Oct. 10, 1933. H. TARDIFF 1,929,458

DRILLING MECHANISM

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Fig. 1.

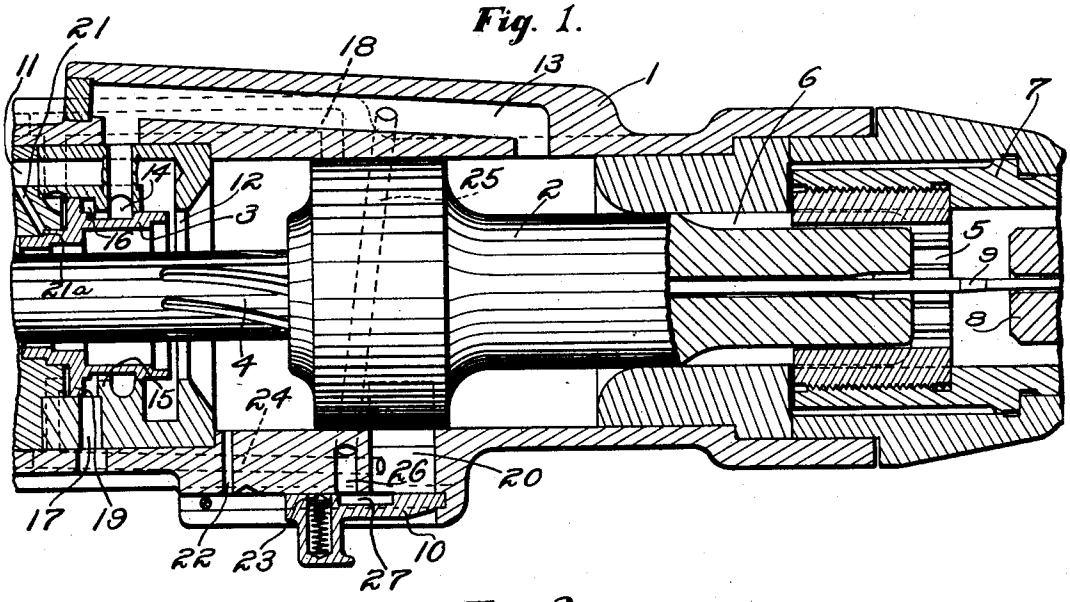


Fig. 2.

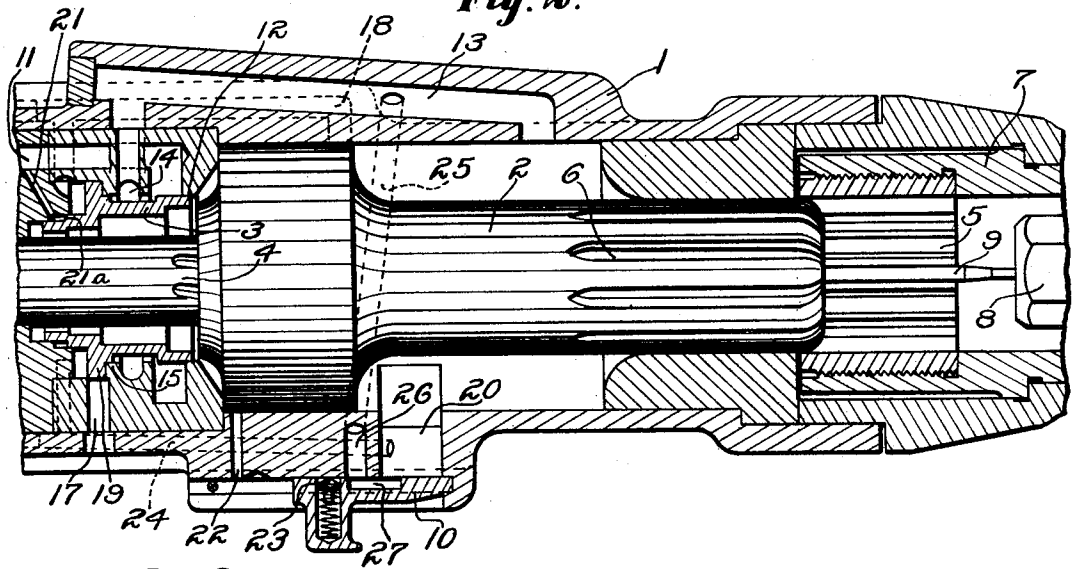
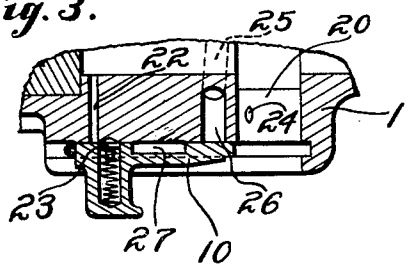


