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MACHINE FOR TRENCHLESS BORING

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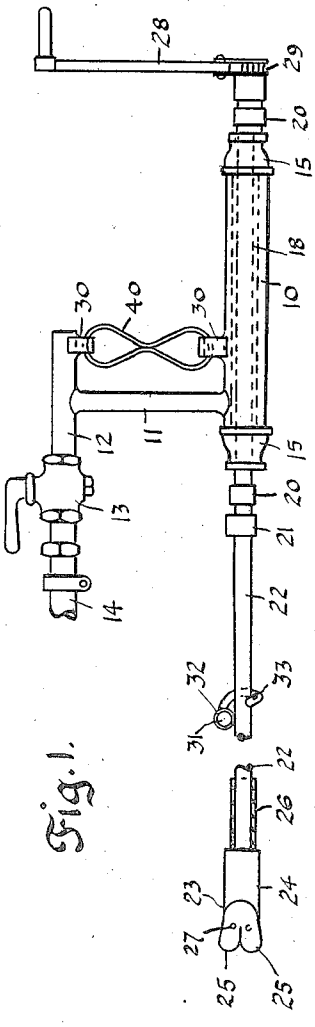


Fig. 1.

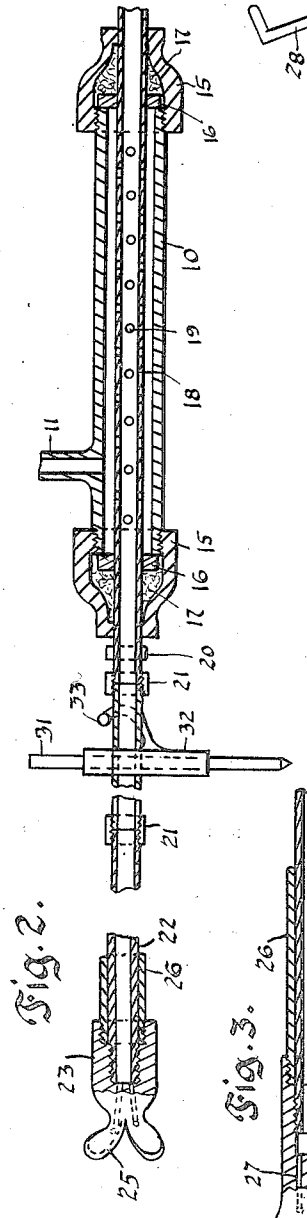


Fig. 2.

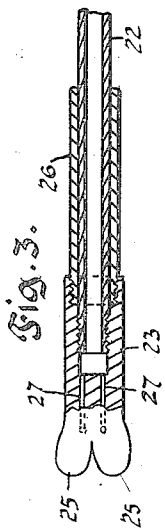


Fig. 3.

Fig. 5.

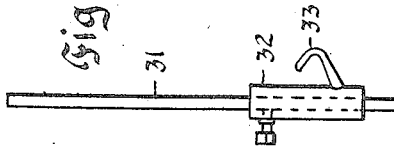


Fig. 6.



Fig. 4

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MACHINE FOR TRENCHLESS BORING

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Application January 2, 1935, Serial No. 116

4 Claims. (Cl. 255—20)

My invention relates to that class of boring machines which are used to bore through earth, gravel and similar material preparatory to making connections to street mains, for conduit tubes under streets for various purposes such as traffic signal connections and underground wires.

The purpose of my invention is to provide a machine which can perform these functions with a minimum of digging in either the street or in the adjoining property. Machines for this purpose which have been in use heretofore required the digging of a long trench of a width sufficient to take the machine, and of a depth equal to that of the street mains below the surface. Such machines are large and cumbersome and are dependent upon a track on which to operate. My invention does not require any track and the machine is operated above the surface of the ground, obviating the necessity of a long and deep trench.

I accomplish these objects by means of the mechanism illustrated by the accompanying drawing, in which similar numerals refer to similar parts in the several views.

