

March 7, 1944.

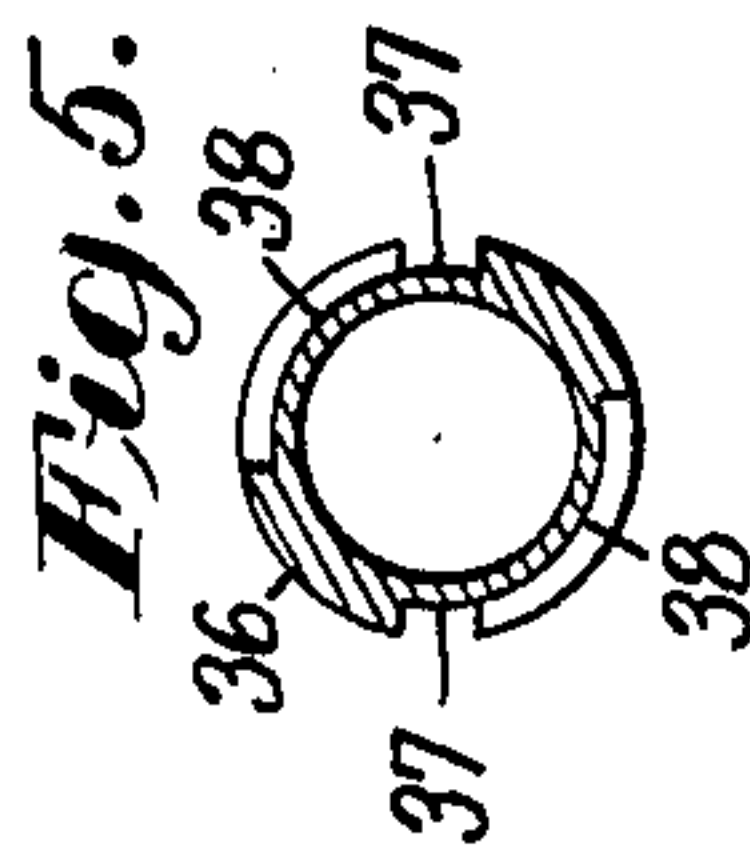
