

UNITED STATES PATENT OFFICE.

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VALVE MECHANISM FOR ROCK-DRILLS, &c.

No. 909,923.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JONAS L. MITCHELL, a resident of Denver, in the county of Denver and State of Colorado, have invented a new and useful Improvement in Valve Mechanism for Rock-Drills, &c.; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to cut-off valves for use in connection with rock drills or mechanism of a character where a reciprocating piston or hammer is employed.

The object of my invention is to provide a cut-off which may be regulated so as to control the flow of the pressure to the main cylinder with great accuracy.

To these ends my invention comprises the novel features hereinafter set forth and claimed.

In the drawings Figure 1 is a longitudinal section of a suitable rock drill or coal puncher showing my invention applied thereto; Figs. 2 and 3 are like views showing the cut-off valve and main valve in different positions; Fig. 4 is a section on the line 4-4, Fig. 2; and Fig. 5 is a rear view of the drill or puncher.

In the drawing the numeral 2 designates a suitable shell or casing having the piston chamber 3 within which is the hammer or piston 4 with the stem 5 adapted to carry the tool, said stem passing through the contracted passage 6 of the extension 7 connected with said shell or casing 2. Formed within the shell or casing 2 are the main ports 8 and 9 for admitting the fluid to opposite ends of the cylinder 3 for reciprocating the hammer or piston 4. In the upper part of the shell or casing 2 is the cut-off valve 11 which is adapted to move back and forth in the chamber 12. This cut-off valve is provided with the ports 13 and 14 as well as the ports 15 and 16. The casing 2 is provided with the ports 13^a and 14^a. Within the shell or casing are the ports 17 and 18 which enter the valve chamber 12 at opposite ends, said ports being connected to the ports 19 and 20 connected to the passages 21 of the controlling valves 22. There are two of these controlling valves 22 and 22^a, one at each end of the shell or casing but it will only be necessary to describe one in detail. This valve 22 is operated by the lever 23 and said valve is provided with ports 24 which are adapted to register with the ports 1^a, 2^a, 3^a, 4^a, 5^a and 6^a according to the amount of turn

which is given to the rotary valve 22. An indicating device 25 is provided at the outside of the shell or casing to indicate how much movement to give to the lever 23 to bring one of the ports 24 into engagement with any one of the ports 1^a, 2^a, 3^a, 4^a, 5^a or 6^a.

Located within the cut-off valve 11 is the main valve 26, said valve consisting of the stem 27, the enlargements 28, and the rings 29 connected by the short stems 30 to said enlargements. The casing 2 has the by-pass ports 31 and 32 which lead from the inlet ports 34 and 35 into the main valve chamber 33 at opposite ends thereof. The main valve chamber has the exhaust 47. Leading from the main valve chamber are the ports 37 and 38, said ports leading to the piston chamber 3 and entering the same at 39 and 40.

The piston 4 is provided with the annular grooves 41 and 42, with which the ports 37 and 38 are adapted to connect. The shell or casing 2 is further provided with the exhaust ports 43 and 44. The travel of the valve 26 is regulated by the pin 49 which passes through a slot 50 in the valve stem.

When my improved cut-off valve is in use, with the parts in the position shown in Fig. 1, the fluid pressure supply is admitted by the port 34, and said fluid pressure passes into the main valve chamber 33, whence it passes by the ports 13 and 13^a to the port 8 and thence into the rear end of the piston chamber 3, as indicated in Fig. 1. The fluid also passes by the by-pass port 31 to the valve chamber 33^a. The controlling lever 23 of the valve 22 having been previously turned so as to bring one of the ports 24 into coincidence with the port numbered 2^a, as the piston advances it passes the port 2^a, whereupon the fluid escaping through said port passes into port 21, whence it passes the port 19 to the port 17 and acts on the end of the cut-off valve 11, whereby said valve is moved to the position shown in Fig. 2. This forward movement of the cut-off valve 11 closes the port 34 and shuts off the supply of the fluid to the rear end of the piston chamber 3, the piston continuing for the remainder of the stroke by the expanding pressure of the fluid contained in said chamber. When the piston has completed its stroke, as indicated in Fig. 3, the port 37 is brought into communication with the annular groove 41 and port 39, whereupon the exhaust takes place from the rear end 33^a of the main valve chamber and the pressure

admitted by the by-pass 32 acts upon that end of the valve 26 and said valve is moved to the position indicated in Fig. 3. This movement of the valve 26 brings the port 14 into register with the port 14^a and the fluid passes by said ports into the port 9 to the forward end of the cylinder to return the piston. As the piston returns and passes the port 5^a the live air passes by way of the passages 21 and 20 to the front end of the valve 11 and said valve is returned to the position indicated in Fig. 1, while the valve 26 is maintained in the position indicated in Fig. 3 until the groove 42 of the piston is brought into communication with the port 40, whereupon the pressure escapes from the front end of the chamber 33^a and the live pressure admitted to the rear end of the chamber 33^a acts to move the valve 26 to the position shown in Fig. 1. When the piston reaches the forward end of its stroke, as indicated in Fig. 3, the piston chamber 3 will be open to the exhaust through the ports 8 and 47 and when the piston is in the position indicated in Fig. 1 the exhaust will take place through the ports 9 and 47.

