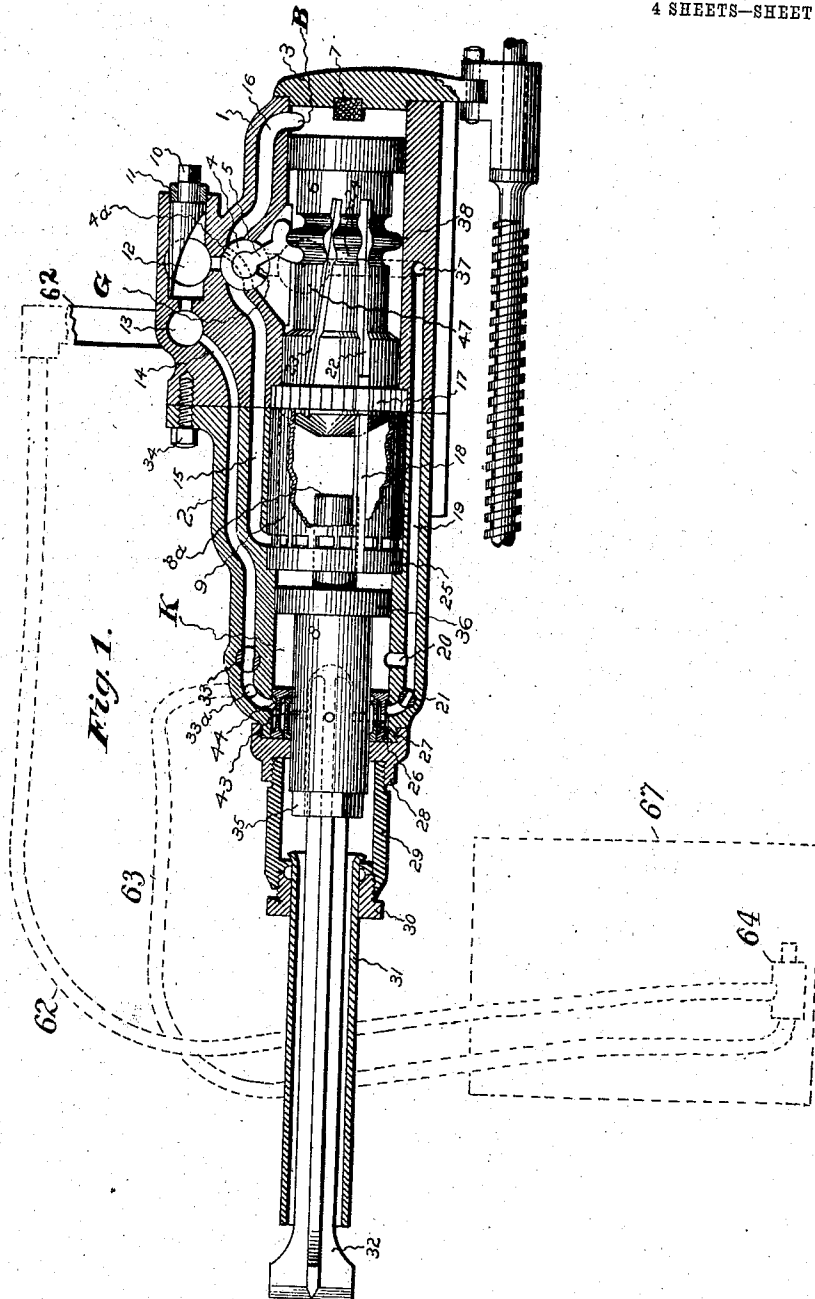


No. 823,980.

PATENTED JUNE 19, 1906.

C. M. WALKER.
ROCK DRILLING MACHINE.
APPLICATION FILED NOV. 28, 1904.

4 SHEETS—SHEET 1.



Witnesses.

Arthur L. Reynolds
Amos J. Hillman Jr.

Inventor.