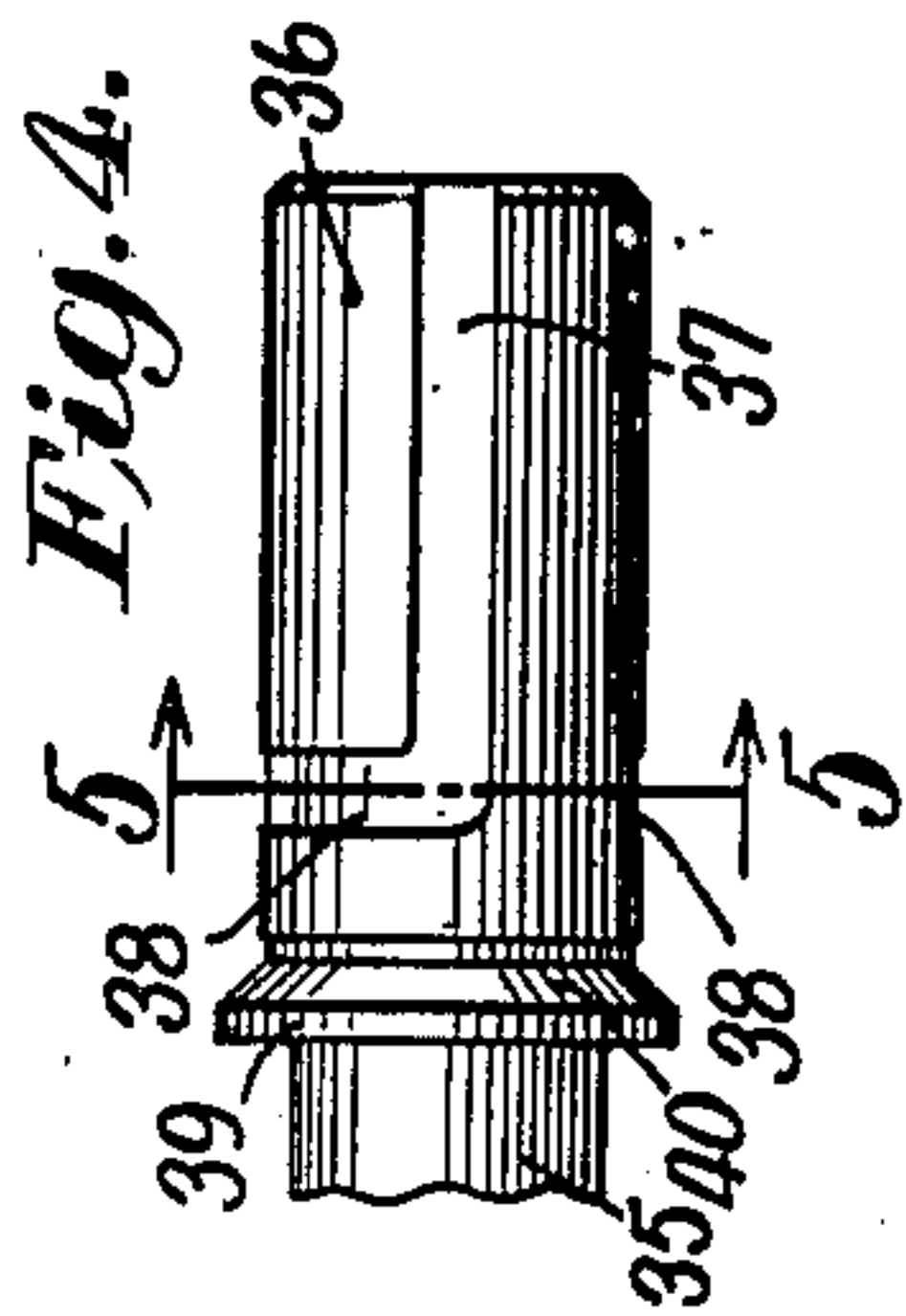
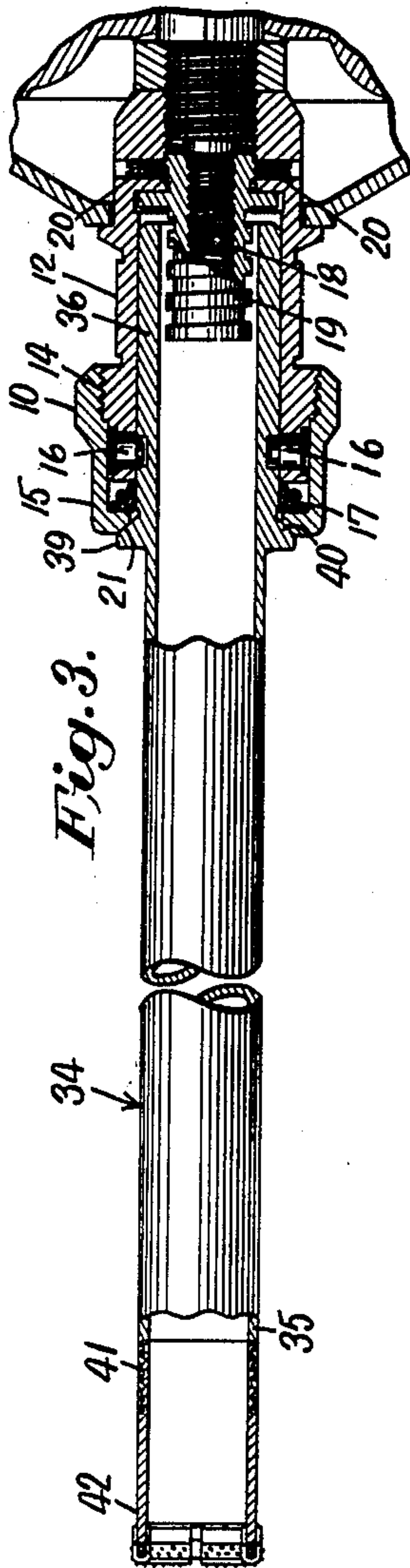
