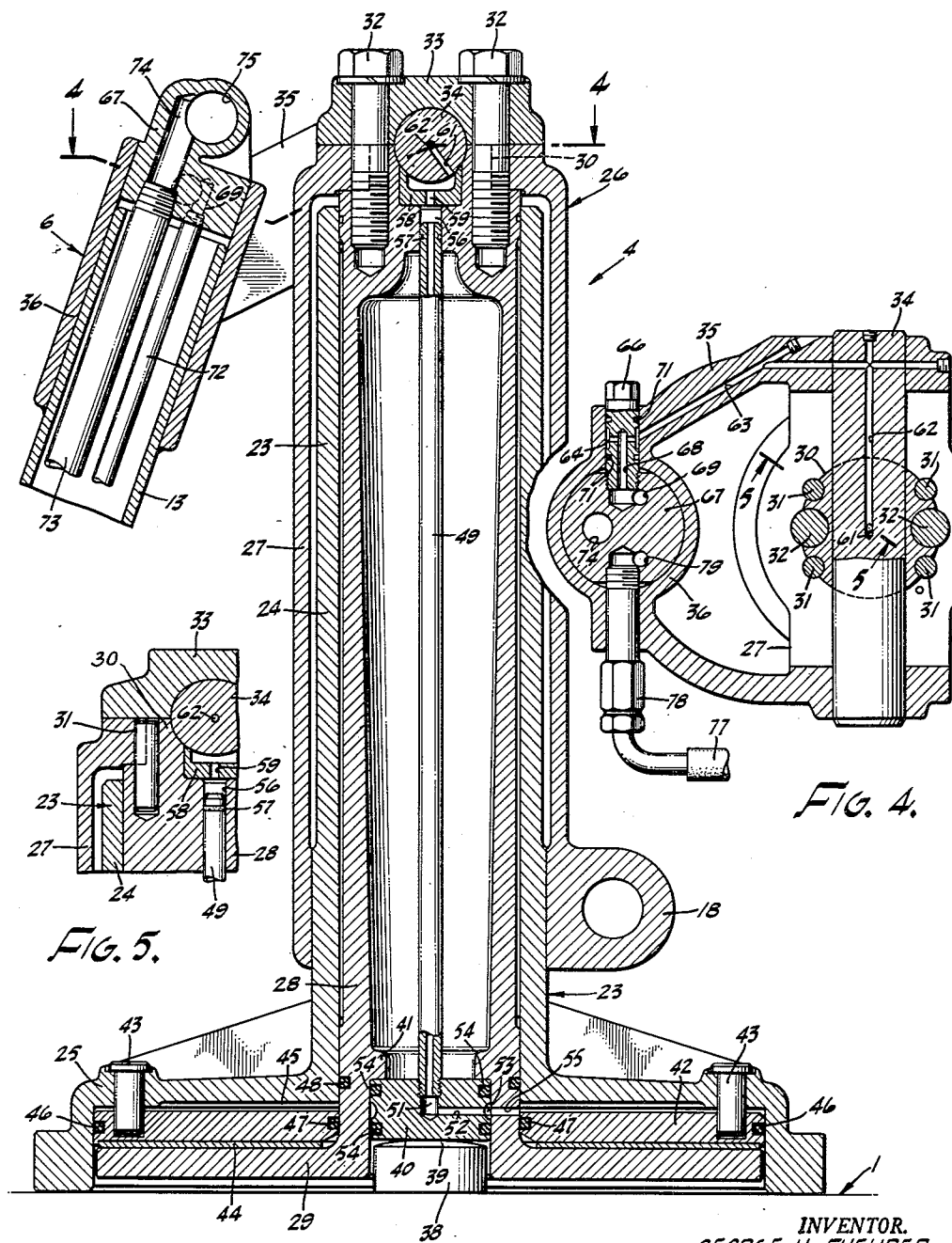


FIG. 5.

FIG. 4.

FIG. 3.

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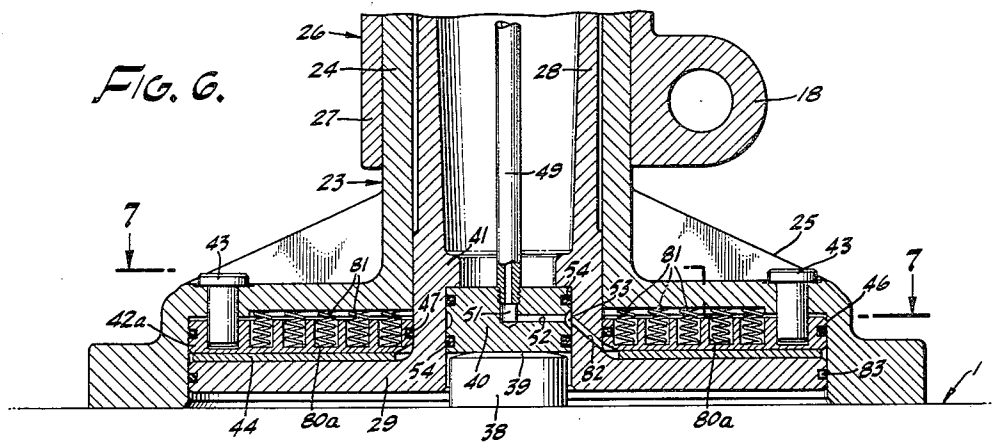
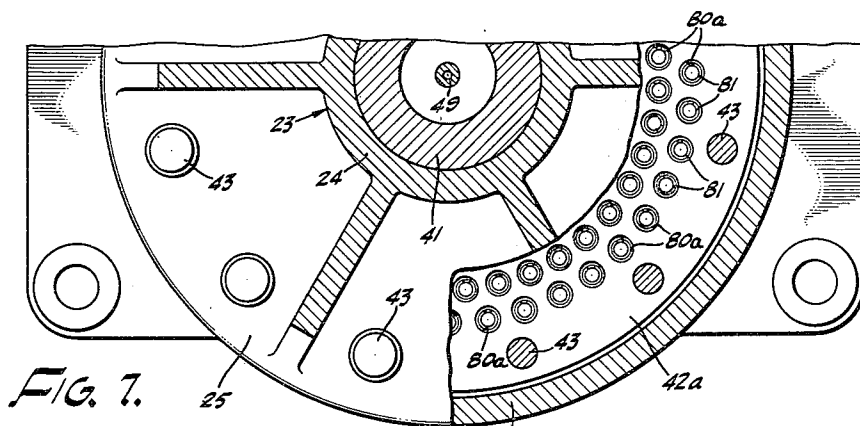
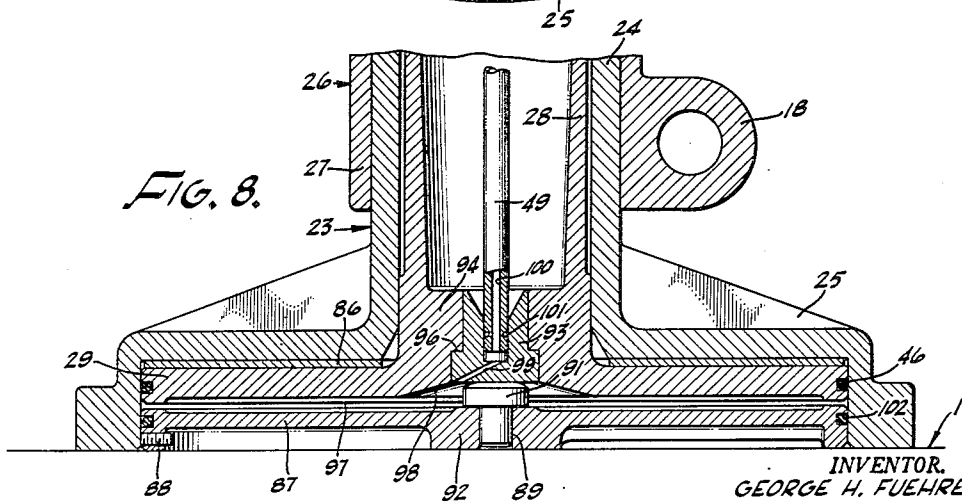
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4 Sheets-Sheet 3



