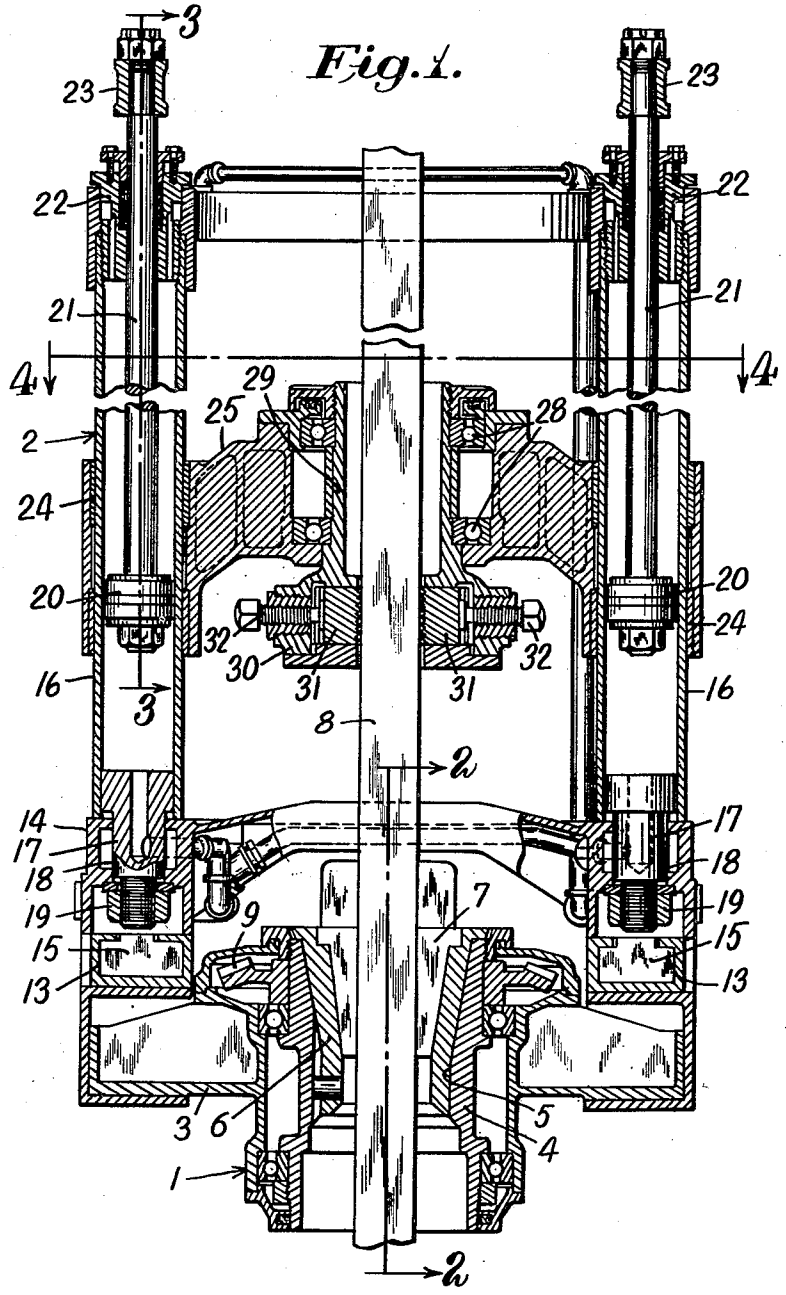
Feb. 2, 1943. H. H. VANDERZEE 2,310,000

DRILLING APPARATUS

Original Filed May 23, 1939 2 Sheets-Sheet 1

Fig. 1.



Inventor:
Harry Herbert Vanderzee.
By
Louis A. Uhlorn.
Atty.

Feb. 2, 1943. H. H. VANDERZEE 2,310,000

DRILLING APPARATUS

Original Filed May 23, 1939 2 Sheets-Sheet 2

Fig. 2.

