C. D. FOOTE.

ROCK DRILL.

No. 60,497. Patented Dec. 18, 1866.

Fig: 3.

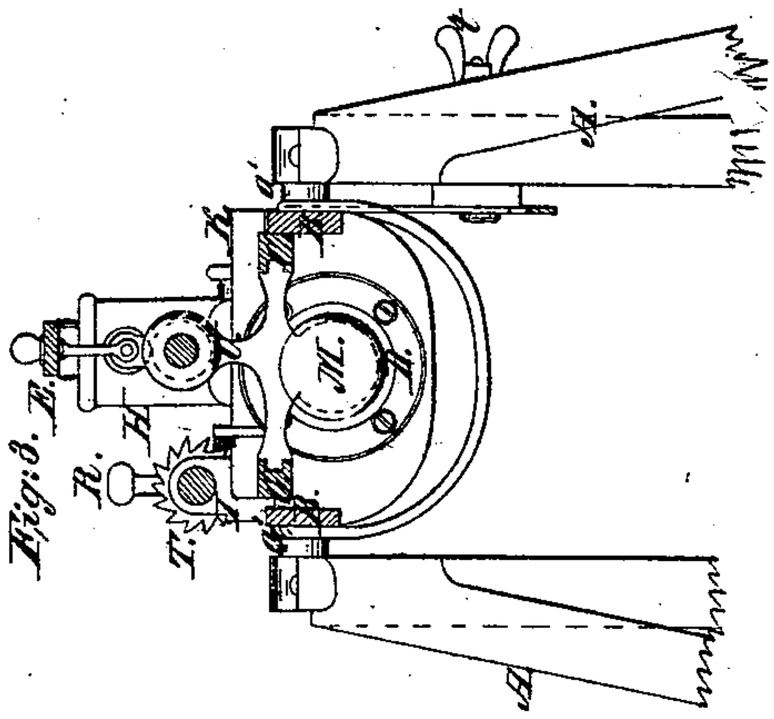


Fig: 4.

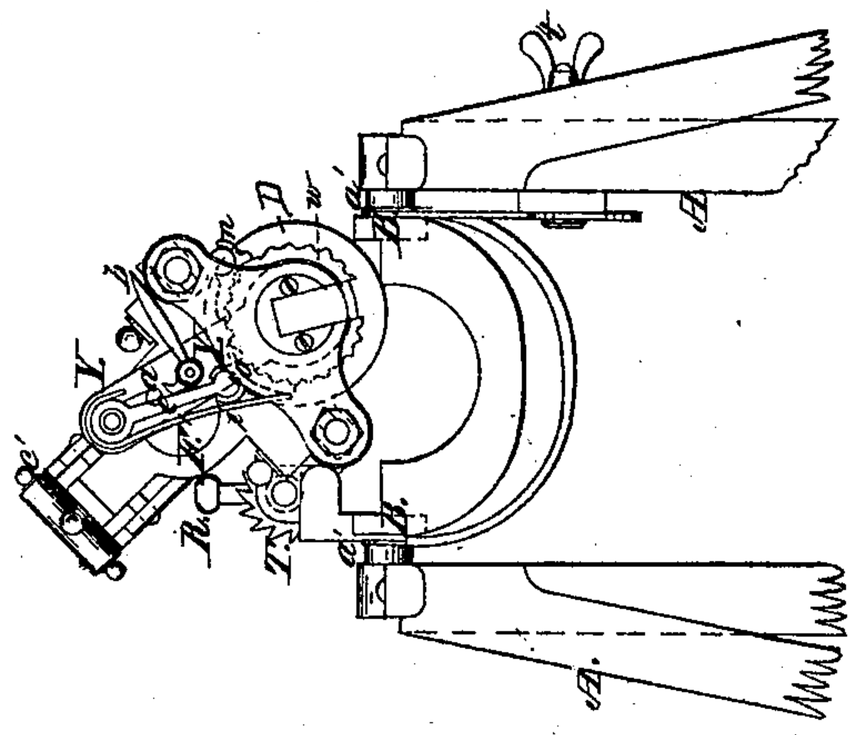


Fig: 1.

