

Oct. 24, 1939.

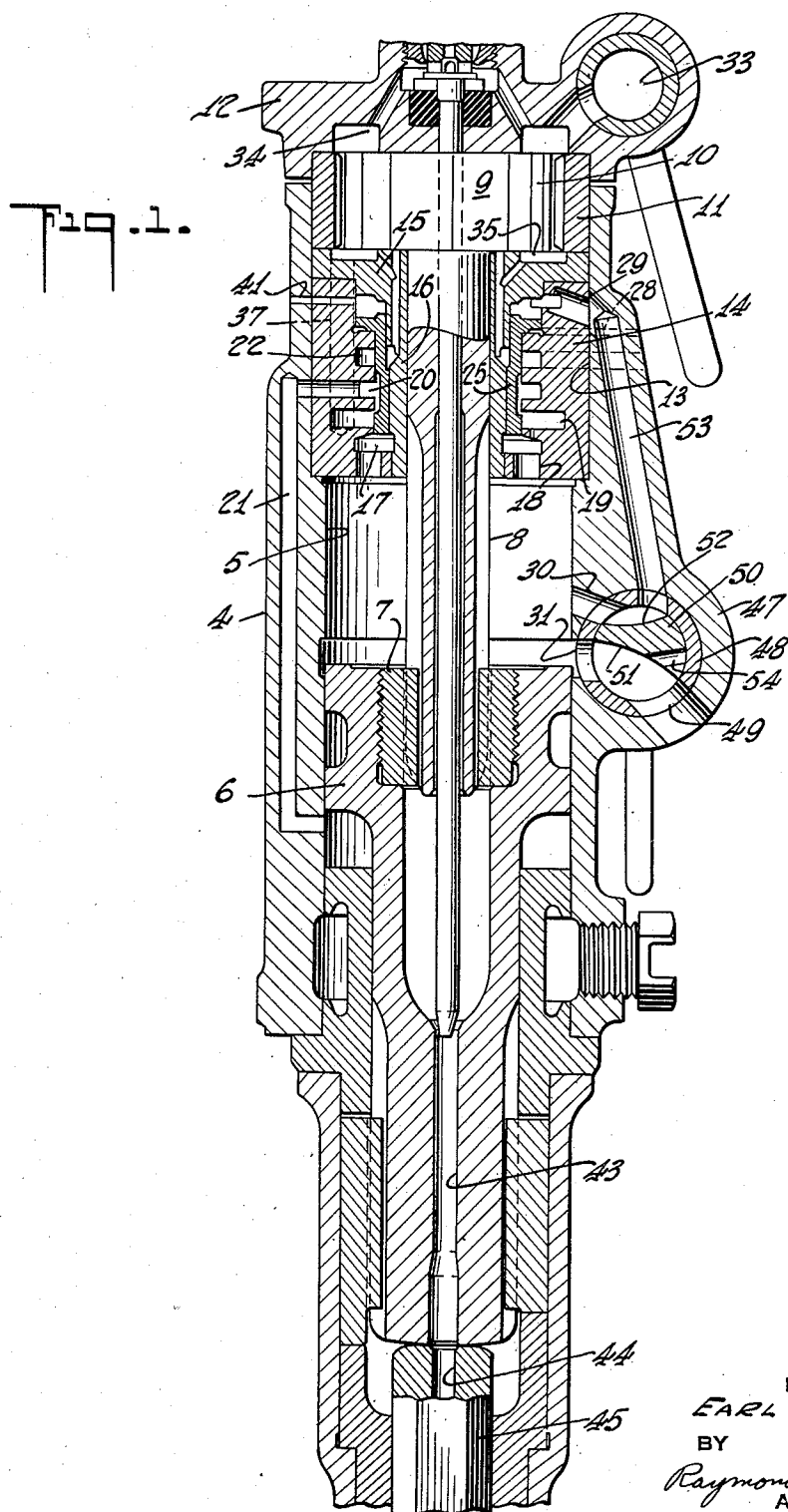
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BLOWING DEVICE FOR ROCK DRILLS