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2,777,671

DRILLING APPARATUS

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17 Claims. (Cl. 255—51)

The present invention relates to portable drilling apparatus, and more particularly to a boom type rock drill support the boom of which is capable of being pivoted to a variety of drill locating positions and locked in such positions by a control located adjacent the drill itself.

In mining and tunneling operations it is necessary to provide means for maintaining the heavy cutting drill mechanism in adjusted positions adjacent the tunnel face being operated upon. This may be accomplished by providing a manually movable frame structure, but the great amount of time lost in setting up and moving such structure has resulted in recent years in the use of an easily movable apparatus known as a "boom jumbo" or a "drill jumbo." Such an apparatus usually comprises a truck movable on a trackway and incorporating a forwardly extending arm or boom adapted at its forward end to support the drilling mechanism, which is conventionally of the drifter type incorporating means to feed a drill bit into the rock. In order to provide for the ready positioning of the drill at any part of the surface to be drilled, the boom is normally pivotable both about a horizontal and vertical axis, and the drill mounting at the boom end is likewise pivotable about horizontal and vertical axes. Since it is necessary for efficiency that the operator of the drill stand in a position closely adjacent the drill itself, instead of adjacent the truck upon which the boom is mounted, it is highly desirable that all control devices be located at the drill instead of on the truck. It is also necessary to the proper operation of the apparatus that the boom be rigidly locked or braked at each desired position, and that the drill be disposed in a forwardly extending position, longitudinally of the tunnel, regardless of the horizontally or vertically pivoted position of the boom.

With an appreciation of the above problems characterizing the field of boom jumbos, it is an object of the present invention to provide a new and improved means for effecting locking and unlocking of the boom, by control means located at the drill itself to render unnecessary any movement by the operator of the apparatus back to the truck on which the boom is mounted.

Another object of the invention is to provide a remote control boom locking means which is completely disposed within the boom itself or within the pedestal therefor, so that all exteriorly located hoses and conduits between the locking means and its control are eliminated and operation of the apparatus improved.

Another object of the invention is to provide a fluid operated locking means disposed within the base of the pedestal for the boom, said means being constructed to provide an extremely large braking or locking surface when in locked condition yet to permit free swinging of the boom when in unlocked condition.

Another object of the invention is to provide a relatively large horizontally disposed locking or braking disc located in the base of the pedestal for the boom and encircling a small bearing surface, the latter being adapted

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to facilitate pivotal movement of the boom when the locking surfaces are in disengaged condition.

A further object of the invention is to provide fluid conduits disposed entirely within the pedestal and boom of a boom jumbo and serving to interconnect control valve means located at the forward end of the boom and a locking mechanism located in the base of the pedestal, said fluid conduits consisting of rigid metal pipes instead of the conventional rubber hoses.

An additional object of the invention is to provide a boom having a novel knee-type shape and constructed so that its forward portion is substantially horizontal when the boom is in an extreme vertically pivoted position, thereby permitting the drill at the forward end of the boom to be at all times maintained in a forwardly extending drilling position regardless of the portion of the tunnel face to which the boom is pivoted.

These and other more specific objects will appear upon a reading of the following specification and claims and upon considering in connection therewith the attached drawings to which they relate.

Referring now to the attached drawings in which several embodiments of the invention are illustrated:

Figure 1 is a side elevational view showing the boom jumbo of the invention, in both depressed and elevated conditions;

Figure 2 is a top plan view of the boom jumbo illustrated in Figure 1;

Figure 3 is a vertical sectional view taken at line 3—3 of Figure 2 and showing the improved means for locking the boom against pivoting about the vertical axis therefor;

Figure 4 is a generally horizontal sectional view taken along line 4—4 of Figure 3;

Figure 5 is a fragmentary vertical sectional view along line 5—5 of Figure 4;

Figure 6 is a partial vertical section of the pedestal base, showing a modified form of the boom locking apparatus of the invention

Figure 7 is a horizontal section taken along line 7—7 of Figure 6;

Figure 8 is a vertical section generally corresponding to Figure 6 but showing a second modified form of the locking apparatus of the invention;

Figure 9 is similar to Figure 8 and illustrates a third modified form of the locking apparatus; and

Figure 10 is a line diagram schematically illustrating the air conduit and valve means connecting the various components of the drilling apparatus.

Referring to the drawings and particularly to Figures 1 and 2, the rock drill supporting and transporting apparatus, referred to as a boom jumbo, is seen to include a frame or truck member 1 having wheels 2 adapted to ride along a trackway 3 laid on the floor of the tunnel being constructed. Truck 1 is provided at its forward end with a boom supporting and pivoting structure 4, to be described in detail subsequently, and at its rear end usually carries a vertically extending jack mechanism, not shown, adapted to engage the tunnel roof to lock the truck against forward or backward movement during the drilling operation. The truck 1 of the boom jumbo is also usually provided with suitable track clamps 5, if desired, with brake shoes, also not shown, to provide additional means for rigidly locating the truck in each operating position.

