2 Sheets—Sheet 1.

E. S. WINCHESTER.

Rock-Drill.

No. 199,389. Patented Jan. 22, 1878.

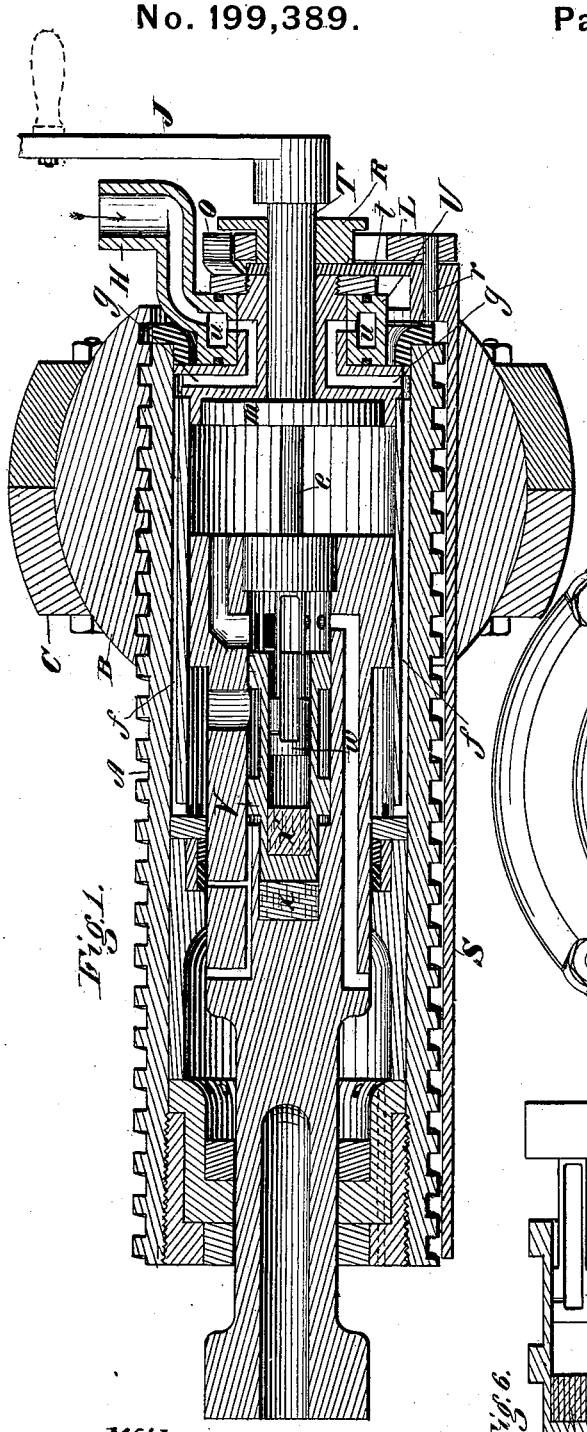

Fig. 1.

