

Oct. 4, 1932.

A. W. SPAULDING

1,881,101

EARTH AUGER

Filed June 20, 1929

4 Sheets-Sheet 1

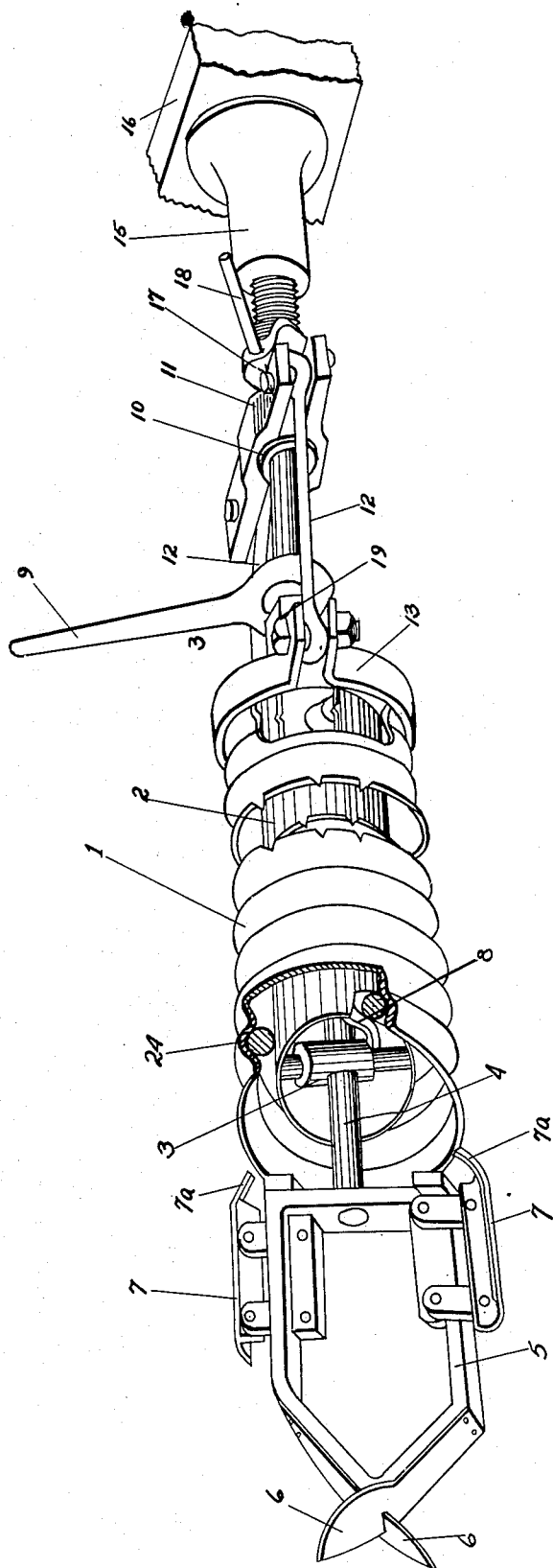


Fig. 1.

