3 Sheets—Sheet 1.

H. C. SERGEANT.

ROCK-DRILL.

No. 183,978. Patented Oct. 31, 1876.

Fig. 1.

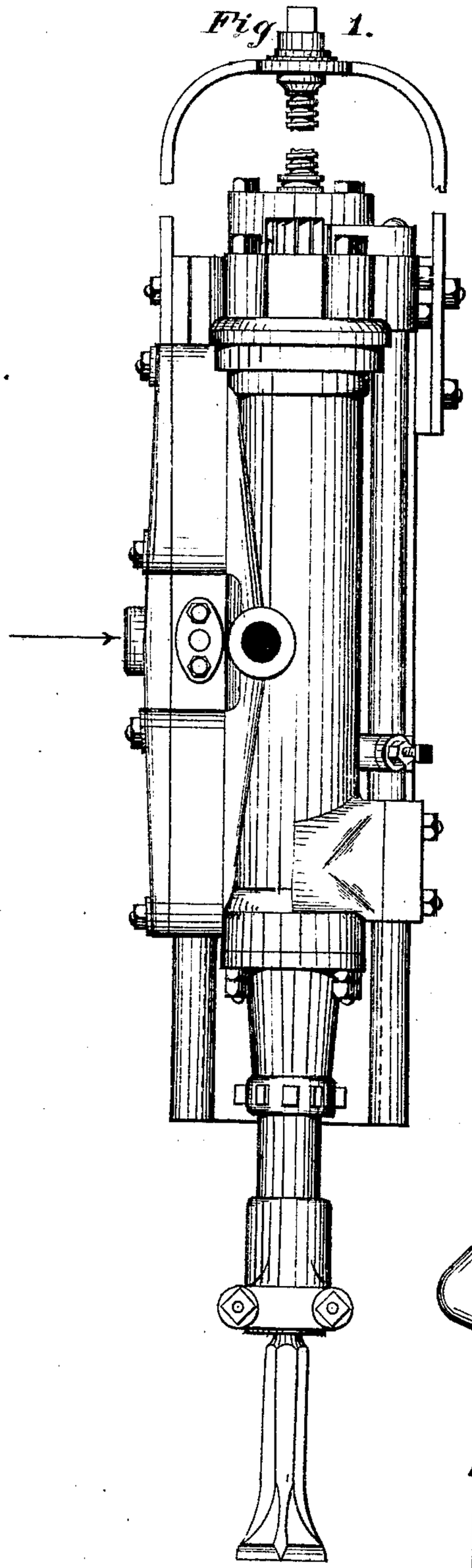


Fig. 12.

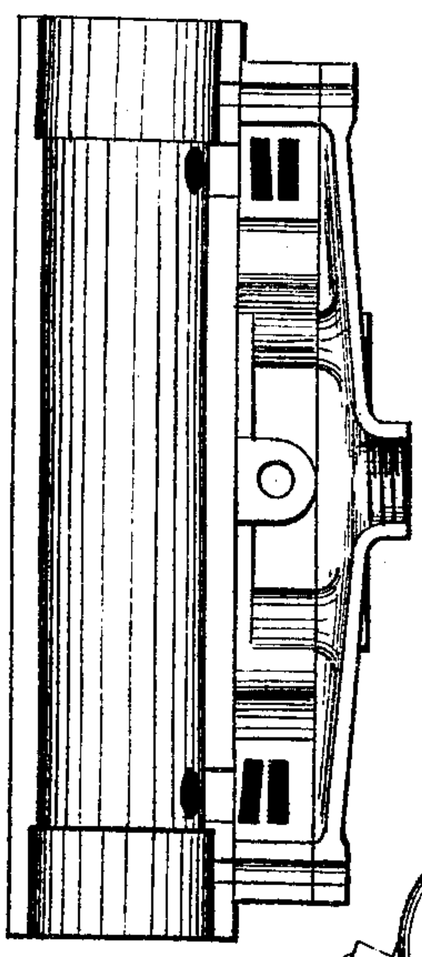
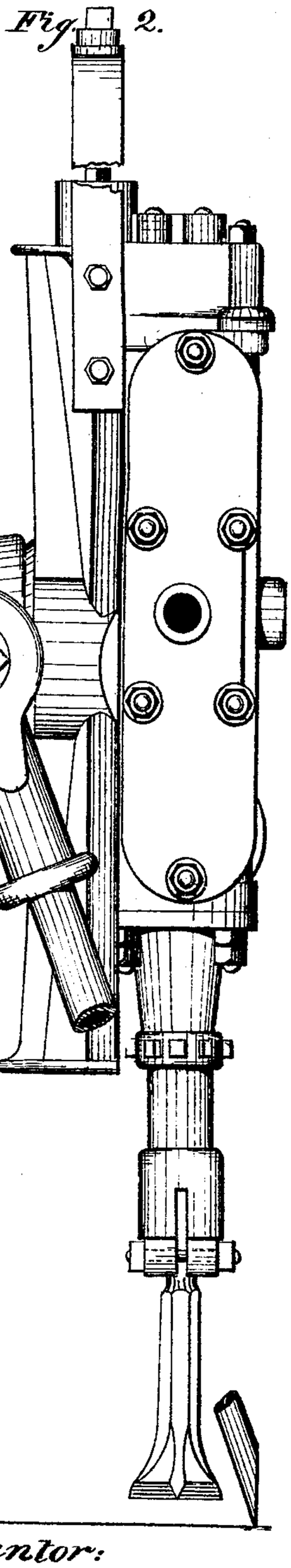


