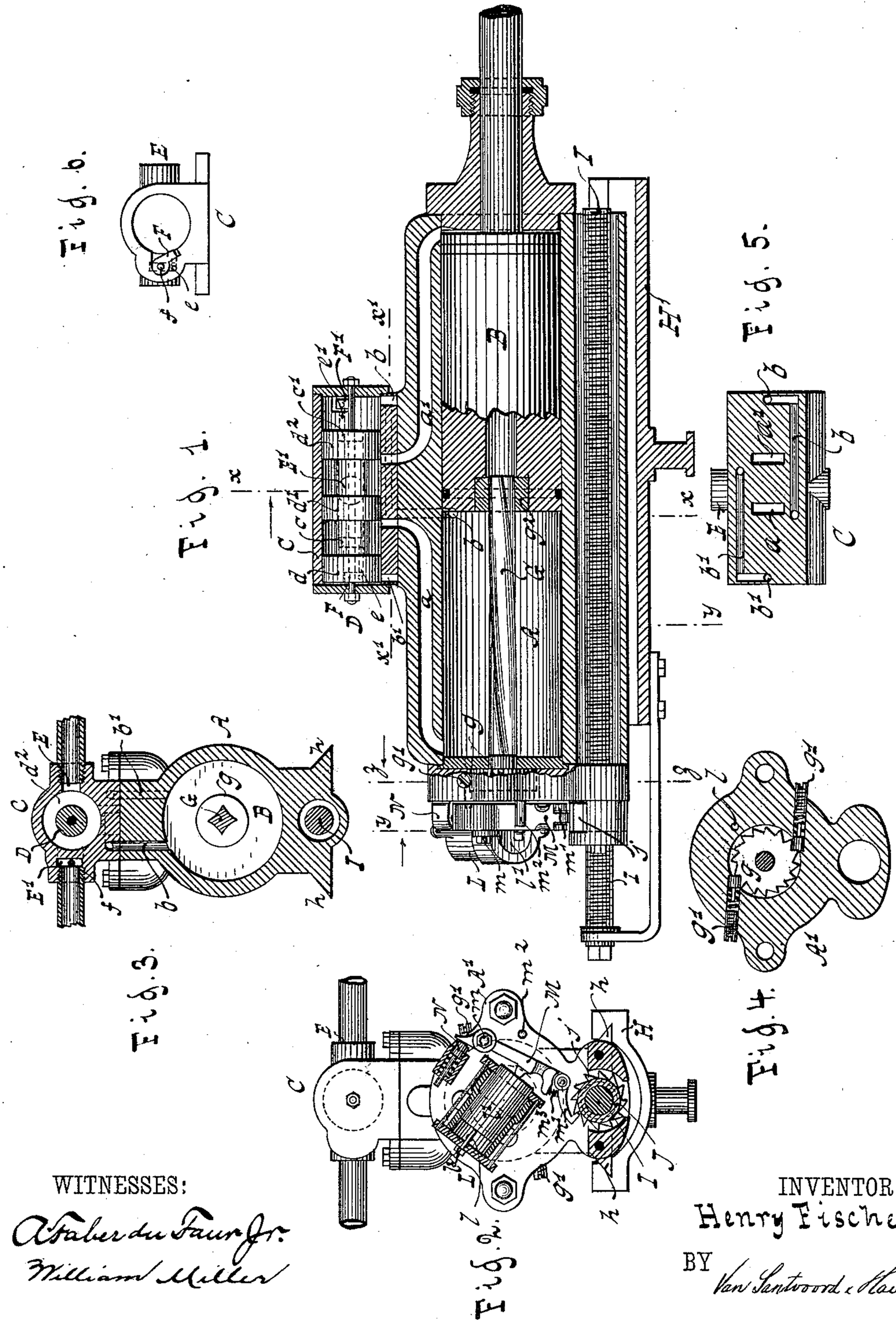
(No Model.)

H. FISCHER.

STEAM ROCK DRILL.

