

J. C. SULLIVAN.

DRILL.

APPLICATION FILED AUG. 18, 1911.

1,044,598.

Patented Nov. 19, 1912.

4 SHEETS—SHEET 1.

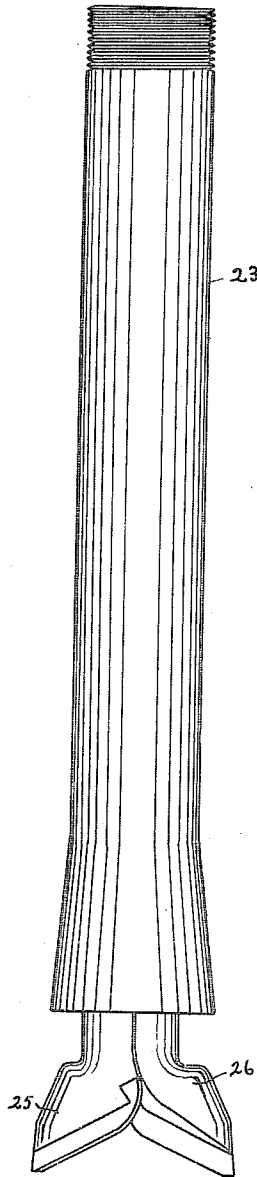


Fig. 1

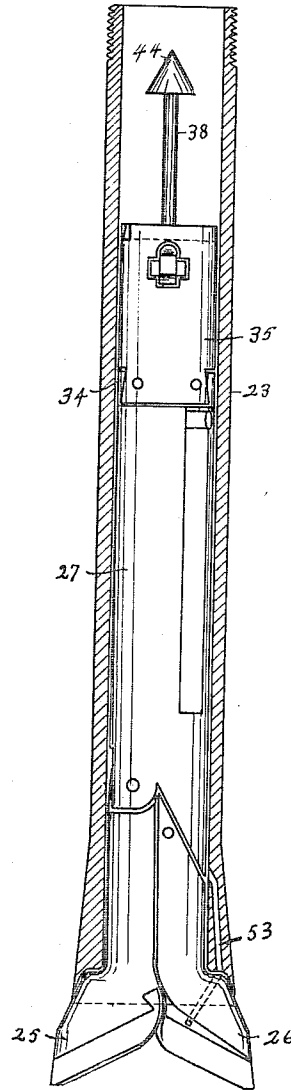


Fig. 2

WITNESSES:

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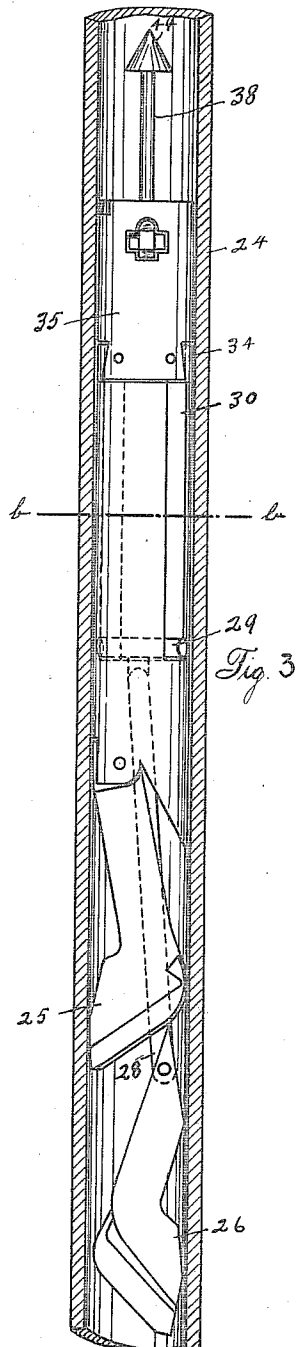


