J. C. GITHENS.

Steam Rock-Drill.

No. 164,990. Patented June 29, 1875.

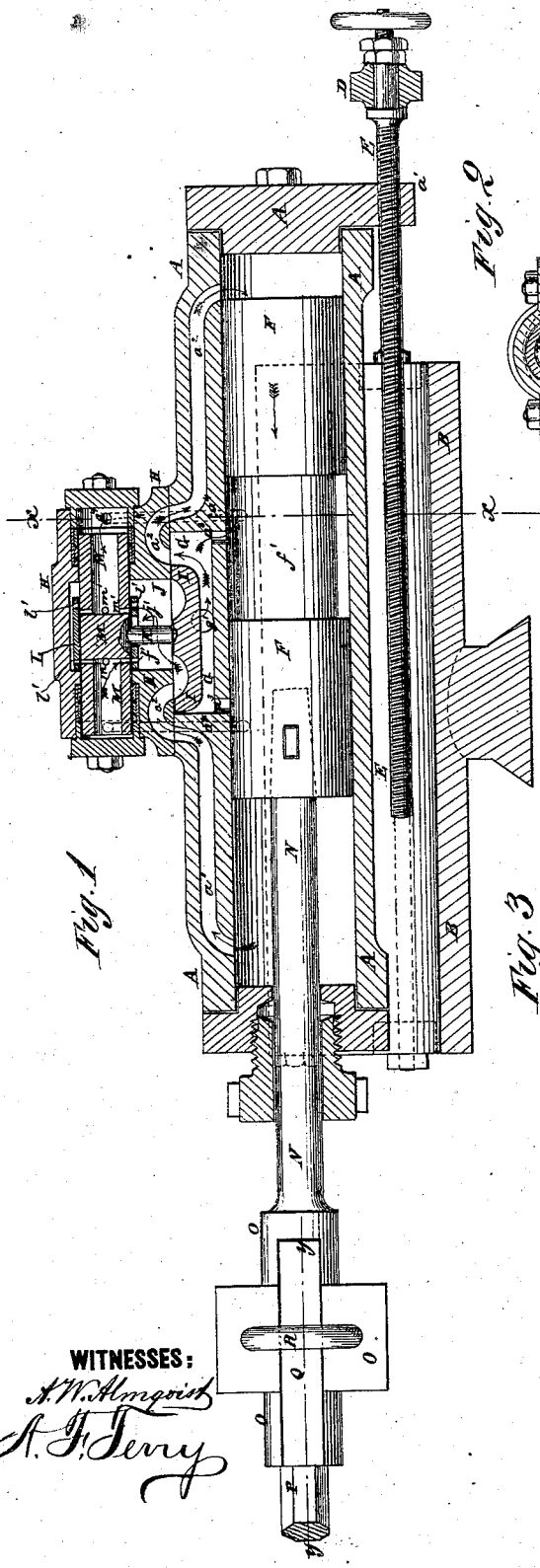

Fig. 1

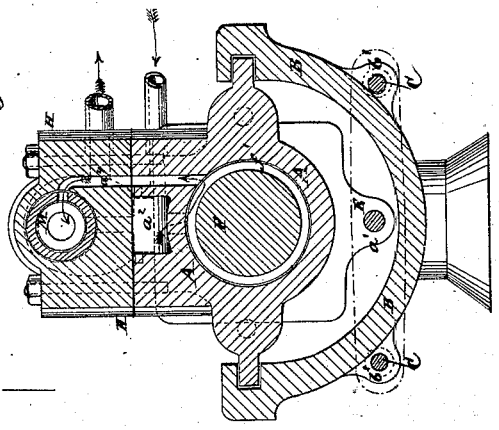

Fig. 2

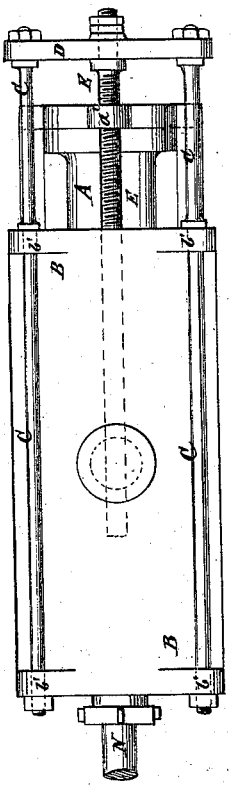

Fig. 3

WITNESSES:

A. W. Almquist

A. F. Terry

INVENTOR:

Joseph C. Githens

BY

ATTORNEYS.

THE GRAPHIC CO. PHOTO-LITH. 39 & 41 PARK PLACE, N.Y.

# UNITED STATES PATENT OFFICE.

JOSEPH C. GITHENS, OF NEW YORK, N. Y.

## IMPROVEMENT IN STEAM ROCK-DRILLS.

Specification forming part of Letters Patent No. **164,990**, dated June 29, 1875; application filed April 17, 1875.

*To all whom it may concern:*

Be it known that I, JOSEPH C. GITHENS, of the city, county, and State of New York, have invented a new and useful Improvement in Steam Rock-Drills, of which the following is a specification:

Figure 1 is a longitudinal section of the steam-cylinder, shield, and valve-chest of my improved drill. Fig. 2 is a cross-section of the same taken through the line *x x* of Fig. 1. Fig. 3 is a rear view of the same, showing the long bolts.

Similar letters of reference indicate corresponding parts.

The object of this invention is to improve the construction of steam rock-drills, so as to make them stronger, more reliable in use, and less liable to get out of order.

The invention will be first fully described, and then pointed out in the claims.

A is the steam-cylinder, which is constructed in the usual way, and moves up and down in ways in the shield B. The shield B is swiveled to the ordinary supporting frame-work in the usual way, and is strengthened by long bolts C, extending the whole length of the said shield B, and passing through lugs *b'* formed upon its ends. The bolts C are extended upward beyond the upper end of the shield B, and to their upper ends are attached the ends of a cross-bar, D, to the center of which is swiveled the feed-screw E, which passes through a screw-hole in a lug, $a^1$, formed upon the rear part of the upper end of the cylinder A, so that, by turning the said screw, the cylinder may be moved down as the drill works its way into the rock, and moved up when the hole has been sunk to the required depth. The screw E is designed to be turned by a crank or hand wheel attached to its upper end. F is the piston that moves back and forth in the cylinder A as it is driven by the steam. The piston F is made long, and around its middle part is formed a wide and shallow ring-groove, *f'*, to serve as a steam-chest for the valve-shifting piston. G is the live-steam chest, which is covered with the cap H, in which slides the valve I, and into which the steam enters through the inlet-port *g'*. $a^2$ are passages leading from the end parts of the cavity of the cylinder A through the walls of said cylinder, and through the lower end parts of the cap H into the steam-chest G, and which become alternately inlet and outlet passages as the valve I is shifted. J is the exhaust-steam chest, which is formed in the lower middle part of the cap H, which becomes connected with the passages $a^2$ alternately as each passage $a^2$ becomes an outlet-passage by the shifting of the valve I, and from which the steam escapes through the exhaust-port *j'*. To the center of the valve I is attached the lower end of a pin, *k*, the upper end of which passes through a short longitudinal slot in the band L, and enters the solid middle part of the piston M. The piston M is placed in the upper part of the exhaust-steam chest J, and its ends enter cylindrical cavities in the upper end parts of the cap H, where they are surrounded by packing-rings to prevent the passage of steam. The piston M is made so much shorter than the cavity in which it works as to give it the same movement or play as the valve I. The end parts of the piston M are made hollow, and through its sides at the ends of its solid middle part are formed a number of small holes or ports, *m'*. In the end parts of the band L that surrounds the middle part of the piston M are formed two sets or circles of holes or ports, *l'*. The ports *m' l'* are exactly in line with each other, but the two sets of ports *l'* of the band L are at a greater distance apart longitudinally than the two sets of ports *m'*, so that the two sets of ports may be alternately opened and closed by the longitudinal movement of the band L upon the piston M. $a^3$ are small ports or passages leading from the end parts of the steam-chest G into the cavity of the cylinder A, so as to be opened as the groove *f'* of the piston F comes opposite either of them, and closed as the end parts of said piston come opposite either of them. The ports $a^3$ are at a distance apart greater than the breadth of the groove *f'*, so that both of said ports $a^3$ can never be open at the same time. $a^4$ are two ports or passages leading from the cavity of the cylinder A, near the ports $a^3$, through the wall of said cylinder, and through the end parts of the cap H, and opening into the cavity in which the piston M works at the ends of said piston M. When the piston F is at the upper

