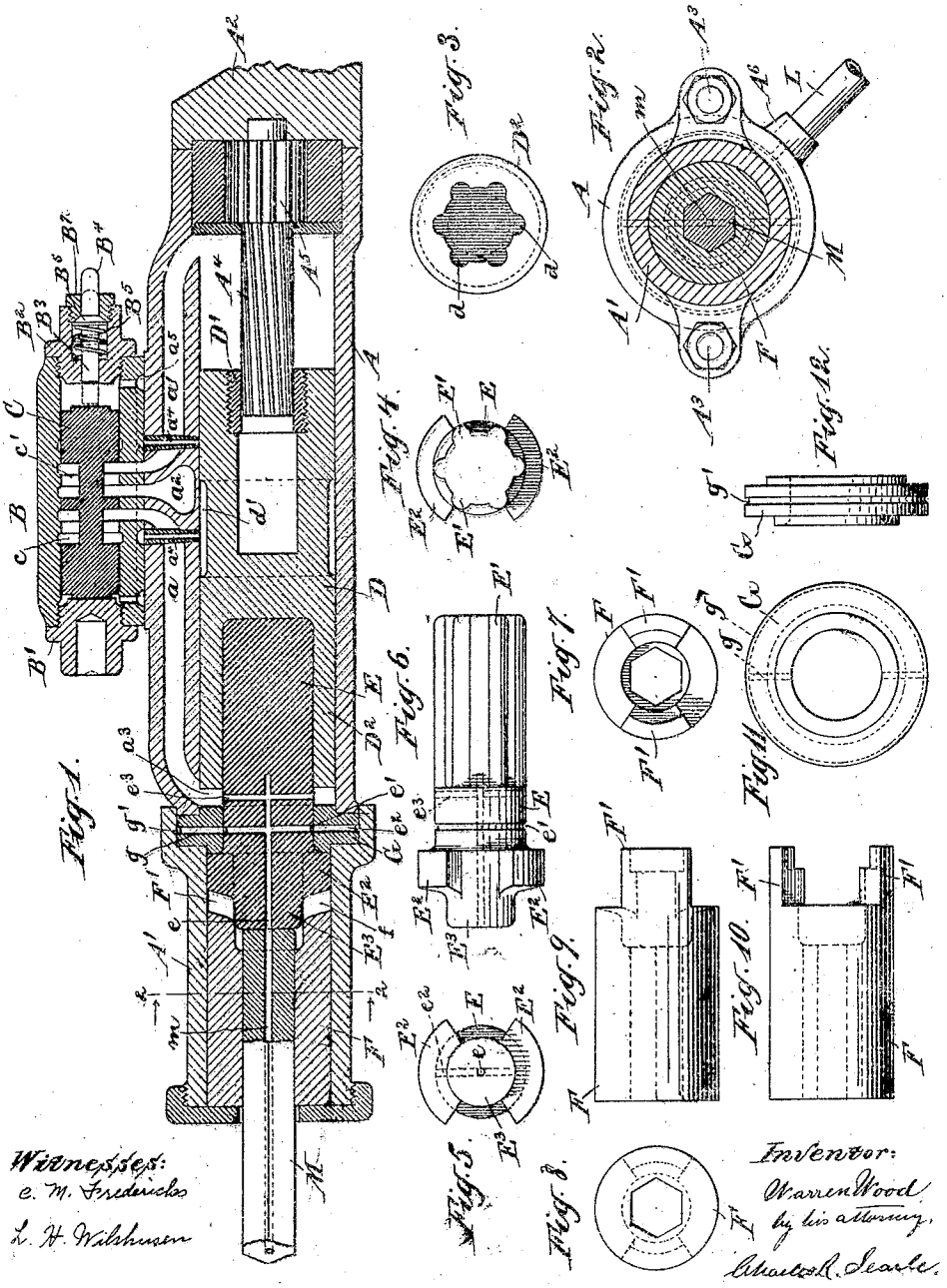
W. WOOD.

ROCK DRILL.

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UNITED STATES PATENT OFFICE.

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ROCK-DRILL.

1,162,964. Specification of Letters Patent. Patented Dec. 7, 1915.

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To all whom it may concern:

Be it known that I, WARREN WOOD, a citizen of the United States, residing at Paterson, in the county of Passaic and State of New Jersey, have invented a certain new and useful Improvement in Rock-Drills, of which the following is a specification.

The invention relates to drilling apparatus in which a piston reciprocated by steam or compressed air delivers blows to a drill, and the object of the invention is to provide an apparatus of this character which shall be light, strong, and efficient, with its working parts constructed and arranged to insure alinement and to reduce wear and the danger and expense of fracture, and also to provide easily operated means for clearing the drilled hole during the drilling operation.

