No Model.)

W. E. EVERITT.

EARTH BORING AND DRILLING MACHINE.

No. 547,601. Patented Oct. 8, 1895.

Fig.1

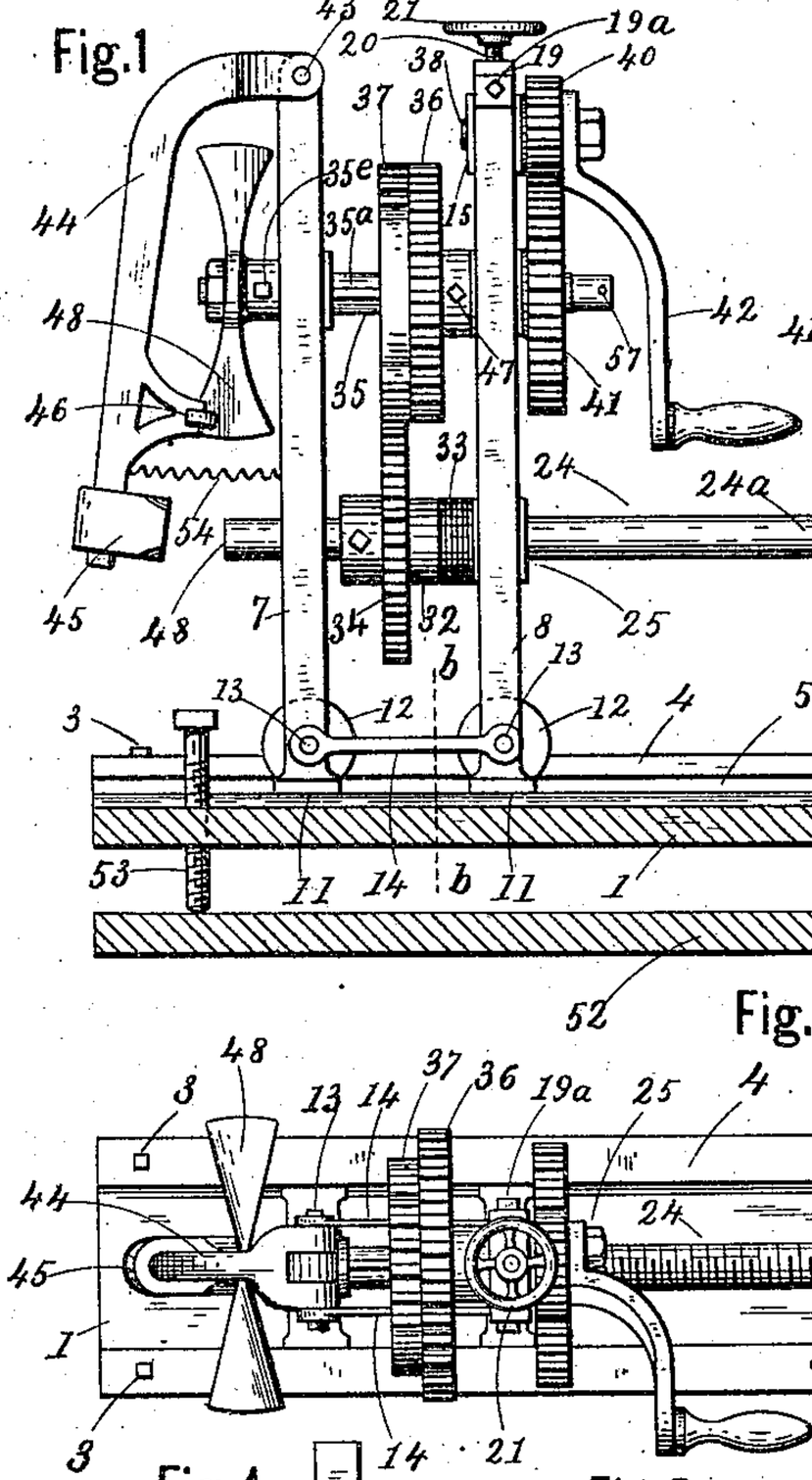


