

April 7, 1925.

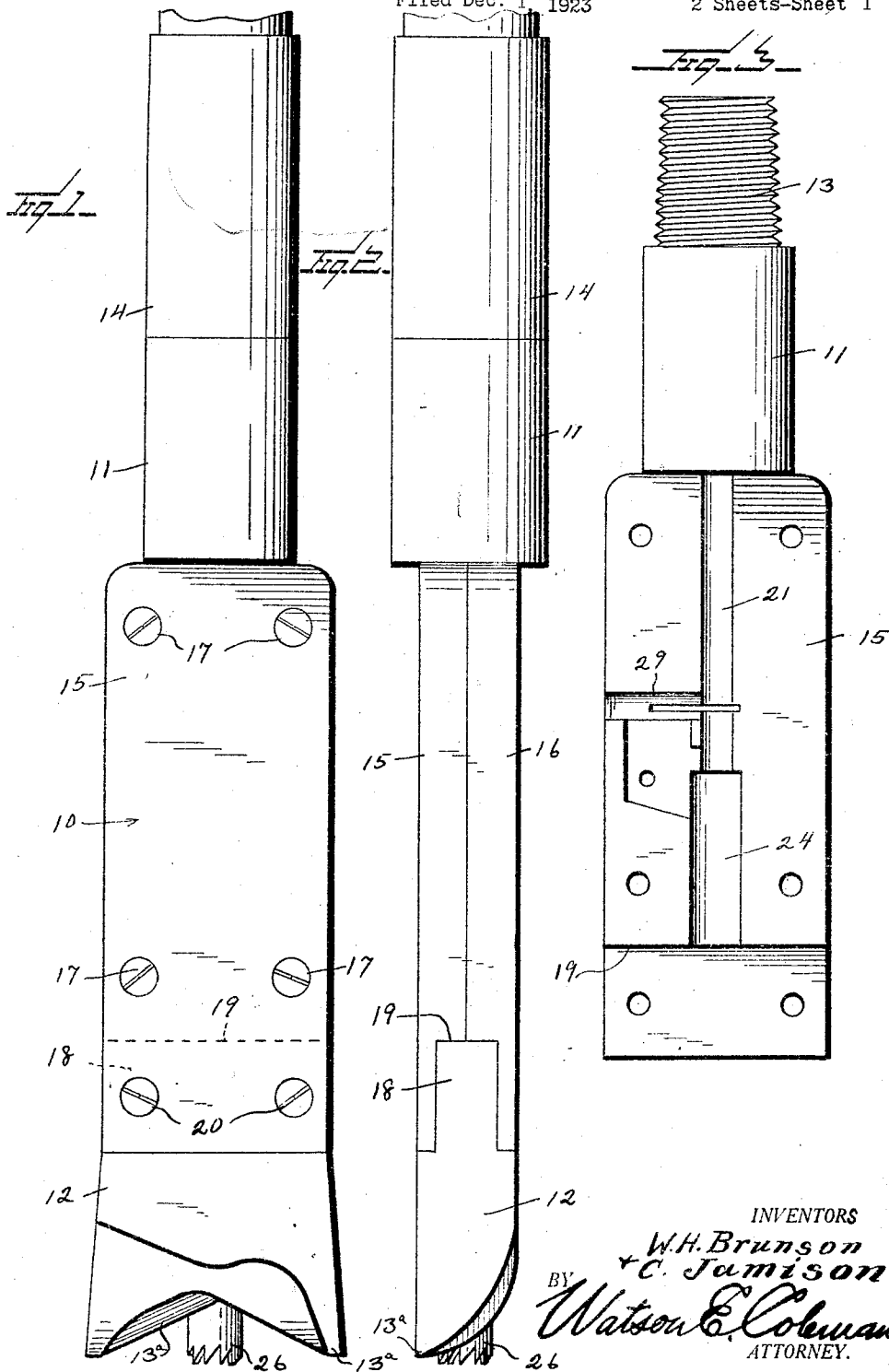
W. H. BRUNSON ET AL

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ROTARY DRILLING TOOL

Filed Dec. 1 1923

2 Sheets-Sheet 1



INVENTORS

