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A. H. GOETT

2,905,443

JET PRONGED DIGGING HEADS

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Fig. 2.

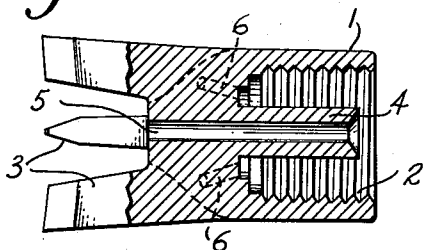


Fig. 3.

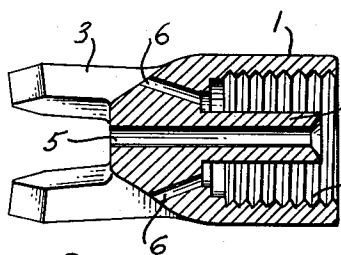


Fig. 1.

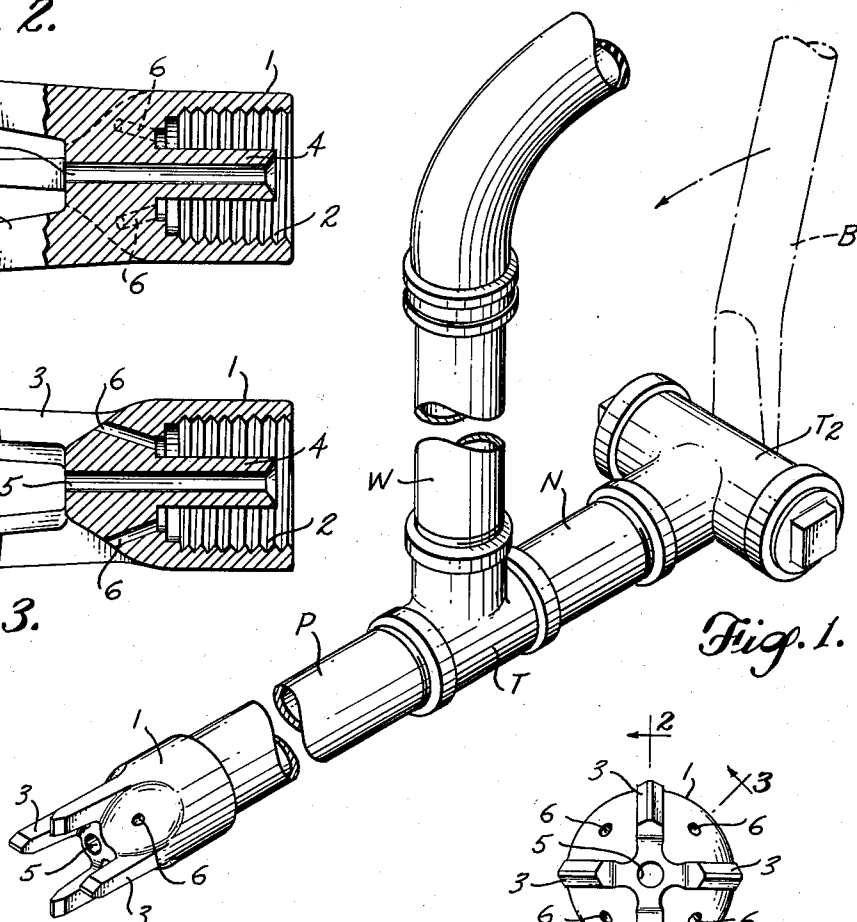
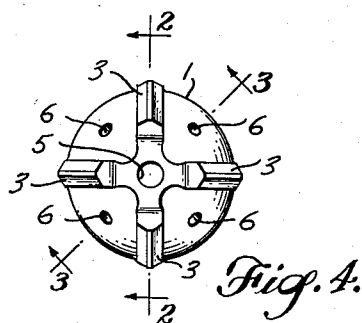


Fig. 4.

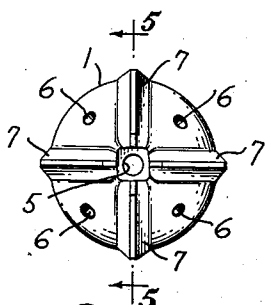


Fig. 6.

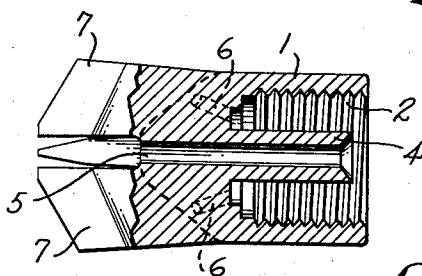


Fig. 5.