The invention consists in certain novel features of construction and arrangement by which the above objects are attained, to be hereinafter described and claimed.

The accompanying drawings form a part of this specification and show the invention as it has been carried out in practice.

Figure 1 is an axial section through the working parts of the apparatus, partly in elevation. Fig. 2 is a transverse section, partly in end view, the plane of section being indicated by the line 2—2 in Fig. 1. Fig. 3 is an end view of the piston alone. Fig. 4 is an elevation of the end of the striking-pin adapted to be engaged in and struck by said piston. Fig. 5 is an elevation of the opposite end of the striking-pin. Fig. 6 is a side view of the same. Fig. 7 is an end view of a collar adapted to hold the steel or drill and match to the striking-pin. Fig. 8 is an elevation of the opposite end of such collar. Fig. 9 is a side view of the collar. Fig. 10 is a similar view at a right angle to Fig. 9. Fig. 11 is a face view of a washer in which the striking-pin is inclosed and guided. Fig. 12 is a corresponding edge view.

Similar letters of reference indicate the same parts in all the figures.

A is the cylinder, A^1 the front head, and A^2 the top-head, joined by rods or standards as usual on the exterior of the cylinder and indicated at A^3 in Fig. 2.

B is the steam or compressed air chest having heads B^1 B^2 and containing a cylindrical three-ring valve C having ports c c^1 and adapted to be reciprocated automatically to control the admission ports a a^1 and intermediate exhaust port a^2 in the chest and cylinder and induce the required reciprocations of the piston D in the latter. The piston is partially rotated at each return stroke by the engagement of a spiral nut D^1 in the piston with a spiral bar A^4 mounted in the cylinder, equipped with a ratchet wheel A^5 and a pawl, not shown, operating in the usual manner.

A tubular extension D^2 on the front end of the piston and forming a continuation of the latter is grooved on the interior as at d to receive corresponding longitudinal ridges or lands E^1 on the cylindrical rear portion of a striking-pin E matching to and received telescopically in the extension D^2 of the piston and adapted to receive on such inclosed rear end the blows delivered by the piston and transmit their force to the drill or steel M, and also by reason of the engagement of the lands and grooves to rotate the striking-pin with the piston.

The steel or drill M is held firmly in a cylindrical collar F mounted in the front head A^1 and having its upper end notched to provide longitudinally extending wings or lugs F^1 F^1 matching to corresponding spaces between the lugs E^2 E^2 on the adjacent end of the striking-pin and causing the collar with its steel to rotate with such pin and with the piston.

G is a ring or washer between the cylinder A and the front head A^1, inclosing the cylindrical rear portion of the pin E and serving as a guide therefor.

The lands E^2 are at all times in engagement with the grooves d of the piston during the reciprocations of the latter, and on the forward or downward movement of the piston the inclosed upper face of the pin is struck by the adjacent inner face of the piston cavity, and the force of the blow delivered by the nose E^3 of the pin to the steel M.

By making the extension D^2 of the piston hollow and inclosing the striking-pin therein, the latter is always held in position to receive the blow squarely upon its inclosed end, and the whole exterior surface of the

extension is utilized to guide the piston of which it forms a part and thus insure true axial movement relatively to the cylinder. The nose E^3 of the striking-pin is similarly guided in the collar F relatively to the steel M so as to rest squarely thereon, and the extreme distance between the pin and collar as at f is preferably greater than that between the washer G and the adjacent end of the extension D^2 at the end of the normal piston travel in delivering a blow, so that in the event of an accidental unresisted blow of the piston when the drill is not in contact with the rock, the movement will be arrested by the contact of the extension D^2 with the washer G and thus transferred directly to the side-rods A^3 instead of to the collar F through the pin E, thus reducing the danger of fracture of the front head A^1.

The steel has a continuous axial opening m and the pin E is drilled axially at e to match thereto and is grooved annularly as at e^1 to register with radial holes g in the washer G extending from the interior opening to an external annular groove g^1 on the exterior of the washer. Radial holes e^2 lead from the central passage e to the groove e^1 and permit water received through a pipe L attached to a hollow boss A^6 on the front head A^1 and communicating with the groove g^1 to be delivered through the striking-pin and steel M to the drill-head, not shown, and thus to the hole being drilled. The pipe L may be equipped with a valve, not shown, to control the flow.

The passage e in the striking-pin is continued beyond the lateral holes e^2 and connects with radial passages e^3 communicating with the steam or compressed air space at a^3 in the lower end of the cylinder. After each blow, on the admission of pressure to return the piston, a small volume of such steam or air flows through the striking-pin and steel and serves to loosen and blow out dust and drillings from the drilled hole. It will be noted that such flow of steam or air is direct from the port a of the cylinder so that the pressure thus delivered through the steel is the full air or steam pressure.