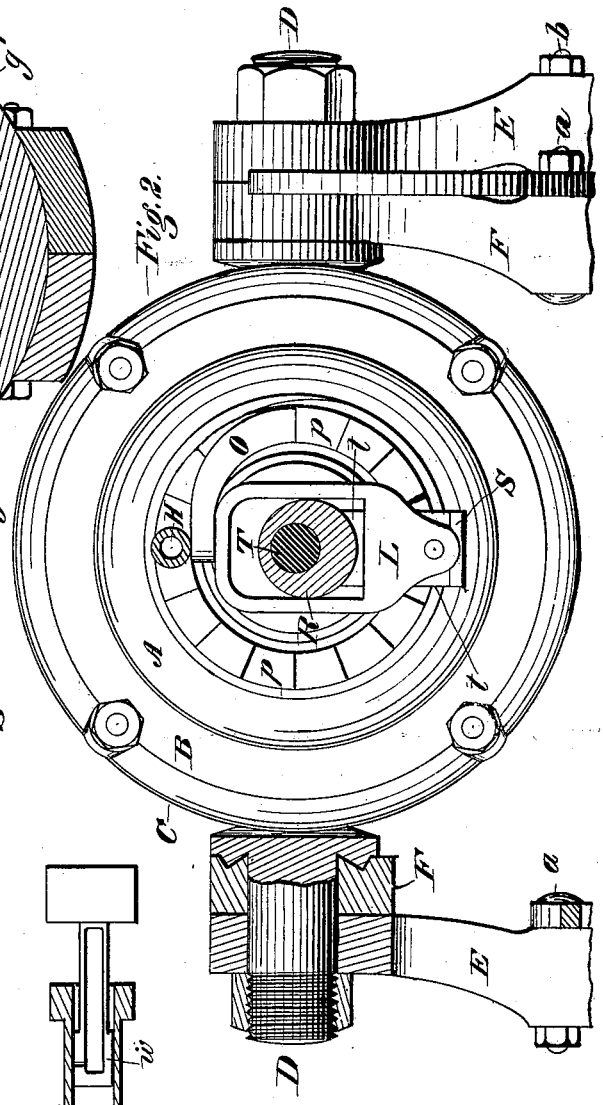

Fig. 2.

Fig. 6.

Witnesses:

Donn B. Tewtchell

Will H. Dodge

Inventor:

E. S. Winchester,

by his Attys

Dodger & Son.

2 Sheets—Sheet 2.

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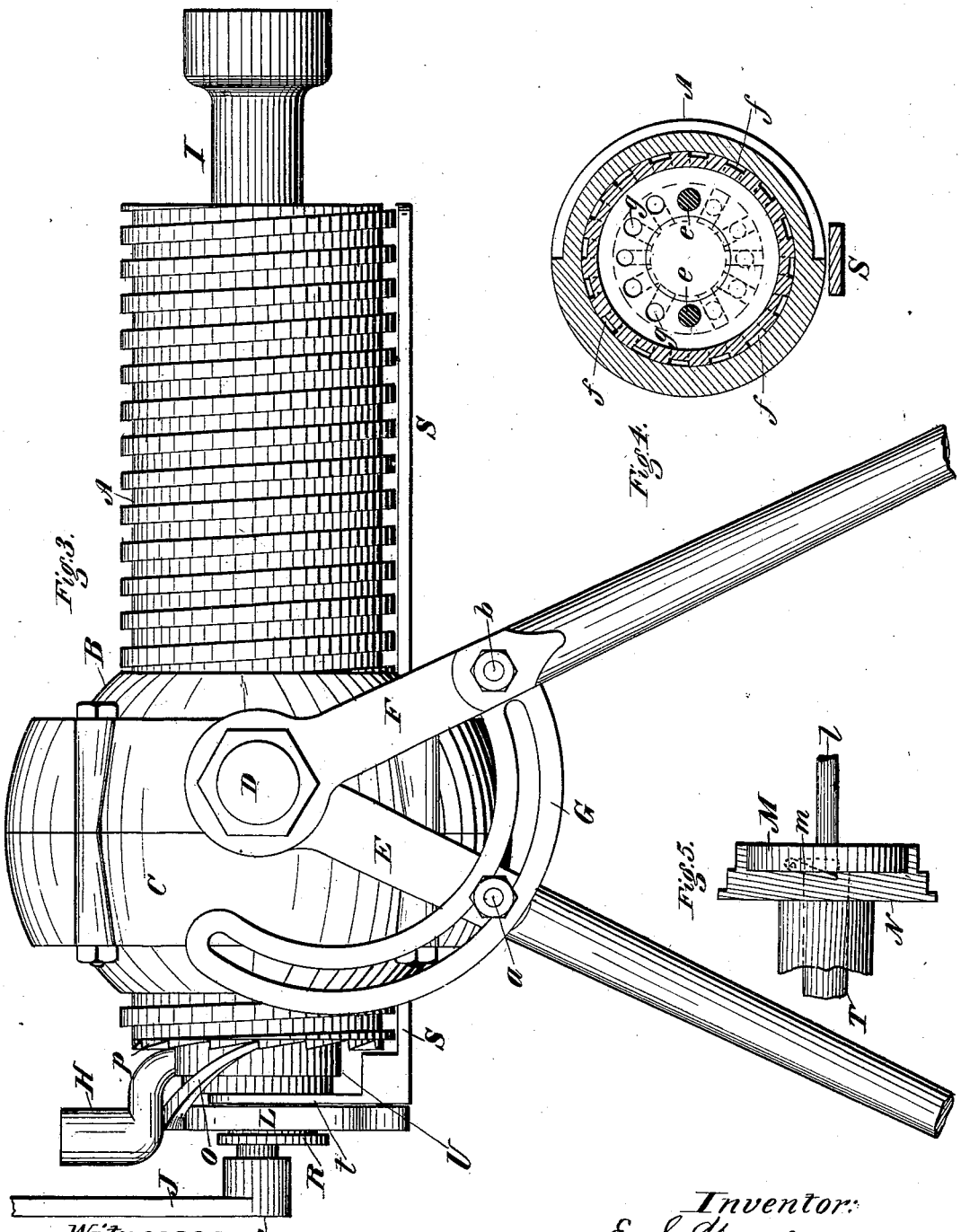

