

Oct. 26, 1926.

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O. S. SHAW

WELL DRILLING APPARATUS

Filed April 6, 1925

2 Sheets-Sheet 1

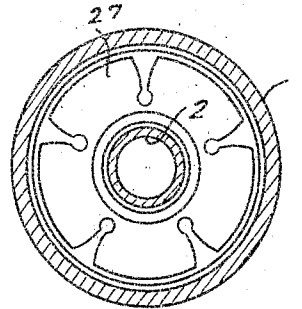
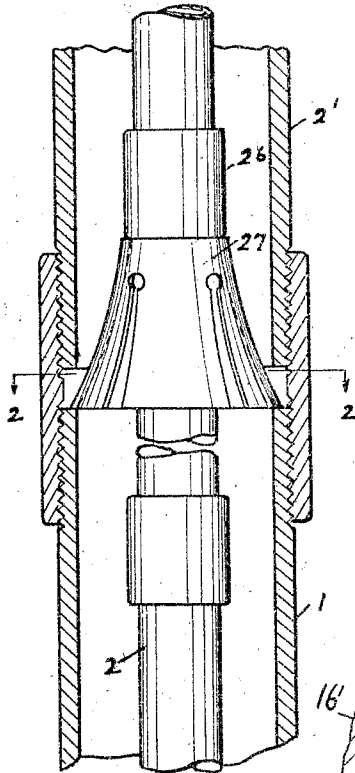


Fig. 2.

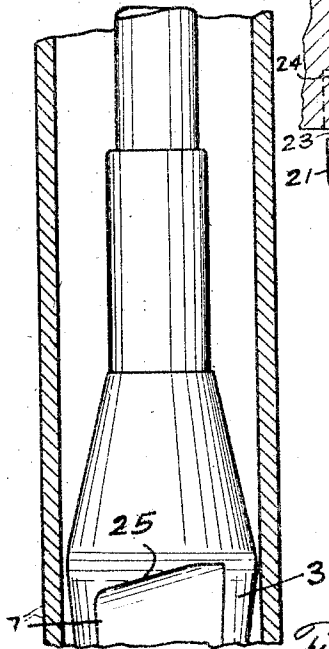


Fig. 3

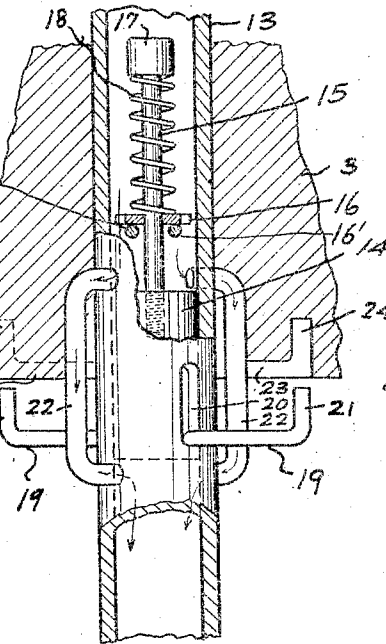


Fig. 4.

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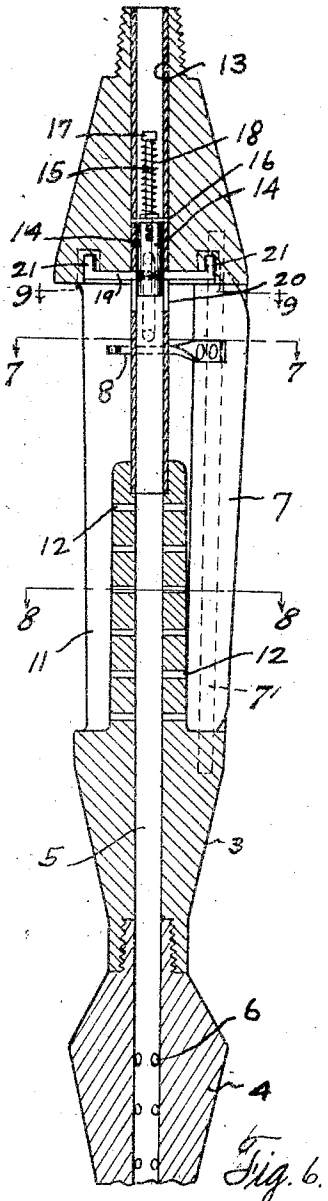
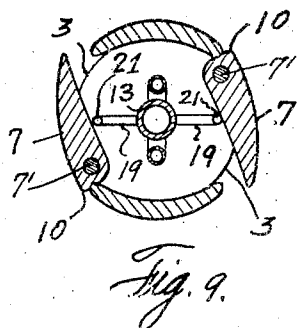
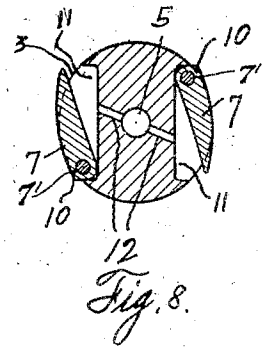
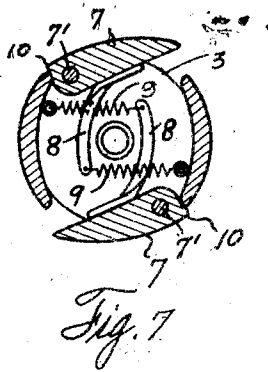
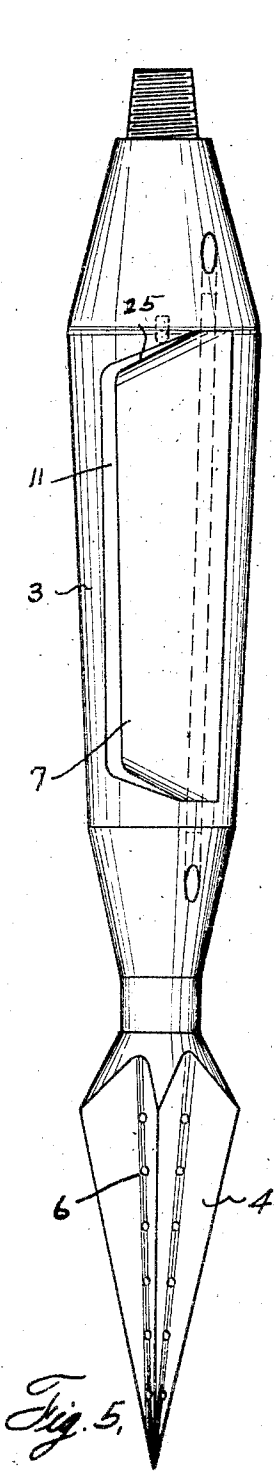
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WELL DRILLING APPARATUS