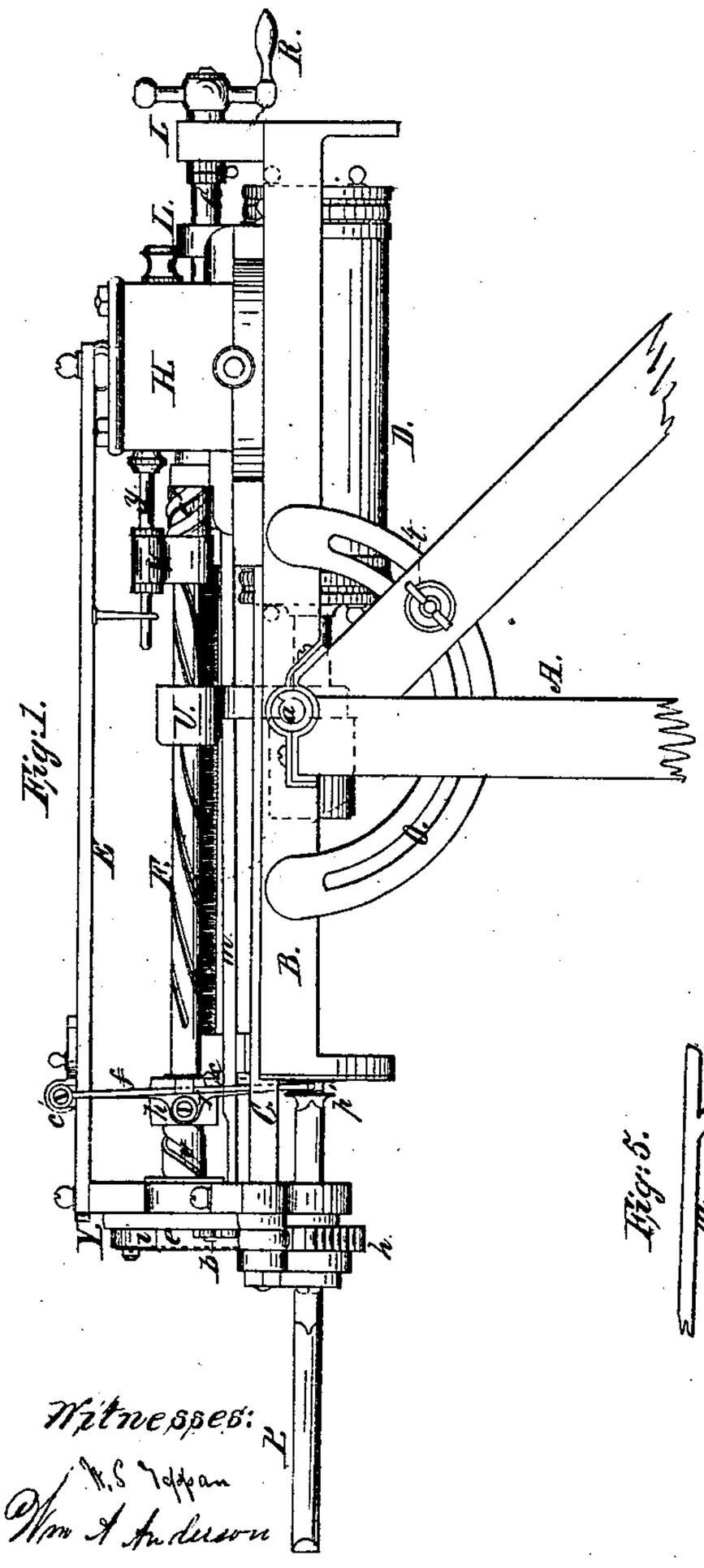
