No. 834,441. PATENTED OCT. 30, 1906.

T. E. ADAMS.

ROCK DRILL.

APPLICATION FILED JULY 29, 1905.

Fig. 1.

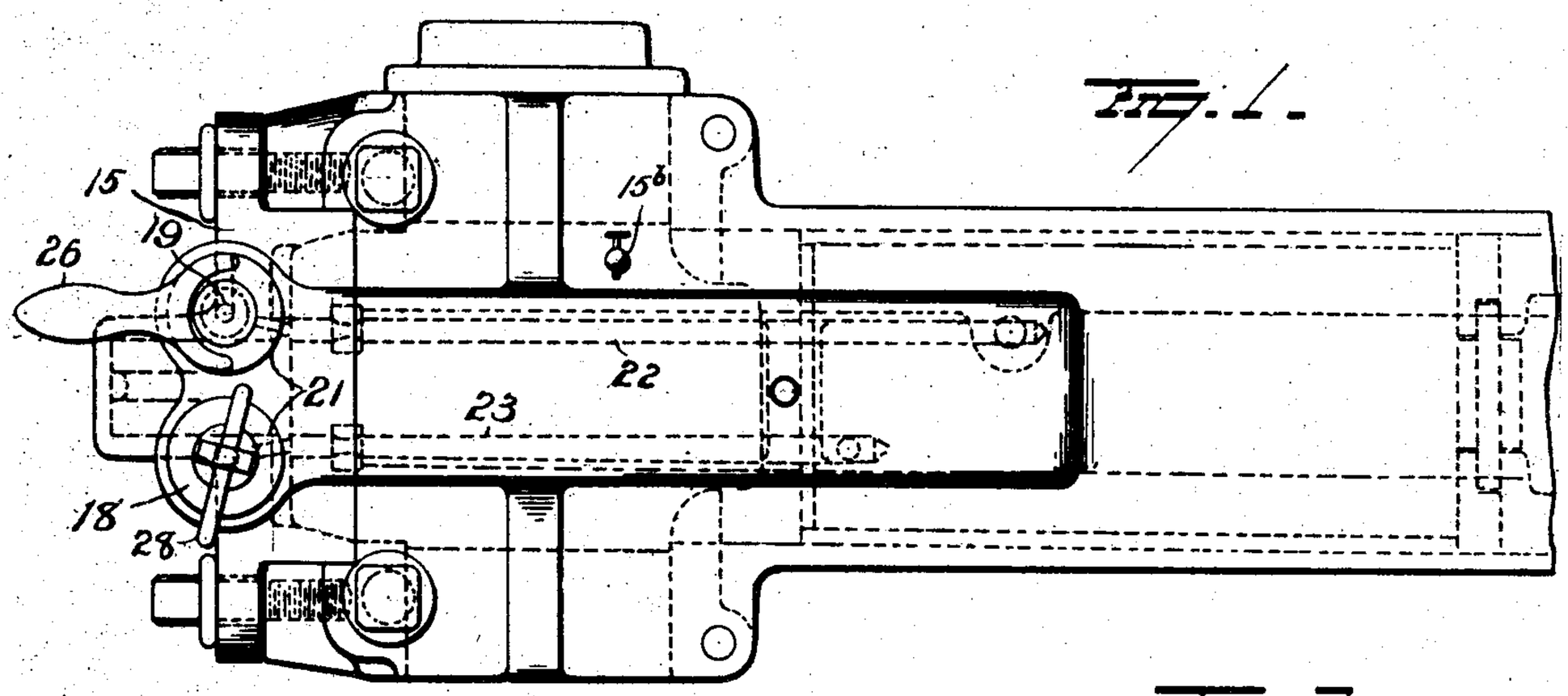


Fig. 2.

