Feb. 21, 1928. 1,659,769

R. D. DODDS

DRILL

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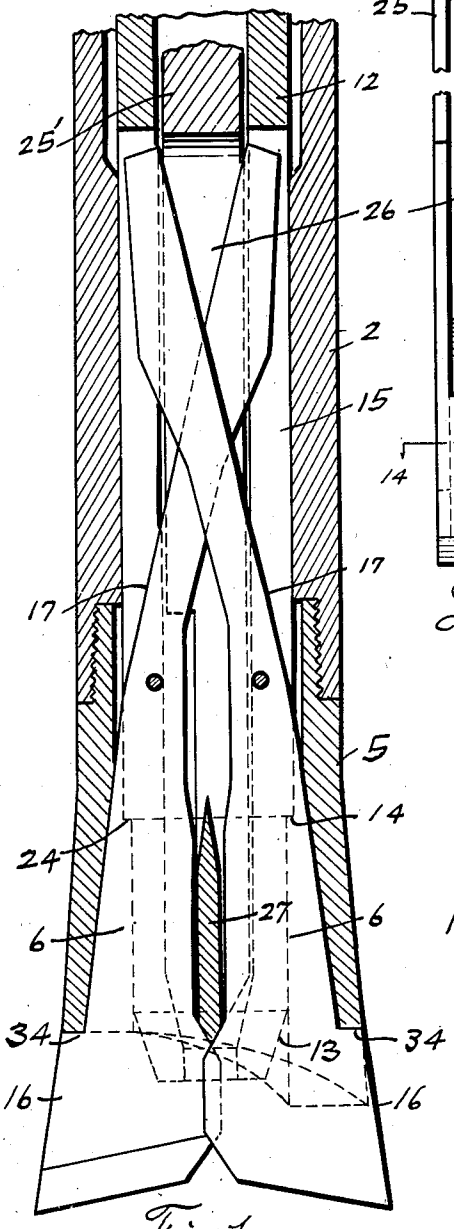


Fig. 1.

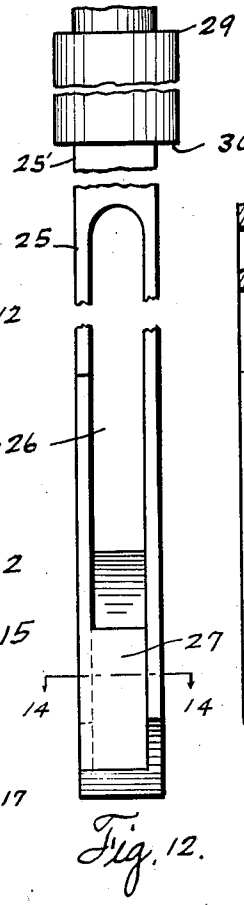


Fig. 12.

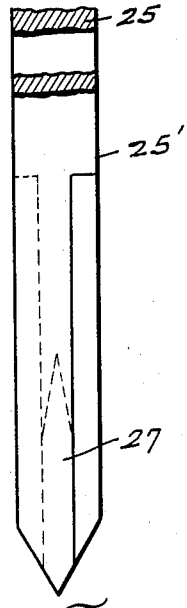


Fig. 13.

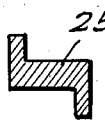


Fig. 14.

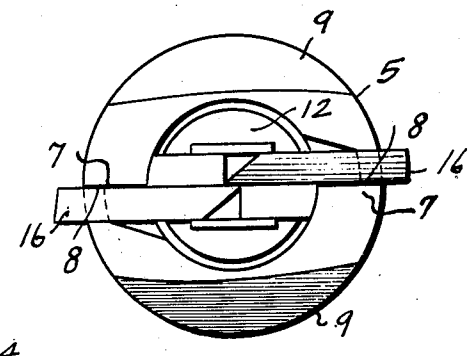


Fig. 10.