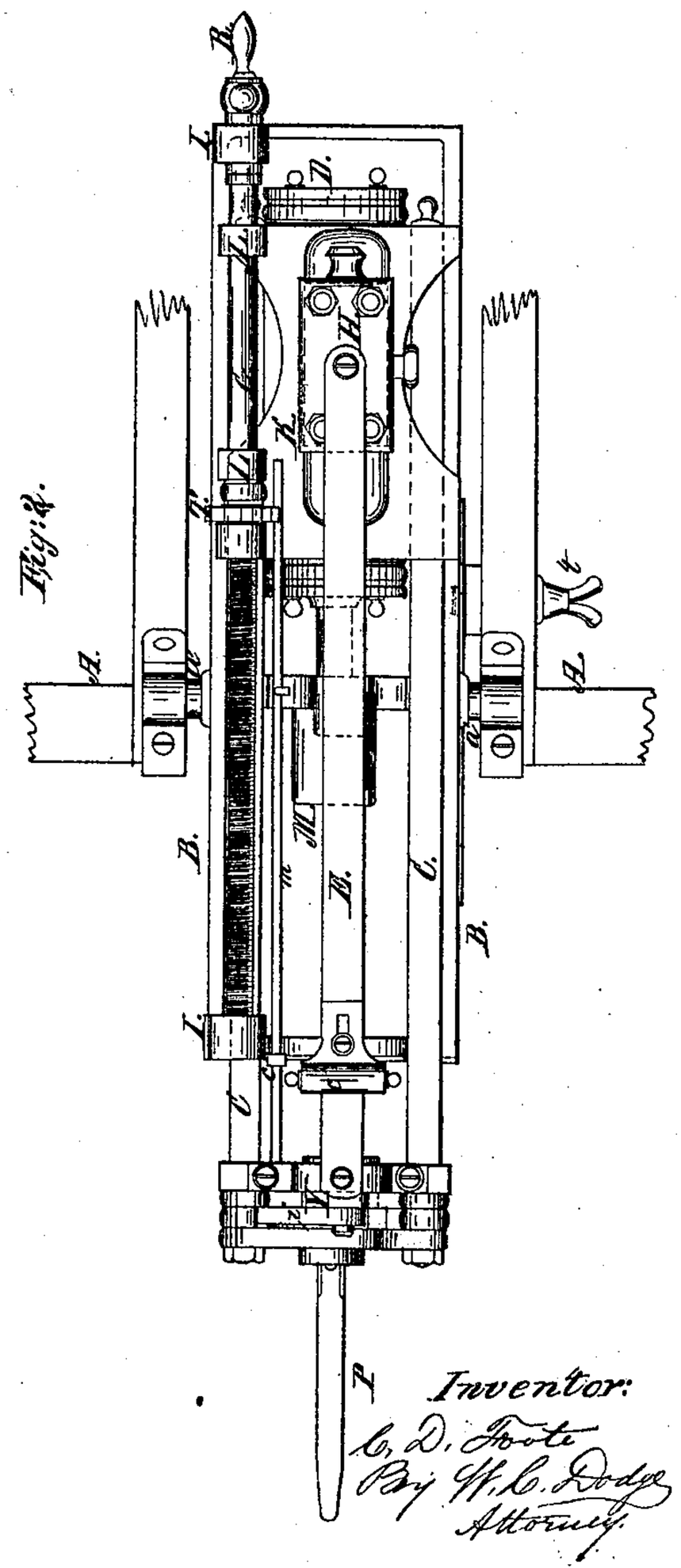


