

April 24, 1934.

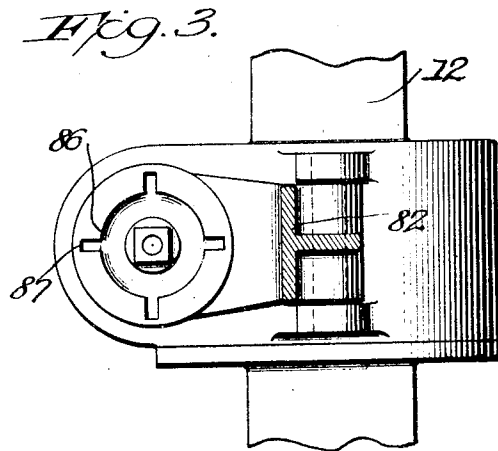
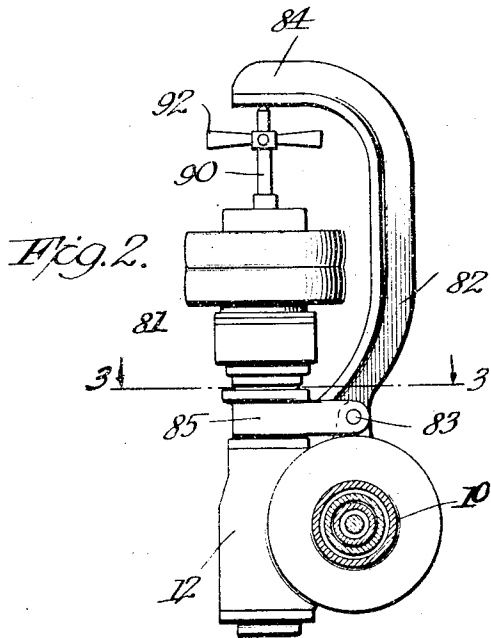
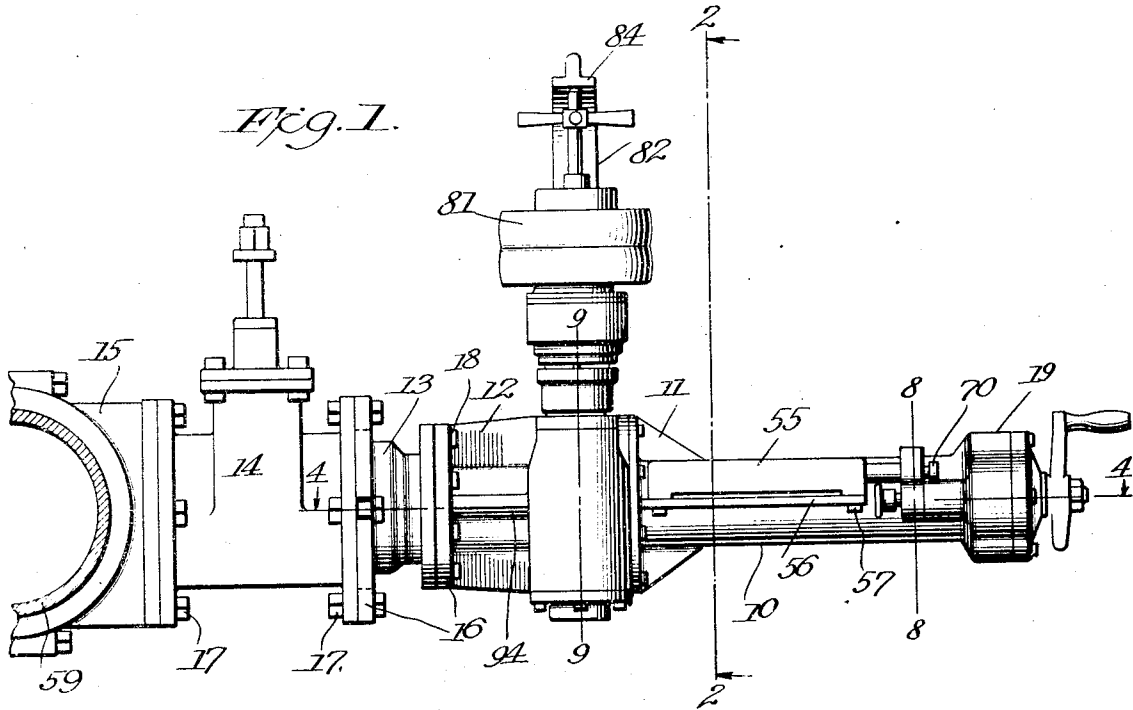
R. H. MUELLER ET AL

1,956,129

DRILLING MACHINE

Filed Nov. 17, 1930

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

Fig. 4.

