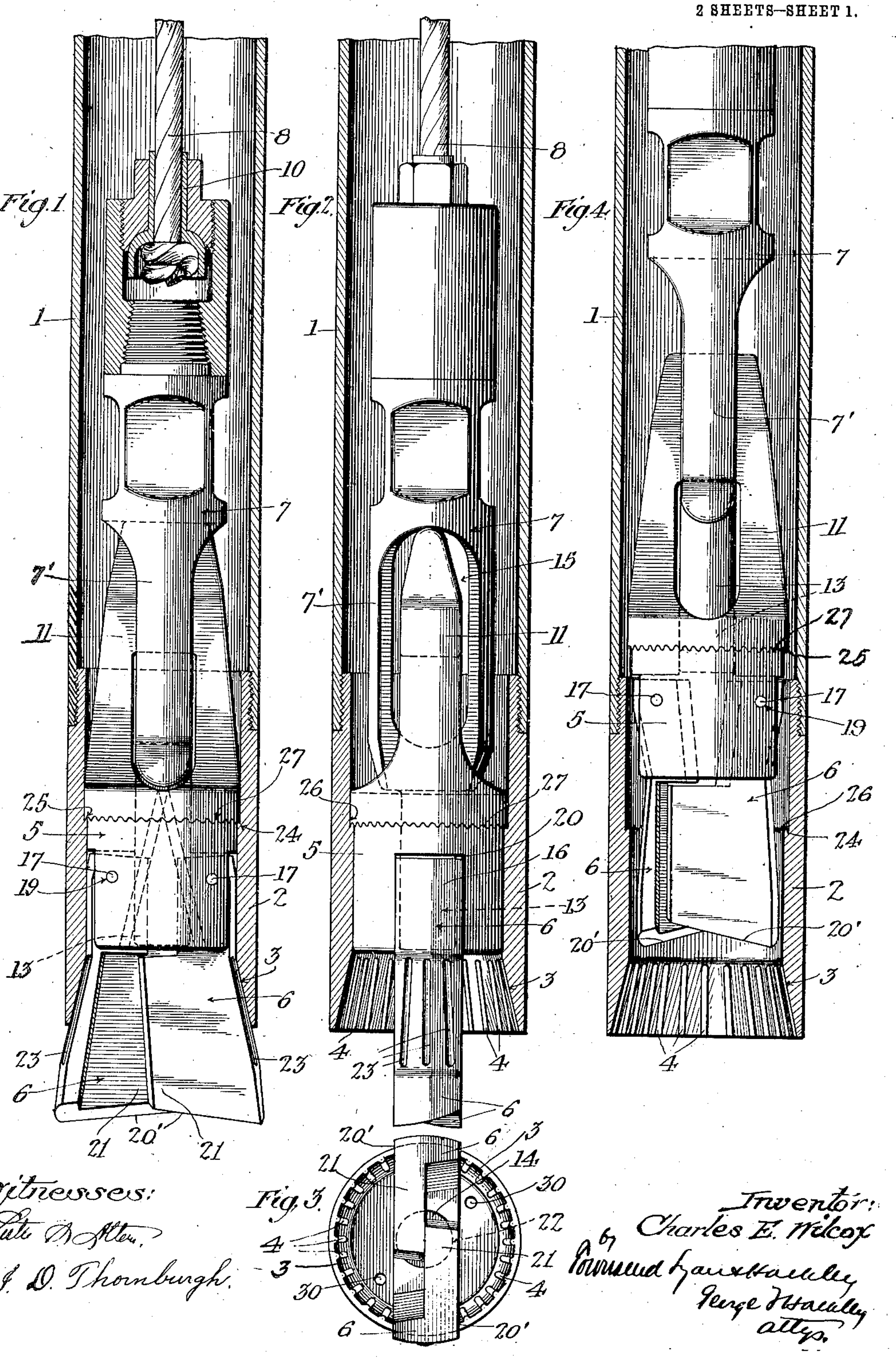
C. E. WILCOX.

WELL DRILLING TOOL.

APPLICATION FILED NOV. 8, 1910.

1,002,793. Patented Sept. 5, 1911.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 5.

