(No Model.)

J. SPRENGER.

ROCK DRILL.

No. 474,069. Patented May 3, 1892.

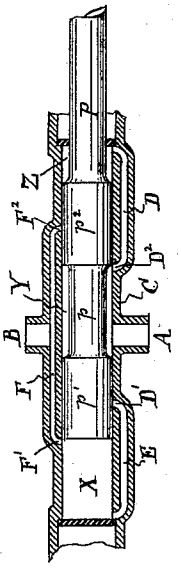

Fig. 1

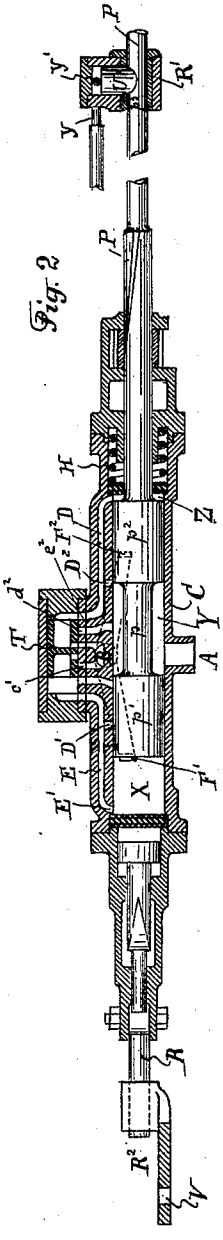

Fig. 2

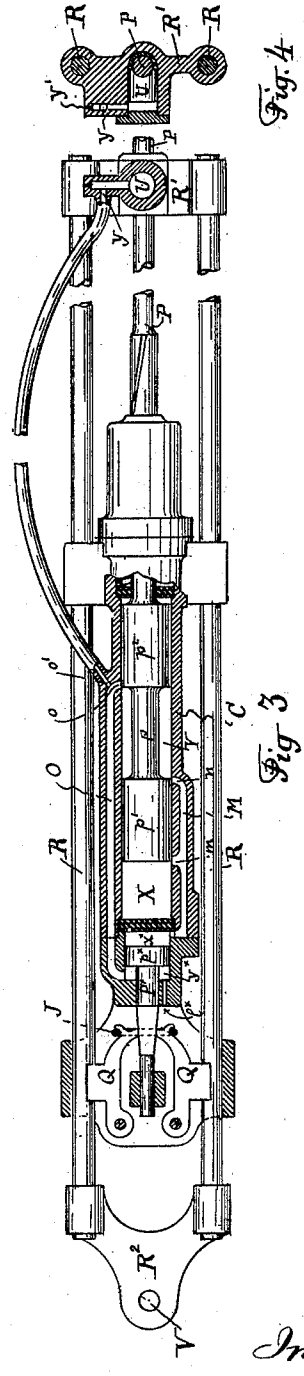

Fig. 3

Fig. 4

Witnesses

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UNITED STATES PATENT OFFICE.

JEAN SPRENGER, OF VEVAY, SWITZERLAND, ASSIGNOR TO THE ATELIERS DE CONSTRUCTIONS MÉCANIQUES, OF SAME PLACE.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 474,069, dated May 3, 1892.

Application filed September 25, 1891. Serial No. 406,833. (No model.) Patented in Switzerland July 15, 1891, No. 3,478.

To all whom it may concern:

Be it known that I, JEAN SPRENGER, a citizen of Switzerland, residing in Vevay, Switzerland, have invented an Improvement in Rock-Drills, (for which a patent was granted to me in Switzerland July 15, 1891, No. 3,478,) of which the following is a specification.

In this invention the piston and piston-rod, to which is connected the rock-drill, are reciprocated by the action of air or steam under pressure, and the cylinder is supported upon guide-rods, so that it may slide endwise, and there are clamps actuated by the fluid-pressure to hold the cylinder to the guide-rods or to hold the piston-rod to the cross-head, and the one is released as the other is brought into action, so that the cylinder and the rock-drill and piston occupy the proper relative positions as the drilling progresses.

In the drawings, Figure 1 is a longitudinal section illustrating the ports that may be made use of in giving motion to the piston and piston-rod. Fig. 2 is a similar section, longitudinally, representing the cylinder and a valve for controlling the action of the fluid under pressure. Fig. 3 is a sectional plan view showing the clamping devices, and Fig. 4 is a cross-section at the front cross-head.

The steam, air, or other fluid under pressure is supplied by a pipe to the opening A into the cylinder C, and within this cylinder C are the pistons p' p^2, connected by the rod p, and the piston-rod P extends through a suitable stiffening box or head at the end of the cylinder and receives at its end the rock-drill. (Not shown in the drawings.) This piston-rod P slides freely through the cross-head R′, and there are guide-rods R R, extending from the cross-head R′ to the back cross-head R^2, and this cross-head R^2 may be secured by a bolt passing through the hole V to any suitable supporting-frame or other device, and the cylinder C has near its ends projecting lugs or brackets through which the rods R R pass, so that this cylinder may slide endwise upon the rods R, as hereinafter described.

