March 16, 1943. F. H. MUELLER ET AL 2,314,013

DRILLING APPARATUS

Filed Jan. 31, 1942

Fig. 1.

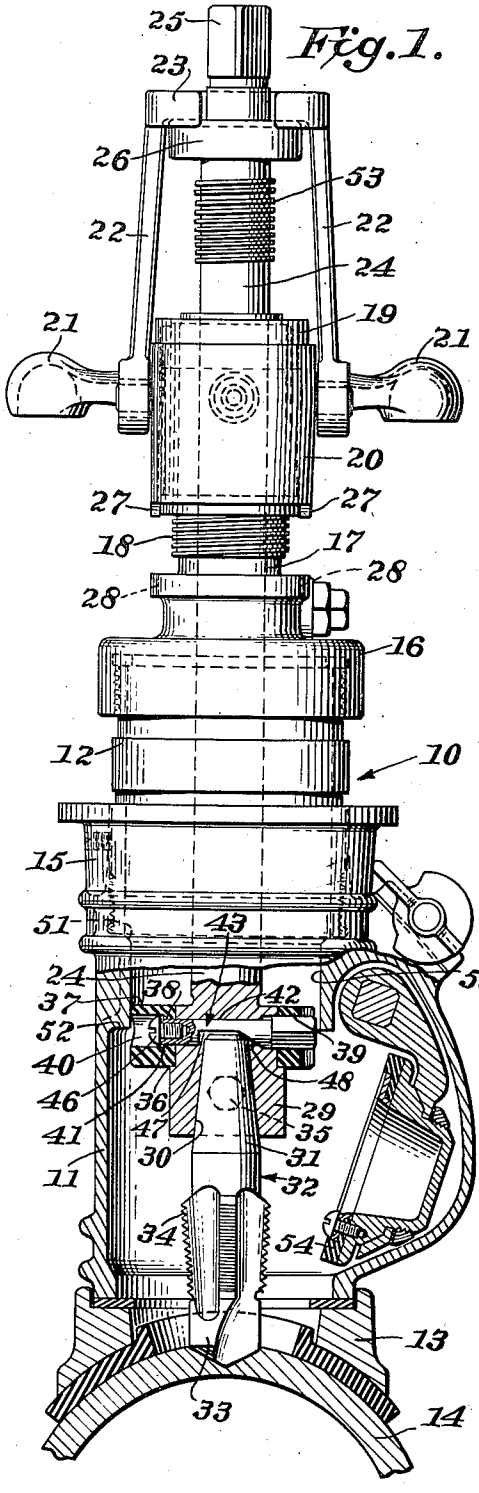


Fig. 3.

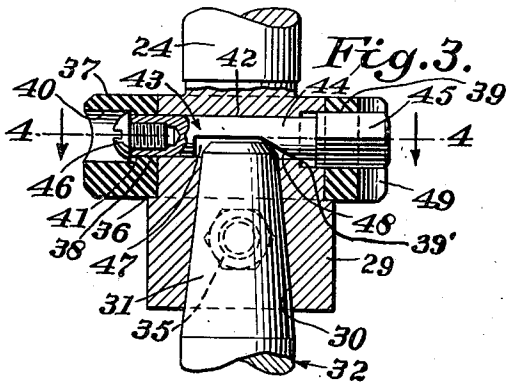


Fig. 4.

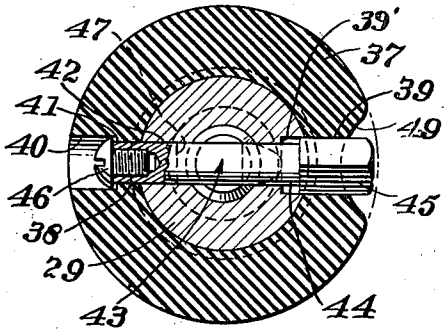
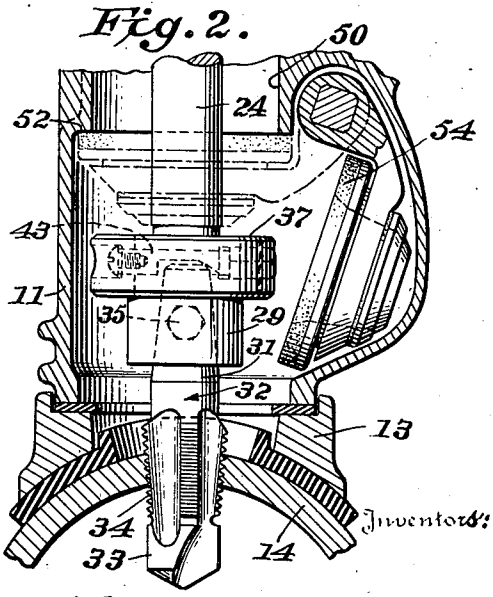


Fig. 2.



