(No Model.) 2 Sheets—Sheet 1.

# A. & A. L. STEVENS.

## STEAM ROCK DRILL.

No. 280,971. Patented July 10, 1883.

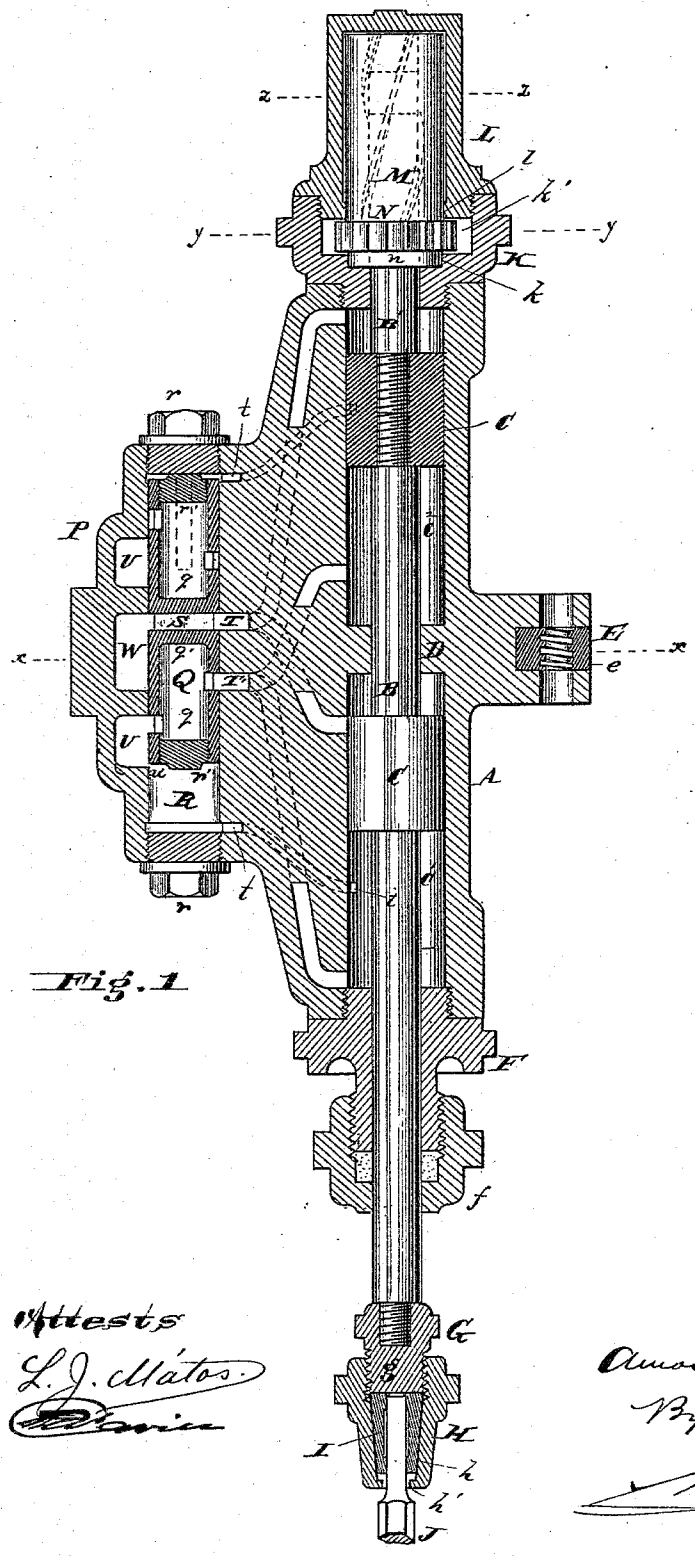



Fig. 1

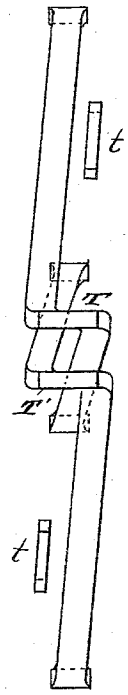



Fig. 3

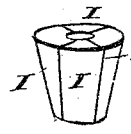



Fig. 7

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(No Model.)

2 Sheets—Sheet 2.

# A. & A. L. STEVENS.

## STEAM ROCK DRILL.

No. 280,971. Patented July 10, 1883.