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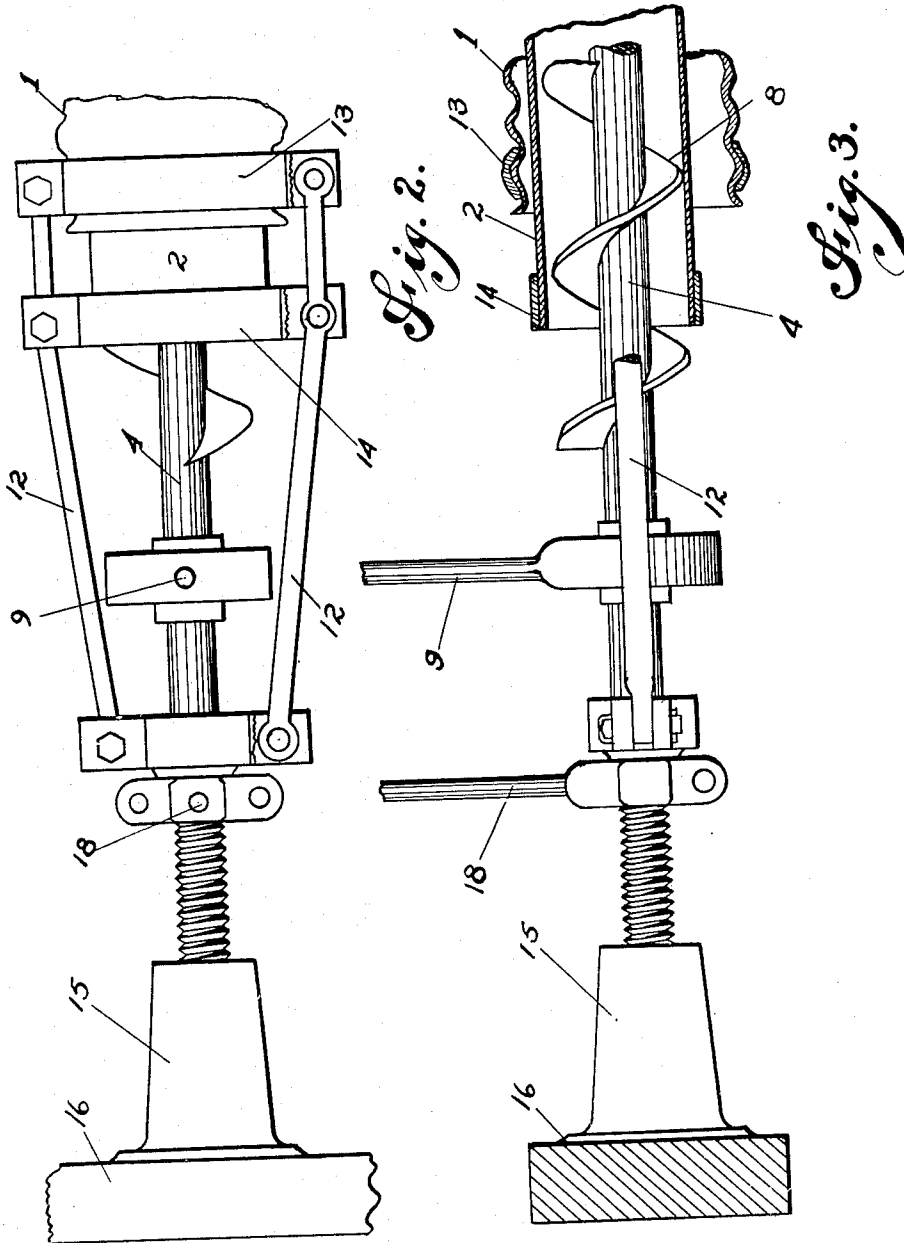
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