Filed Nov. 5, 1938

2 Sheets-Sheet 1



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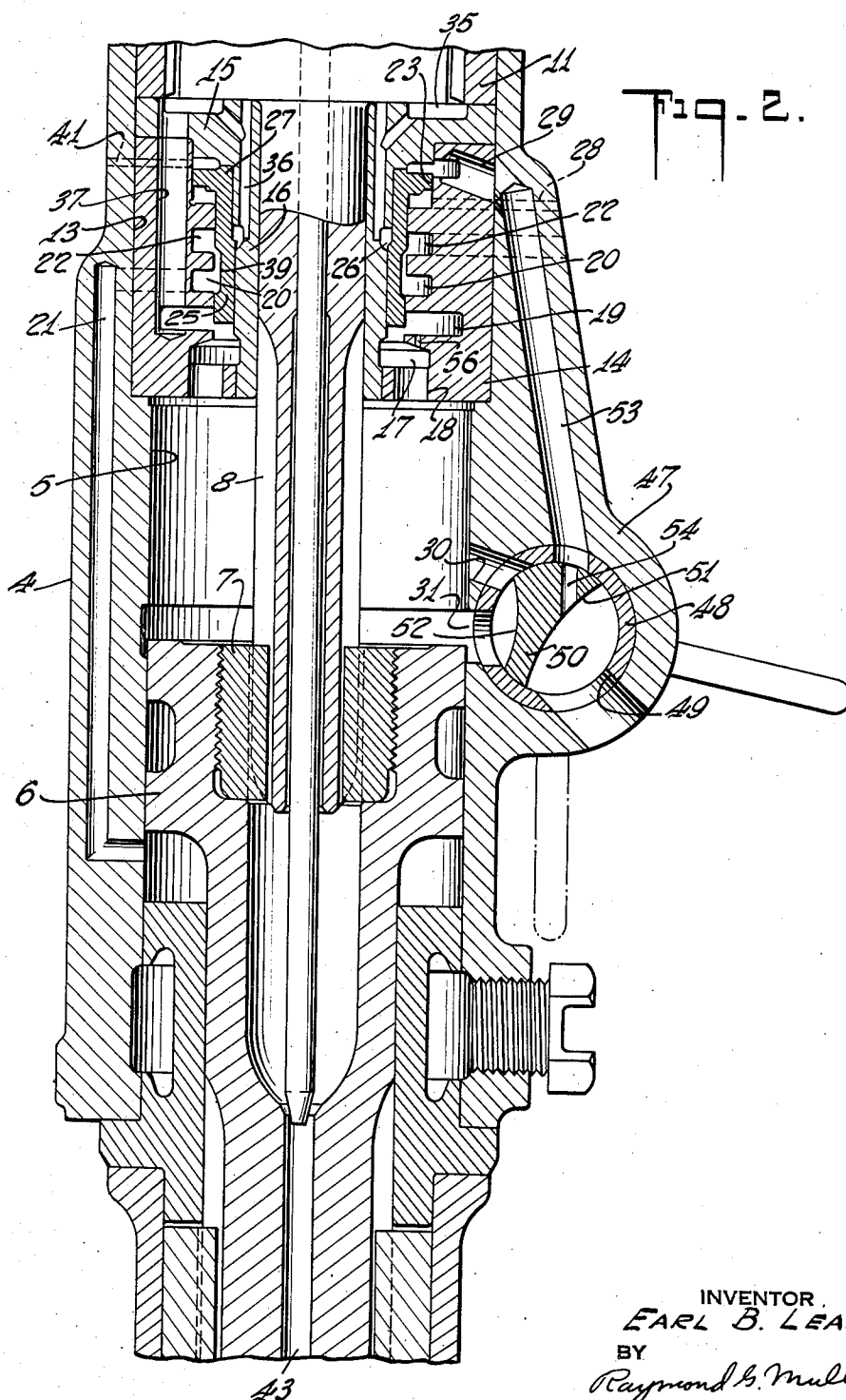
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UNITED STATES PATENT OFFICE