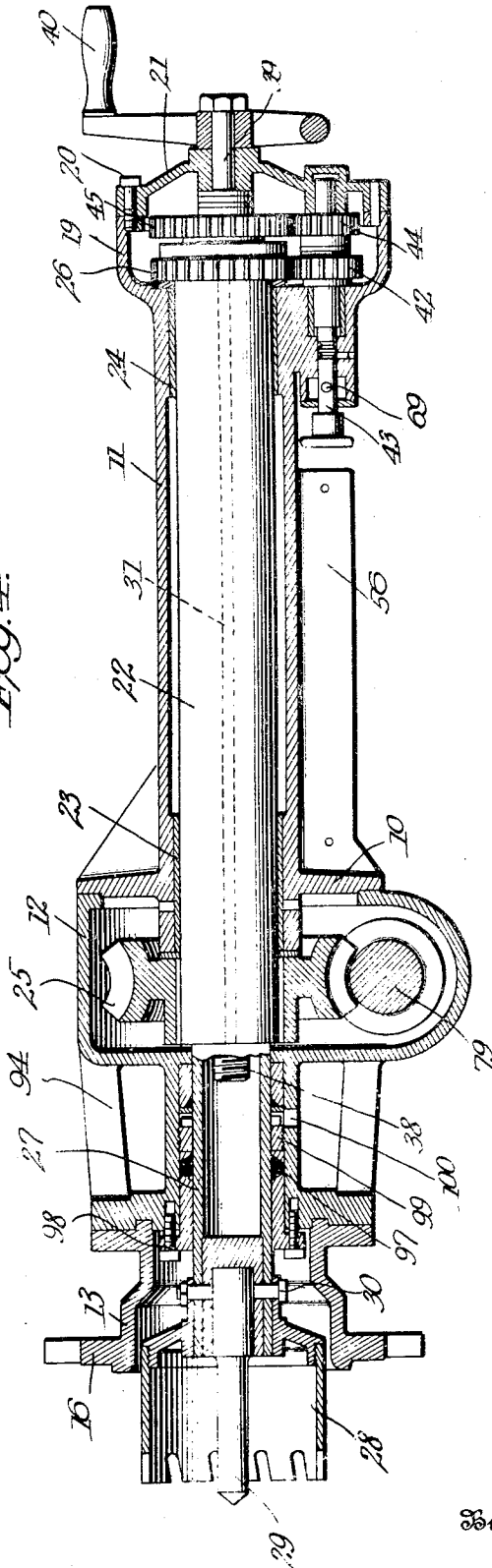
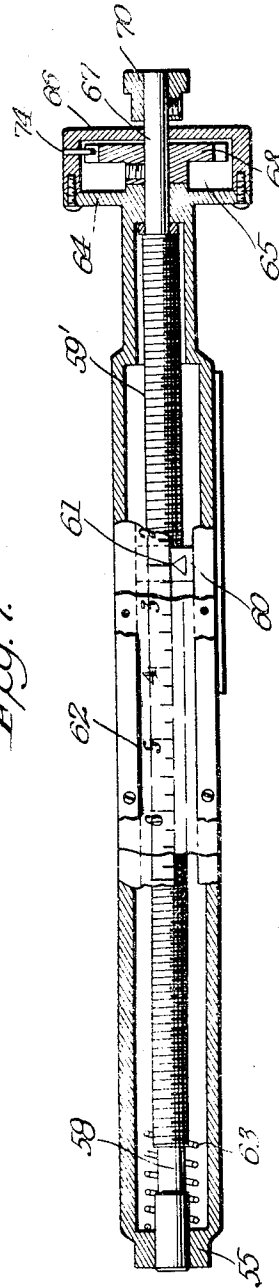


Fig. 7.



