

Oct. 12, 1948.

H. C. JOHANSEN
DRILLING APPARATUS

2,451,223

Filed April 7, 1944

3 Sheets-Sheet 1

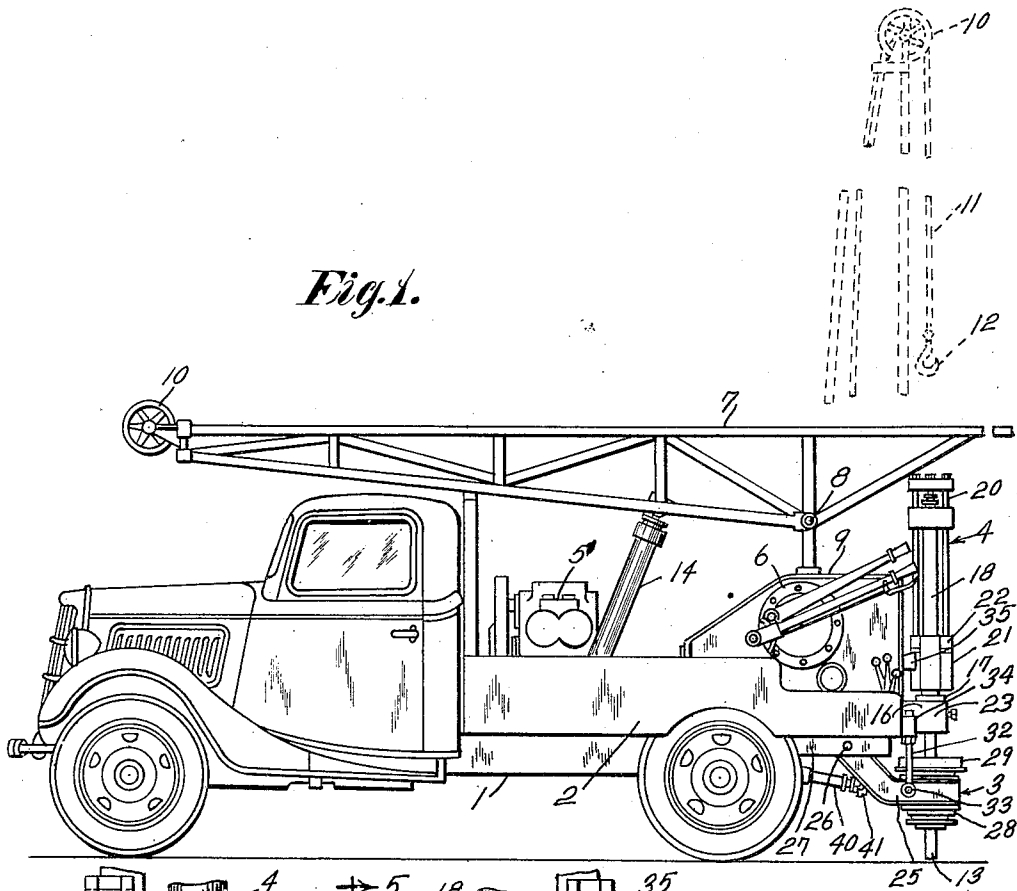


Fig. 1.

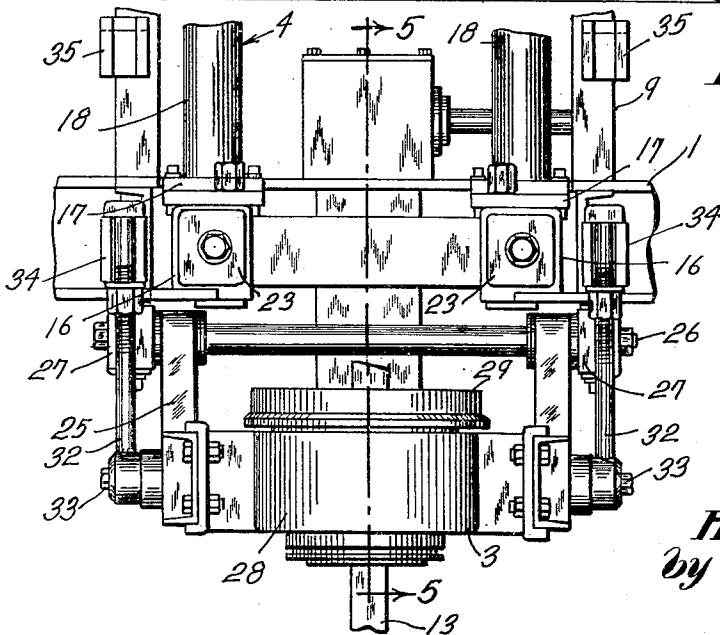


Fig. 2.

