Sept. 17, 1940. J. MOONEY 2,214,970

COMBINATION WELL DRIVING AND BORING TOOL

Filed April 25, 1939

Fig. 1.

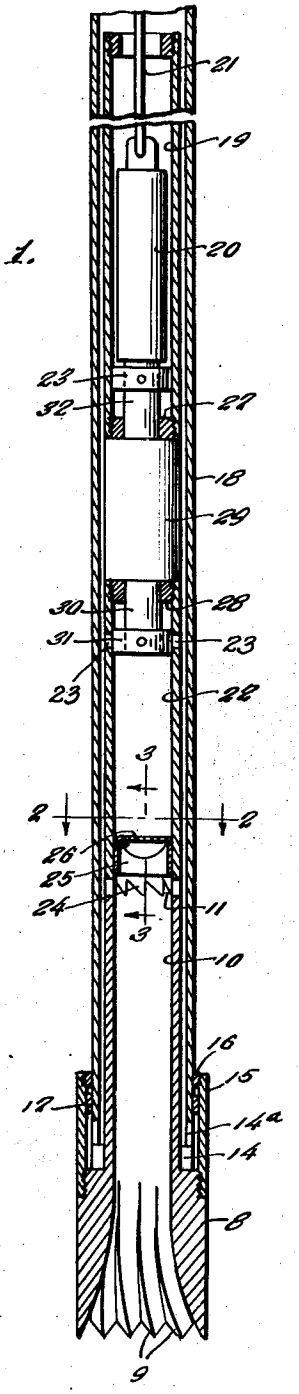


Fig. 2.

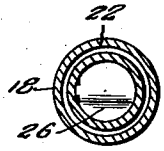


Fig. 3.

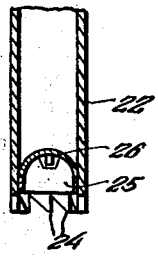


Fig. 4.

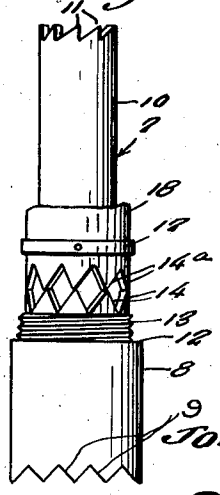


Fig. 6.

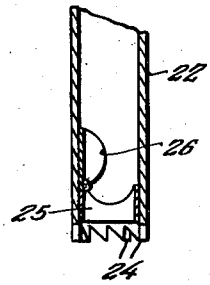
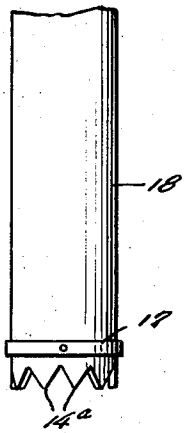


Fig. 5.



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COMBINATION WELL DRIVING AND BORING TOOL

John Mooney, Ionia, Mich.

Application April 25, 1939, Serial No. 269,971

5 Claims. (Cl. 255—61)

This invention relates to oil well equipment, and has reference in particular to what may be conveniently referred to as a two-way or combination rotating and reciprocating well driving and boring tool, that is, a structure which is calculated to properly respond to the demands according to the particular formation encountered during the sinking of the well.

It is recognized that certain earth formations are difficult to drill in, and for this reason different types of driving tools are employed for these particular textures of earth. In other formations, however, the driving operation is found to be impractical, and therefore a rotary cutting or boring tool is necessary. Thus, as indicated in the opening paragraph, I have combined in a single tool the driving and boring facilities whereby to permit sinking or drilling the well by the selective use of these driving and boring functions.

I am sufficiently conversant with the prior state of the art to realize that a combination tool of this two-way action is not broadly new. Therefore, the novelty is predicated upon the specific construction which I have adopted to accomplish the results in a highly satisfactory and reliable manner.

As will be hereinafter seen, novelty is predicated on a gradually receding simultaneously turning drill construction wherein the initial blow causing descent of the bit is accomplished by a mechanical hammer action, this being promptly followed by an additional turning action brought about by the specific construction of the drill bit in conjunction with a heavy gravitating casing provided with means coacting with the bit to produce the desired added turning results.

Other features and advantages will become more readily apparent from the following description and accompanying drawing.