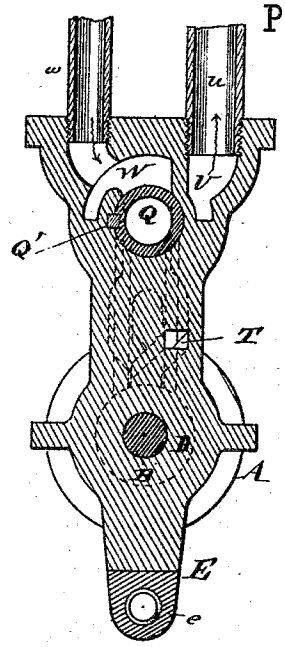



Fig. 2

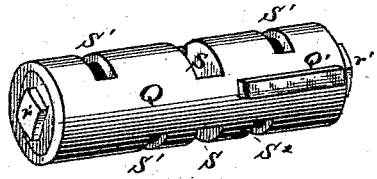



Fig. 4

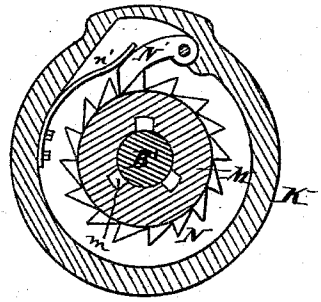



Fig. 5

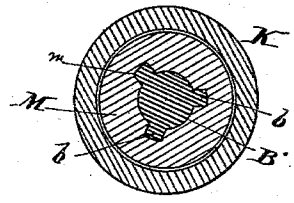



Fig. 6

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# UNITED STATES PATENT OFFICE.

AMOS STEVENS AND ARTHUR L. STEVENS, OF PHILADELPHIA, PA.

## STEAM ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 280,971, dated July 10, 1883.

Application filed February 20, 1882. Renewed June 11, 1883. (No model.)

*To all whom it may concern:*

Be it known that we, AMOS STEVENS and ARTHUR L. STEVENS, both of the city and county of Philadelphia, and State of Pennsylvania, have invented an Improvement in Steam Rock-Drills, of which the following is a specification.

Our invention has reference to rock-drills; and it consists in providing the same with two steam-cylinders, and two pistons adapted to work therein and secured to one shaft, to which the drill-bit is secured, the said steam-cylinders and pistons being so constructed that the piston-rod is arrested at each end of its stroke by a cushion of live steam; further, in a peculiarly-constructed steam-valve; further, in mechanism to rotate the drill-bit as it is raised, which consists in a cylinder adapted to be rotated only in one direction and provided with internal spiral grooves, in combination with a plunger or rod secured to the piston-rod, and provided on its end with corresponding flanges or feathers, which work in said grooves; further, in so constructing the piston-rod and drill-bit and arranging them with the clamp that the thrust is transmitted through a solid rod of metal, the said parts being constructed specifically as shown; and, finally, in many details of construction, all of which are more fully set out in the following specification and shown in the accompanying drawings, which form part thereof.

In the drawings, Figure 1 is a longitudinal sectional elevation of our improved rock-drill. Fig. 2 is a cross-section of same on line *x x*. Fig. 3 is a plan view of the ports, as if removed from the drill. Fig. 4 is a perspective view of the valve. Fig. 5 is a cross-section of the rock-drill on line *y y*. Fig. 6 is a cross-section of same on line *z z*. Fig. 7 is a perspective view of the clamping-pieces removed from the cap.

A is a casing, provided with the two cylinders C′ and C², separated from each other by a wall, D. In the cylinders the pistons C work, and are secured rigidly upon a single piston-rod, B, which works through the wall D. The cylinder C′ is closed on the bottom by a head, F, provided with the stuffing or packing box *f*, through which the piston-rod B reciprocates. Upon the bottom of the piston-rod is secured a nut, G, provided with a solid metal head, *g;* but this head may be dispensed with, if desired. Upon this nut is screwed the conical cap H, in which are located the clamping-pieces I, which are made conical on their exterior surface, to correspond to the perforation *h* in the cap, which is also conical. The cap is provided on its bottom with a flange, *h′*, which prevents the pieces I falling through when inserting them.

J is the drill-bit, and is clamped by the pieces I by screwing the cap H upon the nut G. The drill-bit rests directly against the solid head *g* of nut G, or against the end of the piston-rod B.

Upon the upper end of the piston-rod B is secured an extension, B′, which works through a head, K, which carries a cylinder, M, having a ratchet-wheel, N, cast or otherwise secured upon its bottom. The rim *n* of said cylinder M rests in a recess or groove, *k*, in the cap K, and the ratchet-wheel N is located in a chamber, *k′*, which is closed on the top by a cap, L, inclosing the cylinder M and supporting it by bearing *l* at or near the bottom. Pivoted to the cap K is a pawl, N′, which is pressed against the teeth of the ratchet-wheel N by a spring, *n′*. The cylinder M is perforated to allow the rod B′ to reciprocate therein, and is internally grooved, as at *m*, said grooves being arranged spirally, and in which the feathers or projections *b* on rod B′ work.

Q is the steam-valve, and is cylindrical in cross-section, and works in a valve-chest, P, or cylinder R, having its ends closed by caps *r*. *w* is the steam-pipe, and W the steam-chamber. *u* is the exhaust-pipe, and U is the exhaust-chamber. The steam-valve is formed with two chambers, *q*, separated by a wall, *q′*, perforated by the steam-port S, and the said chambers are closed by caps having projections *r′*, to prevent the ends of the valve reaching the end of the cylinder R.

S′ are exhaust-ports in the valve and opening into the chambers *q*, which chambers may be dispensed with, if desired.