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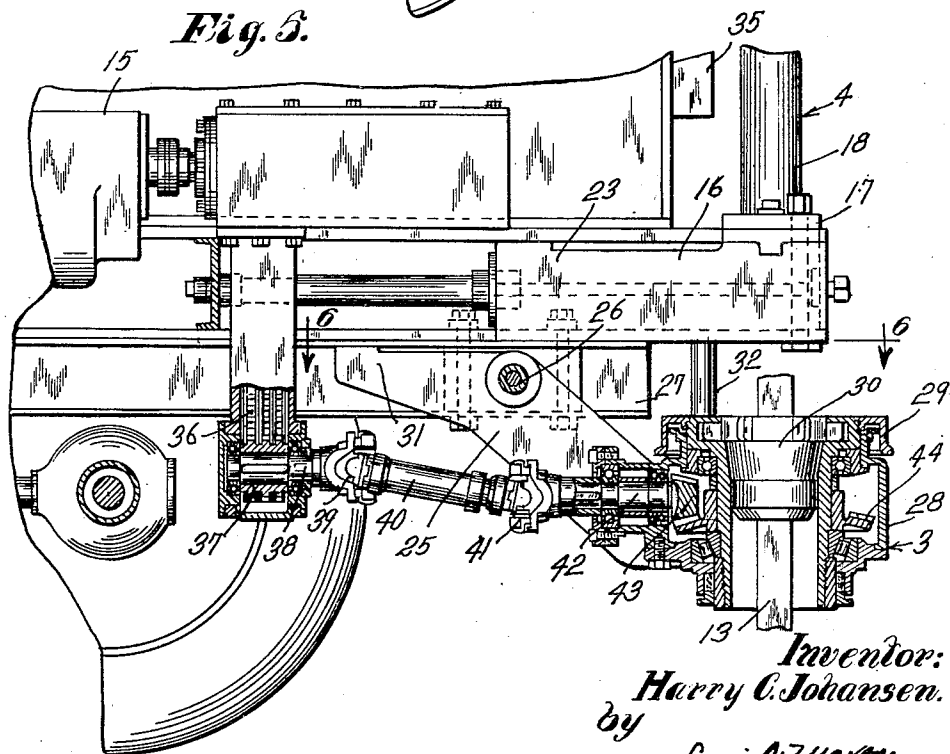
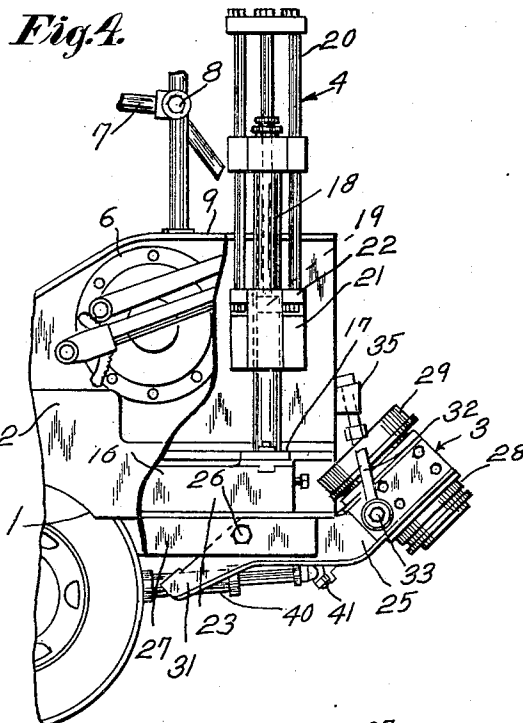
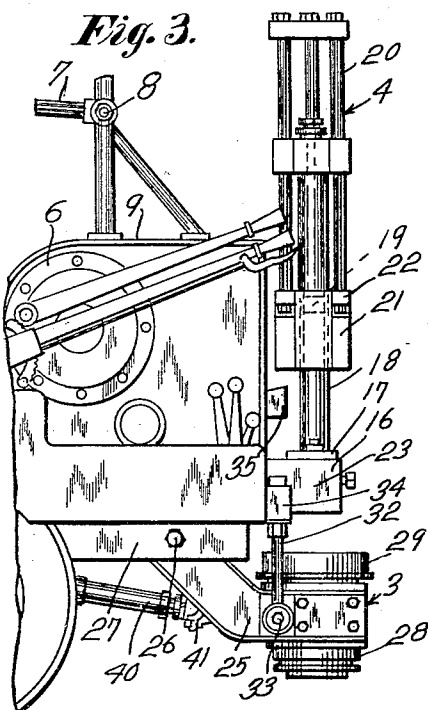
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3 Sheets-Sheet 2



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DRILLING APPARATUS

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Fig. 6.

