

[54] **ADJUSTABLE MAST FOR DRILLING APPARATUS**

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[58] Field of Search ..... **173/27, 28, 43, 44,**

[56] **References Cited**

**UNITED STATES PATENTS**

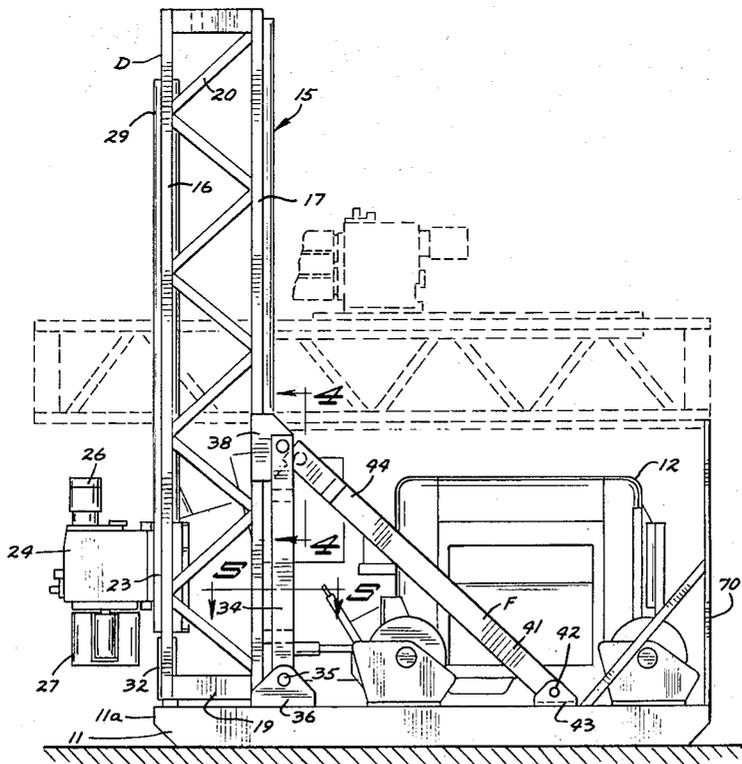