Referring now to Fig. 1 and to the respective ports that are represented thereon as provided in the cylinder C, it will be observed that the distances between the respective ports are such that air under pressure acts in the following manner: There is a constant pressure of the air or fluid in the space Y, and this air-pressure passes through the port D^2 and D to the space Z in front of the piston p^2, and the pressure drives the piston and piston-rod back to withdraw the drill, and the piston p^2 closes the port D^2, and the air acts expansively until the front edge of the piston p^2 reaches the exhaust-port F^2. At this moment the front edge of the piston p' uncovers the port D′, allowing the fluid-pressure to pass by the port E into the space X of the cylinder and act upon the piston p' to project the same and the drill toward the rock; but before the inertia of the parts has been overcome by the pressure in X the fluid-pressure in Z has been reduced by the fluid passing off through the port F^2 and exhaust B, so that the pressure in X exerts its force to drive the piston, piston-rod, and drill toward the rock until the parts arrive at the position indicated in Fig. 1, wherein the port F′ is opened to the exhaust B and the port D^2 is opened to the pressure, and the momentum of the piston, piston-rod, and drill being expended in the blow against the rock the backward movement commences under the action of the air-pressure in Z, as before described.

The action of the air or steam under pressure in the cylinder represented in Fig. 2 is similar to that before described, with the exception that the admission of the fluid under pressure is regulated by the automatic valve T, and in the position represented in Fig. 2 the pressure passes by the port D^2 into the valve-chest, moving the valve T, so that it uncovers the port d^2, and the pressure passes through d^2, D, and D^2 to the front space Z in the cylinder and acts upon the piston p^2 to withdraw the piston-rod P and rock-drill from the rock, and during this movement the air or steam in the chamber X of the cylinder has been passing by the port E′ E and valve-chest and through the port in the valve to the exhaust-port c', such valve T having been moved, as aforesaid, into the reverse position from that shown in Fig. 2, and as soon as the piston p' uncovers the port D′, the pressure acts

through such port D′ and moves the valve T back into the position shown in Fig. 2, opening the ports for the steam or air pressure to pass into the chamber X of the cylinder and project the piston, piston-rod, and drill toward the rock and the aforesaid movements are repeated, and it is to be remarked that the ports F′ F² are connected by the ports shown by dotted lines with the exhaust, so that the pressure of the fluid is instantly released when the pistons reach their end movements in either direction.

The special feature of my present invention relates to the devices for alternately clamping the piston-rod and the cylinder, so that the parts may be moved along as the rock-drilling progresses. With this object in view I provide a cylinder upon the cross-head R′, into which cylinder a clamping-plug U is introduced, one end of which is adapted to fit the piston-rod P, and there is a flexible pipe y extending from the space y' in the cylinder to the connection o' at the side of the cylinder C, adjacent to the port o, and the port O extends to the back end of the cylinder C, where such cylinder is divided by a disk or septum separating the space X from the space $x^{\times}$, and in this portion $x^{\times}$ of the cylinder is a piston $p^{\times}$, with a rod $P^{\times}$ passing through the back end of the cylinder and made inclined or wedge-shaped between the two clamps Q, that are pivoted upon the back flange of the cylinder-head and act against the rods R when the piston $P^{\times}$ is pressed backwardly, and when this piston $p^{\times}$ is drawn forwardly, the pressure of the clamps Q is released, and this operation is aided by a contractile or elastic ring J around the projecting ends of the clamps Q. The operation of this portion of the device is as follows: There being a continuous pressure in the space Y of the cylinder C, that pressure passes through the port n M to the space $x^{\times}$ and acts upon the piston $p^{\times}$ to apply the clamps Q and hold the cylinder, and this operation is continued while pressure is exerted in the chamber X of the cylinder, because there is a lateral port m leading therefrom; but when the piston p' closes the port n as the drill is projected and the piston arrives to the position shown in Fig. 2 the pressure in X is instantly relieved by the steam or air passing off by the port F′, and simultaneously the pressure in $x^{\times}$ is relieved by the fluid passing through the port m, and at this moment the piston p^2 uncovers the port o' and the steam or air pressure, acting through the port o against the back surface of the piston $p^{\times}$, withdraws the piston-rod $P^{\times}$, so that the clamps Q are released, and the pressure, acting through the flexible pipe y upon the clamping-plug U, holds the piston-rod P, at which moment the steam or fluid pressure passing through D² into the portion Z of the cylinder moves the cylinder C, causing it and the clamps Q to slide on the rods R, and in so doing the port o' is closed and the port n is opened, so that the pressure acts upon the piston $p^{\times}$ to again hold the cylinder by the clamps Q, and the pressure of the plug U is simultaneously relieved, so that the pistons and piston-rod move backwardly, as before described.

There may be a spring at H applied around the piston-rod or between the front head of the cylinder and a movable washer around the piston-rod and within the cylinder resting against a shoulder in the said cylinder to prevent injury to the front piston-head should the rock-drill be carelessly handled and the drill projected toward the rock without coming into contact with the same. The piston-rod and drill may be made to rotate progressively, as usual.

I claim as my invention—

The combination, with the cylinder in a rock-drill, of guide-rods upon which the cylinder may slide, cross-heads at the respective ends of such guide-rods, one of which is adapted to be held firmly in position, the piston-rod sliding through the other cross-head, a clamp applied to the piston-rod, clamps adapted to act against the guide-rods for holding the cylinder in position, a piston and wedge-shaped piston-rod acting upon the clamps, ports, and a flexible pipe extending to the front cross-head, whereby the piston-rod and cylinder are clamped and released alternately, substantially as set forth.

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

JEAN SPRENGER.

Witnesses:
E. IMER-SCHNEIDER,
G. PRENTICE NAYLOR.