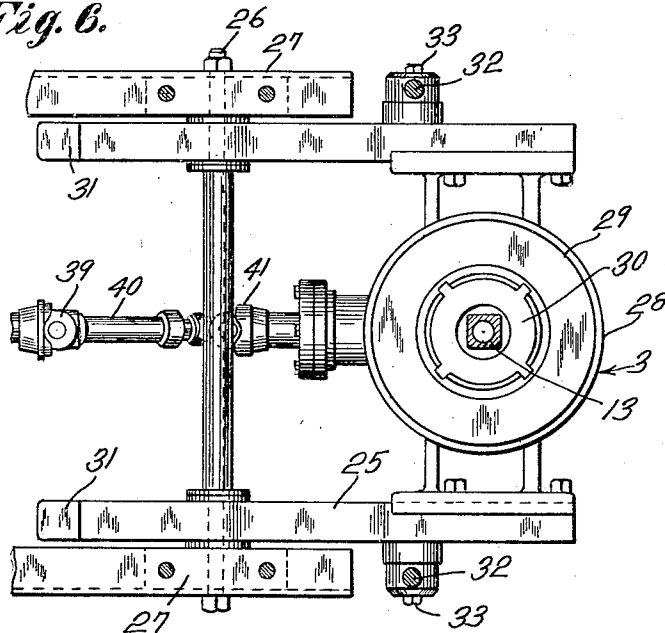


Fig. 7.

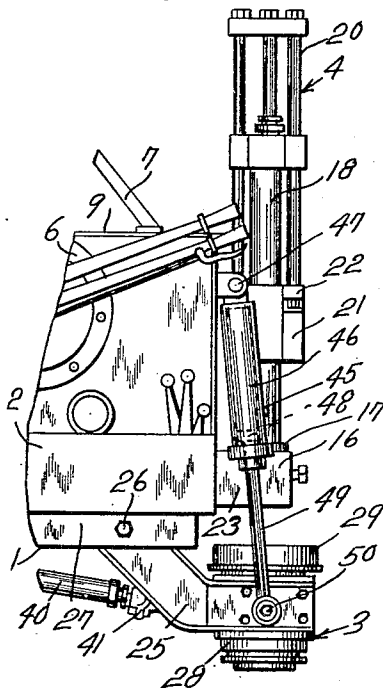
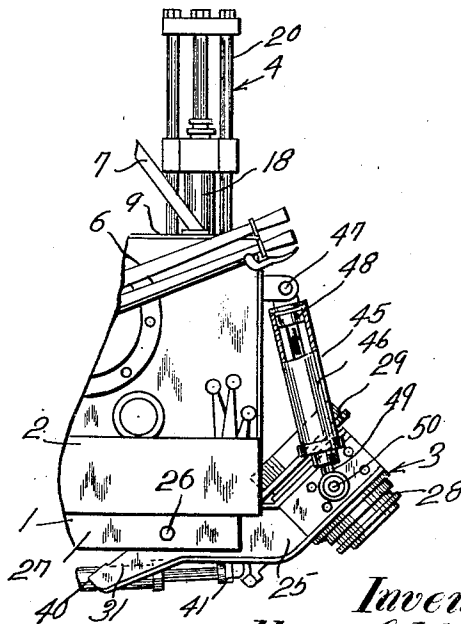


Fig. 8.



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UNITED STATES PATENT OFFICE

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DRILLING APPARATUS

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5 Claims. (Cl. 255—19)

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This invention relates to drilling apparatus and more particularly to improvements in the drill rod rotating mechanism of a rotary drill of the portable type.

