March 18, 1924. 1,487,319

O. DUDA

DEEP WELL DRILLING APPARATUS

Filed March 7, 1922

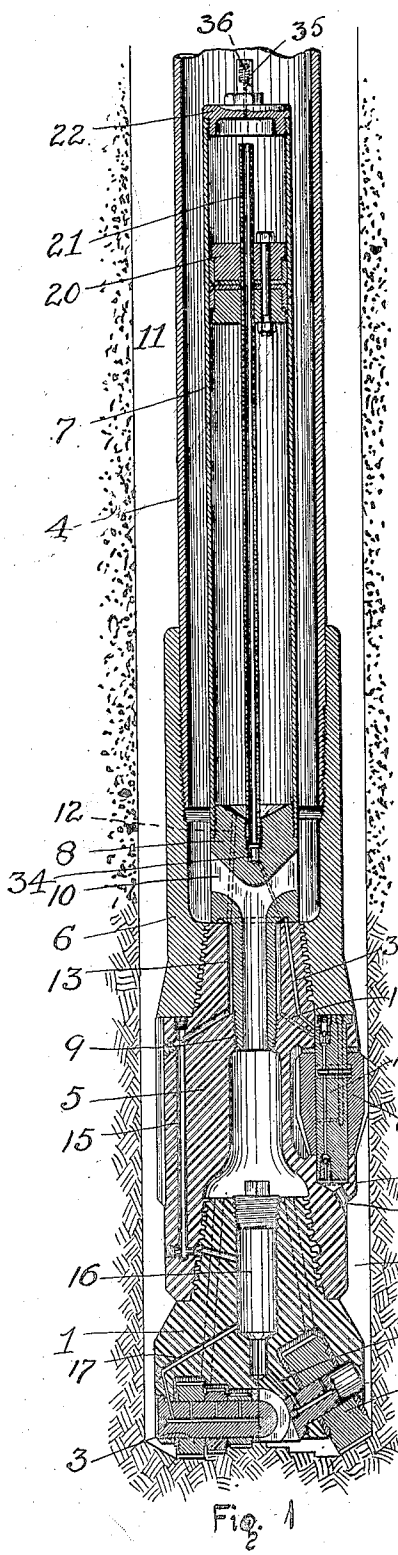


Fig. 1

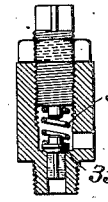


Fig. 4.

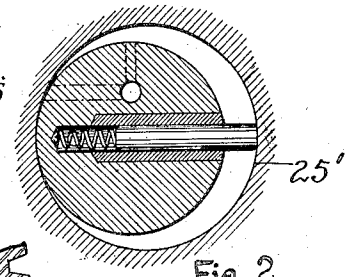


Fig. 2

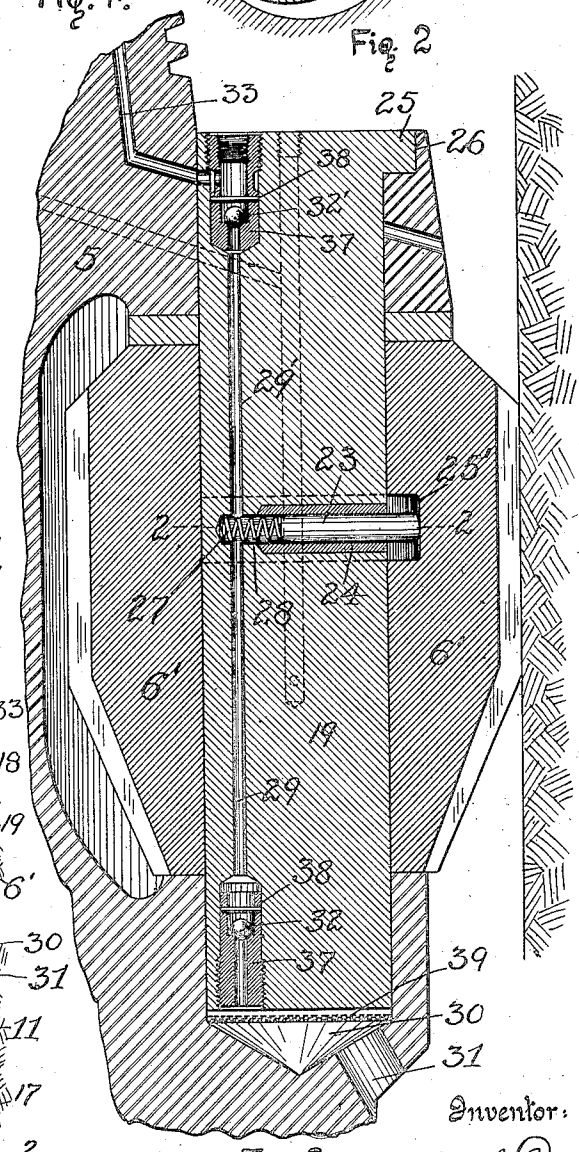


Fig. 3

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UNITED STATES PATENT OFFICE.