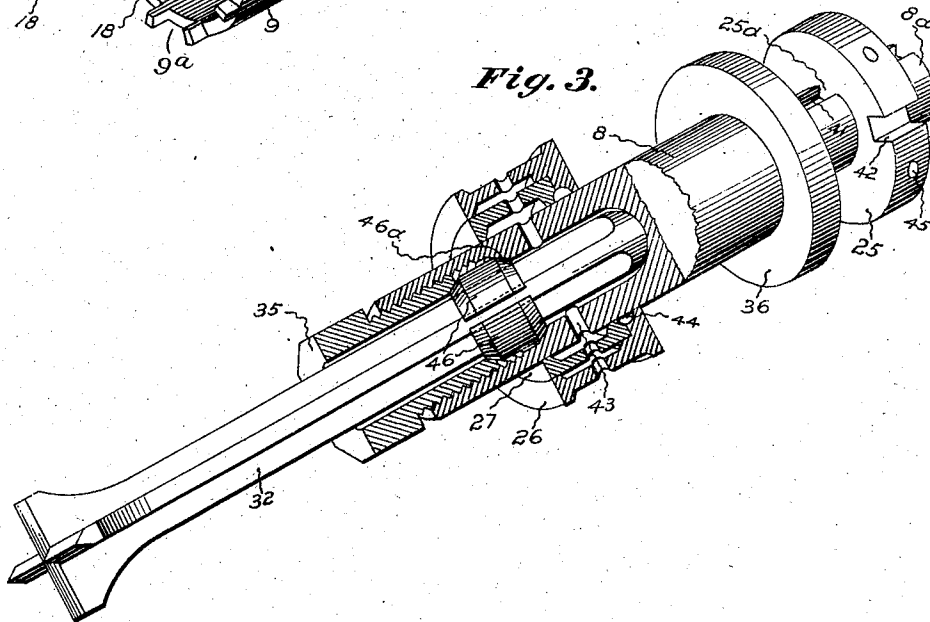
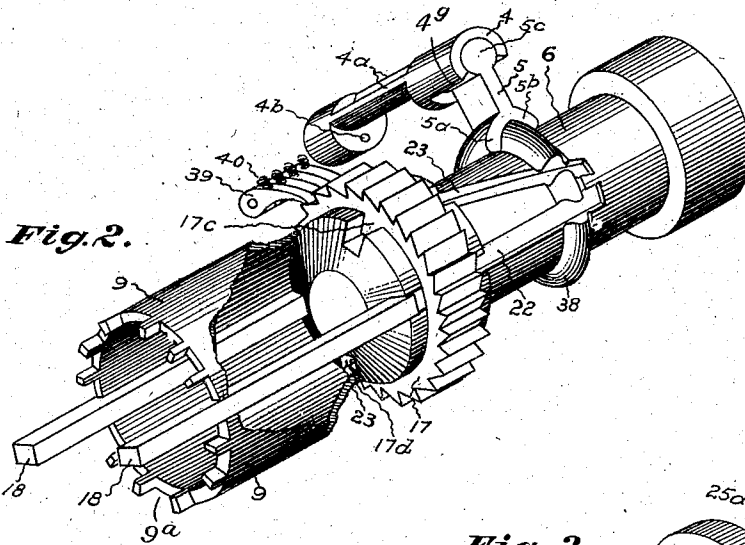
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ROCK DRILLING MACHINE.
APPLICATION FILED NOV. 28, 1904.

4 SHEETS—SHEET 2.



Witnesses.

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No. 823,980.

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APPLICATION FILED NOV. 28, 1904.

4 SHEETS—SHEET 3

Fig. 4.

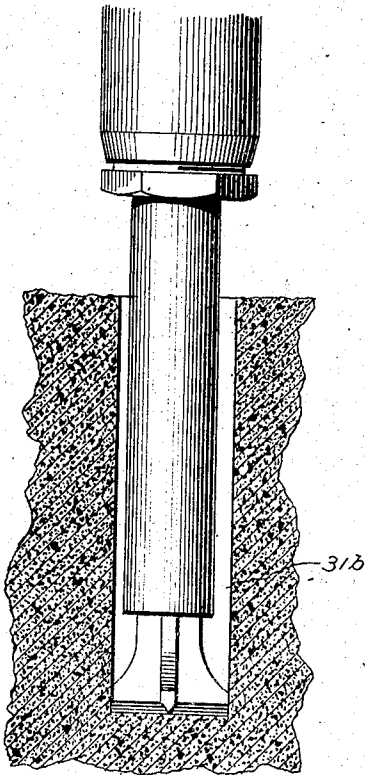


Fig. 5.

