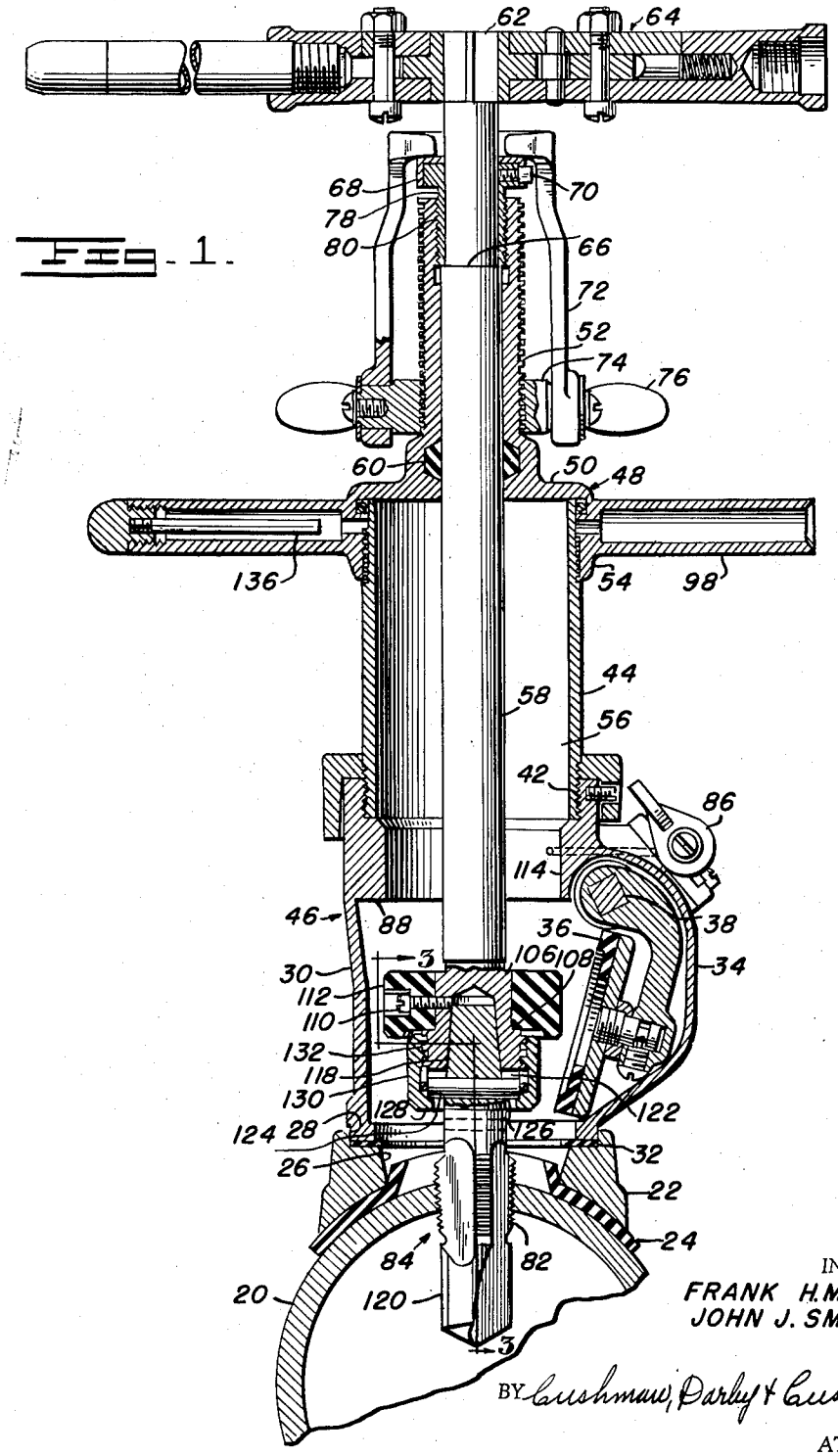
Sept. 4, 1956 F. H. MUELLER ET AL 2,761,688

MACHINE FOR DRILLING AND TAPPING MAINS

Original Filed Feb. 19, 1952 2 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

