A drilling tool that, by means of repeated jarring or percussive forces produced by a cable-hung weight, causes a tool bit to chip away at the bottom of a hole. The bit is affixed to the lower end of a tubular casing in which the weight moves, a reamer being affixed to the upper end of said casing to smooth the wall of the hole that is produced by the tool. The force of the weight may be increased by an expansion spring between the weight and a top fitting closing said casing, said fitting and reamer being fixedly connected.

5 Claims, 5 Drawing Figures
JAR-TYPE DRILLING TOOL

BACKGROUND OF THE INVENTION

The drilling of test holes, post holes and the like, as well as other types of small-diameter holes such as explosive-holding-holes, or water, mineral and oil testing holes. The pertinent prior art is represented by U.S. Pat. No. 2,495,073, as teaching use of a reamer; U.S. Pat. No. 1,607,082, which teaches use of a zig-zag slot to cause jumping motion of a drill head; U.S. Pat. Nos. 2,593,532 and 2,742,263, as teaching hanging of bit-carrying members from cables, and U.S. Pat. No. 2,120,240, which teaches the use of ratchet teeth on a rotating member to produce a hammering action on a bit-provided mandrel.

SUMMARY OF THE INVENTION

The invention is characterized by its simplicity of construction and operation. There is but one place in the structure that requires fitting two relatively movable parts. In all other respects, the parts may be assembled with broad tolerances.

Broadly, the tool comprises a tubular assembly of a casing tube, an earth-chipping bit and a reamer-provided upper fitting, a jarring weight loosely slidable in said tube and hung from a cable connected to a hanger that extends through and is guided in said upper fitting, and the lower end of the weight having rotation-inducing ratchet teeth to engage complementary teeth provided on the upper portion of the bit as the cable alternately raises and releases the weight so that, upon engagement of said teeth, the mass of the weight both jars and rotates the bit to cause the latter to chip away at the bottom of the hole while the reamer smoothens the wall of the hole that is formed by the bit. To increase the force of the weight, an expansion spring may be placed between said upper fitting and the weight.

It is an object of the present invention to provide a jarring drilling tool that, essentially, comprises but two relatively moveable components, one, embodying drilling and reaming means, the other, a weight hung on a cable that is alternately raised and released to cause hole-deepening and holewall reaming rotation of the drilling and reaming component.

Another object of the invention is to provide a tool, as above characterized, in which the force of the weight is increased by a spring bias between the weight and the upper end of the tubular assembly.

This invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description, which is based on the accompanying drawing. However, said drawing merely shows, and the following specification merely describes, one embodiment of the present invention, which is given by way of illustration or example only.

In the drawing, like reference characters designate similar parts in the several views.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a vertical sectional view of a jar-type drilling tool according to the present invention, an intermediate portion thereof being broken away.

FIG. 2 is an enlarged plan view thereof.

FIG. 3 is a vertical sectional view as taken on the line 3--3 of FIG. 2.

FIG. 4 is an enlarged cross-sectional view as taken on the line 4--4 of FIG. 1.

FIG. 5 is a vertical sectional view as taken on the line 5--5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The present tool comprises, generally, a tubular outer assembly 10 that comprises an elongated casing tube 11, a chipping bit 12 affixed to the lower end of said tube 11, and a fitting 13 affixed to the upper end of the tube, a jarring weight 14 loosely movable in said tube 11 an upper extension 15 of which extends through an axial bore 16 of the fitting 13 and is provided, at its upper end, with a ring 17 for hanging engagement with a cable 18 that is adapted to be raised and lowered in a manner to alternately raise the weight and suddenly release the same to fall by gravity toward the bit 12; and, optionally, an expansion spring 19 within the tube 11 between the fitting 13 and the weight 14 to add its force, when released, to that of the weight when released by the cable 18.

It will be seen best from FIG. 1 that the upper end of the bit 12 is provided with ratchet teeth 20 and the lower end of the weight with similar, complementary ratchet teeth 21. It will be clear that, upon release of the weight 14, the teeth 21 will encounter the teeth 20 of the bit to produce a jarring force that causes partial rotation of the bit and, therefore, of the tubular outer assembly 10, since all elements of said assembly are fixedly fastened together.

As seen from FIGS. 2 and 3, the fitting 13 is formed of a plug 22 fitted into the upper end of the casing 11, and of a reamer 23 which is provided with teeth 24 to smoothen the wall of the hole 25 that is formed by the bit 12 of the tool. Means, such as screws 26, fasten said reamer 23 to the upper end of the casing tube 11, and screws 27 fasten the plug 22 to the reamer. The mentioned bore 16, as seen in FIG. 3, extends through both the plug 22 and the reamer, and moisture-sealing O-rings 28 are provided in the fitting 13 to seal between said plug and the extension 15 by which the cable 18 is connected to the weight 14.

