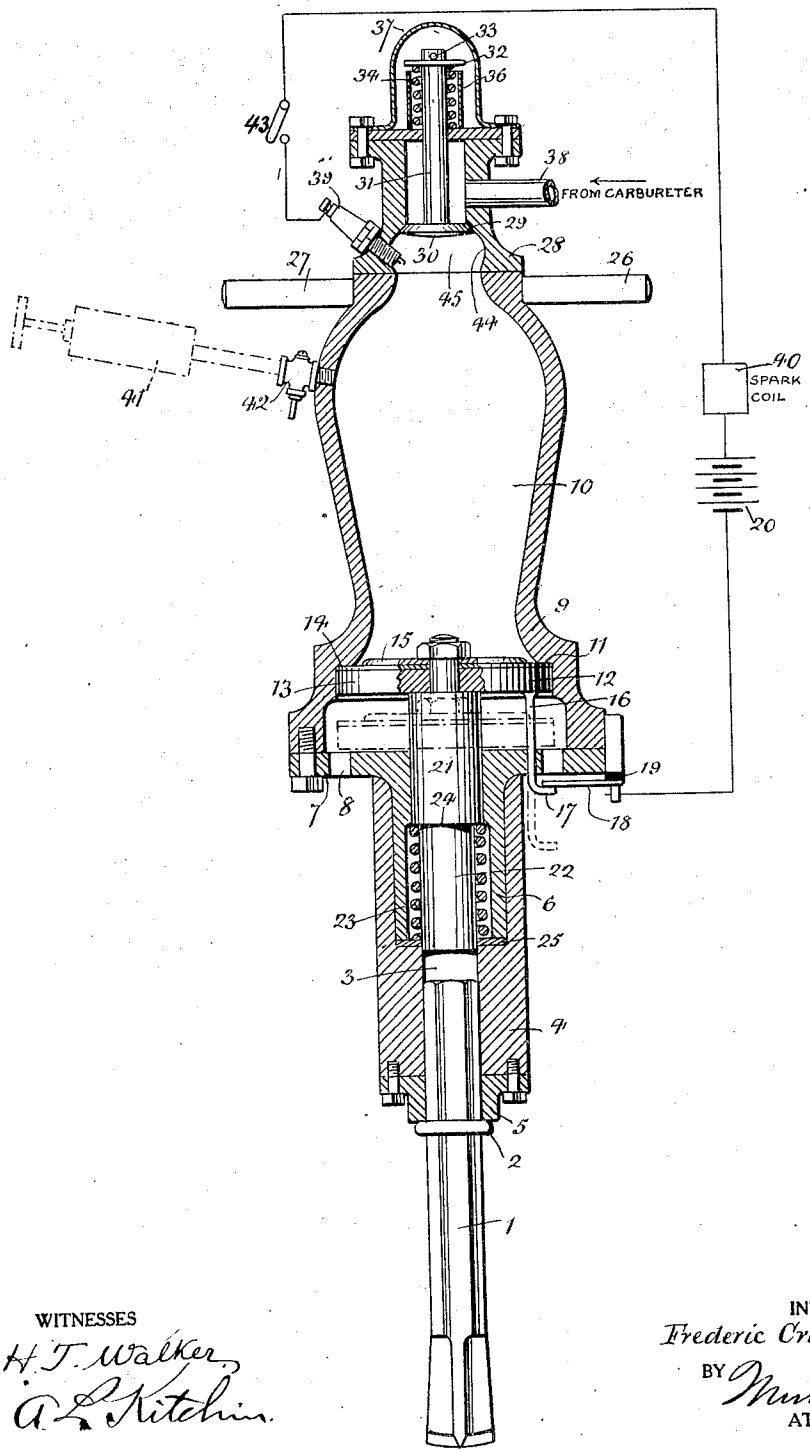
Aug. 31, 1926. 1,598,476

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PORTABLE DRILL

Filed Oct. 25, 1924



WITNESSES

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Patented Aug. 31, 1926. 1,598,476

UNITED STATES PATENT OFFICE.

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PORTABLE DRILL.