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+ C. Jamison

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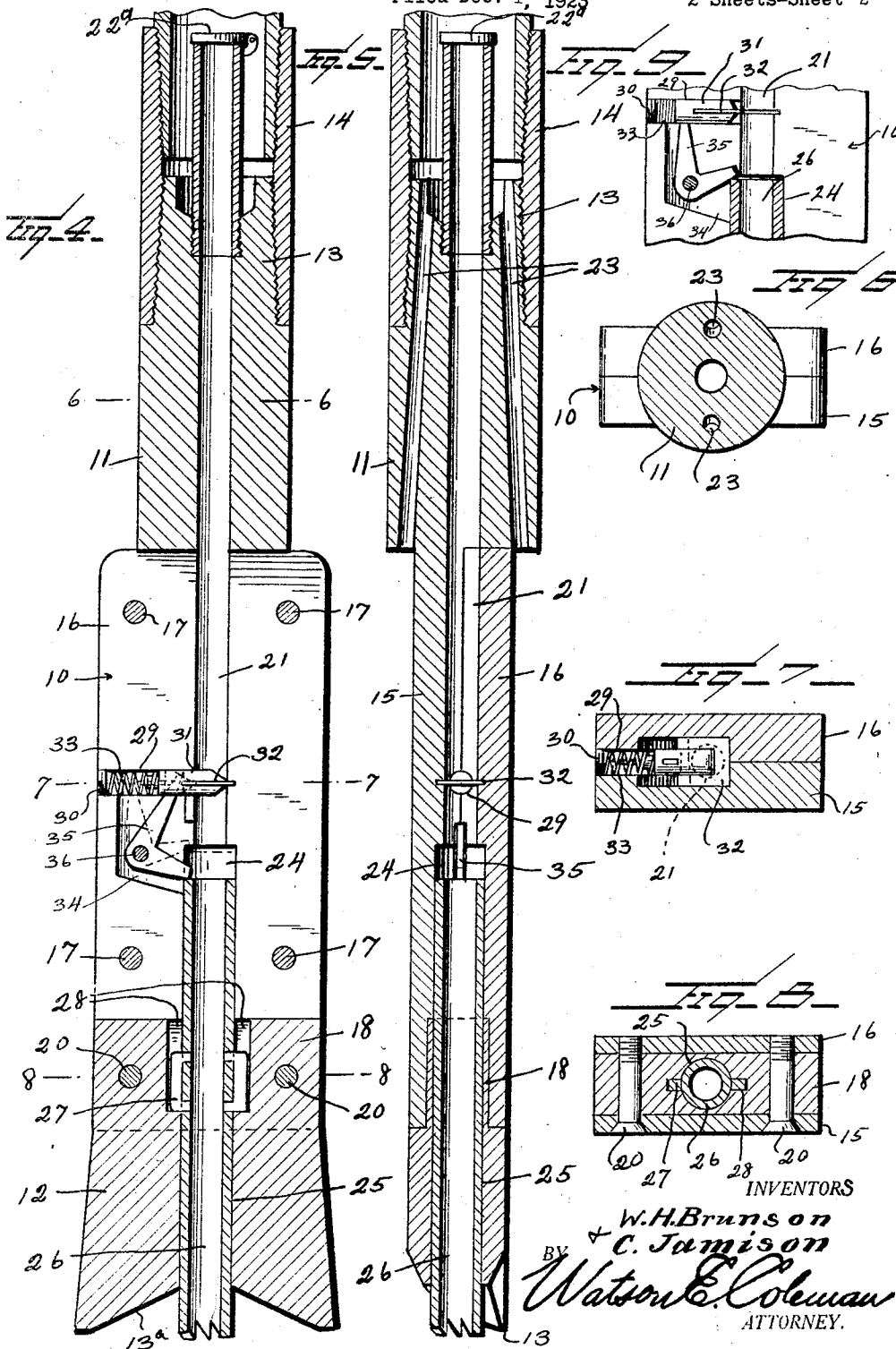
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UNITED STATES PATENT OFFICE.