Inventor

Reuben D. Dodds

By Harding & Ratcliff

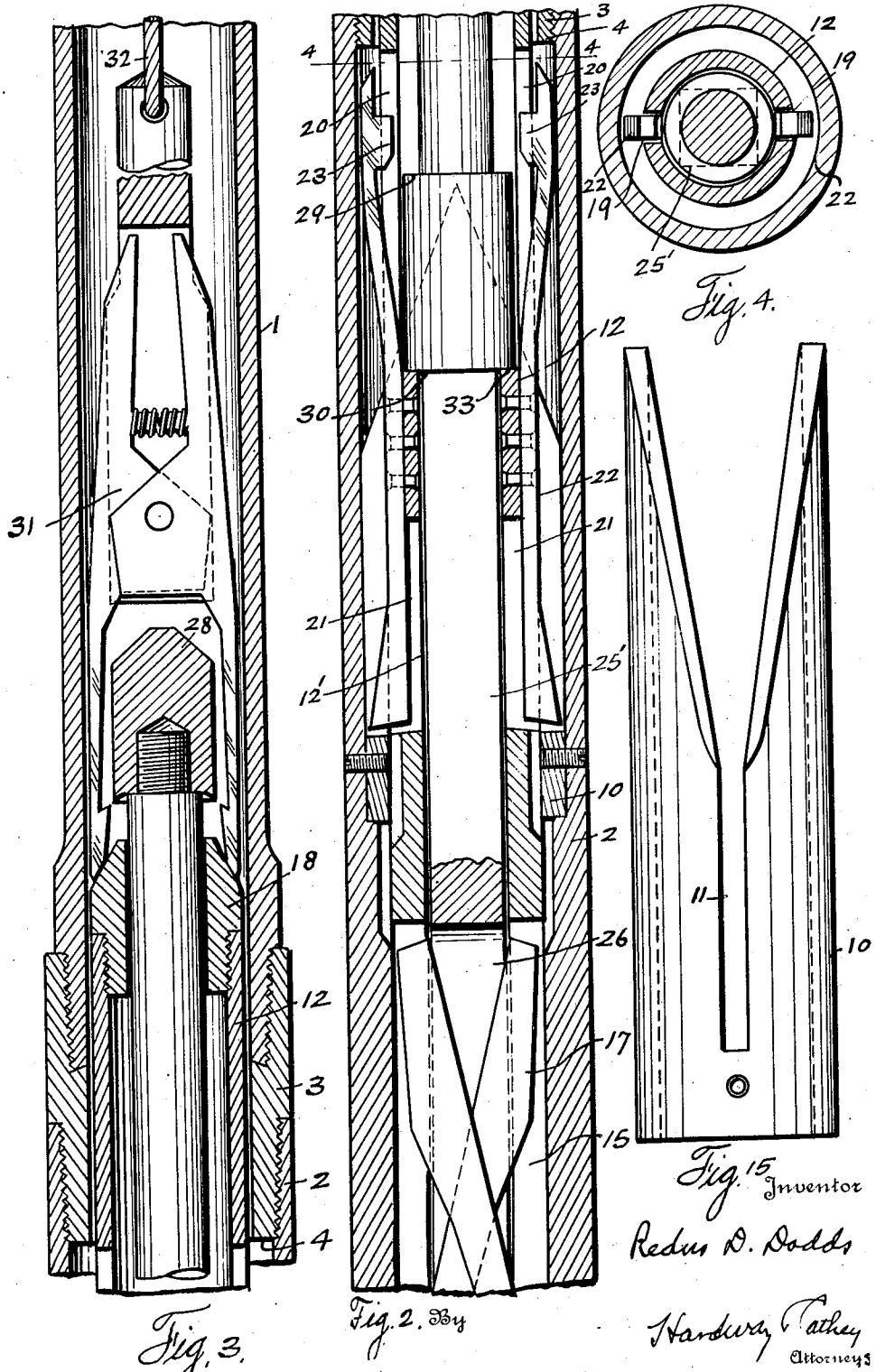
Attorneys

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R. D. DODDS

DRILL

Filed July 17, 1923 4 Sheets-Sheet 2



Inventor