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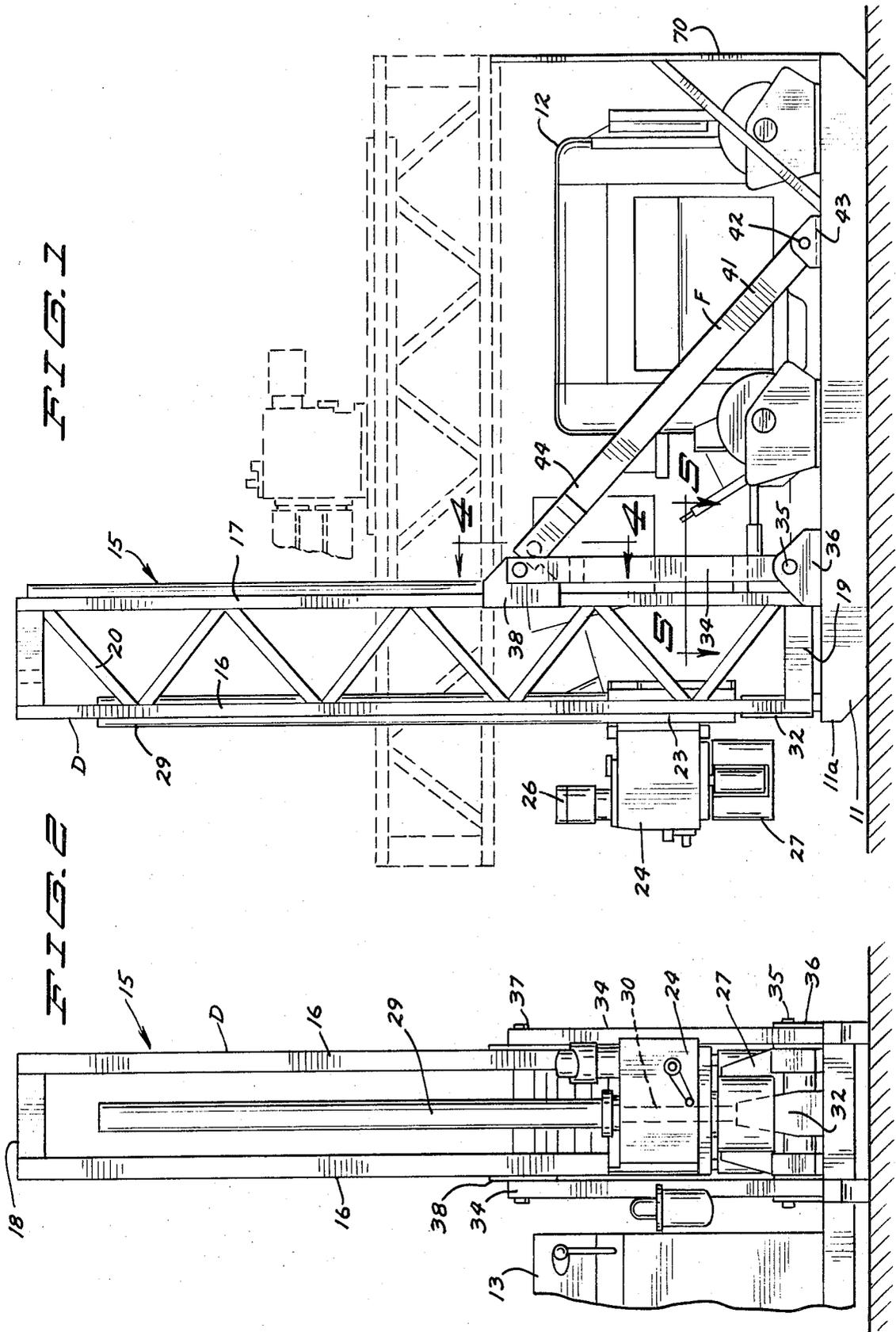
Primary Examiner—Ernest R. Purser  
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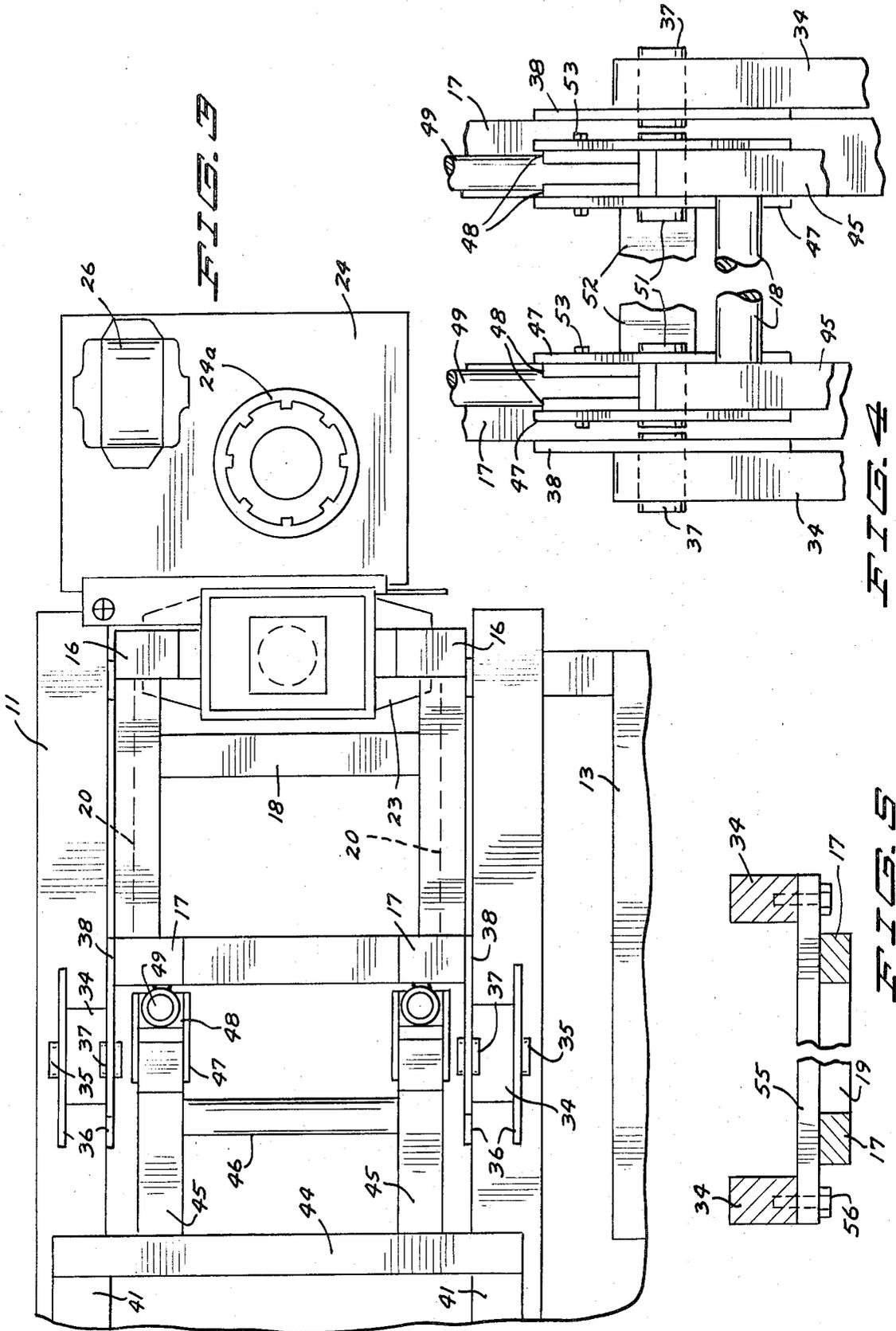
[57] **ABSTRACT**

