J. A. TRAYLOR.

ROCK DRILLING ENGINE.

APPLICATION FILED JAN. 10, 1908.

909,259. Patented Jan. 12, 1909.

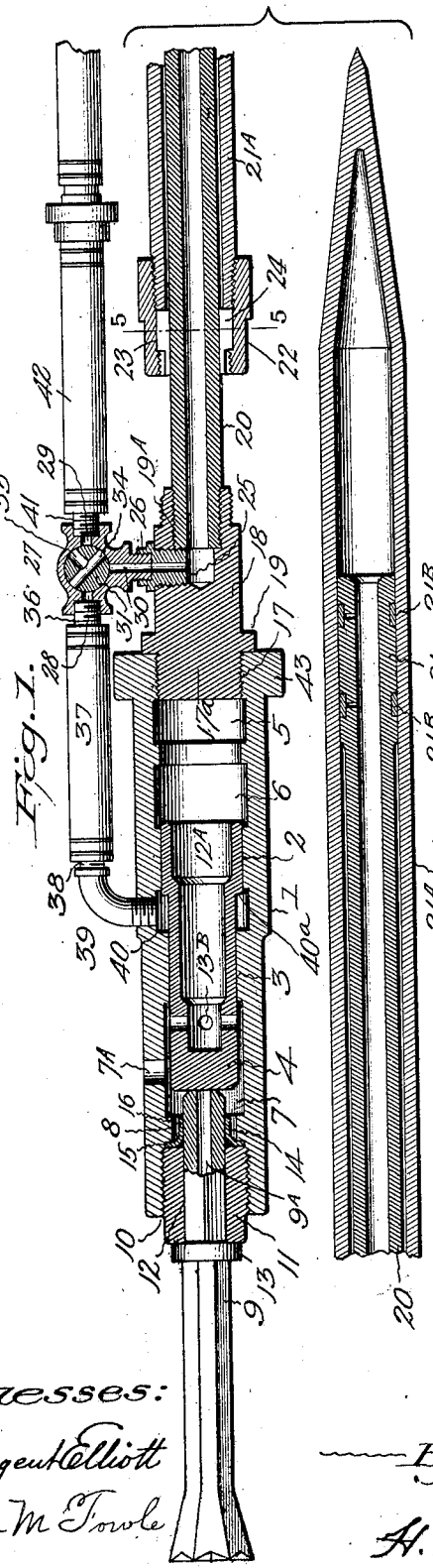


Fig. 1.

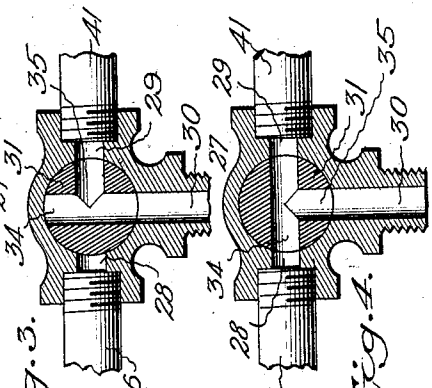


Fig. 3.

Fig. 4.

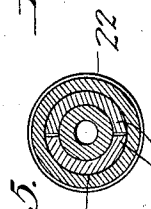


Fig. 5.

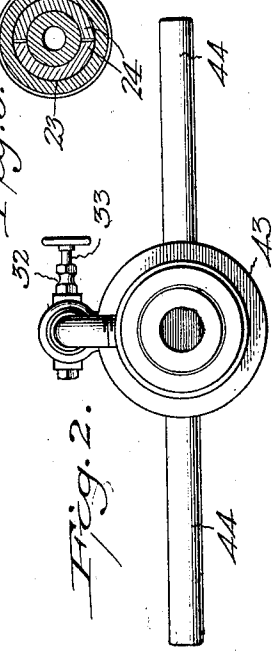


Fig. 2.

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UNITED STATES PATENT OFFICE.

JOHN A. TRAYLOR, OF DENVER, COLORADO, ASSIGNOR TO THE JOHN A. TRAYLOR MACHINERY COMPANY, OF DENVER, COLORADO, A CORPORATION OF COLORADO.

ROCK-DRILLING ENGINE.

No. 909,259. Specification of Letters Patent. Patented Jan. 12, 1909.

Application filed January 10, 1908. Serial No. 410,153.

To all whom it may concern:

Be it known that I, JOHN A. TRAYLOR, a citizen of the United States of America, residing at the city and county of Denver and State of Colorado, have invented a new and useful Rock-Drilling Engine, of which the following is a specification.

My invention relates to improvements in rock drills, and the objects of my invention are: to provide a rock drilling engine having a packing device through which the drill bits are thrust when they are inserted into the rock drilling engine, that is adapted to prevent the escape of the actuating fluid from the cylinder along the drill bits to the atmosphere. I attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1, is a longitudinal, sectional view through the drilling engine and the air feed cylinder, by which the said engine and its drill bit are held against the face of the rock, and fed forward as the drill cuts into the rock. Fig. 2, is a front elevation of the drilling engine. Figs. 3 and 4, are views of the fluid inlet valve, showing the position of the said valve when the fluid is admitted to the feed cylinder only, and also when the fluid is admitted to the feed cylinder and to the hammer piston cylinder simultaneously and Fig. 5, is a sectional view on the line 5—5 of Fig. 1.

