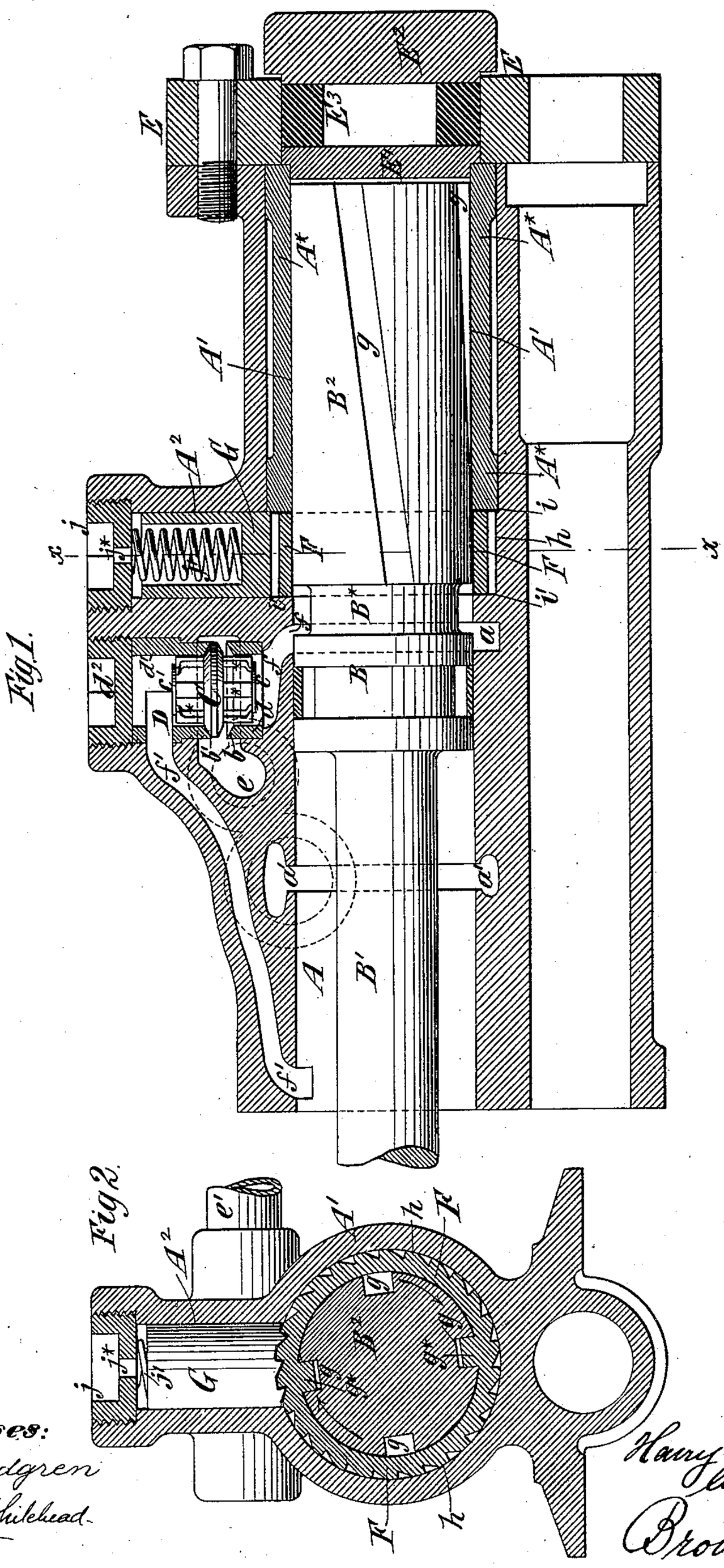
(No Model.) 2 Sheets—Sheet 1.

# H. C. SERGEANT.

## ROCK DRILL.

No. 308,523. Patented Nov. 25, 1884.




Witnesses:
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" Louis M. V. Whitehead

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Brown & Hall

(No Model.) 2 Sheets—Sheet 2.