Fig. 3

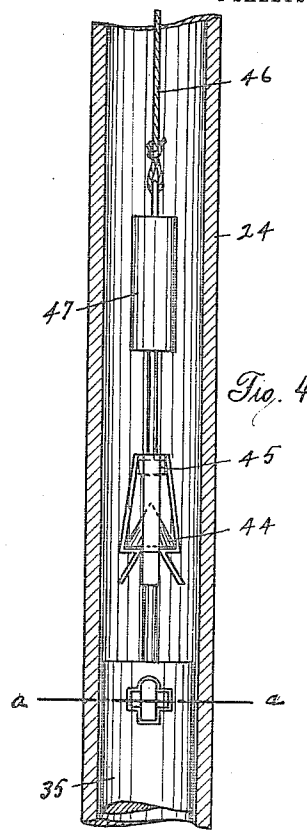


Fig. 4

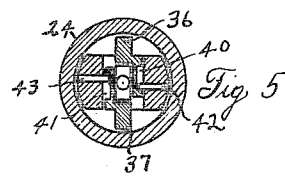


Fig. 5

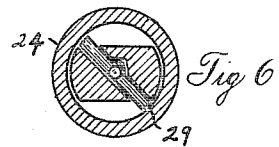


Fig. 6

WITNESSES:

