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EARTH BIT DRIVER

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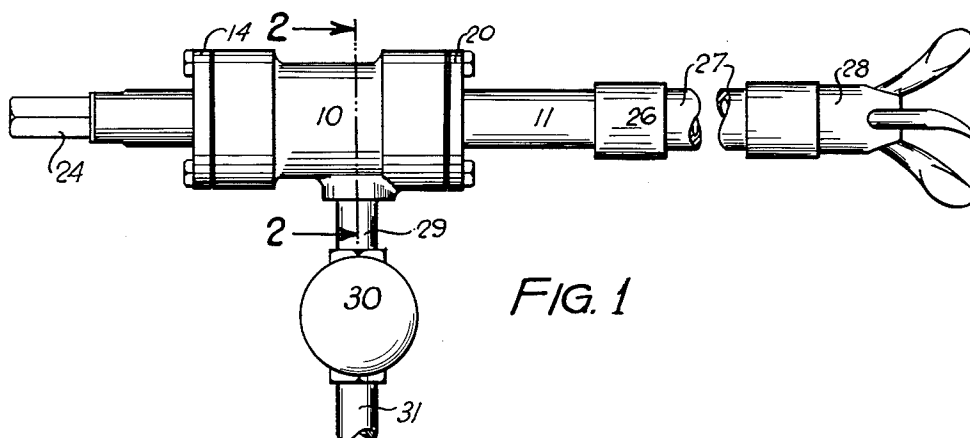


FIG. 1

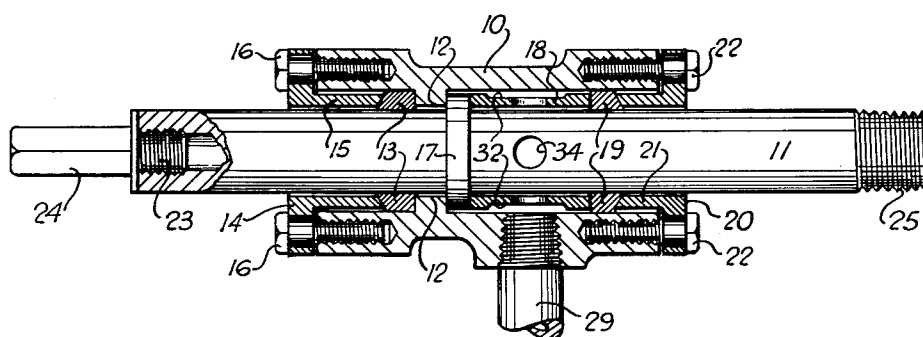


FIG. 3

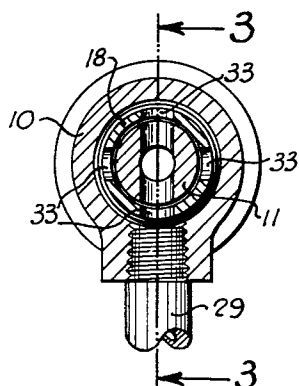


FIG. 2

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EARTH BIT DRIVER

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1 Claim. (Cl. 175-207)

Incident to the installation of subterranean gas and water supply lines, and the like, particularly those of smaller sizes, and to minimize occasion for trenching, it has become common practice to utilize a bit on and rotatable with the leading end of a pipe section under installation for the development of an earth bore accommodative of the pipe in reaction to rotation of the bit, whereby, as the bore is advanced, other pipe sections may be coupled to that carrying the bit until the desired full length of the line is completed in position of installation within a bore developed through rotation of the line. Advance of the bit for the generation of an earth bore that will freely accommodate the line under installation is facilitated by flow of water through the line carrying the bit and outwardly of the latter, and provision for supply of water to and through the line and bit is usual conventional practice. Rotation of the line under installation for bore-generating actuation of the associated bit is conventionally best accomplished through driving mechanism adapted for either manual or powered actuation and arranged for connection with a supply of water under pressure in a manner to effect delivery of water to the advancing end of the bore as the line and bit are caused to rotate, and it is to the provision of a novel and improved mechanism for effectively driving the bit and associated line to attainment of the purposes above set forth that the instant invention is directed.

A further object of the invention is to provide a novel and improved earth bit driver particularly adapted for operative association with conventional power units convenient of application thereto.

A further object of the invention is to provide a novel and improved earth bit driver of relatively small size, light weight, and high adaptability that is practical of use and manipulation under the usually adverse conditions wherein its operation is of advantage.