Drilling apparatus that includes a skid mounting a mast assembly, an engine, and control assembly, the mast assembly including a derrick section, a drill head and drill head motor mounted on the derrick section for reciprocal movement relative thereto, and support members pivotally mounted on the skid for selectively supportingly retaining the derrick section in a vertical drilling position, an inclined angle hole drilling position and a horizontal transport position. One of the support members is attached to the derrick section for selectable slidable movement relative thereto and is connectable to the drill head carriage to facilitate moving the derrick section between different angular positions relative the horizontal.

**24 Claims, 7 Drawing Figures**







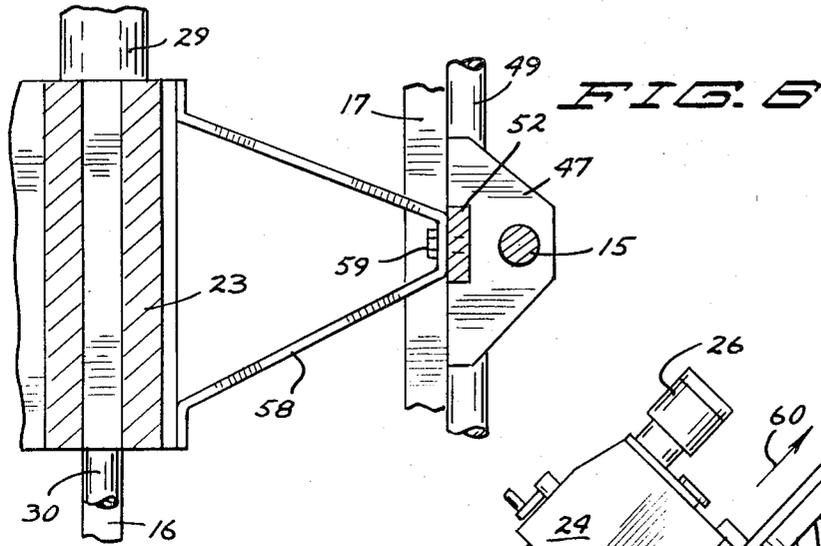


FIG. 6

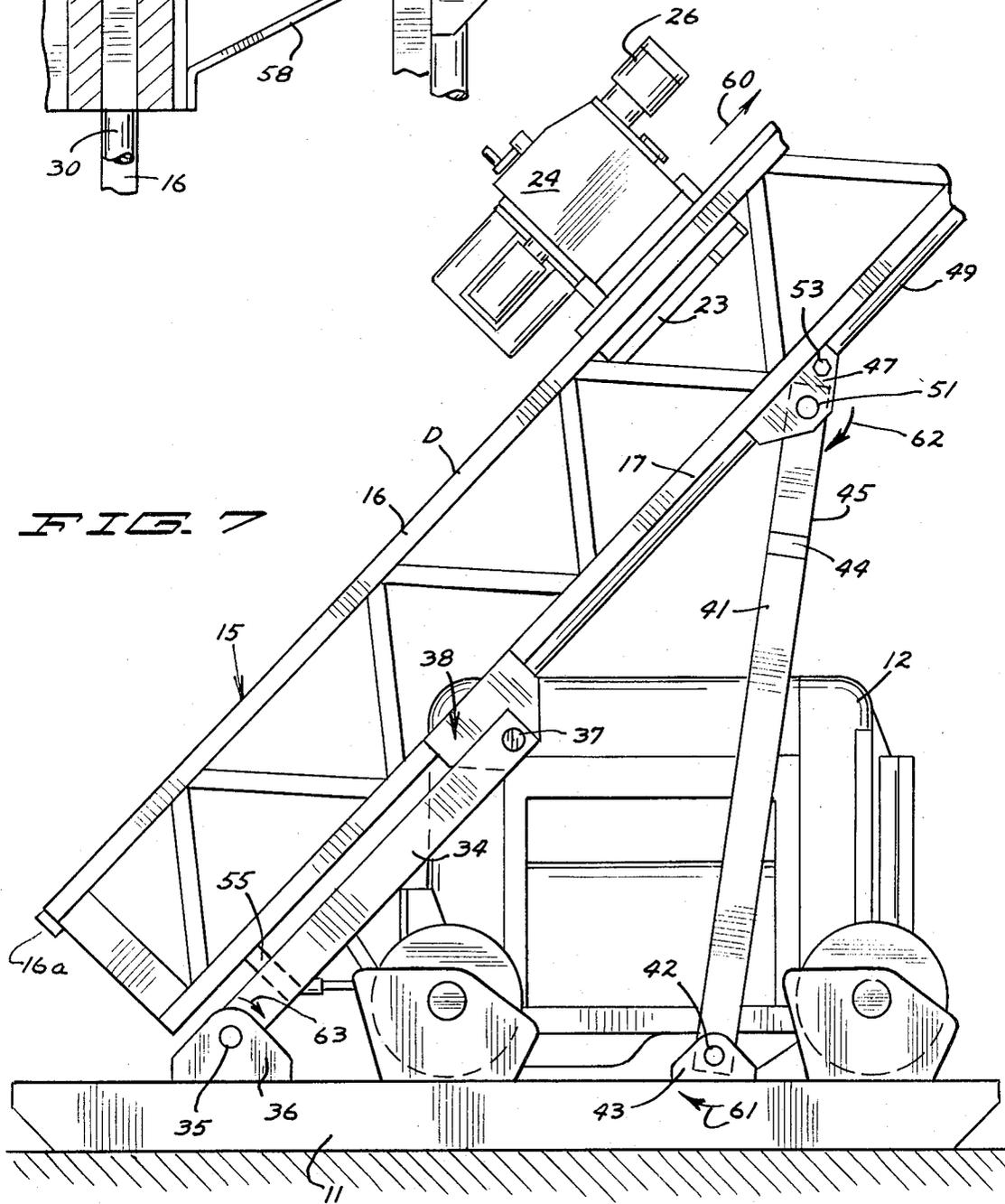


FIG. 7

## ADJUSTABLE MAST FOR DRILLING APPARATUS

## BACKGROUND OF THE INVENTION

Portable drilling apparatus usable for both inclined drilling and vertical drilling operations. It is old in the prior art to provide a portable drill rig that is usable for both angle hole and vertical hole drilling, for example, see U.S. Pat. No. 2,904,310 to Leonard. With structure such as U.S. Pat. No. 2,904,310, relative complex mechanism is provided for supporting the derrick section in its various positions, and in inclined hole drilling, the intersection of the drill rod with a surface that is horizontal or at a relative shallow angle to the horizontal, is substantially more remote from the platform on which the derrick section is mounted than is desirable. In order to overcome problems such as the above, as well as others, this invention has been made.

## SUMMARY OF THE INVENTION

Drilling apparatus that includes a platform, a derrick section, a drill head reciprocally mounted on the derrick section, an elongated support member having one end pivotally mounted on the platform and an opposite end pivotally connected to the intermediate portion of the derrick section, and fixedly securable to the derrick section remote from the last mentioned pivot connection, and a second support member having one end attached to the platform rearwardly of the first mentioned pivot connection for movement relative the platform and a second end portion connected to the derrick section intermediate portion for movement relative thereto.

