(No Model.) 3 Sheets—Sheet 1.

E. A. RIX.

ROCK DRILL.

No. 454,228. Patented June 16, 1891.

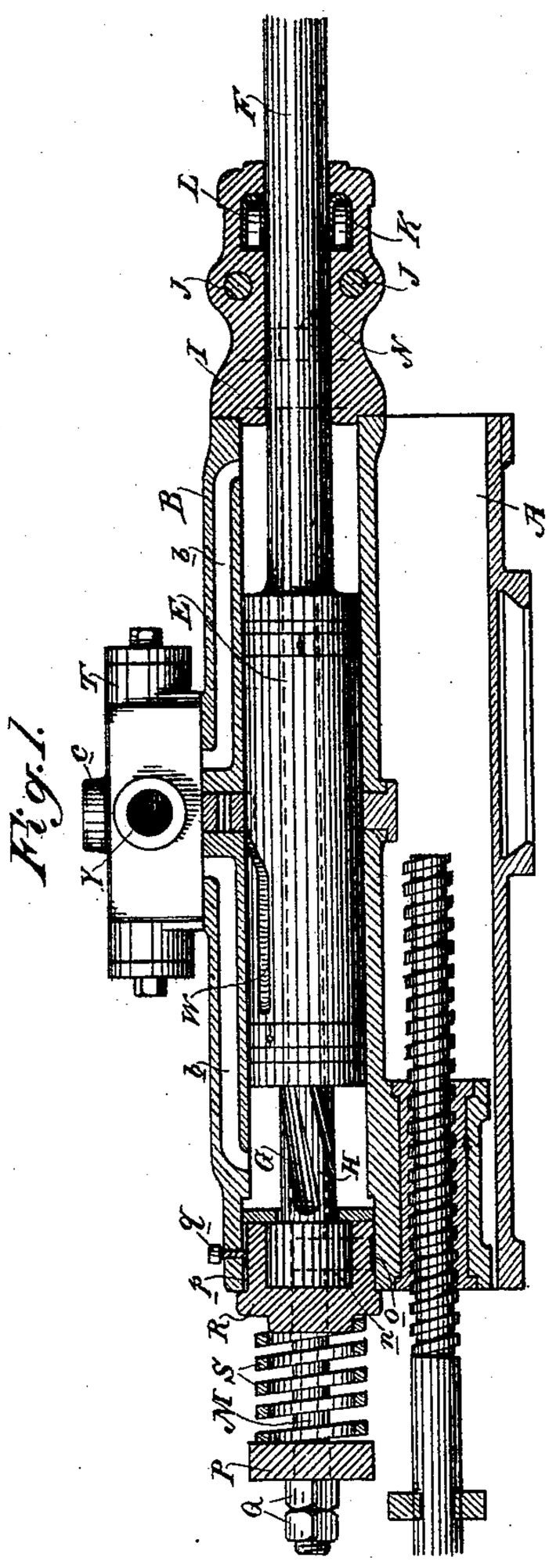

Fig. 1.