From the above description it is apparent that the cut-off valve may be controlled by pressure regulated by the lever 23 to cut off at any desired length of the stroke of the piston.

What I claim is:

1. In valve mechanism for rock drills, coal punchers, etc. the combination of a shell or casing having a piston chamber, a piston therein, an admission valve controlling ports leading to opposite ends of said piston chamber, a cut-off valve within which said admission valve operates, and means for operating said cut-off valve by fluid pressure from said piston chamber.

2. In valve mechanism for rock drills, coal punchers, etc., the combination of a suitable shell or casing having a piston chamber, a piston therein, an admission valve controlling ports leading to opposite ends of said piston chamber, a cut-off valve within which said admission valve operates, means for operating said cut-off valve by fluid pressure from said piston chamber, means for controlling the movement of said cut-off, and means for varying the time of movement of said cut-off by the stroke of said piston.

3. In valve mechanism for rock drills, coal punchers, etc., the combination of a shell or casing having a piston chamber, a piston therein, an admission valve controlling ports leading to opposite ends of said piston chamber, a cut-off valve within which said admission valve operates, said piston chamber having two or more ports leading therefrom, each succeeding port being at a greater distance from the end of said piston chamber than the preceding one, and means for bring-

ing any one of said ports into communication with a port leading to said cut-off valve.

4. In valve mechanism for rock drills, coal punchers, etc., the combination of a shell or casing having a piston chamber, a piston therein, an admission valve controlling ports leading to opposite ends of said piston chamber, a cut-off valve within which said admission valve operates, said piston chamber having two or more ports leading therefrom, each successive port being at a greater distance from the end of said chamber than the preceding one, and a valve adapted to bring any one of said ports into communication with a port leading to said cut-off valve.

5. In valve mechanism for rock drills, coal punchers, etc., the combination of a shell or casing having a piston chamber, a piston therein, a main valve controlling ports leading to opposite ends of said piston chamber, a cut-off valve within which said main valve operates, said piston chamber having two or more ports leading therefrom, each succeeding port being at a greater distance from the end of said chamber than the preceding one, and a rotary valve adapted to bring any one of said ports into communication with a port leading to said cut-off valve.

6. In valve mechanism for rock drills, coal punchers, etc., the combination of a shell or casing having a piston chamber, a piston therein, a main valve controlling ports leading to opposite ends of said piston chamber, a cut-off valve within which said main valve operates, said piston chamber having two or more ports leading therefrom, each succeeding port being at a greater distance from the end of said chamber than the preceding one, a rotary valve having a series of ports corresponding to said last named ports, whereby the fluid pressure may be carried from said piston chamber at different points of distance from the end of said piston chamber and directed against said cut-off valve.

7. In valve mechanism for rock drills, coal punchers, etc., the combination of a suitable shell or casing having a piston chamber, a piston therein, a main admission reciprocating valve controlling ports leading to opposite ends of said piston chamber, a cut-off valve within which said main valve is contained, means for admitting fluid pressure to opposite ends of the main valve chamber, means for connecting the opposite ends of said main valve chamber alternately with an exhaust opened when said piston completes its stroke, and means for operating said cut-off valve by fluid pressure from said piston chamber.

8. In valve mechanism for rock drills, coal punchers, etc., the combination of a suitable shell or casing having a piston chamber, a piston therein having annular grooves formed adjacent to each end thereof, a main reciprocating valve controlling ports leading

to opposite ends of said piston chamber, a cut-off valve within which said main valve is contained, means for admitting fluid pressure to the main valve chamber at opposite ends of said main valve, means for alternately connecting exhaust ports leading from opposite ends of said valve chamber, and connecting with said annular grooves, said shell or casing having exhaust ports com-

municating with said annular grooves, and 10 means for operating said cut-off valve by fluid pressure from said piston chamber.

In testimony whereof, I the said JONAS L. MITCHELL have hereunto set my hand.

JONAS L. MITCHELL.

Witnesses:

JOHN RANNQUIST,
CHARLES J. MUNZ.