Redus D. Dodds

By Hardway & Cathey

Attorneys

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R. D. DODDS

DRILL

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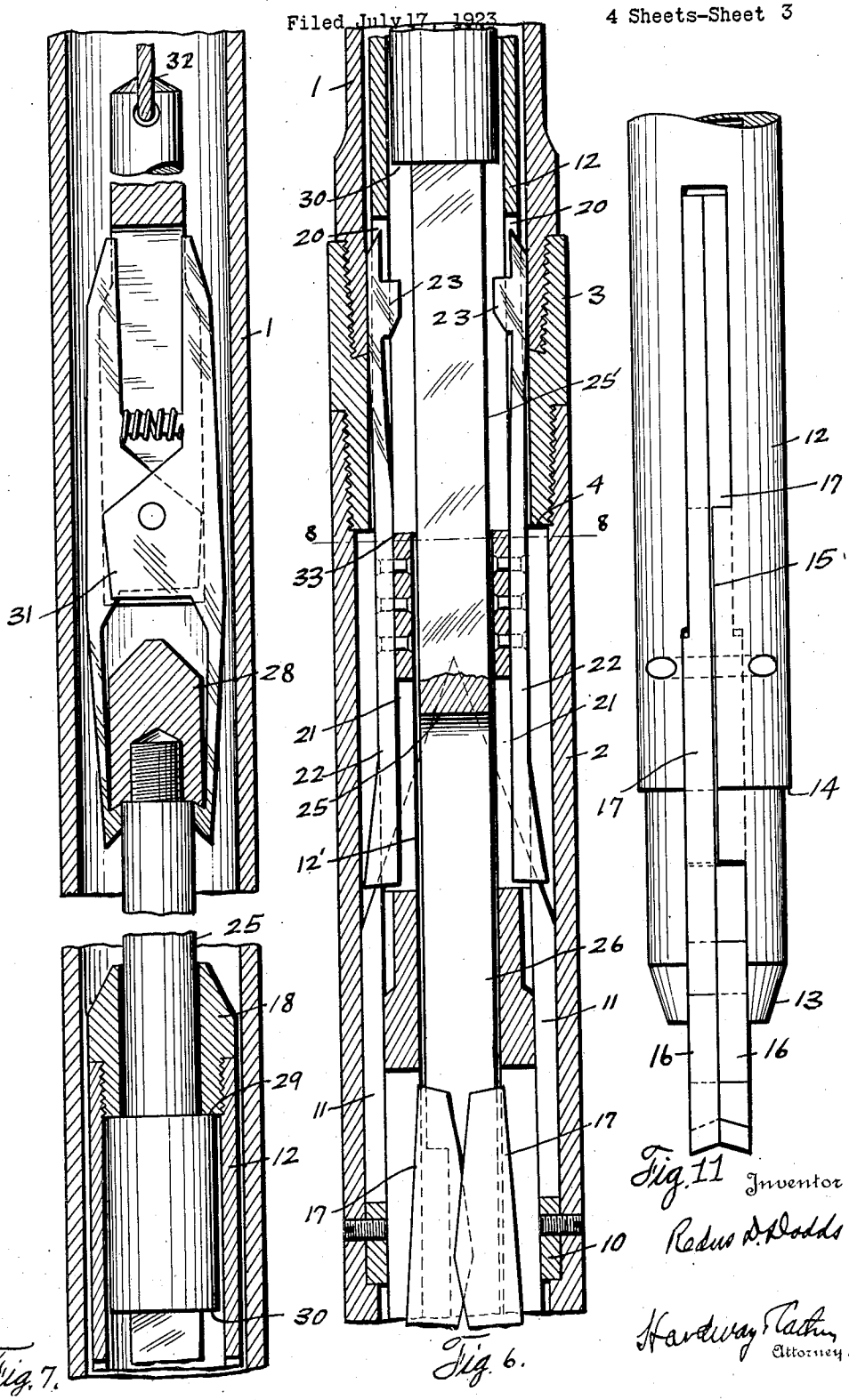


Fig. 7.