The weight 14 preferably has a diametrical size that provides a clearance between it and the casing tube 11 of approximately 1/16 inch, i.e., a clearance that allows for a free fall of the weight when the same is dropped. It will be realized that the mass of such weight will readily overcome the slight friction imposed on the extension 15 by the moisture-sealing O-rings so that the fall of said weight will be rapid and will produce the jarring impact desired on the bit 12 as hereinabove mentioned.

Said bit, as best shown in FIGS. 1, 4 and 5, comprises a plug 29 fitted into the lower end of the casing tube 11 and on the upper end of which the ratchet teeth 20 are provided, a bit body 30, a two-part tooth-mounting bit portion 32 secured to the plug 29 and bit body 30 by screws 32, and a set of hole-forming teeth 33.
3.837,414

3,837,414
carried by the bit so the same may form a hole 25 of a
desired size.

Said teeth 33, as mentioned, may be of any size and
length, be welded in place or formed as adjustable in-
serts, it only being necessary that the bit teeth be 5
such that the same will drill a hole 25 that is slightly less
than the reamed hole 34 that is formed by the reamer

tooth 24.

As is common practice, the cutting ends of the teeth
32 may have stagger ends so their chipping action will
be progressive as the hole 25 is deepened.

From the foregoing, it will be evident that each time
the tool 10 is operated by the cable 18, if there is no
spring 19 present, the weight 14 will first encounter the
plug 22 and raise the assembly 10 so the bit 12 is clear
of the bottom of the hole. Then, as the cable 18 is re-
leased, the weight 14 and the assembly 10, together,
with drop so the bit teeth 33 will strike the hole bottom
first, then the weight 14 will continue to drop to cause
the teeth 21 thereof to strike the teeth 20 of the bit 12
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to provide a second jarring impact that causes the as-
semble 10 to be rotated by the teeth 21 on the weight.
It will be clear that continued impacts of the weight on
the bit will progressively deepen the hole 25 and that
the reamer teeth 24 will similarly extend the depth of
the reamed portion 34 of the hole.

The provision of spring 19 between the plug 22 and
the weight, will allow the weight 14 to strike the bit 12
with an impact that is increased by the expanding force
of the spring. By designing the force of said spring to
be balanced by the weight of the assembly 10, the
weight 14 and said assembly 10 will be lowered to-
gether, with the spring 19 compressed, the latter ex-
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panding after the bit is grounded to cause the men-
tioned rotative movement of the tool assembly 10.

While the present tool is shown without means to
pump tailings, it is pointed out that the central portion
of the tool, due to the relative reciprocative movements
of the assembly 10 and the weight 14, may be employed
to eliminate tailings.

While the foregoing has illustrated and described
what is now contemplated to be the best mode of carry-
ing out the invention, the construction is, of course,
subject to modification without departing from the
spirit and scope of the invention.

Having thus described the invention, what is claimed
and desired to be secured by Letters Patent is:

1. An earth-drilling tool comprising:
a cable-hung elongated weight provided on its lower
end with ratchet-like teeth, and
an elongated casing assembly comprising a casing
with an upper plug and a lower earth-chipping bit
with ratchet-like teeth complementary to the teeth
on the weight, said casing being longer than the
weight and being suspended therefrom,
said weight and casing assembly, upon sudden down-
ward movement of the cable, dropping together to-
ward the bottom of the hole to cause the men-
tioned bit to strike and chip away at said hole bot-
tom, and
said weight, upon such bottoming of the casing as-
sembly, continuing its downward movement to
cause jarring engagement of the ratchet teeth on
the weight with the ratchet teeth on the bit to cause
the teeth of the weight to induce rotative move-
ment of the bit and further chipping away at said
hole.

2. An earth-drilling tool according to claim 1 in
which an expansion spring is located between the upper
end of the casing assembly and the weight to add its ex-
pansion force to the jarring force of the weight.

3. An earth-drilling tool according to claim 1 in
which the upper end of the casing assembly is provided
with a hole-reaming element to smoothen the wall of
the hole being formed by the bit.

4. An earth-drilling tool according to claim 1 in
which said element comprises a member with peripheral
portions that ream the hole formed by the bit to a
smooth condition.

5. An earth-drilling tool according to claim 1 in
which the weight has an outer size that is in clearance
relationship to the interior surface of the casing so the
weight can have frictionless movement in the casing as-
semble.

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