(No Model.) 2 Sheets—Sheet 1.

S. INGERSOLL.

ROCK DRILL.

No. 381,838. Patented Apr. 24, 1888.

Fig. 1.

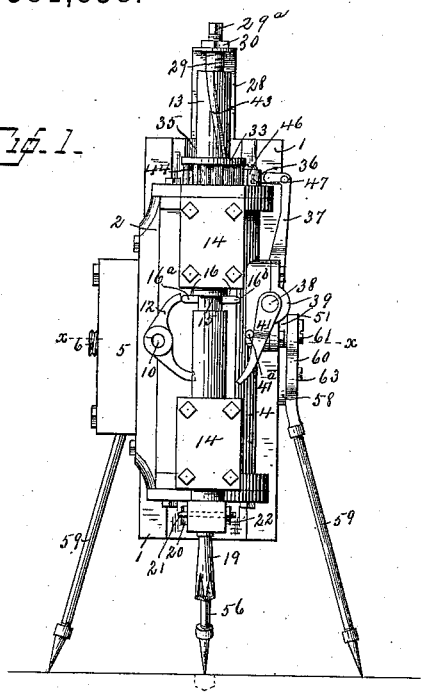


Fig. 2.

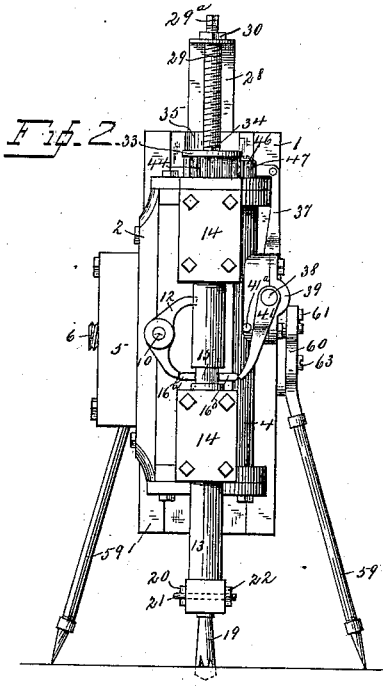


Fig. 3.

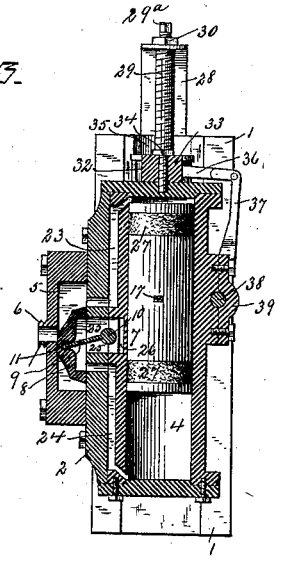
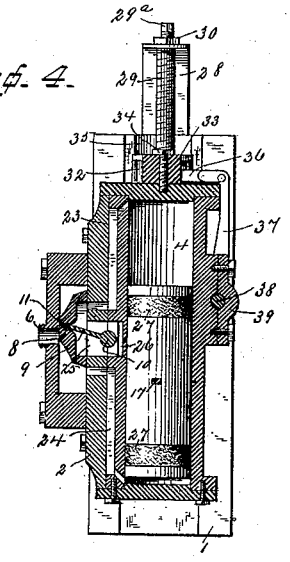


Fig. 4.



Witnesses.
E. D. Smith
C. E. Ruggles

Inventor.
Simon Ingersoll
By A. M. Wooster
Atty.

(No Model.) 2 Sheets—Sheet 2.

S. INGERSOLL.

ROCK DRILL.

No. 381,838. Patented Apr. 24, 1888.

Fig. 5.

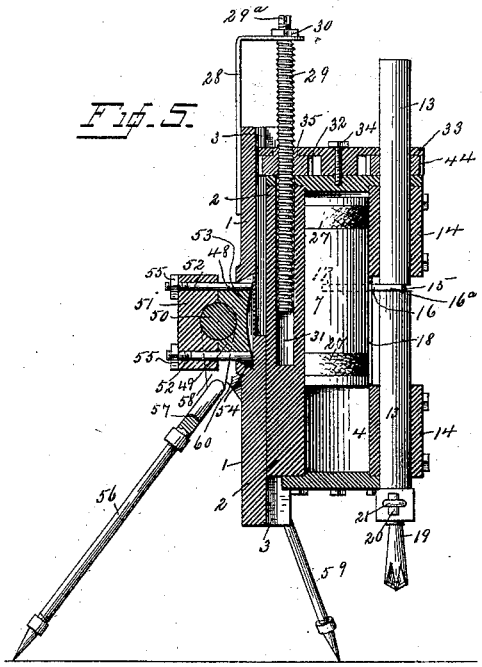


Fig. 6.