Fig. 3.



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DRILLING MECHANISM

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19 Claims. (Cl. 121—6)

This invention relates to drilling mechanism and more particularly to improved motor controlling means especially adapted for effecting a hole cleansing operation.

An object of my invention is to provide a drilling mechanism having improved motor controlling mechanism which in the specific embodiment of the invention herein is adapted to cause the piston to be moved to and held in the rear end of the cylinder, although it will of course be understood that my improved arrangement could be applied to effect a front position as well. A further object is to provide improved means for controlling the motor and effecting a hole cleansing operation. Another object is to provide improved means whereby the cleansing fluid is supplied from the piston cylinder and to insure a predetermined position of the motor piston when it is desired to use the hole cleansing operation. A further and more specific object is to provide improved means whereby the hole cleansing fluid may be supplied from the front cylinder end and to insure that the piston will be retained in, or moved to, its rearmost position when it is desired to supply cleansing fluid to the steel. Another object is to provide an improved controlling means that is particularly effective in cooperating with a fluid distribution valve and the piston so as to effect a positive action on the piston for holding it in, or moving it to, a rearward position. Further objects and advantages will be more apparent to those skilled in the art and also from the following description of the accompanying drawing in which,

Fig. 1 is a sectional view of a drilling motor with parts shown in elevation, the rear head and part of the steel chuck housing being omitted.

Fig. 2 is a similar view with the piston in its rearmost position and with the cleansing fluid control valve in position to permit supply of cleansing fluid to the steel.

Fig. 3 is a fragmentary view of the cleansing fluid control valve in position to permit normal operation of the drilling motor.

For purposes of illustration there is shown a drilling motor of the type having a cylinder 1, reciprocating hammer piston 2, a fluid distribution valve 3 of the hollow sleeve type and steel rotation mechanism including a rifle bar 4, cooperating at one end with a usual ratchet (not shown) and at its other end with a rifle nut carried in the piston 2, and a longitudinally fluted chuck rotating nut 5 cooperating with straight flutes 6 formed in the piston striking bar. The nut 5, carried in the drill steel chuck 7, is supported in the usual manner in the front part of the drill housing so as to permit rotation of the drill steel 8 and at the same time permit a series of impact blows to be imparted to the steel. As is usual in drill mechanisms or tools of this type, the drill steel is hollow and fluid pressure, either liquid or air, or both, may be supplied through a suitable cleansing tube arrangement 9 extending through suitable axial passages in the piston and rifle bar 4. The flutes 6 are also of such a length that they may communicate with the front end of the cylinder 1 when the piston is in a rearward position, thereby permitting flow of pressure fluid in the front end of the cylinder through the flutes to the hollow drill steel to either supplement an existing supply of gaseous fluid or to comprise the sole source of gaseous cleansing fluid for the drill steel.

