G. H. REYNOLDS.

ROCK-DRILLING ENGINE.

No. 169,587. Patented Nov. 2, 1875.

Fig: 1.

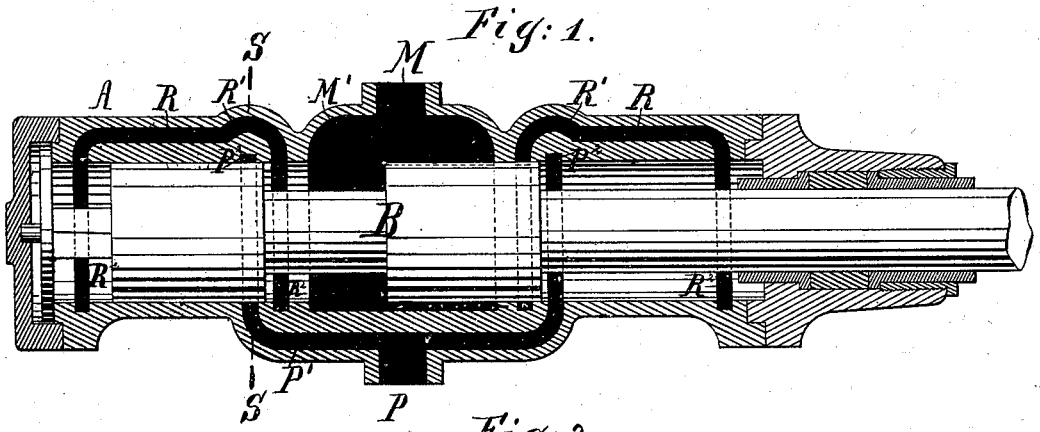
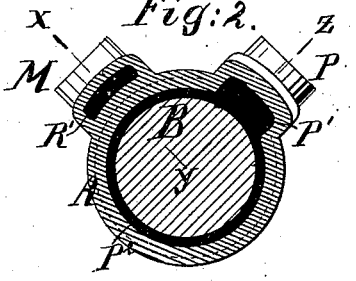


Fig: 2.



Inventor:

Witnesses:

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Geo. H. Reynolds

by his attorney

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UNITED STATES PATENT OFFICE.

GEORGE H. REYNOLDS, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF, C. H. DELAMATER, AND GEORGE H. ROBINSON.

IMPROVEMENT IN ROCK-DRILLING ENGINES.

Specification forming part of Letters Patent No. **169,587**, dated November 2, 1875; application filed September 2, 1875.

To all whom it may concern:

Be it known that I, GEORGE H. REYNOLDS, of New York city, in the State of New York, have invented certain new and useful Improvements in Rock-Drill Engines, of which the following is a specification:

I have devoted much time and labor to the production of an engine which shall work successfully without valves, reciprocating with a high degree of velocity and to about the right extent under all conditions. My present invention is designed more perfectly to accomplish the same object.

With this mode of operation, without valves, it is important that the time of the covering and uncovering of the ports by the movement of the piston should be very nicely adjusted; and it is important that when a port begins to be uncovered it shall immediately expose a large area to the passage of the steam through the port.

I have arranged my ports to terminate in a ring or annular channel, extending all around the interior of the cylinder. The moment the piston has moved so far as to commence to uncover a port it opens the entire area quite around the piston to the movement of the steam. When the piston is closing a port there remains a liberal opening for the movement of the steam until the edge of the piston has arrived at the closing position, and then it at once closes the space quite around the piston.

I have provided for the movement of the steam across the extended area thus provided by gathering it in a comparatively narrow channel in one portion, casting the cylinder with a corresponding high ridge on its exterior along the proper line, and coring a crooked passage, by which the ring of steam-space before referred to is jumped or traveled over without forming a communication therewith.

The accompanying drawings form a part of this specification, and represent what I consider the best means of carrying out the invention in its application to an ordinary rock-drill.

Figure 1 is a section, which, in order to cut through both the receiving and discharging ports, is made on the line *x y z* in Fig. 2—that is to say, the upper half of Fig. 1 is a section on the line *x y*, and the lower half of Fig. 1 is a section on the line *y z*. Fig. 2 is a cross-section on the line *s s* in Fig. 1.