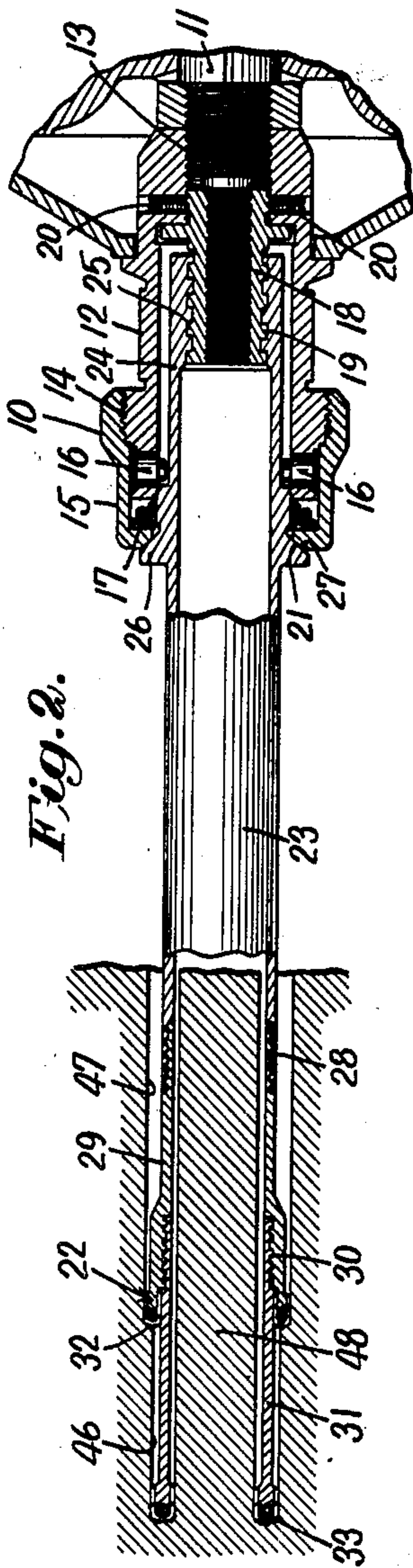
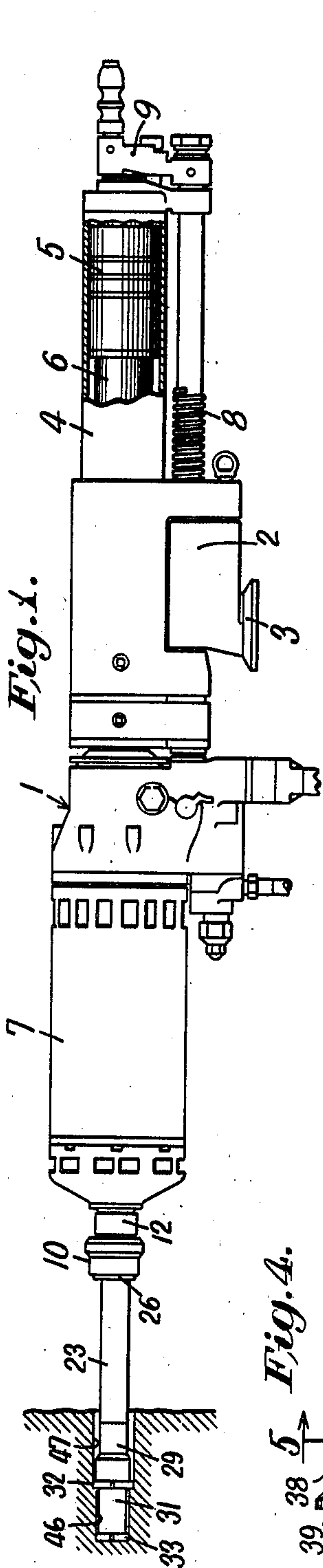
W. V.. PAGET

