

No. 658,495.

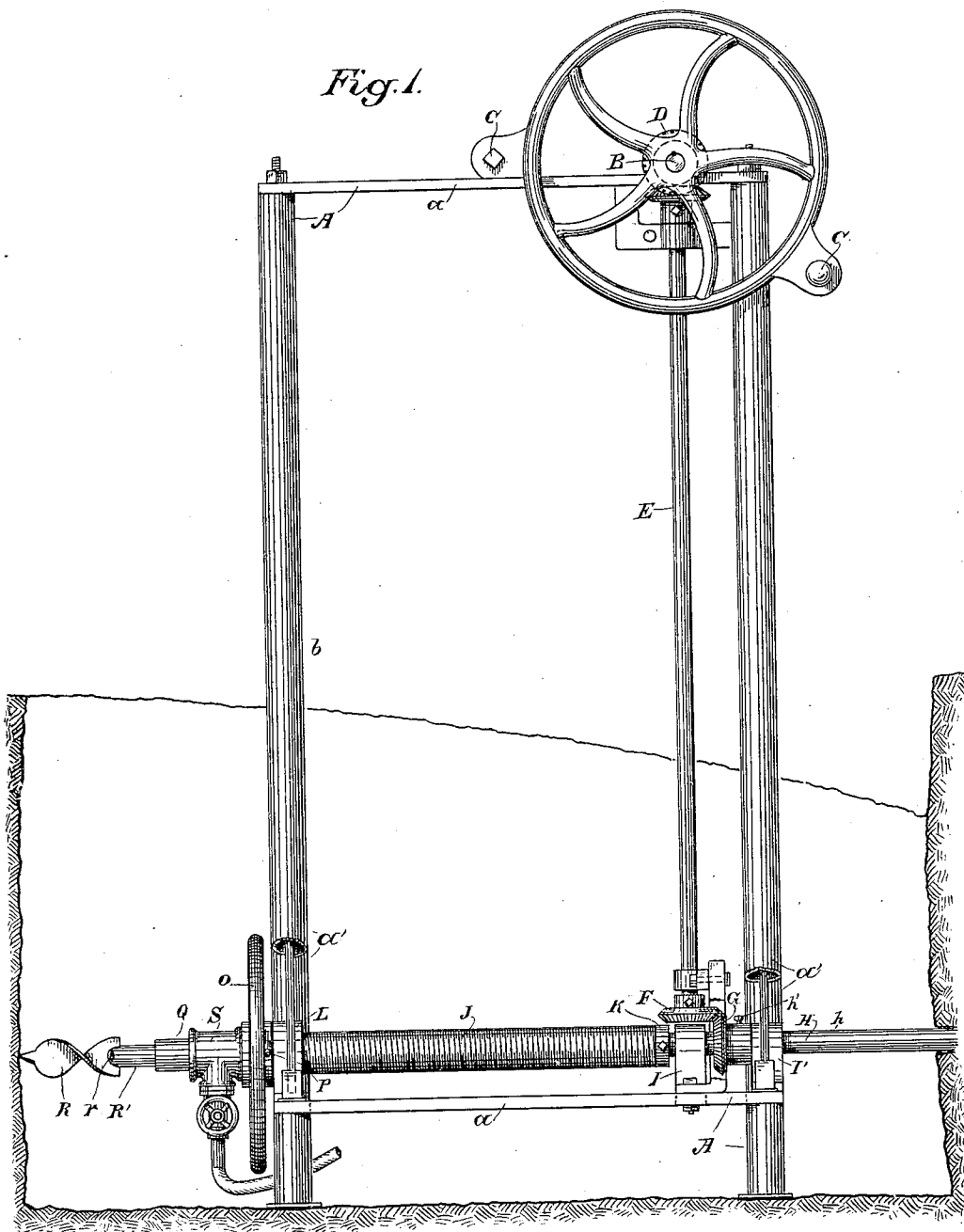
Patented Sept. 25, 1900.

H. E. WILLIAMS.
HORIZONTAL EARTH DRILL.

(Application filed Aug. 22, 1899.)

(No Model.)

2 Sheets—Sheet 1.



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2 Sheets—Sheet 2.

