No. 833,055.

PATENTED OCT. 9, 1906.

C. A. HUFFMASTER.

PIPE LAYING MACHINE.

APPLICATION FILED NOV. 23, 1905.

2 SHEETS—SHEET 1.

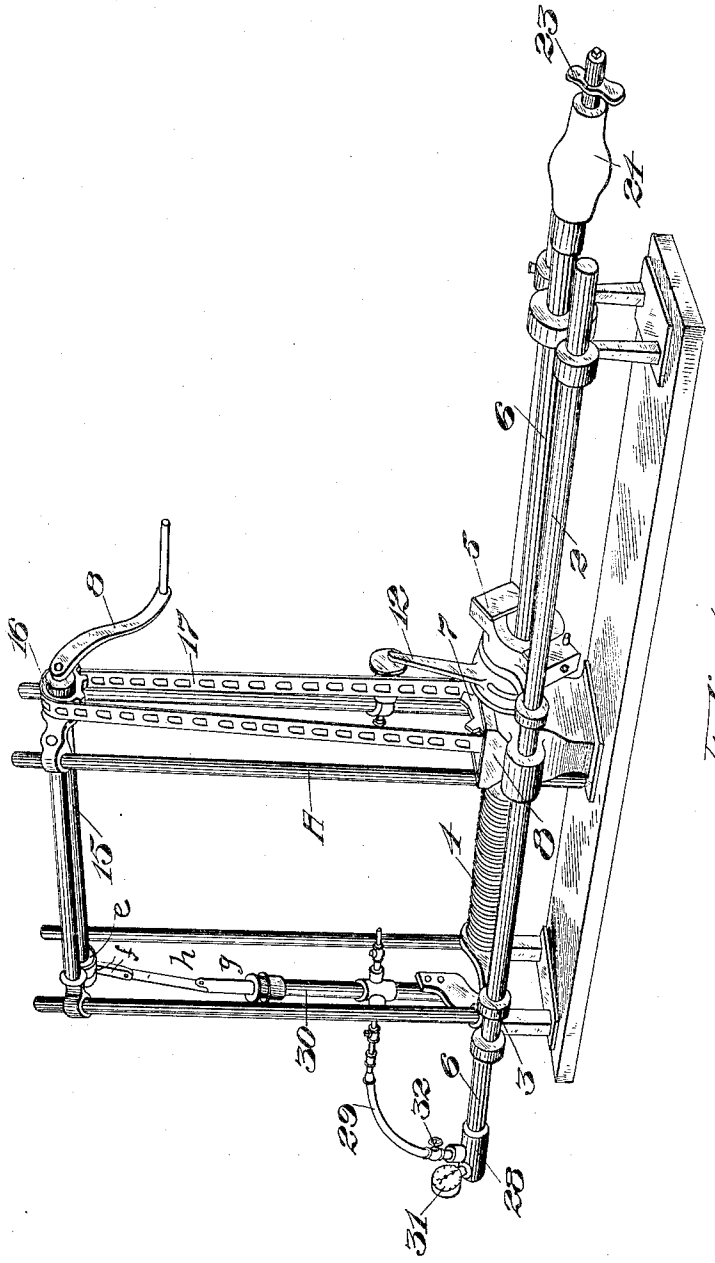


Fig. 1.

Witnesses.
T. Eastberg.
J. Turner

Inventor
Charles A. Huffmaster
By Geo. H. Strong. Atty.

No. 833,055. PATENTED OCT. 9, 1906.

C. A. HUFFMASTER.

PIPE LAYING MACHINE.

APPLICATION FILED NOV. 23, 1905.

2 SHEETS—SHEET 2.

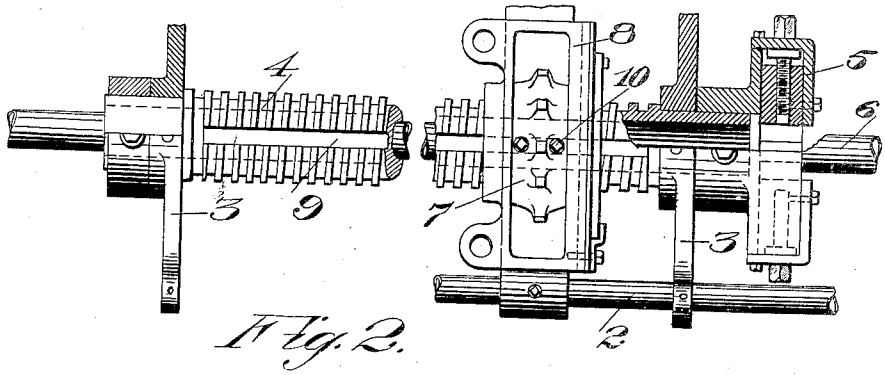


Fig. 2.

Fig. 3.

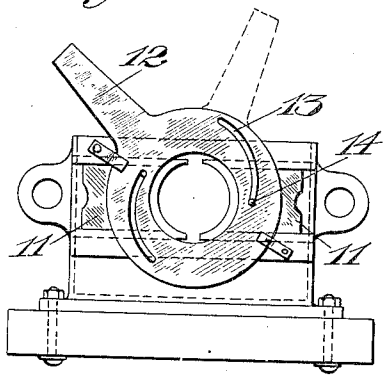


Fig. 4.