In rotary drilling apparatus, it is desirable to locate the drill rod rotating mechanism in a relatively low position close to the ground surface during the drilling operation. However, in a portable type drilling apparatus, such relatively low position of the rotating mechanism would interfere with the transportation of the apparatus from place to place, especially when traveling over rough ground, since there would be danger of the rotating mechanism striking some obstacle and as a result subjecting the apparatus to possible damage. Accordingly, it is desirable to mount the rotating mechanism so that it may be raised into a transport position to provide for additional ground clearance during transport of the apparatus.

An object of the present invention is to provide, in a portable drilling apparatus, a drill rotating mechanism which may be disposed in a relatively low position with respect to the ground during the drilling operation, and which may be readily raised into an inoperative transport position to provide additional ground clearance during traveling of the apparatus from place to place. Another object is to provide an improved rotating mechanism embodying a rotary table mounted in a relatively low position and which may be readily raised into an inoperative transport position. A further object is to provide an improved pivotal mounting structure for the rotating mechanism of a drilling apparatus. Yet another object is to provide improved means for holding the rotating mechanism in either its lowered operative position or its raised transport position. A still further object is to provide improved pivotal mounting means whereby the rotating mechanism may be swung into its different positions. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there are shown for purposes of illustration one form and a modification which the invention may assume in practice.

In these drawings:

Fig. 1 is a side elevational view of a portable rotary drilling apparatus with which the improved drill rotating mechanism is associated.

Fig. 2 is an enlarged fragmentary front elevational view of the apparatus shown in Fig. 1, illustrating the improved rotating mechanism.

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Fig. 3 is a fragmentary side elevational view showing the feeding means and rotating mechanism in operative drilling position.

Fig. 4 is a view similar to Fig. 3, with parts broken away, showing the feeding means retracted and the rotating mechanism raised for transport.

Fig. 5 is an enlarged view, with parts in vertical section, taken substantially on line 5—5 of Fig. 2.

Fig. 6 is a horizontal sectional view taken substantially on line 6—6 of Fig. 5, with parts in plan.

Figs. 7 and 8 are views similar to Figs. 3 and 4 respectively, illustrating a modified construction.

In its illustrative construction, the invention is embodied in a portable drilling apparatus, although it will be understood that the invention, at least from certain aspects, may be associated with other types of drilling apparatus.

The drilling apparatus disclosed herein generally comprises a portable automotive base, herein an automobile truck, 1 having a platform 2 on which the various elements of the drill are mounted. The drill includes drill rod rotating mechanism 3, drill rod feeding means 4, a mud pump 5, hoisting mechanism 6 and a derrick mast 7. The derrick mast is pivoted at 8 on a supporting frame structure 9 mounted on the truck platform, and is swingable in a vertical direction from its lowered transport position shown in full lines in Fig. 1 to its raised operative position shown in dotted lines in that figure. The mast carries at its top end a sheave 10 around which a hoisting cable 11 of the hoisting mechanism 6 may be extended in a well known manner. The drop line of the hoisting cable carries a usual lifting hook 12 which is connectible to the upper end of the drill rod line 13 for raising and lowering the latter. Hydraulic jacks 14 are provided for swinging the mast about its pivot. The drill may be driven from the truck engine through suitable power transmission means 15, as will later be more fully described.

The feeding means 4 may be generally similar to that disclosed in the Vanderzee Patent No. 2,310,000 dated February 2, 1943, and is mounted on parallel side frames 16, 16 extending longitudinally of the truck platform. Slidably guided on these side frames is a frame 17 carrying parallel vertical feed cylinders 18, 18, and reciprocal in these feed cylinders are usual feed pistons 19 connected by rods 20 to a crosshead 21 slidably guided in a vertical direction along the parallel feed cylinders. This crosshead carries a

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usual chuck mechanism 22 for connecting the drill rod line 13 to the feeding means. The feeding means is shiftable bodily laterally along its guideways from its operative feeding position directly above the rotating mechanism 3 into its inoperative retracted position at one side of the rotating mechanism. A hydraulic jack 23 is provided for shifting the feeding means bodily back and forth along its guideways. Since the structure above disclosed is conventional and well known to those skilled in the art further description thereof is herein unnecessary.