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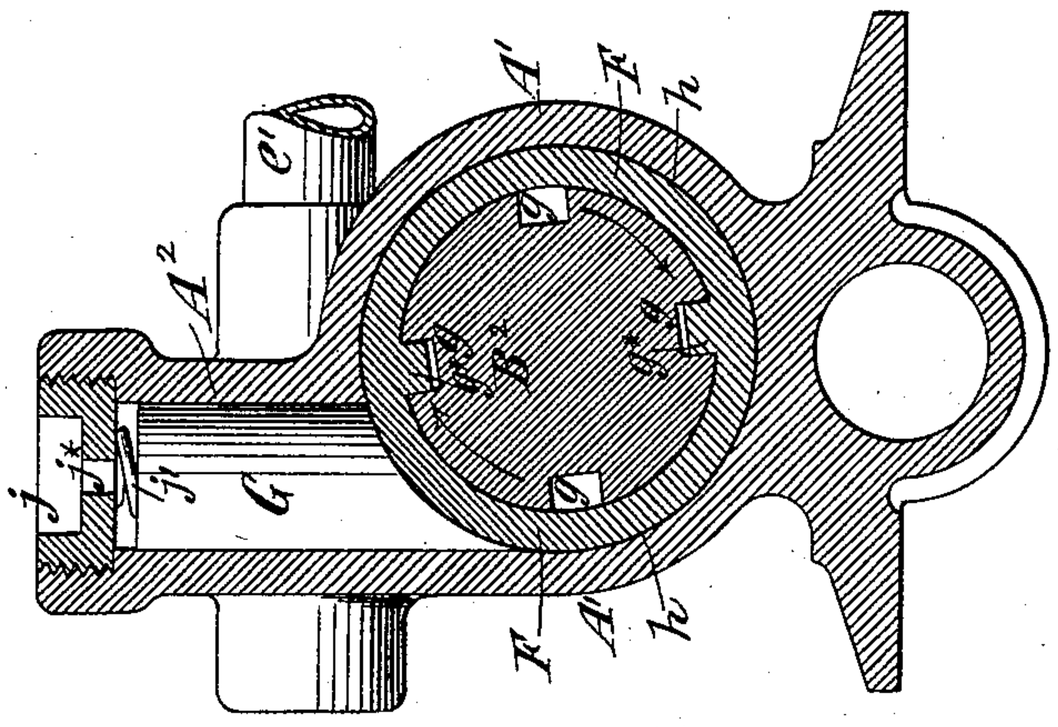
Fig. 3.

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# UNITED STATES PATENT OFFICE.

HENRY C. SERGEANT, OF NEW YORK, N. Y.

## ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 308,523, dated November 25, 1884.

Application filed May 15, 1884. (No model.)

*To all whom it may concern:*

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

My invention relates, principally, to the mechanism employed for rotating the piston and drill-rod of a rock-drill; but it also relates, in part, to a novel combination and arrangement of the cylinder and ports or passages with the valve which forms the subject of my Letters Patent No. 295,682, granted March 25, 1884.

An important object of my invention is to secure a better guidance of the piston and piston-extension in the cylinder than has heretofore been possible in rock-drills; and the invention consists in novel combinations of parts and details of construction, which are hereinafter described, and set forth in the claims.

In the accompanying drawings, Figure 1 is a longitudinal section of such parts of a rock-drill as are necessary to illustrate my invention. Fig. 2 is a transverse section on the dotted line *x x*, Fig. 1; and Fig. 3 is a similar section illustrating a modification of my invention.

Similar letters of reference designate corresponding parts in all the figures.

A designates the cylinder of the drill, and B the piston, which is properly packed, and from which the piston-rod B′ extends. At the back end of the piston is a piston-extension, $B^2$, which may be made in one with the piston B, and which is joined thereto by a neck or portion, B*, of reduced diameter. The piston-extension $B^2$ is shown as of the same diameter as the piston B, and consequently fits the cylinder A, when moved thereinto, in the working-stroke of the drill.

Beyond the cylinder A is a cylinder-extension, A′, which is of approximately the same diameter as the cylinder, and in which the piston-extension fits snugly. The bearing or guiding surface for the piston-rod is therefore as long as the piston and piston-extension combined.

Between the cylinder A and cylinder-extension A′ is an annular groove or cavity, *a*, the purpose of which will soon be understood, and near the middle of the length of the cylinder A is annular exhaust belt or cavity, *a′*, from which leads the exhaust-passage.

C designates the induction-valve for the motive agent, the construction and operation of which are fully described in my before-mentioned patent. It consists of a double puppet-valve working between two seats, *b b′*, and having attached to its opposite sides guiding-arms * and small disks or plates *c c′*. The valve-chest D is radial to the cylinder, and the seats are formed by separate pieces *d d′*, which are inserted thereinto and are held in place by a plug, $d^2$. The fluid-inlet passage or cavity *e* is supplied from either side by a pipe, *e′*, and therefrom the fluid passes through the seat *b* and port or passage *f* to the right-hand end of the cylinder, or through the seat *b′* and port or passage *f′* to the left-hand end of the cylinder.