Referring now to the drawing by distinguishing reference numerals wherein like numerals designate like parts throughout the views:

Figure 1 is a view of a sectional fragmentary type, with parts in elevation, showing the complete assemblage as developed and perfected in accordance with the principles of this invention.

Figures 2 and 3 are horizontal and vertical sections on the line 2—2 and 3—3 respectively of Figure 1.

Figure 4 is a view showing the drill bit unit in elevation and showing a fragmentary portion of the surrounding toothed drop weight tube.

Figure 5 is a fragmentary elevational view of said tube per se.

Figure 6 is a view like Figure 3 showing the valve in the receiving and trapping chamber in open position.

By way of introduction, it is to be pointed out that the subject matter of this application above referred to and hereinafter described and claimed is a "continuation in part" of my co-pending application filed by me January 21, 1938, and identified as Serial No. 186,201, the same being voluntarily abandoned as of the date of this application to provide the desired continuity.

Briefly, the construction to be hereinafter particularly described is characterized by a rotary and reciprocatory ribbed drilling head unit, a portion of which is formed into a shoulder and provided with turning teeth, there being a drill tube cooperable with said head and including teeth cooperating with the teeth on said head, and hammer-like driving means confined wholly within the tube, this having driving and toothed coaction with an upstanding tubular extension on the drill head unit, all of the parts being coordinated for properly timed coaction to develop the progressive reciprocating and turning motion.

Referring now to the drawing by detailing reference numerals, the drill head unit or means is referred to broadly by the numeral 7. This comprises the drill head proper 8, the same being centrally bored and having its lower end flared and provided with spiral turning ribs 9. Rising from the central portion of the head is a tubular impact receiving and turning extension 10 having a series of properly inclined and proportioned teeth 11 on its upper end. Above the shouldered portion 12 of the head is a screw-threaded portion 13 and above this a series of upstanding circumferentially spaced V-shaped teeth 14.

As shown to advantage in Figure 1, a sleeve 15 is threaded on the part 13 and rises in concentric spaced relation around the tubular extension 10. A ring 16 is threaded into the upper end of the sleeve and this functions as a stop shoulder or abutment for an annulus or companion ring 17 secured to the lower end portion of the so-called drill tube or casing 18. The latter part surrounds the extension 10 and rises above it to the surface of the ground (not shown). It will be noted that the lower end of the casing is provided with teeth 14a coacting with the teeth 14. Also the toothed end of the casing is confined within the sleeve 15 so that the drill head is lifted from the well with the casing.

I call attention now to a sectional or triple-part impact unit. This is assembled within the confines of the tubular casing 18 and rests upon and coacts with the upstanding tubular stem or extension 10. Thus the part 10 serves as a blow receiving and transmitting member for the drill head 8. This hammer and impact assembly is characterized by an upper cylinder 19 serving as a housing for the hammer 20, the latter being suspended on the lower end of an operating cable or equivalent element 21. Then there is a second or lower cylinder 22 having ports 23 for escape of slush which backs up into the cylinder 22. Incidentally, this part 22 may be further differentiated as a receiving chamber. At its lower end it is provided with teeth 24 shaped to match and coact with the teeth 11 on the extension 10. Also at this point I provide a fitting 25 to accommodate a flap valve 26, the latter being hinged to the fitting as shown to advantage in Figures 1, 3 and 6. The valve is lifted or opened by the pressure of upwardly flowing slush material. It is swung to the open position as shown in Figure 6 when sufficient material backs up through the extension 10 and into the receiver 22. When, however, the entire device is lifted from the hole, the weight of the material in the receiver closes the valve to trap and bring to the surface the sample of strata thus trapped. It will be noted that the adjacent ends of the cylinders 19 and 22 are provided with threaded abutment collars 27 and 28, there being a coupling 29 joining these cylinders together. The lower stem 30 on the coupling projects down into the receiver and is provided with an abutment ring 31 engageable with the adjacent ring 28. There is also a similar extension 32 on the upper end of the coupling provided with a shoulder or abutment ring 33. The coupling serves to swivelly connect the two sections 19 and 22 of said hammer impact receiving and blow transmitting means.