One of the objects of the invention is to provide a new and novel mounting of a derrick section to adjustably retain the derrick section at various selected angular drilling directions. Another object of this invention is to provide a new and novel mounting of a derrick section that mounts the derrick section for movement between a horizontal and a vertical condition about a common pivot axis at the upper ends of a pair of support members that are attached to a platform for pivotal movement about spaced, parallel axes and releasably retains the derrick sections at various selected angular drilling directions. An additional object of this invention is to mount a derrick section on a low platform to be releasably retained at various selected drilling angles and to maintain the intersections of the drill rod axes with the horizontal relatively closely adjacent the platform in the various derrick section drilling angles.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of the drilling apparatus of this invention, said view showing the mast assembly in a vertical drilling position in solid lines and in a transport position in dotted lines;

FIG. 2 is a fragmentary front view of the structure of FIG. 1 in a vertical drilling position;

FIG. 3 is a fragmentary top view of the drilling apparatus in a vertical drilling position;

FIG. 4 is a fragmentary vertical cross-sectional view generally taken along the line and in the direction of the arrows 4—4 of FIG. 1 to more clearly illustrate the mechanism mounting the derrick section for movement between a transport position, a vertical drilling position, and an angle hole drilling position;

FIG. 5 is a fragmentary horizontal cross-sectional view generally taken along the line and in the direction of arrows 5—5 of FIG. 1 to illustrate the bolting of the derrick section to the pivot support mechanism;

FIG. 6 is a fragmentary view showing the drill head removably connected to the pivot structure for pivoting the derrick section between an angle hole drilling position and a vertical drilling position; and

FIG. 7 is a fragmentary side view showing the drilling apparatus in an angle hole drilling position.

Referring to the drawings, there is illustrated a skid 11 on which there is mounted drill rig engine 12, drill rig control mechanism 13, and the mast assembly, generally designated 15, of this invention. The mast assembly includes the derrick section D that has a pair of elongated front legs 16, a pair of rear legs 17, a top framework 18, a bottom framework 19, and braces 20 that brace the front and rear legs on one side relative one another and the front and rear legs on the other side relative one another. The frameworks 18, 19 as secured to the legs for mounting legs at the corners of a rectangle.

A carriage 23 is mounted by the derrick section for vertical movement from a position that is at a slightly higher elevation than the framework 19 to a position adjacent the framework 18, the carriage having bifurcated legs at either side thereof that extend into sliding abutting relationship with the adjacent surfaces of the front legs 16. The lengths of the carriage legs and the mountings of the braces 20 are such as not to interfere with the movement of the carriage between its positions. A drill head 24 is mounted on the carriage to extend forwardly of the derrick section when the derrick section is extending vertically, the drill head being secured to the carriage to move therewith. The drill head includes a drive spindle 24a and conventional drill spindle drive mechanism within the drill head housing that is driven by the hydraulic or air motor 26 that is mounted on the drill head housing. Suitable fluid lines (not shown) are provided for powering the motor 26 and are connected to a source of fluid under pressure (not shown) on the skid, the source of fluid under pressure being powered by the engine 12. Dependently secured to the drill head housing is a hydraulically operated chuck assembly 27 for releasably supporting drill rods. Although the chuck assembly 27 may be of a conventional nature, it is preferred the assembly such as described in the copending application of Leonard A. Braun and assigned to the same assignee of this application be used, the copending application of Leonard A. Braun being Ser. No. 306,015, filed Nov. 13, 1972. In order to move the drill head from adjacent the framework 19 to adjacent the framework 18, a hydraulic cylinder 29 has its lower end attached to the carriage to extend upwardly therefrom horizontally between the legs 16. The piston rod 30 for cylinder 29 is extended downwardly through an appropriate space in the carriage and has its lower end fixedly secured to the base 32 which in turn is fixedly secured to the framework 19 to extend thereabove.

In order to mount the mast assembly for movement between its various positions, there are provided elongated, transversely spaced support arms 34, each of which has a lower end pivotally connected at 35 to brackets 36 that in turn are mounted on the skid to extend thereabove. The upper end of each support arm is pivotally connected by a pivot 37 to a plate 38 that

is fixed to the adjacent leg 17 to extend rearwardly thereof. Plates 38 are located intermediate the frameworks 18, 19, and a substantial distance away from framework 19, but more closely adjacent framework 19 than framework 18. When the derrick section extends vertically, the front legs thereof are closely adjacent the front edge 11a of the skid.

The structure for mounting the mast assembly for movement between its various positions and supporting in its selected position also includes arm structure F that has a pair of transversely spaced legs 41 that are pivotally connected at 42 to brackets 43. The brackets 43 are secured to the skid a substantial distance rearwardly of the brackets 36. The upper ends of the legs 41 are fixedly secured to the transverse brace 44 which in turn has the one ends of a pair of transversely spaced legs 45 fixedly secured thereto to extend away therefrom in a direction opposite the direction of extension of legs 41. The intermediate portions of legs 45 mount the brace 46 while the opposite ends of each of the legs mounts a pair of transversely spaced plates 47 by being pivotally attached thereto by a pivot member 51. Each plate 47 mounts a shoe 48 to extend towards the other shoe on the same leg 45. The inner surfaces of each pair of shoes for each leg 45 is arcuately curved to form a close sliding fit with diametrically opposed surface portions of the respective tubular guide member 49 to permit the shoes sliding along the axial length thereof but at the same time preventing the shoes and plates 47 being pulled away from the tubular guide member. The forward surface portion of each tubular guide member 49 is welded to the adjacent rear surface of leg 17, or else the upper and lower ends of the tubular guide members are secured by plates (not shown) to the adjacent leg 17. To be noted is that the pivot axes of pivot members 37, 51 are aligned when the derrick section is in its vertical drilling position of FIG. 1, and in the horizontal transport dotted line position of said Figure. A brace 52 extends between and is secured at its opposite ends to the two transversely intermediate plates 47.