In the piston-extension $B^2$ are spiral or oblique grooves *g*, four of which are here shown, and which extend from the portion B*, of reduced diameter, to the end of the piston-extension. Consequently it will be seen that whenever the motive agent passes through the seat *b* and port or passage *f* it enters the annular groove *a* between the cylinder and cylinder-extension which is opposite the neck B* of the piston, and therefrom the steam or motive agent can pass freely through the spiral grooves *g*, to act upon the right-hand end of the piston-extension $B^2$ to make the working-stroke of the drill.

To the end of the cylinder-extension A′ is securely bolted an annular piece, E, which is bored out slightly larger than the said extension, and in which are fitted the back head, E′, and a follower, $E^2$, with a cushion, $E^3$, interposed between them. The follower $E^2$ is connected by bolts (not here shown) with the forward head of the cylinder, as described in my aforesaid patent, and the head E′, which is supported by the cushion $E^3$, can yield slightly when struck by the end of the piston-extension $B^2$. As here shown, the valve C has just shifted to open the seat *b*, and at this time the port or passage *f′* is in free communication with the exhaust belt or cavity *a′*. The motive fluid entering through the port *f* passes through the spiral grooves *g*, and, acting on the right-hand end of the piston-extension $B^2$,

forces the latter and the piston toward the left. As soon as the piston B covers and passes the exhaust-cavity $a'$, the vapor remaining in the left-hand end of the cylinder is trapped and slightly compressed, and its pressure acting on the valve C, together with the drawing force of the incoming fluid on the small disk or plate $c$ of the valve, will be sufficient to move the valve to cover and close the seat $b$, and to open the seat $b'$ to admit the motive fluid through the port $f'$ and to check the piston just as the drill strikes its blow. The operation of the valve C is fully described in my former patent, above referred to, and no further description thereof is here necessary. In my former patent the piston-extension was spirally grooved throughout its circumference, and hence its wearing-surface was greatly reduced, and in that patent the device for turning the piston engaged directly with the said extension. In my present invention the extension has a smooth surface, broken only by the spiral grooves $g$, which may be of little width, and the device for rotating the piston does not engage with the piston-extension, but with a ring or nut, F, which is fitted in an annular groove or seat, $h$, in the cylinder-extension A', and which is in spiral engagement with the piston-extension $B^2$. The interior of the ring or nut F is formed with two or more tongues or short ribs, $g^*$, which engage two opposite spiral grooves, $g$, of the piston-extension, as shown in Figs. 2 and 3. The ribs or tongues $g^*$ do not extend inward the full depth of the grooves, and the motive fluid is free to pass through these two grooves, as well as through the other two, which are unobstructed.

In order to form the annular seat $h$ so that the ring or nut F will be held against axial movement while allowing it to turn freely, I may bore out the cylinder-extension A' to a size slightly larger than the diameter of the ring up to the shoulder $i$, and then continue to bore to the same diameter as the said ring up to the shoulder $i'$. A long bush, A*, which is then inserted up to the shoulder $i$, is held in place by the annular piece E at the end of the cylinder-extension, and thus the annular seat $h$ for the ring F is formed. The internal diameter of the bush A* is equal to the bore of the cylinder A, and the said bush forms the bore of the cylinder-extension A'.

It will be understood that inasmuch as the ring F is capable of rotation only, and is in engagement with the piston-extension, the latter cannot move through said ring without a partial rotation of one of said parts—that is, if the ring is left free, the piston and extension will move without turning, while the ring will turn; but if the ring is held against turning the piston and extension will be turned or rotated as they reciprocate.

In order to avoid any side wear on the piston-extension, I make the ring fit more snugly in the seat $h$ than upon the extension $B^2$, and consequently the ring will be supported against side pressure by its periphery fitting the seat, and not by its interior fitting the piston-extension.