The steam-port T in the casing A opens into the extreme top of the cylinder C², and also in the cylinder C′ a short distance below the top, as shown, and the steam-port T′ opens into the cylinder C′ at the extreme bottom, and into cylinder C² a short distance above the bottom.

*t t* are steam-ports, which admit steam from the cylinders C′ and C² alternately, and after the pistons have traveled a given distance, to the valve-cylinder, the steam from each steam-

cylinder being admitted to the corresponding end of the steam-chest. The steam-valve may be prevented from rotating by means of a feather, Q'.

To the casing A is cast a lug, E, which is perforated on its end, and is fitted with a brass nut, *e*, provided with a screw-thread, by which the drill may be supported.

The operation is as follows: The valve being in the position shown in Fig. 1, steam passes through ports S and T to the top of cylinder $C^2$, above its piston. As the piston-rod descends, the upper port in the lower cylinder, C', is uncovered, and now steam is acting upon both pistons. As they descend, the port *t* from cylinder $C^2$ is uncovered, and port *t* from cylinder C' is closed, and as steam passes from the cylinder $C^2$ to the upper end of the valve-cylinder R the valve Q would be forced down, admitting steam to the steam-port T' and below both pistons, and opening the exhaust from above both pistons. As the pistons move down, that in the upper cylinder, $C^2$, finally closes its bottom port and cushions upon the live steam inclosed between the wall D and the end of the piston, which steam was admitted after the piston uncovered the port *t* and after the valve Q moved down. During the descent of the pistons the exhaust-steam passes out by ports T' through ports S' in the valve Q to the exhaust-chamber U, and as the rod B' is drawn through the cylinder M, it is rotated to the right. As soon as the valve Q is forced down, and immediately after the cushioning has been accomplished, the reverse operation takes place, and as the rod B' ascends through the cylinder M it is rotated, as the pawl N prevents the ratchet-wheel and cylinder from rotating and rotates the drill-bit J, changing the position of its cutting-edges. When the valve Q is reciprocated, the exhaust from the cylinder R takes place through a small space, *u*, opening into the exhaust-chamber U. By the use of two cylinders and two pistons, one piston cushions on live steam, while the other piston receives the motive power to start the reverse movement, and vice versa, and, when the reverse movement is attained, both pistons are acting, thereby greatly increasing the power of the rock-drill.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a rock-drill, two high-pressure steam-cylinders, in combination with two pistons, a single valve to both cylinders, a piston-rod connecting said pistons together and carrying on its end the drill-bit, and a clamp secured to the end of the piston-rod to clamp the drill-bit, substantially as and for the purpose specified.

2. In a rock-drill, two high-pressure steam-cylinders, in combination with two pistons, a piston-rod connecting said pistons together and carrying on its end the drill-bit, a clamp secured to the end of the piston-rod to clamp the drill-bit, and a steam-valve to admit steam alternately to the opposite ends of both of said steam-cylinders, substantially as and for the purpose specified.

3. In a rock-drill, two steam-cylinders and their ports, arranged as shown, in combination with two pistons working therein, a piston-rod connecting said pistons together, and means to intermittently rotate said piston-rod, substantially as and for the purpose specified.

4. In a rock-drill, a valve, P, provided with a valve-cylinder, R, having ports T T' *t t* communicating with the cylinders, in combination with a cylindrical valve, Q, provided with steam-port S and exhaust-ports S', and means to admit steam alternately to each end of cylinder R, as and for the purpose specified.

5. In a rock-drill, a cylinder provided with a steam-port a short distance below its upper head, and a steam-port at its bottom and close to its lower head, in combination with a piston and piston-rod, the said space from the steam-port to the upper head being adapted to retain steam to cushion the upward stroke of the piston, substantially as and for the purpose specified.

6. In a rock-drill, two steam-cylinders separated by a wall, in combination with two pistons working therein, and a piston-rod connecting said pistons, and steam-ports entering one of said cylinders at the top and also a short distance above the bottom and in the other cylinder at the bottom and also at a short distance from the top, to form a steam-cushion to the pistons in their upward and downward movements, as and for the purpose specified.

7. In a rock-drill, the combination of piston-rod B, nut G, with its head *g*, cap H, having conical interior *h*, sectional conical clamping-pieces I, and drill-bit J, as shown, and for the purpose specified.

8. In a rock-drill, the combination, with the steam-cylinder, piston, and piston-rod, of the extension having feathers, cylinder having a spirally-grooved aperture, and ratchet-wheel, head, pawl, and cap, substantially as and for the purpose specified.

9. In a rock-drill, two cylinders arranged end to end and separated by solid metal, and two pistons, in combination with a piston-rod connecting said pistons together and carrying on its end a drill-bit, means to admit live steam alternately to the two adjacent ends of said cylinders before the completion of the strokes, and means to cut off the admission of said live steam before the pistons have completed their stroke, whereby said live steam acts as a cushion to the pistons, substantially as and for the purpose specified.

In testimony of which invention we hereunto set our hands.

AMOS STEVENS.
ARTHUR L. STEVENS.

Witnesses:
R. M. HUNTER,
JOHN W. STEWARD.