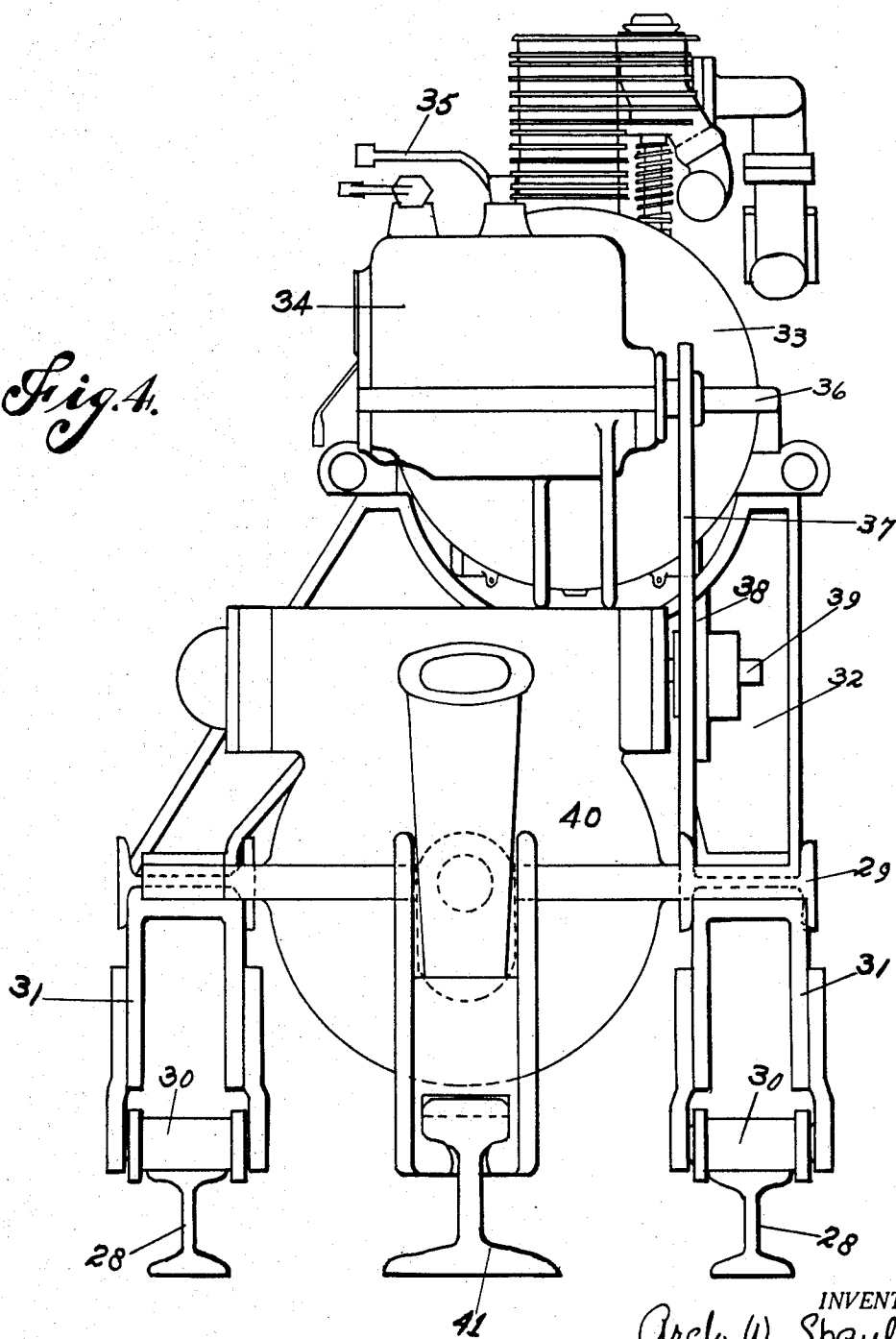
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Fig. 4.