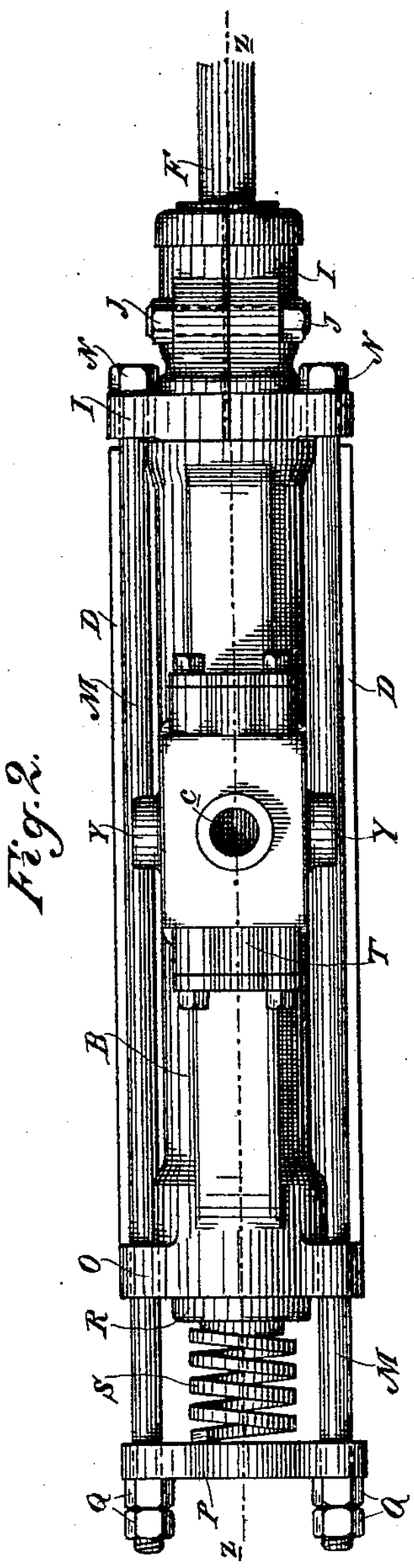

Fig. 2.

Witnesses,
F. L. Ames
H. C. Lee.

Inventor,
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By Dewey & Co
Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

E. A. RIX.

ROCK DRILL.

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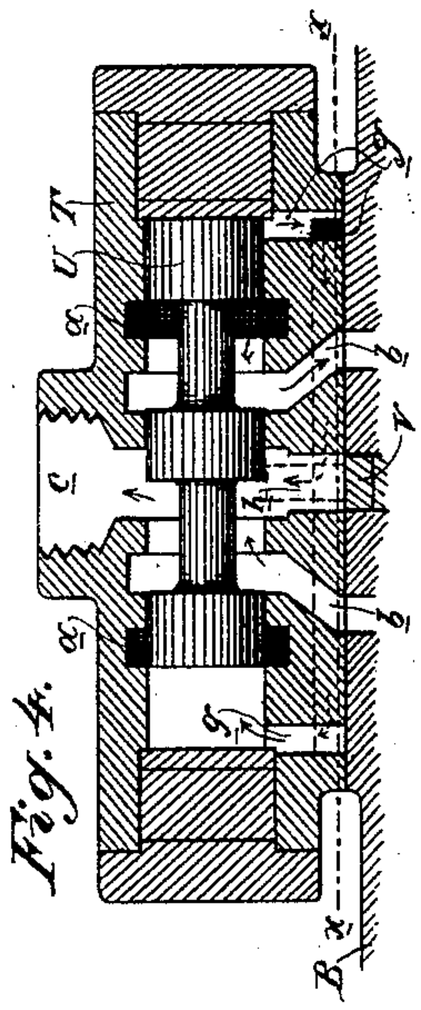

Fig. 4.

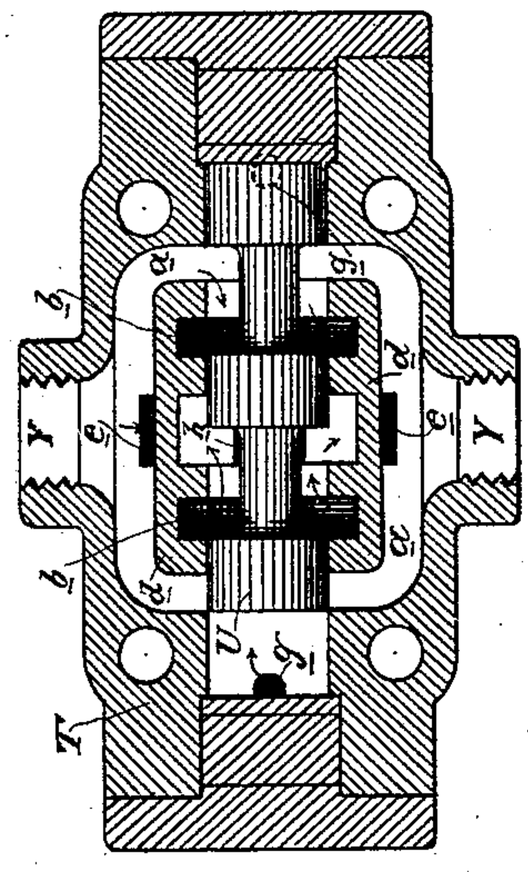

Fig. 5.

