W. A. SMITH.

ROCK DRILL.

APPLICATION FILED OCT. 18, 1917.

1,424,188.

Patented Aug. 1, 1922.

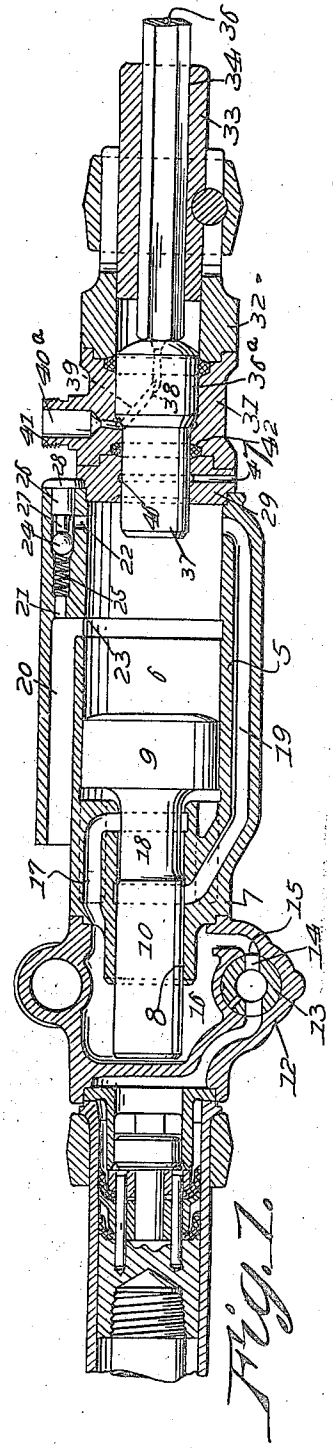


Fig. 1.

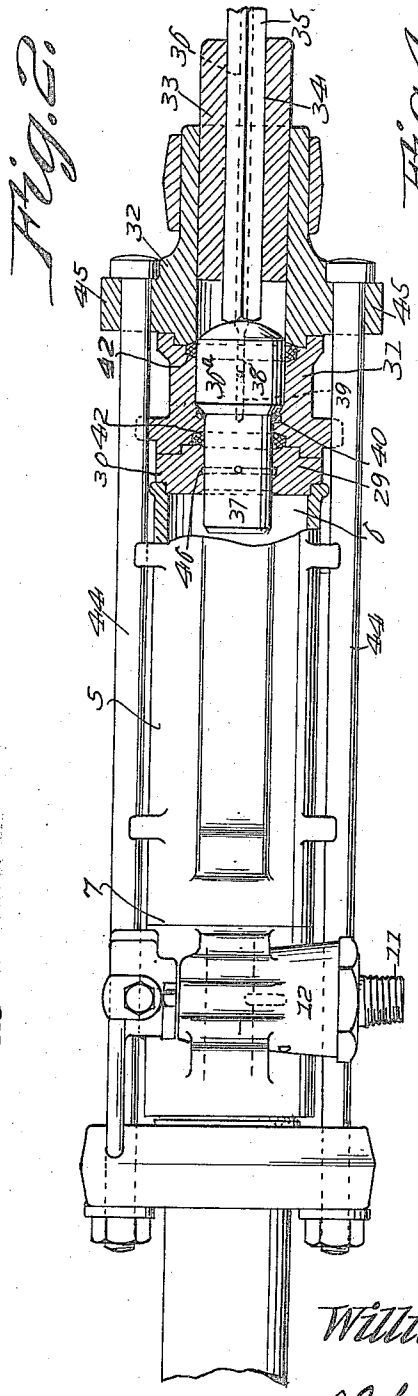


Fig. 2.