Similar letters of reference indicate like parts in both the figures.

A is the body of the cylinder, provided with heads, stuffing-boxes, and means for turning the drill as the piston reciprocates. B is a double piston, forged or otherwise formed on a single stout stem, which connects the pistons and the drill. The pistons are placed at the proper distance apart, and the ports are so arranged that when the piston has been thrown to one end of the cylinder the steam is received at that end through a liberal passage, and it is exhausted from the opposite end. As soon as the piston has been thrown its movement changes the steam-connections, and it is impelled violently back again. With steam of a reasonably high pressure the rock-drill, properly attached, will reciprocate from ten to twelve complete double strokes per second.

The ports and the broad passages or chambers connected therewith outside of the cylinder, being of master importance in this construction, will be designated by several separate letters. The port through which steam is admitted is marked M. The broad chamber into which it is received is marked M′. This chamber M′ extends quite around the cylinder. The port through which steam is exhausted or discharged into the atmosphere is marked P. A long narrow passage, extending parallel to the cylinder, and at a distance therefrom greater than the thickness of the chamber M′ on that side, is marked P^1. Each end of the passage P^1 bends inward toward the cylinder, and communicates with the interior of the cylinder through the medium of a port or hollow channel, P^2, extending quite around the cylinder. Two channels, through which, when the piston is at or near either end of its stroke, the steam is allowed to flow from the central space between the two pistons to the nearest end of the cylinder, are marked R. Each end of these channels is bent inward, and communicates with the interior of the cylinder through the medium of the ports or hollow channels R^2, extending quite around the

cylinder. The steam, in traversing through the passage R, is compelled, at one point, to pass over the port P^2. At this point the metal of the cylinder is thickened, and the passage is bent outward, so as to leave a sufficient thickness of metal between it and the port P^2, as indicated by R^1.

When, in the working of my engine at the high velocity required for economy in this line of engineering, the piston moves toward either end of its stroke and commences to uncover one of the ports R^2, it allows a free flow of the steam through the uncovered area, not of an ordinary port, but of an annular passage quite around the piston. Steam therefrom flows through the passage R^1, thence through the passage R, and enters freely into the cylinder in advance of the front end of the piston. The pressure generated there stops the momentum of the piston before it has reached the end of its stroke. However weak the steam may be, and however violent the motion, the chance of arresting the motion of the piston by destroying its momentum is increased by the sudden closing of the entire port and the imprisoning of the steam in advance of the piston, so that it cannot flow backward. The area is the greatest possible until the piston has cut it off, and then as suddenly as possible the steam is imprisoned, and compelled to serve as a cushion in advance of the piston, first diminishing the stroke, and then hastening the return-stroke of the piston. On the return-stroke, the moment the piston has begun to uncover the port it uncovers a large area, and the steam enters freely.

The same construction of all the ports makes all the changes of condition at each reciprocation more vigorous. When the piston opens or closes the port P^2 it does it very rapidly, with the largest possible area; and the same is true of each port. In consequence of this peculiarity each port may be narrower than would otherwise be allowable.

The bending of the port or passage R R^1 to cross the other port, P^2, not only avoids any interference of currents and communication of steam from one passage to the other, but also maintains a uniformity in the thickness of the cylinder, avoids contortions in cooling, and reduces the liability to fracture.

It is more important in my cylinder than in those usually employed that the bore shall be perfectly round, because the pistons are worked without packing. The extension of the ports P^2 and R^2 quite around the cylinder promotes this end by avoiding the irregular side strain on the boring-tool which occurs in boring past the ports in ordinary cylinders.

I claim as my improvement in rock-drill engines—

1. In combination with a solid double piston, B, serving both as piston and valve, the ports or mouths R^2 P^2 of the respective steam-passages extended quite around the cylinder, as and for the purposes specified.

2. The crooked steam-passages, having the bend R^1 arranged as shown relatively to the annular exhaust-port P^2, as and for the purposes specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

GEO. H. REYNOLDS.

Witnesses:
PHILLIPS ABBOTT,
CHAS. C. STETSON.