As may be noted from the drawings, the length of legs 34 between pivots 35, 37 are substantially less than the length of the framework F between pivots 41, 42, while the length of the framework between the last mentioned pivots is substantially less than the length of each of the guide members 49.

In order to retain the shoes in a selected position relative the guide members, suitable clamp mechanisms is provided. For example, bolts 53, see FIGS. 4 and 7, are threadedly extended through the respective plates 47 and shoes 48 to abut against the adjacent guide member 49. In order to selectively prevent the derrick section from moving relative the legs 34, a transverse bar 55 is welded or otherwise appropriately secured to the derrick legs 17 to extend rearwardly thereof and outwardly therefrom (see FIG. 5). Each end of the bar 55 is selectively bolted to the adjacent leg 34 by a bolt 56. In this connection bar 55 is securable to the legs 34 at a position substantially more closely adjacent pivot members 35 than pivot members 37. As a result, when the legs 34 are bolted to the bar 55, both the lower ends and the upper ends of the legs 34 are secured to the derrick section, the upper ends being secured to pivot members 37 and plates 38. At this time, the legs 34 extend parallel to the legs 17 in a fixed position relative

thereto and extend parallel to the guide tubes 49 which have lower ends terminating adjacent plates 38.

The length of the arms 34 between pivots 35, 37 is less than the minimum distance between pivots 35, 42 while the said distance between pivots 35, 42 is less than the length of the framework F between pivots 42, 51. Pivots 42 are located a substantial distance rearwardly of pivots 35.

In order to facilitate moving the derrick section from the vertical position to an angle hole drilling position at a substantial angle from the vertical such as shown in FIG. 7, a generally V-shaped bracket 58 has the one ends of its legs fixedly secured to rearward portion of the carriage 23 while the apex portion of the bracket is bolted to the brace 52 by a bolt 59. The foregoing assumes that the carriage had first been moved to a position opposite brace 52 such as shown in FIG. 6. With the carriage bracket 58 bolted to brace 52, the clamp bolts 53 out of clamping engagement with the guide tubes 49, the legs 34 bolted to bar 55 and fluid under pressure applied to the appropriate end of the cylinder 29, the cylinder moves relative the piston rod and thereby moves the carriage, for example toward the framework 18 (direction of the arrow 60). As the carriage moves, the brace 52 moves in the same direction and thereby moves plates 47 and shoes 48 in the same direction. This results in the framework F pivoting relative the plates 47 in the direction of the arrow 62 and relative the pivot members 42 in the direction of the arrow 61. Further, as the plates 47 move away from plates 38, the distance between the pivot members 35, 51 increase. Accordingly, the derrick section pivots about pivot members 35 in the direction of the arrow 63. Thus, the angle inclination of the derrick section with the horizontal is decreased. At the time the derrick section has been moved to the desired angular position, the bolts 53 are again tightened to retain the plates 47 and shoes 48 in a fixed position relative the guide rods 49 and legs 17; and thereafter the bolt 59 is removed. Now the piston cylinder combination 29, 30 may be operated in a conventional manner for moving the drill head relative the surface.

When the apparatus of this invention is to be used for a vertical drilling, namely when the drill rod is operated for drilling a hole substantially 90° relative the surface, the derrick bar 55 is bolted to the legs 34 and the plates 47 and guide shoes 48 are clamped to guide tubes 49 by bolts 53 in a position that pivots 51 are aligned with pivots 37. At this time the feet 16a of the legs 16 abut against the skid, the derrick section extends vertically, and the axes of the pivots 35, 42 and the combination of pivots 37, 51 are located at the apexes of a triangle whereby a rigid support is provided for retaining the derrick in the horizontal condition. When it is desired to move the derrick section from the vertical drilling position to a horizontal transport position, the bolts 53 are retained in clamping engagement with the guide rods 49, however the bolts 56 are removed. At this time, the derrick section may be pivoted in a clockwise direction as viewed in FIG. 1 from the vertical position to the dotted line horizontal position since the lower end of the derrick section is free to move relative the legs 34. If desired, the carriage and drill head may be moved vertically upwardly from the solid position of FIG. 1 to an elevation more closely adjacent that of pivots 37, 51 to reduce the force required for pivoting the derrick section to a horizontal position. It is to be noted

that as the derrick section is pivoted from the vertical to the horizontal position the pivot axes of pivot members 35, 42 and the combination 37, 51 are fixed in rigid relationship as previously described with reference to the vertical drilling position. To be mentioned, is that there is provided support members 70 at the rear end of the skid 11 to aid in retaining the derrick section in a horizontal transport position.

With the apparatus of this invention, the front legs of the derrick section in a vertical drilling condition are closely adjacent the front edge of the skid while the axis of rotation of the drive spindle is a short distance forwardly of the skid. Further, since the skid is of a relatively low construction and the pivot members 35 are located a slightly higher elevation than the skid and adjacent the lower ends of the rear legs of the derrick section, when the derrick section is at a substantial angle to the verticle, the spindle axis of rotation intersects the surface only a slightly further distance from the front edge of the skid than when the derrick was in a vertical drilling position. As a result, it is easier for an operator to control the operation of the apparatus of this invention in drilling an angle hole than with prior art structure that is operable in either a vertical drilling position or an angle hole drilling position.