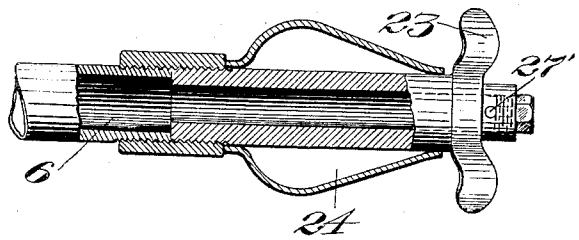
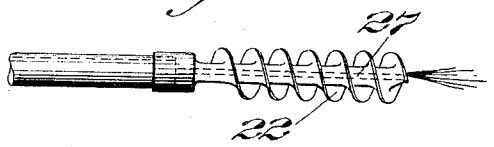


Fig. 5.



Witnesses.
E. Eastberg.
J. Shaw

Inventor.
Charles A. Huffmaster
By Geo. H. Strong. Atty

UNITED STATES PATENT OFFICE.

CHARLES A. HUFFMASTER, OF SAN LEANDRO, CALIFORNIA.

PIPE-LAYING MACHINE.

No. 833,055. Specification of Letters Patent. Patented Oct. 9, 1906.

Original application filed September 15, 1904, Serial No. 224,552. Divided and this application filed November 23, 1905. Serial No. 288,705.

To all whom it may concern:

Be it known that I, CHARLES A. HUFFMASTER, a citizen of the United States, residing at San Leandro, in the county of Alameda and State of California, have invented new and useful Improvements in Pipe-Laying Machines, of which the following is a specification.

My invention relates to pipe-laying machines whereby the pipe is driven horizontally underground by rotating it on its own axis. Its object is to provide means in connection with the boring appliances to expand the hole in advance of the pipe and to plaster the walls of the hole with the mud formed by the loosened earth and the water, so that the pipe may be easily fed forward.

The invention consists of the parts and the construction and combination of parts, as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a perspective view of my improved pipe-laying machine. Fig. 2 is a plan view, in partial section, of pipe-grip and feed-screw. Fig. 3 is an elevation of contractible and expansible feed-nut. Fig. 4 is a section of boring-tool and follower or expander. Fig. 5 shows a modified form of boring-bit.

A represents a suitable portable frame supporting the boring and driving mechanism and capable of being introduced into and operated in a comparatively narrow space. Fixed to and carried by the frame are two longitudinal parallel tracks or guides 2, on which the cross-heads 3, forming a carriage for the hollow or tubular screw 4, are reciprocal. The screw is journaled at its ends in these cross-heads, whereby it may have a rotary movement in addition to its longitudinal movement on the tracks or guides 2. The forward end of the screw is provided with a grip 5, adapted to grip a drill rod or pipe section, as 6, acting as a drill-rod.

7 is a sprocket-wheel concentric with the screw and journaled in a part 8, stationary on the frame and intermediate of the ends of the guides 2. The screw has a longitudinal peripheral groove or keyway 9, in which a key carried by the sprocket engages, and which key is secured by suitable means, as the set-bolts 10. By means of the key engaging the groove 9 the screw is made to rotate in unison with the sprocket, at the same time leaving the screw to have a free sliding longitudinal movement through the sprocket.

The reciprocation of the screw in boring is effected on its rotation by means of suitable parts on the frame engageable and disengageable at will with the threads of the screw.

I have shown, Fig. 3, a chuck or expansible nut comprising two plates 11, slidable in suitable guides at right angles to the axis of the screw and adapted when moved inward to engage the threads of the screw and when moved outward to release the screw. The reciprocation of the plates 11 is effected by a lever 12, fulcrumed coaxially with the screw and having the eccentric slots 13 engaging pins 14 in the respective plates. An oscillation of the lever in one direction closes the clutch to make the screw reciprocate consistent with its rotary movement, as in boring. An oscillation of the lever in the opposite direction opens the clutch to free the screw and allow it to slide through the sprocket, as where it is desired to quickly retract the screw and its carriage in order to take a fresh hold on the drill rod or pipe or to receive a new section of pipe, as will be more fully explained later.

Any suitable means may be employed to rotate the screw. As shown, a shaft 15, suitably journaled on the frame, carries a sprocket 16, over which passes a chain 17 to sprocket 7. A hand-crank 18 serves to rotate shaft 15.

In practice an excavation is made large enough to receive the machine and leave room for its operation and for sections of pipe to be passed lengthwise through the screw.

Either separate drill-rod sections or sections of the pipe to be laid may be passed successively through the hollow of the screw, united to the section immediately in advance, clamped in the grip 5, and driven forward, the foremost section being provided with a suitable bit or auger.

In most cases it is preferred to bore the hole and lay the pipe simultaneously, forcing the pipe forward as the boring proceeds. In such cases the pipe-sections themselves constitute the drill-rod.

