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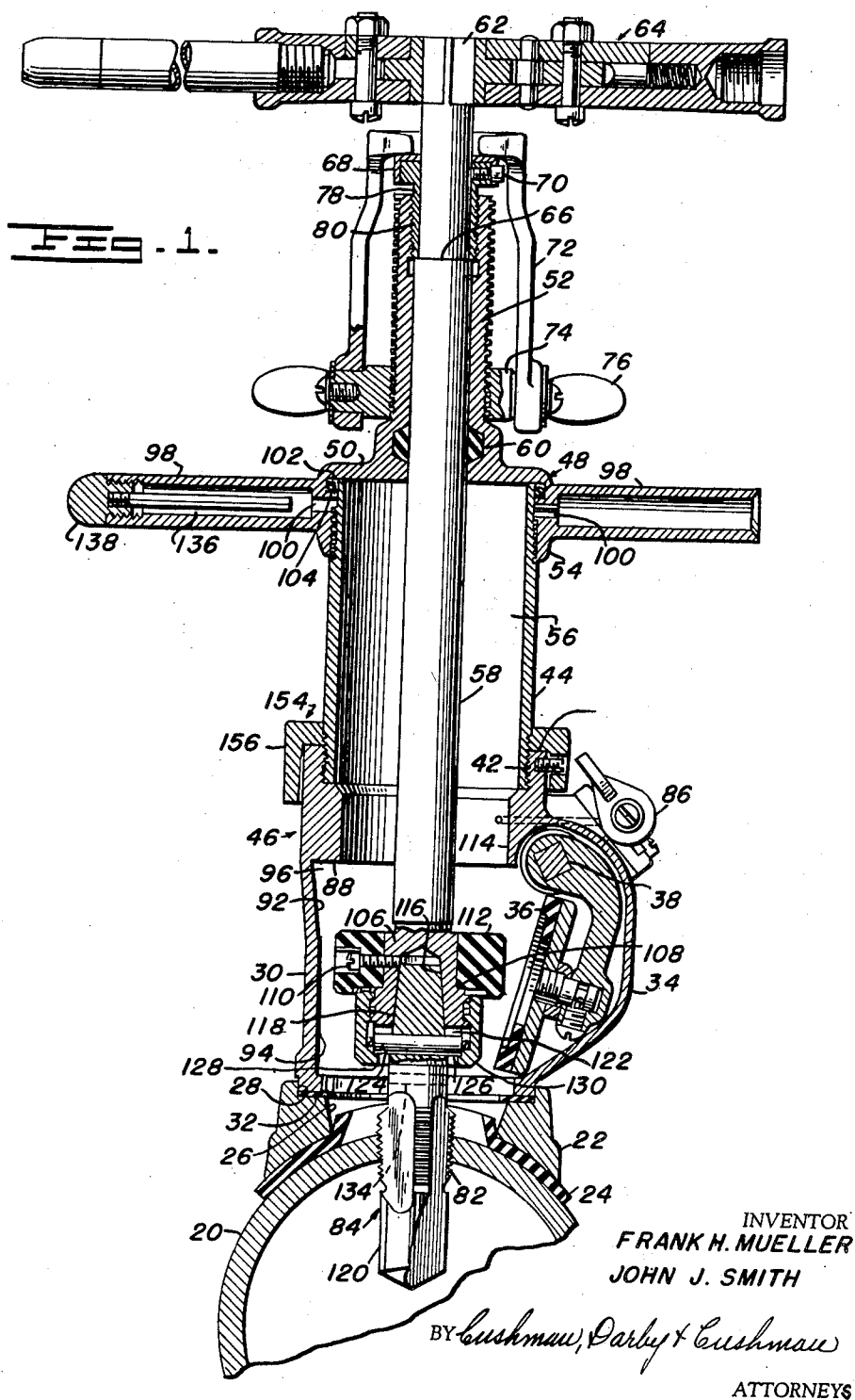
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MACHINE FOR DRILLING AND TAPPING MAINS