Fig. 2.



Witnesses:

Henry Eichberg

P. C. Smith

Inventor:

Henry C. Sergeant

3 Sheets—Sheet 2.

H. C. SERGEANT.

ROCK-DRILL.

No. 183,978. Patented Oct. 31, 1876.

Fig 3.

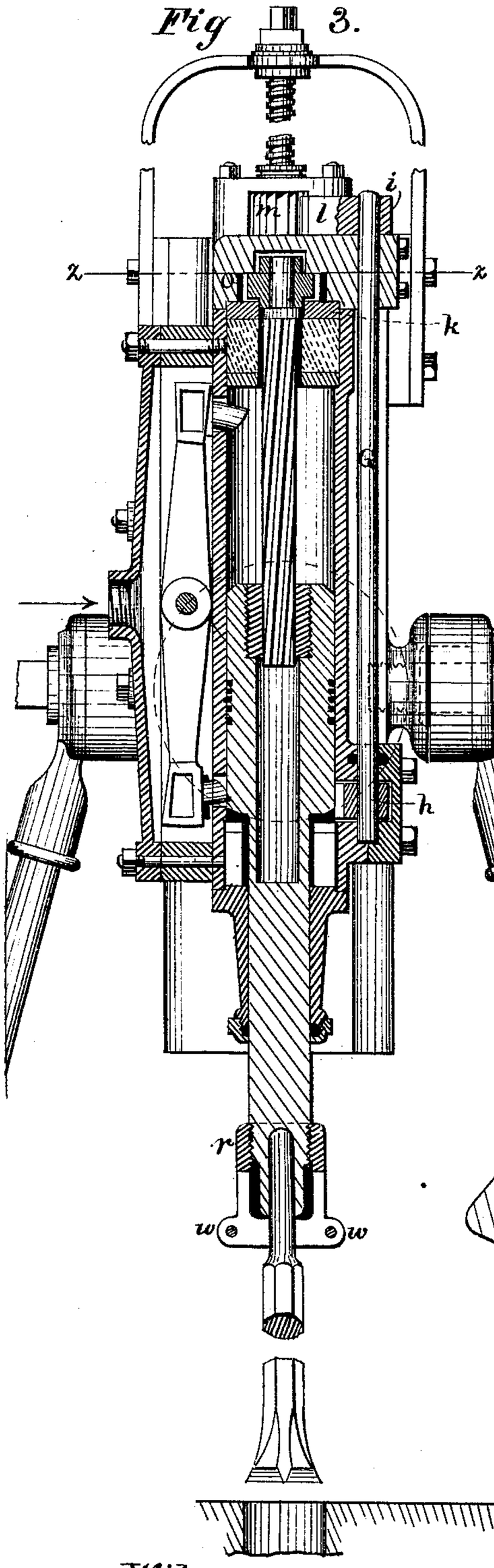


Fig. 11.