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DRILLING APPARATUS

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Application January 31, 1942, Serial No. 429,091

8 Claims. (Cl. 77—40)

This invention relates to drilling apparatus of the type used in drilling and tapping mains without loss of fluid, and relates particularly to the boring bar which forms a part of such apparatus.

In drilling apparatus of this type a barrel is provided for fluid-tight association with the main, this barrel including at its outer end a bearing for the boring bar. Due to the remoteness of this bearing from the main, difficulty has heretofore been experienced in centering the drill in its initial engagement with the main. An object of the present invention is to provide means adjacent the inner end of the boring bar for effectively centering the drilling tool, this is in conjunction with a knock-out pin for the drill or other tool carried by the boring bar, the said pin being made to serve as means for securing the centering means to the boring bar. The invention is shown in practical embodiment in the accompanying drawing with reference to which the description will proceed.

In the drawing:

Figure 1 is an elevation partly in longitudinal section of drilling apparatus in accordance with the invention, the apparatus being shown in association with a portion of a main which appears in transverse section.

Figure 2 shows in a different relationship parts appearing in Figure 1 and with which the invention is principally concerned.

Figure 3 is an enlarged section of the centering and knock-out means appearing in Figure 1, and

Figure 4 is a section on line 4—4 of Figure 3.

Referring to the drawing, reference numeral 10 designates generally a barrel, here shown as comprising a lower or inner portion 11 threaded into an upper or outer portion 12. The lower portion 11 is sealed against a saddle 13 which in turn is sealed against the main 14 which is to be drilled, tapped and equipped. The barrel is held in position on the main by means of straps or chains, not shown, passed under the main and having their ends secured to a ring 15 which embraces the barrel portion 12 and bears against the upper edge of the barrel portion 11.

Reference numeral 16 designates a cap threaded on the upper part of barrel portion 12 and sealed thereagainst. The cap 16 includes an upwardly extending neck 17 provided with external threads 18 engaged by a nut 19 on which is splined a collar 20. Collar 20 is provided with turning handles 21 and has pivoted thereto a yoke 22 having a recessed cross portion 23. Journaled in the neck 17 is the boring bar 24 which has a squared upper extremity 25 adapted to be engaged by a turning tool and, therebeneath, a fixed abutment 26 adapted to be engaged by the cross portion 23 for the purpose of advancing the boring bar in known manner. In this operation a top flange of nut 19 bears against the collar 20 so that downward travel of the nut is transmitted to the collar and therefrom to the yoke and boring bar. In drilling and equipping mains it is necessary, in carrying out the various operations, to remove and replace the cap 16. In order that this may be conveniently done the yoke 22 may be disengaged from the abutment 26 and the collar 20 slid down so that lugs 27 projecting from the lower edge thereof will engage in mating recesses 28 of the cap so that the later can be turned by means of the handles 21. This particular arrangement, however, is not essential so far as the present invention is concerned, and is covered in our copending application Serial No. 429,092, filed Jan. 31, 1942.

At its lower end the boring bar 24 is provided with a head 29 in which is formed a conical axial socket 30 adapted to receive the tapered shank 31 of a tool 32 which, as here shown, has a drilling portion 33 surmounted by a tapping portion 34. The tapered shank portion 31 is keyed in the socket and is retained therein by means such as the set screw 35.

The upper portion of head 29 is reduced to provide a shoulder 36 and embracing the reduced portion is a centering annulus or disc 37 which may be formed of metal, hard rubber, leather or the like, or any other material which can be accurately machined and will not readily chip or break. The annulus 37 is provided with a diametrical bore which includes a cylindrical portion 38 at one side of the boring bar and a portion 39 of square cross section at the other side. Outwardly of bore portion 38 the bore includes a cylindrical enlargement 40 so that an annular shoulder 41 is provided. The head 29 is provided with a diametrical bore 42 registering with the annulus bore and intersecting the upper portion of the socket 30. Bore 42 for the most part has the same diameter as bore portion 38, but adjacent bore portion 39 is square as the latter and registers therewith. Reciprocable in the bores of the annulus and boring bar is a knock-out pin 43 which has a cylindrical stem 44 disposed in bore 42 and portion 38 of the annulus bore and has a head 45 of square section slidable in bore portion 39 and the square portion of bore 42 and normally extending somewhat into the latter, as shown. A screw 46 is threaded axially into the opposite end of pin 43 and has a head of greater diameter than bore portion 38 received in enlargement 40 and cooperable with shoulder 41 as an abutment. Stem 44 is provided with a bottom recess 47 which terminates adjacent head 45 in an inclined or cam surface 48. The normal position of the knock-out pin is shown in various figures, head 46 being adjacent or against shoulder 41, the inner end of head 45 being spaced from the shoulder 39′ at the inner end of the

square portion of bore 42 and the outer portion of head 45 lying within the outline of annulus 37 in a recess 49 so as to be accessible for the knock-out operation.

