No. 841,069. PATENTED JAN. 8, 1907.

H. P. TAYLOR.

PNEUMATIC DRILL.

APPLICATION FILED APR. 28, 1905. RENEWED JULY 14, 1906.

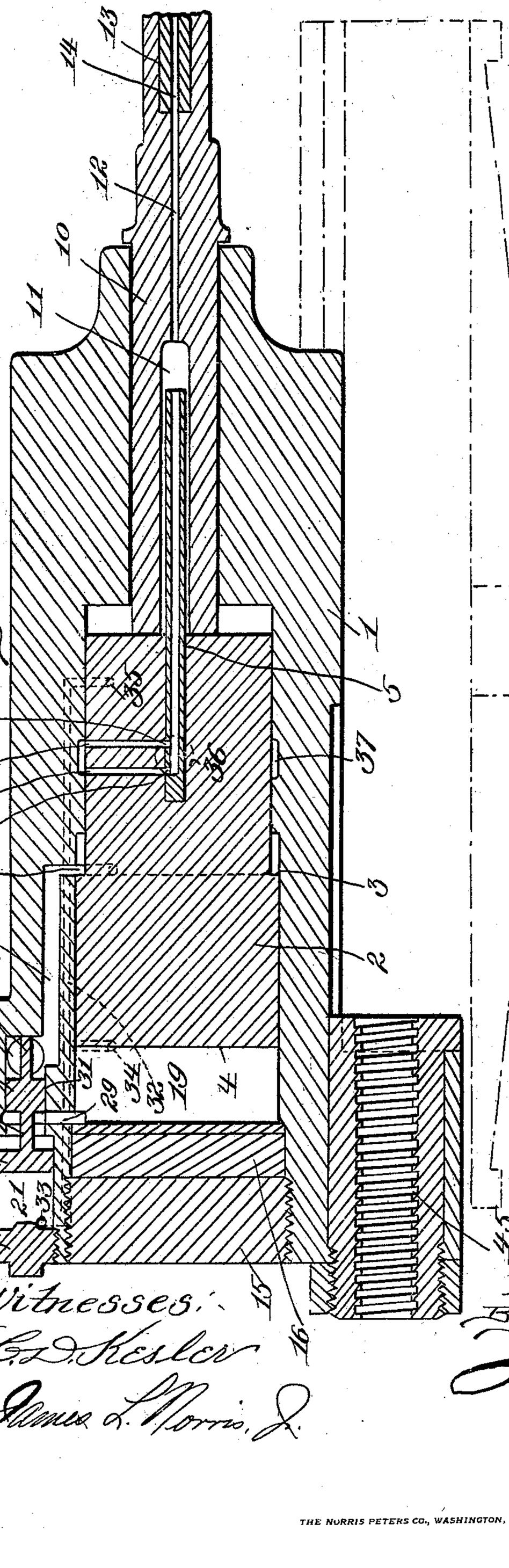

Fig. 1.

Fig. 2.

Witnesses:
C. D. Kesler
James L. Norris, Jr.

Inventor
Harry P. Taylor
By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

HARRY P. TAYLOR, OF SALT LAKE CITY, UTAH.

PNEUMATIC DRILL.

No. 841,069. Specification of Letters Patent. Patented Jan. 8, 1907.

Application filed April 28, 1905. Renewed July 14, 1906. Serial No. 326,277.

To all whom it may concern:

Be it known that I, HARRY P. TAYLOR, a citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented new and useful Improvements in Pneumatic Drills, of which the following is a specification.

This invention relates to pneumatic drills in which the cutting operation is effected by a succession of blows, and has for its object to render such hammers or devices applicable for use as drills, and more especially for drilling or boring rock or stone.

The invention aims to provide a pneumatic percussive device for the purpose hereinbefore referred to which shall be simple in its construction, strong, durable, formed of a few parts, efficient in its use, and comparatively inexpensive to manufacture.

With the foregoing and other objects in view the invention consists of the novel construction, combination, and arrangement of parts hereinafter more specifically described, illustrated in the accompanying drawings, and particularly pointed out in the claims hereunto appended.

In describing the invention in detail reference is had to the accompanying drawings, which form a part of this specification and wherein like reference characters denote corresponding parts throughout both views, and in which—

Figure 1 is a longitudinal sectional view of a pneumatic percussive device constructed in accordance with this invention, and Fig. 2 is an end view of the tool.