WILLIAM H. BRUNSON AND CLARENCE JAMISON, OF BREA, CALIFORNIA.

ROTARY DRILLING TOOL.

Application filed December 1, 1923. Serial No. 677,970.

To all whom it may concern:

Be it known that we, WILLIAM H. BRUNSON and CLARENCE JAMISON, citizens of the United States, residing at Brea, in the County of Orange in the State of California, have invented certain new and useful Improvements in Rotary Drilling Tools, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to rotary drilling tools of the type employed in rotary deep well drilling apparatus.

An important object of the invention is to provide means for forming the core simultaneously with the drilling operation including a part which upon a predetermined operation of the drilling tool severs the formed core and serves as a retaining means to hold the same within the coring barrel.

A further object of the invention is to provide such a means whereby the engagement of the core drill with the surface of the ground to be cored automatically opens a passage for the reception of the formed core and retains the same in such open position until the drill is again lifted at which time the formed core is severed for withdrawal with the coring barrel of the drilling shoe.

A further object of the invention is to provide apparatus of this character which may be used in conjunction with the ordinary drilling apparatus and which in no way interferes with the normal operation of the drill.

A still further object of the invention is to provide an improved drilling apparatus or drill shoe and bit construction providing a free water course for the water of the bit so that this water will not act upon or tend to destroy the core.

These and other objects we attain by the construction shown in the accompanying drawings, wherein for the purpose of illustration is shown a preferred embodiment of our invention and wherein:—

Figure 1 is a side elevation of a drilling shoe constructed in accordance with our invention;

Figure 2 is an edge elevation thereof;

Figure 3 is a side elevation of the stem section and the body section attached thereto;

Figure 4 is a longitudinal sectional view taken through the shoe;

Figure 5 is a similar section taken at right angles to the section in Figure 4;

Figure 6 is a section on the line 6—6 of Figure 4;

Figure 7 is a section on the line 7—7 of Figure 4; and

Figure 8 is a section on the line 8—8 of Figure 4.

Figure 9 is a fragmentary longitudinal section, the combined valve and cutter being shown in withdrawn position.

Referring now more particularly to the drawings, we have illustrated a drilling shoe comprising a main body 10, a shank 11, and a bit 12. The shank 11 is provided with the usual coupling member 13 for coupling the same to the drill pipe coupling 14 by means of which the shoe is rotated and through which water is fed to the drill. The body portion 10 of the shoe is preferably flatly formed, being slightly wider than the shank 11 and of less thickness than this shank.

This body portion is formed in two sections 15 and 16, one of which is preferably formed integrally with the shank 11 and the other of which is secured to the integrally formed section by securing elements 17. The bit 12 is preferably shaped similarly to the body and provided with a reduced shank 18 entering in a socket 19 formed by notching the lower ends of the sections 15 and 16 on their adjacent faces. Through the sections 15 and 16 and through the shank 18 extend securing elements 20 by means of which the bit 12 is held in position. This bit is provided with the usual cutting teeth 13 having their end portions slightly wider than the body 10 of the shoe so as to provide clearance for the shoe. The construction of the bit 12, in other than certain details hereinafter to appear, may be of any desired form and does not enter into this invention.

The shank 11, including the coupling portion 13 thereof and the body 10, is provided with a continuous core receiving bore 21, the upper end of which is threaded for engagement with a core barrel 22. At the upper end of the bore a pair of ports 23 communicate therewith and diverge therefrom opening through the lower face of the shank 11 at opposite sides of the body portion 10. It will be obvious that at these sides of the body portions there will always

be a space at the bore so that water directed through these ports will pass downwardly along the sides of the sections 15 and 16 to the drill to wash from the drill detritus which may tend to collect thereon. The lower end of the bore 21 is enlarged as indicated at 24 for a purpose presently to appear.