Original Filed Feb. 19, 1952

3 Sheets-Sheet 1



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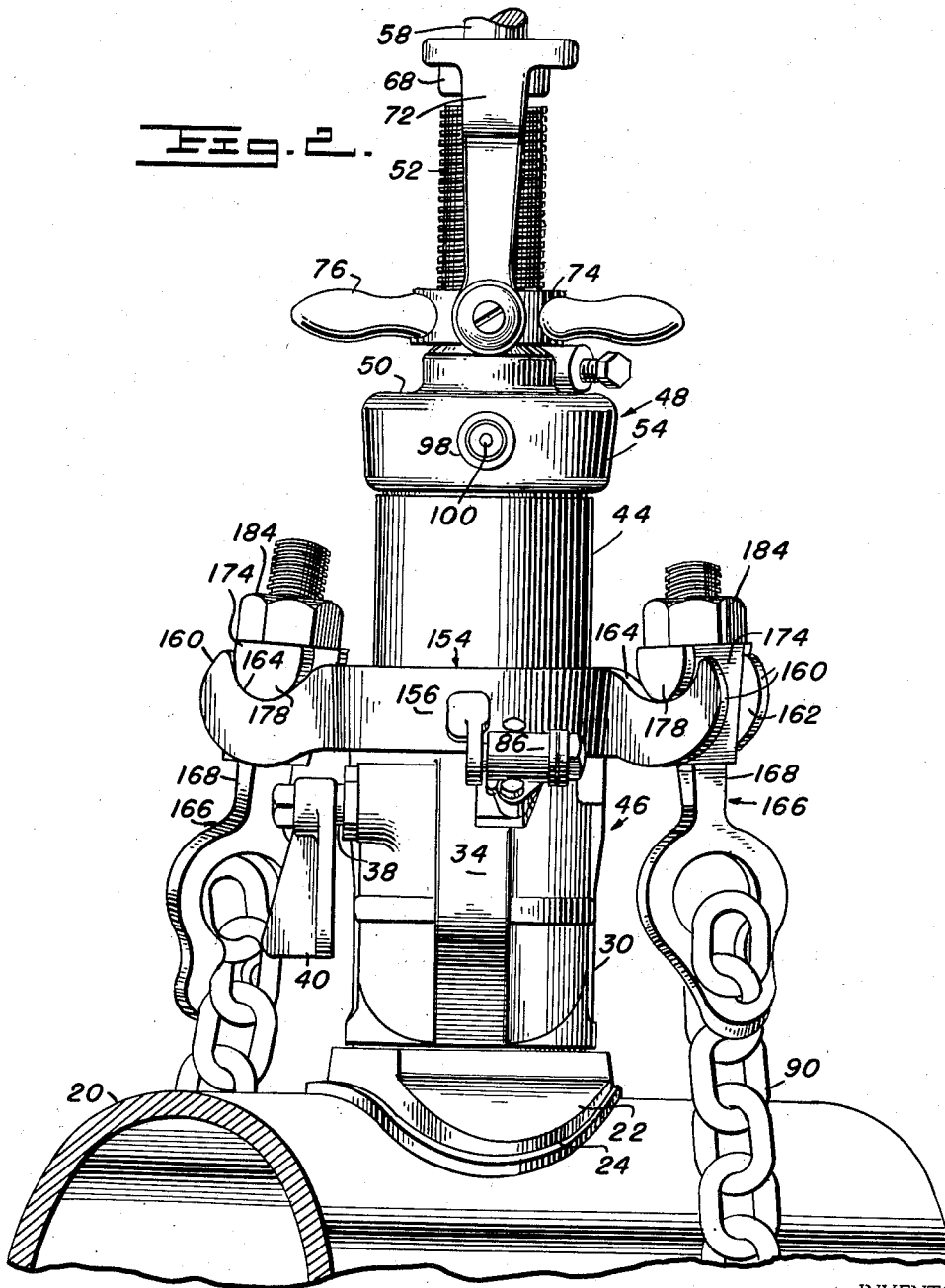
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MACHINE FOR DRILLING AND TAPPING MAINS

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Original application February 19, 1952, Serial No. 272,354, now Patent No. 2,745,669, dated May 15, 1956. Divided and this application April 14, 1954, Serial No. 423,057

6 Claims. (Cl. 77—38)

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, now Pat. No. 2,745,669.