It will be evident that upon loosening the set screw 35 a blow on the exposed end of head 45 will cause cam surface 48 to strike the adjacent extremity of the tool shank so that the latter will be driven out of the socket 30, the knock-out pin at all times serving to secure the annulus 37 to the boring bar. The overall length of the knock-out pin is such, and its reciprocating range is so limited by the heads, that it can in no case project beyond the outline of annulus 37. Due to the stop provisions, portions of each end of the pin are always in both sides of the annulus bore.

As here shown, the annulus 37 is of true circular outline except for the recess 49, which latter is provided so that the head 45 may be conveniently struck without the intervention of a punch. In the drilling operation the annulus 37 cooperates with a reduced cylindrical surface 50 formed in the upper part of barrel portion 11 coaxially with the bore of neck 17. Surface 50 terminates upwardly in a beveled ledge 51 and downwardly in a flat shoulder 52. In the drilling operation, annulus 37 enters the cylindrical guide surface 50 just before the point of the bit engages the wall of the main. The annulus has a close sliding and rotary fit in the surface 50 and thus serves to positively and accurately center the bit. Just before tapping portion 34 of the tool enters the hole formed by the bit, the centering annulus 37 passes below the guide surface 50, this being desirable in order to enable the tap to seek its own adjustment while the threads are being formed. It may be noted that in the illustrated apparatus the boring bar 24 is provided below abutment 26 with threads 53 which are adapted to engage internal threads at the top of neck 17 at the start of the tapping operation, the threads 53 having the same pitch as the tap threads so that the latter is accurately advanced independently of the feed nut 19. While this is a preferred arrangement it is not an essential in the practice of the present invention, as will be obvious.

In Figure 2 annulus 37 is shown as having passed below guide surface 50 during the tapping operation. When the latter operation is completed, the boring bar is withdrawn upwardly to bring the tool above shoulder 52 whereupon a flop valve 54 is swung into engagement with the shoulder as shown in dotted lines in Figure 2. The cap 16, together with the boring bar, is now removed and tool 30 is replaced by a stop inserting tool such, for example, as is shown in the patent to ourselves and Elmer H. Fawley, 2,247,427, issued July 1, 1941. The inserting tool has a shank exactly like the drill shank and cooperable with the knock-out pin in the same manner. After the substitution of the inserting tool for the bit, operations proceed in the well-known manner.

Inasmuch as there must be a substitution of tools in each drilling and equipping operation, it will be evident that the provision of the knock-out means is of considerable importance, since the tools are tightly wedged in the socket and are otherwise removable only with considerable difficulty, and the structure is simplified in that the knock-out member is made to act as retaining means for the centering member. While this latter is shown as being of circular contour except for the recess 49, it would be evident that it could be of different form so long as capable of establishing sufficient point contacts with the guide surface 50 to accurately center the bit. Other variations in the form and arrangement of parts are, of course, possible and are contemplated under the claims which follow.

We claim:

1. A boring bar having a socket at one end adapted to receive the shank of a tool, a centering annulus engaging the bar adjacent the inner end of the socket, and a reciprocable knock-out pin disposed in a diametrical bore in the boring bar at the inner end of said socket and engaging said annulus to secure the latter on the bar.

2. A boring bar having a socket at one end adapted to receive the shank of a tool, a centering annulus engaging the bar adjacent the inner end of the socket, and a reciprocable knock-out pin disposed in registering diametrical bores in the boring bar and annulus at the inner end of said socket.

3. A boring bar having a socket at one end adapted to receive the shank of a tool, a centering annulus engaging the bar adjacent the inner end of the socket, said bar and annulus being provided with registering diametrical bores at the inner end of said socket, a knock-out pin reciprocable in said bores, and means limiting the reciprocating range of said pin so that portions of each end thereof are always in both sides of the annulus bore, the pin being of such over-all length that its extremities are always within the outline of the annulus.

4. Apparatus according to claim 3 wherein the annulus is provided with a peripheral recess in which one end of the pin is normally exposed for access in the knock-out operation.

5. Apparatus according to claim 3 wherein the knock-out pin has a non-round portion at least at one end and the bore portion in which said non-round portion is reciprocable is of complementary section.

6. A boring bar having a socket at one end adapted to receive the shank of a tool, a centering annulus engaging the bar adjacent the inner end of the socket, said bar and annulus being provided with registering diametrical bores, and a reciprocable knock-out pin in said bores, said pin having heads at its ends received in end bore-enlargements whereby to limit the reciprocating range of said pin so that portions of each end of the latter are always in both sides of the annulus bore, the over-all length of the pin being such that its extremities are always within the outline of the annulus.

7. Apparatus according to claim 6 wherein one of said heads is constituted by the head of a retaining screw threaded into an end of the pin.

8. Apparatus according to claim 6 wherein one of said heads is constituted by the head of a retaining screw threaded into an end of the pin, and wherein the other of said heads is constituted by a non-round enlargement and the bore portion in which said other of said heads is reciprocable is of complementary section.

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