Nov. 10, 1931. E. G. GARTIN 1,831,168

ROCK DRILL

Filed March 18, 1929

Fig. 1.

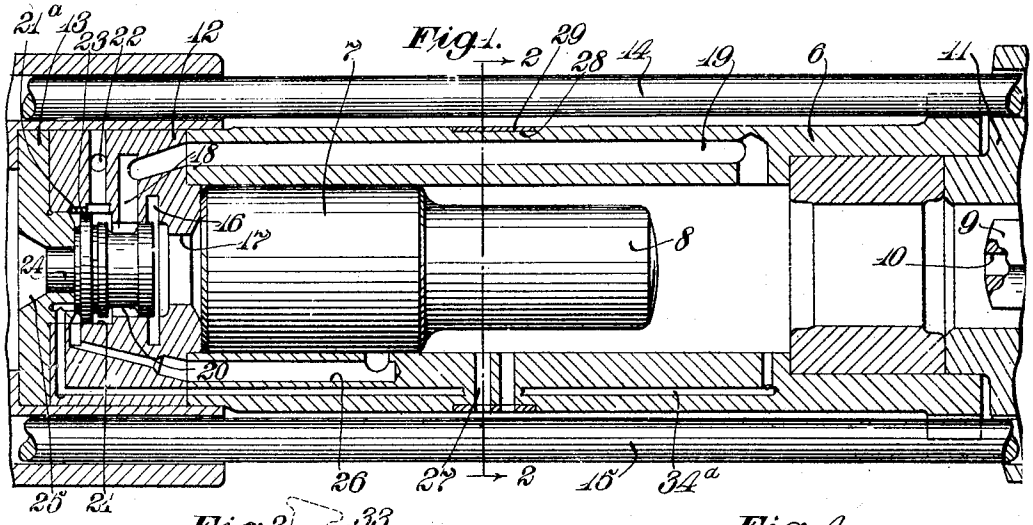


Fig. 2.

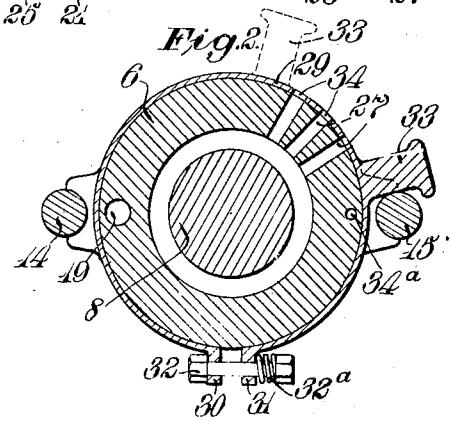


Fig. 4.

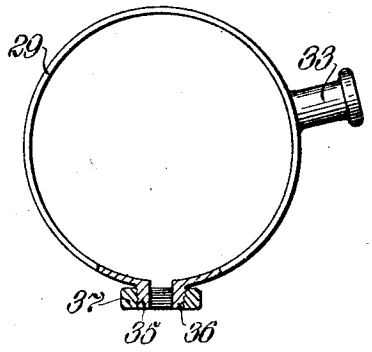


Fig. 3.

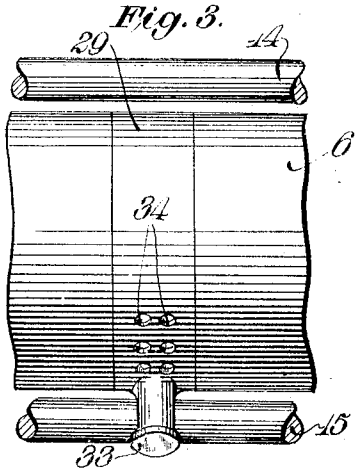
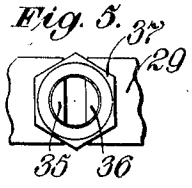


Fig. 5.



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UNITED STATES PATENT OFFICE

ELMER G. GARTIN, OF CLAREMONT, NEW HAMPSHIRE, ASSIGNOR TO SULLIVAN MACHINERY COMPANY, A CORPORATION OF MASSACHUSETTS

ROCK DRILL

Application filed March 18, 1929. Serial No. 347,957.