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1

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JET PRONGED DIGGING HEADS

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2 Claims. (Cl. 255—61)

The present invention relates to a digging head of the jet type to be supported on the end of a pipe and driven through the ground for the purpose of laying the pipe without the necessity of digging a trench in which to lay it.

An object of the present invention is to provide a digging head affording a combined hydraulic jetting and digging or ground-loosening action, so that the jet will dislodge the earth ahead of the head to enable it to progress rapidly through the ground.

A more specific object is to provide such a head which, by appropriate movement of a pipe on which it is mounted, can be reciprocated and/or rotated to loosen the dirt ahead of it effectively and which will clear a burrow through which the remainder of the head may pass readily.

Another object is to provide such a digging head provided with jets to keep the cavity between the dirt loosening prongs clear so as to maintain the digging or dirt loosening effectiveness of the prongs.

It is also an object to provide such a digging head which will have dirt loosening prongs of a character that will tend to displace the dirt from their path and which preferably are reasonably sharp to facilitate their digging action. Such prongs also may be of such shape and arranged so that they can be resharpened easily as they are dulled by use.

An additional object is to arrange jet passages through the digging head so as to clear the cavities between adjacent prongs most efficiently and thus maintain the digging or dirt loosening effectiveness of the prongs.

The foregoing objects can be accomplished by a digging head of substantially cylindrical shape having a pipe receiving socket in one end and a plurality of digging prongs projecting generally axially from the opposite end. Such prongs are spaced radially and circumferentially, each prong being of a greater extent radially than circumferentially, and such prongs diverging from their root ends to their tips to a spread greater than the maximum width of the socket end of the body. Jet bores extend longitudinally through the body, having one end opening into the pipe-receiving socket and including a principal central bore having its other end opening at the center of the cluster of prongs and side bores which diverge from the pipe receiving socket and open respectively in circumferentially spaced positions between the prongs.

Figure 1 is a top perspective view of the jet pronged digging head mounted on a pipe.

Figure 2 is a longitudinal sectional view through the digging head taken on line 2—2 of Figure 4, and Figure 3 is a longitudinal sectional view through the digging head taken on line 3—3 of Figure 4. Figure 4 is a front view of the digging head.

Figure 5 is a longitudinal sectional view through a digging head of a different form, taken on line 5—5 of

2

Figure 6, and Figure 6 is a front view of such modified form of digging head.

In order to burrow most effectively for laying a pipe it is preferred to use a combination of mechanical and hydraulic actions. Such actions in combination are produced by the digging head 1 shown in Figure 1 as being mounted on the end of a pipe P to be installed in the burrow. Exposed beyond the open end of the burrow is a T T screwed onto the end of pipe P, to the side leg of which is connected the water pipe W. A nipple N is connected to the leg of the T opposite that to which the pipe P is connected, and a second T T2 has its side leg connected to the other end of the nipple N. The other legs of the T T2 are closed by plugs.

The digging head includes a body 1 preferably of substantially cylindrical shape, having a threaded socket 2 in one end for receiving the threaded end of pipe P. From the opposite end of the body prongs 3 project, as shown in Figures 1, 2 and 3. These prongs project generally axially from the body and are spaced both radially and circumferentially. As shown in Figure 4, each prong is of greater extent radially than circumferentially. The prongs diverge somewhat from the body so that the total spread of the cluster of prongs adjacent to their tips is greater than the maximum width of the socket end of the body.

While the number of prongs provided may differ, there should not be so many of them as to restrict too greatly the circumferential spacing between the prongs. The tip of each prong should be reasonably sharp, preferably in the form of a ridge, and it is desirable for such ridge to be inclined relative to a plane perpendicular to the axis of the head so that the ends of such ridges farther from the head's axis are located farther from the body 1 than the other ends of such ridges, as shown in Figure 2. Also the prongs may taper somewhat in a direction away from the body throughout their entire length, as shown in Figure 2.

While the prongs 3 can be used to loosen dirt in the end of a burrow by probing with them, the progress of digging the burrow is greatly expedited by sluicing away from in front of the digging head dirt loosened by the prongs. Such sluicing action is accomplished by projecting water from the head through jet bores. In the digging head shown in Figures 1 to 4, inclusive, the principal jet bore extends centrally through the head, having its feed end extending through a stem 4, located concentrically within the pipe-receiving socket 2. The discharge end 5 of the bore opens at the center of the cluster of prongs 3 adjacent to their root ends.

