

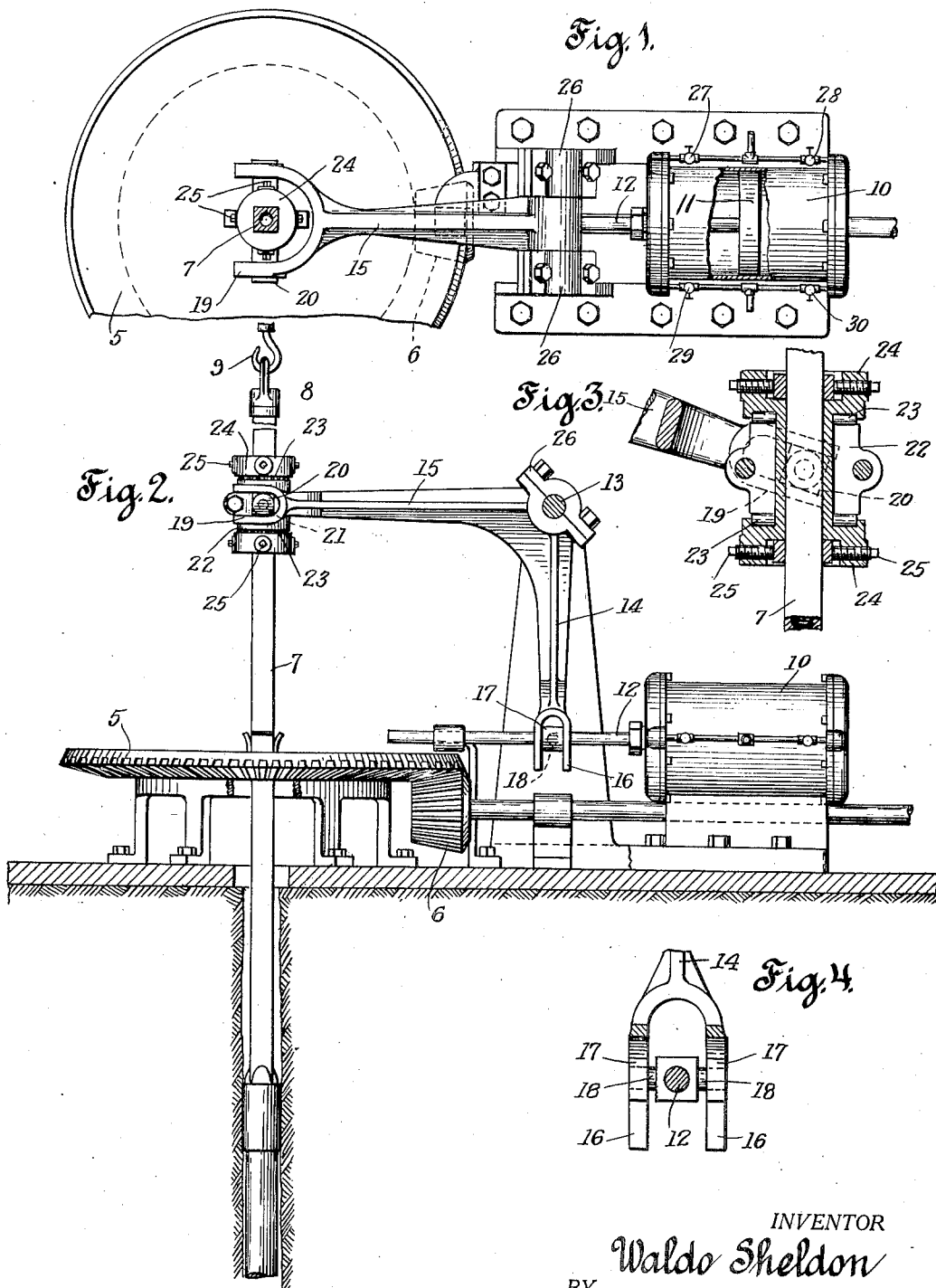
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OIL WELL DRILLING APPARATUS

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OIL-WELL-DRILLING APPARATUS.