Fig. 6.

Fig. 11

Inventor

Rodus D. Dodds

Hardway & Cathey

Attorney.

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R. D. DODDS

DRILL

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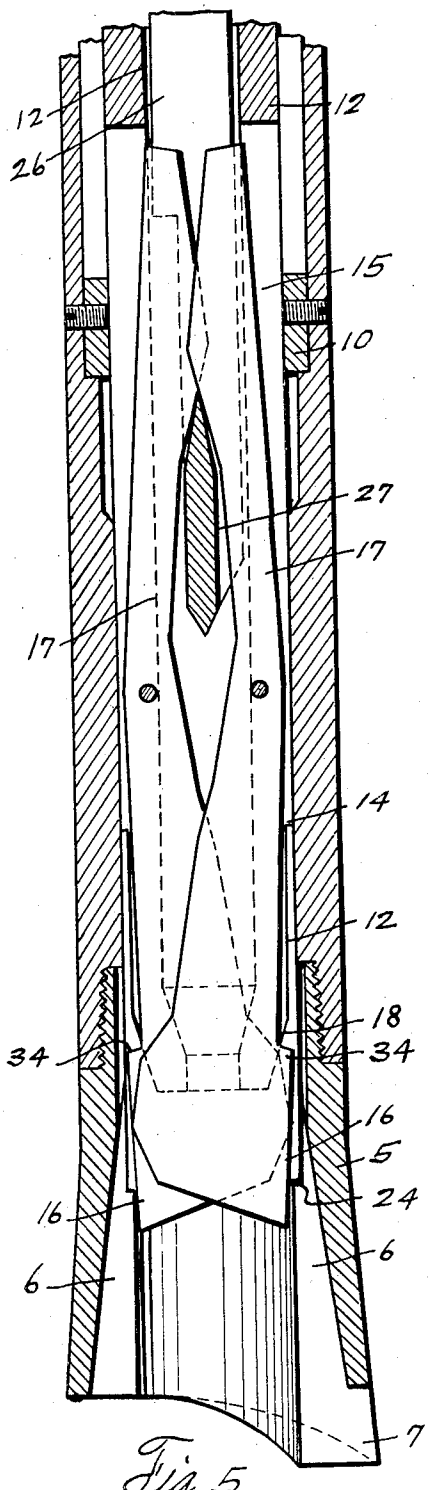


Fig. 5.

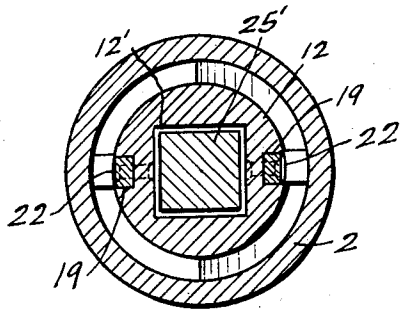


Fig. 8

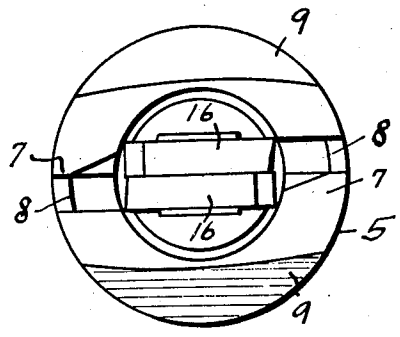


Fig. 9.

Inventor
Reder D. Dodds

By Hardway & Catlin
Attorneys

Patented Feb. 21, 1928. 1,659,769

UNITED STATES PATENT OFFICE.

REDUS D. DODDS, OF HOUSTON, TEXAS.

DRILL.

Application filed July 17, 1923. Serial No. 652,053.

This invention relates to new and useful improvements in a drill.

One object of the invention is to provide an apparatus of the character described embodying the combination with a driving stem, of a boring tool which may be readily attached to the lower end of the stem, or detached therefrom and withdrawn, while the stem is in the bore, and without withdrawing the stem from said bore.