It is to be understood that additional derrick sections may be attached to the upper end of the derrick section of this invention.

What is claimed is:

1. Drilling apparatus comprising a platform having a front end portion and a rear end portion, a derrick section having upper, intermediate and lower end portions, a drill head, first means for mounting the drill head on the derrick section for reciprocal movement between the derrick section upper and lower end portions, a first elongated support member of a substantially shorter length than the derrick section and having upper and lower end portions, second means for mounting the first support member lower end portion on the platform for pivotal movement about a first pivot axis, third means for pivotally connecting the first support member to the derrick section intermediate portion for pivotal movement relative thereto about a second pivot axis, a second elongated support member of a shorter length than the derrick section and having upper and lower end portions, fourth means for pivotally connecting the second support member lower portion to the platform to pivot about a third pivot axis substantially spaced from the pivot axis of the second means, and fifth means connecting the second member upper end portion to the derrick section intermediate portion for movement along the length of the intermediate portion and selectively retain the second member upper end portion in various fixed positions along the length of the intermediate portion.

2. The drilling apparatus of claim 1 further characterized in that the fifth means includes an elongated guide member mounted on the derrick section to extend at least the length of the intermediate portion, guide means pivotally mounted on the second support member upper end portion for slidably attaching the second support member upper end portion to the guide member, said guide means being pivotable relative the second support member about a fourth pivot axis, and means for releasably retaining the guide means in a selected fixed position relative the guide member.

3. The apparatus of claim 2 further characterized in that the second support member is substantially longer than the first support member, and that the third pivot axis is substantially more remote from the platform front end than the first pivot axis.

4. The drilling apparatus of claim 3 further characterized in that the first and third pivot axes are located relative one another and the distances from the first pivot axis to second pivot axis and the third pivot axis to the fourth pivot axis positions the fourth pivot axis in horizontally and vertically aligned with the second pivot axis when the second pivot axis is vertically above the first pivot axis.

5. The drilling apparatus of claim 4 further characterized in that there is provided means attached to the derrick section a substantial distance below the third means for releasably fixedly attaching the derrick section to the first support member.

6. Drilling apparatus comprising a platform having a front end portion and a rear end portion, a derrick section having upper, intermediate and lower end portions, a drill head, first means for mounting the drill head on the derrick section, an elongated, rigid, first support member having an upper end portion and a lower end portion, second means mounted on the platform and connected to the first support member lower end portion for mounting the first support member on the platform for pivotal movement about a first pivot axis between a vertically extending position and an inclined position extending upwardly and rearwardly relative the platform, third means connecting the first support member upper end portion to the derrick section in a fixed position relative thereto for relative pivotal movement about a second pivot axis between a position the derrick section extends generally parallel to the first member and a position extending generally perpendicular to the first support member when the first support member is in its vertical position, a second elongated rigid support member having upper and lower end portions and being of a substantially greater length than the first support member, fourth means mounted on the platform a substantial distance rearwardly of the second means pivot axis and connected to the second support member lower end portion for mounting the second support member for movement between a first position extending upwardly and forwardly relative the platform and a second position forming a substantially larger included angle between the platform and the second support member than when the second support member is in its first position, and fifth means mounted on the second support member upper end portion for supportingly engaging the derrick section intermediate portion in selected fixed positions along the length thereof.

7. The drilling apparatus of claim 6 further characterized in that the derrick section includes an elongated guide member and that the fifth means includes guide means mounted on the guide member for slidable movement relative thereto along the length thereof and pivotally connecting the second support member to the guide member, and means for releasably securing the guide means in a fixed slided position relative the guide member, including a position permitting the derrick section being pivoted about the second pivot axis to extend perpendicular to the first support member when the first support member is in a vertical position.

8. The drilling apparatus of claim 6 further characterized in that the fifth means includes clamp means for clampingly engaging the derrick section in selected fixed positions along the derrick section intermediate portion, and sixth means mounted on the second member upper end portion for mounting the clamp means for pivotal movement about a fourth pivot axis relative the second support member.

9. The drilling apparatus of claim 8 further characterized in that the derrick section includes a rear leg having a lower end and an elongated guide member mounted on the rear leg in a fixed position relative thereto, that the clamp means includes guide means slidably mounted on the guide member, that there is provided means for releasably fixedly securing the first support member to the derrick section at a location substantially spaced from the second pivot axis to block pivotal movement of the first support member relative the derrick section, that the platform is a skid, and that the second means includes a pivot member located at a slightly higher elevation than the skid and adjacent the lower end of the rear leg when the derrick section is at a substantial angle to the vertical and the first support member is fixedly secured to the derrick section.

10. The drilling apparatus of claim 8 further characterized in that there is provided ninth means for selectively fixedly securing the derrick section to the first support member at a substantial distance from the second pivot axis.

11. The drilling apparatus of claim 10 further characterized in the first and fourth pivot axes are coextensive when the derrick section and first support members are vertical, and that the derrick section has front legs abutable against the platform when the derrick section extends vertically, and rear legs, the third means being mounted on the rear legs.