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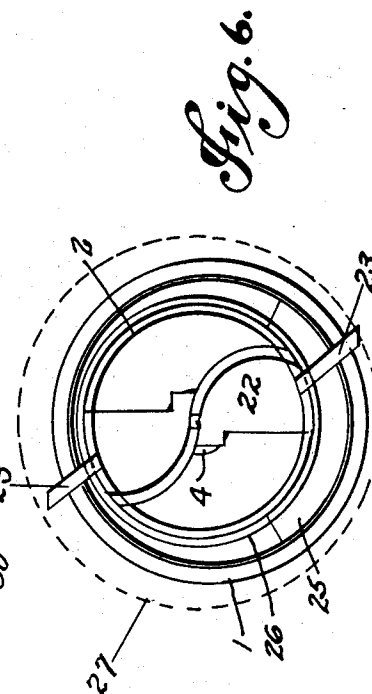
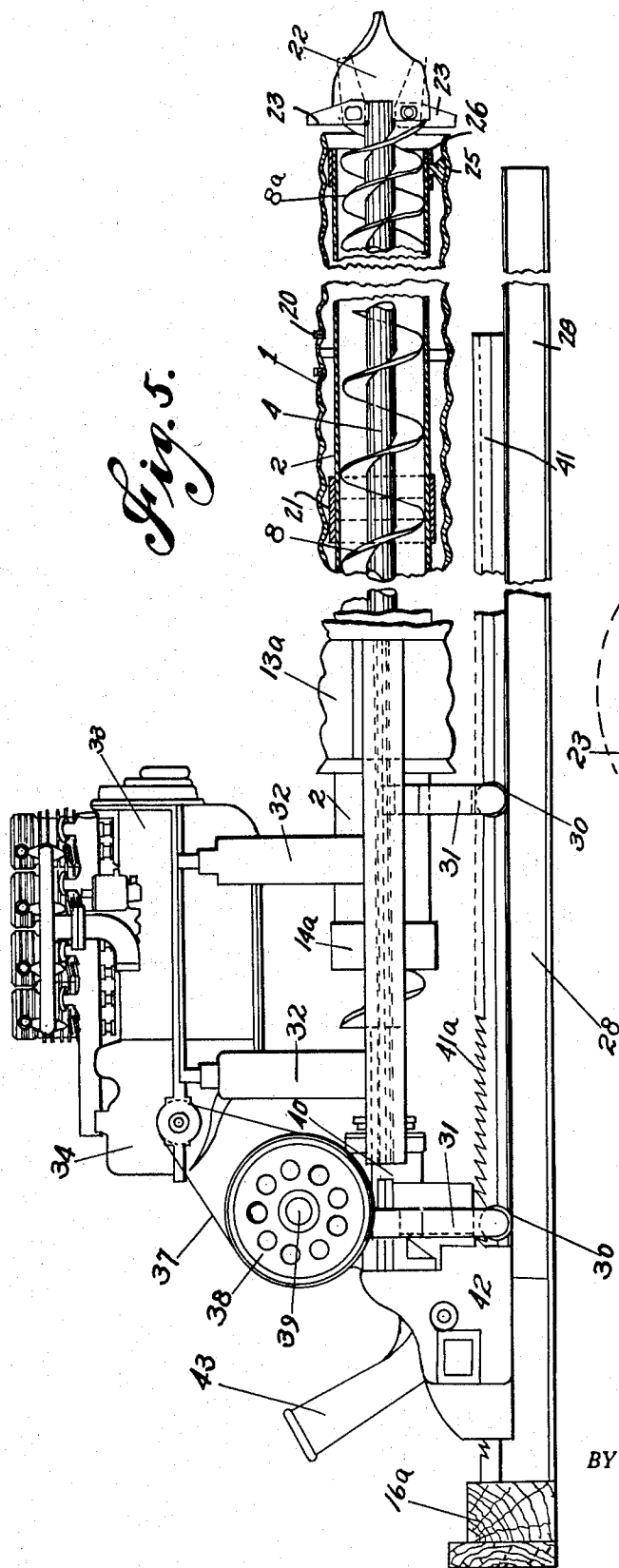
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UNITED STATES PATENT OFFICE