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Some of the more important objects of this invention are to provide readily controlled means for maintaining a desired pressure on the drill bit and for effecting a desired rate of feed and to provide the means for such purposes in simple practical form, capable of ready application and use with the ordinary rotary drilling outfit.

Another important object is the provision of this apparatus in such form that it will aid and facilitate the usual rotary drilling operations and will enable the bringing in of a well against pressure.

A further object is to provide for a relatively long effective feed stroke.

In the accompanying drawing forming part of this specification, I have illustrated but one simple commercial embodiment of the invention and therefore wish it understood that the structure may be modified in many respects without departure from the true spirit and scope of the invention hereinafter defined and claimed.

Figure 1 in the drawing referred to is a broken plan view illustrating an embodiment of the invention applied to and in use with a rotary drilling machine.

Figure 2 is a broken side elevation of the same.

Figures 3 and 4 are detail sectional views illustrating the sliding and rocking connections at the ends of the bellcrank structure which is utilized to transform the horizontal movement at the pressure cylinder into a vertical movement at the drive stem of the drill.

In the illustration I have indicated parts of an ordinary rotary drilling apparatus including a rotating table 5 driven by a pinion 6 and carrying at its center a suitable chuck for holding the drive stem 7 of the drill. A swivel 8 is shown attached to the stem having a cable 9 which extends over a block at the crown of the derrick to a suitable drum (not shown) usually controlled by a friction brake.

For the purpose of effecting the desired feed of the drill and the proper pressure on the drilling bit an accurately and readily controlled pressure device is provided con-

sisting in the illustration of a hydraulic or other power cylinder 10 fixed on the derrick floor in a substantially horizontal position at one side of the rotating table provided with a piston 11 having a horizontally reciprocating piston rod 12 connected with the drive stem by a bellcrank structure pivoted at 13 and having a generally vertical arm 14 connected with the piston rod and a generally horizontal arm 15 connected with the drive stem.

The lower arm of the bellcrank is shown as slidingly and pivotally connected with the piston rod of the power device by having forked terminals 16 slidingly engaging over the squared blocks 17 pivoted on studs 18 outstanding from opposite sides of the piston rod. This construction provides a simple variable connection between the power piston and the bellcrank which allows for the different motions of the two and one which can be readily taken apart and put together.

The connection between the upper arm of the bellcrank and the drive stem of the drill is shown as similarly constructed, the bellcrank having spaced forked terminals 19 slidingly fitting over squared blocks 20 mounted on pivot studs 21, but a rotating engagement is effected with the drive stem by having these studs carried by a sleeve 22 which is rotatably confined between thrust bearings 23 on a chuck sleeve 24 which is adjustably affixed to the drive stem as by means of the clamp bolts 25. If found desirable, the two arms of the bellcrank may be of different length so as to multiply either the applied power or movement. In the case illustrated, the generally horizontal arm, that is, the one which connects with the drive stem is somewhat longer than the other arm, the movement being thereby increased to the extent of this difference in length of the two arms. Also it will be noted that as the bellcrank swings, the applied leverage will vary as the swiveling blocks slide in the forks of the bellcrank arms and it will be seen that by proportioning and relatively positioning these arms, different desired effects may be obtained.

The bellcrank is shown as arranged with its pivot above the pressure cylinder and with its generally vertical arm dependent from such elevated position in front of the
 5 end of the pressure cylinder. This relation of parts enables the pressure cylinder to be placed low and when the pivot bearings are constructed with removable cap pieces, as shown at 26 in the present disclosure, en-
 10 ables the bellcrank to be quickly disconnected from the drive stem by swinging it backward upon the piston rod pivots as a center. To facilitate such operation the bearing caps are shown as arranged on a
 15 rearward incline so that when they are removed the pivot bearings will be open to the rear and so permit the bellcrank journals to lift easily out of such open bearings in the rearward swinging movement of the bell-
 20 crank. In such movement it will be evident that the forked ends 19 of the upper bellcrank arm will simply slide free of the bearing blocks 20.