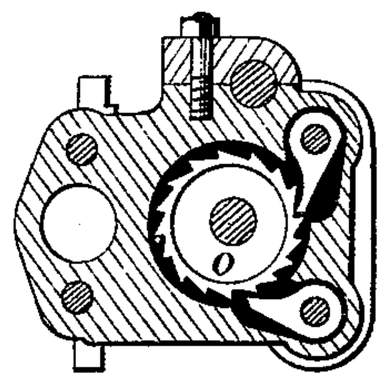
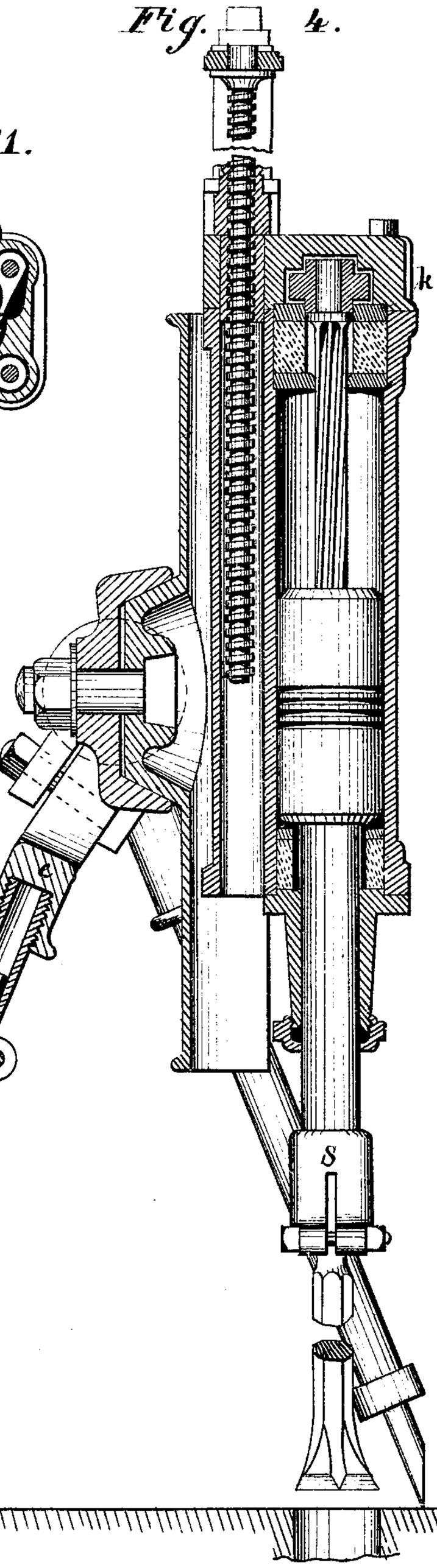


Fig. 4.



Witnesses:

Henry Eichlings

R. Smith

Inventor:

Henry C. Sergeant

3 Sheets—Sheet 3.

H. C. SERGEANT.

ROCK-DRILL.

No. 183,978. Patented Oct. 31, 1876.

Fig. 5.