2,343,319

DRILLING APPARATUS

Filed Aug. 2, 1940

2 Sheets-Sheet 1



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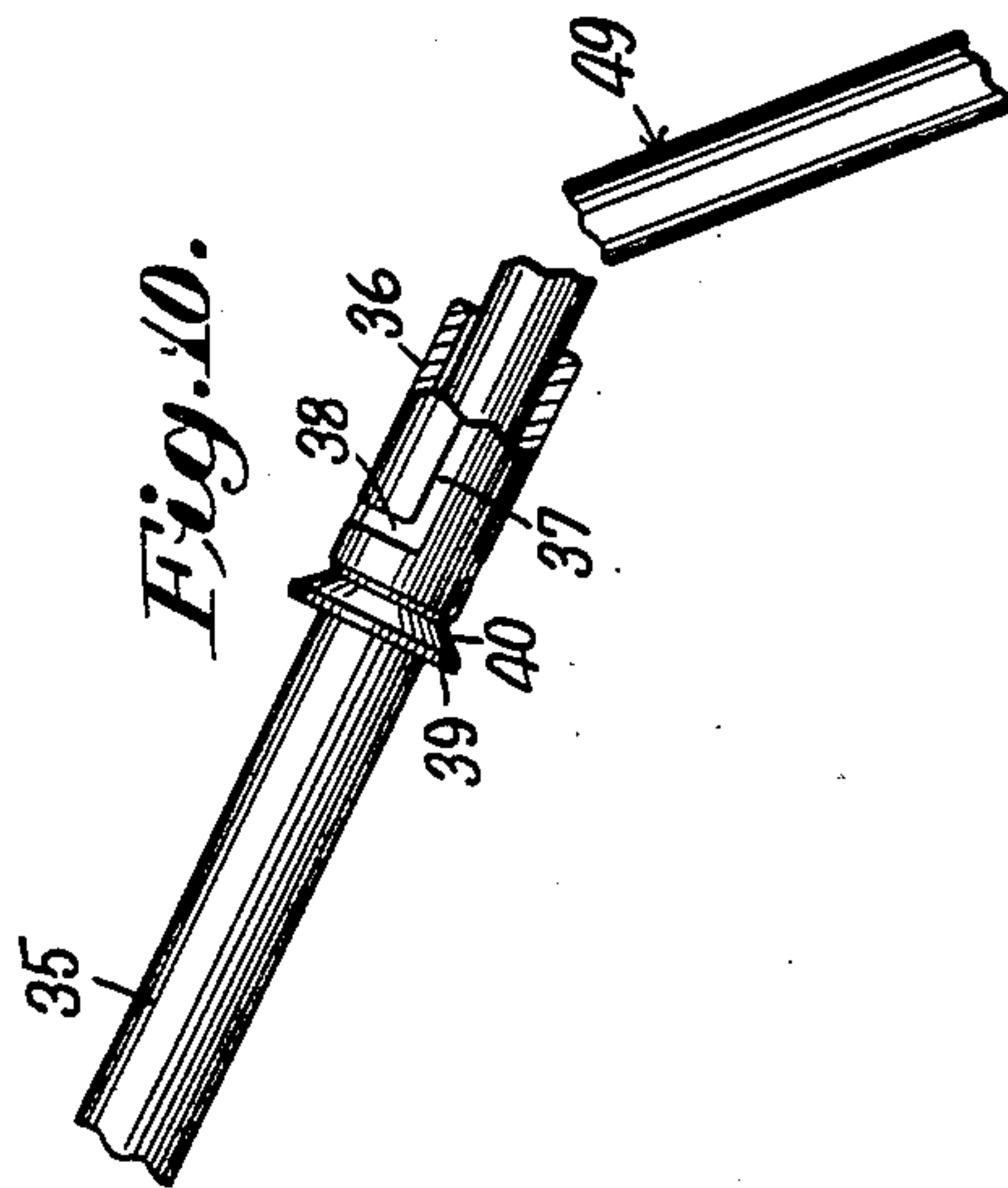
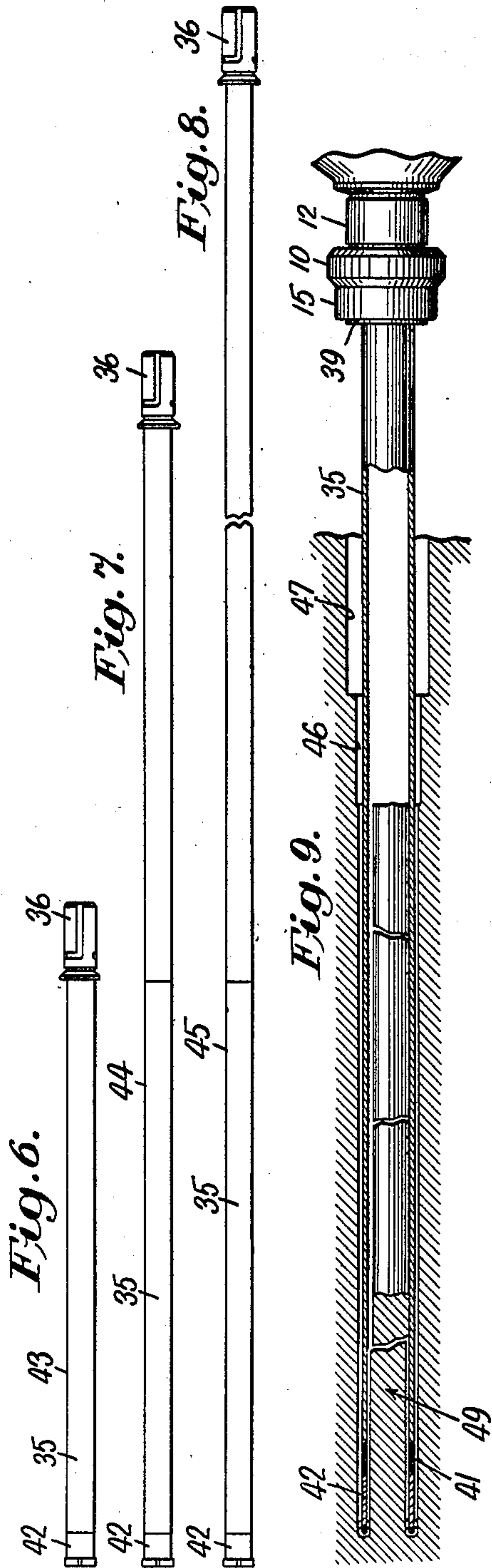
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2,343,319