Where small pipes—say up to an inch and a half or two inches in diameter—are to be laid, I may employ an auger, as 22, attached directly to a pipe-section, and the pipe forced

forward and laid section after section as the boring proceeds. For a little larger pipe or pipes—say from two to four inches in diameter, more or less—I prefer to use a boring-tool, as 23, Figs. 1–4, having radial bits and a concentric sleeve or follower 24 immediately rearward of the bits, designed to force the loosened earth outward and plaster it over the sides of the hole.

When the boring has proceeded a screw length, the lever 12 is operated to release the screw, the grip 5 is opened to ungrip the pipe, and the screw is pushed or pulled back to bring its forward end close to the sprocket 7. The grip 5 may then be closed on the pipe, the plates 11 reëngaged with the screw, and the boring and pipe-laying may again proceed a screw length or until a new section of pipe has to be added.

With whatever form of boring-tool or bit used it is designed that water be fed to the bit as the boring advances. Accordingly the auger 22, which screws directly onto the end of the pipe, is channeled, as at 27, so that water may pass through and serve to soften the earth about the tool and make the sides of the hole slippery, whereby the pipe may easily follow after.

In Fig. 4 the boring-tool 23 has a hollow shank screwing onto the pipe or drill-rod, and the follower 24 is loosely turnable on the shank and is preferably oval or pear shape and tapered somewhat toward its forward end and of a diameter equal to that of the finished hole to be bored and somewhat larger than the pipe, so that the latter will feed forward easily. Water is fed in advance of the boring-tool through channels 27′, connecting with the passage in the shank and through the shank with the pipe 6.

Water under pressure may be delivered into the pipe and to the bits by the following means: The outer end of the last section of pipe 6 carries a union 28, having a flexible connection 29 with a suitable force-pump 30, operated in unison with the screw-feed. The pump may be operated from shaft 15 by a suitable means. In the drawings I show the pump as operated by an eccentric *e* on the shaft 15, said eccentric having its strap *f* connected to the pump piston-rod *g* by means of a pivoted link *h*.

The pump is connected with a suitable source of water-supply, and its object is to deliver water to the drill to soften the ground and in some instances to maintain an internal pressure in the pipe, operating as a drill-rod, to help to hold the pipe stiff and keep it from possibly buckling and, again, in other instances to permit of the pipe being tested when laid. For this latter purpose preferably a gage 31 is connected with the union 28 and the flow of fluid to the gage and to the interior of the pipe controlled by a cock 32.

By removing the bit or auger on the end of the pipe, capping the end of the latter, and opening the chuck-plates 11 the pump may be operated without moving the pipe. When a sufficient pressure is indicated by the gage 31, the pump may be stopped and the cock turned off. If the register of the gage is maintained, the joints of the pipe are tight and well made. If the gage runs down, it indicates a leak which may be corrected before laying the pipe or forcing it farther forward, or in lieu of the force-pump and water-gage a steam-gage connected with a steam or air pressure supply may be used as an indicator for testing.

By the operation of a bit such as shown in Fig. 4 the mud that is formed by the action of the bits and water is pressed outward by the sleeve or follower 24, with the result that an open conduit with smooth plastered walls may be formed, into which, if desired, the pipe may be pushed after the withdrawal through the other end of the hole of the boring-tools.

By means of a boring-tool with a sleeve or follower of this character designed to operate immediately behind the bits and to push the loose earth outward radially one may bore a hole of considerable size and leave all the dirt in the hole.

This application is a division of my original application, Serial No. 224,552, filed September 15, 1904, for an improvement in pipe-laying machines.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a pipe-laying machine, the combination with a pipe to be laid of an auger on one end of said pipe and means for advancing said pipe, said means including a suitably-supported rotary section and means associated with and loosely mounted relative to the auger for forcing the earth loosened by the auger outward radially of the hole bored.

2. An earth-auger having in combination with its cutting edges, a follower disposed rearward of its cutting edges and loosely turnable on the shank of the auger, and adapted to press out radially the earth loosened by the cutting edges.

3. An earth-auger having cutting edges and a rotatable tapered follower disposed behind the cutting edges.

4. An earth-auger comprising a shank portion, cutting edges and rotatable follower coaxial with said shank portion and tapered in the direction of the cutting edges.

5. In a pipe-laying machine, the combination of an earth-auger having a hollow shank, a follower loosely turnable on said shank, a hollow support for said shank, means for advancing and rotating said hollow support, and means for delivering water through said support to the cutting end of the auger.

6. In a pipe-laying machine, the combination with a pipe to be laid, of a screw for advancing the pipe, guides arranged parallel with the screw and pipe, a gripping member slidably engaging said guides and adapted to grip and release the pipe, a supporting-framework, a shaft journaled therein, a sprocket-wheel concentric with the screw and a sprocket-wheel on said shaft, a sprocket chain extending between the sprocket-wheels, a force-pump, connections between the pump and the pipe-section, and connections between the pump and the shaft whereby the pump and screw are operated in unison.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES A. HUFFMASTER.

Witnesses:

M. GEISENHOFER,

C. SHADDOCK.