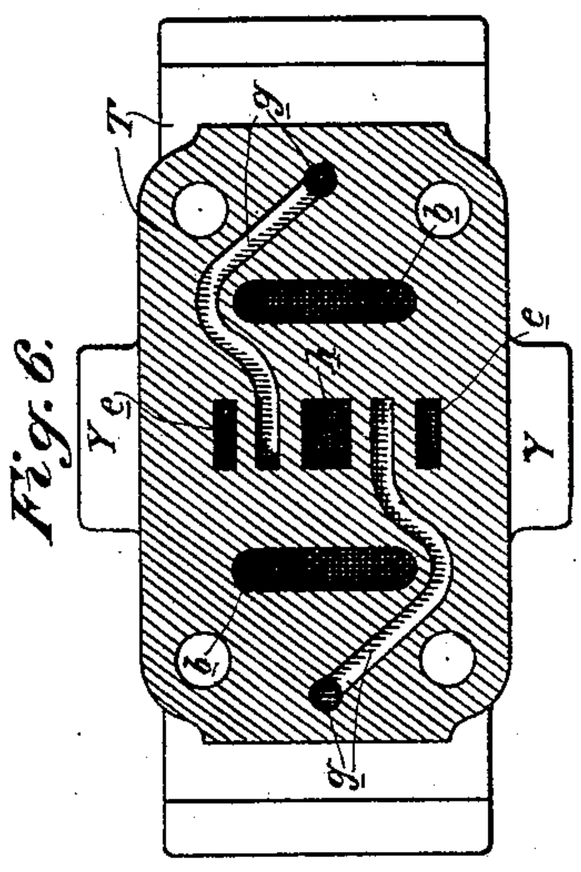

Fig. 6.