UNITED STATES PATENT OFFICE.

EDWARD S. WINCHESTER, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF ONE-HALF HIS RIGHT TO HARVEY K. FLAGLER, OF SAME PLACE.

IMPROVEMENT IN ROCK-DRILLS.

Specification forming part of Letters Patent No. **199,389**, dated January 22, 1878; application filed June 15, 1877.

To all whom it may concern:

Be it known that I, EDWARD S. WINCHESTER, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Rock-Drills, of which the following is a specification:

My invention relates to rock-drills; and the invention consists in a spring or friction device applied to the valve within the cylinder, for regulating and assisting in controlling the movements of the valve.

It further consists in a novel manner of constructing and mounting the cylinder, whereby it can be pointed or turned and held at varying angles; and in a novel means of feeding the drill forward to its work, together with certain novel details of construction, hereinafter more fully set forth.

Figure 1 is a longitudinal vertical section of my improved drill. Fig. 2 is an end view of the head. Fig. 3 is a side elevation, and Figs. 4, 5, and 6 are views of portions shown in detail.

This invention, so far as the valve is concerned, may be considered as an improvement on the device patented to me August 22, 1876, No. 181,386, the same style of valve and means of operating it being used in this case as was described in said patent. The other improvements may be used in connection with, or applied to, other styles of drills, as well as to that.

In the patent referred to, and to which reference is hereby made for a more detailed description, the valve was mounted loosely in a central cavity within the piston, and was operated by the momentum or to-and-fro movement of the cylinder, the said valve being represented by the letter V in Figs. 1 and 6 of the present case.

In order to lessen the shock upon the valve, which sometimes caused it to rebound when at the end of its stroke, I have added a friction or spring guide, W, as represented in position in Fig. 1, and more clearly shown in Fig. 6, which shows the valve and its friction or spring stem detached. It consists simply of a stem or guide-piece of proper size to fit the central cavity of the valve V, and having its head or end fastened securely in the end of the piston, so that it is held securely in place, whereby the valve V, in its to-and-fro movements, is caused to slide over or upon it. This friction-guide *w*, as shown in Fig. 6, is slotted longitudinally near its whole length, thus making its sides or arms operate as springs, which bear on the inner walls of the valve with sufficient force to create sufficient friction to overcome the momentum of the valve after the piston has ceased to move, and thus to stop the valve and hold it in position.

This device also assists to regulate and equalize the movements of the valve, especially when the cylinder is in a vertical position, or nearly so, and prevents the valve from rebounding, as it otherwise would have a tendency to, at the end of its stroke.

To lessen the shock of the valve, and prevent it from being battered or injured by the concussion at the end of its strokes upon the metal of the piston, against which it strikes, I insert the two wooden blocks *x x'*, as shown in Fig. 1, the grain of the wood being arranged parallel with the line of movement or longer axis of the valve. As shown in Fig. 1, one of these blocks is set in a recess, so that the front end of the valve V will strike upon it, while the other piece, *x'*, is inserted within the valve, where, as the valve moves in the opposite direction, it will come in contact with the end of the guide-rod *w*. These wooden buffers, which take the place of the springs used in my former drill, serve to check the movement of the valve and deaden the force of its impact, without causing the rebound which occurred when the springs were used, and which frequently interfered seriously with the action of the drill, in consequence of the valve being thrown back at the wrong time. The use of the wood, the reaction of which is comparatively slow and weak, enables the valve to work uniformly under the varying speed of the piston and the varying length of its stroke.

It is obvious that the spring or friction device *w* may be constructed in a different form or manner, and that the block *x'* may be arranged around the outside of the same, so the end of the valve will strike upon it; but the

plan shown is the simplest, as it is only necessary to turn the blocks of the proper size and drive them into the cavities made for them.