2,177,391

BLOWING DEVICE FOR ROCK DRILLS

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Application November 5, 1938, Serial No. 239,067

2 Claims. (Cl. 121—10)

This invention relates to rock drills and more particularly to an arrangement for delivering a continuous stream of compressed air through the drill steel for blowing detritus out of the drilled hole whenever the usual intermittent supply of air is insufficient to keep the hole clean.

An object of the invention is the provision of a blowing device that is simple in construction, easy to manipulate and dependable in operation. Another object is to adapt the blowing apparatus to be incorporated in a conventional rock drill without requiring extensive alteration of the latter for this purpose.

Other objects and features will appear more clearly from the following description taken in connection with the accompanying drawings and appended claims.

In the accompanying drawings Fig. 1 is a longitudinal section of a fragmentary portion of a rock drill embodying the invention, showing the blower valve arranged in the drilling position; and

Fig. 2 is a similar view on a larger scale showing the valve arranged in the blowing position.

In the illustrative embodiment of the invention the drill comprises a cylinder 4 providing a piston chamber 5 in which a hammer piston 6 reciprocates, the machine being provided with conventional rotation mechanism for imparting step-by-step rotary movement to the piston. Such mechanism may comprise a rifle nut 7 screwed to the piston, a rifle bar 8 having helical splines slidably engaging the rifle nut, a head 9 on the rifle bar, a series of pawls 10 carried by the head, and a stationary ratchet ring 11 surrounding the head and pawls. The ratchet ring is supported by the cylinder 4 and by a back head 12 rigidly secured to the cylinder.

The cylinder has a counterbore 13 which receives a valve chest comprising a valve case 14 and valve cap 15. The valve cap abuts against the ratchet ring 11 to prevent axial movement of the latter. The valve cap has an annular projection or sleeve 16 forming a bearing for the rifle bar 8 and surrounded by the valve case 14. The interior of the valve case is recessed to provide a plurality of spaced grooves or chambers which for convenience may be designated as follows: rear end groove 17 which is in constant communication with the rear end of the piston chamber by means of ports 18; live air groove 19, continuously supplied with pressure fluid; front end groove 20 communicating by means of passageway 21 with the front end of the piston chamber; exhaust groove 22, vented to atmosphere; and an annular chamber 23.

An annular distributing valve 25 is mounted for limited axial reciprocation on the valve cap extension 16. The valve and valve cap extension have complementary engaging surfaces of different diameters providing a shoulder 26 on the inside of the valve which is adapted to be supplied with live pressure fluid constantly tending to move the valve forward. Near its rear end, the valve 25 has a flange 27 projecting into the chamber 23 of the valve chest and dividing said chamber into two separate sections. The section in front of the flange 27 is vented through port 28. The section in back of the flange connects with a port 29 adapted to be connected (by means hereinafter described) to a cylinder port 30. The piston chamber 5 has a main exhaust port 31 adapted to be connected to atmosphere when the machine is conditioned for the drilling operation. The port 30 is disposed to the rear end of the main exhaust 31.

The back head 12 is provided with a manipulative throttle valve 33 adapted, when in the open position, to supply compressed air to an annular groove 34. The air passes from groove 34 through the space separating the rifle bar head 9 from the ratchet ring 11, to an annular groove 35 in the valve cap 15. Passages 36 and 37 deliver live air from the annular groove 35 to the internal shoulder 26 on the valve and the live air groove 19, respectively.