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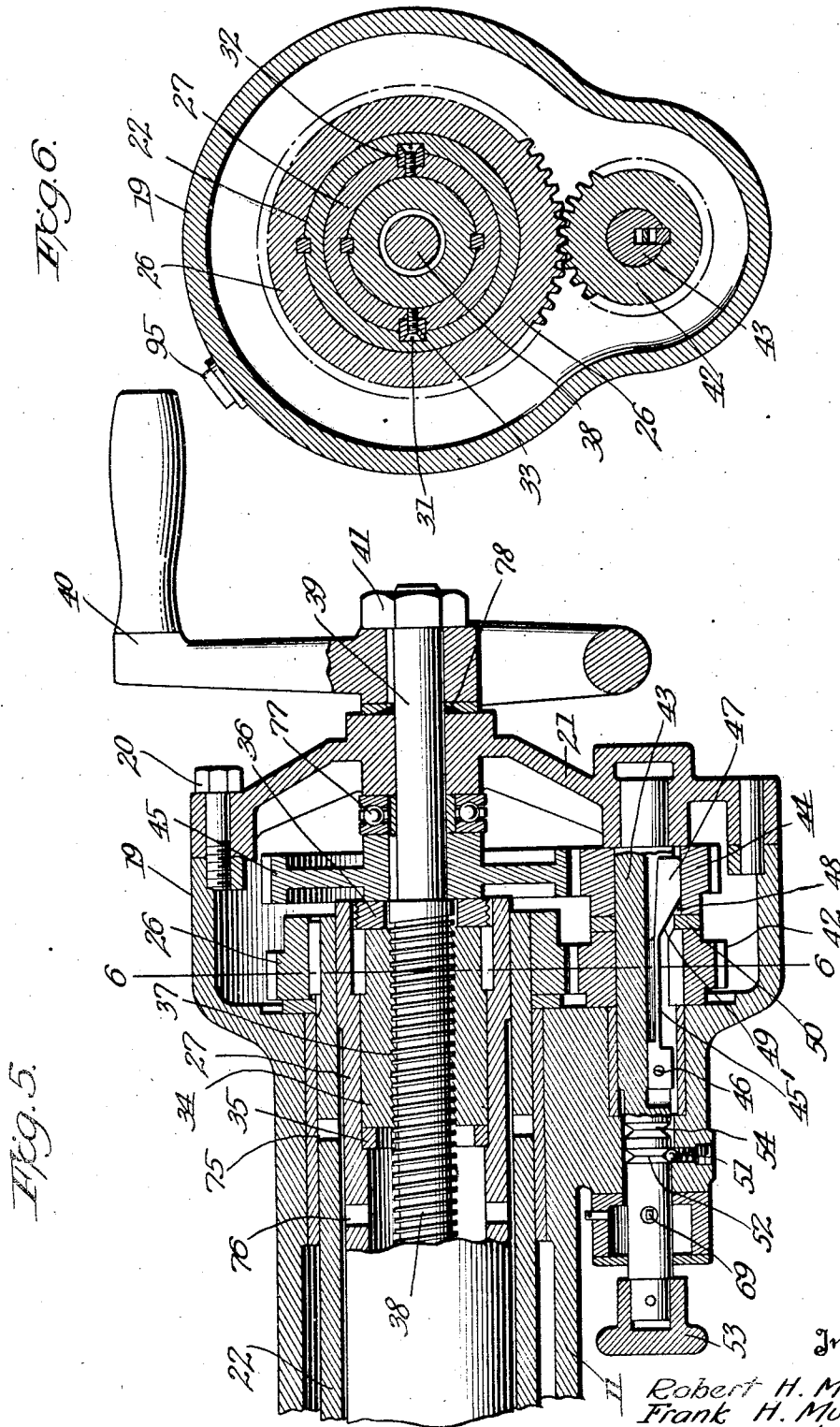
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