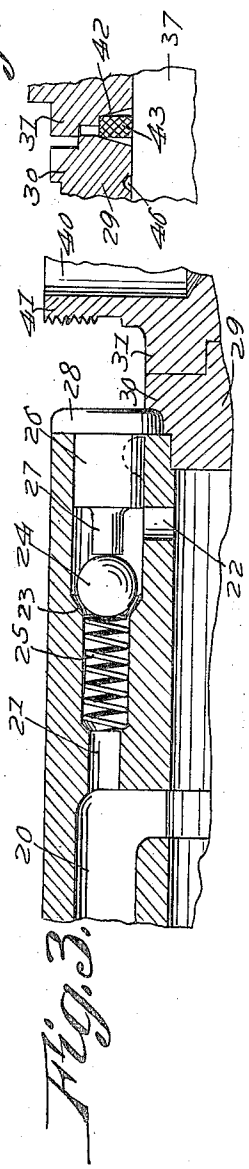


Fig. 3.

Fig. 4.

Inventor

William A. Smith,

By

Attorney

UNITED STATES PATENT OFFICE.

WILLIAM A. SMITH, OF DENVER, COLORADO, ASSIGNOR TO THE DENVER ROCK DRILL MANUFACTURING COMPANY, OF DENVER, COLORADO, A CORPORATION OF DELAWARE.

ROCK DRILL.

1,424,188. Specification of Letters Patent. Patented Aug. 1, 1922.

Application filed October 18, 1917. Serial No. 197,261.

To all whom it may concern:

Be it known that I, WILLIAM A. SMITH, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Rock Drills, of which the following is a specification.

The present invention relates to rock drills in which expansible fluid, preferably air, is used as the actuating medium, and one of the primary objects is to provide novel means which will allow substantially the complete exhaust of the fluid preferably on its forward stroke to avoid any cushioning effect, and thus secure an exceedingly heavy blow upon the tool.

A further and important object is to provide means of a simple and effective nature for introducing a cleansing fluid, such as water, into the front end of the machine, and directing it therethrough to the drill bit, this means being so constructed that it will effectively prevent the leakage of liquid into the motor.

One embodiment of the invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a longitudinal sectional view through the drilling apparatus.

Figure 2 is a plan view partly in section.

Figure 3 is an enlarged view showing in detail the supplemental exhaust passageway and the controlling means therefor.

Figure 4 is a detail view illustrating the head plate and collar slightly separated to indicate the initial form of the gasket clamped therebetween.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

In the embodiment illustrated, the drilling motor consists of a cylinder member having a barrel 5 provided with a piston chamber 6, said barrel having a rear head 7 provided with a neck chamber 8. A hammer piston is employed, comprising a head 9 operating in the chamber 6, said head having an integral rearwardly extending neck 10 operating in the chamber 8.

Motive fluid is supplied to the machine through a nipple 11 connected to one end of a valve casing 12, in which is located a rotatable throttle valve 13 having a supply port 14 movable into and out of register with a passage 15 that leads to a chamber 16 at the rear end of the hammer piston. From this chamber 16, a passageway 17 leads to the front end of the neck chamber 8, and the neck 10 is provided with a reduced portion 18 located just in rear of the head 9. It will be evident that when the hammer piston is in its rearward position and the valve 13 is open, the motive fluid will pass through the chamber 16 and passageway 17 around the groove 18, and thus operate against the rear face of the head 9. This pressure added to the constant pressure against the rear end of the neck 10, drives the hammer piston forwardly. Another passageway 19, communicating with the neck chamber 8 in rear of the front end of the passageway 17, also is in communication with the front end of the chamber 6, and the rear end of the passageway 19 is so situated that when the piston is in its forward position, the rear end of the neck 10 will uncover the rear end of said passageway 19, thus permitting the motive fluid to flow into the front end of the piston chamber 6 and against the front face of the head 9, thereby driving the hammer piston rearwardly. Communicating with an intermediate portion of the chamber 6 is an exhaust passage 20 leading to the atmosphere, and as the head 9 passes the inner end of said passageway 20, it will be obvious that the motive fluid will exhaust alternately from the piston chamber 6 on opposite sides of said head 9.