Similar letters of reference refer to similar parts throughout the several views.

Referring to the drawings, the numeral 1, designates the cylinder of my rock drill. This cylinder is provided with a main cylindrical bore of two diameters 2 and 3, in which a piston 4, which is also made in two diameters, is reciprocally fitted. Annular port portions 5 and 6 are formed in the rear end portion of said cylinder's bore, and an annular exhaust chamber 7 is formed at the forward end of the cylinder around the forward end of the hammer piston, and this chamber is provided with an outlet port 7^A. From the forward end of the piston bore, a smaller short axial bore 8 is formed in the cylinder, through which the rear end of a drill bit 9 passes, said bit being provided with a longitudinal passage 9^A, which extends entirely through it. This aperture 8, is intersected by a larger axial bore 10, that extends into the cylinder from its forward end, and which is threaded. A drill bit holding chuck 11, is threaded to screw into the axial bore 10. This chuck projects out from the end of the cylinder, and is provided with a wrench receiving end. An axial aperture 12 is also formed through it, in which the shank end of the drill bit is inserted, and a collar 13 is formed on the drill bit, which bears against the chuck. A packing cap 14 is inserted in the bottom of the bore 10, which consists of a ring portion 15, provided with a hub portion 16. This cap is made of any suitable flexible material, such as leather, rubber, or special packing materials, and the chuck is screwed tightly against its flange portion, and clamps it between the inner end of the chuck and the bottom of the aperture 10. The hollow hub portion 16 of this flexible packing cap extends loosely into the axial bore 8 of the cylinder, and it is made to fit snugly around the shank end of the drill bit, and as it fits loosely in the aperture 8, the air pressure from the cylinder forces this flexible hub portion of the cap down tight around the shank end of the drill bit, and prevents the air from escaping from the cylinder out through the apertures 8 and 12 of the chuck along the shank of the drill bit to the atmosphere.

The hammer piston 4, which is made in two diameters, is reciprocally mounted in the two bores of the cylinder. This piston hammer is provided with an axial port 12^A, that extends into its rear end to within a short distance of its front end, and a circumferential row of radial port holes 13^B, is formed through the shell of the hammer to intersect the forward end of the axial port 12^A. The rear end of the cylinder is also provided with an axial aperture 17, which is interiorly threaded, and a cylinder head 17^A, having a hub portion 18, is screwed within the threaded aperture 17, until a collar 19 on the hub abuts against the end of the cylinder. An axial aperture 19^A is formed in the outer end of the hub, which is interiorly threaded, and a fixed tubular piston rod 20 is threaded at one end into it. This fixed piston rod is provided at its outer end with a piston head 21, and the rod extends into a long cylinder 21^A, which is termed the air feed cylinder, the piston head being provided with suitable packing rings 21^B, which cause it to fit snugly but slidably in the cylinders. The terminal end of the air feed cylinder is tapered to a point, and is adapted to be abutted against any portion of the rock

workings or against any suitable abutment where the drilling engine is used. The opposite end of the air feed cylinder is slightly tapered and threaded, and a sleeve 22, having a tapered threaded bore at one end, is secured upon this end of the air feed cylinder. The bore at the opposite end of the sleeve 22, is threaded for a short distance, and is of less diameter than the inner end of the tapered bore, an unthreaded and plain bore 23, being formed between the two threaded portions, which terminates in a shoulder, where the smaller threaded bore begins. In this smooth bore 23, is placed a split sleeve 24, preferably of soft metal, and this split sleeve fits snugly upon the piston rod, and within the outer sleeve 22, and forms a bearing, which prevents the inner end of the air feed cylinder from sagging, and thus assures a smooth travel of the cylinder upon the piston and rod. When the drill is shipped or moved from place to place, the split sleeve is removed by removing the sleeve 22, which is again screwed upon the end of the feed cylinder. The cylinder is then moved up on the piston rod, and the sleeve engages and is screwed upon the outer end of the hub 18, which is threaded, as shown, and the two parts of the drill are thus coupled together, and prevented from becoming separated.