The boom mounting structure 4 is constructed to permit pivoting of the boom 6 of the boom jumbo about a vertical axis, and is also adapted at its upper end to permit pivoting of the boom 6 about a horizontal axis. Accordingly, the drill mechanism 7 which is disposed at the forward end of boom 6 may be located at any desired vertical or horizontal position within the operative range, by merely pivoting boom 6 either horizontally or vertically about the mounting 4. It follows that it is only

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necessary to reposition the truck 1 after the entire tunnel face has been operated upon. To provide for the correct aligning of the drill perpendicularly of the face to be bored, a suitable universal tool mounting 8 is provided at the forward end of boom 6 and permits pivoting of the drill mechanism 7 about both horizontal and vertical axes at the forward boom end. Tool mounting 8 also serves to space drill mechanism 7 above the boom and thus permit free pivoting of the drill about a vertical axis as will subsequently be described.

The drilling mechanism 7, which may be located in a desired position by the horizontal and vertical pivoting of the boom 6 upon its supporting mechanism and of the drilling mechanism upon the universal tool mounting 8, is of the conventional drifter type incorporating a drifter guide shell 9 connected at its mid-portion to mounting 8. Guide shell 9 has a suitable air motor 9a mounted at its inner end and adapted to feed a rock drill motor 10 in both forward and reverse directions. The drill motor 10 actuates a drill steel 11 having a drill bit 12 located at its forward end for operation upon the rock to be bored. The drill mechanism 7, and the universal mounting 8, may be of any suitable type and design and accordingly are not described in detail.

It is a feature of the present invention that boom 6 is not of the conventional straight type but instead incorporates a downwardly extending tubular portion 13 which is connected by a rigid knee member 14 with a tubular forward portion 15. The angle of the knee member 14 is such that the forward portion 15 of boom 6 is generally horizontal when the rear portion 13 thereof is in its innermost pivoted position. Because of this generally horizontal positioning of the boom portion 15 when boom 6 is lowered as shown in Figure 1, and because of the spacing of the drill mechanism above boom portion 15, the drill mechanism 7 may be freely pivoted about the vertical axis in universal mount 8 without engagement of the rear end of drifter guide shell 9 with the boom member 15. Accordingly, the boom 6 may be freely raised and lowered or manually swung from one side of the tunnel to the other, and the drill mechanism 7 may be correspondingly pivoted on its mounting 8 so as to be horizontal and longitudinal of the tunnel as is necessary to the drilling operation. It is thus unnecessary to provide two booms and two drills, one for each side of the tunnel face being operated upon, since the single boom and drill of the present invention may be readily moved to either side of the tunnel regardless of the elevation of the drill. Also it is unnecessary to shift the drill from one side to the other of the boom in order to operate at the extreme end positions along the sides of the tunnel as is the case when the drill mechanism is located at the side instead of above the boom. Such side mounting of the drill mechanism is unnecessary in the present construction because of the substantially horizontal extension of the boom portion 15.

The mechanism for pivoting boom 6 about its horizontal axis at the top of support 4 in order to elevate and lower the drill mechanism 7, comprises an actuating arm 16 pivotally connected at its forward end to an upwardly extending rigid bracket 17 on knee member 14, and at its rear end to a rigid bracket 18 (Figures 3, 6, 8 and 9) disposed at the lower rear portion of the boom mount 4. Actuating arm 16 may be of any suitable type but preferably comprises two telescoping tubular members adapted to be telescoped inwardly and outwardly upon relative rotation of an interiorly positioned nut and feed screw, both unshown. Rotation of the nut is effected by a suitable air motor 19 which depends from the forward end of the actuating arm. Air motor 19 is preferably of a vane type, and is operated in a forward direction by directing air against one surface of the respective vanes, not shown, and in the reverse direction by directing air against the opposite vane surfaces. Referring particularly to Figure 1, operation of the air motor in a forward

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direction extends the feed screw and thereby lengthens actuating arm 16 to pivot boom 6 upwardly to the elevated position illustrated in phantom. When, on the other hand, the air motor 19 is operated in a reverse direction to shorten actuating arm 16, the boom 6 is pivoted downwardly and the drill mechanism 7 lowered to its lower position (as shown in solid lines) or to any desired intermediate position.

It is customary in the drilling of tunnels and in other mining operations that the operator of the boom or drill jumbo stand adjacent the drill mechanism 7 rather than next to or on the truck 1. This is because the forward position permits him more accurately to position and operate the drill and, without moving, manipulate the universal mount and drill support 8 and pivot the boom 6 about its vertical axis. According to the present invention, the operator of the boom jumbo may perform all positioning operations while at his station adjacent the drill 7, without the necessity of taking time to walk back to the truck 1 except when it is desired to move the truck forwardly after an entire face has been operated upon. Accordingly, suitable control and shutoff valves 20 and 21 are provided at the forward end of the boom to control the operation of the drill mechanism 7 itself, and a boom control valve 22 is located at one side of drill mount 8 for the purpose of controlling the upward and downward pivot of the boom 6 and the locking of the boom 6 about the vertical axis therefor. The improved means for accomplishing the latter purpose, that is to say the means for locking the boom 6 against swinging about its vertical axis in order to maintain rigidly the drill mechanism 7 in the correct lateral position, will next be described.

Referring particularly to Figures 3, 4 and 5, the boom mounting 4 comprises a vertical pedestal 23 having a tubular body portion 24 and a hollow webbed base 25 which is rigidly and immovably secured to the floor of truck 1. Base 25 is relatively large and houses the braking or locking means which secures the boom against pivoting about a vertical axis. Mounted for pivotal and longitudinal movement on pedestal 23 is a cylindrical column or frame member 26 which includes an outer sleeve portion 27 and an inner cylindrical column portion 28. Tubular column portion 28, which is suitably journaled on the inner surface of pedestal body 24, extends downwardly into the hollow base 25 of pedestal 23 and terminates in a large horizontal flange 29 for locking purposes as will be described. The outer sleeve 27 of column 26 is necked down at its upper end to fit over a reduced cylindrical extension 30 on the upper and closed end of column member 28.

The outer and inner portions 27 and 28 of column or frame member 26 are secured fixedly against relative rotation by four key pins 31, shown in Figure 4, disposed in bores at the junction of the necked down upper end of sleeve 27 and the cylindrical extension 30 of inner column 28. In addition to the key pins 31, a pair of large vertical bolts 32 are similarly disposed in the upper end of column 26 both to secure column members 27 and 28 together and also to secure in place at the top of column 26 an end cap 33 in position over a horizontally disposed trunnion member 34 which serves as a pivot for the inner end of boom 6.

The trunnion 34 is freely rotatable in its seat formed by half round grooves in cylindrical extension 30 and in end cap 33. It is fixedly seated at its outer ends in the spaced arms of a yoke 35 which is formed centrally with a tubular forward sleeve portion 36, the latter being inclined downwardly and rigidly secured to the upper end of tubular portion 13 of boom 6.