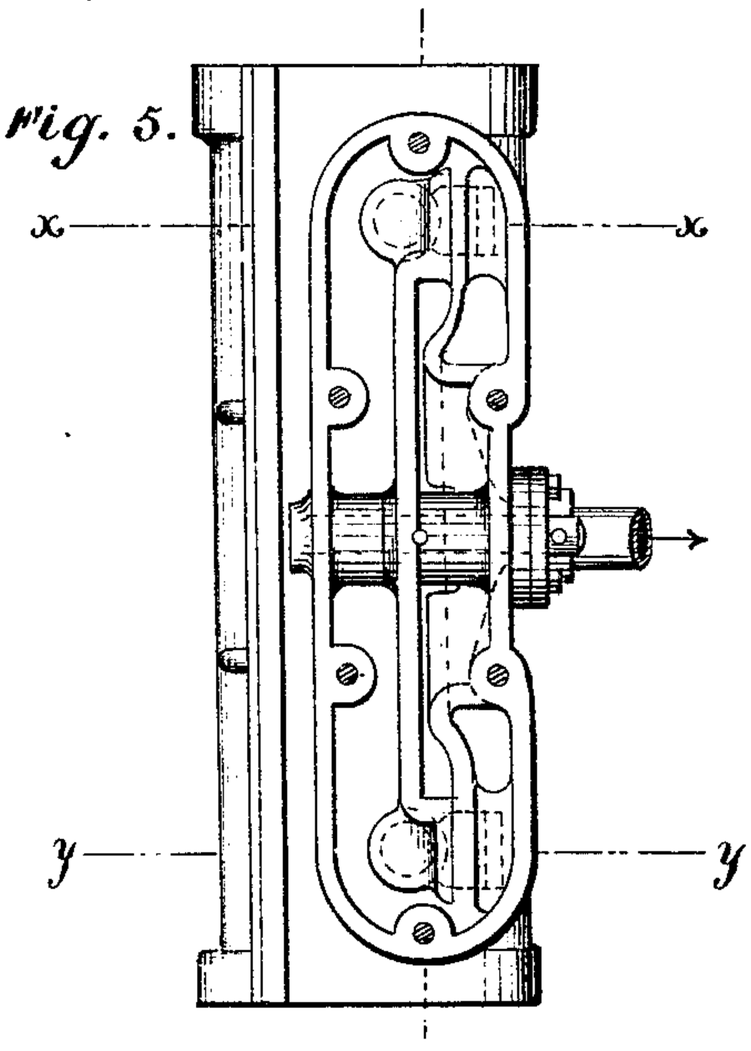


Fig. 6.

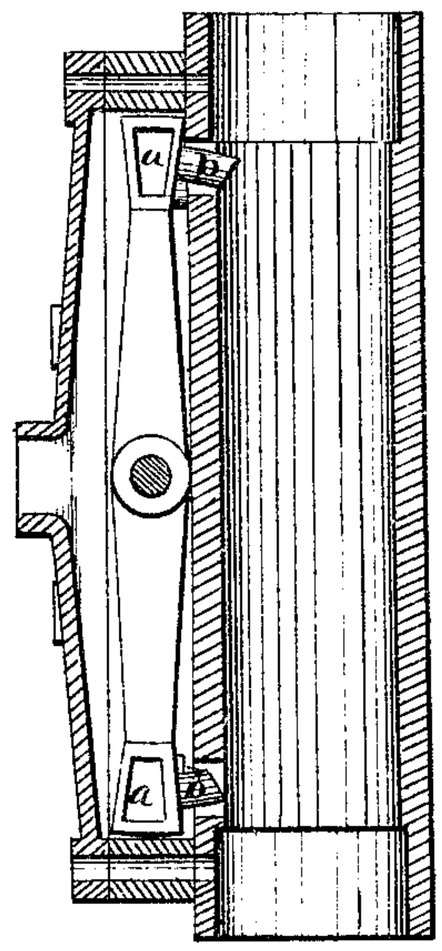


Fig. 7.

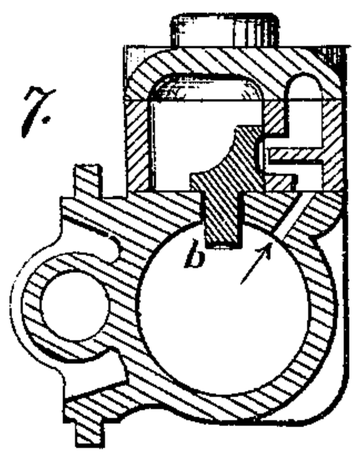


Fig. 8.

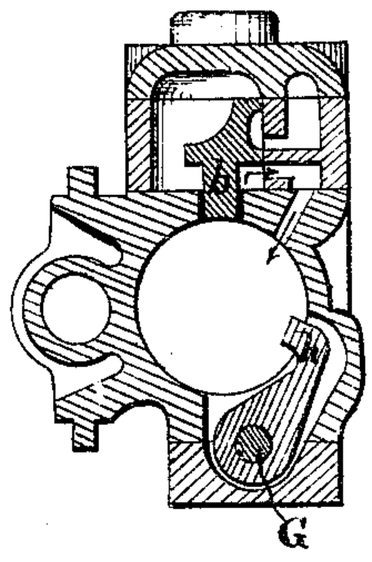


Fig. 9.