Figure 1 is a plan view of the machine. Figure 2 is a sectional plan view on a larger scale but showing the guide bar as horizontal instead of the normal vertical position. Figure 3 is a detail view of the bit in section. Figure 4 is a view of the sight rods. Figure 5 is a sectional view across a street showing the application of the machine as arranged to bore down to a main pipe in the street. Figure 6 is a detail view of the guide bar.

The construction of my device is as follows: 10 is a hollow cylindrical body which is connected to a source of water supply by means of the pipes 11 and 12, the valve 13 and the hose connection 14. The preferred construction is to have the pipe 11 welded into the body 10 and the pipe 12 thus forming a rigid frame. At each end of the body 10 is a packing gland 15, each containing the washer 16 and the packing 17. The glands as shown are made from pipe reducers but they may be of any desired construction such as the usual type of stuffing box. Extending through the body 10, and also through the two glands 15 is a pipe 18 which is provided with numerous holes 19. Assembled on the pipe 18 and outside of and adjacent to the glands 15 are the rings 20 which permit the pipe 18 to revolve but prevent the lateral movement of the said pipe other than that required to permit adjustment of the glands 15. On the end of the pipe 18 extending out of the front end of the body 10 is a coupling 21 secured thereto. The coupling 21 is for the purpose of having screwed therein a section of the extension pipe 22. Additional sections of pipe such as 22 may be coupled together as will be more fully hereinafter described. Adapted to be secured to the outer end of the pipe 22, or to any of the additional similar sections of pipe which may be attached thereto, is a boring bit 23, which consists of a body or shank 24 and teeth 25. The teeth may be of any suitable number and shape according to the character of the material through which it is intended to bore. In the form shown there are two teeth 25 curved in opposite directions and which have been found suitable for boring in sand, loam or gravel. Also tapped into the shank 24 of the bit 23 is a larger pipe 26 which extends backwardly over the pipe 22 or any extension thereof, the length of the pipe 26 being dependent upon the amount of reinforce or stiffening desired in the pipe 22. This will also be more fully hereinafter described. Through the shank 24 of the bit 23 are holes 27 having their inlet connecting with the interior of the pipe 22, or any extension thereof, and having their outlets so located that water issuing therefrom will impinge on the inside of the teeth 25 of the said bit.

Secured to the rear end of the pipe 18 at the back of the machine is a crank 28, which may be either rigidly attached, or it may be provided with a ratchet 29 adapted to work in either direction. On the pipe 12, and in an opposite position on the body 10 are loops 30, adapted to receive leather or other suitable straps 40, against which the operator can rest his knee when forcing the machine forward. For use with the machine is a guide-bar 31 which is a plain bar pointed on its lower end. Adapted to slide on the bar 31 is a sleeve 32 which can be moved up or down on the said bar and locked in any desired position by a set screw or other convenient means. Attached to or integral with the sleeve 32 is a hook 33, of a size and shape suitable to engage and hold the pipe 22, or any extension thereof, preventing any movement in a vertical direction when locked, but allowing free movement of the pipe longitudinally.

The operation of the machine is as follows:

The machine having been assembled as hereinbefore described, it is laid on the ground or held in the hands of the operator. Sections of the pipe 22 are screwed together and to the machine. The bit 23, together with the re-inforcing pipe 26 attached, is screwed to the outer end of the pipe 22 or to the additional sections thereof. The machine is then so placed that the bit 23 is pointed toward the location to be reached by the bore.