To insure that the piston 2 will be withdrawn sufficiently to permit the supply of fluid, from the front end of cylinder 1, through flutes 6 I have provided an improved motor or cleansing fluid control valve 10 and associated passage arrangement adapted to cooperate with the distribution valve 3 and the distribution passages for the cylinder 1, the operation of which will be more easily understood by first describing the normal operation of the drilling motor. During this normal operation the valve 10 is in its rear position as shown in Fig. 3. During the forward stroke, fluid, supplied through an inlet passage 11, passes the front end of valve 3 and through an axial cylinder port 12 to move the piston forward, during which time fluid pressure in the front end of the cylinder is discharged through passage 13, annular groove 14, around partition 15 to the annular space 16 from which it discharges through a port 17. When the piston has moved forward a predetermined distance so as to uncover a throw passage 18, live fluid pressure flows through the latter from the cylinder to the rear surface of an annular flange 19. The valve is thus thrown forward to the position shown in Fig. 2 whereupon fluid flows from the inlet 11, through annular groove 14 to distributing passage 13 and thence to the front cylinder end to drive the piston rearwardly, during which time fluid in the rear cylinder end is exhausted through an intermediate exhaust port 20 which was uncovered as the piston moved forwardly. As the piston is moved rearwardly and overruns throw port 18, fluid will be compressed in the rear cylinder end and act upon the forward surfaces of the distribution valve to move it rearwardly to again permit supply of fluid from inlet 11 through axial port 3 to the front cylinder

end to drive the piston forwardly. The cycle of operation is then repeated. Fluid pressure is also constantly supplied through a passage 21 to a small rearwardly facing area 21a formed on a shoulder of the distribution valve. During the normal operation a small leak port 22 is closed by the control valve 10.

The effecting of the cleansing operation is as follows: To hold the piston rearwardly and permit continuous supply of fluid pressure to the front cylinder end and from there to the flutes 6, to effect cleansing action, the operator moves control valve 10 forward against the initial holding action of a spring held plug 23, thereby covering exhaust port 20 and effecting certain other passage connections. As the piston moves forward from the position shown in Fig. 1 under the power of fluid pressure in the rear cylinder end, fluid pressure therefrom flows through throw port 18 to move the distribution valve forward. Fluid pressure will now be supplied to the front end of the cylinder through passage 13 and act to move the piston rearwardly against the fluid pressure in the rear end of the cylinder, which is not permitted to escape through port 20, but which is permitted to gradually escape through leak passage 22. The piston upon reaching its rearward position will be held there due to fluid pressure passing from the front end of the cylinder through exhaust passage 20 to a passage 24, which communicates directly therewith and also with the rear face of annular flange 19, so that the valve is held against movement to admit again to the rear end of the cylinder. Live fluid pressure is also supplied from the distributing passage 13 through passages 25, 26, recess 27, port 20 to the passage 24 and hence insures a supply of live pressure fluid acting upon the rear face of the annular flange 19, thus positively holding the distribution valve in its forward position against any pressure which may be in the rear cylinder end. As passage 22 will permit gradual discharge of the rear cylinder pressure and as the front cylinder end is constantly supplied with fluid pressure, the piston is moved to, and held in, its rear position so as to withdraw the straight flutes 6 into the front cylinder end and thus permit supply of fluid pressure therefrom to the steel 8. When it is desired to operate the drilling motor in a normal manner the control valve 10 is moved rearwardly to close off the vent passage 22 and also the passage 26, thus preventing communication between passages 24 and 25 so that live fluid pressure in distributing passage 13 cannot have any effect upon the annular flange 19. It is thus seen that I have provided improved means for positively and simply controlling the motor and which is particularly effective for hole cleansing purposes.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is 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. A drilling mechanism comprising, in combination, a cylinder, a piston therein having a striking bar adapted to impart a series of hammer blows to a hollow drill steel carried by the drilling mechanism, flutes in said striking bar adapted when the piston is in the rear end of the cylinder to permit communiation between the front end thereof and said steel, a fluid distributing valve having a surface upon which fluid pressure acts to throw the same, distribution passages controlled by said valve for effecting reciprocation of said piston, an intermediate exhaust port controlled by said piston, and means for stopping operation of said piston with said flutes in communication with the front end of the cylinder and while maintaining a constant supply of live pressure fluid thereto, including a control valve adapted to close said exhaust port, and a passage arrangement controlled by said control valve for insuring supply of live pressure fluid directly from one of said distribution passages to said throwing surface on the distributing valve.