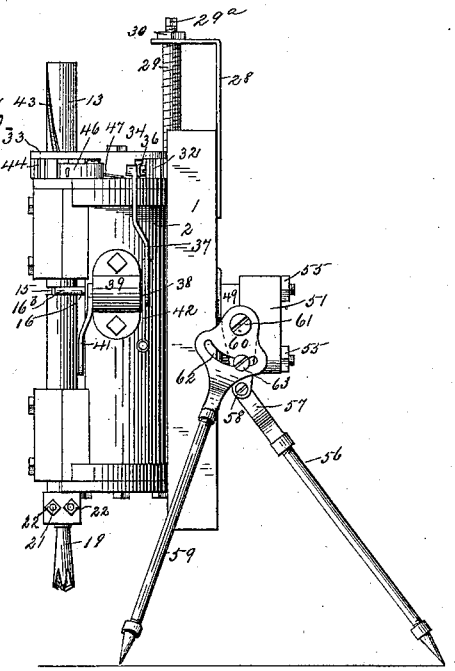


Fig. 7.

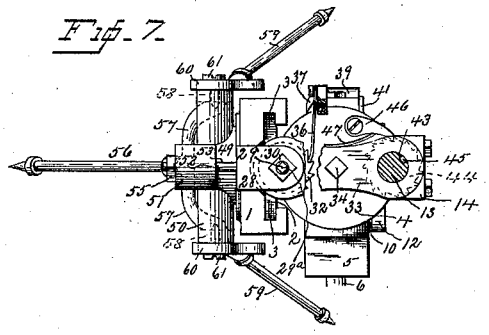


Fig. 8.

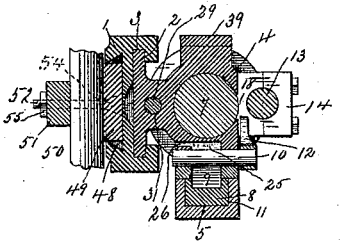


Fig. 9.

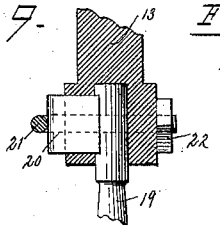
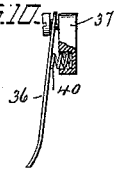


Fig. 10.



Witnesses.
E. D. Smith
C. E. Ruggles

Inventor.
Simon Ingersoll
By F. M. Wooster
Atty.

UNITED STATES PATENT OFFICE.

SIMON INGERSOLL, OF GLENBROOK, CONNECTICUT.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 381,838, dated April 24, 1888.

Application filed December 7, 1887. Serial No. 257,175. (No model.)

To all whom it may concern:

Be it known that I, SIMON INGERSOLL, a citizen of the United States, residing at Glenbrook, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Rock-Drills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to simplify and improve the construction of this class of devices, so that the excessive wear upon the several parts of rock-drills as now constructed shall be wholly avoided and the use of the all-important automatic feed shall be made not only possible but quite practicable upon all classes of work, there being no opening through either head of the cylinder, no glands or stuffing-boxes being used, and there being no tappets in contact with the piston to burr it and cause wear upon the cylinder.

With these ends in view I have devised the novel rock-drill of which the following description, in connection with the accompanying drawings, is a specification.

Figure 1 is a front elevation of my novel machine, the drill being in the raised position; Fig. 2, a similar view, the drill being in the lowered position; Fig. 3, a central vertical section of the steam-chest, valve, and cylinder, the piston being in elevation and the position of the parts corresponding with Fig. 1; Fig. 4, a similar view, the position of the parts corresponding with Fig. 2; Fig. 5, a vertical section on a plane at right angles to the plane in Figs. 3 and 4; Fig. 6, a side elevation as seen from the right in Figs. 1 and 2; Fig. 7, a plan view; Fig. 8, a horizontal section on the line *x x* in Fig. 1; Fig. 9, a detail view, upon an enlarged scale, illustrating the attachment of the drill to the spindle; and Fig. 10 is a detail view, on an enlarged scale, of the arm and pawl for actuating the feed-ratchet.

Similar numbers denote the same parts in all the figures.

1 denotes the frame-work, and 2 the sliding carriage moving in ways 3 in the frame-work.

4 denotes the cylinder, which is made integral with or is secured to the carriage; 5, the steam-chest bolted to the cylinder, and 6 a hub for the attachment of the steam-pipe.