This ready disengageability of the bellcrank is particularly valuable in facilitating the addition of extra sections of the drive stem and in withdrawing and replacing the drill stem.

Suitable valve mechanism is provided for
 30 controlling the pressure in the opposite ends of the pressure cylinder. In the case of a hydraulic cylinder such as illustrated, this valve mechanism may consist simply of hand valves 27, 28, controlling admission of pres-
 35 sure to the opposite ends of the cylinder and other valves 29, 30 controlling release of pressure at opposite ends of the cylinder. Usually the valves will be manipulated so
 40 that as pressure is admitted to one end of the cylinder, the pressure will be correspondingly released at the opposite end of the cylinder. This method of control serves
 45 to maintain a uniform pressure and steady feed at the drive stem and may be varied in accordance with varying conditions met with.

A special advantage of the invention is that it enables the bringing in of a well
 50 against pressure, a proper control of the power cylinder enabling sufficient pressure to be maintained on the drive stem to overcome the pressure of gas or other forces met with in the drilling of oil wells. The hori-
 55 zontal disposition of the cylinder is an important factor in the attainment of this result since it enables the power cylinder being located off to one side of the drive stem where it can be readily controlled and does
 60 not interfere with the proper functioning of the rotating stem.

The horizontal disposition of the power device also enables the construction of the same with a stroke of practically any de-
 65 sired length so that a long feed stroke may

be imparted to the drive stem. At the end of each feed stroke the chuck may be loosened and set back in readiness for the commencement of a fresh stroke.

The bellcrank construction will operate
 70 effectively in both directions, that is, either to advance or to retract the drive stem and it will be evident that by proper control of the cylinder very accurate and exact results may be attained. In withdrawing opera-
 75 tions the bellcrank structure may be entirely disconnected and the hoisting be effected wholly by the cable. If desired also the pressure control feed may be utilized in con-
 80 junction with the independently controlled hoist, for instance, to hold the remaining sections of the drive stem while other sec-
 85 tions are being removed. It will thus be seen that by means of the novel arrange-
 90 ment of the pressure cylinder and the bellcrank connections between the same and the drive stem, the same may be used as a valuable adjunct to and in combination with the ordinary rotary drilling outfit, without
 95 in any way interfering with the usual operations of such outfit and in fact, actually facilitating such usual operations. The bearings for the bellcrank or rocker are
 100 shown as carried by upstanding posts or standards 31 rising from and forming a part of the same base 32 which carries the pressure cylinder, thus making the device a unitary structure for direct application to the floor of the derrick.

What I claim is:

1. In oil well drilling apparatus, the combination with means for rotating the vertical drill stem, of means for effecting the feed and controlling the pressure on the rotating
 105 drill comprising a horizontally disposed pressure cylinder with a piston therein, said cylinder and piston being movably related and one of such elements being connected with the rotating drive stem and connecting
 110 means from such element for translating the horizontal thrust at the cylinder into a vertical thrust at the drive stem.

2. The structure of claim 1 in which the translating means comprises a bellcrank
 115 structure having a readily disengageable swivel connection with the drive stem.

3. The structure of claim 1 in which the translating connection may be readily freed from operative relation to the drive stem and in which means are provided for lifting
 120 and lowering the drive stem independently of the horizontally disposed power applying mechanism.

4. In oil well drilling apparatus, the combination with a drive stem and means for rotating the same, a double thrust collar
 125 adjustably connected with the drive stem, a bellcrank structure having a generally horizontal arm slidably engaged with the thrust collar and a generally vertical arm, a sub-
 130

stantially horizontal power cylinder and a piston in said cylinder operatively connected with the generally vertical arm of the bellcrank.

5 5. The structure of claim 4 in which the sliding connection between the bellcrank arm and thrust collar includes pivoted blocks carried by the thrust collar and operating in forked guides on the bellcrank arm.

10 6. The structure of claim 4 in which the slidable connection between the bellcrank arm and thrust collar is readily disconnectible.