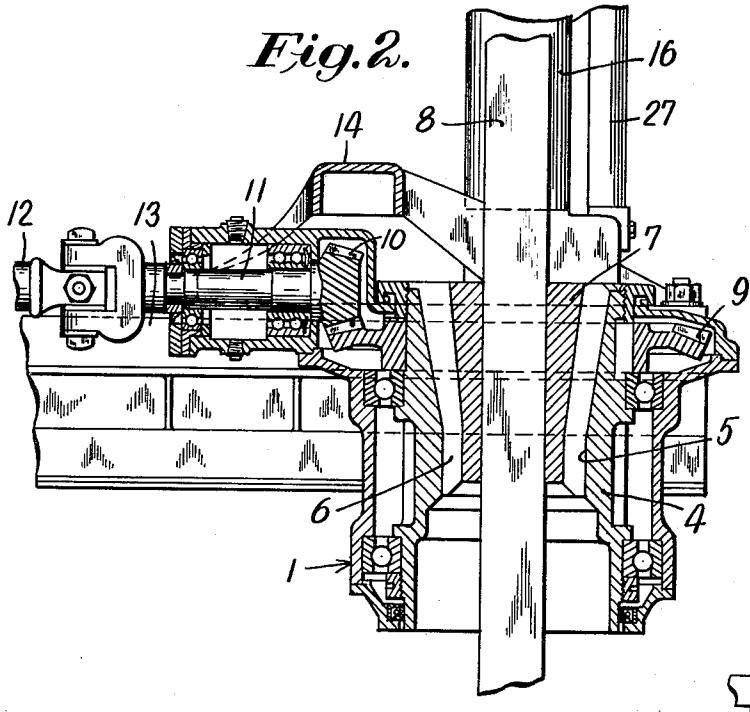


Fig. 3.

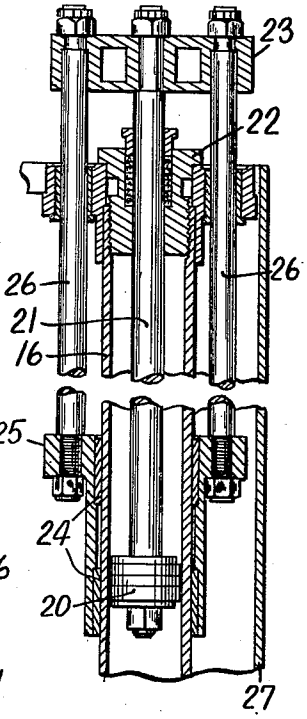
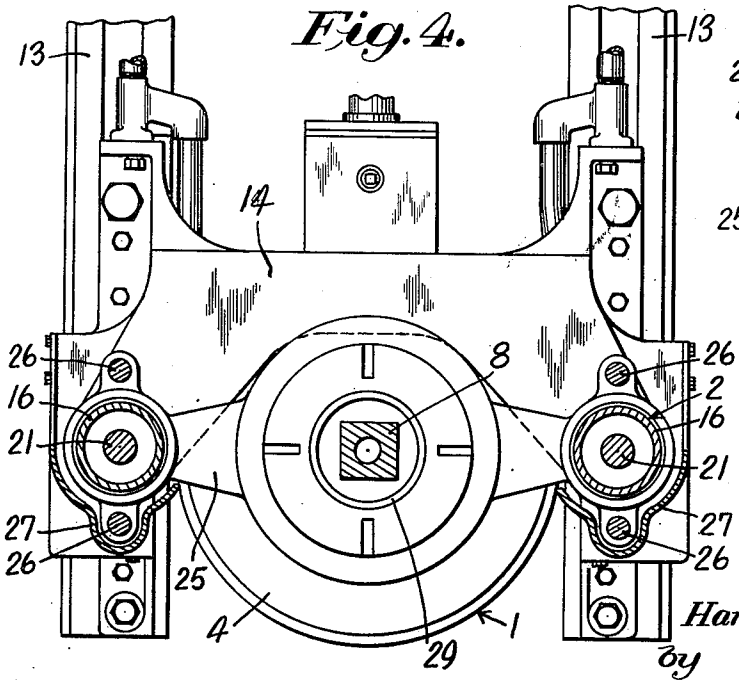


Fig. 4.



Inventor:
Harry Herbert Vanderzee.
By
Louis A. Warren.
Atty.

Patented Feb. 2, 1943

2,310,000

UNITED STATES PATENT OFFICE

2,310,000

DRILLING APPARATUS

Harry H. Vanderzee, Claremont, N. H., assignor to Sullivan Machinery Company, a corporation of Massachusetts

Original application May 23, 1939, Serial No. 275,235. Divided and this application July 25, 1940, Serial No. 347,506

4 Claims. (Cl. 255—22)

This invention relates to drilling apparatus, and more particularly to improvements in the feeding and rotating mechanisms of an oil well drilling apparatus.