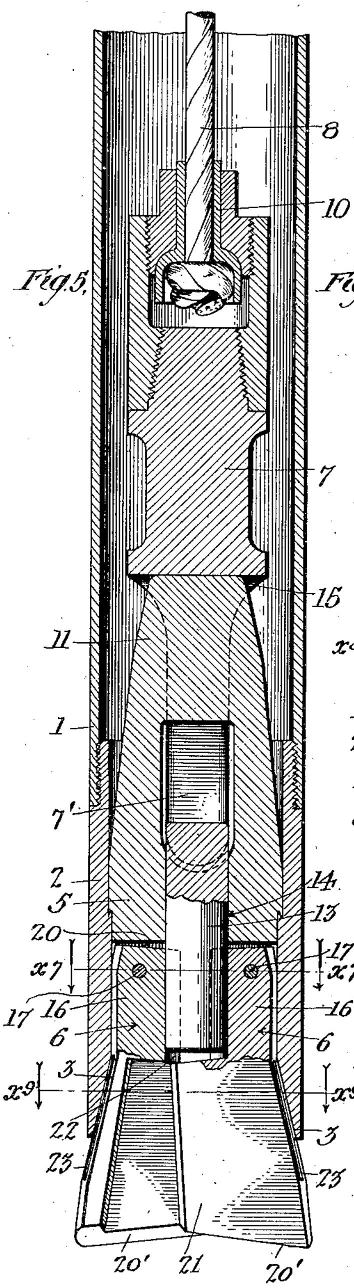


Fig. 6.

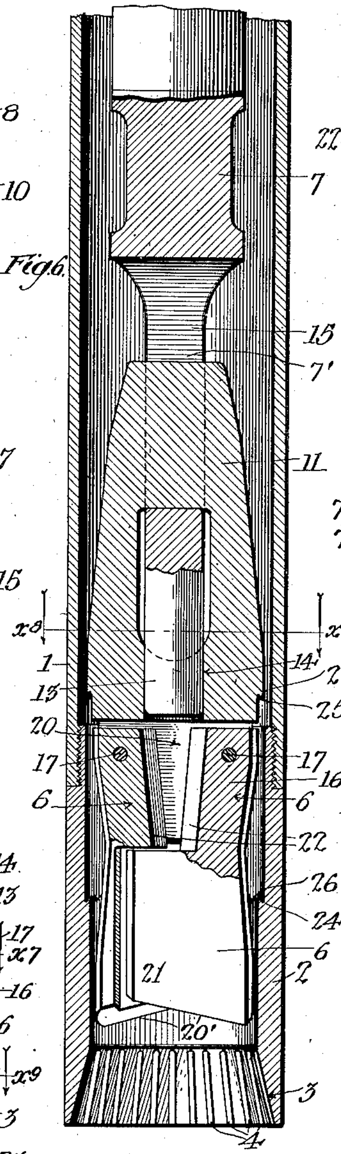


Fig. 7.

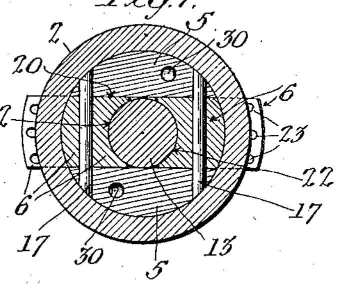


Fig. 8.

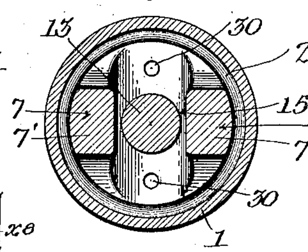


Fig. 10.

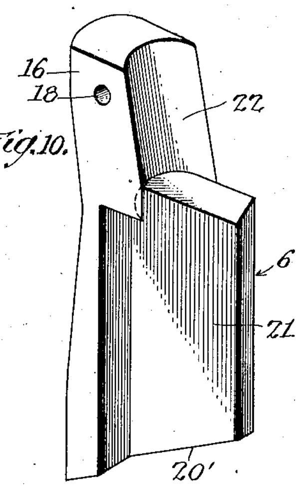
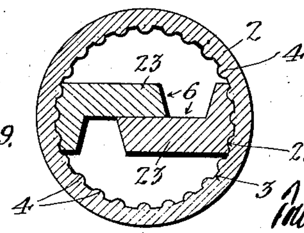


Fig. 9.



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UNITED STATES PATENT OFFICE.

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WELL-DRILLING TOOL.

1,002,793. Specification of Letters Patent. Patented Sept. 5, 1911.

Application filed November 8, 1910. Serial No. 591,309.

To all whom it may concern:

Be it known that I, CHARLES E. WILCOX, a citizen of the United States, residing at Bakersfield, in the county of Kern and State of California, have invented a new and useful Well-Drilling Tool, of which the following is a specification.