It is to be noted that the boom 6, yoke 35, end cap 33, trunnion 34, and frame member 26, including the parts 27, 28 and 29 of the latter, are rotatable as a unit about a vertical axis comprising the central axis of the stationary pedestal 23. In order to reduce friction opposing rotation of the boom and its supporting column 26 in the ped-

estal 23 so that the operator may easily pivot the boom in order to adjust the drill mechanism 7 laterally, a bearing cylinder 38 is mounted on the floor of truck 1 centrally of flange 29 at the bottom of inner column member 28. Bearing cylinder 38 has a rounded upper surface 39 adapted to support a second bearing cylinder 40 which in turn bears upwardly against a reduced or shoulder portion 41 at the lower end of column member 28 in which it is fixed. The flanged lower end 29 of inner column portion 28 is not in engagement with the floor of truck 1, but instead is spaced a slight distance above the same, so that the entire weight of the boom 6 and rotatable column or frame member 26 is borne by bearing cylinder 38 and the resistance to pivotal movement is materially reduced.

To accomplish the locking of flange 29 of rotatable boom supporting column 26 to the stationary base 25 of pedestal 23, a brake or locking disc 42 is mounted above flange 29 in the hollow pedestal base 25. Disc 42 is vertically displaceable, that is, is movable longitudinally of the pedestal. It is, however, held against rotation by a plurality of arcuately spaced pins 43 which extend downwardly through pedestal base 25 and loosely into receiving apertures in the disc. When the brake disc 42 is urged downwardly against a brake facing 44 on the upper surface of flange 29, the latter and its associated column, together with boom supported thereon are rigidly locked against any rotational movement or swinging.

Movement of brake disc 42 to effect locking action is accomplished by introducing air into a chamber 45 in pedestal base 25 immediately above the brake disc. The chamber 45 is sealed against the escape of air by mounting suitable O-rings 46 and 47 at the outer and inner edges of brake disc 42, and by providing a third O-ring 48 between column portion 28 and pedestal base 25. Because of the large braking surface available through the placing of the locking means in the base of pedestal 23, the locking action is positive and the maintenance of the boom and the drill means 7 in any desired position is assured.

The introduction of air into chamber 45 to actuate brake disc 42 and effect locking action is controlled by the valve 22 located at the forward end of boom 6. This is accomplished, despite the relatively great distance between the base of pedestal 23 and the boom control valve 22, in the absence of external hoses along the boom length which would be subject to wear and which might obstruct the movement of the operator.

The internal air system for accomplishing such remote control of the braking or locking means includes a pipe 49 mounted axially of column member 28 of column 26 and threaded at its lower end into a vertical bore 51 in upper bearing block 40. Bore 51 communicates through a radial passage 52 with a circumferential groove 53 in the outer surface of bearing block 40. The groove 53, which is maintained fluidtight by upper and lower O-rings 54 at the outer surface of bearing cylinder 40, conveys air through a port 55 in inner column member 28 regardless of the rotated position of the bearing cylinder. The port 55 communicates with chamber 45 above brake disc 42. Air under pressure into chamber 45 introduced from vertical pipe member 49 operates as described to shift brake disc 42 downwardly and create a braking action.

The upper end of air pipe 49 extends into a vertical duct 56 in the closed upper end of inner column member 28. An O-ring 57 encircling the end of pipe 49 seals the pipe air in passage 56 while permitting limited adjustment. Passage 56 communicates with the interior of a cup member 58 through a port 59 in the bottom thereof. Cup member 58, which is disposed in a recess in the reduced cylindrical extension 30 of inner column member 28, may receive air from a radial passage 61 in trunnion 34 regardless of the rotated position of the trunnion and boom.

Referring particularly to Figures 3, 4 and 5, the passage 61 is seen to extend inwardly to the axis of trunnion 34 and there communicates with an axial bore 62 which in

turn communicates with a passage 63 extending within one arm of the yoke 35. As shown in Figure 4, passage 63 terminates at its forward end in an annular groove 64 in the outer surface of a plug member 66. The plug member 66, which provides means for the bleeding of air when desired, extends radially through the sleeve portion 36 of yoke 35 and into a cylindrical end member 67 mounted in sleeve 36 adjacent the upper end of the downwardly extending tubular portion 13 of boom 6. Plug member 66 is provided with an axial bore 68 which communicates both with the annular groove 64 and with a longitudinal bore 69 extending downwardly through the end member 67. As in the case of the cylindrical bearing member 40 in the base of the pedestal, the annular groove 64 in plug 66 is rendered fluidtight by the presence of suitable O-rings 71 upon its opposite sides.

As shown in Figure 3, longitudinal bore 69 in end member 67 is threaded at its outer end to receive the end of a metal pipe 72 connected to the boom control valve 22. The supply of air to control valve 22 passes through a second and larger pipe 73 which is likewise threaded into end member 67 and communicates through a longitudinal bore 74 and transverse bore 75 therein with an air supply hose 76, shown in Figures 1 and 2. In addition to supply hose 76, a small water hose 77 (Figures 1, 2 and 4) may be connected opposite plug 66 to supply water to the drill mechanism 7. The water supply connection is preferably a fitting 78 inserted into end member 67 and communicating with a longitudinal bore 79 therein, the latter corresponding to the bore 69 for supply of air to the braking mechanism.

Referring next to Figure 10 in which the air supply and valve system embodied in the invention as heretofore described is schematically illustrated, the air supply hose 76 is seen to be connected to a suitable source of air pressure, such as a motor driven compressor. Air is thus supplied through hose 76 to the pipe 73. Pipe 73 is disposed entirely within boom 6 and conducts air not only to the boom control valve 22 but also, by means of a suitable parallel connection, to the shut off valve 21 of the air supply system for drill 7. Boom control valve 22 is of a multi-position type and controls the flow of air through pipes 72 and 49 to the lock pressure chamber 45. It also controls the flow of air through a pair of pipes 80 leading to the air motor 19 which effects the raising and lowering of the boom. Control valve 22 may be manually selectively adjusted to a position effecting locking of boom 6 by increasing the pressure in chamber 45, or to a position effecting the raising of boom 6 by admitting air to the one of pipes 80 which directs a stream of air against vane motor 19 in a direction to rotate the same forwardly, or to still another position effecting boom lowering by admitting air to the other of pipes 80 to reverse the direction of rotation of motor 19.

The shut off valve 21, connected to air supply pipe 73 as previously indicated, controls the flow of air through suitable hoses to the drifter motor 9a and to the control valve 20 for drill motor 10. With this arrangement, the operator may regulate the feeding of drill bit 12 into the tunnel face, and also the reciprocating and rotating movement of bit 12 to provide the drilling action.