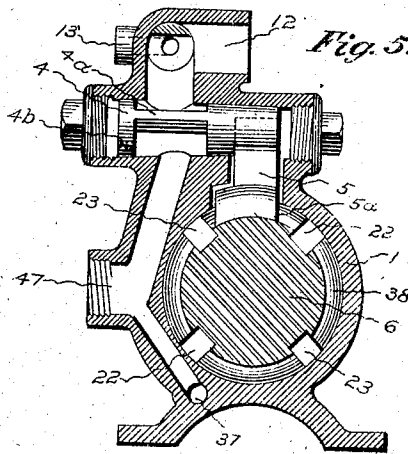


Fig. 6.

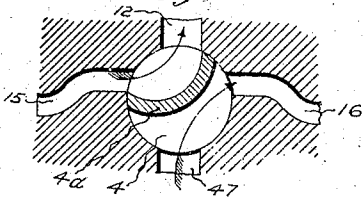
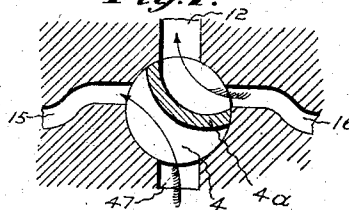


Fig. 7.



Witnesses.

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No. 823,980.

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APPLICATION FILED NOV. 28, 1904.

4 SHEETS—SHEET 4.

Fig. 8.

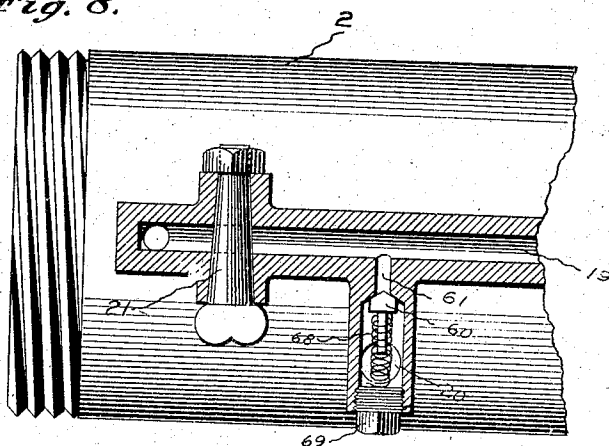
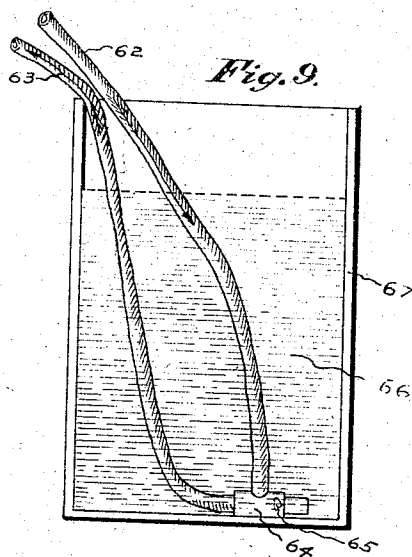


Fig. 9.



Witnesses.

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Amos J. Hall Jr.

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UNITED STATES PATENT OFFICE.

CASSIUS M. WALKER, OF PUEBLO, COLORADO, ASSIGNOR TO THE
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ROCK-DRILLING MACHINE.

No. 823,980.

Specification of Letters Patent.

Patented June 19, 1906.

Application filed November 28, 1904. Serial No. 234,608.

To all whom it may concern:

Be it known that I, CASSIUS M. WALKER, a citizen of the United States, residing at Pueblo, in the county of Pueblo, State of Colorado, have invented certain new and useful Improvements in Rock-Drilling Machines, of which the following is a specification.

