D. C. DEMAREST.

ROCK DRILL.

APPLICATION FILED NOV. 1, 1910.

1,029,855. Patented June 18, 1912.

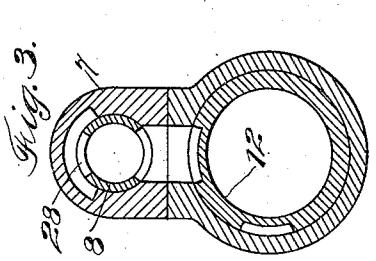

Fig. 3.

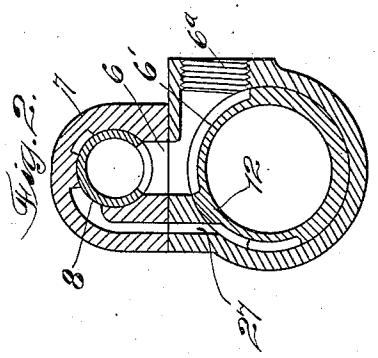

Fig. 2.

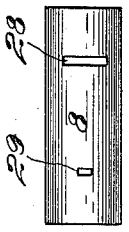

Fig. 4.

Fig. 1.

Witnesses;
F. E. Maynard.
Charles Pickles

Inventor;
David C. Demarest,
By Geo. H. Strong.
his Atty

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

DAVID C. DEMAREST, OF SAN FRANCISCO, CALIFORNIA.

ROCK-DRILL.

1,029,855. Specification of Letters Patent. Patented June 18, 1912.

Application filed November 1, 1910. Serial No. 590,120.

To all whom it may concern:

Be it known that I, DAVID C. DEMAREST, citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Rock-Drills, of which the following is a specification.

My invention relates to rock drills, and particularly pertains to drills known as hammer drills wherein the drill is operative upon the successive impacts of a reciprocating hammer or piston.

The object of the present invention is to provide a rock drill whereby with one lever the air supply may be turned both to the feed device and to the operating mechanism.

A further object is to conduct the live air entirely through the body of the drill without the use of outside connections; a cylinder bushing being employed for this purpose in which all of the ports are machined. This method serves to reduce the size and weight of the machine; insures a clear passage for both the live air and the exhaust without depending in the least on the accuracy of core castings.

A further object is to provide a special valve mechanism controlling the operation of the piston, by which valve mechanism the full air pressure can be admitted behind the piston to drive it forward to deliver its blow, but by which only a small amount of air is used to return the piston.

A further object is to provide a plain bored cylinder with straight symmetrical piston, which latter is inter-changeable forward and backward, or end for end.

There are other objects and advantages which will be apparent hereinafter.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed having reference to the accompanying drawings, in which—

Figure 1 is a central section of the drill. Fig. 2 is a cross section through the exhaust port on the line X—X Fig. 1. Fig. 3 is a cross section through the drive-air port on the line Y—Y Fig. 1. Fig. 4 is a plan of the port bushing.

A represents a drill cylinder containing a piston or hammer member 2 adapted to be reciprocated by any suitable propelling medium, as compressed air, admitted alternately to either end of the cylinder and in front or behind the piston through the ports 3—4 leading from the valve chest 5.

The valve chest is provided with a removable lining or bushing 8, in which the valve 7 is operable. This lining is removable, and is suitably held in place between the heads 9 and buffer-packings 10. The bushing 8 and valve chest are ported correspondingly with the inlet and exhaust ports 3—4—6 in the cylinder. By using the removable bushing or lining for the steam chest, it is possible to case-harden both the bushing and valve before they are assembled in the machine. This results in greatly extending the life of the drill.

Heretofore, with ordinary drills, where the walls of the valve chamber were integral with the chest or cylinder, a great deal of wear has occurred because of the necessity of making some of the wearing parts of soft metal; or rather, because of the inability to case-harden and machine out the chamber in which the valve operates.