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EARTH AUGER

Application filed June 20, 1929. Serial No. 372,428.

My invention is directed primarily to the placing of pipes in the earth by drilling a hole therein with an auger; and its most important application is to the installation of corrugated iron pipe. This application is a continuation in part of my former application Serial No. 263,918, filed March 22, 1928.

My process is particularly useful where the present trench methods of installing pipes are not desirable. Under existing embankments, paved streets or highways, railroad fills and the like, where the surface must not be disturbed, or the stream of traffic interrupted, trench methods of pipe installation are disadvantageous, if not impossible. With my process and apparatus, it is practicable to install subterranean pipe over reasonable distances without disturbing the surface, and at much less cost, particularly in places where a trench would have to be quite deep. My apparatus is also especially adapted for installing perforated, corrugated pipes to drain water pockets, landslides and other unstable soil conditions, where only one end of the pipe will be exposed, the other being located possibly in the center of a high embankment or deep into the soil of a land-slide, where an open trench would invite additional movement of an already unstable soil condition.

It is an object of my invention to provide an earth auger for pipe installation, which can be withdrawn or advanced through the pipe, and which will carry the pipe into the earth with it.

It is a second object of my invention to provide a construction such that the pipe will not turn with the auger, nor exercise any excavating function. In this way, I avoid the removal of the galvanized coating on a culvert by attrition against the earth in a boring operation, or by the abrasion of excavated materials carried back through it.

It is still another object of my invention to provide an auger, which will cut a hole larger than the pipe through which it has been advanced, and which it carries with it.

It is still another object of my invention to provide means whereby the culvert may be advanced along a substantially level floor

into the cut made, so that the cut and the culvert will not tend substantially to follow a curved path downwardly, or bind in the hole being cut.

It is still a further object of my invention to provide a novel mechanism for the accomplishment of these things, including means for operating the auger, and means for advancing the boring mechanism and the culvert into the hole.

These and other objects of my invention, which may be pointed out hereinafter, or will be apparent to those skilled in the art upon reading these specifications, I accomplish by that certain construction and arrangement of parts to be hereinafter more specifically pointed out and claimed, reference being had to the drawings, which accompany this specification.

In the drawings:

Figure 1 is a perspective view of a hand operated form of my device.

Figure 2 is a plan view of the driven end of said hand operated type of my mechanism.

Figure 3 is a side elevation, with parts in section.

Figure 4 is an end elevation of a complete motor driven machine for installing corrugated culverts.

Figure 5 is a sectional side elevation of the motor drive and advancing means of the example of Figure 4.

Figure 6 is an elevation of the end which enters the earth, showing the auger bit and reamer.

Broadly speaking, I provided an auger adapted to bore a hole in the earth through which a pipe or culvert may be advanced. I equip this auger with reamers adapted to enlarge the hole so that it is greater in diameter than the outside diameter of the pipe to be installed. I provide a shaft to operate the auger, and a tube surrounding this shaft to convey away the earth and gravel, which is loosened thereby. This tube is adapted to fit within the pipe to be installed, and I provide means for advancing the pipe and the tube, and means for operating the auger.

Referring to Figure 1, numeral 1 indicates a corrugated pipe or culvert to be installed, let us say in a fill. I provide a tube 2 of such a diameter as will fit within the culvert, which tube may in this instance be provided with internal bearings 3, supporting a shaft 4, which extends from either end of it. Upon the end adapted to enter the earth I position an auger having in the form shown a frame 5, to which are attached blades 6. Expansible reamers 7 are linked to and extended out past opposite sides of the frame, as will be clear from the drawings, and the construction of these reamers is such that when contracted, their distance apart will not be greater than the inside diameter of the culvert, whereby the entire auger may be withdrawn through the culvert, if desired. To assist in the contraction of the reamer blades, I provide turned-in ends 7a thereon, which are adapted to enter the culvert even when the reamers are in expanded position. The shaft within the tube 2 may be provided with a spiral conveyor 8. Outside the culvert, a ratchet operating lever 9 is fastened to the shaft, so that it may be turned by hand power. A thrust bearing 10 is held in a yoke 11, having arms or links 12, attached to a collar 13, clamped to the culvert 1. It is preferable, however, as shown in Figures 2 and 3, to provide a second collar 14, which may be clamped to the tube 2, so that the tube may be positively advanced as well as the culvert. Inasmuch as the corrugated construction of culverts, although giving great transverse or compressive strength, provides an accordion-like resiliency endwise of the culvert, and a liability to collapse, the strain of advancing the mechanism, exclusive of the shaft and auger should not preferably be placed upon the culvert alone. In the use of my device, the culvert will be lined up in the proper position, so that upon the rotation of the shaft, the auger may bite into the earth; and to advance the auger the depth of the culvert, I provide a jack 15, which bears against an abutment 16, provided for the purpose, and which also bears with its head 17 against the yoke 11. Means are provided for operating the jack, as by a lever 18, all as will be well understood.