My invention relates to rock-drilling machines, and has for its object to improve and simplify the construction, arrangement of parts, and mode of operation of the same; and to these ends my invention consists in the various features of construction and arrangement of parts having the general mode of operation and accomplishing the results as hereinafter more particularly set forth.

In the accompanying drawings, wherein I have illustrated a preferred embodiment of my invention, Figure 1 is a longitudinal perpendicular section of the machine. Fig. 2 is an enlarged perspective view of the hammer and allied parts. Fig. 3 is a similar perspective view, partly in section, of the chuck-clutch, chuck, and allied parts. Fig. 4 is a vertical section of a stone in which a hole has been cut, showing the manner of using the machine. Fig. 5 is a transverse section through the main valve. Figs. 6 and 7 are enlarged cross-sectional views through the main valve, showing the different positions of the same with relation to the ports controlled thereby. Fig. 8 is a still further enlarged inverted plan section of the bottom portion of the lower cylinder, showing the details of the check-valve; and Fig. 9 is a cross-section of a water-tank, showing a manner of supplying water to the drill and illustrating diagrammatically the connection of the tank with the drilling mechanism.

While my invention may be embodied in various forms and the details of construction and arrangement varied in accordance with the requirements thereof, the embodiment shown in the drawings has been found satisfactory, and I will describe my invention in connection therewith.

The machine comprises an upper cylinder or shell 1 and a lower cylinder or shell 2, properly formed and shaped and secured together in any suitable way, as by screws 34. The upper cylinder 1 is closed by a head 3, which may be secured in a usual manner and is pref-

erably provided with a rubber buffer 7 on its inner side.

Mounted in the body or shell is a piston or hammer 6, adapted to be reciprocated therein and to operate upon the head-piece 8^a of the chuck 8, which chuck carries the cutting-tool and reciprocates in the lower cylinder in the manner hereinafter described. The movements of this hammer or piston are controlled by a valve 4, which in turn controls the various ports and passages in the manner hereinafter set forth. This valve 4 is tapered longitudinally and provided between its heads with a web 4^a, arranged so as to extend above its center, and thus control the ports, and at the same time it is held by the pressure to its seat, the pressure beneath the valve serving to insure it being well seated at the top of the bore even if its seat should be worn more or less. To further insure the valve being properly held to its seat, its larger head is provided with an opening 4^b, through which pressure is introduced against the larger end of the valve.

In order to operate the valve, it is provided with a valve-dog 5, the upper end of which, 5^c, fits loosely in a socket in the end of the valve 4, the edges 4^c, against which the dog impinges, providing a certain amount of clearance and the position of which determines the length of the stroke of the hammer. This dog is provided with prongs 5^a and 5^b at its free end, which engage a rib 38 upon the hammer 6, and this hammer is preferably provided with grooves 24 at each side of the rib, so that the valve can be operated by the piston in its reciprocations to control the pressure for operating the valve. It will be observed that the valve-dog 5 is not rigidly connected to the body of the valve, but is free to move in its socket and only moves the valve when it impinges on one or the other of the edges 4^c. By this construction of valve and the arrangement of parts it will be seen that the valve does not rotate to any great extent in its seat, but only sufficient to cause its web to open and close the respective ports in the manner hereinafter described, and thus wear on the valve is saved and it operates quickly in controlling the flow of pressure at the time desired.

In order to produce the step-by-step rota-

tion or turning movement of the hammer at each reciprocation, I provide a ratchet 17, which is mounted in the case through which the hammer slides and which is engaged by a series of pawls 39, suitably supported in the case and preferably having springs 40 to hold them to their seats, and thus prevent the ratchet turning in one direction. This ratchet is provided with lugs 17^c and 17^d, which engage spiral grooves 23 23, formed in the body of the hammer 6, and by means of these the hammer is caused to turn on its upward movement, while in its downward movement the ratchet is rotated. This rotary movement of the hammer is communicated to the chuck in some suitable way, and in the present instance I have shown the chuck 8 as being provided with a slot 41, into which extends a lug 25^a on the clutch 25, and this clutch receives rotary movement from the hammer by means of the keys 18, secured in slots 42 in the clutch and sliding in the keyways 22 in the hammer. The keys 18 preferably slide between parts of a sectional bushing 9 in the lower part of the main cylinder, and these serve not only to stiffen the keys, but aid in holding the parts in their proper positions, and the lower ends of the bushing-sections are notched, as indicated at 9^a, to permit the passage of the fluid into the lower end of the main cylinder.