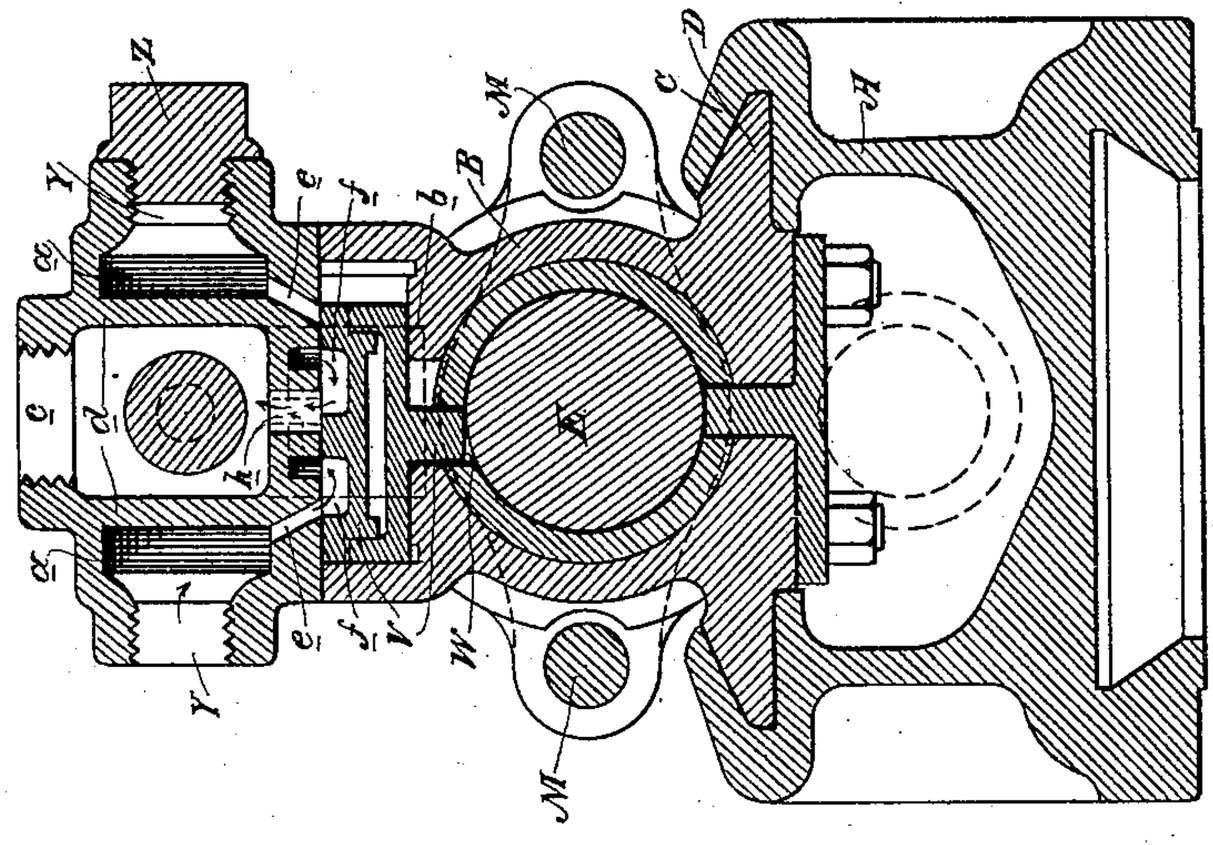

Fig. 3.

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(No Model.)

3 Sheets—Sheet 3.

E. A. RIX.

ROCK DRILL.

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Fig. 7.