Fig: 5.

Fig: 2.



Witnesses:

H. S. Hoffman

Wm A Anderson

Inventor:

C. D. Foote

By W. C. Dodge

Attorney.

United States Patent Office.

IMPROVED ROCK DRILL.

C. D. FOOTE, OF FOND DU LAC, WISCONSIN.

Letters Patent No. 60,497, *dated December* 18, 1866.

The Schedule referred to in these Letters Patent, and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, C. D. FOOTE, of Fond du Lac, in the county of Fond du Lac, and State of Wisconsin, have invented certain new and useful improvements in Drilling Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, and to the letters of reference marked thereon, like letters indicating like parts, wherever they occur. To enable others skilled in the art to construct and use the invention, I will proceed to describe it.

My invention relates to that class of machines in which the drill for drilling holes in rock and similar material is operated by an engine propelled by compressed air or steam, and my invention consists in a novel construction and arrangement of the engine and its supports, for more perfectly accomplishing the desired object, as hereinafter explained.

Figure 1 is a side elevation of the machine complete and ready for use.

Figure 2 is a top plan view of the same.

Figure 3 is a transverse vertical section taken on the line *x x*, of fig. 1.

Figure 4 is a front end view, with the engine swung partially out of position on its frame.

A represents a frame to support the engine and all the operating mechanism. Upon this frame, A, is mounted a longitudinal frame, B, which is secured to frame, A, by trunnions or journals, *a'*, so that the frame, B, and with it the engine and all its attachments may be set at any desired angle in a vertical plane, the slotted segment, O, and set-screw, *t*, serving to secure and hold it in place, when set in any desired position for operation. Resting upon this frame, B, is still another frame, C, arranged to slide to and fro thereon, as hereinafter more fully explained. D represents the cylinder of the engine, having a plate, K, attached to its upper side, by means of which it is secured to or rather suspended within the frame, C, as shown in figs. 1 and 2, the cylinder being located near the rear end of the frame, C. A rod, G, is mounted in supports, I, on one side of frame B, as shown in fig. 2; and to this rod the engine and frame, C, are pivoted on one side by the ears, L, which project from plate K for that purpose. By this arrangement it will be seen that the frame, C, with the engine and all the mechanism attached can be swung over to one side, as shown in fig. 4, when desired to remove it from in front of the hole being drilled. F represents a rod or shaft extending from the front of the valve-chest, H, to the front end of frame C, and is secured in bearings at each end, which permit it to rotate. This shaft, G, has spiral grooves cut in it on its main portion, as shown in fig. 1. An arm, U, is attached rigidly to the piston of the engine, as shown in fig. 1, the upper end of said arm embracing the rod, F, and having projections engaging in the spiral grooves of said rod, F, whereby the latter is caused to rotate, first in one, and then in the opposite direction, as the arm, U, plays back and forth thereon, in connection with the movements of the piston to which it is attached, as previously stated. The rotation of this rod or shaft, F, accomplishes four distinct purposes: first, it operates the valve of the engine by means of the arm, U, which is secured to the valve rod, T, and is moved to and fro by the spiral grooves, *e'*, on the rear portion of said rod, G, as shown in fig. 1. At the front end of rod F another set of spiral grooves, *v*, is made, inclined in the opposite direction from those at the rear end, and these grooves, *v*, as the shaft rotates, impart a to and fro movement to the block, *y*, mounted thereon. A rod, *f*, pivoted at *c'*, to the bar, E, extends down on each side of the block, *h*, and is held against a piece, *r*, pivoted to the block, *h*, so that as the block, *h*, moves to and fro, the rods or arms, *f*, are caused to move with it. The lower end of one of the rods, *f*, engages with a dog, *c*, secured to a sliding bar, *m*, thereby imparting to this bar, *m*, a sliding movement to and fro. At the rear end this bar is forked, or has an arm attached to it and inclined, as shown in the detached fig. 5. This inclined arm, *b'*, of the rod, *m*, works in a hole in the plate, K, directly opposite, and partially under the ratchet-wheel, T, as shown more clearly in fig. 2. As the rod, *m*, moves forward, the inclined arm, *b'*, rides up on the plate, K, causing the rear end of bar *m* to rise and turn the wheel, T, in the teeth of which it engages; by these means the wheel, T, which has an internal screw-thread corresponding with the thread of rod G, is caused to feed the frame, C, with the engine, forward on frame B, gradually at each stroke of the piston; a crank, R, at the rear end of G, serving to run the frame, C, and engine back again, when necessary. P represents a drill, which is secured loosely in suitable bearings attached to the front end of the frame, C, directly in line with the piston. A collar, *p*, is attached to the drill, and the