An object of this invention is to provide an improved oil well drilling apparatus. Another object is to provide an improved oil well drilling apparatus having improved rotation means for rotating the drill rod line, and having associated therewith improved hydraulically operated rod line feeding mechanism. A further object is to provide an improved slidable mounting for the feeding means whereby the latter may be shifted laterally relative to the rotary table to clear the latter for the usual rotary drilling operation. A still further object is to provide improved means for guiding the drill rod chuck with respect to the rotary table, the rod chuck being guided in an improved manner on elements of the rod line feeding mechanism. A still further object is to provide improved rod line feeding and rotating mechanism having novel arrangements and combinations of parts. Other objects and advantages of the invention will, however, hereinafter more fully appear in the course of the following description.

This application is a division of my copending application Serial No. 275,235, filed May 23, 1939.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings:

Fig. 1 is a view in vertical section through an illustrative embodiment of the improved rod line feeding and rotating mechanisms.

Fig. 2 is a view in longitudinal vertical section taken substantially on line 2—2 of Fig. 1.

Fig. 3 is a detail vertical sectional view taken substantially on line 3—3 of Fig. 1.

Fig. 4 is a horizontal sectional view taken substantially on line 4—4 of Fig. 1.

In this illustrative embodiment of the invention, the improved rod line feeding and rotating mechanism are embodied in a rotary drilling apparatus of the portable oil well type especially designed for use in deep structure core testing or shallow or so-called "slim-hole" production drilling. The improved drilling apparatus is preferably mounted on an automotive base, such as an automotive trailer, although it will be evident that the same may be mounted on various forms of transport means, such as an automobile truck or tractor. The oil well rig, as shown in the drawings, includes drill rod rotation mechanism, generally designated 1, and hydraulic drill rod feeding means, generally designated 2.

The improved drill rod rotating means comprises a base frame or rotary base 3, and journaled in bearings supported within the base frame is a rotary table 4 having a central recess 5 for receiving a usual adaptor or bowl 6, the latter in turn having recesses for receiving a "Kelly" drive bushing 7. The "Kelly" drive bushing is of the two-piece type having recesses cooperating to form a rectangular socket for receiving a drill stem or so-called "Kelly" 8, herein preferably of rectangular cross section. The drill stem drive bushing is self-locking in the table adaptor and may be readily lifted out of the way so that standard drill pipe slips may be inserted in its place, in a well known manner. As is usual in rotary drills, the adaptor or bowl 6 is interlocked with the table, and the drive bushings or slips are interlocked with the adaptor so that the parts all rotate together. Secured to the rotary table is a bevel gear 9 driven by a bevel gear 10 keyed to a horizontal, longitudinally extending drive shaft 11, the latter being driven through a shaft 12.

Associated with the rod line rotating means and guided on parallel, longitudinally extending guideways 13, 13 mounted on the base frame at the opposite sides of the rotary table 4, is the hydraulic feeding means 2. This hydraulic feeding means comprises a sliding frame 14 having secured thereto, as by bolts, shoes 15 slidably mounted on the longitudinal guideways 13. The frame 14 is generally U-shaped in plan, as shown in Fig. 4, so that free access to the rotary table from its outer side may be obtained. This hydraulic feeding means is preferably of the twin cylinder type and comprises a pair of parallel vertical cylinders 16, 16 mounted at their lower ends on the sliding frame 14 at the opposite sides of the rotary table with their lower ends in adjacency to the table. The lower cylinder heads have bolt-like portions 17 received in vertical openings 18 in the sliding frame 14 and held in position by nuts 19 threaded on the lower ends of the bolt-like portions. Contained within the cylinders are reciprocable pistons 20 having their piston rods 21 extending upwardly through the packed top heads 22 of the cylinders. The piston rods are connected at their upper ends to cross yokes 23. Slidably guided at 24 on the exterior peripheries of and extending between the cylinders is a sliding crosshead 25, and the crosshead is connected to the yokes 23 by parallel connecting rods 26. The crosshead overlies the