end of its stroke, as shown in Fig. 1, the steam enters through the upper passage $a^2$ and forces the said piston downward. As the piston F approaches the lower end of its stroke, the lower ports $a^3$ $a^4$ are uncovered, and the steam passes through the port $a^4$ to the lower end of the piston M, forcing the valve I upward and allowing the steam to pass through the lower passage $a^2$ to the lower end of the piston F, and force the said piston F upward. As the piston M moves upward the forward edge of the band L strikes the upper end of the chest J, which stops the band L, while the piston M moves onward. This opens the upper set of ports $l'$ $m'$, and allows the steam to exhaust from before the said piston M. As the piston F approaches the upper end of its stroke the upper ports $a^3$ $a^4$ are uncovered, and the valve I is again shifted, and so on until the entrance of the steam is stopped. N is the piston-rod, the inner end of which enters a hole in the forward end of the piston F, and is secured in place by a key. The piston-rod N passes out through a stuffing-box in the end of the cylinder A, and upon its lower end is formed a head or enlargement, O, which is perforated in line with the axis of the piston-rod N to receive the shank of the drill P. The head O is slotted longitudinally upon one side to receive a key, Q, which fits into the said slot, and the inner edge of which is concaved to correspond with the perforation of the head O. Upon the outer side of the middle part of the key Q is formed a projection, which is notched transversely to receive the bend of the U-bolt R. The U-bolt R straddles the key Q, and its arms pass through the head O, and have nuts secured upon their ends. In the face of the key Q, and in the inner surface of the head O directly opposite the said key, are formed longitudinal grooves, as shown in Fig. 5.

By this construction there will always be at least four points of bearing upon the drill-shank, whether said shank be round or octagonal, to hold the drill firmly, thus avoiding the necessity of turning off the octagonal steel of which the drills are usually made.

The inner edge of the middle part of the key Q is grooved or notched transversely beneath the bend of the U-bolt R, so that only the end parts of said key may bear upon the drill-shank to hold it more securely, and at the same time not too rigidly.

I am aware that guide-rods have been employed heretofore, but my bolts C are simply stay-bolts that remedy a difficulty heretofore experienced in these machines. These bolts ordinarily extend only to the upper end of shield, where the latter frequently breaks off. By extending these bolts C the whole length of shield this is prevented.

What I claim is—

1. The combination, with shield B, having lugs *b*, of bolts C, extending its whole length, and the cross-bar D, to which the turning mechanism is attached, all arranged substantially as and for the purpose specified.

2. The valve-shifting piston M, made with hollow ends, a solid center and side ports, M′, and provided with a sliding band, L, made with ports *l*, at a greater distance apart longitudinally than the ports $m'$, in combination with the cap H of the steam-chest, the sliding valve I, the ports $a^3$ $a^4$ opening into the cylinder A, and the piston F, substantially as herein shown and described.

JOSEPH C. GITHENS.

Witnesses:
JAMES T. GRAHAM,
T. B. MOSHER.