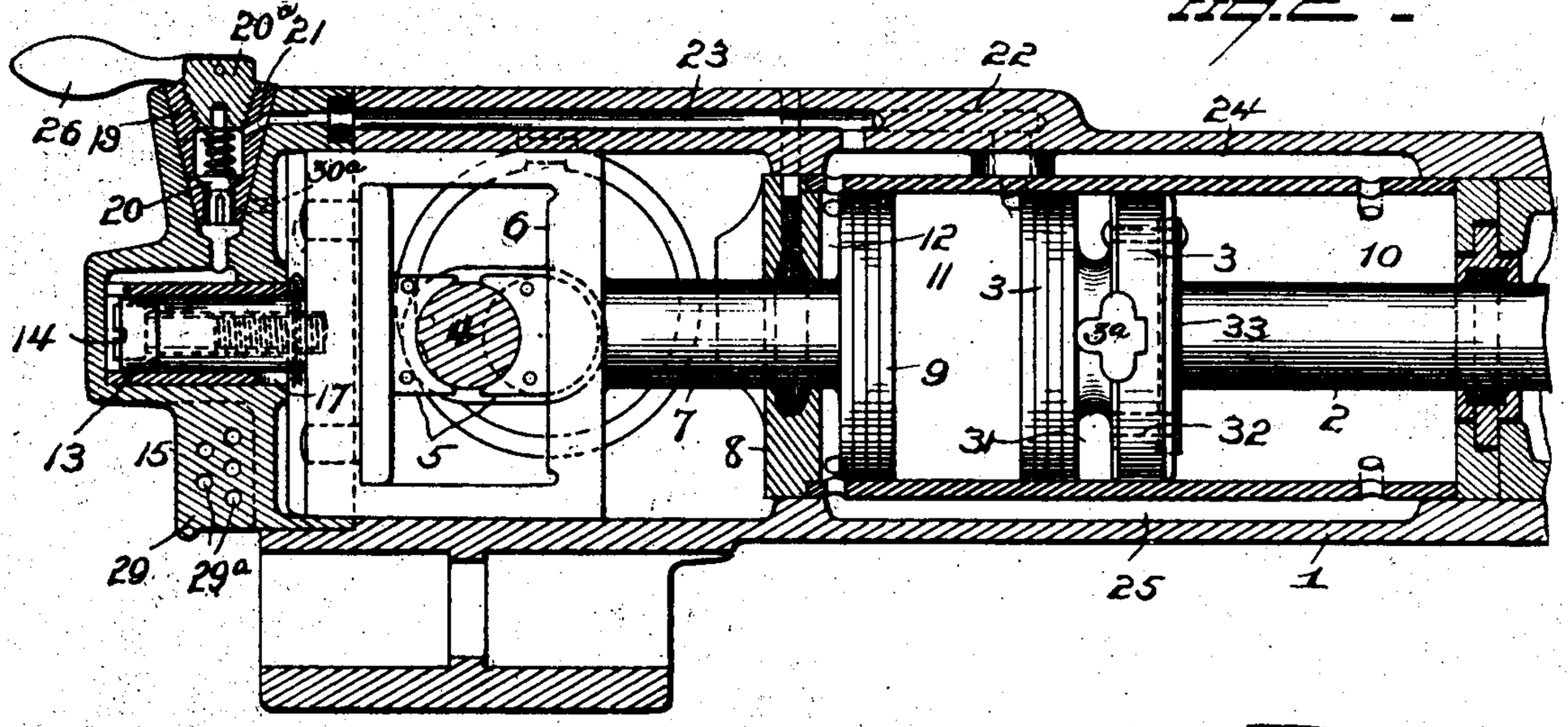


Fig. 3.