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. For example, it has been found that during the operation of such machine in a horizontal position, the cuttings or chips resulting from cutting and tapping operations tend to be carried between the flop valve and its seat to thereby prevent a tight closure of the valve. Further, when the cap is removed from the barrel, the rush of water therefrom tends to carry such chips against the sealing means in the cap to thereby foul the same and necessitate cleaning before replacement of the cap.

Therefore, it is an object of this invention to provide an improved machine of the type described which inhibits the tendencies of cuttings to become lodged between the flop valve and its seat when the machine is operated in a horizontal position.

It is another object of this invention to provide an improved machine of the type under consideration which will prevent cuttings from fouling the seal within the barrel cap when the machine is operated in a horizontal position.

It is a further object of this invention to provide simple means on a machine of the type described for holding the boring bar fixed against turning, when removed from the machine, in order to facilitate the connection and disconnection of the cutting tool or the stop carrier thereto.

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 perspective view of the machine shown in Figure 1.

Figure 3 is a top plan view of the machine shown in Figure 1.

Figure 4 is a fragmentary elevational view of the machine illustrating the chain yoke and the connection of the ends of the machine-supporting chain thereto. Parts are broken away to illustrate details more clearly.

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 journaled in the walls of the housing 30 so that when the shaft is turned by an exterior handle 40 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 90 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.

In the operation of prior machines of this nature, it has been found that, when such machine is operated in a horizontal position, chips or cuttings tend to climb up the flop valve seat 88 to thereby lodge between the valve 36 and such seat. In order to overcome this difficulty, the flop valve housing 30 is interiorly enlarged adjacent the seat 88 to provide a section having an inner wall 92 which converges toward the inner end of the barrel 46 and smoothly merges with a section having a cylindrical inner wall 94. As a result of this construction, the flop valve seat 88 extends radially outwardly for an appreciable distance beyond the periphery of the flop valve 36, when the latter is seated, so that a pocket 96 is formed that collects cuttings and prevents the same from lodging between the flop valve and its seat.

Additionally, as previously stated, it has been found that, when a prior machine of this nature is operated in a horizontal position, chips or cuttings are carried against the gasket seal in the cap 48, when the latter is removed from the barrel 46, to thereby foul such seal and necessitate cleaning thereof before replacement of the cap. In order to overcome this difficulty the skirt 54 is provided with a plurality of radially-arranged tubular handles 98 that are open at their outer ends. Ports 100 in the skirt 54 aligned with the inner ends of the tubular handles 98 provide communication between the interior of such handles and the inner side of the skirt. The skirt 54 is provided with an inner circumferential groove 102 adjacent the top portion 50 of the cap 48, and in such groove is disposed an O-ring 104 for sealing engagement with the outer sides of the outer end of the barrel 46 when the cap is threaded thereon.

By means of this construction, it will be seen that, when the cap 48 is slowly unthreaded by the handles 98, liquid in the chamber 56 will drain slowly through the ports 100 for escape through the tubular handles 98 without a sudden rush of liquid, which would carry chips into the O-ring groove 102 to thereby foul the O-ring 104. Additionally, this construction serves as an auxiliary drain if the flop valve 36 is defective and fails to close entirely in order to permit the establishment of a greater pressure differential to close the flop valve. The draining function of the skirt ports 100 also augments the action of the by-pass valve 86 when the latter is in its drain position.

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 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 threadably 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 holder 106, as described above, and a carrier (not shown) for a corporation stop (not shown) or for a service T (not shown) is connected thereto. By means of the carrier a corporation stop or a service T is supported on the end of the boring bar 58, and by rotation of the latter the stop or service T is readily screwed into the threaded opening in the main 20. Reverse rotation of the boring bar 58, after insertion of the stop or T in the main, readily disengages the boring bar from the carrier, so that the boring bar may be lifted away from the carrier, leaving the stop or T 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 the anchoring chain 90, and an appropriate wrench may be applied to the corporation stop or T, and to the carrier, for unthreading and removing the latter from the stop or T.