This invention relates to well drilling tools for use in well drilling and is particularly intended for use in connection with the swivel disclosed in my application Serial Number 572,599, filed July 18, 1910, in which provision was made for alternative use of standard and rotary drilling tools with a minimum loss of time in changing from one kind of drilling to the other. The aforesaid invention comprised a rotary drilling member and a swivel for supporting the same and is provided with means to allow the insertion of and removal of standard tools through the top of the swivel and through the rotary drilling member.

The main object of the present invention is to provide a rotary member with means whereby a drilling bit may be inserted through the said swivel and into the rotary driving member or casing and to automatically engage therewith to form a drill on being lowered to the bottom thereof and to expand or spread so as to cause it to project beyond the bottom of the rotary driving member or casing and be engaged thereby and coact therewith as a rotary bit and may be again withdrawn through the rotary driving member or casing and through the said swivel when desired to clear the rotary member for the admission of standard tools.

A further object of the invention is to provide a rotary bit in which the cutter members of the bit are engaged and directly driven by the rotary casing, such engagement being effected automatically by the weight of the parts.

Other objects of the invention will appear hereinafter.

The accompanying drawings illustrate the invention, and referring thereto: Figure 1 is a side elevation of the collapsible bit in engagement with the driving casing and coupling means for the bit shown in section. Fig. 2 is a side elevation of the rotary bit at right angles to Fig. 1, the driving casing being shown in section. Fig. 3 is an inverted plan view of Fig. 2. Fig. 4 is a side elevation of the lower portion of the bit in collapsed position, the driving casing being shown in section. Fig. 5 is a vertical section of the bit and casing showing the operative position of the bit. Fig. 6 is a similar view, showing the collapsed position of the bit. Fig. 7 is a horizontal section on line x^7—x^7 in Fig. 5. Fig. 8 is a horizontal section on line x^8—x^8 in Fig. 6. Fig. 9 is a horizontal section on line x^9—x^9 in Fig. 5. Fig. 10 is a perspective of one of the cutter jaws.

1 designates the rotary casing or tubular driving member which serves to operate the bit, said member being connected at its upper end to drive means, for example, any of the well known rotary tables commonly used for that purpose and provided at its lower end with a tubular shoe 2 secured to the member 1 and formed interiorly at its lower end with a beveled or upwardly tapering annular seat 3 having a plurality or series of ridges or projections 4 adapted to engage complementary grooves or channels in the bit blades.

The bit comprises a body 5 adapted to slide within the tubular shoe 2, cutter members 6 movably mounted on said body to be expansible and collapsible thereon and a supporting and controlling member 7 connected to said body and to flexible controlling means, such as a rope or cable 8 extending vertically in the rotary casing 1. Said controlling rope 8 may be attached to a swivel 10 affording rotative connection with the member 7 and said member 7 is formed with bars 7′ extending at each side of a bail 11 on the body 5, the said bars 7′ being connected at their lower ends by a pin 13 adapted to move within a bore 14 in the body 5 and to engage the cutter members, as hereinafter set forth. The bail member 11 extends into the slot 15 in member 7 between the bars 7′ and is adapted to engage the lower end of said slot when the member 7 is raised.

The cutter members 6 are provided with shank portions 16 pivotally mounted by pins 17 at their upper ends extending through holes 18 in said shank portions and through holes 19 in the lower end portion of body 5, such lower end portion being formed with vertical channels 20 in which said shanks 6 fit and are pivotally movable, so as to swing inward or outward therein. The said cutter members are further provided with cutting edges 20′ and with inwardly extending flanges 21, said flanges overlapping and slid-

ing on one another in the in-and-out pivotal movement of the cutter members. The outer faces of said cutter members are provided with grooves or channels 23 adapted to receive and engage the ribs or tongues 4 on the lower end of the shoe 2. The said cutter members are further provided on the inner faces of their shanks 16 with channel portions 22 adapted to be engaged by the aforesaid pin 13 to cause the cutter members to be pushed outwardly to operative position when the said pin is depressed. The shoe 2 is provided with means for arresting the downward movement of the bit body 5, said means consisting of an annular shoulder 24 on the said shoe engaging a shoulder 25 on said body 5, the said shoulders 24 and 25 being preferably corrugated or notched as shown at 26 and 27 to interlock the parts against rotative strain. The corrugations or notches as at 26 and 27 are arranged correspondently with the channels or grooves 23 on the cutter bits, so that when the corrugations 26 and 27 register on the shoulders, the grooves 23 on the cutter bits register and engage with the ribs 4 of the shoe, thereby causing the bit members to engage with the shoe and cause the cutters to travel with the rotary member. Holes 30 are provided in the body member 5 for passage of the water in hydraulicking.