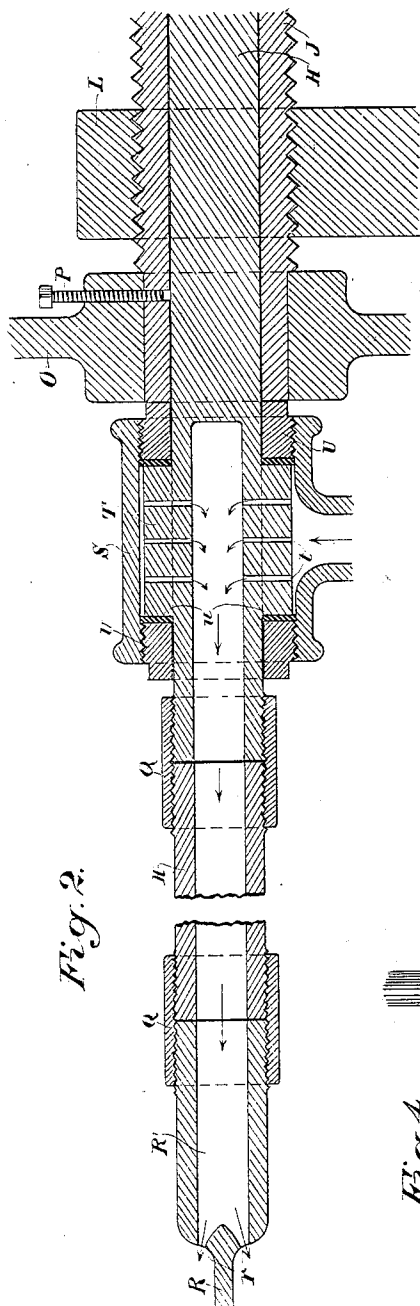


Fig. 2.

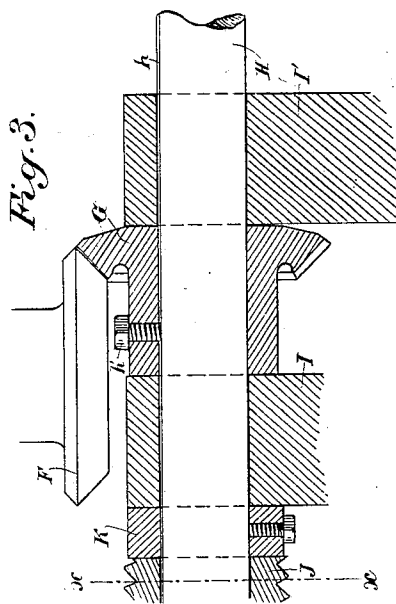


Fig. 3.

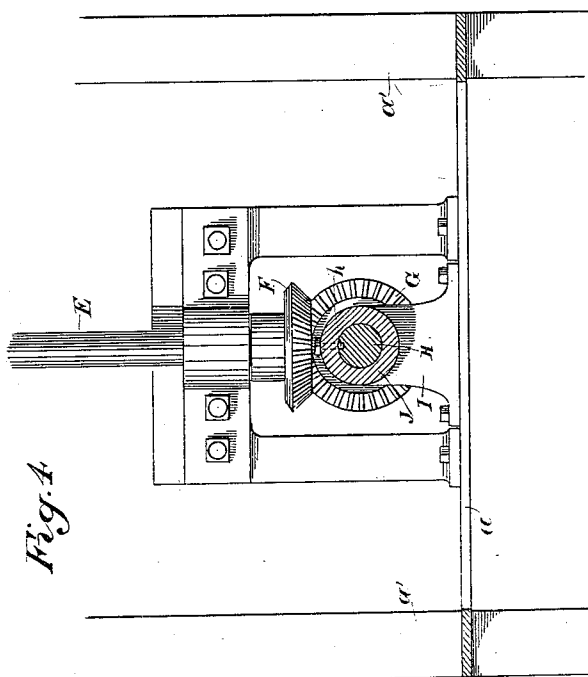


Fig. 4.

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UNITED STATES PATENT OFFICE.

HERBERT E. WILLIAMS, OF SAN JOSÉ, CALIFORNIA.

HORIZONTAL EARTH-DRILL.

SPECIFICATION forming part of Letter's Patent No. 658,495, dated September 25, 1900.