Fig.2

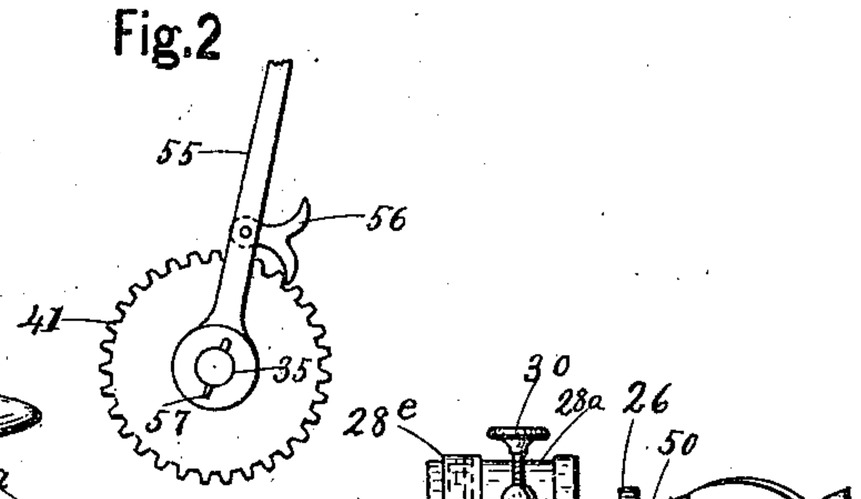


Fig.3

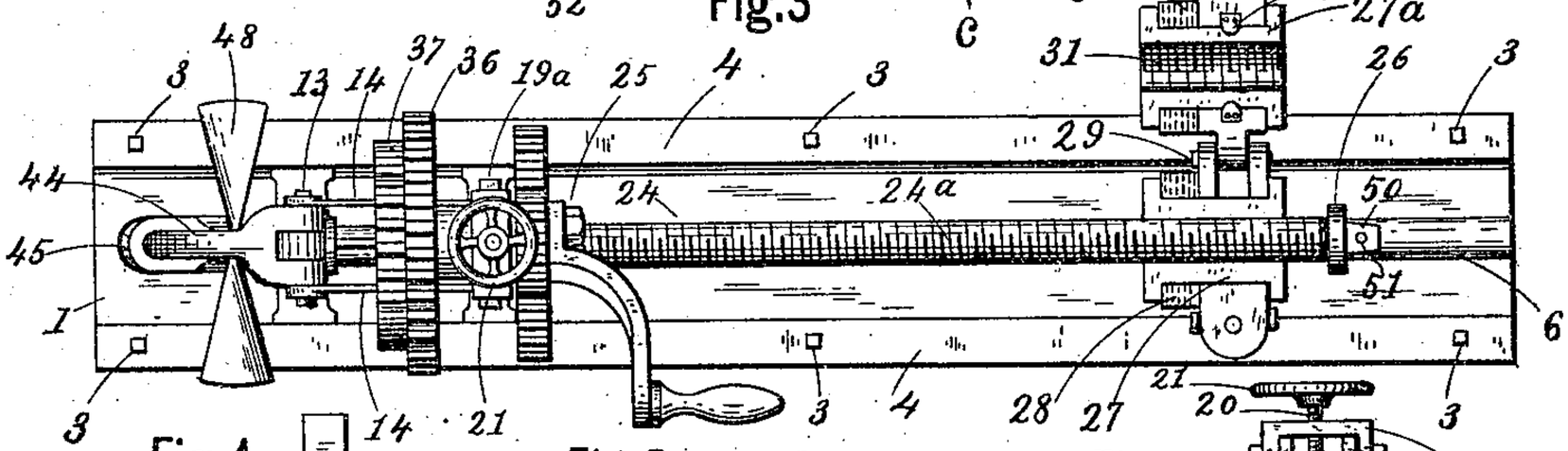


Fig.4.

