W. G. BLODGETT.

WELL DRILLING TOOL.

APPLICATION FILED JULY 29, 1920.

1,375,817.

Patented Apr. 26, 1921.

2 SHEETS—SHEET 1.

Fig. 1.

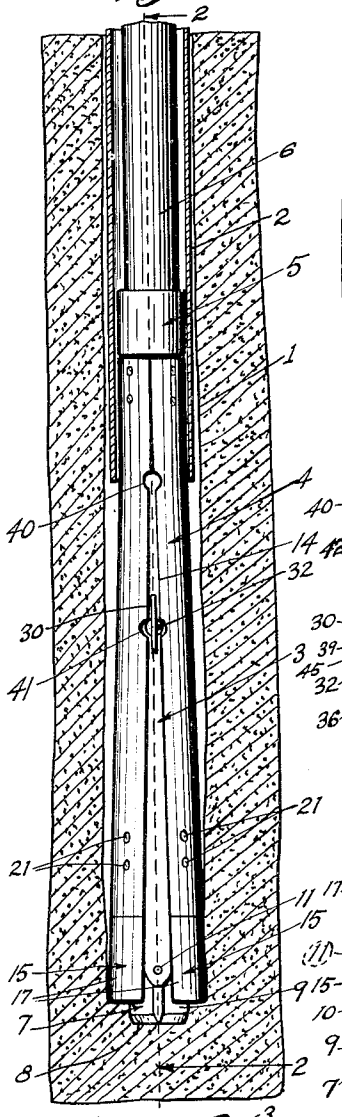


Fig. 2.

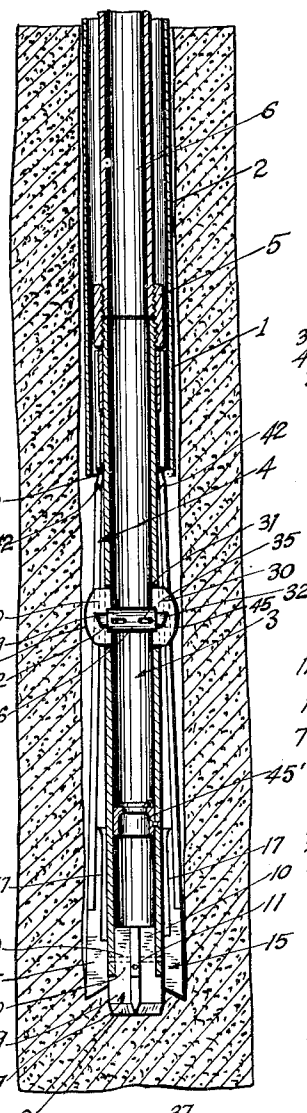
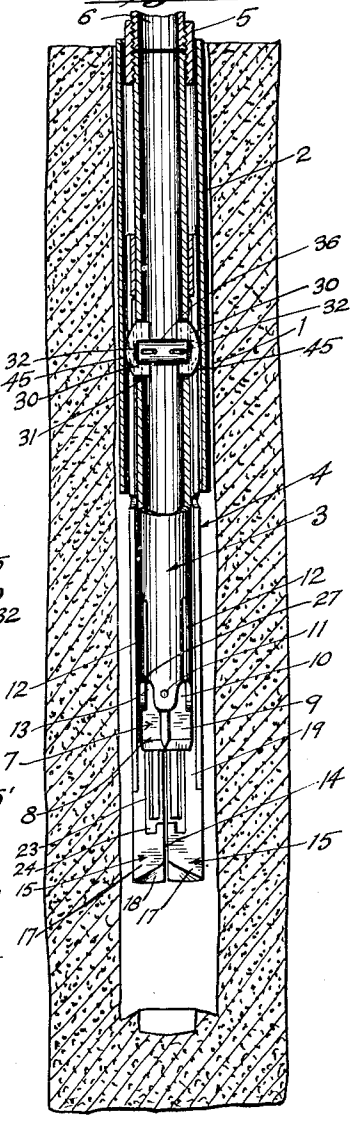


Fig. 3.



