P. S. BUCKMINSTER.

ROCK-DRILLING ENGINE.

No. 186,923. Patented Feb. 6, 1877.

Fig 1

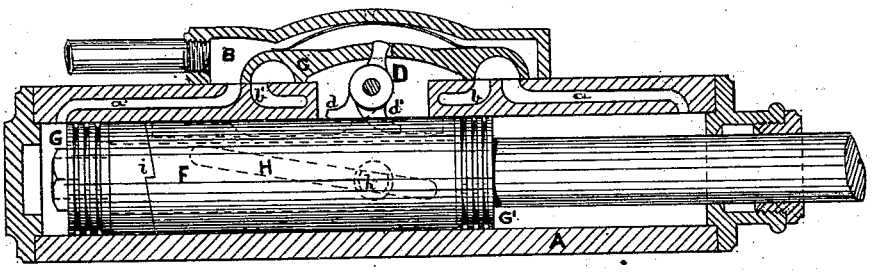


Fig 2

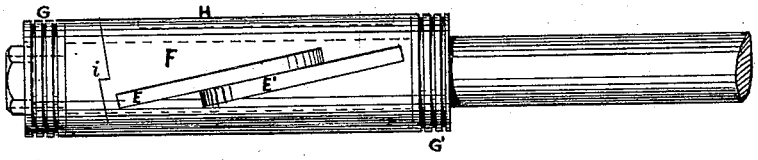


Fig 3

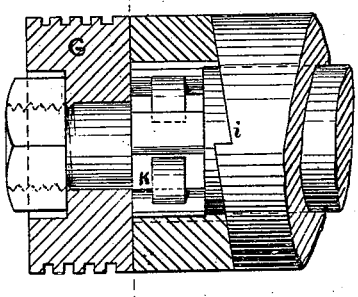
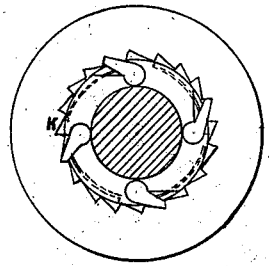


Fig 4



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UNITED STATES PATENT OFFICE.

PRESCOTT S. BUCKMINSTER, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-HALF HIS RIGHT TO IRA P. RANKIN AND GEORGE W. FOGG, OF SAME PLACE.

IMPROVEMENT IN ROCK-DRILLING ENGINES.

Specification forming part of Letters Patent No. **186,923**, dated February 6, 1877; application filed June 30, 1875.

To all whom it may concern:

Be it known that I, PRESCOTT S. BUCKMINSTER, of the city and county of San Francisco, State of California, have invented an Improved Valve-Motion and Drill-Turning Device for Rock-Drilling Engines, of which the following is a specification:

This invention relates, first, to a device for operating the valve which admits the steam or air to, and exhausts the same from, the cylinder of a rock-drilling engine; and, secondly, this invention relates to a new and improved device for automatically turning the drill at each stroke of the piston, so that the face of the drill may never strike twice in the same place.

In the accompanying drawing, Figure 1 is a longitudinal section of cylinder, valve and chest, piston and rod, sleeve, &c. Fig. 2 is a plan of piston and sleeve, showing slots in same, which slots operate in connection with the valve-tripping device. Fig. 3 is a view of sleeve, piston, &c., partly in section, illustrating the device for turning the drill. Fig. 4 is a plan, showing the ratchet-wheel and pawls, also forming part of the turning device.

In all the figures of the drawing, like letters of reference represent like parts.

I will now describe, in detail, the arrangement for moving the valve, which valve, as shown in drawing, is what is called the "double D-valve," having a movement over the ports parallel with the line of motion of the piston.

In Fig. 1, A is the steam or air cylinder, with induction-passages *a a'*, and eduction-passages *b b'*. B is the valve-chest. C is the valve. D is what I call the "rocker-arm" or "tripping-lever," which inserts its point in a slotted hole in the arch of the valve. E E' are slots in the sleeve F, in which slots the two cams *d d'* of the tripping-lever play back and forth. G G' are pistons, divided by the sleeve F, the whole forming, as it were, one solid piston, although the two ends alone need be steam-tight in the cylinder.

The tripping of the lever D, and with it the valve B, is effected as follows: The tripping-lever D and cams *d d'* are of one piece, vibrating on a center pivot, *e'*. Each cam alternately projects down into the slotted way cut for its reception in the sleeve-piece, the slotted way E being for the cam *d*, and the slotted way E' for the cam *d'*. These slotted ways are deepest at their extreme ends, where the points of the cams reach to, and for the purpose of keeping the valve in constant motion the bottom of these slotted ways will form an inclined plane from one end to the other. As the piston nears the end of its stroke, the slotted way directly under the cam, which must then be tripped upward, suddenly ceases curving sharply upward, so that as the cam is thrown up the tripping-lever pushes over the valve, to exhaust the steam or air from one end of the cylinder and supply it to the other. As one cam is tripped up the other cam drops down into its slotted ways, and in turn undergoes the same operation.

It will be observed in Fig. 2 that the slotted ways are cut diagonally along the sleeve, instead of parallel with its sides. This is necessary because, as the piston advances or returns, the sleeve turns slightly around, say about one-sixteenth of a turn—a matter explained below in connection with my device for turning the drill, which forms the second portion of my invention, which I will now describe.

This device consists in providing one or more slotted ways, H, (shown in Figs. 1 and 2,) cut diagonally along the sleeve F, at any suitable point on its circumference. In this slotted way a pin, *h*, plays back and forth as the piston moves, the pin being firmly secured in the side of the cylinder A. The sleeve F is cut in two parts by a zigzag cut at *i*, the cut forming, as it were, a series of ratchet-teeth on each end of the separated pieces which join together. Now, the sleeve being loose upon the piston-rod, when it is revolved in the direction of the arrow-point to the right hand, Fig. 3, it moves freely between the piston-heads; but if it be revolved in the contrary direction the two parts of the sleeve will spread apart and bind firmly between the

heads, because of the inclined faces of the cut at letter *i;* and then, when the sleeve turns, as it must when the slot H passes over the pin *h*, the piston-rod also must turn, and with it the drill. Ordinarily, this device will be sufficient to effect a turning of the drill; but to avoid any chance of slip should the two parts of the sleeve not spread apart sufficiently, I cut the ratchet-teeth, as in Fig. 4, inside the small piece of the sleeve at K, Fig. 3, two or more pawls being attached to the piston-rod, as shown in Fig. 4. There will be springs behind the pawls to keep them engaged with the teeth of the ratchet-wheel. The effect of these pawls and ratchet-wheels will be to hold the small piece of the sleeve from adhering to and turning with the large piece, and will insure their spreading apart, as before described.

What I claim as my invention, and desire to secure by Letters Patent, is as follows:

1. The combination of the cams *d d'*, rocker-arm D, and slotted ways E E', as a means of moving the valve C, substantially as described, and for the purpose set forth.

2. The sleeve-piece F, when cut in two by the zigzag cut *i*, in combination with the slotted way H and pin *h*, substantially as and for the purpose described.

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Witnesses:
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