12. Drilling apparatus comprising a platform having a front end portion and a rear end portion, a derrick section having upper, intermediate and lower end portions, a drill head, first means for mounting the drill head on the derrick section for reciprocal movement between the derrick section upper and lower end portions, power means for selectively reciprocally moving the drill head and first means, a first elongated support member of a substantially shorter length than the derrick section and having upper and lower end portions, second means for mounting the first support member lower end portion on the platform for pivotal movement about a first pivot axis between a generally vertical position and a position extending upwardly and rearwardly relative to the platform, third means for pivotally connecting the first support member upper end portion to the derrick section intermediate portion for pivotal movement relative thereto about a second pivot axis, and fourth means mounted on the platform and connected to the derrick section to act in cooperation with the first support member and the second and third means for supportingly retaining the derrick section in any one of various selected angular positions, relative the platform, said fourth means comprising an elongated rigid second support member having an upper end position and a lower end portion, fifth means for mounting the second support member on the platform for movement relative thereto between various angular positions relative the platform and sixth means for connecting the second support member upper end portion

to the derrick section for movement relative thereto including to a position vertically and horizontally closely adjacent the second pivot axis.

13. The apparatus of claim 12 further characterized in that the sixth means includes a pivot member mounted on the second member upper end portion to have a third pivot axis, and slide means joined to the pivot member for pivotally movement about the third pivot axis and slidably mounted on the derrick section intermediate portion for being retained in selected fixed slided positions relative thereto, including a position that the third pivot axis is coextensive with the second pivot axis when the first support member extends generally vertically, and that is provided a third support member mounted on the platform to in cooperation with the first support member in a vertical condition, and the second means and the pivot member in positions that the second and third pivot axes are coextensive, support the derrick section in a horizontal position.

14. Drilling apparatus comprising a platform having a front end portion and a rear end portion, a derrick section having upper, intermediate and lower end portions, a drill head, first means for mounting the drill head on the derrick section for reciprocal movement between the derrick section upper and lower end portions, a first elongated support member of a substantially shorter length than the derrick section and having upper and lower end portions, second means for mounting the first support member lower end portion on the platform for pivotal movement about a first pivot axis, third means for pivotally connecting the first support member to the derrick section intermediate portion for pivotal movement relative thereto about a second pivot axis, a second elongated support member of a shorter length than the derrick section, of substantially longer length than the first support member, and having upper and lower end portions, fourth means for pivotally connecting the second support member lower portion to the platform to pivot about a third pivot axis substantially spaced from the pivot axis of the second means and substantially more remote from the platform front end than the first pivot axis, fifth means connecting the second member upper end portion to the derrick section intermediate portion for movement along the length of the intermediate portion and selectively retain the second member upper end portion in a fixed position along the length of the intermediate portion, the fifth means including an elongated guide member mounted on the derrick section to extend at least the length of the intermediate portion, guide means pivotally mounted on the second support member upper end portion for slidably attaching the second support member upper end portion to the guide member, said guide means being pivotable relative the second support member about a fourth pivot axis, and clamp means for releasably retaining the guide means in a selected fixed position relative the guide member, the first and third pivot axes being located relative one another and the distances from the first pivot axis to second pivot axis and the third pivot axis to the fourth pivot axis positioning the fourth pivot axis in horizontally and vertically alignment with the second pivot axis when the second pivot axis is vertically above the first pivot axis, means attached to the derrick section a substantial distance below the third means for releasably fixedly attaching the derrick section to the first support

member, said first means including a carriage mounted on the derrick section for reciprocal movement and power means attached to the carriage and derrick section for reciprocating the carriage relative the derrick section, and means for attaching the carriage to the guide means for moving the guide means with the carriage when the clamp means is in an unclamped condition.

15. Drilling apparatus comprising a platform having a front end portion and a rear end portion, a derrick section having upper, intermediate and lower end portions, a drill head, first means for mounting the drill head on the derrick section, said first means including a carriage mounted on the derrick section for movement between the derrick section upper and lower portions, an elongated, rigid, first support member having an upper end portion and a lower end portion, second means mounted on the platform and connected to the first support member lower end portion for mounting the first support member on the platform for pivotal movement about a first pivot axis between a vertically extending position and an inclined position extending upwardly and rearwardly relative the platform, third means connecting the first support member upper end portion to the derrick section in a fixed position relative thereto for relative pivotal movement about a second pivot axis between a position the derrick section extends generally parallel to the second member and a position extending generally perpendicular to the first support member when the first support member is in its vertical position, a second elongated rigid support member having upper and lower end portions and being of a substantially greater length than the first support member, fourth means mounted on the platform a substantial distance rearwardly of the second means pivot axis and connected to the second support member lower end portion for mounting the second support member for movement between a first position extending upwardly and forwardly relative the platform and a second position forming a substantially larger included angle between the platform and the second support member than when the second support member is in its first position, fifth means mounted on the second support member upper end portion for supportingly engaging the derrick section intermediate portion in selected fixed positions along the length thereof, said fifth means including clamp means for clampingly engaging the derrick section in selected fixed positions along the derrick section intermediate portion, and sixth means mounted on the second member upper end portion for mounting the clamp means for pivotal movement about a fourth pivot axis relative the second support member, and seventh means connected to the carriage for moving the carriage relative the derrick section between its positions, and eighth means for selectively clamping the carriage to the clamp means to move the clamp means therewith.

16. Drilling apparatus comprising a platform having a front end portion and a rear end portion, a derrick section having upper, intermediate and lower end portions, a drill head, first means for mounting the drill head on the derrick section for reciprocal movement between the derrick section upper and lower end portions, second means for mounting the derrick section on the platform for pivotal movement about a first pivot axis between a generally vertical position and a position extending upwardly and rearwardly relative

the platform at a substantial angle to the vertical, an elongated rigid support member having an upper end portion and a lower end portion, third means for mounting the support member lower end portion on the platform for pivotal movement about a second pivot axis, a clamp member mounted on the derrick section for slidable movement along a substantial portion of the length of the derrick section and clampable to the derrick section in selected fixed positions, fourth means mounting the clamp member on the support member upper end portion for pivotal movement relative the support member about a third pivotal axis that is parallel to the second pivot axis, power means mounted on the derrick section for moving the first means between a position adjacent the derrick section lower portion and a position adjacent the derrick section upper portion, and means for releasably attaching the clamp member to the first means to move therewith for varying the angle of inclination of the derrick section relative the platform when the first means is being reciprocally moved and the clamp member in in an unclamped slidable condition on the derrick section.