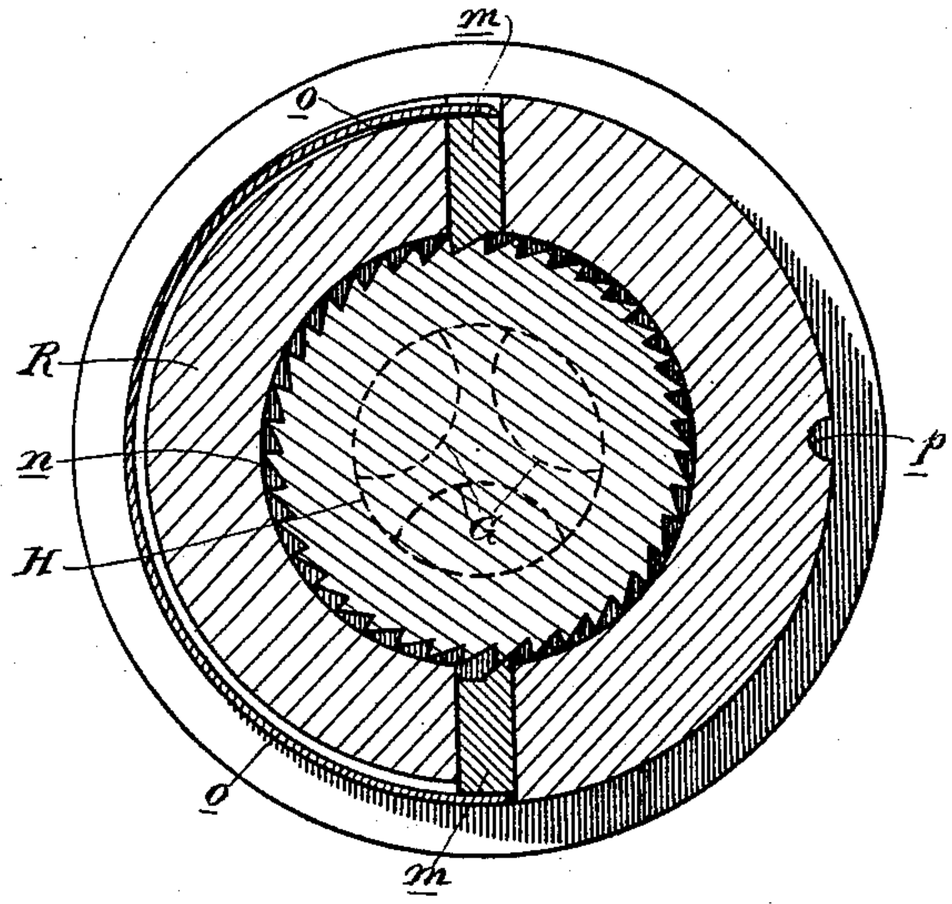
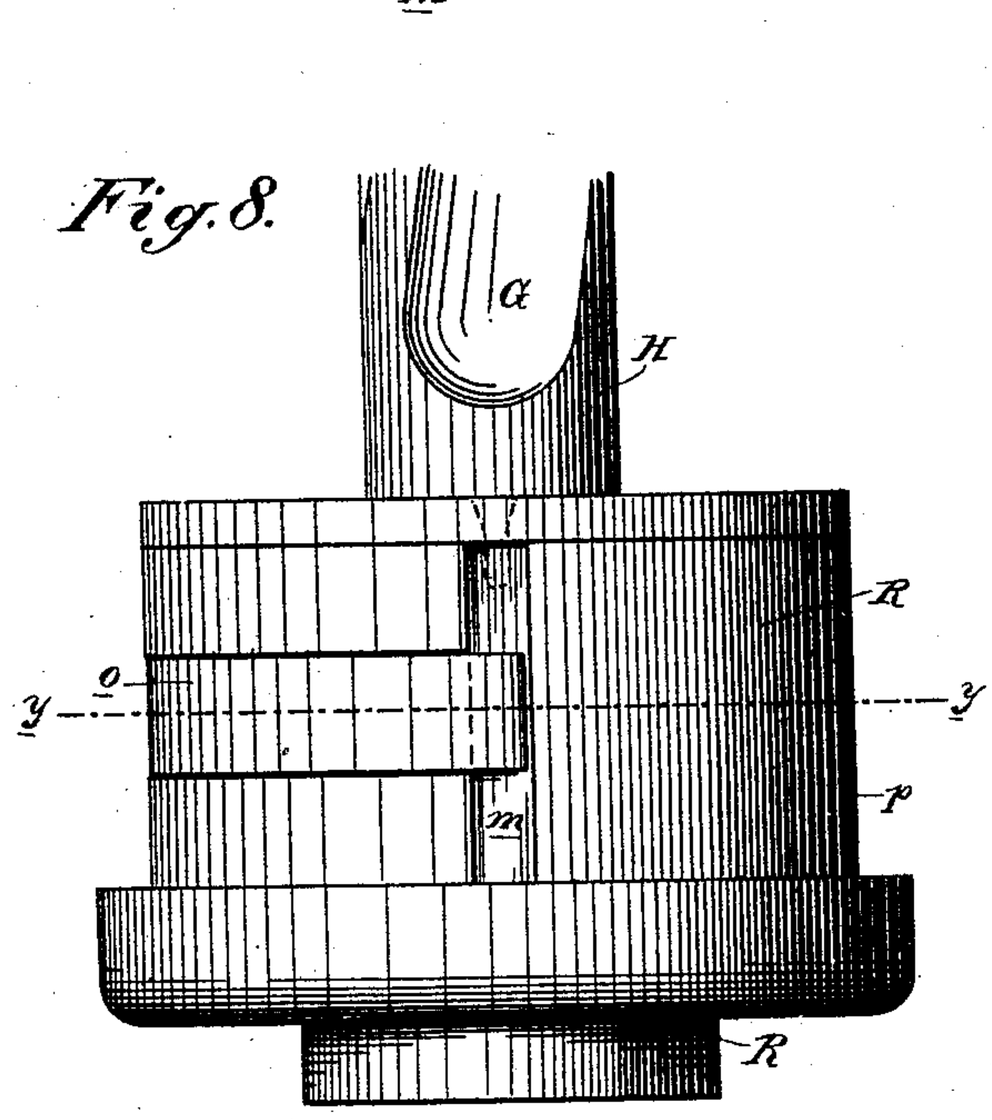


Fig. 8.



Witnesses,
H. C. Lee.