No. 336,401. Patented Feb. 16, 1886.



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STEAM ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 336,401, dated February 16, 1886.

Application filed November 27, 1885. Serial No. 184,021. (No model.)

To all whom it may concern:

Be it known that I, HENRY FISCHER, a citizen of Germany, residing at New York, in the county and State of New York, have invented new and useful Improvements in Steam Rock-Drills, of which the following is a specification.

My invention relates to improvements in rock-drills; and it consists in certain novel features of construction, which are fully pointed out in the following specification and claims and illustrated in the accompanying drawings, in which—

Figure 1 represents a sectional side view of a rock-drill embodying my improvements. Fig. 2 is a transverse section thereof in the plane *y y*, Fig. 1. Fig. 3 is a similar section in the plane *x x*, Fig. 1. Fig. 4 is a section in the plane *z z*, Fig. 1, of the top cylinder-head. Fig. 5 is a section in the plane *x' x'* of the valve-chest. Fig. 6 is an end view of the valve-chest, the chest-head being removed.

Similar letters indicate corresponding parts.

In the drawings, the letter A designates the main cylinder of the rock-drill. B is the piston which works in the cylinder. C is the valve-chest. *a a'*, Figs. 1 and 5, are the steam-ports leading from this valve-chest to the ends of the main cylinder. D is the valve which works in the valve-chest. E is the admission-port to the valve-chest; and *c c'* are the exhaust-ports from the valve-chest, which open into a common channel, E', opening outward. The valve D is provided with circumferential grooves which form pistons *d d' d²*, closely fitting the cylindrical bore of the valve-chest, thus leaving isolated steam-spaces surrounding the necks between the pistons. Of the three pistons *d d' d²*, piston *d* controls exhaust-port *c*, piston *d'* the admission-port E, and the piston *d²* exhaust-port *c'*. The valve is reciprocated by steam entering the valve-chest at either end of the same through passages *b b'*, Figs. 1 and 5, leading from the interior of the cylinder to the valve-chest, and which passages are opened and closed by the piston B.

To remove the steam from behind the end pistons, *d d²*, of the valve, small exhaust-passages *e e'* lead from both ends of the valve-chest to the exhaust-ports *c c'*, and said passages are controlled by hinged flap-valves F F', which are firmly secured to a spindle, *f*, having bearings in the walls of the cylinder, and which valves F F' are actuated by the valve D. The flap-valves F F' are secured to the spindle at such an angle to each other that when one is closed by the valve D the other is open, and vice versa, and that face of each flap-valve which is engaged by the valve D is somewhat inclined, so that it may be engaged without shock by said valve. Since the openings of the passages controlled by the flap-valves F F' are located a short distance from each end of the valve-chest, the shutting off of the escape at this point will cushion the valve D, and thus prevent the same from striking violently against the chest-heads.

The turning of the piston, and consequently the turning of the drill, is effected by means of a shank, G, having thereon threads of a large pitch, one end of which shank has thereon a ratchet-wheel, *g*, which is engaged by suitable spring-pressed pawls, *g'*, extending through the upper cylinder-head, A', which pawls are thrown backward when engaged by the face of the teeth so as to allow the ratchet to rotate, while when the ratchet-wheel is thrown in a reverse direction the pawls are engaged by the rear of the teeth and bind against the walls of their bearings so as to prevent the ratchet from turning. The opposite end of the shank engages a nut, *g²*, in the piston B, and can extend into a recess in said piston. From the previous description it will be observed that the piston will be turned only on its upward non-working stroke.