The chuck 8 is provided with a piston 36, moving in the lower portion of the cylinder, and the end of the tool 32 is secured in the socket of the chuck in any suitable way; but as shown I have provided two collapsible jaws 46, having conical ends 46^a and adapted to embrace the tool and be forced into position by a check-nut 35, the bearings for these jaws being correspondingly coned or shaped, so that as the check-nut is screwed in it forces the jaws to tightly grasp and securely hold the tool in position.

The chuck reciprocates through the cylinder-head 26, and this head is provided with a stuffing-box 44 and gland 27, so as to properly pack the head and provide close joints. The head is held in place in the present instance by a reducing-collar 28, to which is connected the hollow cylinder 29, in which is mounted the cleaning-tube 31, which envelops the tool 32, and I have shown a gland 30, which aids in supporting the enveloping cleaning-tube in position and packing the joint between the tube and cylinder. The tube is flanged at its inner end, which prevents it from working entirely out of the cylinder 29, while at the same time it permits of adjustment longitudinally and rotatively therein. This is important, as if perchance the tube should become bent or crushed so as to engage the cutting-tool it can be adjusted as above indicated, and the cylinder and gland, with the packing around the tube, will

permit a certain amount of motion or adjustment of the tube.

The tool is designed to be operated by fluid-pressure, such as steam or air, and this is supplied at the main pressure-inlet port 47, and from thence it passes to the valve-chamber, from whence its passage is controlled by the valve 4, so that it can pass through the ports 15 or 16, extending to opposite ends of the main cylinder and operating as inlet or exhaust ports therefor, according to the position of the valve. Connected to the valve-chamber is an exhaust-port 12 for permitting free passage of the exhaust to the open air when open; but this is provided with means for throttling it or entirely closing it, as by a tapering valve 10, held in position by a gland 11 and capable of being rotated and adjusted in any desired position to secure the desired amount of throttling. The purpose of this throttling of the exhaust is to permit the same to be used for cleaning the hole formed in using the drill, and in order to permit this there is connected with the exhaust-port 12 ports 13 and 14, the former of which is open to the air and may be connected to a proper pipe 62 in a manner hereinafter described and the latter of which leads to the openings 43 in the cylinder-head and gland 26 and 27 and chuck 8, thus delivering the exhaust through the tube 31 at or near the bottom of the hole formed by the tool and enabling it to force out the cuttings from the hole. The port or passage 14 is provided with a valve 33, and communicating with the port or passage 14 is an opening 33^a, to which a flexible pipe may be connected and through which water may be introduced into the passage and forced through the enveloping cleaning-tube. Sometimes it is preferable to use high-pressure fluid for the purpose of cleaning the hole, and in order to permit this a passage 19 at the side of the casing-section 2 communicates with the port 47 and is provided with a valve 21, which can be opened to permit the live fluid from the port 47 to communicate through the channels 43 with the interior of the cleaning-tube.

One of the important features of my invention is the means for providing a cushion for the chuck 8 to prevent injury to the cylinder-head 26 from overstroke, and to do this the main inlet-port 47 is connected by a passage 37 to the live pressure port or passage 19 and communicates through a port 20 with the lower cylinder beneath the chuck-piston 36. It will be seen in Fig. 8 that extending from the live port or passage 19 is a port 61, provided with a check-valve 60, normally held in its seat by a spring 68 and plug 69 and operating in the manner hereinafter described to control the flow of fluid to form a cushion for the chuck.