lower ends of the rods, *f*, engage in this collar, and as they move to and fro, they impart the same motions to the drill. The drill, P, is not connected to the piston, but, instead, the latter is provided at its front end with a hammer, M, which at each stroke imparts a blow to the end of the drill, P. It will thus be seen that as the piston is drawn back, the drill is also raised from the bottom of the hole, and is again carried back to its position as the hammer delivers its blow. The drill, P, is held in a collar, *w*, which is secured to the front portion of the frame, C, and which has a square hole in it to receive and hold the shank of the drill, which is also made square at that part. This collar is cut away at one side of the full diameter of the hole, thus leaving an opening in the side of the collar by which the drill, P, can be inserted or removed from the collar at pleasure. In order to give to the drill the necessary rotary movement, the collar, *w*, which holds it, is provided with a series of projections or teeth on its periphery, as shown in figs. 1 and 4. An arm, Y, is pivoted to the rear side of the collar, *w*, and extends up past the front end of rod F, where it is connected by a pin, *a*, working in a slot therein, to a disk, F′, attached rigidly to the end of shaft F. The pin, *a*, is placed eccentric to the axis of shaft F, whereby, as the shaft moves, it imparts a crank movement to the pin, *a*, and this in turn gives a to and fro motion to the arm, Y. Another arm, *e*, is pivoted to the upper end of the arm, Y, and has attached to its lower end a pawl, *o*, shown in dotted lines in fig. 4, which pawl engages with the teeth on the periphery of collar *w*, a spring, *i*, serving to keep the pawl, *o*, up to its work, except when thrown out of connection by the elbow-lever, *b*. A similar pawl, *n*, is pivoted on one side of the frame, C, in proper position to also engage in the teeth of the collar, *w*, for the purpose of holding the collar, while the pawl, *o*, is being carried back to get a fresh hold on the collar. It will thus be seen that the same movement of the shaft, F, that works the valve of the engine, also feeds the engine forward at each stroke, draws back and partially rotates the drill, and then carries the drill back to the bottom of the hole ready to receive the blow of the hammer.

The drawings represent an engine one-fourth of the working size, although it is obvious that they may be made of any required size. These engines are intended to be used with compressed air, and when so used, I find them to give good results, working under a pressure of sixty pounds per inch, and making from three hundred to five hundred strokes per minute. It is, however, obvious that when used in suitable positions they may be operated by steam, if desired, and at such pressure and speed as may be required. By mounting it on trunnions, as shown, it can be readily adjusted to drill holes in any desired position overhead, in the vertical face of rock, or underneath. By hinging the machine and its sliding frame, as described, it can be readily swung away from the hole, and thus permit the drill to be inserted or removed, and also to remove the detritus without disturbing the framework or foundation. By this method of constructing my drilling machine, I am enabled to produce a machine that operates with great rapidity, and in a most perfect manner.

Having thus described my invention, what I claim, is—

1. I claim, in drilling machines of the character above described, so arranging the cylinder and its attachments that the same shall be fed up to their work, substantially as set forth.

2. Mounting the cylinder and its attachments upon a horizontal frame, hinged to the side of the main frame, so that the drilling mechanism may be swung out of line with the hole being drilled without removing the main frame, as set forth.

3. Arranging the cylinder in such a manner as to operate the drill by a blow direct from the end of the piston, substantially as set forth.

4. The rod F, or its equivalent, arranged to operate substantially as set forth.

5. The drill-holding device, with the opening in its side to permit the insertion or removal of the drill, as and for the purpose set forth.

6. The bar *m* arranged to operate the ratchet-wheel T, for the purpose of feeding the machine forward, substantially as described.

7. The mechanism so arranged as to raise the drill from the rock at its cutting point, and return it again at each blow of the hammer, as herein described.

C. D. FOOTE.

Witnesses:

J. H. EARNST,

H. M. HARTWELL.