Provisions are also made for delivering a continuous flow of steam or air under pressure to the steel M when desired. When the valve C is in the position shown in Fig. 1, steam or air flows through the valve-port c and cylinder port a to return the piston for the next effective stroke and in this position of the valve the air or steam flows momentarily to the steel as above described; in the head B^2 of the chest B is an axially arranged push-pin B^3 extending to the interior of the chest and having an exteriorly protruding end B^4 by which it may be thrust into the chest in opposition to the force of a spring B^5 inclosed in the head B^2, and the valve C thus held in position to interrupt the reciprocations of the valve and piston and to admit pressure continuously to the steel for as long a period as may be desired.

The push-pin carries a valve B^6 matching to a seat in the gland B^7 and preventing leakage around the pin when it is returned by the spring B^5 after release.

The valve C is reciprocated automatically by the compressed air or steam through small ports a^4 and passages a^5 controlled by an annular port d^1 on the piston as will be understood.

In clearing the hole being drilled, the steel is partially withdrawn therefrom or reciprocated slowly to produce a churning action therein, and a quantity of water is supplied through the pipe L and steel M to the hole. The push-pin B^3 is then forced inwardly to move the valve to the position shown and hold it there while steam or air under full pressure is delivered to the steel and thence to the drilled hole, blowing out the water with the drillings or chips in partial suspension therein until the hole is sufficiently cleared, the push-pin is then released and the drilling operation automatically recommenced and continued.

Modifications may be made in the forms and proportions of the parts, especially in the shapes of the grooves and lands in the striking-pin and piston, and in the notches and lugs for engaging the striking-pin and collar; the forms shown are considered preferable as affording the desired engagement while maintaining axial alinement and permitting the necessary relative movement.

I claim:—

1. In a rock-drill, a cylinder, a reciprocating piston therein having a cavity in its end, and a striking-pin movable relatively to said piston, received in said cavity and arranged to be inclosed partially within said piston in all positions of the latter.

2. In a rock-drill, a cylinder, a reciprocating piston therein having an axial cavity in its end, and a striking-pin in axial alinement with said piston and loosely received and guided in such cavity.

3. In a rock-drill, a cylinder, a reciprocating piston therein having an axially grooved cavity in its end, a striking-pin in axial alinement with said piston and loosely received and guided in such cavity, and lands on said striking-pin matching such grooves.

4. In a rock-drill, a cylinder, a reciprocating piston therein having an axially grooved cavity in its end, means for rotating said piston relatively to said cylinder, a striking-pin in axial alinement with said piston and loosely received and guided in said cavity lands on said striking-pin matching such grooves, said pin having longitudinal notches on its exterior, and a drill-carrying collar in axial alinement with said striking-pin and

having lugs loosely engaged in said notches, said grooves and lands, and notches and lugs, serving to hold said piston, striking-pin and collar against longitudinal disengagement and insuring mutual rotation.

5. In a rock-drill, a cylinder, a head thereon, a washer held between said cylinder and head and having a central opening, a piston in said cylinder and means for reciprocating it, said piston having an axial cavity in its end, a striking-pin in axial alinement with said piston and received in said cavity and opening, a collar in said head adapted to receive a drill, said washer so located relatively to said piston as to receive a blow of the latter upon said washer and prevent impact of said striking-pin upon said collar.

6. In a rock-drill, a cylinder, a head thereon, a washer held between said head and cylinder and having a central opening, a piston in said cylinder and means for reciprocating it, said piston having an axial cavity in its end, a striking-pin in axial alinement with said piston and received in said cavity and opening, a collar in said head adapted to receive a drill having a longitudinal passage therethrough, said washer so located relatively to said piston as to receive a blow of the latter and prevent impact of said striking-pin upon said collar, said striking-pin and washer having passages arranged to receive water and deliver it to the interior of such drill.

7. In rock-drill, a cylinder, a head thereon, a washer held between said head and cylinder and having a central opening, a piston in said cylinder, said piston having an axial cavity in its end, a striking-pin in axial alinement with said piston and received in said cavity and opening, a collar in said head adapted to receive a drill having a longitudinal passage therethrough, said washer so located relatively to said piston as to receive a blow of the latter and prevent impact of said striking-pin upon said collar, a valve-chest, a cylindrical reciprocating valve therein controlling the admission and exhaust ports for said cylinder, said striking-pin having passages for receiving pressure from one of said admission ports when supplied by said valve and deliver it to the passage in said drill.

In testimony that I claim the invention above set forth I affix my signature, in presence of two witnesses.

WARREN WOOD.

Witnesses:
CHARLES R. SEARLE,
SOPHIE KEITEL.