In order to mount the drill so that it can be readily adjusted and held at various angles, and so that it may also be fed forward to its work the whole length of the cylinder without loosening its supports, I cut upon the exterior of the cylinder A a screw-thread, as shown in Figs. 1 and 3, and mount it in a spherical nut, B, which has a corresponding thread, so that by rotating the cylinder in the nut B the drill may be fed or screwed forward. As shown in Figs. 1, 2, and 3, this nut B is mounted in a clamp, C, which consists of two rings, which are made concave on their interior, so as to fit snugly on the nut B, they being slipped on from opposite sides, and then fastened together by bolts and nuts, so that they can be made to clasp the nut B with sufficient force to hold it in any position or any angle at which it may be set.

Whenever it is desired to adjust the drill at a different angle, it is only necessary to loosen the clamps C, turn it, and tighten up the bolts which fasten the clamps C.

It will at once be understood that the nut B, with the drill, can thus turn in the clamp C upon the well-known principle of the ball-and-socket joint.

I am aware that a short cylinder having an open end has been threaded on its exterior, and mounted in a tight exterior case or cylinder, by which it was sustained, protected, and supplied with steam, the exterior cylinder being a steam-receiver and a necessary part of the drill; and to such arrangement I make no claim, the special advantage of my invention being that it enables me to dispense with the extra cylinder, and thus materially reduce the length of the drill, so that it may be operated and adjusted in a much smaller space.

In order to support the drill and allow of its being adjusted in a vertical plane without loosening the clamp C, the latter is provided with trunnions D, as shown in Figs. 2 and 3, and upon each of these are pivoted two legs, E and F, which latter are connected by a quadrant-shaped bar or rod, G, as shown in Fig. 3, with a clamping-nut and bolt, *a*, by which they can be adjusted and held at any relative angle, thereby elevating or lowering the drill at will, and also enabling them to be so adjusted as to fit any irregularities of the rock or surface upon which the drill may be set.

It will be seen that by hanging the clamp in the two trunnions the cylinder is permitted to make an entire revolution in a vertical plane, and that by the arrangement of the spherical support in the clamp a limited universal adjustment of the cylinder is permitted in relation to the clamp. By the combination of the two adjustments a wide range of movement is secured, and the drill enabled to act in almost any direction without changing the position of the sustaining-legs.

When it is desired to secure the drill to a post or column set upright, as is often necessary in tunneling, the clamps C will be provided with a sleeve or additional clamp for securing it to the post or column. By providing a separate clamp thus made the drill can in a few moments time be transferred from its legs to the column, or vice versa, as circumstances may require.

In order to turn the cylinder so as to screw or feed it forward through the nut B, I provide its rear end or head with a series of ratchet-teeth, *p*, as shown in Figs. 2 and 3, and through the head or end of the cylinder, I run a shaft, T, to the outer end of which is secured a crank, J, for turning it by the hand of the operator. Upon its inner I rigidly secure a disk, *m*, which fits and turns loosely in a recess made for it upon the inner face of the cylinder-head, as shown in Fig. 1, there being two guide-rods, *l*, extending from this disk *m* and fitting loosely in holes bored in the cylinder, so that when the crank J is turned the cylinder and its drilling bit or tool are caused to turn with it. Upon the shaft T, outside of the cylinder-head, is secured an eccentric, R, (shown in Fig. 2,) which, as the crank is turned, operates a yoke, L, pivoted at one end to a friction-rod, S, which is held in a groove on the interior of the nut B, and slides back and forth as the cylinder is moved to and fro, this rod S being secured to the shaft T by an arm, *t*, which encircles the shaft T, as shown in Figs. 1, 2, and 3. This rod S, as shown in Figs. 1 and 3, is arranged to bear upon the screw-thread on the cylinder, and thus serves as a friction-rod, to prevent any sudden or accidental turning of the cylinder within its nut B.