The operation is as follows: Assuming that the rotary casing 1 is in place in a well and that it is desired to use the rotary cutters, the said bit is lowered into the well through the said casing 1, the bit while passing through the casing being in the collapsed position shown in Figs. 4 and 7 with the cutter members folded on one another to position occupying minimum radial space. In this position the weight of the cutter members is supported by the engagement of the bail portion 11 of the body 5 with the lower end of the slot 15 of the supporting member 7 and the channel portions 22 of the cutter members extend convergently inward and downward so that the space between their lower portions is smaller than the pin 13. When the bit reaches the position for use at the bottom of the rotary casing 1, the shoulder 25 on the body 5 rests on the shoulder 24 on the shoe 2 with the corrugations in register to position the grooves 23 on the cutters to fit over the ridges 4 on the shoe, thereby arresting the downward movement of the bit and on continuing to lower the supporting member 7 by means of the cable 8, the pin 13 is driven in between the inclined channel portions 22 of the cutter members, thereby wedging said cutter members apart and driving the same outwardly to the position shown in Figs. 1 and 5. In this position, the outer faces of the cutter members engage and fit the upwardly tapering seat 3 in the lower end of the shoe 2 and the grooves 23 in said cutter member engage and fit the ridges 4 on said shoe, so that the shoe is operatively connected to the cutter members and in driving engagement therewith, the whole weight of the casing being available to force the shoe into engagement with the cutter members to maintain the rotary driving connection, as well as to afford the downward pressure for cutting.

If at any time it is desired to change from rotary to standard drilling operation, for example, in case boulders or hard rock are encountered, the rotary bit may be easily removed by drawing up the suspending cable 8, thereby lifting the supporting member 7 which first withdraws the pin 13 from between the shanks of the cutter members and then by engagement of the lower end of the slotted portion of said supporting member with the bail portion 11 of the body lifts the body with the cutters thereon, causing the cutters to be collapsed as they pass upwardly within the upwardly tapering seat 3 at the lower end of the shoe, and the bit so collapsed may then be withdrawn upwardly through the rotary casing.

It will be noted that in the rotation of the bit by the casing, the driving engagement for the bit is wholly at the lower end of the casing and there is no rotative strain on the controlling and supporting means for the bit. In fact, the controlling rope 8 does not rotate as it is connected to the bit by the swivel connection 10 and this rope being flexible, the bit may be lifted out of the casing when required by a single continuous operation, the suspending rope winding onto a drum, thereby obviating the difficulty and loss of time involved in uncoupling of connecting rods.

What I claim is:

1. The combination of a rotary casing provided at its lower end with a downwardly flaring seat, a body longitudinally movable within said casing, cutters pivotally mounted on said body to be movable inwardly and outwardly, controlling means movable relatively to the body and provided with means engaging said cutter means to force the same outwardly into engagement with the seat on the lower end of the rotary casing, and controlling means connected to said cutter member to raise and lower the same, said cutter means and seat being provided with interengaging longitudinally arranged projections and recesses to cause rotation of the cutter means by rotation of the casing, said body and rotary casing being provided with interengaging shoulder means limiting the downward movement of the body within the casing.

2. The combination of a rotary casing provided at its lower end with a downwardly flaring seat, a body longitudinally movable within said casing, cutters pivotally

mounted on said body to be movable inwardly and outwardly, controlling means movable relatively to the body and provided with means engaging said cutter means to force the same outwardly into engagement with the seat on the lower end of the rotary casing, and controlling means connected to said cutter member to raise and lower the same, said cutter means and seat being provided with interengaging longitudinally arranged projections and recesses to cause rotation of the cutter means by rotation of the casing, said body and rotary casing being provided with shoulder means limiting the downward movement of the body within the casing, said shoulder means being provided with interengaging projections and recesses for the purpose set forth.

3. The combination of a rotary driving casing having an annular shoulder arranged a distance above the end thereof and an upwardly tapering annular seat below such shoulder, a bit movable longitudinally in said casing and having means for engaging with the annular shoulder and means for engaging with the upwardly tapering seat, means for forcing the bit into engagement with such seat when the bit engages with the shoulder and means for moving the bit into and out of engagement with the annular shoulder.

4. The combination of a rotary driving casing having an annular shoulder arranged a distance above the end thereof and an upwardly tapering annular seat below such shoulder, a body movable longitudinally in such casing, a shoulder on such body adapted to engage with the annular shoulder in the casing, cutters pivotally carried by the body and means for causing such cutters to engage with the seat below the annular shoulder when the body is in engagement therewith.