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2 Sheets-Sheet 2



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WELL-DRILLING APPARATUS.

Application filed April 6, 1925. Serial No. 21,134.

This invention relates to new and useful improvements in a well drilling apparatus.

One object of the invention is to provide a device of the character described which includes a novel type of bit, specially adapted for drilling or under reaming, and so constructed that an abundant supply of water will be delivered to the cutting points, and cutting blades, of the bit.

Another object of the invention resides in the provision of an apparatus of the character described which may be employed either in drilling through the soft or hard formation.

A further feature of the invention resides in the provision of a well drilling apparatus which embodies novel means for sustaining the drill stem and bit in the bore when it becomes necessary to do so, as, for example, when it becomes necessary to add additional joints, or sections, to the upper end of the casing.

With the above and other objects in view this invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification, and illustrated in the accompanying drawings wherein:—

Figure 1 shows a fragmentary vertical sectional view of the apparatus.

Figure 2 shows a cross sectional view taken on the line 2—2 of Figure 1.

Figure 3 shows an enlarged fragmentary sectional view of the bit.

Figure 4 shows a side view of one type of bit blade.

Figure 5 shows a side view of the complete bit.

Figure 6 shows a fragmentary view thereof.

Figure 7 shows a cross sectional view taken on the line 7—7 of Figure 6.

Figure 8 shows a cross sectional view taken on the line 8—8 of Figure 6, and

Figure 9 shows a cross sectional view taken on the line 9—9 of Figure 6.

Referring now more particularly to the drawings, wherein like numerals of reference designate similar parts in each of the figures, the numeral 1 designates the well casing, which is gradually let down into the well bore as drilling progresses. The nu-

meral 2 designates the drill stem composed of a plurality of joints, or sections and to the lower end of which a bit is attached. This bit comprises a substantially cylindrical body 3, whose ends are beveled or tapered and a point 4 is threaded onto the lower end of the body. This point may be of any conventional form desired, depending on the character of stratum being pierced. The body 3 has a central water course 5 there-through with a plurality of rows of ports, as 6, through which water is discharged onto the cutting edges of the pilot 4. The bit body 3 has the oppositely disposed side blades 7, 7 pivoted thereto by means of the pins 7' whose ends are fitted into suitable recesses in the body 3. These blades are mounted so as to swing on substantially vertical axes. Each blade has an inwardly extending arm 8 fixed thereto, and a pull spring 9 is attached, at one end, to the free end of said arm, and at the other end to the opposite wall of the body 3. The body is hollowed out to permit the free action of the arms and springs 8 and 9, and the springs normally tend to hold said blades in open position. The pivoted edges of the blades have the shoulders 10 which are adapted to abut against the opposing part of the bit body to limit the outward movement of the blades. The sides of the body are concaved, underneath the blades, as at 11, 11, so that the blades, when collapsed will be flush with the outer surface of said body, and the walls of the body opposite said blades, is provided with perforations, forming ducts, as 12, leading out from the water course 5, through which water may be delivered against the inner sides of the blades 7, and to the cutting edges thereof. A modified form of blade has a toothed roller 8', Figure 4, mounted at the outer edge and rotatable on a vertical axis for cutting rock or other hard formation.