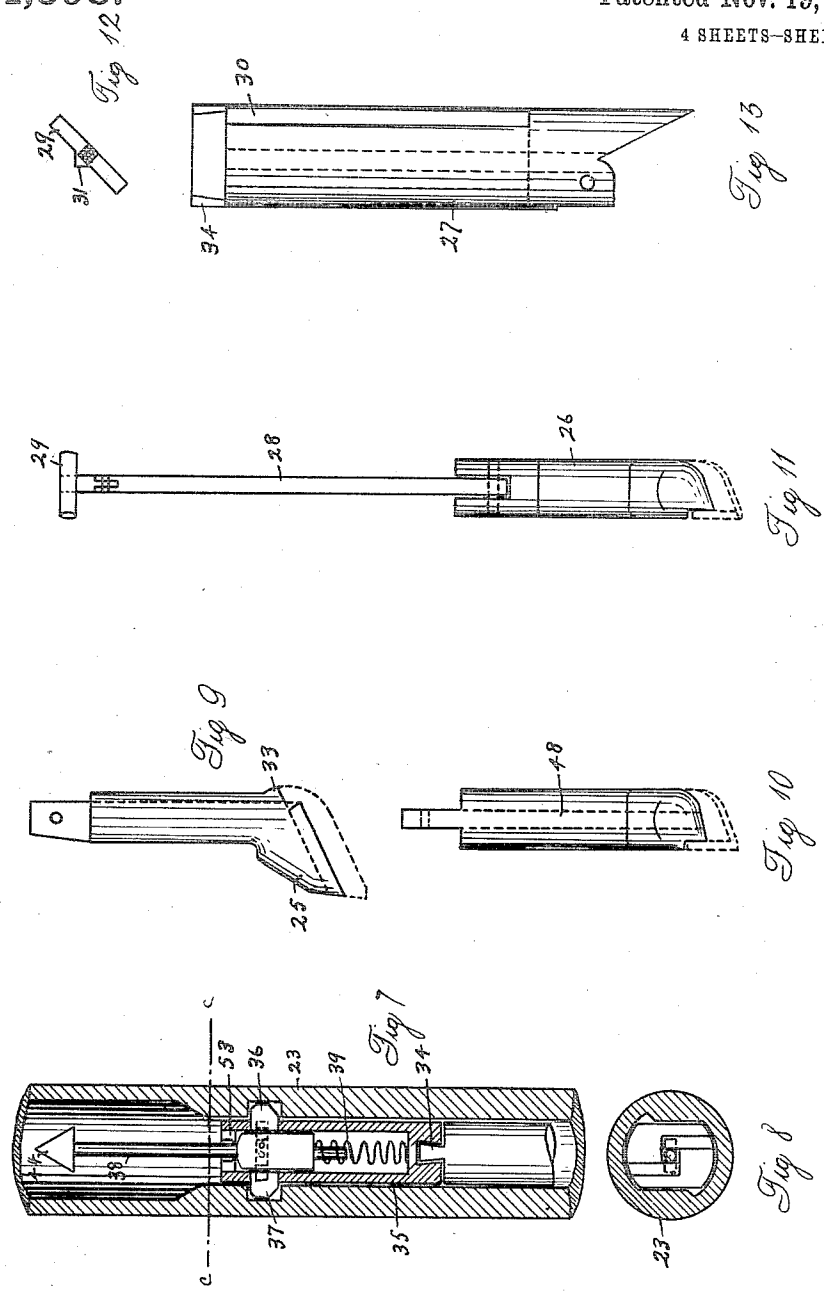
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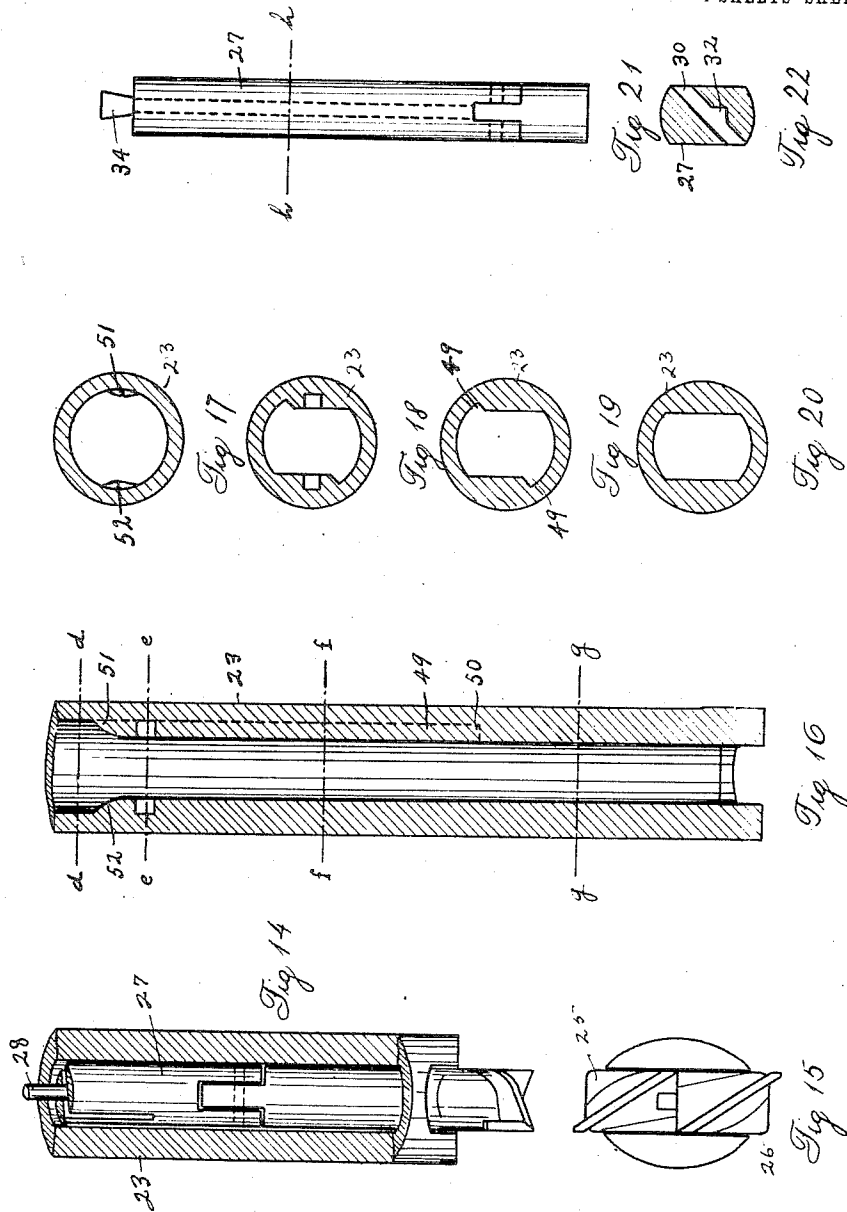
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

JAMES C. SULLIVAN, OF HUMBLE, TEXAS.