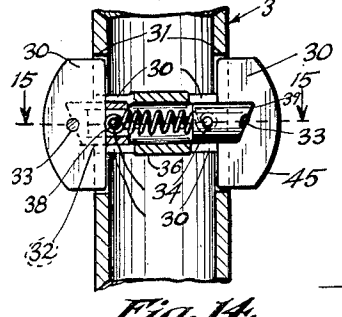


Fig. 14.

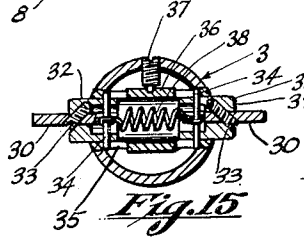


Fig. 15.

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2 SHEETS—SHEET 2.

Fig. 4.

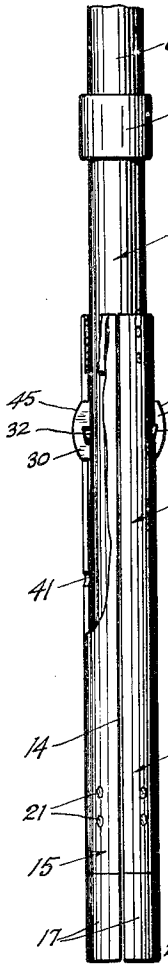


Fig. 5.

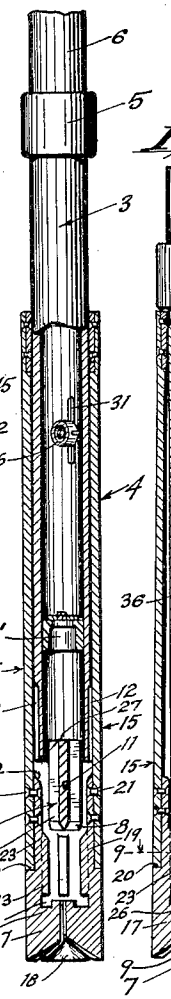


Fig. 7.

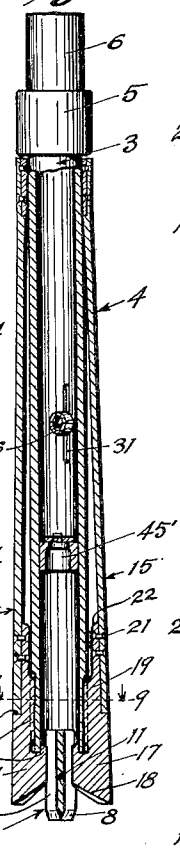


Fig. 12.

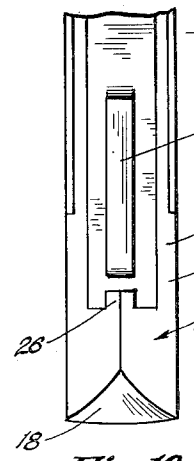


Fig. 13.

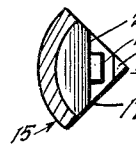


Fig. 10.

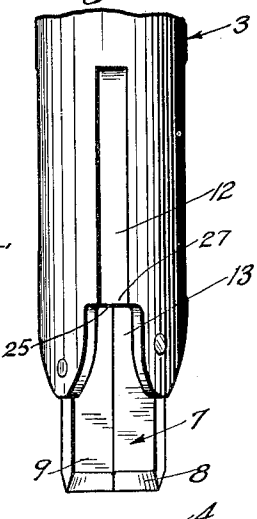


Fig. 11.

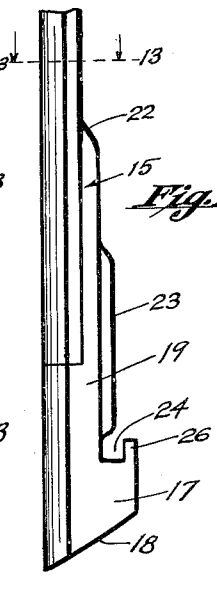


Fig. 9.

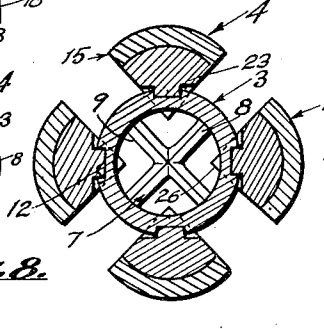


Fig. 6.