rotary table and when in its lowermost position is disposed in adjacency to the top of the table near the lower ends of the cylinders. Extending coextensively with the feed cylinders between and suitably secured to the top heads and the bottom frame are vertical guards 27, and these guards afford protection for the cylinders and connecting rods at the outer side of the rotary table. Journaled within spaced bearings 28 supported within the sliding crosshead 25 is a chuck sleeve 29 carrying at its lower end a usual chuck 30. The chuck 30 includes chuck jaws 31 adapted to grip the flats of the square drill stem 8 and provided with adjusting screws 32. When the chuck jaws are adjusted into gripping relation with the drill stem and hydraulic pressure is supplied to one end or the other of the feed cylinders, the crosshead may be fed upwardly or downwardly along the feed cylinders, and as a result the drill stem may be fed either upwardly or downwardly as desired through the drive bushing of the rotary table. When the feed pistons are in their lowermost positions within the feed cylinders, the chuck is disposed in adjacency to the top of the rotary table, and in all positions of the chuck the latter is adequately guided by the feed cylinders.

The general mode of operation of the improved drill rod rotating and feeding mechanisms will be clearly apparent from the description given. When it is desired to effect feed of the rod line by means of the hydraulic feeding means, for instance when it is desired to take cores, or during other drilling operations when it is desired to apply hydraulic control to the rod line, the feeding mechanism is slid along the guideways 13, 13 into its operative position above the rotary table as shown. The rod line will then be lowered through the chuck 30 and through the drive bushing of the rotary table 4 and the screws 32 adjusted to move the chuck jaws into gripping engagement with the drill stem 8. When hydraulic pressure is supplied to one end or the other of the hydraulic cylinders 16, the rod line may be fed upwardly or downwardly as desired under hydraulic control. When it is desired to operate the drilling rig in accordance with the usual rotary drilling operations, the feeding mechanism is slid laterally along the guideways 13, 13 into its retracted position with respect to the rotary table, thereby clearing the latter for the usual rotary drilling operations. When the hydraulic feeding means is retracted, the hoisting cable of the drilling rig may be connected, in a well known manner, to the upper end of the rod line so that the rod line may be raised or lowered with respect to the rotary table, and, at certain times during the rotary drilling operation, the hoisting cable may be employed for relieving the drill bit of a substantial portion of the weight of the rod line. By the provision of the improved arrangement of the parts, the space above the crosshead and rotary table is clear at least in line with the chuck to permit the lower end of the drill stem to be moved laterally at an elevation just above the chuck and crosshead into and out of alinement with the chuck.

As a result of this invention, it will be noted that an improved well drilling rig is provided having improved rod line rotating and feeding mechanisms whereby the rod line is fed and rotated in an improved manner. It will also be noted that by the provision of the improved hydraulic feeding means, it is possible to apply pressure to the rod line in an improved manner, and by the provision of the slidable mounting for the feeding means the latter may be retracted with respect to the rotary table, thereby to clear the table for the usual rotary drilling operations. It will further be evident that by guiding the chuck crosshead on the exterior peripheries of feed cylinders with respect to the rotary table, the chuck is also adequately guided, and, due to its improved arrangement with respect to the rotary table, may be moved downwardly into a position into close adjacency to the top of the table. Other uses and advantages of the improved rod rotating and feeding mechanisms will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without 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, a base, a rotary table mounted on said base and having means for rotating a rod line, hydraulic rod line feeding means mounted on said base comprising a pair of vertical cylinders arranged in parallel relation at the opposite sides of said rotary table with their lower ends in adjacency to said table, feed pistons reciprocable in said cylinders and having piston rods extending upwardly through the top cylinder heads, a crosshead extending between and guided on the exterior peripheries of said cylinders for vertical movement therealong, said crosshead overlying said rotary table and when in its lowermost position disposed in adjacency to the top of said table near the lower ends of said cylinders, connections between the upper ends of said piston rods and said sliding crosshead, and a chuck rotatably mounted on said crosshead for connecting the rod line to the crosshead for vertical movement therewith with respect to said rotary table, said rotary table effecting rotation of the rod line as the latter is moved vertically with respect thereto with said chuck and crosshead.