DRILL.

1,044,598.

Specification of Letters Patent.

Patented Nov. 19, 1912.

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To all whom it may concern:

Be it known that I, JAMES C. SULLIVAN, a citizen of the United States, residing at Humble, in the county of Harris and State of Texas, have invented a certain new and useful Improvement in Drills, of which the following is a specification.

My invention relates to new and useful improvements in drills and more particularly to devices of this character which are designed to be secured upon a drill pipe and used in rotary drilling.

As is well known, in rotary drilling the drill bit soon becomes worn and dull and must often be withdrawn from the well being bored and a sharp bit substituted therefor and the bits now in common use are secured directly to the lower end of the drill stem, or pipe, and consequently the entire pipe must be withdrawn in order to remove the drill bit.

It is the object of this invention to provide a bit which is so secured to the drill pipe that it may be readily detached therefrom and withdrawn from the well without withdrawing the entire drill pipe.

Another object of the invention is to provide a drill, of the character described, having a plurality of bits which are so secured together that the drill may be collapsed when it is desired to remove the same from the drill pipe or to place the same in position on said pipe, and which will thus occupy small space when removing the same from, or placing the same on said pipe; and as the drill must be passed through the pipe in removing and replacing the same it is thus obvious that a much smaller pipe may be used than would be the case were the drill not collapsible and it is further obvious that a drill may be passed through said pipe which, when secured thereon will form a bore of much greater diameter than the pipe, and thus a small light pipe may be used in driving a bore of much greater diameter.

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

Figure 1 is a side elevation of the complete drill. Fig. 2 is a side elevation thereof showing the bushing in section. Fig. 3 is a partial sectional side elevation showing

the bits in the position they occupy in being removed through the drill pipe. Fig. 4 is a partial sectional side elevation of the drill pipe showing a fishing tool in position to remove the drill. Fig. 5 is a sectional view taken on the line *a—b* of Fig. 4. Fig. 6 is a sectional view taken on the line *b—b* of Fig. 3. Fig. 7 is a partial sectional side elevation of the drill showing the method of securing the bits in the bushing. Fig. 8 is a sectional view thereof taken on the line *c—c* of Fig. 7. Fig. 9 is a side elevation of one of the bits. Fig. 10 is an edge view thereof. Fig. 11 is an edge view of the other of said bits. Fig. 12 is a plan view of the yoke which secures the bit shown in Fig. 11 to its support. Fig. 13 is a side elevation of the bit support. Fig. 14 is a partial sectional view of the lower end of the drill. Fig. 15 is a view of the complete drill looking toward the drill point. Fig. 16 is a partial sectional view of the drill bushing. Fig. 17 is a sectional view of the bushing taken on the line *d—d* of Fig. 16. Fig. 18 is a sectional view of the bushing taken on the line *e—e* of Fig. 16. Fig. 19 is a sectional view of the bushing taken on the line *f—f* of Fig. 16. Fig. 20 is a sectional view of the bushing taken on the line *g—g* of Fig. 16. Fig. 21 is a side elevation of the bit support, and Fig. 22 is a sectional view thereof taken on the line *h—h* of Fig. 21.

Referring now more particularly to the drawings, wherein like numerals of reference designate similar parts in each of the figures, the numeral 23 refers to the drill bushing which is substantially cylindrical in shape and is slightly flared at its lower end and is outwardly threaded at its upper end to receive the drill pipe 24 which carries the same on its lower end. This bushing is provided to carry the drill bits and the supports therefor which, when in position for use, are arranged as shown in Fig. 2.