There is a pipe section 13, driven into the upper end of the bit body 3, which forms a cylinder and constitutes a continuation of the water course 5. In the cylinder there is a plunger 14, attached to which there is the upstanding stem 15 which works through a spider 16, fixed in the cylinder 13 and supported on the cross pins 16', 16'. The upper end of the stem has an enlarged head, and

surrounding the stem, and interposed between the spider and head there is a strong coil spring 18. The plunger carries oppositely extending arms 19, 19 which work through side slots 20, 20 in the cylinder 13 and whose free ends 21, 21, are upturned.

While drilling the water pressure exerted from the usual "slush pump" (not shown) down through the drill stem forces the plunger downwardly which carries the arms 19 downwardly with it and the upturned ends 21 lock against the inner sides of the blades, as shown in Figure 9, and the blades are thereby locked in open, or cutting position. There are two by pass pipes or channels 22, 22, whose ends are inwardly turned and connected into the cylinder 13, above and below the plunger 14, when the latter is in its lower position, and through these the flushing water is conducted around the plunger 14 and back into the conduit 5 and thence to the drilling bit.

When it is desired to pull the drill stem and bit upwardly the pump is stopped and the pressure cut off and the spring 18 will elevate the plunger carrying the arms 19 out of engagement with the blades 7. When elevated the arms 19 seat in the cross grooves in the bit body 3, with the upturned ends 21 seated in the opposing sockets 24, 24 in said body. The drill stem may be then pulled upwardly and when the upper ends of the blades 7 strike the lower end of the casing the blades will be closed into the recesses 11 provided to receive them. This is brought about by reason of the fact that the upper ends of said blades 7 are beveled, as at 25, so that they will readily enter the casing. The bit may thus be readily lowered through, or withdrawn through, said casing in carrying on drilling operations.

In drilling, and particularly while under-reaming the bore beneath the casing, as soon as the bit passes beneath the casing it should be stopped immediately beneath the lower end of the casing and rotated until the formation is cut away sufficiently to permit the blades to fully expand and then the drilling may be permitted to proceed downwardly.

When it is desired to lower the casing further in the bore the drill stem is pulled upwardly, withdrawing the bit up into the casing and the upper joint of the stem broken out. The collar 26 is then removed and the anchor 27 is inserted over the stem and said collar 26 replaced. The upper end of the anchor supports said collar and the lower end of the anchor is supported on the upper end of the casing.

This anchor, as is shown, is downwardly flared, or bell shaped, with its sides slitted vertically, and formed of strong but flexible material. The drill stem is thus supported while an additional section, as 2', is connected onto the upper end of the casing. The

drill stem is then pulled upwardly, the anchor 27 contracting and passing up through the section 2' of the casing. The casing is then forced downwardly in the bore, in the usual way until its upper end reaches the ground surface, and if necessary other joints may be added, as before stated, until the casing reaches the bottom of the bore. The anchor 27 is then removed and the drill stem connected up for drilling, and lowered into the bore and drilling proceeds as hereinabove explained.

What I claim is:—

1. In a well drilling apparatus a bit including a body, a drill point carried thereby, side cutting blades hinged to the body, and adapted to open and close, and yieldable means tending to hold the blades in open position, means adapted to be actuated by fluid pressure into interlocking relation with the blades to lock them in open position.

2. In a well drilling apparatus a bit including a body, a drill point carried thereby, side cutting blades hinged to the body, and adapted to open and close, yieldable means tending to hold the blades in open position, and means adapted to be actuated by fluid pressure into interlocking relation with the blades to positively lock them in open position.

3. In a well drilling apparatus a bit including a body, a drill point carried thereby, side cutting blades hinged to the body and adapted to open and close, said bit having a fluid course therethrough which has lateral ducts through which flushing fluid may be delivered to said point and blades and means adapted to be actuated by fluid pressure into interlocking relation with the blades to hold them in open position.

4. In a well drilling apparatus a drill stem, a bit attached to the lower end thereof, side reaming members hinged to the sides of the bit and adapted to open into expanded position, and close into contracted position, said bit having a fluid course therethrough, locking means, adapted to be actuated by fluid, exerted through said course, into interlocking relation with said blades, to lock them in open position.

5. In a well drilling apparatus a drill stem, a bit attached to the lower end thereof, side reaming members hinged to the sides of the bit and adapted to open into expanded position, and close into contracted position, said bit having a fluid course therethrough, locking means, adapted to be actuated by fluid, exerted through said course, into interlocking relation with said blades, to lock them in open position and yieldable means normally tending to hold said blade locking means in inactive position.

6. In a well drilling apparatus a drill stem, a bit attached to the lower end thereof, side reaming members hinged to the sides

of the bit and adapted to open into expanded position, and close into contracted position, said bit having a fluid course therethrough, locking means adapted to be actuated by fluid, exerted through said course, into interlocking relation with said blades, to lock them in open position, said bit being also

provided with the lateral ports leading from said water course through which flushing fluid may be supplied to said blades. 10

In testimony whereof I have signed my name to this specification.

OTHO S. SHAW.