7 denotes the piston, 8 the valve, and 9 an arm carried by rock-shaft 10, which is adapted to engage a recess, 11, in the valve and impart motion thereto. Shaft 10 is journaled in the carriage, as clearly shown in Fig. 8, and is provided at one end with a pair of tappets, 12, which are preferably made in a single piece, substantially like a bell-crank lever.

13 denotes the drill bar or spindle, which is journaled in boxes 14 upon the carriage. The drill-bar is provided with a groove, 15, which is engaged by the arms 16^a and 16^b of a carrier, 16, whose shank 17 passes through a slot, 18, in the cylinder and engages the piston, as clearly indicated in Fig. 5.

19 denotes the drill, which engages a recess in the end of the drill-bar and is secured in position by means of a block, 20, which is let into the side of the drill-bar near the end, is provided with a curved face to engage the drill, and is clamped against it by a U-bolt, 21, the arms of which pass through the head of the drill-bar and are secured by nuts 22.

The operation of this portion of my invention is as follows: Steam enters the steam-chest through the pipe connected to hub 6. Starting with the parts in the position shown in Figs. 1 and 3, the steam passes from the steam-chest through port 23 and enters the cylinder above the piston, acting to force the latter downward, carrying the drill-bar with it, until the arm 16^a of carrier 16 (see Figs. 1 and 2) strikes the lower tappet, 12, throwing it from the position shown in Fig. 1 to that shown in Fig. 2, and causing arm 9 to throw the valve from the position in Fig. 3 to the position shown in Fig. 4. This movement of the valve causes it to wholly cover port 23, thus cutting off the entrance of steam above the piston, at the same time uncovering the lower port, 24, so that steam will pass through said port and enter the cylinder below the piston. This forces the piston upward again, causing the steam above the piston to exhaust through port 23 into open space 25, from whence it passes out through exhaust-opening 26. The relative arrangement of the ports and valves is such that it is impossible for the piston to strike either head of the cylinder. Suppose the piston to be moving upward. Before it can reach the upper end of the cylinder the entrance of steam below the piston is

cut off and steam begins to enter above the piston. It will thus be seen that I provide a perfect steam-cushion above and below the piston, and by making both ends of the cylinder solid I avoid the use of glands and stuffing-boxes, prevent the slightest loss of steam, and am enabled to use a relatively larger sized piston and give it much greater bearing-surface. It will be seen in Fig. 5 that neither end of the piston can pass inward beyond the end of slot 18, so that loss of steam through said slot is impossible.

27 denotes packing-rings, which are preferably used upon the cylinder.

As the use of a piston-rod passing through the lower cylinder-head is avoided and an independent drill-bar is used journaled outside of the cylinder, the great wear upon piston, cylinder, and cylinder-heads, which was unavoidable in former constructions, is entirely done away with. Even if the drill should be diverted from a right line, the strain is entirely taken up by the bearings of the drill-bar and cannot be communicated to the piston. Furthermore, it is made impossible for dirt and cuttings to get into the cylinder to wear the packing, and the friction of the rod in the glands is wholly avoided. I am thus enabled to get a much greater power with a given-sized machine, or to produce equal results with a smaller-sized machine having diminished steam-space, on account of the doing away with glands through which the drill-bar must pass.

It will be noticed that in Figs. 1 and 2 I have shown the groove in the drill-bar made wider than the arms of the carrier, so the drill-bar can continue its stroke after the return movement of the piston has commenced, thus enabling the drill to strike the rock with full force before the carrier comes in contact with the upper side of the groove. In this manner, while securing a perfect cushion for the piston, I avoid cushioning the drill, a result never heretofore accomplished, and also greatly reduce the jarring of the machine.

I will now proceed to describe the automatic feed which I use in my improved drill. The special construction of the parts enables it to be readily applied and renders it as durable as any portion of the machine.

28 denotes a bracket projecting upward from the frame-work, which supports a screw, 29. The screw is rigidly secured to the bracket by a nut, 30, and extends downward into a recess, 31, in the carriage.

32 denotes a ratchet, which is internally threaded to engage screw 29, and is held in position by a cross-piece, 33, which is secured to the top of the cylinder by a bolt, 34.

35 denotes a recess in the frame-work, into which the edge of the ratchet projects. This ratchet is actuated by means of a pawl, 36, secured to the upper end of an arm, 37, carried by rock-shaft 38, which is journaled in the carriage, being held in position by a cap, 39.