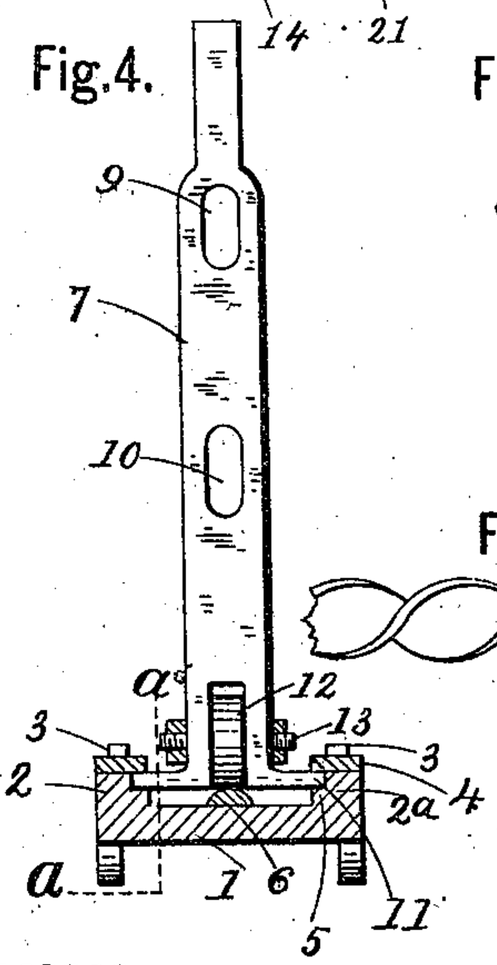


Fig.5.

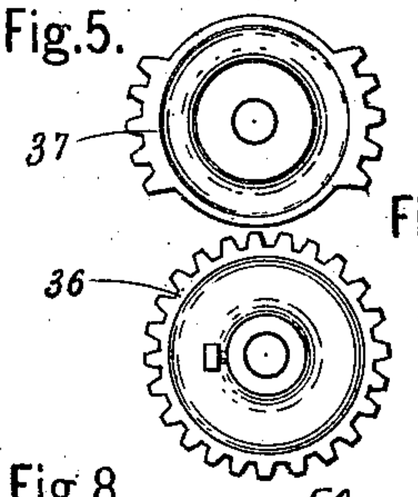


Fig.6

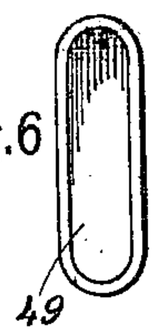
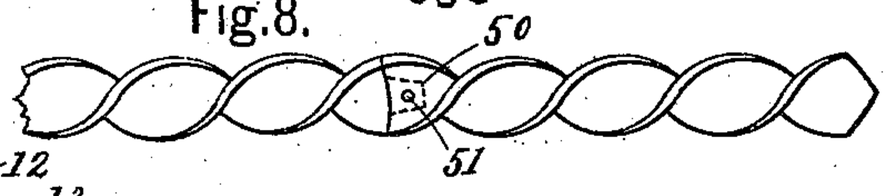


Fig.7.

Fig.8.



Witnesses.

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UNITED STATES PATENT OFFICE.

WALTER E. EVERITT, OF BUFFALO, NEW YORK.

EARTH BORING AND DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 547,601, dated October 8, 1895.

Application filed August 2, 1894. Serial No. 519,253. (No model.)

To all whom it may concern:

Be it known that I, WALTER E. EVERITT, a citizen of the United States, residing in Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Earth Boring and Drilling Machines, of which the following is a specification.

My invention relates to an improved machine for boring long distances into the earth at any desired angle, or under a street-pavement, or for other purposes for which it may be adapted, and it will be fully and clearly hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the machine complete, a vertical longitudinal section being cut through the base in or about line *a a*, Fig. 4. Fig. 2 is a detached front elevation of the ratchet-gear and removable arm and ratchet-pawl for operating it. Fig. 3 is a top plan view of the machine complete, showing the upper half of the screw-bar supporting-box open. Fig. 4 is a vertical transverse section in or about line *b b*, Fig. 1, cutting through the base and showing a front elevation of the rear vertical supporting frame-piece. Fig. 5 is a detached front elevation of the intermittingly-operating gear. Fig. 6 is an enlarged rear end view of one of the auger-bars, all parts beyond the socket being omitted, showing the open end of the bar and substantially its form. Fig. 7 represents a vertical cross-section through the base of the machine in or about line *c c*, Fig. 1, showing a front elevation of the forward vertical supporting frame-piece, the gearing and other parts being omitted. Fig. 8 is a side elevation of one of the auger-bars, showing a portion of another bar connected thereto.