2. A drilling mechanism comprising, in combination, a cylinder, a hammer piston therein adapted to impart a series of blows to a hollow drill steel carried by the drilling mechanism, means for supplying cleansing fluid to said drill steel when said piston is held in a substantially predetermined position, and means for effecting movement of said piston to, and for holding the same in, said position, including a source of live pressure fluid, a free exhaust port controlled by said piston, and means for closing said port and effecting communication between said source of live pressure fluid and said exhaust port.

3. The combination set forth in claim 2, further characterized in that the means for closing said exhaust port and for effecting said communication with the source of live pressure fluid is adapted during normal operation to uncover said exhaust port and prevent said communication of the source of live pressure fluid with said exhaust port.

4. The combination set forth in claim 2 further characterized by the provision of an atmospheric vent passage from the rear end of said cylinder.

5. The combination set forth in claim 2 further characterized by the provision of a vent passage in the rear end of said cylinder and adapted to be controlled by the means for controlling the closing of said exhaust port.

6. The combination set forth in claim 2 further characterized by the provision of a vent passage from the rear end of said cylinder and adapted to be controlled by the means for controlling the exhaust port whereby when the exhaust port is closed said vent passage is opened.

7. The combination set forth in claim 2 further characterized by the provision of a vent passage for the rear end of said cylinder adapted to be controlled by said means for closing the exhaust port whereby when said exhaust port is open said vent passage is closed.

8. The combination set forth in claim 2 further characterized by the provision of a vent passage for the rear end of said cylinder, said vent passage being controlled by the means for closing said exhaust port whereby when said exhaust port is opened said vent passage is closed and communication between the source of live pressure fluid and said exhaust port is prevented.

9. A drilling mechanism comprising, in combination, a cylinder, a piston therein adapted to actuate a hollow drill steel carried by the drilling mechanism, a fluid distribution valve and passage arrangement for effecting reciprocation of said piston including a live fluid pressure distribution passage leading to the front end of said cylinder, and means for effecting movement of said piston to, and holding the same in, a

predetermined position including a control valve, and a passage arrangement controlled by said latter valve and adapted when said control valve is in one position to establish communication between said distribution passage and a throw surface on said distribution valve.

10. A drilling mechanism comprising, in combination, a cylinder, a piston therein adapted to actuate a hollow drill steel carried by the drilling mechanism, a fluid distribution valve and passage arrangement for effecting reciprocation of said piston including a live fluid pressure distribution passage leading to the front end of said cylinder, means for conducting cleansing pressure fluid to said drill steel when said piston is in its rearward position, and means for effecting movement of said piston to, and holding the same in, a predetermined position including a control valve, and a passage arrangement controlled by said latter valve and adapted when said control valve is in one position to permit communication between said distribution passage and a throw surface on said distribution valve and to vent the rear end of said cylinder.

11. The combination set forth in claim 10 further characterized in that during normal operation of said piston said control valve closes said vent passage and disconnects said communication between said distribution passage and said distributing valve.

12. A drilling mechanism comprising, in combination, a cylinder, a piston therein adapted to actuate a drill steel carried by the drilling mechanism, means for effecting reciprocation of said piston including an exhaust port, and means for controlling said piston including a passage adapted to have communication with a source of live pressure fluid and a manually shiftable valve mechanism adapted to close said exhaust port, said valve mechanism having a recess therein for effecting communication between said exhaust port and said source of live pressure fluid.

13. The combination set forth in claim 12 further characterized in that said valve recess is operative to conduct the live fluid pressure irrespective of the position of said piston.

14. A drilling mechanism comprising, in combination, a cylinder, a piston reciprocable therein and adapted to actuate a hollow drill steel carried by the drilling mechanism, means for effecting reciprocation of said piston including a fluid distribution valve and passages, means for supplying cleansing fluid to said drill steel when the piston is moved to, and held in, a substantially predetermined position, means for effecting said movement and holding including means for conducting live pressure fluid from one end of said cylinder opposite the predetermined position to a throw surface on said distribution valve, and means for supplementing said supply of pressure fluid to the distribution valve including a passage adapted to be connected to a source of live pressure fluid at a point outside of said cylinder whereby supply of pressure fluid to said end of the cylinder is adapted to be positively maintained whenever a hole cleansing operation is effected.