40 denotes a spring acting to hold pawl 36 in engagement with the teeth of the ratchet. At the other end of rock-shaft 38 is an arm, 41, which extends downward and is curved inward slightly, so that it will be engaged by arm 16^b of carrier 16 each time the carrier moves downward from the position shown in Figs. 1 and 6 to the position shown in Fig. 2.

41^a is a stop-pin which limits the inward movement of arm 41, so that the pawl is in no danger of being carried away from the ratchet. The action of arm 16^b is to throw arm 41, carried by the rock-shaft, outward, and consequently to throw arm 37 inward, causing pawl 36 to move the ratchet forward, and as the latter is in engagement with the thread of screw 29 the carriage is moved downward slightly each time the ratchet is actuated.

42 is a spring engaging arm 37, which acts to throw it outward the moment arm 16^b begins to move upward. This acts to carry pawl 36 to its retracted position, so that at the next downward movement of the piston arm 16^b, by its engagement with arm 41, will cause another movement of arm 37 and the pawl, and consequently another actuation of the ratchet and downward movement of the carriage.

When the drilling of a hole has been completed and it is desired to raise the carriage and drill, this may be accomplished by loosening nut 30 and applying a crank to the squared head 29^a of the screw. The rotation of the screw in the opposite direction of course acts to lift the carriage and with it the drill and the other operative parts of the machine.

The rotation of the drill-bar and the drill is accomplished by means which I will now describe. The drill-bar is provided with a spiral groove, 43, and passes through a ratchet, 44, which is provided with a spline, 45, engaging said groove. This ratchet is held in position by cross piece 33 in the same manner as ratchet 32.

46 is a pawl engaging said ratchet, and 47 a spring acting to hold said pawl in engagement with the ratchet. The operation of this portion of the mechanism is as follows: Pawl 46 holds the ratchet firmly when the upward movement of the drill-bar takes place. Consequently the drill-bar must slide through the ratchet, the engagement of spline 45 with groove 43 causing the drill-bar to move spirally and make a partial turn. When the downward movement of the drill-bar takes place, the ratchet, not being held by pawl 46, is left free to turn through the engagement of spline 45 with the spiral groove in the drill-bar, the force of the movement being sufficient to carry the drill-bar straight down, so that the ratchet is necessarily turned forward, the teeth sliding freely under the pawl until the movement is finished, when the pawl locks the ratchet, causing a partial turn of the drill-bar during the upward movement, as already explained.

I will now proceed to describe the manner in which the drill is supported in use.

48 denotes a circular undercut recess in the back of the frame-work, and 49 a circular block adapted to engage said recess and turn therein.

50 is a tripod-shaft, which is journaled partially in block 49 and partially in block 51, which is secured thereto by bolts 52, which pass through block 51 and lie in recesses 53 therein. These bolts are provided with enlarged heads 54, which engage the overhanging portion of the undercut recess 48 in the frame-work. In assembling, the heads of the bolts are first placed in recess 48. Block 49 is then passed in, the bolts lying in recesses 53. Shaft 50 is then placed in position, block 51 placed over that, bolts 52 passing through it, and the parts are then secured together and in place by nuts 55, which engage the outer ends of bolts 52. When it is desired to shift the frame-work upon block 49, it may be done by slightly loosening nuts 55, which permits the frame-work to turn upon block 49 and the heads 54 of bolts 52. When the frame-work has been placed in the desired position, the nuts are tightened up, which acts to draw the heads of the bolts against the overhanging portion of recess 48, thus locking the frame-work in position.

56 denotes the central leg of the tripod, which is provided with curved branches 57, which are pivoted to arms 58, which are made integral with the tripod shaft.

59 denotes the outer legs, which are provided at their upper ends with plates 60, and are secured to the ends of the tripod-shaft by screw-pivots 61.

62 denotes curved slots in plates 60, and 63 set-screws which pass through these slots and engage arms 58. It will be seen that by loosening set-screws 63 the legs may be placed in any desired position, and that they may then be locked in position by tightening up the set-screws again.

It will of course be understood that the details of construction may be greatly varied without departing from the principle of my invention.

I claim—

1. In a rock-drill, a cylinder closed at both ends and having a slot through one side, and a piston adapted to reciprocate in said cylinder, in combination with an independent drill-bar and a carrier for said drill-bar, whose shank passes through said slot and engages the piston.

2. The cylinder closed at both ends and having a slot in one side, and a piston adapted to reciprocate in said cylinder, in combination with an independent drill-bar and a carrier having arms which embrace the drill-bar, and a shank which passes through the slot in the cylinder and engages the piston.