17. The drilling apparatus of claim 16 further characterized in that the derrick section includes an elongated guide tube and that the clamp member includes guide shoes slidably retained on the guide tube and means for selectively retaining the guide shoes in a fixed position on the guide tube.

18. Drilling apparatus comprising a platform having a front end portion and a rear end portion, a derrick section having upper, intermediate and lower end portions, a drill head, first means for mounting the drill head on the derrick section for reciprocal movement between the derrick section upper and lower end portions, power means for selectively reciprocally moving the drill head and first means, a first elongated support member of a substantially shorter length than the derrick section and having upper and lower end portions, second means for mounting the first support member lower end portion on the platform for pivotal movement about a first pivot axis between a generally vertical position and a position extending upwardly and rearwardly relative to the platform, third means for pivotally connecting the first support member upper end portion to the derrick section intermediate portion for pivotal movement relative thereto about a second pivot axis, and fourth means mounted on the platform and connected to the derrick section to act in cooperation with the first support member and the second and third means for supportingly retaining the derrick section in any one of various selected angular positions relative the platform, said fourth means comprising an elongated rigid second support member, fifth means for mounting the second support member lower end portion on the platform for movement relative thereto between various angular positions relative the platform, sixth means for connecting the second support member upper end portion to the derrick section for movement relative thereto and seventh means for releasably securing the first support member to the derrick section at a location substantially spaced from the third means and acting in cooperation with the third means to hold the derrick section in fixed relationship to the first support member during drilling.

19. The drilling apparatus of claim 18 further characterized in that sixth means includes a pivot member mounted on the second support member and having a

third pivot axis and clamp means pivotally mounted by the pivot member for clampingly engaging the derrick section at various selected locations along the length of the derrick section.

20, The drilling apparatus of claim 19 further characterized in that the clamp means includes means for releasably securing the pivot member to the derrick section in a position the third pivot axis is coextensive with the second pivot axis.

21. Drilling apparatus comprising a platform having a front end portion and a rear end portion, a derrick section having upper, intermediate and lower end portions, said derrick section having a pair of transversely spaced first and second front legs that abut against the platform when the derrick section is in a vertical drilling position and transversely spaced, elongated rear legs, an elongated guide member for each rear leg secured to the respective rear leg to extend along at least the length of the intermediate portion of the derrick section, a drill head, first means for mounting the drill head on the derrick section for reciprocal movement between the derrick section upper and lower end portions, second means for mounting the derrick section on the platform for pivotal movement about a first pivot axis between a generally vertical drilling position and a position extending upwardly and rearwardly relative the platform at a substantial angle to the vertical, an elongated rigid support member having an upper end portion and a lower end portion, third means for mounting the support member lower end portion on the platform for pivotal movement about a second pivot axis, a clamp member mounted on the derrick section for slidable movement along a substantial portion of the length of the derrick section and clampable to the derrick section in selected fixed positions, the clamp member including for each guide member a pair of guide shoes and means slidably retaining the guide shoes on the respective guide member, and fourth means mounting the clamp member on the support member upper end portion for pivotal movement relative the support member about a third pivot axis that is parallel to the second pivot axis, the second means including a pair of transversely spaced, elongated support arms having upper end portions and lower end portions on the platform for pivotal movement about the first pivot axis, sixth means for pivotally connecting the upper end portion of one of the arms to the one of the derrick rear legs and seventh means for pivotally connecting the upper end portion of the other arm to the other rear leg, said sixth and seventh means having

coextensive pivot axes.

22. The apparatus of claim 21 further characterized in that the sixth and seventh means are transversely spaced to permit the slidable retaining means moving therebetween, the slidable retaining means including a pivot member that is movable to a position to have its pivot axis coextensive with the sixth and seventh means pivot axes when the derrick section is in its vertical position.

23. The drilling apparatus of claim 21 further characterized in that the second means includes means for selectively securing the derrick section to the arms in fixed relation thereto at locations substantially spaced from the sixth and seventh means pivot axes.

24. Drilling apparatus comprising a platform having a front end portion and a rear end portion, a derrick section having upper, intermediate and lower end portions, a drill head, first means for mounting the drill head on the derrick section for reciprocal movement between the derrick section upper and lower end portions, a first elongated support member of a substantially shorter length than the derrick section and having upper and lower end portions, second means for mounting the first support member lower end portion on the platform for pivotal movement about a first pivot axis between a generally vertical position and a position inclined at a substantial angle relative to the platform, third means for pivotally connecting the first support member to the derrick section intermediate portion for pivotal movement relative thereto about a second pivot axis, and fourth means mounted on the platform and connected to the derrick section to act in cooperation with the first support member and the second and third means for supportingly retaining the derrick section in any one of various selected angular positions relative the platform, said fourth means comprising an elongated rigid second support member, fifth means for mounting the second support member on the platform for movement relative thereto between various angular positions relative the platform, and sixth means connecting the second support member upper end portion to the derrick section for pivotal movement relative thereto about a third pivot axis and mounted for movement along the derrick section intermediate portion between various selected positions, including a position the third pivot axis is coextensive with the second pivot axis when the first support member is in a generally vertical position.

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