In the operation of the boom jumbo constructed in accordance with the present invention and incorporating the embodiment of locking apparatus illustrated in Figures 3 to 5, inclusive, the truck 1 upon which the boom is mounted is rolled along tracks 3 to the desired position relative to the tunnel face to be bored. The pneumatic jack, not shown, and the track clamps 5 are then manipulated to lock the truck 1 firmly in position so that vibrations and stresses created by the drilling operation will not result in physical displacement. After the truck 1 has been positioned and locked, the boom 6 may be pivoted, by a force exerted by the operator, about its vertical axis through pedestal 23 until the drill 7 is

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in the proper lateral position in the tunnel. During such pivotal movement the boom, and the supporting column members 27, 28 and 29, all rotate upon the upper rounded surface 39 of bearing cylinder 38, the pedestal 23 remaining stationary because it is fixed to the floor of the truck.

The drill 7 being in the desired lateral position, the control valve 22 is next operated to admit air into one of the pipes 80 and thus operate motor 19 and relatively rotate the nut and lead screw in actuating arm 16 until the boom 6 is elevated or depressed to the desired position due to outward or inward telescoping of the actuating arm. Once the boom 6 is in either of the positions illustrated in Figure 1, or in any intermediate vertical position, the universal tool mount 8 at the forward end of the boom is adjusted to pivot drill mechanism 7 about a horizontal axis until the drill is in the desired horizontal position and about a vertical axis until the drill is disposed longitudinally of the tunnel as desired. Because of the previously described knee-type construction of the boom 6, that is to say because of the construction of boom 6 with a downwardly extending portion 13, a knee 14, and a forwardly extending portion 15, the pivoting of drill 7 about the vertical axis of tool mount 8 is made possible regardless of the elevated or depressed position of the boom.

The control valve 22 may then be rotated to rigidly lock the boom 6 against pivotal movement about pedestal 23. Depending upon the exact construction of the control valve 22 and other valves, and upon the particular type of drilling operation being performed, the locking of the boom about its vertical axis may take place at any point during the operating cycle prior to the commencement of actual drilling. Ordinarily, however, it will be desired to lock the boom against rotation as soon as the drill 7 has been completely positioned.

When the control valve 22 is rotated to the position adapted to effect locking of the boom against pivotal movement about pedestal 23, an air circuit is completed from air supply hose 76 through transverse bore 75 in end cylinder 67 (Figure 3) and longitudinal bore 74 therein to the relatively large pipe 73 leading through the boom to control valve 22. The air then passes through the valve 22, which is at this time in an open position, and back through small pipe 72 in the boom to the longitudinal bore 69 in boom end cylinder 67. Referring to Figure 4, the path of flow is continued from bore 69 through bore 68 and annular groove 64 in plug 66, then through passage 63 in yoke member 35 and trunnion member 34, to the axial bore 62 in the trunnion member. The air supply then flows downwardly through a radial passage 61 in the center of trunnion 34 and into the cup member 58 therebeneath, regardless of the rotated position of trunnion member 34 depending upon the elevated or depressed condition of the boom 6. Thereafter, the air flow continues through port 59 in the bottom of cup 58 and through passage 56 and downwardly extending pipe member 49 to the axial bore 51 in upper cylindrical bearing member 40. To complete the flow circuit, the air passes horizontally through bore 52 in cylinder 40, through annular groove 53 at the outer surface thereof, and through port 55 in column member 28 into chamber 45 above the vertically movable brake member 42.

As soon as the air pressure in chamber 45 reaches a sufficient value, the brake disc 42 is urged downwardly against the brake facing 44 of the flange portion 29 of inner column member 28. The disc is held against rotation by the circumferentially spaced pins 43 and then becomes operative to lock flange 29, as well as the entire column member 26 and the connected boom 6, against any rotation. When it is desired to release the locking action and swing the boom to a different lateral position, the control valve 22 is shifted to a position cutting off the flow of air from pipe 73 to pipe 72, and

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in addition effecting venting of the compressed air in the chamber 45 through connecting pipe 72 to atmosphere. The column member 26 and boom 6 are then free for relatively frictionless pivotal movement on the upper curved surface of lower bearing block 38.

Referring next to Figures 6 and 7, an embodiment of the invention is illustrated which maintains the boom 6 and related apparatus in locked position at all times except when positive pressure is applied to the locking means to release them. This construction has the advantage of maintaining the boom against swinging when the truck 1 is being moved along the track 3 to a new position during which movement the air supply to the boom jumbo may be disconnected.

The normally braked or locked embodiment illustrated in Figures 6 and 7 is exactly the same as the normally unlocked embodiment previously described, except that the air pressure is applied beneath brake or clutch disc 42a in order to elevate the same against the downward bias of a large number of circularly and radially spaced helical compression springs 81 located in recessed seats 80a in the upper surface of the disc. The air pressure inlet port 55 of the embodiment of Figure 3 is replaced by a downwardly extending passage 82 opening into the space between flange 29 and brake disc 42a. In addition, the O-ring 48 between the pedestal body 24 and the column member 28, illustrated in Figure 3, is rendered unnecessary and instead there is provided an O-ring 83 located between the edge of flange 29 and the base 25 of pedestal 23. The various compression springs 81 bear upwardly against the upper inner surface of cylinder base 25, and downwardly against the upper surface of brake disc 42a.

In the operation of the embodiment of Figures 6 and 7, movement of boom control valve 22 to complete the previously described air circuit admits air under pressure through passage 82 into the space between brake facing 44 on column flange and brake disc 42a, which operates to force disc 42a upwardly against the bias of springs 81 until the brake facing 44 is no longer engaged by the brake disc. Then, and then only, are the flange 29 and connected boom 6 free for rotation about the pedestal 23. As soon as the air supply circuit is broken, and the excess air vented, the springs 81 force the brake disc 42 tightly against brake facing 44 and column flange 29 to prevent rotation of the boom and the drill mechanism 7 at the forward end thereof about the vertical axis of the pedestal.

A second modified form of the invention is illustrated in Figure 8. This embodiment likewise incorporates substantially the same air supply system as was described in connection with the previous forms but eliminates the separate brake disc described and illustrated in connection with both of the previous embodiments. In this embodiment the flanged lower end portion 29 of supporting column member 26 is mounted immediately adjacent the inner surface of the horizontal wall portion of pedestal base 25. A suitable brake facing 86 is carried by flange 29 to increase braking action as in the previously described embodiments. Disposed beneath flange portion 29 is a disc 87, a central hub portion 92 of which rests upon the floor of the truck 1. Disc 87, which is maintained against rotational movement as by a set screw 88, provides at its center a mounting for a relatively small base portion 89 of a bearing cylinder 91. The bearing cylinder 91 serves to support rotatably a bearing and air conduit member 93 positioned in a relatively heavy necked down lower portion 94 of tubular column member 28. An overhanging shoulder 96 in neck 94 effectively prevents relative upward movement of bearing member 93. The column or frame member 26 and of course the boom which it carries, are supported by cylinder 93 on the upper rounded surface of bearing member 91, providing for minimum frictional resistance to pivotal movement.