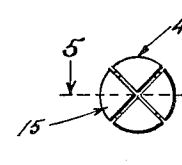
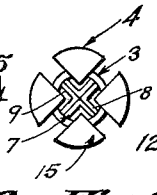


Fig. 8.



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WILLIAM G. BLODGETT, OF LOS ANGELES, CALIFORNIA.

WELL-DRILLING TOOL.

1,375,817. Specification of Letters Patent. Patented Apr. 26, 1921.

Application filed July 29, 1920. Serial No. 399,772.

To all whom it may concern:

Be it known that I, WILLIAM G. BLODGETT, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Well-Drilling Tools, of which the following is a specification.

This invention is a well drilling tool comprising a combined drilling bit and reamer.

It is the object of the invention to provide a construction whereby the reamer may be readily contracted while inserting the tool through the well casing and in which the reamer will be expanded when the end of the tool engages at the bottom of the boring.

The invention will be readily understood from the following description of the accompanying drawings, in which—

Figure 1 is a vertical section through a well boring showing the improved tool in said boring in operative position.

Fig. 2 is a longitudinal section on the line 2—2 of Fig. 1.

Fig. 3 is a longitudinal section through a well boring showing the improved tool in its contracted position as it is being inserted through the well casing.

Fig. 4 is a side elevation of the tool in contracted position.

Fig. 5 is a longitudinal section on the line 5—5 of Fig. 6.

Fig. 6 is a bottom end view of the tool in contracted position.

Fig. 7 is a longitudinal section of the tool in expanded position.

Fig. 8 is a bottom end view of the same.

Fig. 9 is an enlarged transverse section on the line 9—9 of Fig. 7.

Fig. 10 is an enlarged view of the drilling bit.

Fig. 11 is an enlarged view of one of the cutters of the reamer.

Fig. 12 is a side elevation of the same.

Fig. 13 is a transverse section on the line 13—13 of Fig. 11.

Fig. 14 is an enlarged longitudinal section through a portion of the drilling bit showing the lugs positioning the reamer relative to the bit.

Fig. 15 is a transverse section on the line 15—15 of Fig. 14.

In the drawings I have shown a usual well boring at 1 having a usual casing 2 inserted therein to a point spaced from the bottom of said boring. The improved drilling tool comprises a hollow bit rod 3 having the expandible and contractible reamer 4 received thereon. The upper end of the bit rod may be connected by any suitable rod connection 5 to a usual hollow rod 6.

The lower end of the bit rod is provided with a detachable drilling bit 7 shown as comprising angularly disposed cutting surfaces 8 arranged upon crossed shanks 9, preferably undercut as shown at 10 so as to be received within the end of the bit rod with suitable rivets 11 connecting the bit to the bit rod. The bit rod above the drilling bit is longitudinally slotted as shown at 12, one of said slots being provided between each pair of adjacent angularly disposed webs of shanks 9 of the drilling bit. The end of slot 12 toward the drilling bit is, preferably, outwardly flared as shown at 13 so that a gradually restricted slot is formed from the end of the bit rod upwardly along the same.

The reamer received over the bit rod comprises an elongated sleeve longitudinally slit from its lower end to a point spaced from its upper end as shown at 14 in order to provide a plurality of cutters 15, preferably, four in number. By this arrangement the reamer may have its cutters either contracted against the bit rod so that the tool may be inserted through a well casing, or the reamer may have its cutters expanded relative to one another to provide for the reaming of the well boring. The cutters of the reamer are, preferably, each provided with a detachable cutting end 17, preferably, provided with a tapering end 18 and a shank 19 extending upwardly within the cutter 15 with the shank undercut as shown at 20 to permit of engagement of said undercut portion against the inner surface of the cutter. Suitable rivets 21 may extend through the cutter and the undercut shank of the cutting end for connecting the parts.