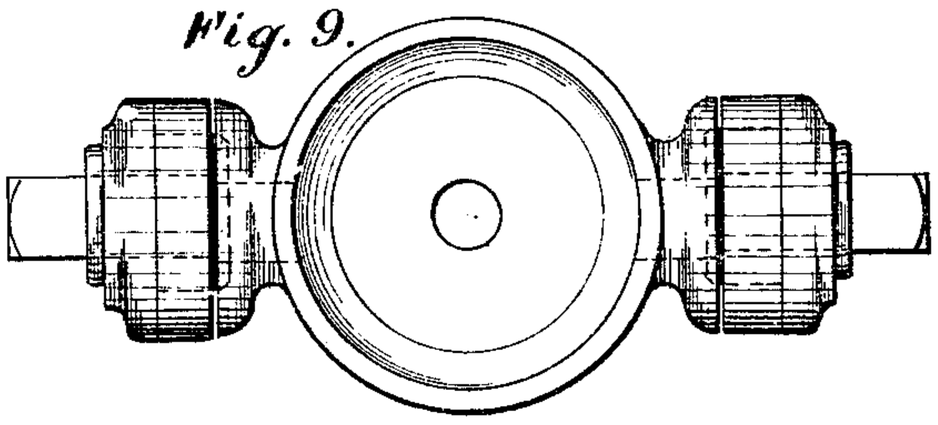
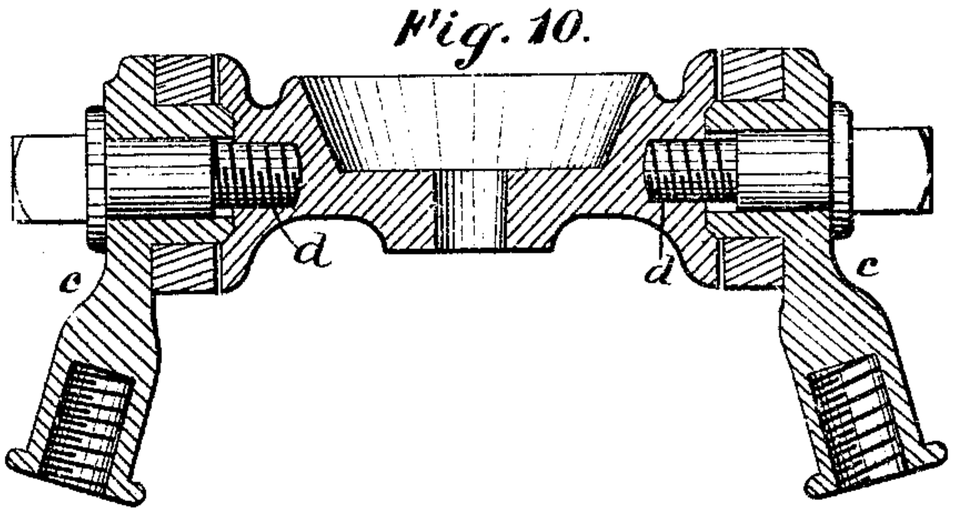


Fig. 10.



Witnesses:

Henry Eichhorn

P. Smith

Inventor:

Henry C. Sergeant

UNITED STATES PATENT OFFICE.

HENRY C. SERGEANT, OF NEW YORK, N. Y.

IMPROVEMENT IN ROCK-DRILLS.

Specification forming part of Letters Patent No. **183,978**, dated October 31, 1876; application filed February 5, 1876.

To all whom it may concern:

Be it known that I, HENRY C. SERGEANT, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Rock-Drills; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification—

Figure 1 being a front elevation of the cylinder and its appendages, together with the frame in which it moves, and the drill in position. Fig. 2 is a side elevation, showing the parts above alluded to, and the tripod upon which they are supported. Fig. 3 is a vertical section, showing the construction and arrangement of the parts of the machine. Fig. 4 is a transverse sectional and vertical elevation, showing the cylinder and its frame in a vertical position, and the method of attaching them to the tripod, the feeding-screw, the spiral for rotating the piston, and the chuck for attaching the drill to the piston-rod being also shown. Fig. 5 is an elevation of the cylinder and valve-chest, with the chest-cover removed, showing the position of the valve, and bearings upon which it oscillates. Fig. 6 is a sectional elevation of the cylinder and steam-chest, showing the position of the valve and tappets which project out of the cylinder. Fig. 7 is a transverse section of the cylinder and valve-chest on line *x x* of Fig. 5. Fig. 8 is a transverse section on line *y y* of Fig. 5. Fig. 9 is an elevation of the cross-head which supports the cylinder and connects it to the tripod. Fig. 10 shows the method of connecting the cross-head to the tripod. Fig. 11 is a transverse section on line *z z* of Fig. 3, showing a ratchet and pawl used in giving rotation to the piston; and Fig. 12 is a vertical sectional elevation through the cylinder and steam-chest, showing the valve-seats and the induction steam-passage into the cylinder.