Inventor,
Edward A. Rix
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Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDWARD A. RIX, OF SAN FRANCISCO, CALIFORNIA.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 454,228, dated June 16, 1891.

Application filed August 30, 1890. Serial No. 363,539. (No model.)

To all whom it may concern:

Be it known that I, EDWARD A. RIX, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Rock-Drills; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to certain improvements in rock-drills of that class in which the drill is connected with a piston working in a cylinder under air-pressure, and in which the valve mechanism is so arranged that the reciprocation of the piston and drill will be produced automatically.

My invention consists in certain details of construction, which will be more fully explained in the following specification.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a longitudinal vertical section taken through the chamber of the cylinder of the piston which actuates the drill, showing the end of the supplemental valve and an exterior view of the main-valve chamber and the relieving device. Fig. 2 is a plan or top view of the same. Fig. 3 is a transverse vertical section taken through the main supplemental-valve chambers and the main cylinder and piston. Fig. 4 is a longitudinal vertical section taken through the main-valve chamber, showing the valve within it. Fig. 5 is a horizontal section of the same. Fig. 6 is a section taken through line *x x* of Fig. 4. Fig. 7 is a transverse section of the drill-head and ratchet mechanism on the line *y y* of Fig. 8. Fig. 8 is an exterior side view of the same.

A is the bed piece or frame, upon which the cylinder B is mounted.

C are the guides in the bed, and D are the slides connected with the cylinder traveling in these guides, so as to allow the cylinder to be advanced longitudinally upon the bed-piece in the usual manner, these forming no portion of my present invention.

E is the piston, reciprocating within the cylinder B and acting through the rod F upon the drill. The spiral grooves G in the shank H serve to turn the drill-head during this reciprocation, these parts operating in the usual manner for rock-drills. The rod F extends outwardly through the head I, which I have shown in the present case formed in two halves, bolted together by bolts at J. Within this head is formed a chamber K, surrounding the rod F and adapted to receive an annular folded ring of leather or flexible material L, which serves as a packing for the piston-rod. This flexible packing is bent upon itself, as shown in Fig. 1, so that the inner portion of it presses against the rod and the outer portion against the interior of the chamber K, the fold being toward the outer end of the head and the open portion of the packing facing toward the cylinder. The head I fits upon the end of the cylinder B, as shown, and extends outwardly therefrom far enough to contain this stuffing-box and packing. Through the projecting flanges of the head I and exterior to the cylinder the rods M pass, having heads or nuts, as shown at N, which abut against the head I. These rods M extend parallel with the cylinder and pass loosely through the flange O at the opposite end of the cylinder, extending beyond this flange and passing through a cross-head P, as shown in Figs. 1 and 2. Nuts Q upon the exterior end of the rods secure them to this cross-head. Between the cross-head P and the head R at this end of the cylinder B is fitted a stout spring S, the tension of which is sufficient under ordinary conditions, acting against the cross-head P and through the rods M, to retain the head I in place against the opposite end of the cylinder; but if, through the reciprocation of the piston E, it should pass too far and exert any undue pressure upon the head I the spring S would allow this head to move, and thus relieve itself temporarily from the pressure by allowing the air which is cushioned between the end of the piston and the cylinder-head to escape at this point. The spring is sufficiently stiff to immediately return the head to its place and to retain it there under the ordinary conditions of the operation of the apparatus.

T is the main-valve chamber, within which the piston-valve U reciprocates parallel with the main piston, and V is a supplemental valve moving transversely in a chamber beneath the main chamber T. This supplemental valve is reciprocated transversely by the inclined cam-groove W on the main piston E, and by its action admits steam to move