The bit 12 has formed therein a bore 25 of the same size as the enlarged lower end 24 of the bore 21 and in this bore is slidably mounted a coring drill 26. This coring drill, which is in the form of a tube having its lower end dentated, is provided upon the sides thereof with flanges 27 engaging in diametrically opposed slots 28 formed in the wall of the drill 12 at the sides of the bore 25 thereof, these flanges preventing rotation of the core drill and being of such length as to permit longitudinal movement thereof. The sections 15 and 16 of the body portion 10 have formed therein at corresponding points semi-circular grooves 29 which combine when the sections are in assembled relation to form a bore directed into and communicating with the bore 21 immediately above the enlarged portion 24 thereof. The outer end of this bore is closed by a removable threaded plug 30. Disposed within the bore is a plunger 31 having at its forward end a combined valve and cutter 32. Between the plug 30 and the plunger 31 a spring 33 is disposed which normally forces the combined valve and cutter 32 into the bore 21 to close the same.

Adjacent sides of the sections are further provided with recesses 34 combining to form a housing for a bell crank lever 35 pivoted, as at 36, to one of the sections. One arm of this bell crank lever extends into the enlarged portion 24 of the bore and is of such length that it will not interfere with the passage of a core of the size of the bore 21. The other arm of the bell crank lever is engaged with the plunger 31 so that upon elevation of the first named arm the plunger 31 is withdrawn and the valve and cutter 32 is withdrawn from the bore 21.

The operation of the device is as follows: When the bit is lowered into the well and until the same comes into engagement with the bottom of the well, the combined valve and cutter member 32 closes the bore 21, for during this period the core drill 26 moves downwardly by its own weight until the flanges 27 come to rest upon the bottoms of the grooves 28 and the bell crank lever 35 accordingly exercises no effect whatever upon the plunger 31. Accordingly, the bore 21 being closed, collected water at the bottom of the well, which is always present during drilling operations, will not enter this bore to any greater height than the valve 32. When the bottom of the well is reached and the core drill 26 meets resistance it moves

upwardly until the upper ends of the flanges 27 come into engagement with the lower end of the sections 15 and 16 into which the grooves 28 do not continue. In its upward movement the upper end of the core drill engages the arm of the bell crank 35 causing the plunger 31 to be shifted and the valve 32 to be withdrawn, thus opening the bore 21. As the drilling continues the formed core moves upwardly through the bore 21 and any water which may have collected in the bore above the wall may escape through the upwardly opening check valve 22^a at the upper end of the core barrel 22, at the same time the pressure of the water from the slush pump is held from engagement with the core, it being well-known that this water acting upon the core has a tendency to wash the same particularly if the material being acted upon by the drill is soft. At the same time this wash water is free to move downwardly along the sides of the sections 15 and 16 to cool the drill and wash away from the drill any cuttings made thereby. After the desired length of drilling has been completed the drill is elevated until the core cutter 26 is freed from the ground when it is rotated for a sufficient period to enable the combined valve and cutter 32 to sever the core, it being obvious that this cutter will be forced into engagement with the core by the spring 33. After the cutter has completed the severing of the core it completely closes the lower end of the core receiving bore 21 and maintains the core in position therein preventing the loss of any part thereof. When the drill is drawn to the surface all that is necessary to release the core from the drill is to place sufficient pressure against the lower end of the core drill 26 to cause withdrawal of the combined valve and cutter 32 at which time the core is readily withdrawn from the coring barrel. In event the core sticks or is otherwise hard to remove this may be readily accomplished by separating the sections 15 and 16 and removing the core in this manner.