This invention relates to rock-drills; and it consists in the construction, combination, and arrangement of certain of the parts of which the machine is composed, as will be more fully described hereinafter.

To enable others skilled in the art to make and use my improved machine, I will proceed to describe its construction and operation.

In machines of this character, which necessarily have a rapid motion imparted to them when in operation, it is necessary that the induction port or passage from the steam-chest to the cylinder should be as short as possible, in order that the smallest possible amount of steam be wasted by being exhausted from such passages, which has not been used in propelling the piston, and so that the least possible amount of resistance be offered in exhausting the steam from the cylinder; and in order that the above-described result may be produced I use a double **D**-valve, formed of a single piece of metal, or of parts united to each other, so as to form a valve upon each of its ends, as shown at *a a*, Fig. 6. This valve also has upon each of its ends beveled projections *b b*, which act as tappets, and which pass through openings into the cylinder, as shown in Figs. 3, 6, 7, and 8, they being so constructed and arranged that when the piston is moved backward and forward in the cylinder its rounded or beveled ends will come in contact with said projections, which are beveled, and thus change the position of the valve by causing the tappet on one end thereof to be forced laterally from within the cylinder by said piston, while the other one moves laterally into the same, so as to be operated upon by the reverse movement of the piston. The valve-seats are arranged on the inside of the steam-chest, parallel to and in line with the movements of the valve, as shown in Fig. 12.

In Fig. 8 the valve is represented as being in position for admitting steam to the cylinder, its direction being indicated by arrows, while in Fig. 7 it is in the proper position for exhausting the steam, it passing out, as indicated by the arrow, into an apartment formed in the steam-chest to the central portion thereof, where it escapes into a pipe, as shown in Fig. 5.

The operation of this valve is clearly shown in the sectional view, Fig. 3, where the piston is represented as at the lower end of the cylinder, and, having struck the tappet upon the corresponding end of the valve, has moved it outward, and the upper end inward, which movement has had the effect to open the in-

duction and close the exhaust-port upon the lower end of the cylinder, and to close the induction and open the exhaust upon its upper end, which will allow the steam admitted under the piston to move it upward, in doing which its upper end will come in contact with the tappet upon the corresponding end of the valve, when its position will be reversed and the steam exhausted from the lower end of the cylinder and admitted to its upper end, which operation will be repeated as often as the piston passes from one end of the cylinder to the other. As a consequence of this arrangement, the side pipe usually employed is dispensed with, and the steam or air used for propelling the piston is reduced by about the amount that would be required to fill the passage or port in said pipe at each stroke of the piston.

The feeding or moving of the cylinder toward the boring or work to be done is an important matter in devices of this character, and it is of vital importance that the mechanism therefor should be both simple and durable; and to make it thus it is important that the parts employed should be reduced to the smallest possible number, and especially is this the case in so far as it relates to the moving parts. Such a reduction of parts is effected, in this case, by passing a shaft or rod, G, alongside the cylinder, as shown in Fig. 3, to the lower end of which an arm, *h*, is fastened, which projects into the cylinder. This arm is beveled on its upper and inner side, so as to allow the piston to pass under and raise it, by doing which a partial rotary movement is imparted to the shaft G, to the upper end of which another arm, *i*, is attached, to which a pawl is pivoted, which operates a feed-nut, *m*. The beveled arm *h* is forced back into the cylinder, after it has been released from the control of the piston, by a spring, one end of which is attached to the cylinder, and its other end is fastened to the pawl *l*. This spring is parallel with the shaft G, and is so arranged that it serves the double purpose of holding the pawl *l* into the teeth of the feed-nut *m*, and also presses the arm *h* into the cylinder. Whenever the piston moves a slight distance toward the lower end of the cylinder, after having moved the valve or tappet, as shown in Fig. 3, it strikes the beveled edge of the arm G, and imparts thereto the required motion, which, in turn, operates the pawl *l* and ratchet-nut *m*, thus regulating the advance of the cylinder upon its frame, the pressure of the steam upon its lower head aiding in the advance, and thus enabling it to be moved forward as fast as the rod is penetrated, with the least possible strain upon the feeding mechanism.