The operation of the mechanism described up to this point is as follows: Assume that the parts are as shown in Fig. 1 with the piston 6 and the distributing valve 25 in their forward positions. Pressure fluid passes from the live air groove 19, over the valve groove 39 to the groove 20 and passageway 21 leading to the forward end of the piston chamber. The piston moves rearward since the rear end of the piston is vented through the main exhaust port 31. In its rearward travel, the piston covers the main exhaust and, after closing port 30, compresses the air trapped in the rear end of the piston chamber. The pressure of the trapped air acts against the area at the front end of the valve 25 (in groove 17) and, when this pressure reaches the proper value, it overcomes the opposing pressure on the internal shoulder 26 to trip the valve rearwardly.

When the distributing valve 25 is in its rearward position, as illustrated in Fig. 2, the valve groove 39 connects the front end groove 20 with the exhaust groove 22 to vent the front end of the piston chamber. At the same time the valve admits live pressure fluid from the supply groove 19 to the rear end groove 17 from whence the air

passes through the openings 18 to the rear end of the piston chamber, thus driving the piston forwardly. At the start of the forward travel of the piston, the air in front of the piston head is vented through the main exhaust port 31. As the piston closes the main exhaust port, the air in front of the piston head is exhausted through the passageway 21.

During its forward travel, piston 6 uncovers port 30 thereby allowing pressure fluid from the rear end of the piston chamber to enter the valve chest port 29 and chamber 23, where it acts on the rear face of the valve flange 27. The combined area of the rear face of flange 27 and the shoulder 26 is considerably greater than the area of the front end of the valve and consequently the valve trips forward to the Fig. 1 position, thus completing a cycle of operation.

If desired, an exhaust port 41 may be connected to the rear end of the annular chamber 23 in the valve chest in order to vent the fluid in this part of the chamber before the opposite compression stroke of the valve takes place. Port 41, however, should be restricted in diameter in order to permit pressure to build up in chamber 23 when the piston uncovers the port 30 during its forward movement.

The drilling operation is substantially the same as in prior constructions. The present invention is directed to the arrangement for permitting live air to pass in a continuous stream through the drill steel while the piston is held stationary. As seen in Fig. 1, the front end of the piston has a central bore 43 registering with the bore 44 in the drill steel 45. According to the present invention, the piston is held in the position shown in Fig. 1 while the main exhaust port 31 is closed and pressure fluid is delivered to the rear end of the piston chamber 5 from whence it passes between the splines on the rifle bar 8 and rifle nut 7 to the piston bore 43 and drill steel bore 44 to blow the detritus from the bottom of the hole being drilled.

For this purpose, the cylinder 4 is provided with a housing 47 in which is secured a valve chest 48. The valve chest has an exhaust port 49 leading to atmosphere. A blower valve 50, mounted for turning movement in valve chest 48, has a recess 51 adapted to connect the cylinder exhaust port 31 with the valve chest exhaust port 49, when the blower valve is adjusted to the Fig. 1 position. Another recess 52 is adapted to connect port 30 with a passage 53 leading to the port 29 in the valve chest 14 to effect forward tripping of the valve in the manner hereinbefore described.

When the blower valve is adjusted to the blowing position, as shown in Fig. 2, the main cylinder exhaust port 31 is cut off from communication with the atmospheric port 49. Passage 53 is disconnected from the port 30 and is connected to atmosphere by a port 54 in the blower valve 50, for the purpose of relieving any pressure that might build up at the rear face of the distributing valve flange 27. Assuming the distributing valve is in the position shown in Fig. 2, compressed air is delivered by the supply groove 19, through groove 17 and ports 16 to the rear end of the piston chamber 5, from whence the compressed air passes through the piston 6 and drill steel 45 to remove the detritus from the bottom of the drilled hole. The valve is held in the Fig. 2 position by the pressure acting against the front end of the valve which predominates over the pressure against internal shoulder 26 and is unop-

posed by any pressure against the rear face of flange 27.