Application filed October 25, 1924. Serial No. 745,901.

This invention relates to portable drills and has for an object to provide an improved construction wherein a combustible mixture is used as a power element in operating the drill.

Another object of the invention is to provide a portable drill structure wherein the piston acts as an exhaust valve.

A still further object of the invention is to provide a portable drill using an explosive mixture as the power element wherein a closed chamber is provided for the mixture at the time of operation or explosion.

An additional object of the invention is to provide a portable drill using an explosive mixture as the power element, the construction being such that the momentum of the exhaust gases creates a suction for drawing in new charge, the parts being adapted to remain open until the new charge has entered.

In the accompanying drawing—

The figure is a longitudinal vertical sectional view through a drill, embodying the invention.

Referring to the accompanying drawing by numerals, 1 indicates an ordinary drill used for drilling stone, concrete and the like. Instead of using a drill similar to the drill 1, a chisel or other implement might be used. Preferably, the drill 1 is provided with a ring 2 to limit the upward movement into the bore 3 of the covering sleeve 4. The sleeve 4 carries a guiding boss 5 at the lower end while at the upper end it is mounted on the depending sleeve 6, which sleeve at the upper end merges into a closure disk 7 having a number of apertures 8 which act as exhaust ports. The disk 7 is bolted or otherwise rigidly secured to the lower end of the body 9, which body is formed with an explosion chamber 10 occupying most of the body. A shoulder or stop 11 provides a seat in the body 9 which co-acts with the piston 12, which piston acts in the additional capacity of an exhaust valve for chamber 10. The piston 12 is formed with a metal body 13 preferably of steel, an asbestos disk 14 and a metal washer 15. The piston is movable into the annular enlargement adjacent to the shoulder or stop, which enlargement constitutes an exhaust chamber. A depending rod 16 extends from the piston 12 and is bent over for forming a hook 17 co-acting with the contact spring 18. This spring is supported on the body 1 in any desired manner, as for instance, by insulation 19, whereby it is insulated from body 9 and the battery 20 is grounded only when the hook 17 is engaging the spring 18. The piston 12 carries a rod 21 acting as a hammer for striking the upper end of the drill 1. The hammer 21 is provided with a reduced portion 22 surrounded by the spring 23, which spring at one end bears against the shoulder 24 and at the opposite end against the washer 25. The spring 23 continually acts to hold the piston 12 in its closed position as shown in the drawing, though it will permit the piston to be moved downwardly to the dotted line shown in the drawing whenever an explosion takes place in chamber 10.

The chamber 10 may be of any desired shape and at the upper end is provided with handles 26 and 27, said handles acting as the members by which the device may be moved from place to place. The handles also permit the operator to guide the tool when the device is in use. Arranged above and bolted or otherwise rigidly secured to the body 9, is what may be termed a valve casing 28 which is provided with a valve seat 29 normally engaged by the inlet valve 30. This valve is provided with a valve rod 31 carrying a washer 32 and a pin 33 at its upper end whereby the spring 34 may act on the washer 32 and on the plate 35 for normally holding the valve 3 seated. A stop sleeve 36 surrounds the spring 34 and extends almost up to the washer 32 whereby valve 30 can open only a very short distance. A suitable cap 37 encloses the upper end of rod 31 and associated parts. An inlet pipe 38 is connected to the casing 28, said inlet pipe permitting an explosive mixture to pass into the casing 28 from any suitable form of carburetor and from casing 28 the explosive mixture passes downwardly into the chamber 10 when valve 30 is open. A spark plug 39 of any approved type is connected to a spark coil 40 which in turn is connected to a source of current 20 and said source of current is connected to the contact or spring 18 whereby whenever the hook 17 is in the position shown in the drawing, the circuit will be closed as the spring 19 will then be grounded. The spark plug 39, is of course, formed so that one side is grounded and, therefore, whenever the hook 17 touches the spring 18, a spark will be produced.