Inasmuch as the inner end or port of the passageway 20 is necessarily placed at some distance from the front end of the piston chamber 6, it will be obvious that after the front end of the head 9 passes the exhaust port, pressure would be built up in the front end of the chamber 6, thereby producing a cushion that would weaken the blow of the hammer piston. To obviate this a supplemental exhaust passageway 21 is provided, having its inner end communicating by means of a port 22 with the front end of the piston chamber, its other end preferably opening into the exhaust passage 20. In the passageway 21 is located a valve seat 23 against which a ball valve 24 is adapted to seat itself. The valve 24, it will be noted, is an outwardly closing valve, and it is normally held in open position by a coiled spring 25 located in the passageway 21 and abutting against said valve. A plug 26 closing the front end of the passageway 21, has

a stop 27 against which the valve 24 abuts, and this plug 26 has an exposed head 28.

The spring 25 is of such tension or strength that it will hold the valve 24 in open condition against the pressure of the normal exhaust, and therefore after the piston head 9 has passed the main exhaust 20, the motive fluid in advance of the same can freely pass through the port 22 around the valve 23 and out of the passageway 21. As soon, however, as the motive fluid is admitted to the front end of the piston chamber 6 through the passageway 19, this increased pressure will overcome the force of the spring 25, the valve 24 will seat itself, and the exhaust will consequently be cut off.

The front head of the cylinder member is sectional. It comprises a head plate 29 that constitutes a closure for the front end of the piston chamber 6, and has a flange 30 that abuts against the front end of the barrel 5, and against the head 28 of the plug 26, thereby holding the latter in place. In front of the head plate 29 is a collar 31, and in advance of said collar is located a chuck sleeve 32 having a bushing 33 provided with an angular socket 34 to receive a drill bit shown at 35. The drill bit is provided with the usual bore 36 longitudinally therethrough. A tappet is located in this head for transmitting the blow from the hammer piston 9 to the drill bit 35. Said tappet consists of a head 36^a located in the collar 31 and a rearwardly extending neck 37 that passes through the head plate 30 into the piston chamber 6, where it will be struck by the hammer piston.

In order to supply cleansing fluid, preferably water to the bore 36 of the drill bit 35, this tappet is provided with an axial passageway 38, the front end of which communicates with the bore 36, the rear end being in communication with a lateral port 39 that opens through the side of the tappet at the juncture of the head 36^a and neck. The collar 31 has an annular channel 40 with which the outer end of the port 39 communicates, and this channel is in communication with the bore 40^a of a supply nipple 41 formed upon one side of the collar 31. Liquid from any suitable source can be supplied to a hose connected to the nipple 41, and it will be evident that this liquid will flow freely through the bore 40^a, port 39, channel 40, and bore 36 of the drill steel to the bottom of the hole being drilled, to eject the cuttings.

One of the serious difficulties that has been experienced in supplying a cleansing liquid to the front end of the machine has been due to the leakage of said liquid. In the present structure to prevent this, the collar 31 is provided in its end with tapered grooves 42, in which are placed packing gaskets 43 that respectively surround the head 36^a and neck 37 of the tappet, and are thus located on opposite sides of the channel 40 and port 39. The gaskets, it will be noted, are clamped snugly between the collar 31, the head plate 39 and chuck sleeve 32. Preferably these gaskets initially have parallel faces, and are somewhat thicker than the sockets containing them, so that when the parts are drawn together, they will be compressed and forced snugly against the surface of the tappet. This compressing action is secured by the side bolts 44, the front ends of which are engaged in ears 45 on the chuck sleeve 32, the side bolts serving to draw the parts of the front head together and also clamp said head upon the barrel. As a further precaution against leakage of the liquid rearwardly into the motor, the head plate 30 is provided with an internal channel 46 that surrounds the neck 37 of the tappet in rear of the rear gasket and in rear of the channel 40. This channel 46 constitutes a drain and has an outlet port 47 leading to the exterior of the machine. Therefore any moisture that may pass the rear gasket will be caught in the channel and the leakage of the motive fluid forwardly around the tappet will drive the same out through the port 47.

From the foregoing it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

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

1. In apparatus of the character set forth, the combination with a motor having a barrel, a hammer and a drill receiving chuck, of an exposed collar interposed between the front end of the barrel and the rear end of the drill receiving chuck, a tappet in the collar for transmitting the blows of the hammer to a tool in the chuck and also directing cleansing fluid to such tool, side bolts connecting the chuck and motor for clamping the same against the interposed collar, the exposed portion of the collar having means projecting between the side bolts for supplying cleansing fluid to the blow-transmitting and fluid directing means, and packing interposed between the collar and the barrel and chuck and forced thereby against the tappet for preventing leakage around said tappet.