My invention relates to rock drills and more particularly to hole cleansing means associated with rock drills.

An object of my invention is to provide improved means in a percussive rock drill for introducing pressure fluid to a hollow drill steel to blow the cuttings from a hole. Another object is to provide an improved valve device for closing off the cylinder exhaust port of a rock drill motor to effect a hole blowing operation. A further object is to provide improved means for holding the distribution valve of a rock drill motor in position to effect continuous admission to the front end of the cylinder, and in connection therewith, a valve device for closing a free cylinder exhaust port to blow the cuttings from the hole. Other objects and advantages of the invention will more fully appear during the course of the specification.

In the accompanying drawings I have shown for purposes of illustration two embodiments which my invention may assume in practice.

In these drawings,—

Fig. 1 represents a central sectional view through a rock drill having, in one illustrative form, my invention associated therewith, the ends of the drilling machine being broken away.

Fig. 2 is a transverse sectional view on line 2—2 of Fig. 1.

Fig. 3 is a plan view of a portion of the rock drill showing my improved valve device.

Fig. 4 illustrates a modified form of the valve device.

Fig. 5 is a fragmentary view showing a portion of the modified form of valve device, looking at right angles to Fig. 4.

The rock drill shown in Fig. 1 is of the hand rotated type, although it will be understood that my invention is equally applicable to drills of the automatically rotated type. In a cylinder member 6 reciprocates a free piston 7 which has a reduced striking portion 8 adapted to strike against the shank 9 of a hollow drill steel, the bore in said steel being indicated at 10. The front end of the cylinder is closed by a front head member or chuck housing 11; and at the back end is mounted a valve block 12 and a rear head member 13, all of these parts being secured in assembled relation with the cylinder by means of the side rods 14 and 15 in a manner well known in the art.

The valve block has means for admitting the air under pressure including an inlet groove 16 from which pressure fluid is supplied in one position of the valve to the rear end of the cylinder directly through an axial passage 17, and in the opposite position of the valve, through passages 18 and 19 to the front end of the cylinder. The valve has an annular groove 20 which serves to connect the passage 18 alternately with the supply groove 16 and with an exhaust groove 21 which opens to the atmosphere through a port 22. The valve is provided with an enlarged flange or spool 23 which reciprocates in a corresponding bore in the valve block and rearwardly of this flange has also a reduced portion 24 which is subjected to constant pressure by a passage 25 communicating with the inlet. When the valve is in the forward position, the space behind the enlarged flange is in communication with the exhaust groove 21 so as to allow a free reduction of pressure on this area and a small groove 21ª connects the space to the rear of this flange continuously with the exhaust. A throwing passage 26, controlled by the piston 7, leads from a suitable point in the cylinder to the bore in which reciprocates the enlarged flange of the valve. One or more free cylinder exhaust ports 27 are provided substantially midway between the ends of the cylinder.

In operation, live pressure fluid flows into the inlet groove 16 and, when the valve and piston are in the positions shown in Fig. 1, through the axial passage 17 and acts on the rear end of the piston. The valve is held in the rearward position at this time by the live pressure fluid flowing to the inlet groove and acting on the end of the valve. The piston is driven forwardly to strike a blow on the drill steel 9 and during its forward travel the throwing passage 26 is opened whereby pressure fluid flows from the rear end of the cylinder to the bore behind the enlarged flange 23 on the valve, thereby overbalancing the

pressure acting on the front end of the valve and throwing the same forwardly. The throwing of the valve cuts off supply of live pressure fluid to the rear end of the cylinder, which is opened to exhaust at practically the same time through the free cylinder exhaust ports 27. After the valve is thrown, the pressure on the front end of the valve is relieved, thereby enabling the pressure acting on the end surface 24 and also the pressure acting on the enlarged flange to hold the valve in its forward position. Air now flows to the front end of the cylinder and reverses the direction of travel of the piston. The front end of the cylinder is then exhausted through the free exhaust ports 27 and also, after the valve is thrown, through passages 18, 19, groove 20 and passage 22. The valve is thrown rearwardly by compression pressure which acts on the front end of the valve and is quickly built up as the piston covers passage 26.