In the embodiment of Figure 3 I have not shown bearings within the tube 2, and these may or may not be provided, depending upon conditions, such as the length of culvert to be installed, and the diameter thereof. Particularly for small diameter culverts, which are not to be installed for great lengths, no bearings need be provided within the tube 2. It is contemplated that shaft and tube sections, equipped or not with bearings, and with a spiral conveyor, may be made as standard sections for a given size of culvert, and may be joined one on the other, as the work of installation progresses, and additional cul-

vert sections are added. A connecting device is indicated at 19 in Figure 1, and may comprise any well known device for connecting sections of shafting, such as a collar equipped with key-ways or set-screws. As new culvert sections are added, they will be joined to the old in any way desired, as by the use of the common culvert joining clamp, or collar, indicated at 20 in Figure 5. Sections of the tube 2 may be joined together by screw nipples or collars 21.

Figures 5 and 6 show a different type of auger than that of Figure 1, though comprising essentially the same elements. It has a blade 22, tapered and curved (see Figure 6), and provided with sharp cutting edges. Collapsible reamer blades 23 are, in this instance, hinged to the main auger blade itself. In the operation of the auger, the earth will tend to expand these reamers, but when the auger is withdrawn through the culvert, they will strike the end thereof, and be knocked down into collapsed position. It is sometimes advantageous to provide a section of spiral conveyor 24, which is double adjacent the bit, rather than single, as elsewhere, since this facilitates the initial movement of the earth.

My invention contemplates the supporting of the pipe 2, and the cutting mechanism within the culvert. This may be done by a ring 24 in Figure 1, or by means of a support 25 in Figure 5, which has a tongue bearing in a groove 26 in the end of the tube. It is not necessary absolutely to close the space between the culvert and the tube, but it is desirable to arrange so that the tube carries all of the dirt and materials loosened by the auger bit. In this way there is no attrition upon the corrugated culvert. Furthermore, my invention contemplates the supporting of the tube 2 and the cutting mechanism eccentrically within the culvert 1. The purpose of this is to make a cut, upon the floor of which the culvert may lie without bending. The position of the cut with reference to the culvert is clearly shown by the dotted line 27 in Figure 6. It is desirable to have the reamer blades 23 cut a hole considerably larger than the internal diameter of the culvert; but if the cutting is done concentrically with the culvert, the culvert will continuously tend to ride down onto the bottom of the cut, and as the work progresses, it will either follow a path curving downwardly into the fill, or will tend to bind greatly. By arranging the mechanism to cut eccentrically of the culvert, I find I can push the culvert along upon a level floor, and make my excavation and installation without substantial curvature or binding.

Figures 4 and 5 illustrate a motor driven installation, which may comprise the same shaft 4, tube 2, culvert 1, conveyor 8 and 8a, and bit 22. Rails 28 are laid in alignment

with the excavation which is to be made, and are spiked to appropriate supports. A main framework 29 is supported upon these rails by means of rollers or wheels 30 in feet 31.

5 The main framework bears standards 32, which carry a motor. In this instance, a gasoline motor 33 of the air cooled variety is shown, having a transmission or gear box 34, controlled by a shift lever 35, and a work
10 shaft 36. Power from this work shaft is transmitted as by means of a chain 37 to a sprocket 38 on a shaft 39. This shaft, through a gear box 40, transmits power as
15 desired to the shaft 4. A collar 14a clamps the tube 2 to the framework, and another collar 13a clamps the culvert to the framework. Another rail 41 is spiked to the sup-
20 ports centrally of the two rails 28, and at the rear of the device, this rail comes against the abutment 16a, which is made suitably strong to bear the thrust. The upper side
25 of this rail is notched as at 41a, and a jack 42, having an operating lever socket 43, operates upon the rail 41, and bears against the gear box 40. It will now be understood
30 that this gear box contains a thrust bearing for the shaft 4. An operation of the jack 42 will tend to advance the entire mechanism along the rails 28, as will be clear.
33 It will be evident that modifications of my invention may be made by those skilled in the art, without departing from the spirit of it.