An actuating fluid inlet aperture 25 is formed in the hub 18, which intersects the axial aperture of the hub and of the fixed piston. A nipple fitting 26 is threaded to the inlet 25, and a three-way valve 27 is threaded to the nipple. This valve comprises globe body portion or casing, having three fluid entrance or outlet apertures 28, 29, and 30, a circular valve 31, and a valve stem stuffing box portion 32, which is placed in alinement with the valve seat. A valve stem 33 is operatively mounted in the stuffing box portion of the valve, and the valve 31 is mounted on the inner end of the valve stem. This valve comprises a plug having a transverse port 34, extending through it, and a port 35, at right angles to the port 34, which extends half way through the valve, and intersects the port 34. The fluid apertures 28 and 29 of the valve 27, are arranged in alinement, and communicate respectively with the hammer piston cylinder and with the air feed cylinder, and the aperture 30, is at right angles to them, and communicates with the port in the hub 18 and the hollow fixed piston of the feed cylinder. To the fluid aperture 28 of the valve, I connect one end of a nipple 36, to which one end of a hose 37 is connected, and the opposite end of this hose is connected to a nipple 38, which is threaded to one end of an elbow 39, the opposite end of which is threaded to an inlet port 40, formed in the hammer piston cylinder. To the fluid aperture 29 of the valve, I secure one end of a nipple 41, to the opposite end of which one end of a hose 42 is connected, the opposite end of which leads to a supply of any suitable actuated fluid, which preferaby is compressed air.

While the feed cylinder is adapted to be used as an abutment for the hammer piston cylinder, it can be held by any suitable chuck, and be supported on a stopping bar or column, which is a common way of supporting rock drills in mine workings. A collar portion 43 is formed on the rear end portion of the hammer piston cylinder, and two handles 44 are secured to it at one end, and are arranged to radiate from it and are adapted to be grasped by the hands of an operator, and the hammer piston rotatably oscillated to and fro, as the drill bit drills into the rock.

The operation of my improved rock drilling engine is as follows: The rock drilling engine is placed in position to drill a hole in rock, and assuming that the feed cylinder is to be used without a chuck and column, its abutment point is placed against a suitable abutment, and the three-way valve is turned to the position shown in Fig. 3, so as to admit the actuating fluid into the hub and hollow piston rod, through which it flows to the rear end of the piston and feed cylinder, where it forces the piston and the piston hammer cylinder forward until the drill-bit bears against the rock. The three-way valve is then turned to the position shown in Fig. 4, to admit the actuating fluid, which will then flow to the hammer piston cylinder at the same time it is flowing continuously to the feed cylinder, and the actuating fluid reciprocates the hammer piston, moving it backward by flowing into the inlet port 40 and against the shoulder 40^A of the piston until the port holes 13^B register with the inlet port, when the air flows into and through them into the axial port 12^A of the piston hammer, and thence to the rear end of the cylinder, where it expands against the greater area of the rear end of the hammer piston, which is thereby driven forward against the end of the drill-bit, which is driven against the rock, and when the hammer piston reaches its forward stroke, the air from the rear end of the cylinder exhausts through the port holes 13^B into the chamber 7, and through the exhaust port 7^A to the atmosphere, a portion of the exhaust air escaping through the passage 9^A of the bit. In the rock drilling engines in common use, the exhaust air rushes into the port with such force that it flows along the shank of the drill bit, and blows the rock dust back into the face of the operator, but this fault is completely obviated by the use of my flexible rubber washer, and the construction of the chuck and front end of the cylinder enables the washer to be secured around the shank of

the drill-bit, and loosely within the neck of metal; the terminal end portion of the drill-bit projects into, and through, and lies close enough around and against the drill-bit, so that when the air rushes into this port it surrounds and strikes this hub portion with such force that it is compressed and closed tightly around and against the shank of the drill bit tight enough to prevent the air from flowing along the drill-bit in any perceptible quantity, and thus completely eradicates and overcomes a very disagreeable feature of the drilling engines in use.

The three-way valve enables an operator to set his drilling engine and move the drill bit against the rock into operative rock drilling position, before the air is turned into the piston hammer cylinder. After the drilling engine is set and the piston hammer is at work, the operator oscillates the piston hammer cylinder by grasping the handles and partially rotating this cylinder to and fro, thus rotating the drill bit step by step so that it will strike in a new place in the hole being drilled, at each blow of the piston hammer.

While I have illustrated a preferred form of three-way valve, I do not wish to be limited to it, as my invention contemplates the use of any operative three-way valve that will operate either one of these cylinders independent of the other, or both at the same time.

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

1. In a rock drill, the combination of the piston hammer cylinder, provided with an operative piston hammer, and a drill bit arranged in the operative path of said piston hammer, a chuck in said cylinder arranged to support said drill-bit, a neck portion in said cylinder provided with an axial bore surrounding said drill bit and registering with the bore of said piston hammer, and a flexible washer secured between said chuck and the adjacent side of said neck portion, having a hub portion extending into the axial aperture of said neck portion and surrounding said drill bit.

2. In a rock drill, the combination of the piston hammer cylinder provided with a reciprocating drill bit striking piston hammer, a drill bit holding chuck extending into the drill bit holding end of said cylinder, a neck portion in said cylinder provided with an axial bore, adapted to receive the shank end of a rock cutting drill bit and registering with the piston hammer bore of said cylinder, a drill bit provided with a shank end supported by said chuck and extending loosely into and through said neck portion, and a flexible washer secured in said cylinder between said chuck and the adjacent side of said neck portion, provided with a hub portion extending loosely into and through said neck portion to said piston hammer bore, and surrounding the shank end of said drill-bit.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN A. TRAYLOR.

Witnesses:
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E. D. TRAYLOR.