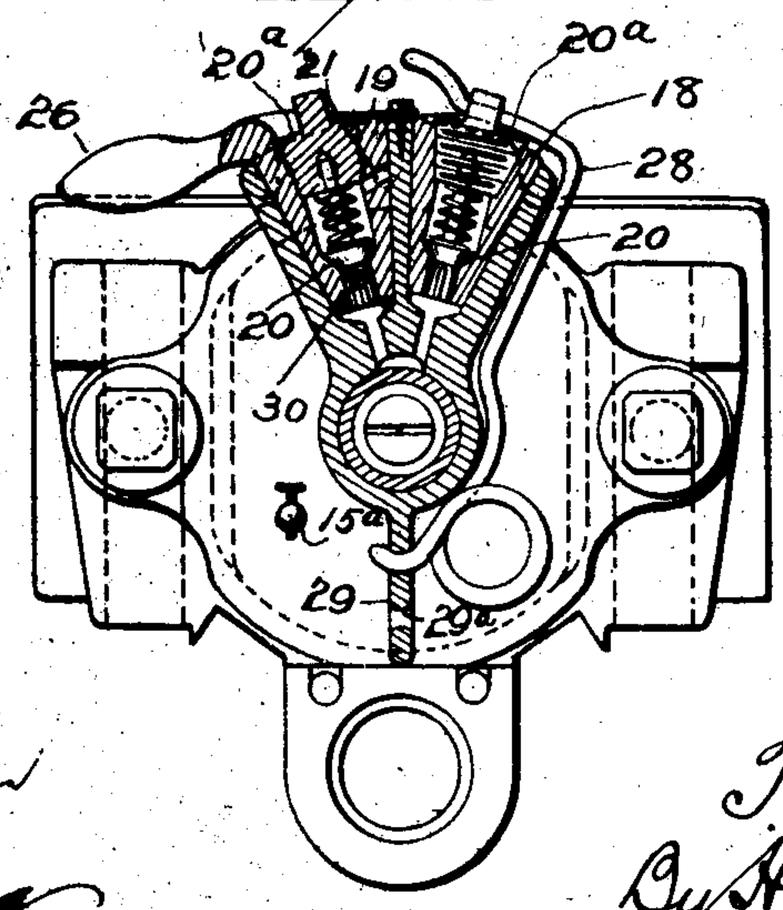
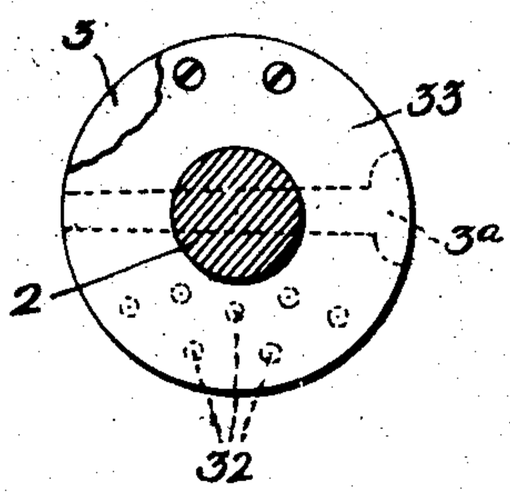


Fig. 4.



WITNESSES

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ROCK-DRILL.

No. 834,441. Specification of Letters Patent. Patented Oct. 30, 1906.

Application filed July 29, 1905. Serial No. 271,806.

To all whom it may concern:

Be it known that I, THOMAS EDGAR ADAMS, a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Rock-Drills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in rock-drills, one object of the invention being to provide an improved drill in which compressed air is employed as a cushioning connecting medium between operative parts of the drill and providing an air-pump to be operated by the drill, or otherwise if more convenient, to maintain the air in the drills at a density that will insure the driven piston being moved in unison with the driving-piston, even though the drill-bit connected with the driven piston should stick in the hole being drilled.

A further object is to provide valves suitably arranged to control the pressure of air, and thereby control the length of the stroke of the driven piston, it being obvious that drill-steels of various weights require different densities of the air-cushions to maintain the uniform length of stroke.

A further object is to so arrange the valves that the position of the driven piston in the cylinder may be changed, it being well understood that in drilling upward the weight of the reciprocating parts gradually trends to move downward through the air-cushion until struck by the driving-piston. In the improvement here shown I can by increasing the density of air between the pistons force the driven piston away from the driving-piston to a suitable distance.

With these and other objects in view the invention consists in certain novel features of construction and combinations and arrangements of parts, as will be more fully hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view, and Fig. 2 is a view in longitudinal section, illustrating my improvements; and Fig. 3 is a view in cross-section through the back door of the drill. Fig. 4 is a face view of piston 3.

1 represents a drill-barrel provided in its forward end with a mounting for the drill-rod 2, which mounting at its inner end, at least, is air-tight, and a piston 3 is secured on the inner end of the rod by means of a key 3^a and fits snugly in the barrel 1.

Located in the rear end of the barrel is an operating crank-shaft 4, engaging bearing-blocks 5, forming a vertically-reciprocating box in a cross-head 6, movable in barrel 1, and a rod 7, secured to cross-head bar, projects through an air-tight partition 8 in barrel 1 and has a piston 9 secured on its forward end. For convenience of description I shall refer to the chamber in front of piston 3 as chamber 10, the space between pistons 3 and 9 as chamber 11, and the space between piston 9 and partition 8 as chamber 12.