2. In apparatus of the character set forth, the combination with a motor barrel, of a hammer piston therein, a sectional head

member for the barrel extending in advance thereof and comprising a head plate, a tool supporting chuck and a collar interposed between the head plate and chuck and having an exposed portion provided with means for the attachment thereto of a supply conduit, said collar having a bore, the end portions of which are of different diameters, a tappet in the collar having a head in the portion of larger diameter and a reduced neck in the portion of smaller diameter, said tappet having a lateral inlet port between its ends, packing gaskets interposed between the head plate and collar and between the collar and chuck, and respectively engaging the neck and head of the tappet on opposite sides of the inlet port, and means for drawing together said head plate, collar and chuck.

3. In apparatus of the character set forth, the combination with a motor barrel, of a hammer piston therein, a sectional head member for the barrel, comprising a head plate, a tool holding chuck sleeve and a collar interposed between the head plate and chuck sleeve, a tappet in the collar for operating on a tool supported by the chuck sleeve and having a delivery passageway and a lateral intake port, said collar having a supply port in communication with the intake port, packing for the tappet interposed between the head plate and collar and also between the collar and chuck sleeve, said packing respectively engaging the tappet in advance of and in rear of the supply and intake ports, and means for drawing together said head plate, collar and chuck.

4. In apparatus of the character set forth, the combination with a motor barrel, of a hammer piston therein, a sectional head member for the barrel, comprising a head plate, a chuck sleeve and a collar interposed between the head plate and chuck sleeve, a tappet having an enlarged head in the collar and a reduced neck in the head plate, a packing gasket interposed between the head plate and collar and surrounding the tappet neck, a packing gasket interposed between the collar and chuck sleeve and surrounding the tappet head, said tappet having a forwardly delivering cleansing fluid passage and a lateral port opening at the juncture of the head and neck, said collar having a supply passage communicating with the tappet passage, and side bolts engaged with the chuck sleeve and clamping the elements of the head member together and to the barrel.

5. In apparatus of the character set forth, the combination with a motor barrel, of a hammer piston therein, a sectional head member for the barrel comprising a head plate, a tool supporting chuck and a collar interposed between the head plate and chuck and provided with means for the attachment thereto of a supply conduit, said collar having a bore, the end portions of which are of different diameters, a tappet in the collar having a head in the portion of larger diameter and a reduced neck in the portion of smaller diameter, said tappet having a lateral inlet port between its ends, packing gaskets interposed between the head plate and collar and between the collar and chuck and respectively engaging the neck and head of the tappet on opposite sides of the inlet port, the opposing end faces of said collar, head plate and chuck being oppositely inclined forming sockets that flare inwardly to receive the outer portions of the gaskets and forcing said gaskets inwardly when the said parts are drawn together, and means for drawing together said head plate, collar and chuck.

6. In apparatus of the character set forth, the combination with a motor, of a head member therefor, comprising a head plate and a collar in advance of the same, a tappet operating in the head member and having an inlet port, means on the collar for supplying cleansing fluid to the intake port, and a drain channel in the head plate surrounding the tappet and having an outlet port.

7. In apparatus of the character set forth, the combination with a barrel, of a hammer piston therein, a head member for the barrel, comprising a head plate, a chuck sleeve and a collar interposed between the chuck sleeve and head plate, side bolts engaged with the chuck sleeve for clamping the parts of the head member together, a tappet in the head member, packing gaskets for the tappet respectively interposed between the chuck sleeve, the collar and the head plate, said tappet having a forwardly delivering fluid passage and a lateral intake port, said collar having a supply passage communicating with the intake port between the packing gaskets, and a drain channel in the head plate surrounding the tappet in rear of the rear gasket, said drain channel having an outlet port.

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

WILLIAM A. SMITH.

Witnesses:
N. P. ALBRIGHT,
R. G. DAVIS.