3. The frame-work, the carriage, and a cylinder upon said carriage closed at both ends and having a slot, 18, in combination with a drill-bar journaled in said carriage and having a groove, 15, and a carrier having arms which engage said groove, and a shank which passes through said slot and engages the piston, said groove being wider than said arms, so that the drill-bar can continue its stroke after the return movement of the piston has commenced, enabling the drill to strike the rock with full force before the carrier comes in contact with the upper side of the groove.

4. The cylinder having ports 23 and 24 and slot 18, the piston, drill-bar 13, and a carrier having an arm, 16^a, which engages the drill-bar, and a shank passing through said slot and engaging the piston, in combination with a valve adapted to cover and uncover said ports alternately, and a rock-shaft, 10, having an arm engaging said valve, and tappets 12, which are engaged by arm 16^a in the upward and downward movements of the drill-bar to control the movements of the valve.

5. The combination, with a cylinder closed at both ends and having a slot, 18, an independent drill-bar, and a carrier having an arm, 16^a, engaging the drill-bar, and a shank passing through said slot and engaging the piston, of a rock-shaft carrying tappets 12, one of which is engaged by arm 16^a in its upward movement and the other engaged in its downward movement, as and for the purpose set forth.

6. The frame-work, the carriage sliding therein, a cylinder upon said carriage closed at both ends and having a slot, 18, a piston in said cylinder, an independent drill-bar, a carrier having an arm, 16^b, engaging said drill-bar, and a shank passing through said slot and engaging the piston, in combination with a screw, 29, carried by the frame-work, a ratchet, 32, upon the carriage, which is internally threaded to engage the screw, and connecting mechanism, substantially as described, whereby each downward movement of arm 16^b is caused to actuate said ratchet and impart a downward movement to the carriage.

7. In a rock-drill, an automatic feed consisting of a screw attached to the frame-work, a ratchet upon the carriage internally threaded to engage the screw, a reciprocating arm, 16^b, a rock-shaft, 38, having arms 37 and 41, one of which is engaged by arm 16^b, and the other carries a spring-pawl engaging the ratchet, whereby each downward movement of arm 16^b carries the ratchet forward and moves the carriage downward.

8. A steam-cylinder closed at both ends and having slot 18, a piston, and an independent drill-bar, in combination with valve mechanism, automatic feed mechanism, and a carrier having a shank passing through said slot and engaging the piston, and arms 16^a 16^b, which engage the drill-bar and also actuate the valve mechanism and the feed mechanism.

9. The combination, with valve mechanism and feed mechanism, of a steam-cylinder closed at both ends and having a slot in its side, a

piston, an independent drill-bar, and a carrier therefor having a shank which passes through the slot and engages the piston, and arms 16^a 16^b, which actuate, respectively, the valve mechanism and the feed mechanism.

10. The combination, with a carriage, a cylinder closed at both ends and having a slot in its side, an independent drill-bar having a spiral groove, a piston in said cylinder, and a carrier for the drill-bar, whose shank passes through the slot and engages the piston, of ratchet 44 upon the carriage, through which the drill-bar passes and which is provided with a spline engaging the spiral groove, and a pawl adapted to hold said ratchet against backward movement.

11. The carriage, the cylinder closed at both ends and having slot 18, a piston in said cylinder, and an independent drill-bar journaled in the carriage and having a spiral groove, in combination with a carrier connected to said drill-bar and to the piston, whereby the movements of the latter are communicated to the former, a ratchet, 44, through which the drill-bar passes and which is provided with a spline engaging the groove, and a bolt acting to hold the ratchet against backward movement, so that when said drill-bar is raised a partial turn is imparted thereto through the engagement of said spline and groove, and when the downward movement takes place the ratchet is free to turn.

12. The steam-chest, valve 8, having recess 11, and the cylinder closed at both ends and having ports 23 and 24, open space 25, exhaust-opening 26, and slot 18, in combination with a piston, an independent drill-bar, a carrier therefor having a shank engaging the piston, and an arm, 16^a, and a rock-shaft having an arm engaging the valve, and tappets engaged by arm 16^a, all operating as described, and for the purpose set forth.

13. The steam-chest, valve, cylinder, piston, and valve mechanism constructed substantially as described, in combination with feed mechanism, an independent drill-bar, and a carrier therefor having a shank engaging the piston, and arms engaging the drill-bar, one of said arms being adapted to actuate the feed mechanism and the other to actuate the valve mechanism.

In testimony whereof I affix my signature in presence of two witnesses.

SIMON INGERSOLL.

Witnesses:
GRAHAM R. HOLLY,
CHARLES E. HOLLY.