It will be obvious that by this structure means are provided whereby the core may be formed simultaneously with the drilling operation and by which the withdrawal of the complete core is assured. It will furthermore be obvious that the structure hereinbefore set forth is capable of a considerable range of change and modification without in any manner departing from the spirit of our invention and we accordingly do not limit ourselves to such specific structure except as hereinafter claimed.

We claim:—

1. In rotary well drilling apparatus, a shoe including coring apparatus, the shoe having a bore for the reception of a core formed by the coring apparatus, and means within the shoe operative upon a predeter-

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mined actuation of the shoe for severing a core housed within the shoe and for completely closing the lower end of the bore of the shoe to prevent escape of any portion of the core therefrom.

2. In rotary well drilling apparatus, a shoe including coring apparatus, the shoe having a bore for the reception of a core formed by the coring apparatus, and means within the shoe operative upon a predetermined actuation of the shoe for severing a core housed within the shoe and for completely closing the lower end of the bore of the shoe to prevent escape of any portion of the core therefrom, said means acting during lowering of the shoe into the well to prevent the entrance of water into the bore through the lower end thereof.

3. In rotary well drilling apparatus, a shoe including coring apparatus, the shoe having a bore for the reception of a core formed by the coring apparatus, means within the shoe operative upon a predetermined actuation of the shoe for severing a core housed within the shoe and for completely closing the lower end of the bore of the shoe to prevent escape of any portion of the core therefrom, said means acting during lowering of the shoe into the well to prevent the entrance of water into the bore through the lower end thereof, and means at the upper end of the bore preventing the entrance of water thereto and permitting the escape of water therefrom.

4. In rotary well drilling apparatus, a shoe including coring apparatus, the shoe having a bore for the reception of a core formed by the coring apparatus, and a combined cutter and valve normally closing the lower end of the bore and withdrawn to open the bore upon elevation of said coring apparatus.

5. In rotary well drilling apparatus, a shoe, a coring apparatus associated therewith and shiftable longitudinally of the shoe but held against rotation with relation thereto, the shoe having a bore for receiving a core formed by the coring apparatus, and a combined cutter and valve normally interrupting said bore and withdrawn from normal position to admit a core to the bore upon engagement of the coring apparatus with the lower end of the bore of the well.

6. In rotary well drilling apparatus, a shoe having a bore for the reception of a

core and coring apparatus carried by the shoe and discharging a formed core to the bore, and single means within the bore preventing the entrance of water to the bore during lowering of the shoe into the well and operating to sever the formed core and close the bore to prevent the loss thereof upon a predetermined operation of the shoe.

7. In rotary well drilling apparatus, a shoe having a bore for the reception of a core and coring apparatus carried by the shoe and discharging a formed core to the bore, single means within the bore preventing the entrance of water to the bore during lowering of the shoe into the well and operating to sever the formed core and close the bore to prevent the loss thereof upon a predetermined operation of the shoe, and an operative connection between said single means and the coring apparatus withdrawing said means to open the bore upon engagement of the coring apparatus with the bottom of the well.

8. In rotary well drilling apparatus, a shoe having a longitudinal bore formed therein, a second bore formed in the shoe extending transversely of the first named bore and communicating therewith at one end, a valve positioned in the last named bore, a spring within the bore urging the valve to close the first named bore, coring apparatus carried by the shoe and shiftable longitudinally therein, and operative connections between said valve and coring apparatus withdrawing the valve upon elevation of the coring apparatus.

9. In rotary well drilling apparatus, a shoe having a longitudinal bore formed therein, a second bore formed in the shoe extending transversely of the first named bore and communicating therewith at one end, a valve positioned in the last named bore, a spring within the bore urging the valve to close the first named bore, coring apparatus carried by the shoe and shiftable longitudinally therein, operative connections between said valve and coring apparatus withdrawing the valve upon elevation of the coring apparatus, and a drill carried by the lower end of the shoe and through which said coring apparatus is directed.

In testimony whereof we hereunto affix our signatures.

WILLIAM H. BRUNSON.
CLARENCE JAMISON.