The flange 29 and disc 87 are recessed in their opposed faces to provide a chamber 97 into which air under pressure may be directed to lift flange 29 and compress brake facing 86 against the upper interior wall of pedestal base 25 to effect a positive braking action. The chamber 97 communicates through a central conical recess 98 in the lower surface of flange 29 with an inwardly and upwardly directed air passage 99 in cylinder 93. The passage 99 extends to the axis of cylinder 93 and there communicates with a vertical central bore 100 into which the lower end of the pipe 49 is inserted. A suitable O-ring 101 at the lower end of pipe 49 prevents any air leakage. An additional O-ring 102 is provided circumferentially of the disc 87 and serves to provide, in cooperation with the O-ring 46 on flange 29, against leakage of air out of chamber 97.

In the operation of the embodiment of the invention as shown in Figure 8, the flange 29, column 26 and boom 6, are freely pivotable on the upper curved surface of bearing cylinder 91 at all times except when boom control valve 22 is positioned to direct air through the previously described air conduit system and into vertical pipe 49. The air so directed passes downwardly from pipe 49 through passage 99 and conical recess 98 into chamber 97 and creates a pressure in said chamber sufficient to lift the flange 29, inner column member 28, and the boom 6 a slight distance until the clutch facing 86 is clamped tightly between the flange and base 25 to provide the braking action. Upon operation of control valve 22 to cut off the flow of air and to vent air under pressure from the chamber 97, the flange 29 and related parts again move downwardly to unlocked position to permit free pivoting of the boom on the rounded bearing surface of cylinder 91.

A third modified form of the locking apparatus is illustrated in Figure 9. This modification is somewhat similar to the embodiment of Figure 8, but incorporates means to effect a locking action to both the upper and lower surfaces of column flange 29 and accordingly increase the locking area and locking effectiveness. The braking or locking force against the upper surface of column flange 29 is applied by lifting it, as in the case of the structure of Figure 8, until the brake facing 86 on its upper surface is compressed against the horizontal interior wall of pedestal base 25. This lifting of flange 29, together with the associated column 26 and boom, is effected by lifting an underlying locking disc 105 by air pressure. Disc 105 also compresses a brake facing 106 against the lower surface of flange 29 by this upward movement. To make the lifting of locking disc 105 effective as a braking force against the lower surface of flange 29, a plurality of vertical cylindrical pins 107 are anchored in arcuately spaced relation on the floor of truck 1 and extend upwardly through a base disc 108 and loosely into locking disc 105 to prevent the latter from rotating. Base disc 108 is flanged at 108a to seat pedestal base 25.

A lock pressure chamber 109 for lifting disc 105, is provided by recessing the lower surface of disc 105 inwardly of pins 107. Similarly to the embodiment of Figure 8, air is conducted from pipe 49 to lock pressure chamber 109 through a bearing cylinder 111 mounted centrally of flange 29 and having a relatively large lower portion seated against the lower surface of flange 29 to support the weight of column member 26. The lower surface of bearing cylinder 111 is downwardly convex to minimize the amount of friction at the area of contact with an upwardly convex upper surface 112 of a lower bearing cylinder 113 mounted axially of horizontal base disc 108.

The air pressure chamber 109 is sealed against leakage by a pair of O-rings 114 and 116 positioned, respectively, at the outer edges of locking disc 105 and base disc 108. Further sealing means compress on O-ring 117 mounted between bearing cylinder 111 and lock-

ing disc 105, and an O-ring 118 seated between a relatively large upper portion of lower bearing cylinder 113 and a shoulder 119 formed in base disc 108. To complete the means for sealing the chamber 109, an O-ring 121 is provided in a groove 122 at the upper end of each of the locking pins 107.

In the operation of the embodiment of Figure 9, the lower end of upper bearing cylinder 111 normally rests on the upper curved surface 112 of lower bearing cylinder 113. Flange 29 is thus supported a slight distance above the brake facing 106, and the brake facing 86 is disposed a slight distance below the interior wall of pedestal base 25, so that the flange 29 and boom are free for relatively frictionless pivotal movement on the rounded bearing surfaces. To lock the flange 29 and with it boom 6 against rotation, control valve 22 at the end of the boom is rotated to direct air through pipe 49, passage 99 in cylinder 111, and into chamber 109. The pressure in chamber 109 then increases to elevate locking disc 105 and engage brake facing 106 with the lower surface of flange 29, the locking disc 105 moving longitudinally of pins 107 and cylinder 111. Further upward movement of locking disc 105, elevates flange 29, and also the column 26 and boom, until the brake facing 86 engages the horizontal interior wall of pedestal base 25, with the air above flange 29 venting through a vent or port 123 in the pedestal base. When locking disc 105 is thus in its uppermost position engaging brake facing 86 with the pedestal base, the flange 29 is locked on both its upper and lower surfaces against rotation, so that the very large amount of braking area is operative to effectively prevent boom rotation as is desired. To release the locking action when it is again desired to rotate the boom, the control valve 22 is operated to vent the air in chamber 109, the flange 29 and locking disc 105 then settling downwardly to the initial positions illustrated in the drawing.

While the particular apparatus herein shown and described in detail is capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that these embodiments are merely illustrative and that no limitations are intended other than as defined in the appended claims.

I claim:

1. In a rock drilling apparatus for use in mining and tunneling operations, a portable support, a hollow pedestal having a relatively large hollow base immovably anchored on said support, a column mounted on said pedestal for rotation about a vertical axis passing there-through, said column having an inner portion extending downwardly through said pedestal to said base, a drill supporting boom mounted at the upper end of said column and rotatable therewith to position laterally a rock drill relative to the tunnel face to be drilled, a horizontal flange member disposed within said base and rigidly associated with said inner column portion, and fluid operated means to effect a locking and unlocking action between said flange member and said base to thus selectively prevent rotation of said column and said boom.

2. In a rock drilling apparatus for use in mining and tunneling operations, a truck, a tubular pedestal having a large hollow base flange rigidly anchored on said truck, a boom supporting column rotatably mounted on said pedestal and extending downwardly therethrough to the base thereof, a bearing member supported on said truck axially of said pedestal base and engaging the lower end of said column to support the same and permit relatively frictionless rotation thereof about a vertical axis, a boom pivoted at the upper end of said column and having a rock drill mounted at the forward end thereof, a generally horizontal flange member formed integral with said column and disposed within said hollow pedestal base outwardly of said bearing member, means to inject air pressure into said pedestal base, and means disposed in said pedestal base and responsive to said air pressure

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to effect selective locking and unlocking of said column flange and said pedestal base.