By the present construction, the chest casting 5 is of ordinary cast metal, while the bushing and valve are case-hardened and carefully fitted before they are put in. The advantage in this respect is manifest. The valve 7 is a spool valve having cylindrical ends of sufficient area to guide it in the bushing 8, and provided with a central diaphragm 7′; thus making what I term a "three-wall spool valve." The advantage of this construction is that the valve is made as short as possible, and consequently as light as possible.

In the smaller sized valve used, I still further lighten the valve by recessing the two end walls of the valve, and inserting a filling 11 of cork or aluminum, or other suitable light material. By chambering the ends of the valve in the manner described, and inserting a light filling, I get the same bearing surface for the valve in the bushing, lighten the valve, and at the same time do not increase the size of the chambers 12′ at either end of the valve.

The piston 2 is preferably a plain cylindrical solid piston with its ends substantially symmetrical so that it may be interchangeable end for end. As a rule however, the impact or forward end is slightly reduced or beveled, as shown at 11′, so that it will not be fulled out against the bushing 12 in which it operates by the successive blows

delivered on an anvil 13, which acts against the drill which is inserted into the socket portion 14 of the cylinder.

One important feature of this invention is the use of the removable cylinder lining or cylinder bushing 12. This bushing incloses the chamber in which the piston 2 operates; the bushing being inserted into the cylinder A from the back and adapted to bear against an inwardly projecting collar or flange 15, which latter forms a guide for the stem of the hammer 13. Against the rear end of the cylinder bushing 12 is placed a backhead washer 16 which is held in place by a gasket and coupling member 17 in which coupling is the air cock 18. Screwing into the opposite side of the combined coupling and valve case 17 is a cylinder 19 in which a piston 20 operates; this piston having a stem 21 which bears against the rock. The parts 19—20—21 are known as the telescope, and are expanded by air pressure admitted through the cock 18 and serve to hold the drill to its work. The air cock 18 is adapted when opened to connect with two ports, 22—23, one of which as 22 opens into the air chamber 24 in the telescope to expand the latter, and the other of which ports as 23, opens into a space 25 which communicates with ports 26 in the backhead washer. This backhead washer is so constructed as to deliver the air from the backhead chamber 25 to a live air port 27, Fig. 2, which is cut in the outer periphery of the cylinder bushing 12. This live air port 27 makes a connection with the valve chest bushing 8 in which the valve 7 operates. By this means the live air is conducted from the air cock 18 to the drill chest and valve entirely through the body of the drill without the use of outside connections. As also shown in Fig. 2, a portion of the exhaust port 6′ in continuation of the port 6 is cut or machined in the cylinder bushing. Final exhaust takes place at 6^a, as shown. Thus it will be seen that all of the ports required for the operation of the drill, both for live air and exhaust are machined in the cylinder bushing, except where they extend radially of the cylinder to connect with the valve chest. This method not only enables the weight and size of the machine to be kept down, but also insures a clear passage for both the live air and the exhaust without depending in the least on the accuracy of cores that would otherwise be placed in the castings themselves.

It will be observed that the live air which enters the valve chest finds admission into the valve bushing 8 and to the valve chambers through two ports, 28 and 29 in the valve bushing 8; port 28 being at the front anl letting the live air in to drive the piston forward to strike the drill, and the port 29 admitting a lesser amount of air in to return the piston ready for the next stroke. These ports 28 and 29 are in the form of slots; the slot 29 being much shorter or smaller than the slot 28. The reason for this difference in area of the ports 28—29 is that it is desired to admit a full charge of air to the back end of the cylinder to drive the piston against its work, but that only a small amount of air comparatively is required to push the piston back to its starting point after delivering its blow. It is for this reason that the port 29 is reduced to a very small area so as to throttle the air supply on its way to the front end of the cylinder; the port 4 being kept its usual size so as to make a free passage back for the exhaust air. This throttling through port 29 is such that the air pressure is reduced to a point just sufficient to move the weight of the piston. This is a novel feature in practice in this line of work and effects a large economy of air and a reduction of wear and tear as compared with drills of the type where the piston is turned down on the front end so as to work through a collar in the cylinder, and in fact is economical over any other type of drill of which I have knowledge. Furthermore, by my construction I am able to use a plain bored cylinder with a plain straight symmetrical piston, as previously described.