In operation, the device may be moved readily from place to place and used in the

usual manner of portable drills. To cause the hammer 21 to operate when the parts are all cold, a suction pump 41 of any desired kind is applied to the valve 42, which valve is open. As the pump 41 rarefies the air in chamber 10, valve 30 will open and a combustible mixture will be drawn into the chamber 10. As soon as this has occurred, the manually actuated switch 43 is closed and immediately the plug 39 will produce a spark for igniting the explosive mixture. This will cause an explosion and will drive the piston 12 downwardly together with hammer 21 so that the hardened reduced end section 22 will strike the drill or chisel 1 for producing the desired result. As the piston 12 moves down to the dotted position shown in the drawing, the burnt gases will exhaust past the piston and out through the exhaust ports 8. The momentum of discharge of the exhaust gases will produce a suction in the upper part of the chamber 10, causing the valve 30 to open whereupon a new charge of explosive mixture is drawn in by the time the old charge has been exhausted. As soon as the old charge has been exhausted and the pressure reduced, spring 23 will return the parts to the position shown in the drawing whereupon hook 17 will contact with spring 18 and plug 39 will again spark so that a new ignition or explosion of the combustible mixture will take place. This action continues as long as the switch 43 is closed. In order to assist until the parts become heated, pump 41 may be operated until several explosions have taken place in chamber 10, after which, valve 42 may be closed and the pump 41 dispensed with. It will be noted that the chamber 10 is completely closed at the time of explosion or sparking of the plug 39 whereby an appreciable pressure is generated and which will give the desired impulse to the piston 12 and hammer 21. It will also be noted that the piston 12 acts in the double capacity of an automatic exhaust valve and as a piston while the valve 30 acts as an automatic inlet valve. It will thus be seen that there are no driven parts necessary for the operation of the device and the only moving parts are the two valves with their associated parts.

In forming the casing 28, the same is preferably curved out at 44 so as to provide in a certain sense an ignition chamber 45. The plug 39 extends into the chamber 45 and as this chamber is supplied with fresh explosive mixture upon each operation of the device, the spark will produce its desired function which would not be the case if the plug was positioned near the exhaust port.

What I claim is:—

1. A drill comprising a chamber having exhaust ports and an adjacent stop constituting a seat, a valve controlling a combustible charge inlet to the chamber, a piston occupying said seat and carrying a hammer, and means including a spring pressing the piston against the seat and closing the chamber while a charge is ignited imparting a blow to the piston and hammer said piston then being unseated and acting as a valve to permit escape of the burnt gas to the adjacent ports, the momentum of the escaping gas producing suction to open the inlet valve for the entrance of another charge.

2. A drill comprising a working chamber having an annular exhaust chamber having ports and including a stop constituting a seat, a valve controlling an inlet through which is admitted a combustible charge to fill the working chamber, a piston operable in said exhaust chamber, means including a spring to press the piston against the seat and cut off communication of the working chamber with said ports, and means actuated by the piston upon said seating thereof to ignite the charge thereupon unseating the piston and driving it into the exhaust chamber to permit escape of the gas at said ports.

3. A drill comprising a chamber having an annular shoulder, a disk closing the adjacent end of the chamber but having exhaust ports, a sleeve depending from the disk, a combustible charge inlet casing, a valve controlling the admission of the charge from the casing to the chamber, a hammer rod guided in said sleeve and carrying a piston, means including a spring contained by said sleeve seating the piston upon said shoulder, and means actuated upon said seating of the piston to ignite a charge in the chamber thereupon unseating the piston to permit escape of the gas at said ports and causing opening of the inlet valve for the admission of another charge.

4. A drill comprising a working chamber having an annular shoulder and an adjacent annular enlargement constituting an exhaust chamber, means including a closure disk completing the exhaust chamber but having exhaust ports, a sleeve depending from the disk, a covering sleeve applied to the depending sleeve and providing a rest, a shouldered hammer rod guided in said sleeves and carrying a piston, a spring bearing against said rest and hammer rod shoulder to seat the piston upon said annular shoulder, a valve operable to admit a combustible charge into the working chamber by suction created upon the escape of gas at said ports, and means actuated by the piston upon seating thereof to ignite said charge displacing the piston and imparting a blow to a drill receivable by the covering sleeve.

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