The improved drill rotating mechanism 3 includes a swinging frame 25 pivotally mounted at 26 on side supports 27 secured to the truck platform to swing in a vertical direction. This frame 25 has an annular portion 28 in which a rotary table 29 is journaled. The rotary table has a usual drive bushing 30 engageable with the grief stem of the drill rod line for rotating the rod line as it is fed axially through the table by the feeding means. When the frame 25 is in its lowered position, as shown more clearly in Figs. 3 and 5, rearward projections 31 on the frame 25, located at the opposite side of the frame pivot from the rotary table, underlie the side frames 16 on the truck platform so that the rotary table is rigidly supported during its operation. Bolts 32, pivotally connected at 33 to the sides of the rotary table frame, are engageable with lower lugs 34 on the truck platform so that the table may be rigidly held in its lowered operative position. When the table is swung upwardly into the transport position shown in Fig. 4, these bolts are engageable with upper lugs 35 for holding the rotary table raised. When the feeding means 4 is retracted, the rotary table may be raised into its transport position wherein it occupies a portion of the space which was formerly occupied by the feeding means.

The rotary table may be driven from the transmission connections 15 through the drive chain 36 engaging a chain sprocket 37 keyed to a longitudinal shaft 38. Shaft 38 is connected through a conventional universal joint 39 to a telescopic drive shaft 40, the latter in turn being connected through a conventional universal joint 41 to a longitudinal shaft 42. Keyed to the shaft 42 is a bevel pinion 43 meshing with a bevel gear 44 secured to the rotary table 29. Thus the rotary table may be raised or lowered without disconnecting the driving connections between the transmission means and the table. Raising and lowering of the rotary table may be effected by connecting the lifting hook 12 of the hoisting cable 11 in a suitable manner to the table frame and operating the hoisting mechanism to wind in or pay out the cable. Under certain conditions, the table may be manually raised and lowered.

In the modified construction shown in Figs. 7 and 8, power operated means, separate from the hoisting mechanism, is provided for raising and lowering the rotary table. This power operated means comprises hydraulic jacks 45 including hydraulic cylinders 46 pivotally connected at 47 to the frame structure 9 and containing reciprocable pistons 48 having piston rods 49 pivotally connected at 50 to the sides of the table frame 25. By trapping the liquid in the jack cylinders, the rotary table may be held in its different positions.

Conventional liquid pumping means may be embodied in the apparatus for supplying liquid under pressure to the various hydraulic jacks 14, 23 and 45 and to the feed cylinders 18, under the control of suitable valve mechanism.

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The general mode of operation of the improved drilling apparatus is as follows. During transport from place to place, the derrick mast 7 is in its lowered position as shown in full lines in Fig. 1, and the feeding means 4 is retracted and the rotating mechanism 3 is raised, as shown in Fig. 4. Thus during transport, the height of the apparatus is maintained at a minimum and adequate ground clearance is afforded. The rotating mechanism is rigidly held in raised transport position by the bolts 32 engaging the upper lugs 35. When the working place is reached, the hydraulic jacks 14 may be operated to raise the derrick mast into the dotted line position shown in Fig. 1, and, the rotating mechanism 3, upon release of the bolts 32 from the lugs 35, may be lowered into its operative rotating position either by the hoisting cable 11 or manually. The rotating mechanism is rigidly held in its lowered operative position, as shown in Figs. 1, 3 and 5, by the bolts 32 engaging the lower lugs 34. The feeding means 4 may then be shifted laterally along its guideways by the hydraulic jack 23 from the retracted position shown in Fig. 4 to the operative feeding position above the rotary table, shown in Figs. 3 and 5. The drill rod line 13 may then be lowered through the chuck mechanism 21 of the feeding means and through the drive bushing 30 of the rotary table by the hoisting cable 11 in a well known manner. The drill rod line may be connected to the feeding means by the chuck mechanism 22, and the feed cylinders 18 may be operated to effect feed of the grief stem of the drill rod line axially through the table bushing, and, as the rod line is moved axially, it is rapidly rotated by the table through the driving connections 36, 40, 43, 44. In the modification shown in Figs. 7 and 8, the rotating mechanism may be raised and lowered by the hydraulic jacks 45, and, by trapping the liquid in the jack cylinders, the table may be held rigidly in either its raised or lowered position. When the drilling operation is completed and it is desired to transport the drilling apparatus to another working place, the drill rod line is detached and the feeding means 4 is again retracted, the rotating mechanism moved into its raised transport position, and the derrick mast is lowered.