OSWALD DUDA, OF HOUSTON, TEXAS, ASSIGNOR TO CLARENCE E. REED, OF HOUSTON, TEXAS.

DEEP-WELL-DRILLING APPARATUS.

Application filed March 7, 1922. Serial No. 541,818.

To all whom it may concern:

Be it known that I, OSWALD DUDA, a citizen of the United States, and resident of Houston, in the county of Harris and State of Texas, have invented certain new and useful Improvements in Deep-Well-Drilling Apparatus, of which the following is a specification.

The invention concerns lubricating means for deep well drilling apparatus and consists in the features and combination and arrangement of parts hereinafter described and particularly pointed out in the claims.

In the accompanying drawings—

Figure 1 is a vertical sectional view of a drill bit or head with a part of the drill stem, and with my improvement incorporated therein.

Fig. 2 is a cross sectional view on the line 2—2 of Fig. 3.

Fig. 3 is an enlarged detail view in vertical section of a part of the apparatus.

Fig. 4 is a view of a detail.

In these drawings 1 indicates a drill bit or head having rotary side cutters 2 and a cross roller cutter 3, it being understood that the section at the lower part of the drill head is taken in two planes, a quarter turn from each other. This drill head is carried at the lower end of a hollow drill stem 4 and it may include, as shown, a reamer block 5 and a coupling member 6. The reamer block carries reamer cutters, one of which is shown at 6′ to ream out the hole at a point above where the cutters 2 and 3 operate. Within the drill stem there is a lubricant holding chamber 7 which is mounted at its lower end upon a socket member 8, the stem of which is screw threaded at 9 into the reamer block. This socket member has ports or passages 10 for the flushing water which is pumped down through the drill stem for the purpose of flushing the cuttings which are then carried up outside of the drill stem through the space 11 to be discharged at the top of the well. The lubricant chamber communicates with the bearings of the rotary cutters by means of ports 12 extending through the socket piece to the space 13 from whence conduits 15 lead to a central chamber 16 in the drill head, and from here the lubricant is conveyed through ports as at 17 to the bearings of the cutters. Other ports 18 connect the chamber 13 with the bearing pins 19 of the reamer cutters 6′. Within the lubricant holding chamber there is a plunger or piston 20 to rest upon the supply of lubricant therein so that as this piston moves down the lubricant is forced through the ports described to the bearings of the cutters.

For causing the down movement of the piston 20 fluid is pumped from the space 11 surrounding the drill head and drill stem to the upper end of the lubricant holding chamber at a point above the piston 20. For this purpose a pipe 21 is arranged centrally of the lubricant chamber, its upper end terminating just under the cap 22 which forms the closure for the upper end of the lubricant chamber, the lower end of the said pipe 21 being screw threaded into the socket piece 8. The pump for forcing the fluid from the exterior of the apparatus up through the pipe 21 includes a pump plunger 23 mounted in a bushing 24 carried by one of the bearing pins 19 of the reamer cutter. This bearing pin has an eccentric head 25 seated in a socket 26 of the reamer block, the said pin being borne upon by the overhanging portion of the coupling block 6. The pump plunger 23 operates in a direction transversely of the bearing pin 19 and it is reciprocated by an eccentric trackway or counterbore 25′ formed on the interior of the reamer cutter 6′, a spring 27 bearing on one end of the plunger, serving to keep it pressed against the eccentric trackway or surface. The chamber in which the pump plunger 23 operates is indicated at 28 and this communicates by a lower passage 29 with a recess 30 in the reamer block below the lower end of the pin 19. This recess 30 communicates through a port 31 with the space 11 between the head or stem of the drill apparatus and the wall of the well. A check valve 32 consisting of a ball allows the ingress of the fluid through the port 31 and chamber 30 to the passage 29 and the fluid is discharged through a check valve 32′ into a conduit 33 which communicates with the space 34 in the socket member 8, and from this space the fluid is forced up through the pipe 21 to the top of the lubricant holding chamber at a point above the piston 20.

It will thus be seen that rotation of the apparatus in the well will cause the rotary member 6′ to be turned about its bearing pin 19 and the eccentric trackway 25′, to-

gether with the spring, will impart reciprocation to the pump plunger 23 which will draw in fluid from the well, that is, from the space exterior to the drill stem and head, and force this fluid through the conduit 29′ past the check valve 32′, through conduit 33, up through the pipe 21 to the space above the piston so that this piston will be gradually forced downwardly to eject the lubricant from the chamber and direct it to the various parts to be lubricated.