Referring to said drawings in detail, 1 represents the base of the machine. It is preferably constructed of iron and is provided with a raised portion extending lengthwise at each side 2 and 2^a. On the top of the raised portions 2 and 2^a is secured by bolts 3 a flat strip 4, thereby leaving a groove 5 in which the supporting-pieces of the upright frames slide. (See Figs. 1, 3, and 7.) In the longitudinal center of the base is a strip of half-round iron 6, secured with its flat face down on the base by bolts or other well-known means, the use of which will appear farther on.

The upright-frame pieces 7 and 8 are preferably made of wrought-iron, but any well-known suitable material may be used. The rear frame 7 is provided with two elongated openings 9 and 10 and with two laterally-projecting foot-pieces 11, which project into the slideways 5 to support it in a vertical position and allow it to slide freely therein.

Near the base of the frame-piece 7 is pivoted a roller 12, which rests on the top of the half-round bar 6 and travels back and forth with the frame-piece 7. The vertical front frame-piece 8 is also provided with laterally-extending feet 11, adapted to move in the slideways 5, and with a pivoted roller 12, resting and partly supporting the frame on the half-round bar 6. Both rollers are each pivoted by a bolt 13, on which they turn easily. The object of the half-round bar 6 or raised portion is to provide an elevated narrow portion for the wheels 12 to travel on, and thereby avoid the dirt or gravel which may get upon the platform.

The two frame-pieces 7 and 8 are connected by bars 14, secured by the bolts 13. In the front frame 8 is fitted three boxes 15, 16, and 17, (see Fig. 7,) all of which are connected together by connecting-pieces 18 and 18^a. At the top of the frame 8 is a cap 19, secured by bolts 19^a. In this cap 19 is a screw-threaded piece 20, provided with a hand-wheel 21 at its upper end and an enlarged head 22 (shown by dotted lines) at its lower end and secured in place to the box 15 by a plate 23, (see Fig. 7,) so that while it is free to turn it cannot draw away from the box. This construction enables the operator to raise or lower all of the boxes 15, 16, and 17 at the same time by turning the hand-wheel 21. The screw-bar 24 is mounted in the box 17 in the frame 8, and its rear end passes through the hole 10 in the frame 7. The screw-threaded portion 24^a of the bar 24 extends from the point 25 to the collar 26. At or near the forward end of the base 1 is rigidly secured an upright supporting-piece 26^a, in the upper end of which is mounted a sleeve formed in two halves 27 and 27^a and adapted to have a slight longitudinal movement thereon, and is

held with a yielding force by a rubber spring or cushion, also made in two halves 28 and 28^e. The upper half of the sleeve and its rubber half piece 28^e is mounted in a cover 28^a, pivoted to the top of the supporting-piece 26^a by a pin 29, and is kept from falling out of said cover 28^a by the small flat pieces 29^e, which allow it to move longitudinally in said cover. (See Fig. 3.) When closed, the cover 28^a is kept closed by a thumb-screw 30. (See Fig. 1.) The interior of the sleeve 27 27^a is provided with a screw-thread 31, adapted to fit the screw-thread 24^a. Near the rear end of the screw-bar 24 is rigidly secured a collar 32, and between the collar 32 and the box 17 is a rubber spring or cushion 33.

On the screw-bar 24 is rigidly secured a gear-wheel 34, and above the screw-bar is mounted in the box 16 of the frame 8 and in the opening 9 of the frame 7 a shaft 35, on which is a feather 35^a, and on this shaft 35 is mounted a gear-wheel 36, adapted to gear in with the wheel 34. At the rear of the gear-wheel 36, and rigidly secured to or formed in one piece with it, is a mutilated gear-wheel 37.

A stud 38 is secured to or forms a part of the box 15. On the stud 38 is loosely mounted a pinion 40, adapted to gear in with a gear-wheel 41, mounted on the front end of the shaft 35, and to the pinion 40 is rigidly secured a crank and handle 42, by which the machine is operated.