DRILLING APPARATUS

Filed Aug. 2, 1940

2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

2,343,319

## DRILLING APPARATUS

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Application August 2, 1940, Serial No. 349,471

6 Claims. (Cl. 279—93)

This invention relates to drilling apparatus, and more particularly to improvements in the driving means for the drill bit of a drilling apparatus.

An object of the present invention is to provide an improved drilling apparatus. Another object is to provide an improved driving means for the drill bit of such an apparatus. A further object is to provide an improved drill rod construction for such a drilling apparatus, together with improved rod coupling means. A still further object is to provide an improved drill rod chuck. Yet another object is to provide an improved chuck mechanism having improved releasable means for locking the bit driving element in the chuck and improved means for centering and sealing the bit driving element. Other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there is shown, for purposes of illustration, one form which the invention may assume in practice.

In these drawings:

Fig. 1 is a side elevational view of a drilling apparatus with which an illustrative embodiment of the invention is associated.

Fig. 2 is a view in longitudinal section through the starting and reaming bit and illustrating the improved chuck.

Fig. 3 is a view in longitudinal section through the core bit and barrel.

Fig. 4 is a detail view illustrating the improved core barrel rod shank.

Fig. 5 is a detail cross sectional view taken on line 5—5 of Fig. 4.

Figs. 6, 7 and 8 are elevational views showing the core barrel and rod sequence.

Fig. 9 is a view partially in longitudinal section and partially in elevation, showing the core barrel in core-receiving position in a drill hole.

Fig. 10 is a detail view illustrating the manner of removing the core fragments from the core barrel.

In this illustrative embodiment of the invention there is shown a high speed core drilling apparatus, generally designated 1, which may be of the same general character as that disclosed in my copending application Serial No. 322,267, filed Mar. 5, 1940, now Patent No. 2,283,543 issued June 30, 1942. It will be evident, however, that various features of the invention may be associated with drilling apparatus of various other types.

The drilling apparatus comprises a trunnion support 2 having a swivel plate 3 adapted to be

secured in the saddle mounting of a conventional rock drill support. Suitably slidably guided in the trunnion support is a feed cylinder 4 of a hydraulic feeding means, and this cylinder contains a reciprocable feed piston 5 having a forwardly projecting piston rod 6. Carried by the piston rod at the forward end thereof is a motor 7 for rotating the drill bit. Associated with the hydraulic feeding means is a manual feeding means comprising a feed screw 8 having a hand crank 9. By means of the manual feeding means the hydraulic feeding means may be adjusted into different feeding positions with respect to the trunnion support, in the manner fully described in the copending application above referred to.

The motor 7 is preferably of the high speed electric type having a chuck 10 carried by its power shaft 11. The chuck comprises a chuck sleeve 12 threadedly secured at 13 to the motor power shaft. Threadedly connected at 14 to the sleeve 12 is a sleeve-like cap 15. Arranged in radial bores in the chuck sleeve, at diametrically opposite points, are pins 16 held in position by the cap 15, and arranged within the cap at the front end of the chuck sleeve is a packing 17. A coupling member 18 is threadedly secured within the chuck sleeve 12, and the coupling member has external threads 19. Set screws 20 carried by the chuck sleeve engage the member 18 to hold the parts rigidly together. The cap 15 has a tapered seat 21 for a purpose to be later explained.

A starting and reaming bit, generally designated 22, is employed for starting a hole in the face of the work so that the core bit may be adequately guided during starting of the core drilling operation. This starting bit not only provides a starting hole for the core bit but also forms a counterbore for receiving a spray guard in the manner described in my copending application Serial No. 349,470, filed concurrently, now Patent No. 2,270,334 issued January 20, 1942. This starting and reaming bit comprises a tubular rod 23 having a shank 24 receivable in the chuck 10. The rod shank has internal threads 25 threadedly engageable with the threads 19 of the coupling member 18 secured to the chuck sleeve. The rod shank has an external diameter substantially less than the diameter of the sleeve bore, so that the shank clears the pins 16 in the manner shown. Formed on the rod shank is a collar 26 having a tapered portion 27 adapted to seat against the tapered seat 21 for centering the rod within the chuck. When the rod shank



is inserted within the chuck, the packing 17 sealingly embraces the rod periphery. Coupled at 28 to the rod is a tubular reaming bit member 29, while coupled at 30 to the member 29 is a tubular starting bit member 31. The member 29 has an annular reaming bit 32 surrounding the member 31, while the member 31 has an annular core cutting bit 33. Both the starting and the reaming bit are herein preferably of the abrasive type commonly known as diamond bits.