When the drill is used as a sinker and if the blower valve is closed before the throttle valve 22 is opened, both the piston and the distributing valve will be in the lower or forward position as shown in Fig. 1. In order to insure movement of the distributing valve to the Fig. 2 position under these conditions, a restricted port 56 may be provided between the live air groove 19 and the rear end groove 17 in the valve chest 14. The purpose of the restricted port 56 is to permit a gradual leakage of pressure fluid into the rear end of the piston chamber until the pressure therein increases to an amount sufficient to trip the valve to the Fig. 2 position by acting against the front end thereof. The restricted port 56, while useful as a precautionary measure is not indispensable, since there may be sufficient leakage between the grooves 19 and 17, due to the slight clearance at the periphery of the distributing valve.

What is claimed is:

1. A rock drill comprising a cylinder providing a piston chamber, a piston reciprocable therein, said cylinder having a main exhaust port separating the front and rear ends of the piston chamber and adapted to be overrun by the piston in both directions, a source of live pressure fluid, means including an automatic distributing valve for distributing pressure fluid from said source to the respective ends of the piston chamber, said distributing valve having a first area in constant communication with the rear end of the piston chamber and intermittently exposed to live pressure fluid and fluid compressed by the rearward movement of the piston for moving the distributing valve in one direction, a second area opposed to said first area and of larger extent and intermittently exposed to fluid pressure under control of the piston for moving the distributing valve in the opposite direction, said piston being adapted to deliver impacts against a drill steel and having a bore adapted to deliver pressure fluid to the drill steel for blowing purposes, a blower valve housing carried by the cylinder, a blower valve adjustably mounted therein, said blower valve and housing having complementary ports and passages adapted in one position of the blower valve to connect the main cylinder exhaust port to atmosphere and the second area on said distributing valve to a port at the rear portion of the piston chamber to condition the drill for drilling operation, said complementary ports and passages being adapted in another position of adjustment of the blower valve to close the main cylinder exhaust port from atmosphere and disconnect said second area on the distributing valve from its associated piston chamber port and connect said second area to atmosphere to hold the distributing valve and piston in a position for delivering air through said piston bore to the drill steel.

2. A rock drill comprising a cylinder providing a piston chamber, a piston reciprocable therein, said cylinder having a main exhaust port separating the front and rear ends of the piston chamber and adapted to be overrun by the piston in both directions, a source of live pressure fluid, means including an automatic distributing valve for distributing pressure fluid from said source to the respective ends of the piston chamber, said distributing valve having a first area in constant communication with the rear end of the piston chamber and intermittently exposed to live pressure fluid and fluid compressed by the rearward

5 movement of the piston for moving the distrib-
ing valve rearwardly, a second area opposed to
said first area and of larger extent and inter-
mittently exposed to fluid pressure under control
10 of the piston for moving the distributing valve
forwardly, a third area of less extent than and
opposed to said first area and continuously ex-
posed to live pressure fluid under constant pres-
sure for assisting in the forward movement of
15 the distributing valve and holding it in its forward
position when pressure on said second area be-
comes relatively low, said piston being adapted to
deliver impacts against a drill steel and having
a bore adapted to supply pressure fluid to the drill
20 steel for blowing purposes, a blower valve hous-
ing carried by the cylinder, a blower valve ad-
justably mounted therein, said blower valve and
housing having complementary ports and pas-
sages adapted in one position of the blower valve
to connect the main cylinder exhaust port to at-

mosphere and the second area on said distribut-
ing valve to a port at the rear portion of the pis-
ton chamber to condition the drill for drilling
operation, said complementary ports and passages
5 being adapted to another position of adjustment
of the blower valve to close the main cylinder
exhaust port from atmosphere and disconnect
said second area on the distributing valve from
its associated piston chamber port and connect
10 said second area to atmosphere to hold the dis-
tributing valve and piston in a position for de-
livering air through said piston bore to the drill
steel, and a restricted passageway constantly
delivering a minute stream of live pressure fluid
15 from said source to the rear end of the piston
chamber to gradually build up pressure in the lat-
ter to trip the valve to its rear position, in op-
position to pressure against said third area.

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