Referring to the drawings by reference characters, 1 denotes a cylinder in which is arranged a reciprocatory hammer 2, operated through the medium of a supply of motive fluid in a manner as hereinafter referred to. The hammer 2 is provided with a peripheral shoulder 3, acting as a bearing-surface for the motive fluid, so that owing to the pressure of the motive fluid the hammer 2 will be reciprocated in what is termed a "rearward" direction. The end 4 of the hammer 2 also forms a bearing-surface for the motive fluid, so that the pressure of the motive fluid against said end 4 will reciprocate the hammer 2 in what is termed a "forward" direction. The hammer 2 is furthermore provided with a nozzle 5, secured therein and projecting from the forward end thereof. Said nozzle 5 is provided with a pair of ports 6 7, which communicate, respectively with a pair of passages 8 9, formed in the hammer 2. The function of the nozzle 5, ports 6 7, and passages 8 9 will be hereinafter referred to. The nozzle 5 is of such length as to project into the tool-holder 10, a channel 11 being provided for such purpose, and the said channel 11 opens into a passage 12, which forms a means for supplying the motive fluid to the cutting end of the tool, so as to cool it. To the said holder 10 is suitably connected the tool 13, which is provided with an axial bore 14, communicating with the passage 12.

The cylinder 1 is closed at one end with the exception of an opening through which the tool-holder 10 passes, and the other end of the cylinder is closed through the medium of a removable plug 15, which acts as a means for retaining the abutment 16 in position. The cylinder 1 is so constructed as to form a chamber 19 of two different diameters, in which operates the hammer 2.

At the rear end of the cylinder 1 a valve-chamber 21 is provided, and in which operates an unbalanced piston-valve formed of a pair of pistons 22 23, connected together by a stem 24, said piston 22 being of less diameter than the piston 23 and has projecting therefrom a stem 25, acting as a stop when the said unbalanced valve is in its normal position, as shown in Fig. 1. The chamber 21 is closed at one end through the medium of a removable screw-plug 26 and at its opposite end communicates with a passage 27, which opens into the cylinder, as at 28, so as to supply motive fluid against the peripheral shoulder 3 to cause the rearward movement of the hammer 2. The chamber 21 also communicates through the medium of the port 29 with the chamber 19, so as to supply motive fluid against the end 4 of the hammer 2, and moves the said hammer forwardly. The chamber 21 has a motive-fluid inlet 30, which communicates with the motive-fluid supply, and the said inlet causes the supply of motive fluid to enter the chamber 21 forwardly of the piston 22, so that said piston 22 will be caused to move from its seat 31 and open the port 29, allowing a supply of motive fluid against the end 4 of the hammer 2, thereby reciprocating said hammer in its forward direction, or rather imparting a forward stroke to the hammer. The cylinder 1 is further provided with a passage 32, communicating, through the medium of the port 33, with the chamber 21 at the rear of the piston 23, communicating with the rear

end of the chamber 19 through the medium of a port 34, and communicating with the forward end of the chamber 19 through the medium of the port 35. The passage 32 is an exhaust-passage for the motive fluid from the valve-chamber 21 for controlling the valve in the said chamber 21. The cylinder 1 is furthermore provided with a water-inlet 36, communicating with a water-supply and with a water-space 37, which opens into the chamber 19. The cylinder 1 is slidably mounted upon a suitable support 44, and a suitable screw-feed 45 is provided. The support 44 and screw-feed 45 may be of any suitable construction.

When the motive fluid consists of air, the nozzle 5, in connection with the channel 11 and passage 12, is adapted to supply air and water to the working end of the tool for not only cooling the working end of the tool, but also for washing away the fragments of the rock or other material which is being drilled or bored. If any other motive fluid is employed, the same is supplied in combination with the water. If water alone is used as a motive fluid, then only water is supplied by the nozzle. It will be assumed that air is the motive fluid and that air and water is supplied through the medium of the nozzle for the purpose specified. The water and air is supplied to the device at the same pressure. The manner in which the air and water is supplied to the nozzle 5 is as follows: It will be assumed that the hammer 2 is in position, as shown in Fig. 1. Therefore it will be evident that water enters the passages 8 and 9 and into the nozzle 5 through the ports 6 and 7. Now it will be assumed that the piston has been moved rearwardly. When the hammer 2 reaches the rear end of its travel, the passage 8 is closed by the cylinder, owing to the fact that the said passage 8 is moved away from the water-space 37, and the passage 9 will now register with the port 28. Consequently air will come from the continuous air-supply inlet 30 through the passage 27 and port 28, as the passage 9 will register with the port 29. The air will then pass through the passage 9 and through the port 6 into the nozzle 5, and on the forward movement of the hammer 2, when the passages 8 and 9 register with the water-space 37, water will be caused to enter the nozzle 5. Therefore it is evident that through the medium of the nozzle 5, in connection with the passages 8 9, ports 6 7, channel 11, and passage 12, air and water will be supplied alternately to the working end of the tool to cool it, as well as to wash away the fragments of the material and lay the dust.