When the starting hole has been completed, the starting bit is removed from the chuck, and inserted in its place is a core barrel member and rod, generally designated 34, comprising a tubular core-receiving barrel portion 35 and a shank 36 receivable in the chuck 10. In this improved construction, the core barrel opens at its rear end directly into the rod bore which extends outwardly through the rod shank, and in this instance the rod bore is of the same diameter as the core barrel bore. A quick-detachable bayonet lock is provided so that the core barrel rod may be readily inserted into or released from the chuck, comprising longitudinal grooves 37, 37 opening into circumferentially extending grooves 38, 38. When the rod shank is inserted within the chuck, the pins 16 project within the longitudinal grooves 37, and when the shank has been shoved completely into the chuck the rod is turned so that the pins enter the circumferential grooves 38 to lock the shank against axial release from the chuck. Formed on the core barrel shank is a collar 39 having a tapered portion 40 adapted to seat against the tapered seat 21 for centering the barrel rod within the chuck. When the rod shank is inserted within the chuck, the packing 17 sealingly engages the barrel rod periphery. Coupled at 41 to the forward end of the barrel is a core-cutting bit 42 of annular form and also of the diamond type. As drilling progresses, the core bit cuts a core which is received in the core barrel bore, as will later be described.

Heretofore it has been necessary to disconnect the bit and barrel from the drill rod to enable removal of the core from the core barrel. In this instance, however, by extending the core barrel bore rearwardly through the drill rod it is possible, simply by releasing the rod from the chuck and tilting the rod, to remove the core directly from the rear end of the rod without uncoupling the rod and barrel. Also in previously known types of core drilling apparatus it has been necessary to add additional rod sections to the core barrel as drilling progressed, but in the present invention this is unnecessary. In this instance, several core bits and barrels are employed and the barrels are coupled in any suitable way—by threading, or integrally, or otherwise—to drill rods of different lengths to enable successive drilling operations, solely by substitution of different rod and barrel elements. As the hole deepens, a barrel and rod member having a longer rod section is substituted for the member having the shorter rod section, and increasingly longer rods are used as drilling progresses until a hole of the desired depth is reached. A series of barrel and rod members are indicated at 43, 44 and 45 in Figs. 6, 7 and 8. It is accordingly evident that the time-consuming and laborious task of uncoupling the bit, barrel and rods is entirely done away with in the present invention.

The general method of use of the drilling ap-

paratus above described is as follows. When the drilling apparatus is properly positioned with respect to the working face, in the manner shown in Fig. 1, the swivel plate 3 of the trunnion support is firmly clamped in its saddle mounting in a well known manner. The starting and reaming bit 23 is then rigidly threadedly coupled to the motor power shaft and the bit is fed by either the hydraulic or manual feeding means toward the work in the manner described in the copending application Serial No. 322,267, mentioned above. The starting bit 33 forms a guide hole 46 while the reaming bit 32 forms a counterbore 47. The core formed by the starting bit is designated 48 and enters the rod bore as drilling progresses, and when the bit is withdrawn from the starting hole the core fragment may be broken off by means of any suitable core breaker. Upon completion of the starting hole the drilling apparatus is retracted from the working face and the starting and reaming bit is uncoupled from the motor power shaft and the core barrel rod 34 is quickly inserted into and locked within the chuck 10 by the bayonet locking grooves and pins. The core bit is then fed into the starting hole 46 and the spray guard is inserted in the counterbore 47. As the core bit is fed forwardly by the hydraulic feeding means, the core formed by the core bit, generally designated 49 in Fig. 9, enters the core barrel 35; and as the hole deepens, the core breaks off by its own weight into fragments. When the core barrel has been fed into the work its entire length, the core fragments may be readily removed from the barrel simply by removing the rod shank from the chuck and tilting the barrel so that the fragments will fall out through the rear end of the rod. A barrel having a longer rod section may then be substituted for that previously used and core drilling resumed in an obvious manner.