The drill-casing is provided with a removable back door 15, which may be provided with a valved inlet 15^a for air to the crank-casing, or air may be admitted through a valve 15^b on the crank-casing. The removable back door 15 is provided with a pump-cylinder 13, having a plunger 14 therein connected to cross-head 6, and an opening 17 is provided in the pump-barrel to admit air from the crank-case into the pump-cylinder.

Above the pump, in the back door, two conical turning-plugs 18 and 19 are located and are made hollow to receive check-valves 20, having tight plugs 20^a to close the opening over the check-valve springs. Short ducts 21 are provided in the plugs 18 and 19, connecting the air-passage from the pump with ducts 22 and 23, respectively, in the drill-barrel, the duct 22 communicating with chamber 11, and the duct 23 directs the air into a channel 24, communicating with chambers 10 and 12, and a similar channel 25 is provided opposite to channel 24 to more perfectly equalize the air-pressure and allow a more rapid movement of the air.

The plug 19 has a handle 26 to permit the same to be manually turned to shut off communication with the chambers 10 and 12, and a rod-spring 28 is connected at one end to the plug 18, and at its lower end located in any of a series of openings 29^a in a web 29 on the back door. This spring 28 will admit of ample torsion to permit its upper end to be operated to turn plug 18 and shut off communication with the chamber 11, but return the plug to its normal open position when released, and it also permits the plug to be raised by excessive air-pressure to maintain a proper density in the drill. The plug 19 is provided in its lower portion with a port 30, normally closed, yet which can be

moved to aline with a port 30ª in the back door to permit the air from the pump to be returned to the drill-barrel.

The driven piston is provided with an annular chamber 31, connected by ports 32 with chamber 10, and a leather disk 33 serves as a flap-valve for all of these ports. When the driven piston moves far enough forward to bring its chamber 31 over the outlets of channels 24 and 25, the air will enter chamber 31 and pass though ports 32 into chamber 10 and drive the piston back.

The operation of my improvements is as follows: The air-pump forcing its air through ducts 22 and 23 compels a uniform air-pressure in chambers 10, 11, and 12, so that when piston 9 is moved forward the air between the pistons 9 and 3 will act as a cushioning connection between them to drive the piston 3 and drill-rod forward, the air in advance of piston 3 passing through channels 24 and 25 to the chamber 12 between the partition 8 and piston 9, and the reverse stroke of piston 9 causes the air between the same and partition 8 to flow through channels 24 and 25 into chamber 10 and compel the piston 3 to move back with piston 9. By this arrangement of parts the air not only serves as a connecting medium to drive the drill-rod, but also acts as a cushion to take the shock and vibration. By turning plug 18 to close its communication with duct 23 all the air will be forced between the pistons to separate them, and when plug 19 is closed and plug 18 open the air will be forced into chambers 10 and 12 to force the pistons toward each other, thus permitting the operator at all times to move the driven piston in any direction he may desire.

The air entering the drill is preferably water-cleaned or freed from dust and grit by other suitable means to prevent injury to the drill, and a great many changes might be made in the general form and arrangement of parts described without departing from my invention. Hence I do not restrict myself to the precise details set forth, but consider myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of my invention.

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

1. In a drill, the combination with a barrel, of a drive-piston in the barrel, a driven piston in the barrel, and manually-controlled means for maintaining air at proper density between said pistons and similar means for maintaining the air at proper density on the opposite sides of the pistons to compel the driven piston to move with the driver.

2. In a drill, the combination with a barrel, of a drive-piston in the barrel, a driven piston in the barrel, means for supplying air between the pistons and at both sides of said pistons to compel them to move together, and devices for controlling the supply of air to the different air-chambers, to adjust the driven piston toward or away from the driver.

3. In a drill, the combination with a barrel, driving and driven pistons therein and separated by an air-chamber, and means for reciprocating the driving-piston, of means for forcing air into the chamber between the pistons and simultaneously in front of one piston and behind the other for maintaining the air at proper density between and in front of and behind the pistons, and means for overcoming excessive pressure.