Application filed August 22, 1899. Serial No. 728,061. (No model.)

To all whom it may concern:

Be it known that I, HERBERT E. WILLIAMS, a citizen of the United States, residing at San José, county of Santa Clara, State of California, have invented an Improvement in Horizontal Earth-Drills; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to an apparatus which is designed for drilling horizontally through the earth. It is especially useful for making connections between water and gas mains and like conductors which are laid in the street with the buildings or other points at the sides which require service connections therewith, and it is designed to enable such connections to be made without disturbing the asphalt or other pavement with which the surface of the street may be covered.

My invention consists of a frame adapted to be set in the line of the hole which is to be drilled, a horizontally-journaled shaft carrying the boring-tool at the front end, mechanism by which it is rotated, and means for clearing the hole as it is bored, together with means for constantly advancing the boring-tool until it has reached its destination.

The invention also comprises details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a general view of the apparatus. Fig. 2 is a longitudinal section of the front portion of the drill. Fig. 3 is a similar view through the rear portion of the drill. Fig. 4 is a lateral section on line *xx* of Fig. 3.

In making service connections of various kinds from gas and water pipes, electric conduits, and the like, the mains of which are usually carried along the streets, it has been necessary to dig trenches for the purpose of laying the proper connections, and the pavement or surface of whatever description when disturbed is difficult to replace so as to make it again homogeneous and continuous with that which has not been disturbed. It is the object of my invention to provide an apparatus by which such connections can be easily and quickly made without materially disturbing the surface of the street.

The main supporting-frame A may be of any suitable or desired description and ma-

terial, the object being to provide such a frame as will support a horizontally-journaled boring-shaft with means for advancing and retracting it, a vertically-journaled driving-shaft with gears by which the two are connected, and means for rotating the vertical shaft, the whole being so constructed that the frame can be set into a channel or trench which is made at the point where the work is to be commenced. This point may either be near the main with which connection is to be made when the said main is carried along the side of the street, or it may commence at a point near the curb if the main is centrally located, or it may be otherwise arranged to suit the conditions of the parts where the connection is to be made. In the present case I have illustrated it as being placed in a trench which is sunk near the curb of the street to a depth which will bring the boring-shaft in the desired line. For convenience in constructing the frame may consist of two rectangular portions *a*, one at the top and the other at the bottom, and vertical guiding-posts *a'* at the corners. These posts may be made tubular, and rods extend through them with screw-threads upon the ends, upon which nuts can be afterward screwed to bind the whole together. Across the upper part of the frame is journaled a shaft B, with cranks or other equivalent driving devices C, by which it may be rotated. Upon this shaft is fixed a bevel-gear D, which engages with a corresponding bevel-gear upon the vertically-journaled shaft E. This latter shaft extends down to near the bottom of the frame and has also a bevel-gear F fixed upon it, which meshes with the bevel-gear G, mounted upon a horizontal shaft H. This shaft turns in boxes I I' adjacent to its driving-gear and extends forward through the feed-screw J, the front end of which is supported in a box upon the opposite side of the frame, as will be hereinafter more fully described.

A keyway *h* is made in the shaft H, and into this a set-screw *h'* or an equivalent device carried by the pinion G enters, so that when said gear G is rotated it acts through the set-screw or feather to rotate the shaft H, while at the same time the keyway allows the shaft to be fed forward without disturbing the position of the gear G, which is turnable,

as here shown, between the boxes I and I', these serving to keep it in position and in mesh with the gear F. At the rear of the screw J is a collar K, secured firmly upon the shaft H by a set-screw or otherwise, so that it forms a stop against which the rear end of the screw abuts and prevents the screw from sliding in this direction on the shaft. The forward end of the screw passes through a fixed nut L, which is supported upon the lower rectangular portion of the frame.

O is a hand-wheel or other feed device secured to the barrel of the screw by a set-screw P, so that when the hand-wheel is turned the screw will be advanced through the nut L, as may be desired.

The shaft H extends through the screw and at the front end is screw-threaded and has a sleeve or coupling Q, by which it may be connected with the boring-tool R. This tool may be of any suitable description. I have found that a flat twisted auger-shaped blade is very suitable for the purpose where the work is being done in soft earth. The diameter of this boring-tool is sufficient to make a hole which will admit a pipe of the desired size, from the size of a small water or gas pipe up to a sewer-pipe connection, if the latter is desired.