Another object of the invention is to provide an apparatus of the character described having a specially formed drill stem section, forming the lower end of the stem, and adapted to interlock with the collapsible drill, and form a driving connection between said stem and the bit.

A further feature resides in the provision of a very effective arrangement for expanding and collapsing the bit blades as well as for anchoring the same in, and releasing them from the driving stem.

Another important feature of the invention resides in the special formation of the drill collar, forming the lower section of the driving stem, and which is so formed as to permit the easy passage of heavy formations, such as "gumbo", up from beneath said collar around the outside thereof, to relieve the congestion about the drilling tool.

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

Figure 1 shows a vertical sectional view of the lower and of the collapsible bit connected, for operation, to the stem.

Figure 2 shows a vertical sectional view of an intermediate section thereof.

Figure 3 shows a vertical sectional view of the upper section thereof.

Figure 4 shows a cross sectional view taken on the line 4—4 of Figure 2.

Figure 5 shows a vertical sectional view of the lower part of the driving stem with the bit mechanism therein collapsed for withdrawal.

Figures 6 and 7 show the intermediate and upper sections, respectively, thereof showing said mechanism collapsed.

Figure 8 shows a cross sectional view taken on the line 8—8 of Figure 6.

Figures 9 and 10 show bottom end views, respectively, of the bit, in collapsed and expanded position.

Figure 11 shows a side view of the lower end of the bit blade holder, with the bit blades therein.

Figures 12 and 13, respectively, show side and edge views of the expander employed.

Figure 14 shows a cross sectional view taken on the line 14—14 of Figure 12, and

Figure 15 shows a side view of a tubular guide employed.

In the drawings, the numeral 1 designates a drill stem, formed of the usual tubular sections. The lower section 2 of the stem proper is connected to the section above by the collar 3, said collar being threaded onto the section above and having the section 2, beneath, threaded into it, the section 2 having a larger inside diameter than the rest of the stem, and the lower end of said collar forming a downwardly facing annular shoulder, as 4, within said section 2.

Threaded into the lower end of the stem there is a drill collar 5 which flares downwardly, and has the opposing inside downwardly widening grooves forming shoulders 6, 6, which terminate at their lower ends in the blunt cutting blades 7, 7, with the side slots 8, 8, in front of them. These blunt blades serve to reinforce the blades of the collapsible drill.

This drill shoe is tapered downwardly on opposite sides, forming the flat downwardly converging faces 9, 9, and between said faces, on each side, is flared, as shown in Figures 1, 5, and 10. The diameter of the bore, formed by the blunt blades 7, as in Figure 10 is somewhat larger than the drill stem, thus leaving a space between said stem and the walls of the bore, and during drilling operations the "gumbo" and other cuttings, congesting around the boring tool will escape up past said flat faces into the space above the boring tool.

Fastened in the section 2 there is a tubular guide 10 which has the opposite side slots 11, 11, flared at their upper ends, as shown in Figure 15.

The numeral 12 designates a blade carrier, which, at its lower end is tapered as at 13,

and above said taper has an annular shoulder 14. The lower end of this carrier is transversely slotted, forming a blade bearing 15. Pivoted in this bearing, are the oppositely disposed blades 16, 16, having the upwardly elongated arcuate shanks 17, 17, which are spaced apart but over lap at their upper and lower ends, in scissor-like fashion. The blade holder is tubular, in form, and its upper end has a conical shaped gland 18 threaded therein. The carrier has opposite, lengthwise grooves 19, 19, therein, intermediate its ends, and the upper and lower ends of these grooves are cut clear through the wall of the carrier forming upper and lower pairs of slots, 20, 20, and 21, 21. Lying in these grooves are the guide arms 22, 22, which are riveted or otherwise fastened, to said carrier. The lower ends of these arms are flared outwardly and aligned with the slots 21, 21, and their upper ends are beveled inwardly and have the oppositely disposed shoulders 23, 23, which project through the slots 20. As the carrier is lowered through the stem, in attaching the bit mechanism to the stem, the outwardly flared lower ends of the guide arms 22, pass into the corresponding slots 11. The upper ends of these slots are flared as stated, so as to insure the entrance of said guide arms therein. The blades 16 will thus be aligned with the slots 8 and will expand and seat in said last mentioned slots, as hereinafter explained.