15. In a rock drill, the combination of a cylinder, a piston reciprocable in said cylinder, fluid distribution means for controlling admission and exhaust of motive fluid including an exhaust port in said cylinder intermediate its length and governed by the piston and a distributing valve adapted in one position to effect admission of motive fluid to the front end of the cylinder, a drill steel arranged to be percussively actuated by said piston and having a longitudinal passage for motive fluid to its cutting end, means for establishing communication between said passage and the front end of said cylinder when the piston is in the rear end of the cylinder, and means including a valve for closing said exhaust port and a passage overrun by said valve in one position of the latter, for effecting simultaneous closure of said exhaust port and supply of pressure fluid to an area on said distributing valve to hold the latter in a position to admit motive fluid to the the front end of the cylinder to effect hole blowing.

16. In a rock drill, the combination of a cylinder, a piston reciprocable in said cylinder, fluid distribution means for controlling admission and exhaust of motive fluid including an exhaust port in said cylinder intermediate its length and governed by the piston and a distributing valve adapted in one position to effect admission of motive fluid to the front end of the cylinder, a drill steel arranged to be percussively actuated by said piston and having a longitudinal passage for motive fluid to its cutting end, means for establishing communication between said passage and the front end of said cylinder when the piston is in the rear end of the cylinder, and means for effecting simultaneous closure of said exhaust port and supply of pressure fluid to an area on said distributing valve to hold the latter in a position to admit motive fluid to the front end of the cylinder to effect hole blowing, said last mentioned means including a valve arranged exteriorly of the cylinder for closing said exhaust port and a plurality of cooperating passages leading respectively to said area, and from a source of supply, and connected only when said valve approaches exhaust port closing position.

17. In a rock drill, the combination of a cylinder, a piston reciprocable therein, means for distributing live fluid pressure to each end of said cylinder including a distributing valve, a free exhaust port controlled by said piston, a drill steel arranged to be percussively actuated by said piston and having a longitudinal passage for conducting cleansing fluid to its cutting end, means for establishing communication between said drill steel passage and the front end of said cylinder when the piston is in the rear end of the cylinder, manually operable valve mechanism for closing said exhaust port and for directing a supply of pressure fluid to an area on said distributing valve to hold the latter in position to admit motive fluid to the front end of said cylinder to effect a hole blowing operation, and means controllable by said valve mechanism for venting the rear end of said cylinder when said exhaust port is closed, said valve mechanism maintaining said venting means closed only when said valve mechanism is in a position to open said exhaust port.

18. In a rock drill, the combination with a cylinder, a piston reciprocable therein, and fluid distribution means including a pressure fluid actuated valve, and a hollow drill steel arranged for actuation by said piston, said drill having provision for the supply of fluid to said hollow drill steel when said piston is adjacent one end of said cylinder, of means movable to control fluid flow relative to said valve to effect maintenance of the latter in a position to hold the piston in the last mentioned end of said cylinder, and means independent of said pressure fluid actuated valve for venting the last mentioned end of the cylinder during a hole blowing operation.

19. In a rock drill, the combination of a cylinder, a piston reciprocable therein, means for distributing live fluid pressure to each end of said cylinder including a distributing valve, a free exhaust port controlled by said piston, a drill steel arranged to be percussively actuated by said piston and having a longitudinal passage for conducting cleansing fluid to its cutting end, means for establishing communication between said drill steel passage and the front end of said cylinder when the piston is in the rear end of the cylinder, manually operable valve mechanism for closing said exhaust port and for directing a supply of pressure fluid to an area on said distributing valve to hold the latter in position to admit motive fluid to the front end of said cylinder to effect a hole blowing operation, and means wholly independent of the control of said distributing valve and controllable by said valve mechanism for venting the rear end of said cylinder.

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