The front end of the shaft H is made tubular, and the shank R' of the boring-tool, which screws into the coupling Q, is also made tubular, with holes at the front end, as shown at r, through which water may pass into the space around the boring-tool for the purpose of softening the earth and causing it to move backward from the boring-tool to prevent the latter from clogging. By thus supplying water to the tool the earth is moistened and softened, and the material is carried backwardly along the shank of the boring-tool as fast as the latter advances, and it may thus be advanced a distance equal to the length of the feed-screw before it is necessary to stop.

In order to supply water to the interior of the tube H and its connections, I have shown a T-coupling S of sufficient diameter to receive the bushing T, which surrounds the forward end of the pipe H. Screw-threaded end pieces U loosely surround the shaft H and are screwed into the ends of the coupling S, so that when the side branch of the T-coupling is connected with a hose or other source of water-supply which prevents the coupling from turning the shaft H and the bushing T turn freely inside of the coupling and its end supports U. The water admitted into the coupling surrounds the bushing T, which is of smaller diameter than the interior of the coupling S, and by means of holes t, made radially through the coupling and the interior tubular portion of the shaft H, the water can pass freely into the shaft and thence through the hollow shank R' of the boring-tool and the openings r into the hole.

In order to prevent leakage between the ends U of the coupling S and the shaft H, I

have shown washers u, fitted between the bushing T and the ends U, which form a sufficiently-tight joint for the purpose. When the screw is advanced by rotating it within its screw-threaded box L, it will also force the shaft H and the boring-tool forward with it, and the shaft being rotated by the mechanism, as previously described, will cause the tool to bore its way into the earth, and the latter being softened by the water and prevented from clogging will be carried back into the pit in which the machine stands, from which it can be removed as required.

When the tool has been fed forward a distance equal to the length of the feed-screw J, the device may be retracted by turning the screw P, which passes through the hub of the hand-wheel O until it also contacts with the shaft H within the screw J. Then by reversing the movement of the driving-shaft the screw J will be caused to travel backward through its nut L until it is withdrawn to its most rearward position. It is then necessary to add another section of tubular shaft, which is similar in all respects to the shaft H, and by coupling the front end of such a section with the shank R' of the boring-tool, then connecting the rear end of the section with the coupling Q or a similar one, the tool is ready to be advanced again a distance equal to the length of the screw. The reason for these short advances is because of the difficulty of obtaining space sufficient to introduce a long boring-shaft in the first instance, it being desirable to make as small an opening as possible in the street for the reception of the apparatus, and for the purpose of reciprocating the shaft H, I have found it desirable to bore a hole at the opposite side of the pit in which the framework is placed to receive the rear end of this shaft when it is being withdrawn to receive a new section after each forward advance. This can be easily done by fitting the boring-tool upon this end of the shaft and boring the necessary depth of hole in that direction, after which it is placed upon the forward end.

The pit is made of such depth as to allow the apparatus to be placed at the desired level below the surface of the street, as shown, and by leveling the frame with horizontal and vertical levels I am enabled to drive a hole as far as may be necessary in the widest street and arrive at the desired point with very little variation and near enough to make the proper connections.

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

An improved earth-drill comprising a framework consisting of two rectangular portions one at the top and the other at the bottom, and vertical guiding-posts at the corners, said upper and lower portions provided with journal-boxes, a horizontal shaft mounted in the lower boxes and a hollow feed-screw through which the shaft passes, said screw

having its forward end mounted in one of
the lower boxes, a vertical shaft and gears
between the same and the horizontal shaft,
one of said gears located between adjacent
5 boxes and splined on the horizontal shaft, a
collar against which the feed-screw abuts and
a fixed nut in which the front end of said
screw works, means for rotating the screw, a
boring-tool and means for coupling it to the
10 front end of the horizontal shaft said hori-

zontal shaft having a hollow front end, and
means for admitting water to the interior of
said shaft.

In witness whereof I have hereunto set my
hand.

HERBERT E. WILLIAMS.

Witnesses:

S. H. NOURSE,
JESSIE C. BRODIE.