2. In a drilling apparatus, a base having parallel guideways, a rotary table mounted on said base intermediate said guideways and having means for rotating a rod line, hydraulic drill rod feeding means mounted on said base for movement along said guideways laterally relative to said rotary table, said feeding means comprising a pair of vertical cylinders arranged in parallel relation at the opposite sides of said rotary table with their lower ends in adjacency to said table, feed pistons reciprocable in said cylinders and having piston rods extending upwardly through the top cylinder heads, a crosshead extending between and guided on the exterior peripheries of said feed cylinders for vertical movement therealong, said crosshead overlying said rotary table and when in its lowermost position disposed in adjacency to the top of said table near the lower ends of said cylinders, connections between the upper ends of said piston rods and said sliding crosshead, and a chuck rotatably mounted on said crosshead for connecting said rod line to said crosshead for vertical movement therewith with respect to said rotary table, said rotary table effecting rotation of the rod line as the latter

is moved vertically with respect thereto with said chuck and crosshead, and said hydraulic feeding means, when said chuck is released from the rod line, being shiftable along said guideways laterally relative to the rotary table to clear the latter for the usual rotary drilling operations.

3. In a drilling apparatus, a base, a rotary table mounted on said base and having means for rotating a drill stem, hydraulic drill stem feeding means mounted on said base and comprising a pair of vertical feed cylinders arranged in parallel relation at the opposite sides of said table with their lower ends in adjacency to said table, said cylinders having cylindrical peripheral surfaces providing guides, feed pistons reciprocable in said cylinders and having piston rods extending upwardly through the top cylinder heads, a crosshead extending between said cylinders and overlying said table, said crosshead having portions slidably engaging the cylindrical peripheral surfaces of said cylinders to guide said crosshead for vertical movement along said cylinders relative to said table, said crosshead having thereon between said cylinders a rotatably mounted chuck arranged for free rotation on an axis parallel to and between the axes of said cylinders for connecting a drill stem to the crosshead for vertical movement therewith with respect to said table, operative connections between the upper ends of said piston rods and said crosshead including connecting rods extending downwardly alongside said cylinders when said pistons are in lowered positions and connected at their lower ends to said crosshead, said crosshead being disposed near the lower ends of said cylinders in adjacency to the top of said table when said pistons are adjacent the lower ends of said cylinders, said table effecting rotation of the drill stem as the latter is moved vertically with respect thereto with said chuck and crosshead, and said cylinders being so spaced and said operative connections being so formed that said crosshead may move upwardly and downwardly along said cylinders from points adjacent the upper ends thereof to points adjacent the lower ends thereof, and the space above said crosshead and chuck being clear at least in line with the chuck to permit the lower end of a drill stem to be gripped in the chuck to be moved laterally at an elevation just above the chuck and crosshead into and out of alinement with the chuck.

4. In a drilling apparatus, a base, a rotary table mounted on said base and having means for rotating a drill stem, hydraulic drill stem feeding means mounted on said base and comprising a pair of vertical feed cylinders arranged in parallel relation at the opposite sides of said table with their lower ends in adjacency to said table, said cylinders having cylindrical peripheral surfaces providing guides, feed pistons reciprocable in said cylinders and having piston rods extending upwardly through the top cylinder heads, a crosshead extending between said cylinders and overlying said table, said crosshead having portions slidably engaging the cylindrical peripheral surfaces of said cylinders to guide said crosshead for vertical movement along said cylinders relative to said table, said crosshead having thereon between said cylinders a rotatably mounted chuck arranged for free rotation on an axis parallel to and between the axes of said cylinders for connecting a drill stem to the crosshead for vertical movement therewith with respect to said table, operative connections between the upper ends of said piston rods and said crosshead including connecting rods extending downwardly alongside said cylinders when said pistons are in lowered positions and connected at their lower ends to said crosshead, said crosshead being disposed near the lower ends of said cylinders in adjacency to the top of said table when said pistons are adjacent the lower ends of said cylinders, said table effecting rotation of the drill stem as the latter is moved vertically with respect thereto with said chuck and crosshead, and said cylinders being so spaced and said operative connections being so formed that said crosshead may move upwardly and downwardly along said cylinders from points adjacent the upper ends thereof to points adjacent the lower ends thereof, and the space above said crosshead and chuck being clear at least in line with the chuck to permit the lower end of a drill stem to be gripped in the chuck to be moved laterally at an elevation just above the chuck and crosshead into and out of alinement with the chuck, and means for mounting said feeding means for bodily movement laterally relative to said rotary table to clear the latter for the usual rotary drilling operations.

HARRY H. VANDERZEE.