During reciprocation of the piston, a certain amount of pressure fluid will pass through the front end of the cylinder to the bore 10 in the drill steel when the piston is in the rear end of the cylinder. However, in drilling fairly deep holes and particularly in soft formations, the cleansing fluid supplied in this manner is not sufficient to blow the cuttings from the hole effectively. In order to completely stop the machine and supply live air to the bore in the drill steel, it is desirable to close off the free cylinder exhaust port and for this purpose I have provided an improved form of manually operated valve device. An annular groove 28 is cut around the exterior surface of the cylinder substantially midway between the ends thereof so that the free exhaust ports open into this groove. A cylindrical band 29 preferably made of sheet metal fits into this groove so that the exterior surface of the band conforms to the cylindrical outline of the cylinder. The ends of this band are provided with suitable lugs 30 and 31 for the purpose of receiving a bolt 32 to tie the ends together and hold the band in position. A coil spring 32^a may be placed around the bolt in the position shown so as to keep the band always under tension. Any suitable means may be provided for enabling the operator to move the band circumferentially in the groove and for this purpose I have shown a knob 33. The band has a series of holes 34 so arranged that when the knob 33 moves into engagement with one of the side rods 15, all of the exhaust ports are open. When it is desired to close the exhaust ports, the knob is simply shifted to some such position as indicated by the dotted lines in Fig. 2.

Now it will be clear that the exhaust ports may be closed by the operator when the piston is in the front end of the cylinder or midway between the ends thereof, and, if this were done, the machine might be stopped in such position that pressure fluid would not be supplied continuously to the front end of the cylinder. In order to insure that, whenever the valve device is moved to close the free exhaust ports, the distribution valve will always be held in its forward position so as to effect continuous supply to the front end of the cylinder, I have provided a supplementary passage 34^a opening into the front end of the cylinder and leading to the enlarged bore behind the spool 23 on the valve. The passage 21^a to the exhaust is relatively restricted so that with the aid of the supplementary passage 34^a there will be a substantial pressure acting continuously on this enlarged flange. The valve will thus be shifted and held to its forward position no matter at what point in the cycle of the motor piston that the free exhaust port is closed. The area of the groove 21^a is so small as not to affect normal drilling operations and the passage 34^a will not, with the parts formed as they are, interfere in any way with normal operations during hammering.

In the modified form of valve device in Fig. 4 the ends of the band are formed so as to provide screw threaded plugs 35 and 36 which are held together by a suitable nut 37. Obviously any desired form of retaining means may be attached to the ends of the band for holding the same in position.

In each form of my invention it will be observed that merely by shifting the exhaust controlling band or valve, the motor may be stopped and the piston held in retracted position with air flowing to the hollow steel through the front end of the cylinder.

While I have in this application specifically described two forms which my invention may assume in practice, it will be understood that these forms of the same are shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a rock drilling apparatus, a fluid actuated percussive motor having a cylinder and piston, a hollow drill steel actuated by said motor, fluid supply and exhaust means for said motor including a free exhaust port through the cylinder wall, said motor having provision for establishing communication between fluid supply and the bore of the hollow drill steel when said exhaust port is closed during fluid supply to the motor, and a valve device for closing said exhaust port at will to effect a hole blowing operation, said valve device being oscillatable about the axis of said cylinder as an axis.

2. In a rock drilling apparatus, a fluid actuated percussive motor having a cylinder and a piston reciprocable therein, a hollow

drill steel actuated by said motor, longitudinally extending side rods for holding the parts of said motor in assembled relation, pressure fluid supply and exhaust means for said motor including a free exhaust port, said motor having provision for establishing communication between fluid supply and the bore of the hollow drill steel when said exhaust port is closed during fluid supply to the motor, a valve device for closing said free exhaust port at will to effect a hole blowing operation, said valve device being oscillatable about the axis of said motor as an axis, and a projection on said valve device adapted to move into engagement with one of the side rods to determine the open position of said valve.