In order to securely hold the machine in operative position on the main, there is provided a chain yoke 154 comprising a collar 156 which rests against an upward-facing exterior shoulder 158 on the barrel 146 provided by one end of the flop valve housing 30. On diametrically-opposite sides of the collar 156, there are provided parallel pairs of outwardly-extending lugs 160 having opposed flat inner side faces 162 and arcuately-recessed upper surfaces 164. The chain 90 is adapted to pass around the main 20 and to have its opposite ends detachably connected to these lugs 160 on the chain yoke 154. The fastening means for each end of the chain comprises a chain harp 166 having a stem 168 projecting through a washer 174 and having a tension nut 184 threaded thereon. The washer 174 is provided with projections 178 on opposite sides thereof that have arcuate surfaces complementary thereto and seating in the arcuate recesses 164 in the upper sides of the lugs 160 to permit rocking adjusting of the stem 168.

In order to facilitate connection and dis-connection of the cutting tool 84 or the stop carrier to the tool holder 106 of the boring bar 58, there is provided on the chain yoke 154 a lateral enlargement having a square socket 194 for reception of the upper square end 62 of the boring bar. Hence, when the cap 48 is unscrewed from the barrel 46, the ratchet wrench 64 may be removed from the boring bar 58 and the latter inverted to place its square end 62 within the socket 194 to fixedly hold the boring bar while an appropriate wrench is applied to the retaining nut 130 or to the stop carrier to connect or disconnect the same to or from the tool holder 106.

It thus will be seen that the objects of this invention

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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. In a drilling machine, a barrel cap having a top and a depending annular skirt provided with means for detachably engaging over the end of a barrel, sealing means disposed within said cap adjacent said top for engagement against the barrel, and said skirt having a port therethrough between the bottom edge thereof and said sealing means.
2. In a drilling machine, a barrel cap having a top and a depending annular skirt provided with means for detachably engaging over the end of a barrel, sealing means disposed within said cap adjacent said top for engagement against the barrel, at least one tubular handle projecting radially from said skirt, and said skirt having a port therethrough between the bottom edge thereof and said sealing means and aligned with the interior of said handle.
3. In a drilling machine, a barrel cap having a top and a depending annular skirt provided with inner threads for engaging with complementary outer threads on the end of a barrel, said skirt having an inner circumferential groove adjacent the inner end of said threads for reception of packing means to seal against the barrel, and said skirt having a port therethrough between the bottom edge thereof and said groove and in alignment with the interior of said handle.
4. In a drilling machine the combination comprising: a barrel; a cap threaded thereon; an inner circumferential groove in the skirt of said cap adjacent the top thereof; packing means in said groove sealing against the inner end of said barrel; a tubular handle on said

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cap having an open outer end; and port means in said skirt between the bottom edge thereof and said groove and providing communication between the inner side of said skirt and the interior of said handle.

5. In a drilling machine the combination comprising: a barrel adapted to have the inner end thereof sealed against a main; a boring bar provided with a non-circular projecting outer end sealingly mounted for rotation and reciprocation within said barrel, the inner end of said bar being provided with threaded means for detachably connecting a tool thereto; an outwardly-facing shoulder on said barrel; a detachable collar engaged with said shoulder; flexible means adapted to engage the wall of the main opposite said barrel and to have its ends detachably secured to said collar; and means defining an outwardly-facing recess in said collar complementary to the outer end of said bar for fixedly retaining the latter, when removed from said barrel, during tool-connecting and disconnecting operations.
6. In a drilling machine having a barrel adapted to have its inner end sealed against a main, a boring bar provided with a non-circular outer end mounted for axial and rotary movement within the barrel, a collar on the barrel, and flexible means having its ends detachably secured to the collar and adapted to be passed around the main to retain the barrel thereon, the combination of a socket in the collar complementary to the outer end of the boring bar for reception of the boring bar outer end when the bar is removed from the barrel for the operations of connecting and disconnecting a tool to the other end of the bar.

References Cited in the file of this patent

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