The cylinder A, as usual in rock-drills, is provided with suitable guides, *h*, Fig. 3, which bear in guideways formed in a housing, H, and through a suitable way in the casting of the cylinder extends a feed-screw, I, which is engaged by a nut, J, Figs. 1 and 2, bearing in an extension of the upper cylinder-head, A', so that when the nut is turned in the proper direction the cylinder will be fed forward. To automatically turn this nut I provide an auxiliary cylinder, L, which has a steam-inlet passage, *l*, Figs. 1, 2, and 4, from the main cylinder A, and in said cylinder L works a plunger, *l'*, which engages with a lever, M, pivoted to the head A' at *m*, and one arm of which carries a feed-pawl, *m'*, which engages with ratchet-teeth *j* on the nut J. The other

arm of the lever M is subjected to the action of a spring-pressed plunger, N, which works in a housing cast on the cylinder-head, so that the arm which carries the pawl forces the plunger back to its upper position after the same has been moved outward by the steam from the cylinder. A stop, m^2, governs the outward sweep of the lever M, and therefore the possible length of the stroke of the plunger l' can be set by the set-screw l^2 in the head of the cylinder, whereby the arc through which the nut J is rotated can be regulated. The feed-pawl m' is subjected to the action of a spring, m^3, Fig. 2, for an obvious reason. Steam enters the auxiliary cylinder to actuate the plunger l' when the piston is on the downward stroke and exhausts therefrom when the exhaust-port is opened.

The operation of the drill is as follows: As shown in the drawings, the piston B is at the end of the downward stroke, and the exhaust through steam-port a is opened. As the piston ends its downward stroke, it opens steam-passages b, and live steam impinges upon the piston d^2 and moves the valve D to the position shown in Fig. 1, thereby opening the admission of steam through the admission-port E to the interior of the valve-chest and in the steam-space between the pistons b' b^2, from which it passes into the cylinder and drives the piston in its upward stroke. The live steam admitted through port E cannot escape through exhaust-port c, because the latter is now closed by piston d^2 of the valve, while the exhaust-steam passes from port a into the space between pistons d d' and escapes through exhaust-port c, which is open in this portion of the valve. As the valve D is moved to the position shown in Fig. 1, it strikes flap-valve F and closes the same, whereby flap-valve F′ at the opposite end of the cylinder which was closed is opened, so that when the valve D reverses, the steam behind piston d^2 can escape through the passage e'.

Instead of actuating the valve D by steam from the cylinder, motion could be imparted thereto by the use of a system of valve-gear connected with the piston-rod or other moving part; but I prefer to use the steam-actuated valve.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the cylinder, the valve-chest, the admission-port E, the channel E′, the ports a a', leading from the cylinder to the valve-chest, the passages b b', leading from the ends of the valve-chest to the cylinder, the exhaust-ports c c', opening into said channel, and exhaust-passages e e', of the steam-moved valve D, having three pistons, d d' d^2, the one, d', controlling the steam-admission port E, the other, d, controlling the exhaust-port c, and the other, d^2, controlling the exhaust-port c', substantially as described.

2. The combination, substantially as shown and described, of the steam-ports a a', leading from the valve-chest to the cylinder, the admission-port E, the exhaust-ports c c', properly aligned in the valve-chest, the steam-actuated piston-valve D, the exhaust-passages e e', leading from the ends of the valve-chest to the exhaust-port, and the valves F F′, governing the exhaust-ports and actuated by the valve D, substantially as shown and described.

3. The combination, with the main cylinder, the piston, the feed-screw I, and housing H, of the toothed nut J, engaging the feed-screw, the auxiliary cylinder L in steam-connection with the main cylinder by a port, l, the plunger l' in said cylinder L, the spring-pressed lever M, engaged by the plunger, and the pawl m', hinged to the lever to engage the teeth on the nut, substantially as shown and described.

4. The combination, with the main cylinder, the piston, the feed-screw I, and housing H, of the toothed nut J, engaging the feed-screw, the auxiliary cylinder L, the port l leading from the main cylinder to the same, the plunger l' in the auxiliary cylinder, the spring-pressed lever M, the pawl m' thereof, the stop m^2, and regulating-screw l^2, substantially as shown and described.

In testimony whereof I have hereunto set my hand and seal in the presence of two subscribing witnesses.

HENRY FISCHER. [L. S.]

Witnesses:
W. HAUFF,
A. FABER DU FAUR, Jr.