4. In a drill, the combination with a driving-piston, of a driven piston, air-chambers between and on both sides of both pistons, a duct connecting the end chambers, and means for forcing air into all of said chambers.

5. In a drill, the combination of a drill-barrel, a drive-piston therein, a driven piston in the barrel, air-chambers between and at both sides of both pistons, an air-duct connecting the end chambers, and a pump operated by the drill to supply compressed air to all of said air-chambers.

6. In a drill, the combination with a drill-barrel, of a drive-piston in the barrel, a driven piston in the barrel, and a pump operated by the drill to force air into the barrel and serve as a connecting medium between the pistons.

7. In a drill, the combination with a drill-barrel, of a drive-piston therein, a driven piston in the barrel, an air-pump, ducts connecting the pump with the chambers between the pistons and on both sides thereof, a reciprocating draw-bar connected with the drive-piston, and a plunger in the pump connected with the draw-bar.

8. In a drill, the combination with a drill-barrel, of a drive-piston therein, a driven piston in the barrel and air-chambers between and on both sides of said pistons, an air-pump at the rear end of the drill-barrel and operated by the drill, air-ducts connecting the air-chambers with the pump, check-valves in said air-passages and a pressure relief-valve in one of said passages.

9. In a drill, the combination with a drill-barrel, of drive and driven pistons dividing the barrel into three air-chambers, a duct connecting the end chambers, an air-pump operated by the drill to force air into all of the air-chambers, means for regulating the supply of air to the chambers and a pressure relief-valve.

10. In a drill, the combination with a drill-barrel, of drive and driven pistons in the barrel spaced apart and forming three air-chambers in the barrel, a duct connecting the end air-chambers, drill-driving mechanism, an

air-pump operated by the drill-driving mechanism, check-valves, means for adjusting the check-valves, and a pressure relief-valve operated by pressure in the air-chambers.

11. In a drill, the combination with a barrel, of drive and driven pistons in the barrel spaced apart, an air-pump, plug-valves in the air-passages between the pump and chambers formed by the pistons, check-valves in the plug-valves, and a spring holding one plug-valve down and permitting the same to operate as a pressure relief-valve.

12. In a drill, the combination with a barrel and a removable back door thereon, of drive and driven pistons in the barrel forming air-chambers between and at both sides thereof, an air-pump in the back door operated by the drill and receiving air from the barrel, air-passages connecting the pump with the air-chambers, plug-valves in said passages having check-valves therein, a duct returning air from the pump to the barrel when one of said plug-valves is moved to close its air-passage to the chambers, and the other plug-valve serving as a pressure relief-valve as well as a turning-plug.

13. In a drill, the combination with a drill-barrel, a drill-rod, a driven piston in the barrel connected with the drill-rod, said piston having a chamber therein and having outlet-ports communicating with said chamber, and means for forcing fluid through said chamber and forwardly through the ports to move the piston rearwardly.

14. In a drill, the combination with a drill-barrel, and a drill-rod, of a piston movable in the barrel and connected with the drill-rod, said piston having a chamber therein, means for forcing air into said chamber, said piston also having forward ports communicating with said chamber and a valve on the forward face of the piston covering said ports.

15. In a drill, the combination with a drill-barrel, of a driving-piston and a driven piston in said barrel and separated from each other, a drill-rod connected with the driven piston, means for supplying air between said pistons and means for supplying air in front of the driven piston when the latter passes beyond the forward end of its normal throw.

16. In a drill, the combination with a drill-barrel, of a driving and a driven piston therein separated by an air-space, means for operating the driving-piston to operate the driven piston in both directions, a drill-rod connected with the driven piston, and means for supplying air in front of the driven piston when it passes the forward end of its normal throw.

17. In a drill, the combination with a drill-barrel having a compartment therein, of a driven piston in said compartment, a drill-rod connected with said piston, means for reciprocating the piston, and means operating automatically to supply air between said piston and the forward end of the compartment in which it moves if the piston passes beyond the forward end of its normal throw in said compartment.

In testimony whereof I have signed this specification in the presenee of two subscribing witnesses.

THOMAS EDGAR ADAMS.

Witnesses:
F. W. SINRAM,
J. H. WORBS.