3. In a rock drilling apparatus for use in mining and tunneling operations, a truck, a tubular pedestal having a large hollow base flange rigidly anchored on said truck, a sleeve mounted over said pedestal and rotatable relative thereto, a tubular column member journaled within said pedestal and extending downwardly therethrough to the base thereof, the upper ends of said sleeve and column members being rigidly interconnected above the upper edge of said pedestal to insure simultaneous corresponding pivotal movement thereof relative to said pedestal, a boom adapted at its forward end to support a rock drill and at its rear end to pivot about a horizontal axis member at the upper connected ends of said sleeve and column members, an extensible actuating arm pivotally connected to the mid-portion of said boom and the lower portion of said sleeve and serving when extended or retracted to pivot said boom about said horizontal axis member to thus effect elevation or lowering of the rock drill, a first bearing member seated in the lower end of said column member, a second bearing member supported on said truck axially of said pedestal base and having a rounded upper surface supporting said first bearing member and the column member and boom associated therewith, a horizontal flange member formed integral with the lower end of said column and extending outwardly therefrom to adjacent the peripheral wall of said pedestal base, means to inject air pressure into said pedestal base, and means responsive to said air pressure to effect selective locking and unlocking between said horizontal flange and an interior wall of said base.

4. In a rock drilling apparatus for use in mining and tunneling operations, a portable support, a hollow pedestal having a relatively large hollow base portion immovably anchored on said support, a column mounted on said pedestal for rotation about a vertical axis passing therethrough, said column having an inner portion extending downwardly through said pedestal to the base thereof, a drill supporting boom mounted at the upper end of said column and rotatable therewith to laterally position a rock drill relative to the tunnel face to be drilled, a horizontal flange member disposed within said hollow base of said pedestal and rigidly connected with said inner column portion, a horizontal brake member disposed adjacent said flange member in said pedestal base, means to lock said brake member against rotation but to permit upward and downward movement thereof, and means to introduce air into said pedestal base adjacent said brake member, said last-named means being selectively operable to engage and disengage said brake member and said flange and thus lock against rotation said flange and associated column and boom.

5. In a rock drilling apparatus for use in mining and tunneling operations, a truck, a tubular pedestal having a large hollow base flange rigidly anchored on said truck, a boom supporting column rotatably mounted on said pedestal and extending downwardly therethrough to the base thereof, a bearing member supported on said truck axially of said pedestal base and engaging the lower end of said column to support the same and permit relatively frictionless rotation thereof about a vertical axis, a boom pivoted at the upper end of said column and having a rock drill mounted at the forward end thereof, a generally horizontal flange member formed integral with said column and disposed within said hollow pedestal base outwardly of said bearing member, a horizontal brake disc disposed outwardly of said column and between said column flange member and the upper interior wall of said pedestal base, a plurality of circularly spaced pins extending downwardly through said upper pedestal base wall and loosely into said brake disc to prevent rotation thereof while permitting the same to move into and out of engagement with said column flange member, and means to introduce air into a chamber one wall of which is formed

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by said brake member, said last-named means being selectively operable to engage said brake member and column flange member and thus lock against rotation said flange and the associated column and boom.

6. In a rock drilling apparatus for use in mining and tunneling operations, a truck, a tubular pedestal having a large hollow base flange rigidly anchored on said truck, a boom supporting column rotatably mounted on said pedestal and extending downwardly therethrough to the base thereof, a bearing member supported on said truck axially of said pedestal base and engaging the lower end of said column to support the same and permit relatively frictionless rotation thereof about a vertical axis, a boom pivoted at the upper end of said column and having a rock drill mounted at the forward end thereof, a generally horizontal flange member formed integral with said column and disposed within said hollow pedestal base outwardly of said bearing member, a horizontal brake disc disposed outwardly of said column and between said column flange member and the upper wall of said pedestal base, a plurality of circularly spaced pins extending downwardly through said upper pedestal base wall and loosely into said brake disc to prevent rotation thereof while permitting the same to move into and out of engagement with said column flange member, and means to introduce air into a chamber formed between the upper interior wall of said pedestal base and the upper surface of said brake member, said arrangement operating when the air pressure in said chamber attains a sufficient value to force said brake disc downwardly into braking engagement with said column flange to thus prevent rotation of said flange and the column and boom connected therewith.

7. In a rock drilling apparatus for use in mining and tunneling operations, a truck, a tubular pedestal having a hollow base flange rigidly anchored on said truck, a boom supporting column rotatably mounted on said pedestal and extending downwardly therethrough to the base thereof, a bearing member supported on said truck axially of said pedestal base and engaging the lower end of said column to support the same and permit relatively frictionless rotation thereof about a vertical axis, a boom pivoted at the upper end of said column and having a rock drill mounted at the forward end thereof, a generally horizontal flange member formed integral with said column and disposed within said hollow pedestal base outwardly of said bearing member, a horizontal brake disc disposed outwardly of said column and between said column flange member and the upper wall of said pedestal base, a plurality of circularly spaced pins extending downwardly through said upper pedestal base wall and loosely into said brake disc to prevent rotation thereof while permitting the same to move into and out of engagement with said column flange member, spring means compressed between said upper pedestal base wall and said brake disc to bias the latter downwardly into braking engagement with said column flange, means to seal the space between said brake disc and column flange into a substantially air-tight chamber, and means to inject air into said chamber and thereby force said brake disc upwardly out of locking engagement with said column flange and release said flange and the associated column and boom for pivotal movement about said pedestal.

8. In a rock drilling apparatus for use in mining and tunneling operations, a portable support, a pedestal having a hollow base portion immovably anchored on said support, a column mounted on said pedestal for vertical movement and for rotation about a vertical axis passing therethrough, said column having an inner portion extending downwardly through said pedestal to the base thereof, a drill supporting boom mounted at the upper end of said column and rotatable therewith to laterally position a rock drill relative to the tunnel face to be drilled, a horizontal flange member disposed within said hollow base of said pedestal and rigidly connected with said inner column portion, means to create a fluid-tight

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chamber the upper wall of which is formed by the under surface of said horizontal flange, and means to inject air pressure into said chamber and thereby elevate said flange, column, and boom until said flange is in braking engagement with the upper interior wall of said pedestal base.