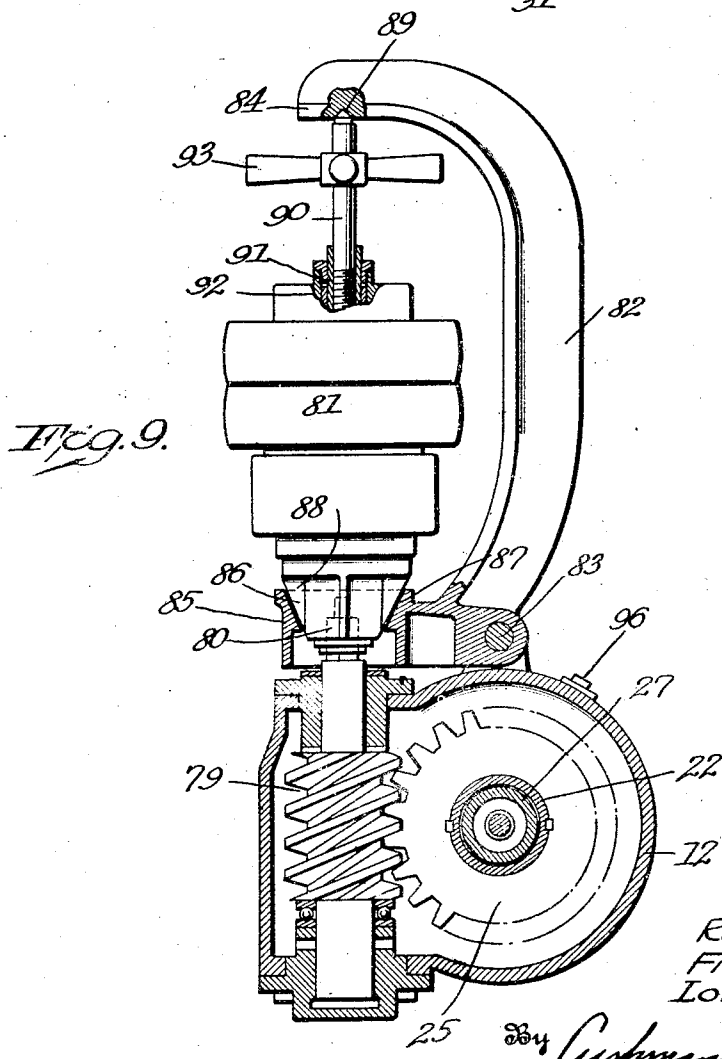
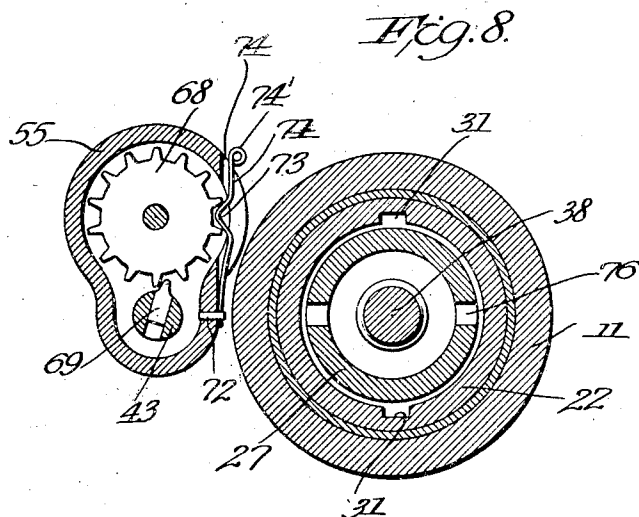
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DRILLING MACHINE