the main valve U, which in turn admits steam to the main cylinder to actuate the piston E. By this construction but very little power is exerted through the cam-groove W of the main piston to operate the small supplemental valve V, and this valve opens ports which admit air to reciprocate the main valve U. The construction of these valves and ports is well shown in Figs. 3, 4, 5, and 6. Air is admitted into the main-valve chamber T through either of the passages Y which is most convenient for the position of the apparatus with relation to the supply, the other passage being closed by a screw-cap, as shown at Z, Fig. 3. Within the valve-chamber is an annular passage *a*, (shown at Fig. 5,) which entirely surrounds and incloses the main steam-ports *b* and the exhaust-port *c*. Between this passage and these ports is a diaphragm or partition *d*, which cuts off direct communication between the annular passage and the ports, as is well shown in Fig. 5. Exterior to this diaphragm are the ports *e*, communicating directly with the annular passage and allowing air to pass through them and into the valve-chamber of the auxiliary valve V. This valve V is made with two interior chambers in its face, as shown at *f*, Fig. 3. These chambers alternately connect the passages *e* with the passages *g*, through which air is admitted to reciprocate the piston-valve U and also with the exhaust-passage *h*, through which the air is allowed to escape after it has completed its work.

b are the ports through which the air is admitted by the movements of the valves U alternately to each end of the cylinder B to actuate the piston E, and through which it is also allowed to exhaust after its work is done, the exhaust taking place also through the exhaust-passage *h*, which serves for the auxiliary valve, as shown more plainly in Figs. 4 and 5.

Figs. 7 and 8 show an enlarged transverse section and side view, respectively, of the drill-head R.

m are pawls fitted into radial slots in the drill-head R and engaging the teeth of the ratchet *n*, which is fixed upon the end of the stem H within the drill-head. These pawls are so arranged with reference to the teeth of the ratchet that when one pawl is engaged with one of the teeth the opposite pawl will stand midway between the teeth upon that side. By this construction I insure the engagement of the pawls with the teeth of the ratchet, either upon one side or the other, with a very small amount of rotation, while at the same time the teeth of the ratchet are made double the size and strength which would otherwise be required. In order to retain these pawls in contact with the ratchet-teeth, I employ a single segmental spring *o*, which is fitted into a chamber in the drill-head, and it is bent to a curvature somewhat smaller than the circle of the chamber within which it lies, so that the ends will press upon the ends of the pawls *m*, and a single spring thus acts to hold both pawls in contact with the ratchet.

p is a groove or channel in the turned-down part of the drill-head, and a set-screw *q*, passing through the cylinder B, enters the groove and serves for the purpose of keeping the head R from turning with the stem H, this head being fitted into the cylinder in the same manner as head I, and it is also similarly actuated by the spring S.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rock-drill, the cylinder, reciprocating piston, a valve-chamber having the main valve reciprocating therein, and supply and exhaust ports whereby air or fluid under pressure may be admitted to and exhausted from the main cylinder, in combination with the transversely-moving slide-valve, a stud projecting from said valve into the main cylinder, and a sleeve fitting the piston within said cylinder and having the cam-shaped groove with which the stud engages, whereby the supplemental valve is actuated, and the supplemental steam-ports *e* and *g* and the exhaust-port *h*, arranged and operating with relation to each other and to the main valve substantially as herein described.

2. In a rock-drill, the cylinder, reciprocating piston, main-valve chamber having the supply-ports *b* leading to the main cylinder, the supplemental valve moving in its separate chamber transversely to and independent of the main valve, the supply-ports *e g*, through which air is admitted by the supplemental valve to drive the main valve, a stud projecting from the supplemental valve and engaging a cam-groove upon the main piston, whereby said supplemental valve is reciprocated by the movements of the main piston, and an exhaust-passage common to the main and supplemental valve and arranged with relation thereto substantially as herein described.

3. In a rock-drill, the combination of a reciprocating piston, a spirally-grooved drill-rod, a drill-head having radial slots formed through it, a disk having peripheral ratchet-teeth, pawls mounted to slide in the radial slots in the drill-head and arranged at opposite sides of said head, one of said pawls engaging one of the teeth of the ratchet-disk on one side, while the other pawl stands midway between contiguous teeth on the opposite side, and a spring fitting loosely in a chamber with its ends pressing upon the outer ends of the pawls for forcing them toward the center, substantially as herein described.

In witness whereof I have hereunto set my hand.

EDWARD A. RIX.

Witnesses:
S. H. NOURSE,
H. C. LEE.