9. In a rock drilling apparatus for use in mining and tunneling operations, a portable support, a hollow pedestal having a relatively large hollow base portion immovably anchored on said support, a column mounted on said pedestal for limited vertical movement and for rotation about a vertical axis, said column extending downwardly through said pedestal to the base thereof, a drill supporting boom mounted at the upper end of said column and rotatable therewith to laterally position a rock drill relative to the tunnel face to be drilled, a circular flange element formed integral with said column and disposed within said pedestal base, a disc resting on said support and disposed in said pedestal base beneath said flange element, a brake facing mounted in said pedestal base above said flange element, sealing means to create an airtight chamber between said flange and said disc, means to inject air pressure into said chamber, said air pressure effecting elevation of said flange to compress said brake facing against the upper interior pedestal base wall and thus lock the flange and associated column and boom against rotation, and bearing means mounted on said disc to support the lower end of said column and permit substantially frictionless pivoting thereof after release of said air pressure.

10. In a rock drilling apparatus for use in mining and tunneling operations, a truck, a tubular pedestal having a large hollow base flange rigidly anchored on said truck, a sleeve mounted over said pedestal and rotatable relative thereto, a tubular column member journaled within said pedestal and extending downwardly therethrough to the base thereof, the upper ends of said sleeve and column members being rigidly interconnected above the upper edge of said pedestal to insure simultaneous corresponding pivotal movement thereof relative to said pedestal, a boom adapted at its forward end to support a rock drill and at its rear end to pivot about a horizontal axis member at the upper connected ends of said sleeve and column members, an extensible actuating arm pivotally connected to the mid-portion of said boom and the lower portion of said sleeve and serving when extended or retracted to pivot said boom about said horizontal axis member to thus effect elevation or lowering of the rock drill, a first bearing member seated in the lower end of said column member, a second bearing member supported on said truck axially of said pedestal base and having a rounded upper surface supporting said first bearing member and the column and boom associated therewith, a horizontal flange formed integral with the lower end of said column and extending outwardly therefrom to adjacent the peripheral wall of said pedestal base, and means to inject air into said pedestal base and to effect selective locking and unlocking of said horizontal flange and an interior wall of said base, said air injecting means including both rigid piping disposed entirely within said column and boom members and air passages located in the upper end of said column and in said axis member.

11. In a rock drilling apparatus for use in mining and tunneling operations, a truck, a tubular pedestal anchored on said truck, a sleeve mounted concentrically over said pedestal and rotatable relative thereto, a tubular column member journaled within said pedestal and extending downwardly therethrough to the base thereof, the upper ends of said sleeve and column being closed above said pedestal and rigidly interconnected for corresponding rotation relative to said pedestal, a horizontal trunnion member mounted in said upper closed ends of said sleeve and said column, a boom, a yoke connecting said boom and said trunnion, conduit means disposed

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within said boom, fluid-operated means disposed in the base of said pedestal to lock the lower portion of said column to said pedestal base, a pipe extending axially of said pedestal and column from said fluid-operated means to the upper end of said column, and a fluid passage extending through said trunnion and said yoke to connect said conduit means to said pipe.

12. In a rock drilling apparatus for use in mining and tunneling operations, a tubular pedestal, a sleeve mounted concentrically over said pedestal and rotatable relative thereto, a tubular column journaled within said pedestal and extending downwardly therethrough to the base thereof, the upper ends of said sleeve and column being closed above said pedestal and rigidly interconnected for joint rotation relative to said pedestal, a horizontal trunnion journaled at the upper ends of said sleeve and column, a boom, a yoke connecting said boom and trunnion and locked to said trunnion for rotation therewith, fluid conduit means disposed within said boom, fluid-operated means disposed in the base of said pedestal to lock the lower portion of said column to said pedestal base, a pipe extending axially of said pedestal and column from said fluid-operated means to the upper end of said column, a cup mounted at the upper end of said column, said cup communicating at its lower closed portion with said pipe and having its upper open portion partially surrounding said trunnion, a first fluid passage extending axially of said trunnion and having one end disposed to communicate with said pipe regardless of the rotated position of said trunnion, and a second fluid passage extending through said yoke and interconnecting said first fluid passage and said fluid conduit means on said boom.

13. In a rock drilling apparatus for use in mining and tunneling operations, a movable support, a pedestal having a hollow base portion immovably anchored on said support, a column mounted on said pedestal for rotation about a vertical axis passing therethrough, said column having an inner portion extending downwardly through said pedestal to said base, a drill supporting boom mounted at the upper end of said column and rotatable therewith to position a rock drill laterally relative to the tunnel face to be drilled, a horizontal flange member provided on the lower end of said inner column portion adjacent the upper interior wall of said base, said flange member being locked against rotation relative to said inner column portion, a locking member mounted in said base adjacent the lower surface of said flange member, means to prevent rotation of said locking member relative to said support while permitting limited vertical movement thereof, means to define a fluid chamber beneath said locking member, and means to inject fluid into said chamber and thereby elevate said locking member into braking engagement with said flange member, and said flange member into braking engagement with said interior pedestal base wall.

14. In a rock drilling apparatus for use in mining and tunneling operations, a truck, a pedestal anchored on said truck, said pedestal having a relatively large hollow base formed with a generally horizontal upper interior wall, a column mounted on said pedestal for vertical movement and for rotation about a vertical axis passing therethrough, said column having an inner portion extending downwardly through said pedestal into said hollow base, a drill supporting boom mounted at the upper end of said column and rotatable therewith to laterally position a rock drill relative to the tunnel face to be drilled, a horizontal flange member formed integral with the lower end of said inner column portion and disposed adjacent said interior base wall, a locking member mounted in said pedestal base adjacent the lower surface of said flange member, means to define a fluid tight chamber the upper wall of which is formed by the lower surface of said locking member, means to prevent rotation of said locking member relative to said truck but to permit said locking member to

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move vertically into engagement with said flange member, bearing means to support said flange member, column, and boom and permit substantially frictionless rotation thereof, and means to inject air into said chamber to lift said locking member into locking relation relative to the lower surface of said flange member, and to lift said locking member, flange member, column and boom until the upper wall of said flange member is in locking relation relative to said interior pedestal base wall.

15. The rock drilling apparatus as claimed in claim 14, wherein the means to prevent locking member rotation is a plurality of pins anchored on said truck and extending loosely into said locking member, and the bearing means is a bearing cylinder resting on said truck and rotatably supporting the lower end of said inner column portion.

16. The rock drilling apparatus as claimed in claim 14, wherein the lower wall of said fluid tight chamber is formed by a base disc mounted in said pedestal base adjacent the floor of said truck.

17. In a rock drilling apparatus for use in mining and tunneling operations, a movable support, a pedestal having a hollow base anchored on said support, a column mounted on said pedestal for rotation about a vertical axis

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passing therethrough, said column having an inner portion extending downwardly through said pedestal to said base, a drill supporting boom mounted at the upper end of said column and rotatable therewith to position laterally a rock drill relative to the face to be drilled; a flange member disposed within said base and non-rotatably associated with said inner column portion, and fluid operated means to effect a locking and unlocking action between said flange member and said base to thus selectively prevent rotation of said column and said boom.

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