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UNITED STATES PATENT OFFICE

1,956,129

DRILLING MACHINE

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7 Claims. (Cl. 77-42)

The present invention relates to drilling or tapping machines and more especially to improvements in the construction and operation of a cutting and valve unit inserting device, employed for making branch connections in a supply pipe or the like, without the necessity of cutting off the main supply.

One of the important features of the invention consists in providing a simple, efficient and compact drilling machine designed to facilitate the installing of a valve unit in a supply pipe, and which may be conveniently lifted into and out of a ditch or the like, in which the supply main is located at a minimum expenditure of time and labor.

A further object comprehends the provision of means for supporting a motor on the drilling machine, which motor is operatively connected to the cutter shaft and is maintained in a rigid position during the cutting operation.

Another object consists in a compensating means for controlling the movement of the cutter shaft so as to insure the proper longitudinal travel of the cutter when the machine is in operation.

A still further object consists in operatively associating with the drilling machine, means for indicating the length of travel of the cutter.

Other objects and advantages of the invention will become apparent from the following description when taken in conjunction with the accompanying claims and drawings.

Referring to the drawings, in which is disclosed a preferred embodiment of the invention,

Figure 1 is a side elevation of a drilling machine shown connected to a supply pipe or main.

Figure 2 is a sectional view taken substantially along the line 2-2 of Figure 1.

Figure 3 is a sectional view taken substantially along the line 3-3 of Figure 2.

Figure 4 is an enlarged sectional view taken substantially along the line 4-4 of Figure 1, with the auxiliary valve casing removed.

Figure 5 is an enlarged detail sectional view of the outer end of the machine.

Figure 6 is a sectional view taken substantially along the line 6-6 of Figure 5.

Figure 7 is a sectional view of the indicator.

Figure 8 is an enlarged sectional view substantially along the line 8-8 of Figure 1.

Figure 9 is a sectional view substantially along the line 9-9 of Figure 1, with parts cut away.

Referring to the drawings, in which like numerals indicate like parts in the several figures, 10 generally designates the casing of a drilling or

tapping machine, which preferably comprises the interconnected sections 11, 12, 13, 14, and 15 (Fig. 1), each of which sections is provided with the flanges 16 that receive the bolts 17 and 18 for detachably connecting the adjacent sections together. The end section 11 constitutes the housing for the cutter shaft and the section 12 encloses the main drive gear mechanism, while the section 14 acts as a housing for the auxiliary cut-off valve employed for preventing the escape of fluid when the cut has been completed and the machine disconnected by unbolting section 13 from housing 14. In Figure 4, the auxiliary valve casing 14 is removed and the cutter section 15 may be connected to the section 13 by the bolts 17.

The section 11 terminates at its outer end in an enlarged gear chamber 19 (Fig. 5), which has connected thereto by the bolts 20 a closure member or head 21. A drive tube 22 is revolvably mounted in the spaced bearings 23 and 24 carried by the casing 10 and has keyed to its forward end a large worm gear 25 and at its opposite end a small gear 26. Extending axially within the drive tube 22 is a hollow reciprocating cutter shaft or spindle 27, that has connected to its forward end a shell cutter 28 and a pilot drill 29 by the bolts 30. The drive tube 22 has on its inner wall diametrically disposed longitudinal grooves 31, which extend throughout the entire length of the tube and receive the splines or lugs 32 connected to the rear end of the cutter shaft 27 by the screws 33 (Fig. 6), so as to cause the shaft 27 to rotate with the tube 22. The shaft 27 is also arranged to be moved axially relative to the tube 22, by means of a feed nut 34, keyed or otherwise secured to the shaft 27, so as to be movable therewith and is confined between a collar 35 and a screw member 36, that is threaded to the internal wall of the shaft (Fig. 5). The nut 34 has an axially threaded bore 37 through which extends the threaded portion 38 of a feed screw 39. To the outer end of the screw 39 is connected a handle 40 by the nut 41, so as to permit the manual operation of the feed screw. It will be seen that upon the actuation of the tube 22, the nut 34 and shaft 27 may be moved axially relative to the drive tube 22, the entire length of the threaded portion 38.

In order to insure the shaft 27 being advanced at the proper rate of speed, the gear 26 on the tube 22 meshes with a pinion 42 (Fig. 5), which is keyed to a movable clutch shaft 43 mounted in the chamber portion 19 of the casing. The clutch shaft 43 also loosely carries a pinion 44

that meshes with a gear 45 keyed to the feed screw 39. The pinion 44 is arranged to be selectively locked or keyed to the clutch shaft 43 by a clutch 45' fixed to said shaft as at 46 and provided with a normally outwardly disposed head 47 that fits into a slot 48 formed in the pinion 44. The head 47 of the clutch is provided with an inclined face 49 which rides on a collar 50, so that, upon movement of the clutch shaft axially away from the pinion 44, the head 47 will be moved inwardly, to allow the pinion 44 to rotate idly on the clutch shaft 43. As shown, the clutch is maintained in either its locked or unlocked position by a yieldable stop or pin 51, which is in engagement with an annular groove 52 formed in the clutch shaft 43. Upon actuating the clutch 43 by the handle 53, the clutch 45 is forced inwardly to release the locking engagement of the pinion 44 therewith and is maintained in this position by the locking pin 51, which is moved from the position shown, to engagement with an annular groove 54. When the pinion 44 is keyed to the clutch shaft 43 and the drive tube is actuated, it will cause the gear 45 to rotate the feed screw in the same direction as the drive tube, but at a sufficient retarded speed to produce the proper forward longitudinal travel of the drive shaft 27 in accordance with the cutting speed of the shell cutter 28, thus providing means for controlling the unscrewing of the nut 34 on the threaded portion 38 of the feed screw.