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

1. In an earth auger, a pipe, a boring shaft passing through said pipe and journaled in bearings therein, an auger bit on the end of said boring shaft, said auger bit provided with expansible reamer blades, said
40 shaft within said pipe bearing a spiral conveyor to convey the earth loosened by said auger bit through said pipe, and means for supporting the pipe in a conduit to be installed eccentrically of the latter.

2. In an earth auger for installing pipes, an auger bit and shaft therefor, a pipe to be installed, and a hollow member encircling said shaft, about which hollow member the
50 pipe is placed, said shaft provided with a conveyor operating in said hollow member, means for rotating said shaft and means for advancing said shaft and said auger bit, and means for supporting said shaft, and said
55 auger bit, eccentrically of said pipe.

3. In an earth auger for installing pipes, a hollow member about which a pipe may be placed, a drill shaft passing through said hollow member, an auger bit on the end of
60 said drill shaft, means for progressively rotating said drill shaft without rotating said hollow member, means for advancing said drill shaft and said auger into the earth, and means for advancing the pipe with said
65 auger and means for holding said hollow

member and said shaft eccentrically of said pipe.

4. In an earth auger, a pipe, a boring shaft passing through said pipe and journaled in bearings therein, an auger bit on the end of
70 said boring shaft, said auger bit provided with expansible reamer blades, said shaft within said pipe bearing a spiral conveyor to convey the earth loosened by said auger
75 bit through said pipe, and means for holding said shaft eccentrically of said pipe, for the purpose described.

5. In an earth boring tool, an auger bit and shaft, a conveyor on said shaft, and a tube surrounding said conveyor, a pipe to be installed surrounding said tube, means
80 for holding said pipe eccentrically of said shaft, expansive reamer blades on said auger bit, whereby said auger bit will cut a hole larger than the diameter of said pipe, a
85 frame, connections between said frame, said tube and said pipe, rails and means for mounting said frame, whereby it may be advanced along said rails, a motor mounted on said frame, power connections between
90 said motor and said shaft, and means for advancing said frame along said rails.

6. In an earth boring tool, an auger bit and shaft, a conveyor on said shaft, and a tube surrounding said conveyor, a pipe to be
95 installed surrounding said tube, means for holding said pipe eccentrically of said shaft, expansive reamer blades on said auger bit, whereby said auger bit will cut a hole larger than the diameter of said pipe, a frame, con-
100 nections between said frame, said tube and said pipe, rails and means for mounting said frame, whereby it may be advanced along said rails, a motor mounted on said frame, power connections between said motor and
105 said shaft, and means for advancing said frame along said rails, said means comprising a third parallel rail having notches and bearing against an abutment, a jack bearing against said frame and operating upon the
110 notches in said third rail, said frame supporting a thrust bearing for said shaft.

7. In an earth boring tool for the installation of culverts, rails in alignment with the cut to be made, a framework supported on
115 said rails, a culvert section clamped to said framework, a tube within said culvert section, and also clamped to said framework, a shaft bearing a conveyor within said tube, an auger bit fitted with expansive reamers
120 on the end of said shaft, extending beyond said culvert, a thrust bearing for said shaft in said frame, a motor mounted on said frame, means for transmitting power from said motor to said shaft, and means for advancing
125 said frame along said rails.

8. In an earth-boring machine to make a substantially non-vertical bore and to be operated through a pipe which is to be left in the bore, and comprising boring means to ex-
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tend through the pipe, a conduit to surround the boring means inside the pipe with open ends near respective ends of the pipe for passage of borings and having means to engage the pipe so as to hold the conduit and the boring means with the effective axis of the boring means above the central axis of the pipe, driving means at one end of said boring means for operating said boring means, and means at said end for positively and simultaneously advancing the boring means, the conduit and the pipe into the earth.

9. In an earth-boring machine to make a substantially non-vertical bore and to be operated through a pipe which is to be left in the bore, and comprising boring means to extend through the pipe, means to engage the pipe and the boring means to hold the boring means with its effective axis above the central axis of the pipe, driving means at one end of the boring means for operating said boring means, and means at said end for positively and simultaneously advancing the boring means and the pipe into the earth.

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