As a result of this invention it will be noted that an improved drilling apparatus is provided whereby the drill hole may be started and the hole drilled in an improved manner. It will further be evident that by the provision of the improved rod coupling means and the novel rod sequence it is possible to change rods and remove cores in an extremely expeditious manner. It will also be evident that by the provision of the starting bit a starting hole may be provided whereby the core bit may be adequately guided during the starting of the core drilling operation. Other uses and advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice it will be understood that this is disclosed for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a driving means for a drill bit, a chuck comprising a chuck sleeve having a bore for receiving a cylindrical portion on a bit driving element and carrying means providing a tapered seat coaxial with the bore of the chuck sleeve, said chuck sleeve also carrying at least one locking and driving pin, a tubular element constituting driving means for a drill bit and having a cylindrical portion receivable in said bore and having a bayonet groove for the reception of said pin and further having a tapered portion



engageable with said tapered seat for centering said tubular element relative to said chuck sleeve, and sealing means housed in said chuck sleeve for sealingly engaging the exterior periphery of said tubular element.

2. In a driving means for a drill bit, a chuck comprising a chuck sleeve having a bore for receiving a cylindrical portion on a bit driving element and carrying means providing a tapered seat coaxial with and outwardly of the bore of the chuck sleeve and housing an annular packing element, said chuck sleeve also carrying at least one locking and driving pin, and a tubular element constituting driving means for a drill bit and having a cylindrical portion receivable in said bore and having a bayonet groove for the reception of said pin and further having a tapered portion engageable with said seat for centering said tubular element relative to said chuck sleeve and an annular portion engageable by said annular packing element.

3. In a drilling apparatus, a driving means for a drill bit, a chuck comprising a chuck sleeve having a bore for receiving a cylindrical portion on a bit driving element and having at least one locking and driving pin projecting into said bore, a cap carried by said chuck sleeve and extending over the outside of said locking pin and providing a tapered seat coaxial with said bore and forwardly of the forward end of the latter and also cooperating with said sleeve to form a housing for an annular packing, and a tubular element constituting driving means for a drill bit and having a cylindrical portion receivable in said bore and having a bayonet groove for the reception of said pin and further having an annular tapered flange engageable with said tapered seat for centering the tubular element relative to said chuck sleeve and also having a portion with which said annular packing is sealingly engageable.

4. In a driving means for a drill bit, a chuck comprising a chuck sleeve having a bore for receiving a cylindrical portion of a bit driving element and carrying means providing a tapered seat coaxial with the sleeve-bore, and housing a sealing means, an element constituting driving means for a drill bit and having a cylindrical

shank portion receivable in said sleeve-bore, means providing a releasable interlocking connection between said cylindrical shank portion and said chuck sleeve whereby the sleeve may drive said bit driving element, said bit driving element having a tapered portion engageable with said tapered seat for centering said driving element in the chuck, and said sealing means sealingly engaging the exterior periphery of said driving element in advance of said shank portion.

5. In a driving means for a drill bit, a chuck comprising a chuck sleeve having a bore for receiving a cylindrical portion of a bit driving element, and carrying means providing a tapered seat coaxial with the bore of the chuck sleeve, and housing a sealing means, said chuck sleeve also carrying a lateral locking and driving projection, and an element constituting driving means for a drill bit and having a cylindrical shank portion receivable in said sleeve-bore, and having a bayonet groove for the reception of said lateral projection, and further having a tapered portion engageable with said tapered seat for centering said driving element in the chuck, and said sealing means sealingly engaging the exterior periphery of said driving element.

6. In a driving means for a drill bit, a chuck comprising a chuck sleeve having a bore for receiving a cylindrical portion of a bit driving element, and carrying means providing a tapered seat coaxial with the bore of the chuck sleeve, and housing a sealing means, said chuck sleeve also carrying a lateral locking and driving projection, and an element constituting driving means for a drill bit and having a cylindrical shank portion receivable in said sleeve-bore, and having a bayonet groove for the reception of said lateral projection, and further having a tapered portion engageable with said tapered seat for centering said driving element in the chuck, and said sealing means sealingly engaging the exterior periphery of said driving element intermediate said tapered portion and the front part of said cylindrical shank portion.

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