In practice, the air supply enters the air cock 18 placed between the drill proper and the telescope air feed. This is done so that with one lever the air supply may be turned both to the feed device and to the operation of the machine. From the air cock the air flows into the back-head chamber 25. The air is cut off from the drill cylinder by means of the backhead washer 16; this backhead washer being so constructed as to deliver the air from the backhead chamber to the live air port 27 cut in the outside of the cylinder bushing 12. From the port 27 the air enters the valve chest through the ports 28—29 and is thence delivered on the proper reciprocation of the valve 7, alternately to the front and rear of the piston 2; the return stroke of the piston 2 being comparatively light and slow as compared with its forward striking stroke, by reason of the differential areas of the ports 28 and 29.

By my construction the wear of both the cylinder and chest is taken up by means of the bushings 8 and 12, as shown. The valve used being a three-wall valve of minimum length of travel and minimum length of valve accomplishes a very quick movement of the valve and of course of the drill piston.

This drill in its operation shows a very valuable feature in the fact, that it short-strokes, and gives perfect control of the blows by means of the throttle lever of the air supply. This feature is of great assistance in drilling through soft and

seamy ground where it is necessary to go forward at times cautiously.

The instrumentality through which the operation of the piston 2 is accomplished is as follows: Motive fluid is admitted at the throttle 18, passing thence through chamber 25 and ports 26 into a live air passage 27. The passage 27 delivers the air to the valve chest 5 in which the lining 8 is placed with its differential driving and returning ports 28 and 29 respectively. The motive fluid passes through first one and then the other of these ports into chambers formed on opposite sides of the diaphragm 7′ of the valve 7. The relation of the ports 28 and 29 is such that when air passes through port 28 it moves the valve 7 to the right. The piston 2 has a central turned down portion or groove movable into register with one or the other of small exhaust ports 30 and 31 at the ends of the chest 5, the annular space around the piston being in communication with the exhaust passage 6, as at 32. When pressure accumulates in one of the valve chambers it leaks around the adjacent end of valve, and at the instant the moving piston uncovers the escape port, as 30, of the opposite end of the valve chest, the accumulated pressure will shift the valve; cut off the flow of pressure fluid at port 28 driving the piston, and open the ports 29 and 4 to allow air to the front of the piston. When the valve 7 closes the exhaust port 30 the motive fluid flowing in port 29 will leak to end of valve and move it to the right just as soon as the returning piston uncovers exhaust port 31.

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

1. In a rock drill, a cylinder, a reversible bushing having external ducts terminating in ports leading inward near the ends of the bushing and having passage ways in its central part registering with openings in the cylinder, a piston therein, a valve chest with ports registering with said ducts and with said passage ways, a valve movable in the chest by fluid pressure to control flow to the ports, a disk fitting one end of the bushing and having channels on one side registering with a duct in the bushing, a coupling holding the disk against the bushing and fitting the cylinder, and a cock in said coupling regulating the flow of fluid past the disk and duct.

2. In a rock drill, a cylinder having a plurality of openings in its side, an interchangeable bushing fitting the cylinder and having ducts extending endwise along its surface and terminating in openings leading inward, a central passage in the bushing wall and passage ways on each side of said passage registering with openings in the cylinder, a piston in the bushing having a central annular recess forming a chamber communicating with the central passage, a valve chest mounted on and approximate the center of the bushed part of the cylinder, a piston valve controlling the flow of fluid to said ports, a live air chamber on the chest communicating with a channel on the bushing, a backhead washer holding the bushing in place and having passage ways leading to said channel, and a fluid controlling cock secured to the cylinder.

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

DAVID C. DEMAREST.

Witnesses:
W. T. VETTER,
H. TOUGGINO.