In operation, when the hammer 20 strikes the impact pin 32, the coupling 29 transmits the blow to the impact receiving cylinder or tube 22, which in turn, transmits the resultant effect of the blow to the drill bit or head 8 through the medium of the coacting upstanding extension 10. At this time it is to be assumed that the teeth 24 are intermeshed or in engagement with the teeth 11. The spiral ribs 9 in the bit cause the same to turn in a counter-clockwise direction, as is obvious. Then as the bit drops away from the lower end of the weighted follower pipe or casing 18, the turning of the bit causes the teeth 14*a* to rise on the pinnacle or crest portions of the underlying teeth 14 on the drill bit. The teeth are so arranged that the teeth 14 move out of engagement with the superposed teeth 14*a* without interfering with the downward movement of the bit or the turning thereof. This same coaction of the teeth is observed between the aforesaid teeth 11 and 24. Now when the heavy weighted casing or tube 18 drops of its own weight in the follower action it is evident that the teeth 14*a* come into cam-like engagement with the teeth 14 on the bit and cause the bit to rotate in the same direction as was given thereto by the action of the rib 10. The same is true of the cam coaction of the teeth 24 and 11. Thus the ribs 9 impart the initial rotary motion and the secondary progressive rotary motion is accomplished by the coaction of the two sets of teeth and the progressive dropping of the weight applying casing 18.

It is obvious that by swivelly connecting the casing 18 with the drill head, the latter has independent reciprocating and rotary motion. The swivel connection also mechanically joins the drill unit to the lower end of the casing 18 so that when the latter is pulled from the well the entire drill structure is lifted up.

It is believed that the progressive reciprocating and rotating coaction of parts is clear from the drawings and description. The construction of the impact unit comprising the upper and lower sections 19 and 22 swivelly joined together by a coupling which transmits the blow to the drill head or unit is also clear. Then too, the explanation of the self-operating trapping valve means in the lower end of the cylinder 22 appears to be clear. The drillings back up through the bit into the receiver 22 and after this is fully charged and the device is drawn or pulled to the surface, the cuttings can be emptied.

It is thought that the description taken in connection with the drawings will enable a clear understanding of the invention to be had. Therefore, a more lengthy description is thought unnecessary.

While the preferred embodiment of the invention has been shown and described, it is to be understood that minor changes coming within the field of invention claimed may be resorted to if desired.

I claim:

1. A combined driving and boring tool for drilling wells comprising a drilling bit, a drill tube, a toothed rotary driving connection between the tube and bit, said bit being provided with an impact receiving shoulder, a sectional impact unit mounted in said drill tube, said unit including a coupling having a hammer pin, said coupling swivelly adjoining the complemental sections, and a reciprocatory cable controlled hammer cooperable with said pin.

2. As a component part of an assemblage of the class described, a cylinder, a coupling detachably and swivelly connected with said cylinder, said coupling being of solid formation and provided with a reduced concentrically disposed upstanding impact pin, a cable controlled reciprocatory hammer, a pipe-length forming a casing for said hammer, said casing resting on said coupling and surrounding in concentric relation said pin.

3. In a driving and boring tool of the class described, a drilling head including a shouldered and toothed upper end, a drill tube cooperable with said head and including teeth cooperating with the teeth on said head, and driving means confined wholly within the tube and head and including a cable controlled reciprocatory hammer, an impact pin, and means for transmitting the blow from the pin directly to the shoulder on said head.

4. As a new article of manufacture, and as a component part of a combined driving and boring tool for drilling wells, a drill head unit comprising a bit centrally bored and provided with spiral drilling and turning ribs, said bit being provided with a concentric upstanding tubular extension, said extension being provided on its upper end with impact receiving and turning teeth, the upper part of said drill bit having a screw-threaded shoulder and upstanding circumferentially spaced teeth, a sleeve connected to said drill bit and concentrically surrounding the tubular extension and teeth

carried by said drill bit, said sleeve being adapted to function as a housing for the lower toothed end of an associated weight applying casing.

5. As a component part of an assemblage of the class described, an impact receiving and blow transmitting unit comprising a cylinder, the lower end of said cylinder being toothed and provided with an automatically operable flap valve, an upper cylinder in longitudinal alignment with said first named cylinder and providing a hammer housing, a coupling member swivelly adjoining the adjacent ends of said cylinders, the upper end of said coupling member being provided with an impact receiving pin with which the hammer is cooperable.

JOHN MOONEY.