Having thus described the various parts or

features of construction of my machine and specified their relations to each other, their mode of operation will be largely understood by those skilled in the art, and it may be described somewhat briefly as follows: Assuming the parts to be in the positions shown in Fig. 1, with the hammer 6 leaving the extreme upper end of its movement, the valve 4 is moved to bring its web to the position shown in Fig. 6, thus opening the port 16 to the main pressure-supply from the inlet-port 47 and at the same time opening port 15 to exhaust-port 12 and to the ports 13 and 14, as the case may be, and pressure will enter the cylinder at its upper end at B and drive the hammer or piston 6 toward the opposite end of the cylinder, where it comes into violent contact with the chuck-head 8^a, thereupon delivering a blow through the chuck 8 to the stone-cutting tool 32. In doing this the position of the valve 4 has been changed to that indicated in Fig. 7, making the port 15 the pressure-port and port 16 the exhaust-port. It will be observed that the valve 4 is moved by the dog 5 engaging the rib 38, and owing to the clearance between the edges 4^a there is lost motion in the dog, so that the valve is not moved until just before the chuck reaches the extreme of its movement, and then it is quickly moved through a short portion of the rotation, sufficient to cause its wings to assume their proper position (indicated in Figs. 6 and 7) to control the flow of fluid to and from the cylinder, and thus it is exposed to a little wear. As above intimated, the fluid pressing against the web tends to hold the valve in its seat, and it is further held in its seat, when so desired, by means of the opening 4^b permitting the full pressure of the fluid against the large head of the tapering valve. It will be understood that as the hammer reciprocates in this manner it rotates the cutting-tool step by step, and as the hammer moves downward the ratchet 17, through the lug 17^a engaging the spiral groove 23, is partially rotated, and as the hammer moves upward, the ratchet being held from rotating by the pawls 39, the hammer is forced to rotate a partial revolution and through the keys 18 rotates the chuck 8 and the tool carried thereby.

It will be noticed that the live fluid is supplied to the inlet-port 19 under full pressure and passes by way of the port 20 into the lower portion of the cylinder beneath the chuck-piston 36, so that in this cylinder the pressure is equal to that supplied to the piston, and the check-valve 60 prevents the fluid from returning to the source of supply, so that the pressure once attained in this chamber or cylinder is never exhausted from it and forms a cushion for the chuck, the fluid being compressed between the chuck-

piston 36 and the cylinder head 26, which will effectually protect the machine from injury from overstroke. It will thus be seen that by this arrangement the cushioning fluid is constantly kept at the full pressure of the supply, and when the chuck moves downward the pressure of this cushioning fluid is increased over that of the source of supply.

As above intimated, the cuttings may be blown out of the hole either by live pressure or exhaust pressure fluid, and when it is desired to use the live pressure the valve 21 in the passage 19 is opened, permitting the fluid to flow to the ports 43 through the enveloping cleaning-tube 31, which extends to or near the bottom of the hole. When, however, the exhaust fluid is used directly for this purpose, the exhaust-port 12 is throttled to the desired extent, causing the exhaust fluid to pass through the exhaust-ports 13 14, and the valve 33 being opened it will pass through the ports or channels 43 and through the enveloping cleaning-tube 31, as before.

When it is desired to use water in connection with the fluid, it may be supplied in any suitable way, as at the opening 33^a, and the apparatus indicated in Fig. 9 may be used. To do this, the hose or pipe 62, for instance, may be connected to the exhaust-port 13, and the other end may be connected to the T 64, either immersed in the water in the tank 67 or connected to the exterior of the tank. This T is provided with a check-valve 65, and it will be seen that normally the water will rise in the hose 62 and 63, the latter being connected to the opening 33^a, the valve 33 being closed, and when the exhaust fluid passes through the hose 62 it forces the water through the hose 63, thereby emptying the hose 62 and 63, and as the exhaust-pressure falls therein the water flows into the T past the check-valve 65 and again supplies the hose with a portion of water. It will thus be seen that the hole may be cleaned by means of the enveloping cleaning-tube, practically surrounding the cutting-tool and carried on the shell or body of the tool, by the use of either the live pressure fluid or exhaust pressure fluid or with the addition of water mixed with the fluid.