To the top of the rear frame 7 is pivoted by a pin 43 the handle 44 of a hammer 45, having a forwardly-projecting bracket carrying a friction-roller 46. (See Fig. 1.)

At the end of the shaft 35 is rigidly secured by a set-screw 35^c (that can be easily loosened when required) a propeller-shaped double cam, the inclined sides of the blades 48 of which, as they pass the friction-roller 46 during their rotation, impart a reciprocating swinging motion to the hammer 45, which strikes the end 48 of the screw-bar 24, so as to drive the drill forward by a blow from the hammer when drilling through rock.

In Fig. 8 I have shown one of the auger-bars (the one having the drill at the end) as attached to a portion of one of the intermediate bars. The intermediate bars are each provided with a socket 49 at its rear end and a reduced slightly-tapering projection or tongue 50 at its forward end adapted to fit in the socket 49 and is rigidly secured by a pin or screw-bolt 51. The socket 49 and tongue 50 are made as flat as possible consistent with the required strength, so as to interfere as little as possible with the continuity of the screw form of the auger-bar.

The sockets 49, cut in the ends of the auger-bars, conform to the spiral form of the auger-bar, and as the tongues are made in substantially the same spiral form the insertion of the tongues into the sockets is done by giving the auger-bar having the socketed end a partial turn and then securing the two auger-bars together with the pin or screw-bolt 51. From this curved form of the sockets and tongues the auger-bars are securely locked to each other during the rotating of the said auger-bars in the direction used while boring. When the direction of the revolution of the screw-bar is reversed, the auger-bars can easily be separated by removing the pin or screw-bolt 51 and withdrawing the tongue from the socket.

If desired, the intermediate auger-bars may be plain tubes of ordinary gas-pipe; but for many uses the form shown in Fig. 6 answers a good purpose.

The operation of the machine is as follows: By turning the crank 42 its motion is transmitted to the gear-wheels 40 and 41, and from the gear-wheels 36 or 37 motion is given to the gear-wheel 34 and from that to the screw-bar 24, thereby operating the drill. The screw-bar being in gear with the screw-threaded box or sleeve 27 27^a causes the drill to move forward and draw the carriage or supporting-frame and its several parts along at the same time. When the full length of the auger-bar or nearly its full length has advanced into the earth, the pin or thumb-screw 30 is removed, the upper portion 27^a of the screw-sleeve is opened, the hand-wheel 21 is then turned, so as to lift the screw-bar above the screw-threaded portion 31 sufficiently to allow the supporting-frame to be pushed back far enough to allow another length of auger-bar to be put on. The operation is then repeated. During the above operation the set-screw 35^c has been loosened to allow the shaft 35 to turn freely without turning the cam. The hammer, therefore, does not operate in this instance; but when drilling through rock or shale it is sometimes desirable to use the hammer, which is done by tightening the set-screw 35^c, and thereby bringing the cam into action. When boring through soft earth, the wheel 36 may be brought into gear with the wheel 34 by loosening the set-screw 47 and moving it sufficiently to one side to bring its teeth in gear with the teeth in said wheel and then tightening the set-screw 47. When the rock is too hard for the speed of the auger-bar, the set-screw 47 is loosened and the gears 36 and 37 are moved along the shaft 35 until the mutilated gear 37 comes into gear with the wheel 34. The set-screw 47 is then tightened. The screw-bar is then only moved intermittingly, the device being timed so that the blow of the hammer is struck during each intermission. In Fig. 1 I have illustrated this position of the gear-wheels, showing the teeth of the gear-wheel 34 in engagement with one of the series of teeth on the mutilated gear-wheel 37 and adapted to turn the screw-bar 24 until the revolution of the gear-wheels bring one of the non-teeth-bearing faces of the mutilated gear into the position substantially as shown in Fig. 5, when the screw-bar 27 ceases to turn and will not again revolve until the next series of teeth on the mutilated gear are brought into en-

gagement with the gear-wheel 34. This operation is repeated during the revolution of the screw-bar 24 while the gears 34 and 37 are in engagement, thus giving an intermittent movement to the screw-bar. The base 1 is pivoted to a frame 52 (see Fig. 1) and is made adjustable by means of screws 53. The object of this construction is to provide the means for adjusting the boring-tool to any angle it may be desired to bore into the earth. The force of the blow from the hammer 45 may be increased by means of a spring 54.