The pawl or dog (represented in Figs. 2 and 3) for turning the piston consists of a cylindric plug, G, fitted to a socket or slideway, $A^2$, the axis of which is transverse to the cylinder-extension, and the outer end of which is closed by a plug or bonnet, $j$, perforated at $j^*$. The plug G is held in its inward position by a spring, $j'$, acting upon it, and the hole $j^*$ forms a vent to allow the pawl or dog to move freely. The inner face of the pawl or dog is formed with ratchet-shaped teeth, which engage with the toothed periphery of the ring or nut, and so hold it against turning in one direction. It is desirable to leave the piston free to move without turning during its forward or working stroke, and to cause it to turn during its backward stroke. When the valve C is in the position shown, the motive fluid in the cylinder-extension will act upon the face of the pawl or dog G, to force it back or outward against the force of the spring $j'$ and out of engagement with the toothed periphery of the ring F. The piston then moves without turning, while the ring F turns freely. During the return or backward movement of the piston, which is effected by pressure on its left side, the agent does not act upon the pawl or dog G, and the latter is by its spring $j'$ held in engagement with the toothed periphery of the ring F, and the ring is thus held against turning. Consequently during the backward movement of the piston the latter and the piston-extension $B^2$ will be turned by the spiral engagement of the ring and extension $B^2$.

When it is desired to turn the piston by hand, it may be readily done in the direction of the arrow, Fig. 2, the teeth of the ring or nut F moving freely under the pawl or dog G.

In the modification of my invention shown in Fig. 3 the socket or slideway $A^2$ is tangential to a circle nearly as large as that of the piston-extension $B^2$, and the face of the pawl or dog G is curved to fit the periphery of the ring or nut F, both being here shown as smooth and without teeth. When it is desired to turn the piston by hand, it may be done in the direction of the arrow, Fig. 3, but not in the opposite direction, owing to the wedge-like form of the face of the pawl or dog. Owing to the comparatively large diameter of the ring F, the turning of the piston is accomplished with but little power, and but a light spring, $j'$, is necessary. When the pawl or dog is forced outward by the pressure of the motive fluid upon its face, its outer end seats on the plug $j$, and so prevents the escape of fluid through the aperture $j^*$.

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

1. The combination, with the cylinder of a rock-drill having an extension which is of the same diameter as the cylinder, and is provided with an annular groove or seat in its interior, of a piston and a piston-extension of uniform diameter fitting the cylinder and cyl-

inder-extension, a nut having a spiral engagement with the piston-extension and capable of turning in said annular groove or seat, and a pawl or dog engaging with the periphery of said nut and holding it against turning during the movement of the piston and piston-extension in one direction, substantially as and for the purpose herein described.

2. The combination, with the cylinder of a rock-drill, of a piston and piston-extension, a nut or ring capable of a turning movement only, and having a spiral engagement with the piston-extension, and a spring-actuated pawl or dog engaging with the periphery of the nut or ring to hold it against turning during the movement of the piston in one direction, and capable of being forced back by the pressure of the motive agent upon its face to free it from said nut or ring during the movement of the piston in the other direction, substantially as and for the purpose herein described.

3. The combination, with the cylinder and cylinder-extension A A′, of like diameter, the latter being formed with the annular groove or seat *h*, of a piston and piston-extension of equal diameter fitting said cylinder and cylinder-extension, a nut or ring having a spiral engagement with said piston-extension, and capable of turning in said groove or seat, and a spring-actuated pawl or dog engaging with the periphery of said nut or ring to hold it against turning during the movement of the piston and piston-extension in one direction, and capable of being forced back by the action of the motive agent upon its face to free it from said nut or ring during the movement of the piston and piston-extension in the other direction, substantially as and for the purpose herein described.

4. The combination, with the cylinder A and cylinder-extension A′, of the bush A*, fitted to the interior of the latter, and forming an annular seat or groove, *h*, the piston and piston-extension fitting said cylinder and cylinder-extension, and the nut or ring capable of turning in said seat or groove, and having a spiral engagement with the piston-extension, substantially as and for the purpose herein described.

5. The combination, with the cylinder A, having the exhaust port or cavity *a′* between its ends, of the valve-chest D, containing the seats *b b′*, and ports *f f′*, leading to opposite ends of the cylinder, and containing an inlet-cavity, *e*, between said seats, the double puppet-valve C, capable of movement between said seats, and arranged with its axis transverse to the axis of the cylinder, and provided with the disks *c c′*, and the piston B, fitted to the cylinder and controlling the exhaust port or cavity, substantially as and for the purpose herein described.

H. C. SERGEANT.

Witnesses:
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FREDK. HAYNES.