An indicator casing 55 is preferably mounted on a flanged portion 56 of the section 11 by the bolts 57 (Fig. 1) and encloses an operating shaft 58 which is connected to the clutch shaft 43 in a manner hereinafter described, for the purpose of showing the distance the shell cutter 28 has travelled after it is brought into cutting engagement with the supply pipe or main 59. The shaft 58 has a threaded portion 59' (Fig. 7), on which is slidably mounted a nut 60 provided with an indicator finger 61, the longitudinal travel of the nut 60 relative to the shaft 58 being indicated by the numerals 62 conveniently positioned on the casing 55. A coil spring 63 is confined between one end of the indicator housing 55 in order that when the nut 60 is moved to its extreme forward position, this spring acts to keep the nut 60 in contact with the threaded portion 59' so that the nut may be started back on the thread by rotating the shaft 58 in the opposite direction. The outer end of the indicator housing 55 has a radial flange 64, which provides a chamber 65 that is closed by a head 66 and has extending therethrough the end portion 67 of the shaft 58. A gear 68 keyed to the end portion 67 of the shaft 58 is arranged to be driven from the clutch shaft 43 by a plunger 69, that extends transversely through the said shaft (Fig. 8), so as to cause the actuation of the feed screw 58 upon the rotation of the clutch shaft 43. The teeth in the gear 68 are of such a size relative to the clutch shaft 43, that the indicator nut 60 will be advanced substantially one-fourteenth of a revolution for each rotation of the clutch shaft 43. A handle 70 on the outer end of the shaft 58 permits the manual actuation of the indicator 61, so that the latter may be moved back to its initial starting position. A yieldable spring brake member 71 (Fig. 8), is pivoted at 72 to the casing 55 and has a lateral offset portion 73, which extends through a slot 74 in the casing, so as to engage the teeth of the gear 68, thus insuring the actuation of the gear 68 only when it is

in engagement with the locking plunger 69. The outer or exposed end of the spring 71, preferably terminates in a bead 74' for permitting the manual actuation thereof. When it is desired to rotate the indicator shaft or screw 58 by hand, the clutch shaft 43 is moved axially, to release the engagement of the plunger 69 with the gear 68.

In order to insure the proper circulation of the oil throughout the fluid tight casing 10, the drive tube 22 and cutter shaft 27 have radial ports 75 and 76 respectively (Fig. 5), for conducting the lubricant to all of the working parts. A ball bearing 77 interposed between the closure plate 21 and the gear 45, facilitates the smooth operation of the machine, while a packing 78 may be inserted between the closure plate 21 and the operating handle 40 to prevent leakage at this point.

The tube 22 and its associated parts are preferably actuated by a drive worm 79, which meshes with the gear 25, (Fig. 9). The worm 79 terminates at one end in a reduced polygonal shaped portion 80, which extends through one side of the section 12, so as to be operatively connected to a complementary portion formed in the drive shaft of a prime mover or the like, such as the air motor 81. The motor 81 is preferably detachably connected to the drilling mechanism by means of an adapter or supporting member 82, which is pivoted as at 83 to one side of the casing (Fig. 2) and is provided with the spaced arms 84 and 85, so as to constitute a substantially yoke shaped support for detachably maintaining the motor in proper position. The arm 85 of the adapter is formed with a recess 86 having inclined spaced grooves 87 arranged to receive the complementary formed strengthening fins 88, usually formed on the end portion of motors of this type. The arm 84 of the adapter has a tapered recess 89 arranged to receive one end of an adjustable shaft 90, said shaft having its opposite end threaded so as to fit in a complementary formed tubular sleeve 91, that is secured in a recess 92 formed in the adjacent face of the motor 81. The shaft 90 has an operating handle 93, which upon being actuated, tends to either force the motor into proper working position or to release the same after the work has been done. When desired the adapter 82 may be moved to an inoperative position and the worm shaft 79 can be operatively connected to any other suitable source of power, such as a ratchet or the like.