A further object of the invention is to provide a novel and improved earth bit driver uniquely organized for the continuous supply of water under pressure to and through driven elements in a practical and efficient manner.

A further object of the invention is to provide a novel and improved earth bit driver of relatively low power consumption and high facility of operation with respect to attainment of its purposes.

A further object of the invention is to provide a novel and improved earth bit driver that is amenable to convenient adjustment, maintenance, and rehabilitation throughout extended periods of efficient utility.

A further object of the invention is to provide a novel and improved earth bit driver susceptible of economical production in any desired range of sizes and capacities through the application of known facilities and techniques to readily-available materials and components.

With the foregoing and other objects in view, my invention consists in the construction, arrangement, and operative combination of elements as hereinafter set forth, pointed out in my claim, and illustrated by the accompanying drawing, in which—

FIGURE 1 is a side elevation of a typical embodiment of the invention as organized ready for practical use save for connection with a power unit, a portion of the view being broken away to conserve space.

FIGURE 2 is a transverse section, on a relatively-enlarged scale, through the organization according to

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FIGURE 1 taken substantially on the indicated line 2—2 of said latter view.

FIGURE 3 is a section, on the same scale as FIGURE 2, longitudinally and substantially axially of the organization according to the preceding views taken substantially on the indicated line 3—3 of FIGURE 2.

In the construction of the improvement as shown, the numeral 10 designates a generally-tubular barrel, of any appropriate rigid material, defining a bore opening axially therethrough in a diametric size exceeding that of a tubular member 11 adapted for rotatable accommodation therein. Inwardly adjacent one end of the barrel 10, the bore therethrough is restricted by an axially-narrow, inwardly-directed, integral, annular shoulder 12 surrounding and defining a circular opening coaxial with the principal bore of the barrel and of a size to revolvably journal the member 11. The member 11 is of a length to project at each end beyond the barrel 10 and is embraced adjacent the outwardly-directed side of the shoulder 12 by packing material 13 disposed to fill the space between said member and the principal bore of the barrel outwardly thereof in engagement with the shoulder 12, and a pressure plate 14, of a usual construction including a coaxial sleeve 15, loosely engages about the member 11 in adjustable coaction with the end of the barrel 10, as by means of cap screws 16, for the application of pressure to the packing 13 in a manner to compact the latter against the shoulder 12 and into sealing coaction with the member 11 thereby embraced.

At an appropriate point in its length, the member 11 is formed or provided with a fixedly-related, concentric collar 17 projecting radially thereof and outwardly therefrom as an annular rib narrow axially of the member and of a diameter freely rotatable with said member within the principal bore of the barrel 10. The collar 17 is adapted to bear at one of its sides against the side of the shoulder 12 remote from the packing 13 and to thereby limit axial displacement of the member 11 relative to the barrel 10 in one direction, and a tubular sleeve 18, preferably of appropriate friction-minimizing material, is formed to rotatably surround the member 11 in rotatable accommodation within the principal bore of the barrel 10 wherein it is mounted to bear at one end against the side of the collar 17 remote from the shoulder 12. At its end remote from the collar 17, the sleeve 18 is engaged by packing material 19 surrounding the member 11 under compression imposed by a plate 20 furnished with a tubular sleeve 21, said latter plate and sleeve being conveniently similar to or identical with the plate 14 and sleeve 15 at the other end of the barrel, which adjustably coacts with the otherwise open end of the barrel, as by means of cap screws 22, to complete a seal about the rotatable member 11.

The member 11 is expediently tubular throughout its length and the bore therethrough is closed at one end by means of a boss 23, or the equivalent, threadedly engaged therein to support an angularly-faced operating stud 24 connectible with and effective to transmit power from a hand-crank or other agency applicable to rotate the associated member, which stud 24 is mounted to project coaxially from the end of the member 11 extending outwardly through the plate 14. At its other end the member 11 is threaded, as at 25, for coaction with a coupling 26 thereby disposed exteriorly adjacent the plate 20, which coupling 26 serves for connection of pipe sections 27 terminating in an earth bit 28 coaxially to and for rotation with said member 11 as the latter is powered through the agency of the stud 24.