If the action continues after the plunger 20 has reached the bottom of the lubricant holding chamber, relief for the additional supply of fluid pumped into the chamber will be afforded through a valve 35 controlling a port through the cap of the lubricant chamber. This valve is pressed normally by a spring 36 to hold the port closed so that there will be no discharge of fluid while the piston 20 is free to move down.

The valve 35 closes towards the interior of the lubricant holding chamber and it will allow the passage of fluid only from the chamber into the drill stem, but not the reverse.

The check valves 32, 32′ seat themselves in suitable casings 37 screw threaded into the pin 19 and both of the ball valves are limited in their movement by cross pins 38.

A suitable strainer may be used at 39 to prevent the entrance of mud to the pumping arrangement.

The lubricating apparatus operates only when the tools are actually cutting, and thus the lubricant is economized.

I claim:

1. A deep well drilling apparatus comprising a drill stem, a drill bit, a lubricant holding chamber, a plunger therein, a rotary member carried by the drill bit and rotated by contact with the earth as the apparatus is rotated, a pump operated by said rotary member, said pump taking its supply from the fluid outside the drill stem and delivering said fluid into the lubricant chamber above the plunger to force the lubricant to the parts to be lubricated, substantially as described.

2. A deep well drilling apparatus comprising a drill stem, a head having a rotary cutter, a lubricant holding chamber, communicating with the bearing of the cutter, a plunger in the chamber, a pump operated by the rotation of the apparatus in the well, said pump taking its supply from the fluid outside the drill stem and delivering said fluid to the top of the lubricant chamber, above the plunger, substantially as described.

3. A deep well drilling apparatus comprising a drill stem, a head, a rotary cutter thereon, a lubricant holding chamber communicating with the bearing of the cutter, a pump operating in unison with the rotary cutter and taking its supply from the fluid outside the drill stem and delivering said fluid to the top of the lubricant chamber, above the plunger, substantially as described.

4. In combination in a deep well drilling apparatus, a drill stem, a drill bit, a rotary cutter mounted therein, a lubricant holding chamber, a plunger therein, a pump operated by the rotary cutter and t ng its supply from the fluid outside the l, said pump delivering said fluid into the lubricant chamber at a point above the plunger to force the lubricant to the parts to be lubricated, substantially as described.

5. In combination in a deep well drilling apparatus, a drill stem, a drill head, rotary cutters on the head, a lubricant holding chamber within the drill stem, a plunger within the lubricant holding chamber, a hollow pipe extending up through the plunger to discharge at the upper part of the chamber above the plunger, and a pump for forcing fluid from the space between the apparatus and the wall of the well, up through the said pipe to cause the downward movement of the plunger and the delivery of the lubricant to the parts to be lubricated, substantially as described.

6. In combination in deep well drilling apparatus, a drill stem, a head or bit, cutters carried by the head at the lower part thereof, a reaming cutter carried by the bit for reaming out the side of the hole, a lubricant holding chamber within the drill stem, a plunger in said chamber and a pump operated by the reaming cutter for forcing fluid from the space between the drilling apparatus and the wall of the well into the lubricant holding chamber at a point above the plunger, substantially as described.

7. In apparatus of the class described, a drill stem, a drill head, rotary cutters, journal pins for said rotary cutters, a pump plunger arranged to operate transversely of one of the journal pins, a cam track on the rotary cutter for operating the said plunger, a conduit connecting the plunger chamber with the space between the apparatus and the wall of the well, and a conduit connecting the plunger chamber with the upper part of the lubricant holding chamber to introduce the fluid thereinto for causing downward movement of the plunger, substantially as described.

8. In combination in a deep well drilling apparatus, a drill stem, a drill bit, a rotary member mounted therein and rotated by contact with the earth, a lubricant holding chamber, and a pump operated by the rotary member and taking its supply from the fluid outside of the well, said pump delivering said fluid into the lubricant chamber to force the lubricant therefrom to the parts to be lubricated.

9. In apparatus of the class described, a drill stem, a drill bit, a rotary member mounted therein and rotated by contact with the earth when the drill is in operation, a lubricant holding chamber and a pump operated by the rotary member, and forcing fluid into the lubricant holder, said fluid transmitting force from the pump to discharge lubricant from the chamber to the parts to be lubricated.

10. In apparatus of the class described, a drill stem, a drill bit at the lower end thereof, a lubricant holder, and a pump for forcing fluid into the lubricant holder to force the lubricant therefrom to the parts to be lubricated, said pump being carried by the apparatus and operated as a result of the operation of the apparatus in the well, substantially as described.

11. In apparatus of the class described, a drill stem, a drill bit, a lubricant holder having a plunger therein, and a pump for forcing fluid into the lubricant holder on the side of the plunger opposite to that bearing on the lubricant for discharging the lubricant from the holder to the parts to be lubricated, said pump being carried by the apparatus and operated as a result of the operation of the apparatus in the well, substantially as described.

In testimony whereof, I affix my signature.

OSWALD DUDA.