As shown, in Figure 1 of the drawings, the center of gravity of the drilling machine is located at the air motor adapter 82 so that when the adapter is thrown back on the pivot 83, any suitable lifting device (not shown) may be engaged in the circular recess 86 so that the machine may be conveniently lifted into or out of the ditch in which the supply main or pipe 59 is located without danger of the machine being overbalanced.

Plugs 95 and 96 (Figs. 6 and 9) are formed in the casing to permit the filling of the different chambers with oil or liquid grease, so as to insure the smooth operation of the various parts.

In the section 12 there is provided a packing 97 to prevent the fluid under pressure in the pipe or main from escaping during the operation of the machine. The packing 97 also acts as a seal to preclude the possibility of dirty water getting into the casing during the operation of the machine. Two adjustments are provided, the packing gland 98 for permanent and large adjustments and an auxiliary gland 99 for small

adjustments while the machine is being operated. Two oppositely disposed slots 100 are formed through the casing 12 at a position in the same plane as the packing gland 99. These slots give access to the gland 99 so that the packing may be adjusted by operating a suitable tool through them. The slots 100 also permit any fluid which should possibly leak by the packing to escape at this point instead of being forced back into the casing of the machine.

The threaded portion 38 of the feed screw extends substantially the length of the drive tube 22, so as to insure efficient longitudinal travel of the cutter shaft 27 to permit the cutter 28 to pass through the gate valve casing 14 and be brought into cutting engagement with the supply pipe or main 59. Due to the telescopic arrangement of these parts, the cutter may be moved longitudinally the desired distance to be brought into engagement with the main without the necessity of providing a long frame or casing which would be unwieldy and exceedingly difficult to position within the usual restricted area of a ditch or the like, in which the supply main is located. As the reciprocating cutter shaft 27 is moved axially relative to the drive tube 22, it tends to create a vacuum in the casing when carried to the right, as shown in Figure 4, which is similar to the suction developed in an ordinary pump, and acts to draw in the air so that when the shaft 27 and cutter 28 are moved to the left, a considerable pressure is created in the casing which causes the lubricating oil to be forced into all the bearings and other parts inside the casing. As the cutter shaft 27 is free from engagement with the other working parts of the machine, except at its ends, this allows constant lubrication of the shaft so that it will encounter a minimum amount of friction during its travel back and forth in the casing.

The indicator 61 may be moved to its initial or zero position by the manual actuation of the handle 70 and after being operatively connected to the clutch shaft 43 by the plunger 69, will accurately indicate the distance the cutter 28 has travelled after pinion 44 is locked to clutch shaft 43 by pushing in the button 53. Moreover, the manual operation of the feed screw 39 permits the rapid longitudinal travel of the cutter shaft and its associated parts, so as to facilitate the movement of the cutter 28 either into engagement with the main or its withdrawal therefrom after the cutting operation has been completed.

It is to be understood that the form of the invention herewith shown and described is merely illustrative of a preferred embodiment and that such changes as fall within the purview of one skilled may be made without departing from the spirit of the invention and the scope of the appended claims.

We claim:

1. A drilling machine for tapping a supply pipe or main comprising a casing, a tubular member revolubly mounted in said casing, a hollow shaft extending axially within said member, a cutter connected to said shaft, means operatively connecting said shaft to said revoluble member whereby upon the rotation of said member, the shaft is moved axially relative thereto, an adapter pivotally connected to said casing, a motor detachably connected to said adapter and having fins thereon, means operatively connecting said motor to said revoluble member, said adapter having diametrically opposed grooves therein arranged to receive said fins for maintaining the

motor in rigid position during the cutting operation.