This drill is provided with a plurality, preferably two, bits 25 and 26, each having a long shank which extends up within the bushing as shown in Fig. 2. The shank of bit 25 is hinged directly to the bit support 27 and the shank of bit 26 is hinged to a supporting rod 28. This rod extends up into the support 27, and carries at its upper end the yoke 29, hingedly secured thereto, which has free lengthwise play in the diagonal slot 30 which extends entirely through said support 27 and a considerable distance longitudinally thereof. This yoke has a laterally

projecting shoulder 31 which extends into a corresponding groove 32 in support 27 and renders the movement of said yoke, along slot 30, true.

As may be observed from an inspection of Fig. 2 the upper end of the shank of bit 26 is inwardly beveled and the lower end of support 27 has an outwardly beveled extension which overlaps the beveled portion of the shank of bit 26 and the shanks of bits 25 and 26 fit closely together, the lower portion of the inner side of bit 25 being provided with a shoulder 33 which fits into a corresponding depression on the inner side of bit 26 and said bit 26 and its shank are thus locked between the bit 25 and the overlapping extension of support 27, and the bit 25 is also held firmly against the side of the lower end of the bushing 23.

The upper end of the support 27 is provided with a dove-tail 34 which fits into a corresponding groove in the lower end of the supporting block 35 which fits snugly within the bushing 23. This block, as shown in Fig. 7, is substantially hollow, or tubular, and is provided with two catches, 36 and 37, which project laterally therefrom and within the hollow of said block is the shaft 38 which projects a considerable distance above the block and within the bushing. The lower end of this shaft seats upon a coil spring 39 which tends to normally hold said shaft elevated, and said lower end is enlarged and fits snugly within the hollow of the block and normally rests against the inner ends of the catches 36 and 37 and holds them extended from the block, in which position they project into corresponding recesses in the bushing 23, as shown in Fig. 7, and hold said block 35 and the support 27 against movement relative to the bushing and thereby hold the bits 25 and 26 firmly against the lower end of the bushing, as shown in Fig. 2. As will be observed from an inspection of Fig. 5 the catches 36 and 37 are provided on their outer sides with grooves 40 and 41 into which the respective pins 42 and 43, carried by the block 35 project, and said catches are thus securely held in place but are allowed a limited lateral movement.

The upper end of shaft 38 is provided with a conical shaped head 44, over which the fishing tool 45, may be engaged, as shown in Fig. 4, when it may be desired to remove the drill bits from the bushing.

When it is desired to remove the bits from the bushing the fishing tool 45 is lowered within the drill pipe by means of a suitable cable 46. This tool carries a weight 47 which forces the same to engage over the head 44 and also operates to drive down the shaft 38, thereby depressing the spring 39. The enlarged portion of shaft 38 is thus forced down below catches 36 and 37 and

the said catches are forced in by reason of the fact that their lower sides are beveled, as shown in Fig. 7, and said beveled sides pressing against the contacting shoulders of the recesses into which they normally protrude operate to force said catches into block 35 and said block and its appendant support 27 are permitted to descend and the bits 25 and 26, assume the position, relative to the bushing, shown in Fig. 1. A sudden upward pull is then exerted on the cable 46 and the enlarged portion of shaft 38 engages beneath catches 36 and 37 and block 35, support 27 and bit 25 are drawn upward the said bit passing within the bushing, but the bit 26 remains stationary until the lower end of slot 30 engages against the yoke 29 and said yoke is thereby elevated carrying with it the rod 28 and the bit 26 attached thereto, the parts assuming the position shown in Fig. 3. The inner side of bit 25 and the shank carrying the same is provided with a longitudinal groove in which the rod 28 rests when the bits are in the position shown in Fig. 3 and one of said bits is thus hung suspended beneath the other one while the said bits are being withdrawn from the drill stem.