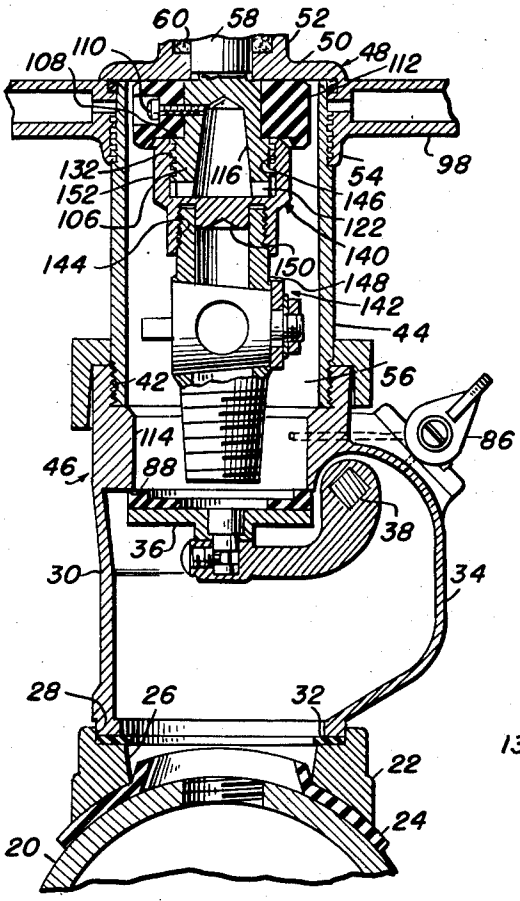


Fig. 3.

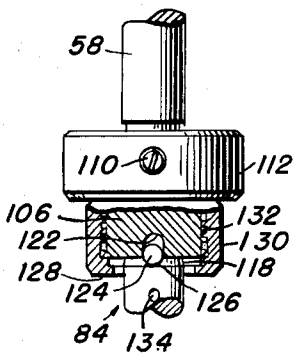
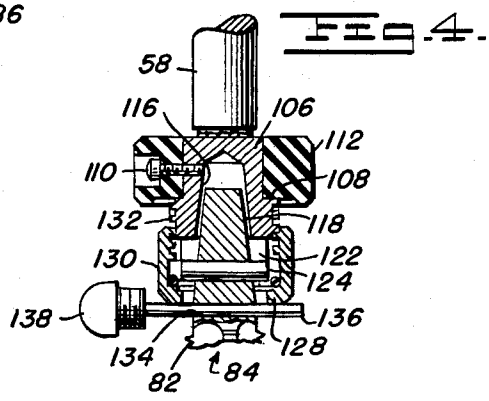


Fig. 4.



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MACHINE FOR DRILLING AND TAPPING MAINS

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Original application February 19, 1952, Serial No. 272,354. Divided and this application April 14, 1954, Serial No. 423,059

4 Claims. (Cl. 279—99)

This invention relates to tapping machines of the type adapted to cut an opening in a fluid chamber to provide an outlet therefrom, and to thread the cut opening to receive a valve body for controlling flow through the outlet or to receive a service T for connecting branch lines to the fluid chamber. Such operations are customary, for example, in attaching lateral or branch line connections to a fluid conduit, such as a water or a gas main.

In particular, this invention pertains to improvements in a machine of the type disclosed in United States Patent No. 2,291,979 to Mueller et al. This application is a division of our copending application, Serial No. 272,354, filed February 19, 1952.

The machine disclosed in the aforementioned patent, while outstandingly successful for its intended purpose, possesses a number of operating disadvantages. Additionally, such machine is susceptible of simplification and other improvements which increase its service life and facilitate its operation.

It also has been found desirable to simplify the end construction of the boring bar for attaching thereto a cutting or tapping tool and also for attaching thereto an improved carrier for inserting a corporation stop or a service T into the tapped opening in a main. In this latter instance, the carrier must be so designed that it will support the weight of the stop or service T, as the stop is lowered into the previously-tapped opening in the main, but will be readily disconnectable therefrom by reverse rotation of the boring bar after the stop or T has been screwed into place.