As a result of this invention, it will be noted that an improved portable drilling apparatus is provided wherein the height of the apparatus is maintained at a minimum, and also adequate ground clearance is provided during traveling of the apparatus. It will also be evident, by the provision of the improved pivotal mounting structure, that the rotary table may be readily raised into transport position to increase ground clearance. It will also be noted that, by the provision of the improved rotating mechanism, the rotary table may be raised and lowered while the driving connection with the table is maintained. By the provision of the improved releasable connections between the rotating mechanism and the frame structure of the drilling apparatus, the rotary table may be rigidly held in either of its raised or lowered position. Other uses and advantages of the improved drilling apparatus will be clearly apparent to those skilled in the art.

While there are in this application specifically described one form and a modification which the invention may assume in practice, it will be understood that this form and modification of the same are shown for purposes of illustration and that the invention may be further modified and further embodied in various other forms without

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departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a drilling apparatus, the combination comprising a portable base adapted to travel over a ground surface, a rotary table adapted to rotate a drill, means for mounting said table in a relatively low horizontal position on said base with the bottom of said table relatively near the ground surface, feeding means for the drill mounted on said base and shiftable laterally in horizontal planes between a drill feeding position above said table and an inoperative transport position at one side of said table, said mounting means embodying means whereby said table may be raised relative to said base and said feeding means while the latter remains stationary in its inoperative transport position, to locate the bottom of said table a substantial distance above the ground surface thereby to increase ground clearance during transport, said table mounting means so constructed and arranged that said rotary table, as it is raised into its elevated transport position, moves into a portion of the space previously occupied by said feeding means when the latter was in its operative feeding position.

2. In a drilling apparatus, the combination comprising a portable base adapted to travel over a ground surface, drill feeding mechanism on said base, drill rotating mechanism on said base, means for mounting said feeding mechanism on said base for lateral movement bodily relative to said rotating mechanism between an operative feeding position above said rotating mechanism and a retracted inoperative transport position at one side of said rotating mechanism, and means for mounting said rotating mechanism on said base for adjustment upwardly relative to said base and said feeding means while the latter remains stationary in its retracted position from a lowered operative position with its bottom near the ground surface to a raised transport position, a substantial distance above the ground surface, said rotating mechanism mounting means so constructed and arranged that when raised it occupies a portion of the space previously occupied by said feeding means when the latter was in its operative feeding position above said rotating mechanism.

3. In a drilling apparatus, the combination comprising a portable base adapted to travel over a ground surface, and having a horizontal portion, a frame pivotally mounted at a point between its ends on said base to swing in a vertical direction with respect thereto, a portion of said frame at one side of its pivot underlying and engaging said horizontal base portion when the portion of said frame at the other side of its pivot is lowered into a horizontal position and said latter frame portion when lowered extending beyond said base at a lower level than said base portion, and drill rotating mechanism mounted on said latter frame portion and disposed thereon when said latter frame portion is lowered as aforesaid in a relatively low drill

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rotating position with the bottom thereof disposed relatively near the ground surface, said frame being mounted to swing about its pivot to move said latter frame portion upwardly to raise said rotating mechanism into a transport position a substantial distance above the ground surface and to move said first mentioned frame portion downwardly away from said horizontal base portion as said rotating mechanism is so raised.

4. In a drilling apparatus, the combination comprising a portable base, a rotary table adapted to rotate a drill, a frame carried by said base for supporting said table in a relatively low operating position below said base at one end of the latter, drill feeding means mounted on said base and shiftable laterally relative to said base and said supporting frame from a feeding position above said table to a retracted transport position at one side of the latter, said supporting frame having a mounting upon which it is movable upwardly relative to said base and said feeding means while the latter remains stationary in its retracted position for raising said table to a transport position at the end of said base, and adjustable connections between said base and said frame for holding said table in either its lowered operating position or its raised transport position.

5. In a drilling apparatus, the combination comprising a base having a horizontal portion, a frame having parallel end portions spaced laterally from each other, means for pivotally connecting said frame between its end portions to said base, said frame so constructed and arranged and so pivotally connected as specified that one of said frame portions underlies and engages said horizontal base portion when the other of said frame portions is lowered and that said latter frame portion when lowered projects beyond said base in a relatively low horizontal position at a lower level than said base portion, drill rotating mechanism mounted on said latter portion and disposed in a relatively low operating position when said latter frame position is low, said frame being swingable about its pivot to move said latter frame portion upwardly to raise said rotating mechanism to transport position, said one frame portion moving downwardly relative to said base portion when said rotating mechanism is raised, and adjustable means for holding said frame in its opposite pivoted positions with said rotating mechanism raised or lowered.

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