The preferred method of obtaining the proper alignment between the starting point of the said bit and the terminal point of the bore is as follows: The bit 23 is started into the ground by turning the crank 28 and pushing on the machine, the approximate direction being determined by sight. After the bit has entered the ground it becomes necessary to direct it accurately toward the terminal point, such as the main pipe 35. This is done by placing a sight rod 36 over the terminal point, and the operator also places two other sight rods of duplicate length, one being located near the bit 23, and the other as near the rear end of the re-inforcing pipe 26 as possible. Across the tops of the three sight rods 36 a trial sight is taken in order to determine where to place the guide bar 31. The guide bar 31 is then inserted into the ground as shown in Figure 5 and the sleeve 32 with the hook 33 adjusted under the pipe 22. The sleeve 32 is rotated and raised so that the said sleeve and hook form three bearing points on the pipe 22. The sleeve and hook are temporarily locked in position by the set screw. The position of the sleeve 32 is determined by repeated sights over the tops of the sight rods 36 if necessary, and the sleeve 32 and the pipe 22 are raised or lowered on the guide-bar 31 until a final correct alignment of the bit is obtained. When this final alignment is determined the sleeve 32 is locked by the set screw. This allows of longitudinal movement of the pipe 22 but holds it in the correct position as to height and direction. The boring is then accomplished by the rotation of the bit by means of the pipes 22 and the crank or ratchet 28. As soon as the boring is started, the water is turned on by the valve 13 and passes through the machine and the pipes 22, discharging through the holes 27 in the bit and against the inside of the teeth 25, thus washing the dirt back out of the bored hole. In Figure 5 a shallow cut in the ground is shown at 34. This cut may or may not be required depending upon the contour of the ground at the starting point of the bore. Where the bore is directed toward a main pipe such as 35, a hole is usually dug as at 37 in Figure 5, to positively locate the said pipe. Experience has shown that it only takes a few minutes to set up the machine and complete a bore of from sixty to one hundred or more feet.

The machine can be assembled before beginning the bore by connecting together the number of lengths of pipe necessary to reach the length of the bore to be made, thus obviating the necessity of breaking the pipe joints and inserting new lengths of pipe as the bore progresses. This latter method is however available where there are buildings or other reasons for starting the bore with the machine close to the starting point.

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

1. In a machine of the class described the combination of a tubular body member having stuffing boxes on each end; a perforated pipe rotatably mounted through said body member and said stuffing boxes; a boring bit attached to said perforated pipe by tubular members adapted to rotate with said perforated pipe; a stiffening sleeve attached to said bit and surrounding a portion of the said tubular members; means for rotating said perforated pipe, the tubular members, the stiffening sleeve and the bit; and means for supplying water to the said bit through said tubular body, the perforated pipe and the tubular connecting members.

2. In a machine of the class described the combination of a tubular body member having stuffing boxes on each end; a perforated pipe rotatably mounted through said body member and said stiffing boxes; a boring bit attached to said perforated pipe by tubular members adapted to rotate with said perforated pipe; a stiffening sleeve attached to said bit and surrounding a portion of the said tubular members; means for rotating said perforated pipe, the tubular members, the stiffening sleeve and the bit; means for supplying water to the said bit through said tubular body, the perforated pipe and the tubular connecting members; and a guide bar and adjustable sleeve adapted to hold the bit in the desired alignment.

3. In a machine of the class described the combination of a tubular member having stuffing boxes on each end; a perforated pipe rotatably mounted through said tubular member; thrust bearings adjacent to each stuffing box; a boring bit attached to said perforated pipe by tubular members adapted to rotate with said perforated pipe; a stiffening sleeve attached to said bit and surrounding a portion of the said tubular members; means for rotating the said perforated pipe, the tubular members, the stiffening sleeve and the bit; means for supplying water to the said bit through said tubular body, the perforated pipe and the tubular connecting members; and means for applying the weight of the operator to produce a longitudinal advance of the machine; and a guide bar and adjustable sleeve adapted to hold the bit in the desired alignment.

4. In a machine of the class described a guide and supporting bar having a sleeve rotatably adjustable and also adjustable along the axis of said bar, a lug on said sleeve, said lug extending upwardly and thence backwardly in a hooked shape, said lug and sleeve being adapted to engage tubular members of various sizes by rotating said sleeve and lug, and permit longitudinal movement of the tubular members, and means for locking said sleeve on said bar.

JOHN W. REIFEL.