In Fig. 2 I have shown a front view of the gear-wheel 41. The shaft 35, on which the gear-wheel 41 is secured, projects out far enough to receive an arm or lever 55, having a pawl 56 loosely pivoted thereto. The lever 55 is removably secured to the shaft 35 by means of a pin 57. The object of this construction is that when from the nature of the earth or rock more power is required to operate the machine the handle 42 is removed and the arm 55 is put on, substantially as shown in Fig. 2, and used, which construction gives the operator a longer lever to work with.

I claim as my invention—

1. In an earth boring machine, the combination with the screw bar, the pivoted hammer, and its operating mechanism of two rubber cushions, one secured between the collar and box located near the rear end of the screw bar and the other made in two halves with the two portions of the sleeve, the upper portion of which is mounted in a cover pivoted to the top of the upright supporting piece, substantially as described.

2. In an earth boring machine, the combination of a hammer, pivotally secured to the frame, a double cam for operating said hammer, a combined gear wheel and mutilated gear wheel secured together so as to be adjusted simultaneously, and mounted on a shaft, means for preventing them from turning on said shaft, and means for bringing and securing one or the other gear into gear with a wheel mounted on the screw bar, for operating the said screw bar either intermittently or continuously, substantially as described.

3. In an earth boring machine, the combination of the hammer 45, pivotally secured to the frame, a propeller shaped cam for actuating the hammer, a combined gear wheel and mutilated gear wheel secured together so as to be adjusted simultaneously, and mounted on a shaft 35, means for preventing them from turning or said shaft, and means for bringing and securing one or the other gear into gear with the wheel 34, for operating the screw bar either intermittently or continuously, substantially as described.

4. In an earth boring machine, the combination with the platform, of two parallel upright frame pieces, one of said frame pieces being provided with elongated openings or slots, and the other with adjustable boxes, adapted to support the rear end of the screw bar, a standard, a box composed of two portions 27 and 27ª, for securing the forward end of the screw bar, and the shafts upon which the gear wheels are mounted, means for connecting said boxes together and a screw threaded portion secured at its lower end to the upper box so as to be capable of revolving back and forth, and a hand wheel on its upper end for turning the same, whereby when the cover 27ª, is opened the boxes in which the gear wheel shafts and screw bar are mounted may be raised upward and the screw bar released from the screw sleeve 27, so that the carriages may be moved back in position to add another length of auger bar, substantially as described.

5. In an earth boring machine, the combination with the platform of two upright frame pieces, slots cut in one of said frame pieces, and boxes mounted in the other, and the rear end of the screw bar mounted in said slots and boxes, a standard, a box composed of two hinged portions for securing the forward end of the screw bar, means for fastening said box portions together and devices for raising the screw bar and its operating mechanism upward and releasing the said screw bar from the screw sleeve, when the hinged box is open, as set forth.

6. In an earth boring machine, the combination of a hammer pivotally secured to the frame, a combined gear wheel and mutilated gear wheel secured together and mounted on a shaft, means for preventing them from turning on said shaft, means for bringing the said gear wheel or the mutilated gear wheel into engagement with a gear wheel mounted on the screw bar, for operating the screw bar either intermittently or continuously and devices for operating the hammer, while the screw bar is revolving intermittently as and for the purposes described.

7. In an earth boring machine, the combination with the frame and the upright frame pieces thereof, of a hammer pivoted to one of said frame pieces, a shaft, a double cam mounted on said shaft for operating said hammer, a combined gear wheel and mutilated gear wheel, also mounted on the said shaft, means for rotating the shaft, and means whereby either the gear wheel or the mutilated gear wheel can be brought into contact with a gear wheel mounted on the screw bar, and thus allow the screw bar to remain quiet during the strokes of the hammer and rotate in the intervals between the said strokes while the hammer is operating, or rotate continuously while the hammer is passive, substantially as described.

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