The inner surface of the cutting end 17 is provided with a curved shoulder 22 at its upper end which is arranged to project within the plane of the bit rod so that as the latter is forced downwardly within the reamer the restricted upper ends of the enlarged portions 13 of slots 21 will impinge against the respective shoulders 22 for spreading the cutters of the reamer apart.

The lower portion of the inner surface of the cutting end 17 of a cutter of the reamer is provided with a longitudinal tongue 23

which is adapted to be received in one of the slots 12 of the bit rod after the reamer has been expanded by the bit rod moving downwardly within the same below the tongue 23. The inner surface of cutting end 17 is undercut as shown at 24 to provide a recess in which is received the shoulder 27 formed at the upper end of the enlarged portion 13 of a slot 12. The recess 24 is, preferably, provided with a tongue 26 adapted to extend within the hollow interior of the bit rod beyond the shoulder 25. Thus it will be seen that when the bit rod is moved downwardly within the reamer so that the drilling bits project beyond the end of the reamer, as shown in Figs. 2 and 7, the cutters of the reamer will be positively positioned relative to the bit rod by the engagement of the bit rod within recesses 24, and also by the engagement of tongues 23 of the cutters within the slots 12 of the bit rod.

In operation the tool is contracted by withdrawing the drilling bit and its rod within the reamer until the drilling bit is above the shanks of the cutting ends of the reamer cutters, in which position the reamer cutters are free for contracting movement toward one another and against the bit rod so that the tool may be readily moved through the well casing. The tool is inserted through the well casing and beyond the lower end of the same until the end of the reamer rests against the bottom of the boring. Pressure is then exerted upon the drilling rod for forcing the bit rod and the drilling bit downwardly through the reamer so as to project the drilling bit beyond the end of the reamer into operative position. This movement of the bit rod will expand the cutters of the reamer into operative position by engagement of the bit rod against the shoulders formed upon the interior of the cutters. Means are provided for retaining the tool in either contracted or expanded position and for automatically releasing said retaining means when it is desired to either expand or contract the tool.

As an instance of this arrangement lugs 30 may project from opposite sides of the bit rod, said lugs being received through suitable slots 31 provided in the bit rod. The lugs are, preferably, supported in pins 32 as by set screws 33, the pins extending within the hollow interior of the bit rod and being slidable through the walls thereof. Within the bit rod a pin 34 extends across each of the pins 32 and is longitudinally movable with the same as by being received in elongated slots 35 provided in a casing 36 extending across the bit rod and suitably retained in position as by means of a set screw 37. The pins 34 of the respective pins 32 are yieldably connected by means of a coil spring 38 arranged to normally urge pins 32 and the lugs 30 outwardly, but arranged to yield to permit of inward movement of said pins and lugs until the outer ends 39 of the pins 32 are within the plane of the wall of the bit rod. The outer ends 39 of pins 32 are, preferably, tapered, as clearly shown in Fig. 14. The pins 32 and lugs 30 are adapted to project through slots 14 of the reamer, the said parts being so arranged that lugs 30 will freely project through said slots, but pins 32 will abut against the walls of said slots and thereby be prevented from projecting beyond the plane of the inner surface of the reamer.

The slots 14 through which lugs 30 project are each provided with enlargements 40 and 41 which will be in alinement with the pins 32 of the lugs when the bit rod has been moved relative to the reamer to withdraw the drilling bit within the reamer and project the latter beyond the reamer respectively. These enlargements are of such size as to permit of the projection of pins 32 through the same so that the abutment of said pins against the walls of the restricted portions of the slots beyond said enlargements will hold the bit rod against longitudinal movement relative to the reamer. The lower portions of the walls of the upper enlargements 40 in slots 14 are, preferably, tapered as shown at 42 so that when pins 32 are in alinement with enlargements 40 and are retracted within the bit rod by pressure exerted upon the lugs 30 the tapered ends 39 of the pins will move over the tapered surfaces 42 of the enlargements so as to releasably retain the pins retracted within the plane of the inner surface of the reamer when the pressure exerted upon lugs 30 is subsequently released.