Therefore, it is an object of this invention to provide an improved connection between a carrier for a corporation stop or a service T and the end of a boring bar, the end of the boring bar being so shaped that it readily may have either a cutting tool or a stop carrier connected thereto with equal facility.

It is another object of this invention to provide an improved carrier for a corporation stop or a service T for inserting the same into a tapped opening in a main.

Other objects and advantages of the invention will become apparent from the following description and accompanying drawings, in which:

Figure 1 is a central vertical sectional view of a tapping machine embodying this invention attached to a main and showing the position of the parts at the termination of a tapping operation.

Figure 2 is a fragmentary vertical sectional view of the machine shown in Figure 1, but showing the apparatus in condition when a valve body, such as a corporation stop, is being inserted through the apparatus toward a previously-cut and tapped opening in the main.

Figure 3 is a fragmentary elevational view, partly in section, taken substantially on line 3—3 of Figure 1.

Figure 4 is a fragmentary elevational view corresponding to Figure 1, but illustrating the tool knock-out pin in position and the tool partially dislodged from its socket in the end of the boring bar by the engagement of the retaining nut with the knock-out pin.

Referring now to the drawings, there is shown in Figure 1 a curved wall chamber, such as a gas or water main 20, having mounted thereon the usual malleable iron saddle 22 with a gasket 24 interposed therebetween. The saddle 22 has an opening 26 therethrough that is counterbored at its outer end, as at 28, to receive a flop valve housing 30. A gasket 32 is interposed between the saddle 22 and the housing 30.

The housing 30 is hollow and bulges outwardly at one side thereof to form a lateral enlargement 34 for reception of a flop valve 36 when the latter is in its open or inoperative position, as best shown in Figure 1. The flop valve 36 is carried by a shaft 38 journalled in the walls of the housing 30 so that when the shaft is turned by an exterior handle the flop valve is moved between open and closed positions. The upper end of the flop valve housing is interiorly threaded, as at 42, for reception of one end of a cylinder 44 which, together with the valve housing 30, constitutes the barrel 46 of the machine. The upper end of the cylinder 44 is closed and sealed by a gasketed bonnet or cap 48 having a top 50 from which projects a cylindrical upward extension 52 and a depending annular skirt 54 that is interiorly threaded for engagement with outer threads on the upper end of the cylinder. Thus, the barrel 46 and the cap 48 form an interior fluid chamber 56.

Extending through the cylindrical extension 52 of the bonnet 48 is a boring bar 58 which is adapted for rotary and axial movement within the fluid chamber 56. Suitable packing 60 is interposed between the boring bar 58 and the cap extension 52. The upper end of the boring bar 58 is squared, as at 62, for reception of a ratchet wrench 64 for rotating the bar and is provided, below its squared end, with a shoulder 66 against which seats a feed-regulating thrust collar 68 conventionally retained on the bar by a locking set screw 70. A yoke 72 of well-known construction is pivotally carried by a feed collar 74 threadedly mounted on the cylindrical extension 52 of the cap, and the upper end of the yoke contacts the top of the thrust collar 68 to thereby impart a downwardly longitudinal force thereto when the feed collar is rotated by radial handles 76 thereon. The upper end of the yoke 72 is substantially U-shaped, as best shown in Figure 1, to embrace the bar 58 when in engagement with the thrust collar 68.

The thrust collar 68 has a depending cylindrical sleeve 78 having relatively-fine regulating threads 80 thereon which are engageable with complementary inner threads in the upper end of the cylindrical cap extension 52. These threads 80 are of the same pitch as the threads 82 on the cutting and tapping tool 84 (later described) carried by the inner end of the boring bar 58 and are much finer than the threads on the exterior of the extension 52. In use, the yoke 72 and feed collar 74 are employed to impart a longitudinal thrust to the tool 84 during the operation of the latter to cut an opening in the main 20. After such opening has been cut, the threads 80 on the thrust collar 68 and in the cap extension 52 are engaged, and the operation of tapping the opening by the tool 84 proceeds.