5. The combination of a rotary driving casing having an annular shoulder arranged at a distance above the end thereof, a cutter seat arranged at a distance from the annular shoulder, a body having a shoulder arranged movable longitudinally within the casing, cutters pivotally carried by the body, adapted to engage with the cutter seat in the casing and means for seating the cutters when the annular shoulder of the body engages with the annular shoulder of the casing.

6. The combination of a rotary driving casing having an annular shoulder arranged at a distance above the end thereof, notches in such shoulder, a cutter seat having ridges or projections arranged adjacent to such annular shoulder, a body movable longitudinally in the casing, a shoulder on such body, notches on such body shoulder adapted to engage with the notches on the annular shoulder of the casing, cutters pivotally carried by the body and having corrugations or grooves thereon adapted to engage with the ridges or projections on the cutter seat of the casing and means whereby the cutters are caused to engage with the cutter seat of the casing; the notches on the annular shoulder of the casing and the ridges or projections on the cutter-seat being correspondingly arranged so as to coincide or register with the notches on the body shoulder and with the corrugations or grooves of the cutters respectively and cause the cutters to properly engage the ridges or projections on the cutter seat.

7. A well boring tool comprising a rotary driving casing having an annular seat and an annular shoulder located at a distance above the seat, a body slidable in the driving casing and having means for engaging the annular shoulder, a cutter pivoted to the body, interengaging means between the annular seat and the cutter, and means for carrying the body having means for throwing out the cutter into operative locked position when the means on the body engages the shoulder on the casing.

8. A well boring tool comprising a rotary driving casing having an annular seat and an annular shoulder located at a distance above the seat, a body slidable in the driving casing and having an annular shoulder for engaging the annular shoulder of the driving casing, a cutter pivoted to the body, interengaging means between the annular seat and the cutter, and means for carrying the body having means for throwing out the cutter into operative locked position when the shoulder on the body engages the shoulder on the casing.

9. A well boring tool, comprising a rotary driving casing having an annular seat and an annular notched shoulder located at a distance above the seat, a body slidable in the driving casing and having means for engaging the annular notched shoulder, a cutter pivoted to the body, interengaging means between the annular seat and the cutter and means for carrying the body having means for throwing out the cutter into operative locked position when the means on the body engages the shoulder on the casing.

10. A well boring tool comprising a rotary driving casing having an annular seat and an annular notched shoulder, located at a distance above the seat, a body slidable in the driving casing and having an annular notched shoulder for engaging the annular notched shoulder of the driving casing, a cutter pivoted to the body, interengaging means between the annular seat and the cutter and means for carrying the body having means for throwing out the cutter into operative locked position when the shoulder on the body engages the shoulder on the casing.

11. A well boring tool comprising a ro-

tary driving casing having an annular seat and an annular shoulder located a distance above the seat, a body slidable in the driving casing and having means for engaging the annular shoulder, a cutter pivoted to the body, ridge and groove connecting means between the annular seat and the cutter, and means for carrying the body having means for throwing the cutter into operative locked position when the means on the body engages the shoulder on the casing.

12. A well boring tool comprising a rotary driving casing having an annular seat and an annular shoulder located at a distance above the seat, a body slidable in the driving casing and having means for engaging the annular shoulder, a pair of cutters pivoted at their upper ends to the body, interengaging means between the annular seat and the cutters, and means for carrying the body having means for throwing out the cutters into operative locked position when the means on the body engages the shoulder on the casing.

13. A well boring tool comprising a rotary driving casing having an annular seat and an annular shoulder located at a distance above the seat, a body slidable in the driving casing and having means for engaging the annular shoulder, a pair of cutters pivoted at their upper ends to the body and each cutter being formed with a shank having a channel, interengaging means between the annular seat and the cutters and means for carrying the body having a pin working in the channels of the cutters for throwing out the latter into operative locked position when the means on the body engages the shoulder on the casing.

14. A well boring tool comprising a rotary driving casing, a body having a bail portion, and a vertical bore, a pair of cutters pivoted at their upper ends to the body, each cutter being formed with a shank having a channel, and means for carrying the body having a pin working through the bore of the body and into the channels of the cutters, and formed with bars embracing the bail of the body.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 2nd day of November, 1910.

CHARLES E. WILCOX.

In presence of—

ARTHUR P. KNIGHT,

FRANK L. A. GRAHAM.