Supply of water under pressure to the driver shown and described is had through a nipple 29 engaged through and radially of the barrel 10 to deliver against the outer surface of the sleeve 18, which nipple is connectible at

its outer end, expediently through a control valve 30, in any practical manner with an available source or supply of water under pressure, the fragmentary portion 31 of a flow line indicated in FIGURE 1 representing any preferred arrangement for supply of water through the valve 30 to and through the nipple 29. The outer surface of the sleeve 18 is relieved by means of an axially-wide, shallow, annular channel 32 and through the floor of said channel an angularly-spaced series of holes 33 open to the exterior of the member 11 traversing said sleeve, the said holes 33 preferably being centered in a plane transverse of the sleeve which includes the axis of the nipple 29. Thus water entering the barrel 10 through the nipple 29 is accommodated in the channel 32 exteriorly about the sleeve 18 and in the holes 33 through said sleeve which open to the member 11, and delivery of the incoming flow to the interior of the member 11 is effected through one or more holes 34 radially intersecting the wall or walls of said member in centered registration with the holes 33 and nipple 29. As should be obvious, water supply to and through the barrel by the means shown and described is directed interiorly of the member 11 and associated coupling and pipe section components to and for escape outwardly from the bit 28, whereby to facilitate operation of the bit in a known and customary manner.

Organized as shown and described, the improved driver is compact and convenient for practical use in pits and trenches of minimum size from which a line may be advanced through actuation of the bit 28 with facility and economy in accordance with known practice. Through the agency of the stud 24, the driver may be operatively engaged with the driving component of an electric motor delivering through a speed reducer, which motor and reducer units are commonly available, for power rotation of the member 11 and associated agencies in an obvious and effective manner; supply of water through the nipple 29 under control of the valve 30 facilitating and expediting advance of the bit 28 as above set forth. Frictions and wear incident to rotation of the member 11 within the barrel 10 are largely concentrated on the packings 13 and 19 with consequent mechanical advantage and facility of compensating adjustment, the only metal-to-metal friction of consequence in operation of the driver being between the inner face of the shoulder 12 and the abutting side of the collar 17, which area of frictional contact is effectively cooled by the water flow through the unit to minimize its practical significance. The sleeve 18 may rotate with the member 11 within the barrel 10, about the member 11 in fixed relation with the barrel 10, or both; the friction-minimizing material from which the sleeve is constituted, its revolubility with respect to the barrel 10 and member 11, its mounting between the collar 17 and packing 19, and its exposure to a cooling flow of liquid, all conducing to minimum wear of the operating elements of the driver, to consequent long life of practical and efficient utility characterizing the driver, and to convenience of unit rehabilitation, when requisite, through simple replacement of the sleeve 18 and packings 13 and 19.

Since changes, variations, and modifications in the

form, construction, and arrangement of the elements shown and described may be had without departing from the spirit of my invention, I wish to be understood as being limited solely by the scope of the appended claim, rather than by any details of the illustrative showing and foregoing description.

I claim as my invention:

An earth bit driver comprising a barrel formed with a tubular bore and an integral, axially-narrow, annular shoulder intruding radially of said bore inwardly adjacent one end of the barrel to therein define a circular passage of restricted size relative to and coaxial with said bore, said shoulder having plane, annular end walls radial of the barrel and its bore, a tubular member longer than said barrel rotatably journaled in and through the passage of said shoulder and extending coaxially of said bore through and outwardly beyond each end of the barrel, an annular collar fixedly and exteriorly embracing said member in a size rotatably receivable within said bore, said collar having plane, annular end walls radial of the associated member and being disposed axially of the latter for end wall coaction with the side of said shoulder innermost of the barrel when the member is engaged through and to extend at each end outwardly beyond the barrel, whereby to limit displacement of said member in one direction axially of the barrel, a stuffing box closing the end of said barrel at the side of said shoulder remote from said collar in radial sealing compression about said member and thrust reaction against the side of the shoulder outermost of the barrel, a tubular sleeve formed with an exterior circumferential channel and holes opening radially therethrough loosely and revolubly embracing said member within the barrel in end-bearing engagement against the side of said collar remote from said shoulder, a stuffing box closing the end of the barrel adjacent the end of said sleeve remote from the collar in radial sealing compression about said member and thrust reaction against the opposed end of said sleeve, whereby to limit displacement of said member in a direction axially of the barrel tending to separate said collar from the shoulder, a flow passage radially of said member adapted to register as an incident of member rotation with the holes radial of said sleeve, means for the input of water under pressure radially through said barrel and to the channel circumferentially of said sleeve, a stud connectible in driven relation with a source of power coaxially and detachably closing the end of said member at the side of said collar remote from said sleeve, and means at the opposite end of said member for separably coupling tubular lengths coaxially thereto.

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