In order that the drill may have a rotary motion imparted to it, the ordinary spirally-grooved bar and ratchet are applied, the bar being placed in the cylinder; but as, when it passes through the head thereof, it causes a great amount of friction upon the piston when moving the spiral bar, I have placed the ratchet in the head, and within the cylinder, so that it is surrounded by the pressure of steam or compressed air. By this arrangement (which is shown at *o* in Fig. 3) the pressure which would be upon it if it were passed through the head is removed, and the ratchet-wheel is allowed to rotate freely when the piston is going down. By the introduction of a ring or washer, *k*, into the upper end of the cylinder I keep the ratchet in the head, and fully protected from dirt, and it also prevents foreign substances from entering the cylinder.

The chuck herewith presented for holding the drill in the piston-rod (it being shown at *r* in Fig. 3) is constructed in the following manner: The piston-rod is bored out to the required depth, the inner end wall of the aperture being by preference rounded, as shown in Fig. 3, a screw being formed upon the outer end of the piston rod for the reception of a collar, S, (shown in Fig. 4,) which is threaded, so as to allow it to be screwed upon the rod. This collar is slotted from its lower end upward, (see Fig. 3,) and is provided with holes for the reception of bolts for clamping the slotted portion upon the drill. The lower portion of the collar is bored out to the same diameter as the aperture in the end of the piston-rod. The lower end of the piston-rod is reduced, as shown in Fig. 3, which leaves a space between it and the interior of the collar S, so that by screwing up the bolts *w w* the drill is tightly clamped just at the end of the piston-rod, and thus an additional support is given to the drill.

The tripod upon which the machine is mounted has the usual cross-head between its legs, in the center of which it is provided with conical surfaces, to fasten the frame of the engine to. (See Figs. 4 and 10.) The two front legs have what are called "hips" fastened to them, as shown at *c c*, Fig. 10, which are made of steel or other suitable material. These hips are bored for the reception of screws, which pass through them into the cross-head, as shown at *d d*. On each side of the cross-head there is a conical recess, to which is fitted the side of the hip, so that when the screws *d d* are turned the hips are drawn against the projections on the cross-head, and the parts are thus held firmly in position. The back leg has a forked upper end, *e*, it being so slotted at its ends as to surround a portion of the hip, said ends being slotted for the purpose of tightening them upon the hips, they being held in contact by bolts, as shown at *f*. Each leg has a foot, which slides up and down inside the hollow legs for the purpose of lengthening or shortening them, which is fastened in position by set-screws, so as to be firm in position. The legs have pieces clamped to them to rest weights upon in the ordinary way.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a machine for drilling rock and other

substances, the double-ended oscillating slide-valve, pivoted at or near its center, it being constructed with seats upon its under surfaces, and upon one of its sides, substantially as shown and described, whereby it is made to control the induction and eduction of steam to and from the cylinder, as set forth.

2. A double-ended oscillating valve, having upon its inner surfaces tappets, arranged to close the openings to the cylinder through which they pass, and to give motion to the valve, substantially as set forth.

3. The steam-chest, constructed as described, whereby it is made to form a passage for the steam to the opposite ends of the cylinder, in combination with a valve having tappets to close the ports to the cylinder through which they pass, for the purpose of preventing the passage of steam through said ports.

4. The shaft G, in combination with an arm fixed rigidly thereto, one end of which extends within the cylinder, an arm and pawl on the opposite end of said shaft, and a toothed nut, the parts being arranged substantially as set forth, whereby they are made to regulate the feeding of the cylinder toward the rock, as described.

5. The ratchet and pawls, when arranged in the head of the cylinder, and surrounded by the pressure of the steam or air, in combination with the supporting-ring in the cylinder, substantially as shown, and for the purpose set forth.

6. The hollow split sleeve or collar attached to the piston-rod, and having a space between the same and the rod, it being bored out at its lower end, so as to receive the drill, and arranged to clamp the same, substantially as shown and described.

7. The forked legs, having at each end of the fork a spring-clamp, to surround a portion of the hip or cross-head, and bolts for securing the same, as shown.

In testimony that I claim the foregoing as my own invention I affix my signature in presence of two witnesses.

HENRY C. SERGEANT.

Witnesses:

C. M. CONNELL,

E. O. BULLEY.