It is to be observed that before the bits are withdrawn the entire drill stem and drill should be elevated a considerable distance to permit the bits to be lowered, as shown in Fig. 1 before they are withdrawn, and the yoke 29 projects laterally on each side beyond the support 27 and into longitudinally extending grooves 49, which extend from the upper end of the bushing down a considerable distance and end in abrupt shoulders 50 against which the ends of yoke 29 engage and the bit support 27 and the bits are thus prevented from falling entirely out of the bushing.

When it is desired to replace the bits in the bushing the fishing tool 45 is first secured over the head 44 of the shaft 38 and the bits are then lowered into the drill pipe, occupying the same position, relative to each other, as when being elevated, and as shown in Fig. 3. The inner wall of the bushing is provided with two oppositely disposed guides 51 and 52 which extend longitudinally thereof and project out from said wall and terminate at their upper ends in sharp apexes. These guides are so disposed as to deflect the course of the bits in passing down through the bushing one way or the other and in whichever way deflected to cause the yoke 29 to coincide with the grooves 49 and to pass down along the same. When said yoke contacts with the shoulders 50 the downward movement of the bit 26 is stopped and the bit 25 and its supporting means continue to descend until the upper end of slot 30 rests upon said yoke and the bits 25 and 26 are then suspended below the

bushing, as shown in Fig. 1. The drill stem and bushing are then lowered, the lower end of the bushing embracing the shanks of the bits, as shown in Fig. 2. The coil spring 39 then operates to force the shaft 38 upward and the enlarged portion thereof which has a slight wedge shape gradually wedges between the catches 36 and 37 and forces them into their corresponding recesses in the bushing and the block 35 and its appendant support 27, and the bits carried thereby are securely held in the bushing, in the position shown in Fig. 2. It is to be observed that the upper end of block 35 carries an inwardly extending annular flange which surrounds the reduced upper portion of rod 38 and engages against the enlarged lower portion thereof and prevents said rod from being withdrawn entirely from the block 35.

In order that the bore may be flushed I have provided a water passageway 53 leading from the inside of the bushing through the wall thereof and also through the bits and terminating near the cutting edges thereof. Water is admitted, through the drill pipe, to the bushing and passes thence through passageway 53 to the cutting point of the drill.

A drill constructed as described in this specification and illustrated in the accompanying drawings which are made a part hereof, will be found to be easily removed from the drill pipe and withdrawn from the well bore without the necessity of withdrawing said pipe and may also be so constructed as to form a bore of much larger diameter than the pipe to which the same is secured, and while I have shown and described only one form of the device I desire to reserve the right to vary the construction thereof so long as the principle of the invention, as set forth in the appended claims, is not departed from.

What I claim is:—

1. A device of the character described including a suitable bushing and a plurality of drill bits secured in the lower end thereof, a supporting member secured within the bushing and supporting said bits and means

carried by the supporting member and connected with said bushing and securing said supporting member in said bushing.

2. A device of the character described including a suitable bushing and a supporting member within the same, means carried by said supporting member and engaging with said bushing and securing the same against movement relative to the bushing, a plurality of bits embraced by the lower end of said bushing, one of said bits being hingedly secured to the supporting member and the other of said bits being slidably secured thereto.

3. A device of the character described including a suitable bushing and a bit support within the same, a plurality of bits secured within the lower end of said bushing, one of said bits being hingedly attached to the bit support and the other of said bits having a slidable engagement therewith, means carried by the bit support and engaging with the bushing and preventing the movement of said bit support relative to said bushing, means for releasing said engaging means and permitting the movement of said bit support in said bushing, and means limiting the downward movement of the bit support relative to the bushing.

4. A device of the character described including a bushing and a bit support within the same and normally having a longitudinal movement relative thereto, a plurality of bits embraced by the lower end of the bushing and secured to the bit support, one hingedly and the other slidably, means carried by the bit support and engaging with the bushing and preventing the movement of the former relative to the latter, means for releasing said engaging means, and means limiting the downward movement of the bit support relative to the bushing.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES C. SULLIVAN.

Witnesses:

MAY MONTGOMERY,
J. W. YEAGLEY.