In regard to the general operation of the device it will be stated that the air-supply under a given pressure is continuously acting against the piston 22 to push it off its seat. In Fig. 1 the hammer 2 is shown at the forward end of its stroke and the air-pressure behind it has just passed through the port 34 into the passage 32 and from there through the port 33 into the chamber 21 at the rear of the piston 23, the port 35 being closed. As the air-pressure is the same as the working pressure—*i. e.*, the air-pressure against the piston 23 is the same as against piston 22—the valve must take the position shown in Fig. 1, due to the larger area of piston 23 over piston 22, thus opening the cylinder behind the hammer to an exhaust-port (not shown) for the valve-chamber 21. Now when the exhaust is open, the hammer 2 moves back to its rear position, due to the air-pressure against the shoulder 3. (The pressure is continuous on the shoulder 3 during the operation of the device.) When the hammer reaches its rear position, it opens the port 35, which exhausts the air from behind the piston 23, and the valve moves to its rear position and allows the air-pressure to enter behind the hammer 2, which moves forward. It will also be evident that owing to the foregoing construction the water is not continuously supplied through the medium of the nozzle 5, but is intermittently supplied, or, in other words, the supply of water coincides with the strokes of the hammer, as is evident, owing to the fact that on the rearward movement of the hammer 2 the water-space is closed and water is not supplied by the nozzle 5 until the hammer 2 has traveled a short distance on its forward stroke. The air which is supplied by the nozzle 5 is received in advance of the reception of the water by said nozzle 5. In regard to the supplying of the air and water it will be stated that if the hammer moves backward and forward slowly the air and water supply to the working outlet will be intermittent; but if it works up to speed it will not be so, because the passage in the nozzle is larger than the passages 8 and 9. Hence the flow will be slower, and so the intermittent supply from the passages 8 and 9 will become practically continuous at the working end of the tool.

Another benefit to be derived from this construction is the saving of air because of one short port 29 between the valve-chamber and the cylinder-chamber. The long ports usually employed in this character of drill are open to the objection that they cause a large loss of air.

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

1. A pneumatic drill comprising a reciprocatory hammer operated by a motive fluid, a tool-holder, and a combined air and water nozzle carried by said hammer.

2. A pneumatic drill comprising a cylinder having a valve-chamber communicating with a motive-fluid supply and with the

interior of the cylinder, a reciprocatory hammer arranged in said cylinder and operated by the motive fluid, a tool-holder, a valve operating in said valve-chamber, said cylinder provided with a water-space communicating with a water-supply, a nozzle carried by said hammer, said hammer provided with passages opening into said nozzle and adapted to communicate with said valve-chamber and said water-space, and said tool-holder provided with a channel and passage, said channel communicating with said nozzle.

3. A pneumatic drill comprising a hammer having a pair of passages adapted to communicate with a fluid-supply, a nozzle carried by the hammer and communicating with the said passages for receiving the fluid therefrom, and a tool adapted to receive the fluid from said nozzle.

4. A pneumatic drill comprising a hammer having a pair of passages adapted to communicate with a fluid-supply, a nozzle carried by the hammer and communicating with said passages, and a tool-holder provided with a channel communicating with said nozzle.

5. A pneumatic drill comprising a cylinder having a valve-cylinder communicating with a motive-fluid supply and with the interior of the cylinder, said cylinder further provided with a fluid-space communicating with a fluid-supply, a reciprocatory hammer arranged in said cylinder, operated by the motive fluid and provided with passages communicating with said fluid-space, a nozzle carried by the hammer and communicating with said passages for receiving the fluid therefrom, and a tool adapted to receive the fluid from said nozzle.

6. A pneumatic drill comprising a hammer, a nozzle carried by and communicating through the hammer with a fluid-supply, and a tool-holder provided with a channel adapted to communicate with the nozzle for receiving the fluid therefrom.

7. A pneumatic drill comprising a hammer, a nozzle carried by and communicating through the hammer with a fluid-supply, a tool-holder provided with a channel adapted to communicate with the nozzle for receiving the fluid therefrom, and a tool carried by the tool-holder and provided with a passage communicating with the channel in the tool-holder for receiving the fluid therefrom.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HARRY P. TAYLOR.

Witnesses:
W. H. CROMER,
J. M. ESLINGER.