To the free end of the oscillating yoke L, which, as before stated, is operated by the eccentric R on shaft T, there is pivoted a pawl, *o*, which is arranged to engage with the teeth *p* on the end of the cylinder, so that at each revolution of the crank J the pawl will turn the cylinder the distance of one tooth, and thus gradually screw it forward in the nut B, thereby feeding the drill forward to its work, the piston and its bit or tool being rotated with the crank, to which it is connected by the rods *l*, as before stated. By giving to the screw-thread a definite pitch, and providing a corresponding or requisite number of ratchet-teeth, it will be seen that the drill may be so constructed as to be fed forward any desired distance at each revolution of the crank J. For instance, suppose the pitch of the thread to be one inch to each turn, and the ratchet-teeth to be sixteen in number, then at each turn of the crank J the cylinder would be fed forward one-sixteenth of an inch, and so on for any pitch of thread and number of teeth that may be adopted.

In order to turn the cylinder in the reverse direction to feed it back, there is pivoted to the disk M, as shown in Fig. 5, a ratchet, *m*, which, when the crank is turned backward, engages in a notch in the head of the cylinder, thereby serving to lock the cylinder fast

to the crank-shaft, so as to make it turn with it when turned in that direction. As, of course, this ratchet *m* is set in a direction opposite to that of the ratchet *o*, it will be seen that when the crank is turned in one direction one ratchet will engage, while the other passes over or past the teeth or notch with which it is designed to engage, and that when turned in the opposite direction the reverse will be the case.

It is obvious that the pawl *o* may be connected to the shaft T or crank R, and made to turn the cylinder by merely moving the crank to and fro, and thus dispense with the eccentric and yoke; but that is not deemed as good a plan.

As it will be impossible to feed the steam or air into the cylinder on its side, as is usually done, without interfering with the supply-pipe which conducts it to the drill, I have devised a means for feeding it in through the end or head of the cylinder, as shown in Figs. 1 and 5.

The supply-pipe H is connected to a hollow collar or ring, U, which is fitted loosely upon a tubular neck projecting from the outer face of the cylinder-head, as shown in Fig. 1. This collar is suitably packed to render its joints steam-tight, and is provided on its inner face with a channel, *u*, which corresponds with a similar channel turned upon the exterior of the neck, as shown in Fig. 1. From this latter groove there extends a series of channels, *g*, which open into an annular recess around the cylinder-head, and which connect with the series of longitudinal passages *f* made in the walls of the cylinder, and which connect with the interior of the cylinder, at the front end of its steam-chamber, by a series of openings, as shown in Fig. 1. By this arrangement it will be seen that while the cylinder is free to rotate the collar U, with its supply-pipe H, remains stationary, so far as any rotary motion is concerned, it simply moving to and fro with the cylinder as the latter is fed to and from its work.

The remaining portion of the apparatus—that is to say, the piston and valve, with their steam-passages—being the same as described in my former patent hereinbefore cited, need not be further described.

The advantages to be derived from these improvements will be readily comprehended by persons familiar with rock-drills, and need not, therefore, be herein set forth.

Having thus described my invention, what I claim is—

1. In combination with the valve V, the friction or spring stem *w*, constructed to operate substantially as described.

2. In a rock-drill, the combination of a clamp, C, supported by two trunnions in adjustable legs E F, an adjustable spherical block or nut, B, mounted in said clamp, and a drill-cylinder supported in and susceptible of longitudinal adjustment through said nut, substantially as shown.

3. In combination with the threaded cylinder and nut or bearing, the rotating eccentric R and pawl *o*, arranged to operate substantially as described.

4. In combination with the cylinder A, having the inlet ports or passages in its head, the hollow or grooved annular collar U, arranged to operate substantially as and for the purpose set forth.

5. In combination with the rotating cylinder A, the pawl *m*, connected to the shaft T, and arranged to operate substantially as set forth.

6. In a rock-drill, a naked externally-threaded cylinder, mounted directly in and adjustable through a sustaining-nut, and provided at one end with a steam-supply pipe, substantially as shown, whereby the steam is delivered directly to the cylinder and the adjustment of the latter permitted without the employment of an inclosing-case, as usual.

7. In a rock-drill, a naked externally-threaded cylinder, adjustably mounted in a sustaining-nut, and provided with a steam-supply pipe and feeding devices, substantially such as shown, both sustained by the cylinder.

8. In a rock-drill, an externally-threaded cylinder mounted and adjustable in a sustaining-nut, in combination with a piston, valve, steam-supply, and feeding devices, all sustained by the cylinder, substantially as shown.

EDWARD S. WINCHESTER.

Witnesses:
C. O. L. DILLAWAY,
WALTER A. TRIPP.