The drill shoe has an internal annular shoulder 24 on which the shoulder 14 of the carrier seats when the apparatus is in operative position, and the bit blades expanded.

The numeral 25 designates the blade expander. The lower end of this expander has a slot 26 through which the bit shanks work and beneath said slot has a web 27 which works between the shanks to expand and collapse the same, as presently will be described. The expander has a square section 25′ which slides in a correspondingly shaped bearing 12′ of the blade holder 12. The upper end of the expander slides through the bushing 18 and has a conical shaped head 28 detachably secured thereto, above the bushing, and beneath said bushing the expander is enlarged forming the annular shoulders 29 and 30. The bit blades and mechanism for expanding and collapsing the same are let down into, and withdrawn from the bore through the instrumentality of a grappling tool, as 31, which is handled through a cable as 32. The grappling tool engages with the head 28 and may be of any conventional construction. While the bit mechanism is in suspended position the blade carrier 12 is in its lower position relative to the expander and the upper edge of the web 27 wedges between the upper ends of the shanks 17, thus carrying said shanks into approximately parallel position, and bringing the blades 16 into overlapping position. The blades, and their shanks, are thus brought into what may be termed collapsed position, that is, they are withdrawn within the carrier. They will not, when in said position, interfere with the movement of the carrier through the stem in either direction. In lowering the bit apparatus, the shoulder 30 hangs on the shoulders 23, which hold the expander suspended, relative to the blade carrier, until the shoulder 14 of the carrier rests on the shoulder 24, of the shoe 5. Meanwhile the upper ends of the guide arms 22 have passed beneath the lower end of the collar 3, and said upper ends expand, as shown in Figure 2, releasing the shoulders 23, from beneath the shoulder 30 permitting the expander 25 to descend and the web 27 will wedge between the lower ends of the bit blade shanks and expand the blades 16 through the slots 8. The downward movement of the expander is stopped at this point by the internal annular shoulder 33 of the carrier on which the shoulder 30 of the expander seats. The blades, when in expanded position interlock with the shoe 5, through the outside blade shoulders 34, 34, which engage with the upper ends of the slots 14, as shown in Figure 1. The shoulders 5 and 6 of the driving stem engage behind the blades and shanks 16 and 17 respectively and not only lock them in driving relation with the stem but also reinforce and strengthen them.

In order to collapse and withdraw the bit apparatus, for repairs or replacements, or for other reasons, the grappling tool 31 is engaged over the head 28 and an upward pull exerted through the cable 32. The expander will thus be elevated in the blade carrier, the web 27 collapsing the blades and shanks 16 and 17, as explained and the shoulder 29 contacting with the gland 18, as shown in Figure 17. A further upward pull will elevate the carrier also, and the inwardly beveled upper ends of the arms 22 will pass within the collar 3 which will contract the same and the entire bit apparatus may now be withdrawn through the stem.

What I claim is:

1. A drill stem whose lower end is formed with opposite downwardly converging flat faces and with depending flared shoulders, and having a radial slot in front of each shoulder, said shoulders continuing up inside the lower end of the stem, and having their lower ends formed with cutting edges.

2. A drill stem whose lower end is formed with depending shoulders, and having a radial slot in front of each shoulder, a guide within the stem formed with opposing flared slots, a detachable drilling apparatus formed to be attached to and detached from the lower end of the stem, said drilling appa-

ratus including bit blades, a common means working between the blades for expending said blades to seat them in said first named slots, and for collapsing the blades to withdraw them from said slots, yieldable means coacting with the guide to align said blades with said first named slots as the drilling apparatus is lowered through the stem.