A by-pass valve 86 is mounted on the flop valve housing 30 and is employed to control communication between the portions of the fluid chamber 56 above and below the flop valve seat 88 to facilitate both tight engagement of the flop valve 36 with its seat and subsequent opening of such valve.

The barrel 46 is held against the saddle 22 by means of a chain (not shown) extending about the main 20 and having its opposite ends secured to the barrel.

The construction thus far described is relatively conventional, and since its operation is set forth in detail in

the aforementioned Mueller et al. patent, no further description is necessary.

The lower end of the boring bar 58 has an enlarged holder 106 for removably carrying the cutting and tapping tool 84. Resting on an exterior shoulder 108 on the holder 106 and secured thereto by a set screw 110 is a guide collar 112 of substantial diameter and which may be made of metal, rubber, or leather. This guide collar 112 cooperates with an accurately-machined guiding cylindrical portion 114 in the flop valve housing 30 to properly maintain the bit or tool 84 in accurate alignment during the initial cutting of an opening in the curved wall of the main 20 and also prevents side shifting of the bar 58 during this cutting operation. After the opening has been cut, and during the subsequent tapping operation, the guide collar 112 passes inwardly beyond the flop valve seat 88, but during the tapping operation it will be evident that no guiding of the bar 58 is necessary.

The holder 106 is provided with a tapered socket 116 for receiving the correspondingly-tapered shank 118 of the tool 84 which has a forward cutting portion 120 and the rearward threaded tapping portion 82. Diametrically-opposed arcuate recesses or notches 122 are provided in the rim of the socket 116 for reception of a transverse locking pin 124 in the tool shank 118. The pin 124, which is of a length equal to or slightly less than the outer diameter of the holder 106, is not completely received within the notches 122. Hence, a side portion 126 of such pin protrudes outwardly beyond the inner end of the boring bar 58, that is, outwardly beyond the rim of the socket 116, for engagement by the inwardly-extending flange 128 of a retaining nut 130 threaded onto the tool holder 106. The threads 132 on the tool holder 106 and in the nut 130 are of a particular construction, being heavy four-pitch double Acme threads, i. e., four threads to the inch and these being made up of two-thread courses. The adjacent sides of adjacent threads, if extended, would join one another at an angle of approximately 29°, but the base of the groove between these adjacent threads is flat. Hence, the threads 132 in cross section may be said to be of modified, or practically square, design. The tangent of the helix angle of the threads is less than the coefficient of friction between the thread materials, which coefficient usually is computed as the tangent of the angle of an inclined plane down which a weight would begin to slide by gravity. In the case of a helical thread, the helix angle heretofore referred to is that which the side surface of the thread would make with a lateral plane passing through the end of the boring bar on which the threads are formed. It is obvious that if the helix angle is as great as the angle of which the tangent is the coefficient of friction, the retaining nut 130 would unscrew of its own weight. Hence, by making the helix angle less than the angle of which the tangent is the coefficient of friction, this event is impossible. For reasons later described, however, the tangent of the helix angle is greater than about one-third of the coefficient of friction.

This type of coarse thread 132 has the advantage of a long life and the fact that the same does not collect as much dirt as finer threads. These features are important in a machine of this type.

The tool 84 is provided, rearwardly of its tapping portion 82 and forwardly of its locking pin 124, with a transverse bore 134 for reception of a knock-out pin 136 that may be conveniently carried, when not in use, within one of the tubular handles 98, as by means of an enlarged portion 138 on one end of such pin that is threadedly engageable within the outer end of such handle. In use, the knock-out pin 136 is inserted through the tool bore 134 and when the retaining nut 130 is unscrewed, the outer or forward end thereof engages the knock-out pin and dislodges the tapered shank 118 of the tool from the correspondingly-tapered socket 116 of the tool holder. Thereupon, the knock-out pin 136 may be withdrawn from the transverse bore in the tool and the retaining nut 130 completely unscrewed and slipped over the tool 84 so that the latter may be removed from the socket 116 in the end of the boring bar. In this connection, it is pointed out that the inner diameter of the flange 128 on the retaining nut 130 is greater than the maximum diameter of the tool 84 (i. e., the tapping portion 82) so that the tool may be inserted in its socket 116 and the nut then slipped over the tool and threaded into engagement with the heavy threads 132 on the tool holder to rigidly retain the tool thereon.