3. In a rock drilling apparatus, a fluid actuated percussive motor having a cylinder and a piston reciprocable in said cylinder, a hollow drill steel actuated by said motor, pressure fluid supply and exhaust means for said motor including a free cylinder exhaust port, said motor having provision for effecting communication between the bore of said steel and the interior of the cylinder in a predetermined position of the piston, and for effecting such positioning when the cylinder exhaust port is closed, and a valve having a concave seat engaging portion and slidable relative to the cylinder wall for closing off said free exhaust port at will so as to prevent discharge of pressure fluid therethrough thereby to effect a hole blowing operation.

4. In a rock drilling apparatus, a fluid actuated percussive motor having a cylinder and piston reciprocable therein, a hollow drill steel actuated by said motor, fluid distribution means for said motor including a free cylinder exhaust port, said motor having provision for effecting communication between the bore of said steel and the interior of the cylinder in a predetermined position of the piston, and for effecting such positioning when the cylinder exhaust port is closed, and a valve device comprising a member extending around said cylinder and slidable relative to the cylinder wall for closing said exhaust port at will so as to prevent discharge of pressure fluid therethrough thereby to effect a hole blowing operation.

5. In a rock drilling apparatus, a fluid actuated percussive motor having a cylinder and a piston reciprocable therein, a hollow drill steel actuated by said motor, fluid distribution means for said motor including a free cylinder exhaust port, said motor having provision for effecting communication between the bore of said steel and the interior of the cylinder in a predetermined position of the piston, and for effecting such positioning when the cylinder exhaust port is closed, a valve device comprising a member extending around said cylinder and slidable relative to the cylinder wall for closing said exhaust port at will so as to prevent discharge of pressure fluid therethrough thereby to effect a hole blowing operation, and a radially projecting knob on said member whereby the same may be shifted from one position to another.

6. In a rock drilling apparatus, a fluid actuated percussive motor having a cylinder and a piston reciprocable therein, a hollow drill steel actuated by said motor, fluid distribution means for effecting supply and exhaust of motive fluid to and from said cylinder including a free exhaust port in the wall of said cylinder, said motor having provision for effecting communication between the bore of said steel and the interior of the cylinder in a predetermined position of the piston, and for effecting such positioning when the cylinder exhaust port is closed, a valve having a curved seat and slidable relative to said cylinder wall for covering said exhaust port at will so as to prevent discharge of pressure fluid therethrough thereby to effect a hole blowing operation, said seat conforming in curvature to the surface of a cylinder struck from the axis of the motor cylinder, and means extending around said cylinder for holding said valve in position.

7. In a rock drilling apparatus, a fluid actuated percussive motor having a cylinder and piston reciprocable in said cylinder, a hollow drill steel actuated by said motor, fluid distribution means for effecting supply and exhaust of motive fluid to and from said cylinder including a free exhaust port in the wall of said cylinder, the exterior of said cylinder having a groove formed therein communicating with said exhaust port, and a band extending around said groove and oscillatable therein, said band having an aperture adapted to be alined with said exhaust port, said band acting when shifted away from said position to close said exhaust port for effecting a hole blowing operation.

8. In a rock drilling apparatus, the combination specified in claim 7 wherein there is further provided means for adjustably tensioning said band to hold the same in engagement with said groove.

9. In a rock drilling apparatus, a fluid actuated percussive motor having a cylinder and a piston reciprocable in said cylinder, a hollow drill steel actuated by said motor, fluid distribution means for effecting supply and exhaust of motive fluid to and from said cylinder including a distribution valve and a free cylinder exhaust port, said distribution valve having a surface adapted to be subjected to pressure fluid for holding the valve in position to admit motive fluid to the front end of the cylinder, piston controlled means for admitting pressure fluid to said surface from the cylinder during normal operation of the machine, a passage arranged to establish com-

munication between said surface and the front end of the cylinder, said passage opening into the cylinder independently of said free cylinder exhaust port and nearer the forward end of the cylinder than said exhaust port, and a valve device for closing said free cylinder exhaust port.

10. In a rock drilling apparatus, the construction set forth in claim 9 wherein said valve device comprises a member extending around said cylinder and oscillatable about the axis thereof to effect closing of the cylinder exhaust port.

In testimony whereof I affix my signature.

ELMER G. GARTIN.