3. A drill stem whose lower end is formed with depending shoulders, and having a radial slot in front of each shoulder, a guide within the stem formed with slots, a detachable drilling apparatus formed to be attached to and detached from the lower end of the stem, said drilling apparatus including bit blades, a common means working between the blades for expanding said blades to seat them in said first named slots, and for collapsing the blades to withdraw them from said slots, yieldable means coacting with the guide and working in the slots thereof to align said blades with said slots in front of the shoulders as the drilling apparatus is lowered through the stem, and means interlocking the stem with said drilling apparatus and establishing a driving relation between them.

4. In combination a drill stem, a blade carrier adapted to pass through the stem, blades pivoted in the carrier, a wedge like blade actuating device adapted to wedge between the blades to expand the same into active position when operated in one direction and to withdraw the same within the carrier, when operated in the other direction, and means interlocking the blades with the stem when the former are in expanded position.

5. In combination a driving stem, a boring apparatus capable of attachment to the lower end thereof, and of detachment therefrom, said apparatus embodying a blade carrier having a polygonal bearing, bit blades pivoted in the carrier, a blade actuating means capable of expanding and collapsing said blades, said means having a wedge which works between the blades and a polygonal section working in said bearing, means for limiting the movement of said blade actuating means relative to the carrier in either direction, the lower end of said stem having slots in which the blades seat when in expanded position.

6. In combination a driving stem, a boring apparatus capable of attachment to the lower end thereof, and of detachment therefrom, said apparatus embodying a blade carrier, bit blades pivoted therein, said carrier having a polygonal bearing, a blade actuating means working snugly through said bearing, and having a transverse wedge working between the blades and capable of expanding and collapsing said blades, means for limiting the movement of said blade actuating means relative to the carrier in either direction, the lower end of said stem having slots in which the blades seat when in expanded position, and a guide in the stem provided to align said blades with said slots.

7. A device of the character described including a driving stem having an internal abutment, a blade carrier within the stem having a projection adapted to seat on said abutment to support the carrier in the stem, bit blades pivoted to the carrier, a blade actuating means capable of limited vertical movement relative to the carrier and provided with a transverse wedge, which operates between the blades to expand said blades when in lower position, relative to the carrier, and to collapse said blades when in upper position relative to said carrier.

8. A device of the character described including a driving stem having an internal abutment, a blade carrier within the stem having a projection adapted to seat on said abutment to support the carrier in the stem, bit blades pivoted to the carrier, a blade actuating means capable of limited vertical movement relative to the carrier and provided to expand said blades when in lower position, relative to the carrier, and to collapse said blades when in upper position relative to said carrier, and means locking said blade-actuating means in said upper position during the downward movement of the carrier until said carrier seats on said abutment.

9. A device of the character described including a driving stem having an internal abutment, a blade carrier within the stem having a projection adapted to seat on said abutment to support the carrier in the stem, bit blades pivoted to the carrier, a blade actuating means capable of limited vertical movement relative to the carrier and provided to expand said blades when in lower position relative to said carrier, and to collapse said blades when in upper position relative to said carrier, and means locking said blade-actuating means in said upper position during the downward movement of the carrier until said carrier seats on said abutment, said locking means automatically releasing when said carrier seats on said abutment.

10. A device of the character described including a driving stem having an internal abutment, a blade carrier within the stem having a projection adapted to seat on said abutment to support the carrier in the stem, bit blades pivoted to the carrier, a blade actuating means capable of limited vertical movement relative to the carrier and provided with a wedge adapted to work between the blades to expand said blades when in lower position, relative to the carrier, and to collapse them when in upper position relative to said carrier, and means for moving said blade-actuating means in either direction relative to said carrier.

11. A device of the character described, including a tubular driving stem having an internal annular shoulder forming a seat, near its lower end, a blade carrier movable through said stem, and having an external annular shoulder adapted to rest on said seat to support said carrier, expansible blades carried by said carrier, and means for expanding said blades beyond, and withdrawing them within said carrier, said means including a wedge like web which works between said blades.

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

REDUS D. DODDS.