The parts, as thus described, are so arranged that when the tool is in contracted position and the pins 32 are in alinement with enlargements 40 and the tool is inserted within the casing, the lugs 30, which are, preferably, provided with curved contact portions 45, will be impinged by the well casing so as to be forced inwardly as the tool is moved downwardly through the casing. As a consequence the pins 32 will be forced inwardly through enlargements 40 to cause engagement of the ends of said pins against the walls 42 of the enlargements.

As a consequence, when the tool has been moved downwardly within the well casing until its point projects beyond the end of the casing with the lugs 30 also beyond the end of the well casing and the end of the tool abutting against the bottom of the boring the pins 32 will still be retained in retracted position by the engagement between surfaces 39 and 42. The bit rod is thus free to move longitudinally within the reamer and will be moved downwardly to its operating position projecting beyond the end of the reamer by

pressure exerted against the upper end of rod 6. The expansion of the reamer will thus be effected, as previously described, and the pins 32 now being in alinement with enlargements 41 in slots 14 will be projected through said enlargements by spring 38. The abutment of said pins against the walls of the restricted portions of slots 14 beyond enlargements 41 will hold the bit rod against further longitudinal movement relative to the reamer, and the reamer in its expanded position is thus firmly held relative to the bit rod during the operation of the tool.

In withdrawing the tool from a well boring, as soon as lugs 30 impinge against the lower end of the well casing they will be forced inwardly so as to force pins 32 inwardly within the plane of the inner surface of the reamer and as a consequence the pulling force exerted upon rod 6 will draw the bit rod upwardly within the reamer so as to permit of the contraction of the latter. When the pins 32 are again in alinement with enlargements 40 their projection into said enlargements will hold the bit rod relative to the reamer by abutment of said pins against the walls of said enlargements so that the reamer and bit rod are rigidly positioned relative to one another during the subsequent withdrawal of the tool from the casing.

In practice a bailer 45′ of any usual or preferred construction may be positioned within the hollow bit rod for functioning in usual manner.

Various changes may be made without departing from the spirit of the invention as claimed.

What is claimed is:

1. A drilling tool comprising a bit rod having a drilling bit, an expansible reamer received over said bit rod, and means for expanding said reamer by longitudinal movement of the same relative to said bit rod.

2. A drilling tool comprising a bit rod having a drilling bit, an expansible reamer received over said bit rod, means for expanding said reamer by longitudinal movement of the same relative to said bit rod, and means for releasably retaining said reamer and bit rod against relative longitudinal movement with said reamer in either contracted or expanded position.

3. A drilling tool comprising a bit rod having a drilling bit, an expansible reamer received over said bit rod, means for expanding said reamer by longitudinal movement of the same relative to said bit rod, means for releasably retaining said reamer and bit rod against relative longitudinal movement with said reamer in either contracted or expanded position, and means for releasing said retaining means by the movement of said tool through a well casing.

4. A drilling tool comprising a bit rod having a drilling bit, an expansible reamer received over said bit rod, means for expanding said reamer by longitudinal movement of the same relative to said bit rod, a retaining engagement between said reamer and bit rod at the points along their relative longitudinal adjustment with said reamer in contracted and expanded position respectively, and means for automatically releasing one of said retaining engagements, shifting said reamer and bit rod relative to one another and making the other of said engagements.

5. A drilling tool comprising a bit rod having a drilling bit, an expansible reamer received over said bit rod, means for expanding said reamer by longitudinal movement of the same relative to said bit rod, a retaining engagement between said reamer and bit rod at the points along their relative longitudinal adjustment with said reamer in contracted and expanded position respectively, and means controlled by the movement of said tool relative to a well casing for releasing one of said retaining engagements, shifting said reamer and bit rod relative to one another and making the other of said engagements.

6. A drilling tool comprising a bit rod having a drilling bit, an expansible reamer received over said bit rod, means for expanding said reamer by longitudinal movement of the same relative to said bit rod, and means for limiting the movement of said reamer relative to said bit rod.

7. A drilling tool comprising a bit rod having a drilling bit, an expansible reamer received over said bit rod, means for expanding said reamer by longitudinal movement of the same relative to said bit rod, and means for preventing turning movement of said reamer relative to said bit rod.

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

WILLIAM G. BLODGETT.