It has heretofore been common to supply the fluid for the purpose of cleaning the holes by passing it through an opening in the tool itself, and while this is effective to a greater or less extent it is expensive. By the use of the enveloping cleaning-tube the cleaning may be readily accomplished at little expense, avoiding the necessity of making all the cutting-tools hollow or with a longitudinal opening through them, which is not only expensive, but interferes with the sharpening of the tools.

I do not here claim the valve device shown.

as it constitutes the subject of a divisional application for Letters Patent, Serial No. 253,301.

Having thus described my invention, what

I claim is—

1. In a rock-drilling machine, the combination with a cylinder, a drill, a cleaning-tube surrounding the drill, a hammer, and ports supplying pressure thereto, of a valve controlling said ports, and an exhaust-port provided with means for throttling the same and means for conducting the exhaust to the tube, substantially as set forth.

2. In a rock-drilling machine, the combination with a cylinder, a chuck for holding a drill, a cleaning-tube surrounding a drill, a hammer, and ports supplying pressure thereto, of a valve controlling said ports, a main exhaust-port exhausting to the air, means for throttling the same, a second exhaust-port, and connections for conducting the exhaust to the cleaning-tube to clean the hole formed by the drill, substantially as described.

3. In a rock-drilling machine, the combination with a cylinder, a chuck for a drill, a cleaning-tube surrounding the drill, a hammer, and ports supplying pressure thereto, of a valve controlling said ports, a main exhaust-port exhausting to the air, means for throttling the same, a second exhaust-port connected to supply exhaust fluid to the cleaning-tube, and means for also supplying water to said connection, substantially as described.

4. In a rock-drilling machine, the combination with a cylinder, and a piston-hammer reciprocating therein and provided with a spiral groove, of a chuck and drill connected therewith, a ratchet mounted to turn in the cylinder and surrounding the hammer, pawls supported by the cylinder and engaging the ratchet, and a projection on the ratchet entering the groove in the hammer to turn the latter, substantially as described.

5. In a rock-drilling machine, the combination with a cylinder, and a piston-hammer mounted therein, of a chuck also mounted in the cylinder, a ratchet and connections for rotating the hammer thereby, keys carried by the chuck, and keyways in the hammer for rotating the chuck, substantially as described.

6. In a rock-drilling machine, the combination with a cylinder, of a piston-hammer and a chuck mounted therein, a ratchet, connections between the ratchet and hammer for rotating the latter, a sectional bushing

mounted in the cylinder, and ribs connecting the hammer and chuck and extending between the bushings, substantially as described.

7. In a rock-drilling machine, the combination with a cylinder having a piston-hammer and a chuck mounted therein, and inlet and exhaust ports, of a tool mounted in the chuck, a cleaning-tube enveloping the tool, and a cylinder-head provided with channels connecting with the exhaust-port whereby exhaust fluid may be supplied to the cleaning-tube during the drilling operations, substantially as described.

8. In a rock-drilling machine, the combination with a cylinder, a hammer and a chuck mounted therein, and inlet and exhaust ports, of a tool mounted in the chuck, a cleaning-tube enveloping the tool, and means including control-valves for supplying either live or exhaust pressure fluid as desired to the cleaning-tube, substantially as described.

9. In a rock-drilling machine, the combination with a cylinder and with the head thereof, of a cylinder connected detachably to said head and provided with a packing-box at the outer end, a cleaning-tube extending through said box and flanged at the inner end, and a cutting-tool extending through the cleaning-tube, with means for operating said tool, substantially as set forth.

10. The combination of a casing, a piston-hammer and a piston-chuck movable therein, a ratchet surrounding the hammer, means for rotating said ratchet, a clutch connected to rotate with the ratchet by keys secured to the clutch and extending into the hammer, and means for turning the chuck with the clutch, substantially as described.

11. The combination of the casing, piston-hammer, piston-chuck, means for supplying fluid under pressure to reciprocate the hammer, an exhaust, means for throttling the exhaust, a cleaning-tube, a valve-controlled channel and ports whereby the exhaust may be conducted to said tube, and a valve-controlled channel and ports whereby the live pressure may be conducted to the cleaning-tube, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CASSIUS M. WALKER.

Witnesses:

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