15 7. In oil well drilling apparatus, the combination with means for rotating the drive stem, of a substantially horizontally disposed pressure device and operating connections from said device to the drive stem for translating the feed stroke of said device into a feeding movement at the drive stem of different extent from the feed stroke of the power device.

20 8. In oil well drilling apparatus, the combination with means for rotating the drive stem, of a substantially horizontally disposed power cylinder and power varying connections from said cylinder to the rotating drive stem.

25 9. In oil well drilling apparatus, the combination with means for rotating the drive stem of the drill including a rotating table, of a pressure cylinder supported in a substantially horizontal position off to one side of the rotating table and provided with a piston having a projecting piston rod, a rocker having a pivotal support located at a higher elevation than the cylinder and having a dependent arm extending downward adjacent one end of the cylinder and another arm extending laterally toward the drive stem, said arms having pivotal sliding connections with the piston rod and with the drive stem respectively and a bearing for the rocker having a removable cap set at an incline.

30 10. In oil well drilling apparatus, the combination with means for effecting continuous rotation of the drill stem, of means for variably feeding and applying accurately regulatable pressure to the drill stem comprising a power device mounted to one side of the drill rotating means and having a readily disconnectible power applying connection with the drive stem adapted to permit free rotation of the drive stem.

35 11. In oil well drilling apparatus, the combination with a rotary table provided with means for driving a drill stem extending therethrough, a power cylinder mounted at one side of the rotary table and power applying connections extending from said power cylinder across the rotary table and including readily adjustable means for applying pressure to the drill stem irrespective of the rotary motion of said drill stem.

12. In oil well drilling apparatus, the combination of a supporting base, a rotary table mounted at a fixed low level on said base with clearance above the same for the usual rotary drilling operations and having a chuck passage at the center for the drill stem, a power feed cylinder supported by the base in a fixed position not interfering with the rotation of the table, a piston in said cylinder having a projecting piston rod, operating connections from said piston rod for applying lifting and lowering forces to the drill stem and including cooperating thrust transmitting members relatively rotatable, one to turn with the drill stem and the other to remain non-rotatable with the power transmitting connections, said rotating member having readily releasable means for variable adjustable engagement with the drill stem, readily controllable means for applying regulated pressure to opposite ends of the cylinder for accurately feeding, sustaining or lifting the drill stem and means for enabling the quick removal of the power applying mechanism to afford clearance of the rotary table and the ready return to rotary drilling operations.

13. In oil well drilling apparatus, the combination of a supporting base, a rotary table mounted at a fixed low level on said base with clearance above the same for the usual rotary drilling operations and having a chuck passage at the center for the drill stem, a power cylinder supported at a fixed level and in position not to interfere with the free rotation of the table, operating connections from said cylinder for applying a pressure feed or lifting force to the drill stem and including chuck mechanism variably adjustable to the drill stem and means for accurately controlling admission of pressure to opposite ends of the cylinder to accurately apply regulated degrees of lifting or lowering force to the drill stem irrespective of the rotation effected by the table, the said mechanisms being readily disconnectible to clear the table for the usual rotary drilling operations.

14. In oil well drilling apparatus, the combination of a supporting base, a rotary table mounted at a fixed low level on said base with clearance above the same for rotary drilling operations and having a driving passage therethrough for holding a member in slidingly keyed engagement, a driven member slidingly keyed in said passage, upward and downward thrust transmitting shoulders connected with said driven member, a power feed cylinder supported by the base in a fixed position not interfering with the rotation of the table, a piston in said cylinder having a projecting piston rod, operating connections from said piston rod for applying lifting and lowering forces to the

slidingly held driven member and including a non-rotating member having thrust transmitting shoulders cooperating with the thrust shoulders of the rotating driven member, readily controllable regulating means for the power cylinder for accurately governing the feeding, sustaining or lifting effect on the driven member and means for enabling quick clearance of the power mechanism to permit return of the rotary table to regular rotary drilling operations. 10

In witness whereof, I have hereunto set my hand this 28th day of September, 1922.

WALDO SHELDON.