2. A drilling machine for tapping a supply pipe or main, comprising a casing, a tubular drive member revolubly mounted in said casing and having spaced gears keyed thereto, means connected to one of said gears for actuating said member, a slidable clutch shaft having fixed and loose pinions, said fixed pinion being in mesh with the other of said gears, a hollow shaft extending axially within said drive member, a cutter connected to said shaft, means slidably connecting said shaft to said revoluble member, a feed screw extending into said shaft and operatively connected thereto, a gear on said feed screw connected to the loose pinion, means for locking the loose pinion to said clutch shaft, means for manually actuating said feed screw, and an indicator detachably connected to said slidable clutch shaft for determining the extent of movement of said cutter whereby all the movable parts are arranged to be actuated by the tubular drive member.

3. A drilling machine of the class described having in combination a casing, a cutter shaft revolubly mounted in said casing, an adapter pivotally connected to said casing and having a pair of spaced arms, one of said arms having a recess provided with spaced grooves, a motor, means for detachably connecting said motor to said arms, said motor having strengthening fins adjacent one end thereof arranged to fit in said grooves for maintaining the motor in rigid position during the cutting operation, and means operatively connecting the motor to said cutter shaft.

4. A drilling machine for tapping a supply pipe or main comprising a fluid-tight casing having longitudinally spaced bearings and a lubricating medium therein, a tubular drive member revolubly supported on said bearings, a gear keyed to each end of said drive member, means connected to one of said gears for actuating said drive member, a slidable clutch shaft mounted in said casing and having a fixed pinion and a loose pinion, said fixed pinion meshing with the other of said gears on the drive member, a hollow reciprocating shaft extending axially within said drive member, a shell cutter connected to said reciprocating shaft, a packing interposed between the reciprocating shaft and the casing for preventing liquid from entering the casing during the cutting operation, means slidably connecting said reciprocating shaft to said revoluble member, a feed screw extending into said shaft and operatively connected thereto, a gearing on said feed screw connected to the loose pinion, means for locking the loose pinion to said clutch shaft, a handle connected to said feed screw for manually operating the same, means associated with said slidable clutch for selectively actuating said cutter, means to supply lubricant to the casing, and means for circulating the lubricating medium through the casing upon the actuation of said reciprocating shaft.

5. A drilling machine for tapping a supply pipe or main having in combination a casing provided with spaced bearings, a tubular member revolubly mounted on said bearings, a cutter shaft extending axially into said tubular member, an adapter pivotally connected to said casing and having a pair of spaced arms, one of said arms having a recess provided with spaced grooves, a driving mechanism operatively connected to the cutter shaft, and means detachably connecting said driving mechanism to said arms, said driv-

ing mechanism having strengthening fins adjacent one end thereof arranged to fit into said grooves for maintaining the parts in rigid position during the cutting operation.

- 5 6. A drilling machine for tapping a supply pipe or main, having in combination a casing provided with longitudinally disposed spaced bearings, a tubular drive member revolubly supported on said bearings, gears keyed to the opposite end portions of said drive member, a hollow reciprocating shaft
10 extending axially within said drive member and having a cutter connected to one end thereof, a block fixedly mounted in one end of said hollow shaft and provided with a longitudinally disposed threaded bore, said casing having a supporting member extending laterally therefrom
15 and provided with spaced arms, driving mechanism carried by said arms, means on said driving mechanism coacting with complementary means on one of said arms for maintaining the
20 motor in rigid position during the cutting operation, a feed screw extending through the bore of said block, means operatively connecting the

screw to said hollow shaft, and means connected to one of said gears for actuating the driving member and the screw whereby to move the reciprocating shaft axially relatively to the machine.

7. A drilling machine for tapping a supply pipe or main having in combination a casing, a cutter shaft revolubly mounted in said casing, a supporting member pivotally connected to said casing and having a pair of spaced arms, one of said arms having a recess provided with spaced
35 grooves, a motor, a feed mechanism operatively connected to the motor and the cutter shaft for moving the latter axially relative to the casing, means detachably connecting said motor to said arms, said motor having strengthening fins adjacent one end thereof arranged to fit in said
90 grooves, and an indicator operatively connected to said cutter shaft for showing the extent of longitudinal movement thereof.

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25	80
30	85
35	90
40	95
45	100
50	105
55	110
60	115
65	120
70	125
75	130
	135
	140
	145
	150