After the drilling and tapping operation has been accomplished, the boring bar 58 is withdrawn into the upper portion of the chamber 56 above the valve seat 88 and the flop valve 36 closed. The cap 48 is thereupon unscrewed from the barrel 46 and the boring bar withdrawn therefrom. The cutting and tapping tool 84 is removed from the tool holder 106, as described above, and a carrier 140 for a corporation stop 142 or for a service T (not shown) is connected thereto. This carrier 140, which is best shown in Figure 2, is also of a special construction to facilitate its connection to the tool holder 106. The carrier 140 consists of a fitting having coaxial sockets 144 and 146 in its opposite ends. The socket 144 is provided with relatively-fine threads for engagement with complementary iron pipe threads on the tapered nipple 148 of the corporation stop 142 (or like threads on a service T). The socket 144 is also provided with the usual central inner boss 150. The other socket 146 has inner threads that are complementary to the exterior threads 132 on the tool holder 106 and has a hexagonal wrench-receiving exterior surface 152. Hence, when the corporation stop 142 (or a service T) is supported on the end of the boring bar 58 by means of this carrier 140, rotation of the boring bar in the threading direction of the stop readily screws the latter into the threaded opening in the main 20.

By reason of the hereinbefore-described construction of the heavy threads 132 on the tool holder and in the mating socket 146 of the stop carrier 140, reverse rotation of the boring bar 58, after insertion of the stop 142, readily disengages these threads so that the boring bar may be lifted away from the carrier, leaving the stop threaded into the main, and pulled upwardly into the chamber 56 above the flop valve seat 88. After the flop valve 36 is closed, the entire machine may be removed from the main 20, by detaching anchoring means later described, and an appropriate wrench may be applied to the corporation stop 142 and to the hexagonal exterior portion 152 of the carrier 140 for unthreading and removing the latter from the stop. It will be noted that the design of the heavy threads 132 is of pronounced usefulness for the above-described operation. The helix angle of the threads is such that the carrier, and the stop supported thereby, may be supported on the boring bar without danger of unscrewing or disconnection while being lowered and threaded into the opening in the main, yet the frictional engagement between the threads is low enough to permit ready disengagement between the carrier and the bar upon reverse rotation of the latter without the possibiilty of the inserted stop following the bar.

It thus will be seen that the objects of this invention have been fully and effectively accomplished by the provision of a drilling machine of improved design. It will be realized, however, that the specific embodiment of the invention which has been disclosed to illustrate the principles of the latter is susceptible of changes without departing from such principles. Therefore, this invention includes all modifications encompassed by the spirit and scope of the following claims.

We claim:

1. A tool for use with a boring bar, having outer threads at one end, for inserting a tubular element, provided with outer relatively-fine threads at its opposite ends, into a threaded opening in a main, comprising: a member having a closed-bottom socket threadably en-

gageable with one end of the element and an opposite coaxial socket provided with inner coarse threads for engagement with complementary threads on the boring bar.

2. The structure defined in claim 1 in which the threads in the opposite socket have a helix angle the tangent of which is greater than one-third of and less than the coefficient of friction between the tool and the boring bar.

3. The structure defined in claim 1 in which the opposite socket threads are double, of four pitch, and substantially square in cross section.

4. In a drilling machine the combination comprising: a boring bar mounted for axial and rotary movement; a tapered tool-shank-receiving socket in one end of said bar; outer threads on said one bar end for reception of a

tool-retaining nut; and a stop-inserting tool having a closed-bottom socket at one end thereof engageable with said threads and a threaded socket at the other end thereof engageable with mating threads on a stop, the engageable threads on said tool and bar being coarse and having a helix angle the tangent of which is greater than one-third of and less than the coefficient of friction between said threads.

References Cited in the file of this patent

UNITED STATES PATENTS

1,218,359	Beatty	Mar. 6, 1917
1,237,056	Kitchen	Aug. 14, 1917
1,654,233	Bath	Dec. 27, 1927
2,291,979	Muller et al.	Aug. 4, 1942