In addition to the central jet bore side jet bores 6 are provided, each having one end opening into the pipe-receiving socket 2. These side bores diverge from their feed ends to their discharge ends, which open respectively in the valleys between adjacent prongs 3. Thus it is preferred to have at least as many side jet bores 6 as there are prongs 3 and to have the side jet bores and prongs located in alternating arrangement, as shown best in Figure 4. Also the side bores may be smaller than the central bore, as shown. If dirt should get into the head, either through the side bores or otherwise, and be packed in the end of the cavity in the head by the water, the stem 4 will insure that at least the central bore will not be clogged.

In operation water will be supplied through the supply pipe W to the pipe P being laid. The water will flow from this pipe through the digging head and will be projected as high pressure sluicing jets from bores 5 and 6. The entire pipe P may be reciprocated lengthwise, as well as being rocked or rotated through part of a turn, by manual manipulation of the pipe to work

the prongs 3 into the dirt at the end of the burrow. As the dirt is loosened by the prongs, it will be sluiced out of the way of the prongs 3 through the clearance between the wall of the burrow and the body 1 by the water from the jets, so as to produce an efficient digging operation. If the dirt at the end of the burrow should be quite hard or if an obstruction should be encountered, additional pressure can be applied lengthwise to the pipe P by using a bar B to pry on the end of the pipe assembly formed by the T T2.

The jet of water projected from the discharge end 5 of the central bore will keep the central space between the prongs 3 clear of dirt, which would tend to pack in it, and the side jets projected from bores 6 in the valleys between the prongs will prevent dirt from packing in such valleys. Consequently, the dirt is prevented from packing around the sharpened ends of the prongs 3, so that their dirt loosening action will not be impaired. The dirt expelled from the spaces between the teeth backward through the clearance between the burrow wall and the body 1 will be packed sufficiently by the sluicing action to make room for formation of the burrow to receive the pipe. The inclined crests of the prongs 3 will tend to wedge the dirt into the space at the center of the cluster of prongs so that it will be subjected to the impact of the large center jet more effectively.

An alternative type of digging head is shown in Figures 5 and 6. This digging head includes the same type of body 1, having in it the pipe-receiving cavity 2 and central jet stem 4, as discussed in connection with the previous modification and the manner in which this digging head is mounted and is used are the same as those already described. Similarly, the central bore has a discharge end 5 opening at the center of the cluster of digging prongs, and the side jet bores 6 extending from the socket 2 diverge in the manner previously described to open in the valleys between the dirt loosening prongs.

The principal difference of the digging head shown in Figures 5 and 6 over that shown in Figures 1 to 4 resides, therefore, in the shape of the individual dirt loosening prongs 7. Each of these prongs 7 is of considerably greater radial extent than that of each of the prongs 3 of the digging head shown in Figures 1 to 4, and the acute angle between the convergent tip surfaces is considerably less than the corresponding angle of the prongs in Figures 1 to 4. In addition, the ridges of the prong tips are inclined relative to a plane perpendicular to the axis of the head so that the ends of such ridges closer to the head's axis are located farther from the body 1 than the other ends of such ridges. The tendency of the ridges of prongs 7, therefore, is to work the loosened dirt away from the center of the cluster of prongs, so that the side jets 6 will have a greater tendency to sluice such dirt than the central jet. In general,

however, the method of using the digging head shown in Figures 5 and 6 will be similar to that of using the digging head shown in Figures 1 to 4, inclusive, and the operations will be generally comparable.

I claim as my invention:

1. A digging head comprising a hollow body, pipe connecting means on one end of said body for connection to a pipe communicating with the hollow of said body, and a cluster of prongs projecting generally axially from the opposite end of said body and spaced circumferentially to form valleys between circumferentially adjacent prongs and radially to form a cavity centrally between said prongs, the axial length of each of said prongs being at least a plurality of times as great as its circumferential extent, the outer edges of said prongs having their root ends substantially flush with the sides of said body and diverging from said body toward their tips, the tips of said prongs being oppositely beveled to form substantially sharp ridges extending radially of said body and inclined relative to a plane disposed perpendicular to the axis of said body, and a jet bore extending through said body having its outer end opening in said central cavity and its inner end opening into the hollow of said body.

2. A digging head comprising a hollow body, pipe connecting means on one end of said body for connection to a pipe communicating with the hollow of said body, and a cluster of prongs projecting generally axially from the opposite end of said body and spaced circumferentially to form valleys between circumferentially adjacent prongs, the axial length of each of said prongs being at least a plurality of times as great as its circumferential extent, the outer edges of said prongs having their root ends substantially flush with the sides of said body and diverging from said body toward their tips, the tips of said prongs being oppositely beveled to form substantially sharp ridges extending radially of said body and inclined relative to a plane disposed perpendicular to the axis of said body, and a plurality of jet bores extending through said body having their outer ends opening in said valleys substantially midway between adjacent prongs and their inner ends opening into the hollow of said body.

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