(No Model.)

J. G. LEYNER.

ROTARY FEEDING DEVICE FOR ROCK DRILLS.

No. 568,089. Patented Sept. 22, 1896.

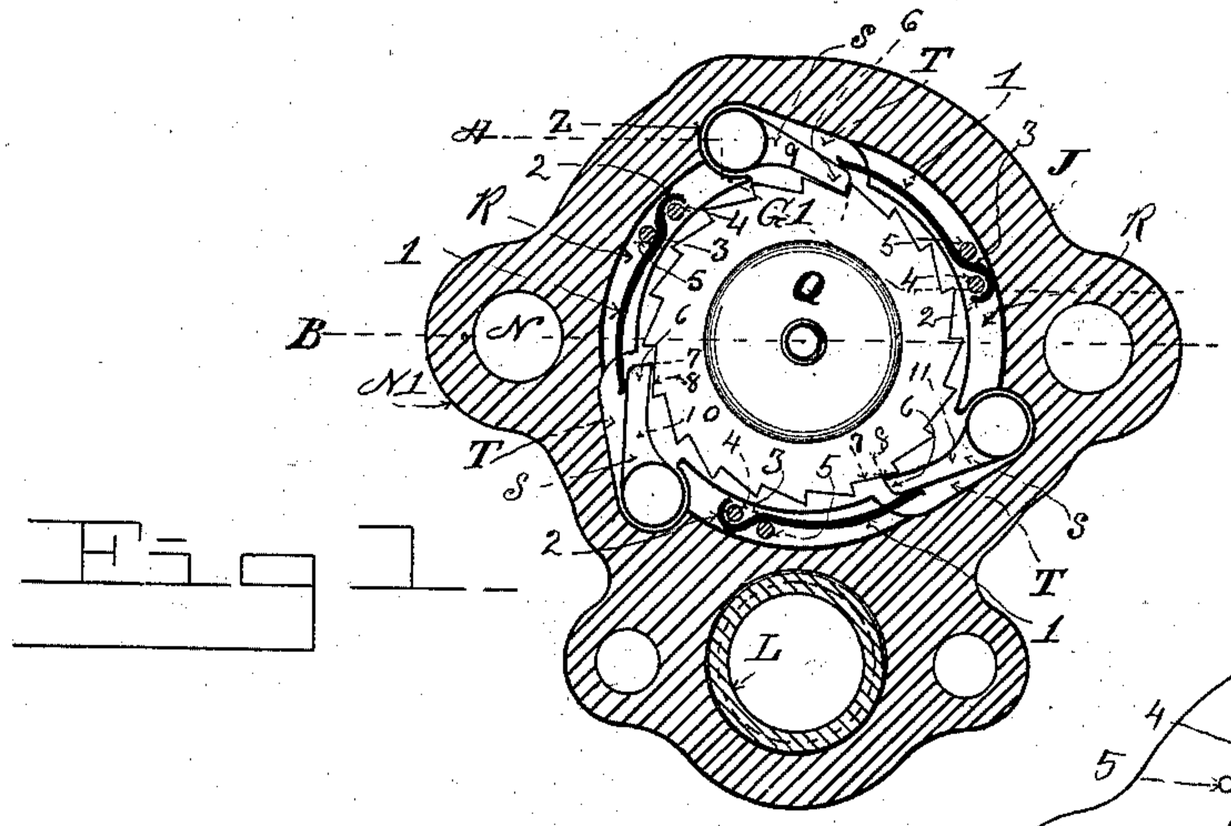

Fig 1.

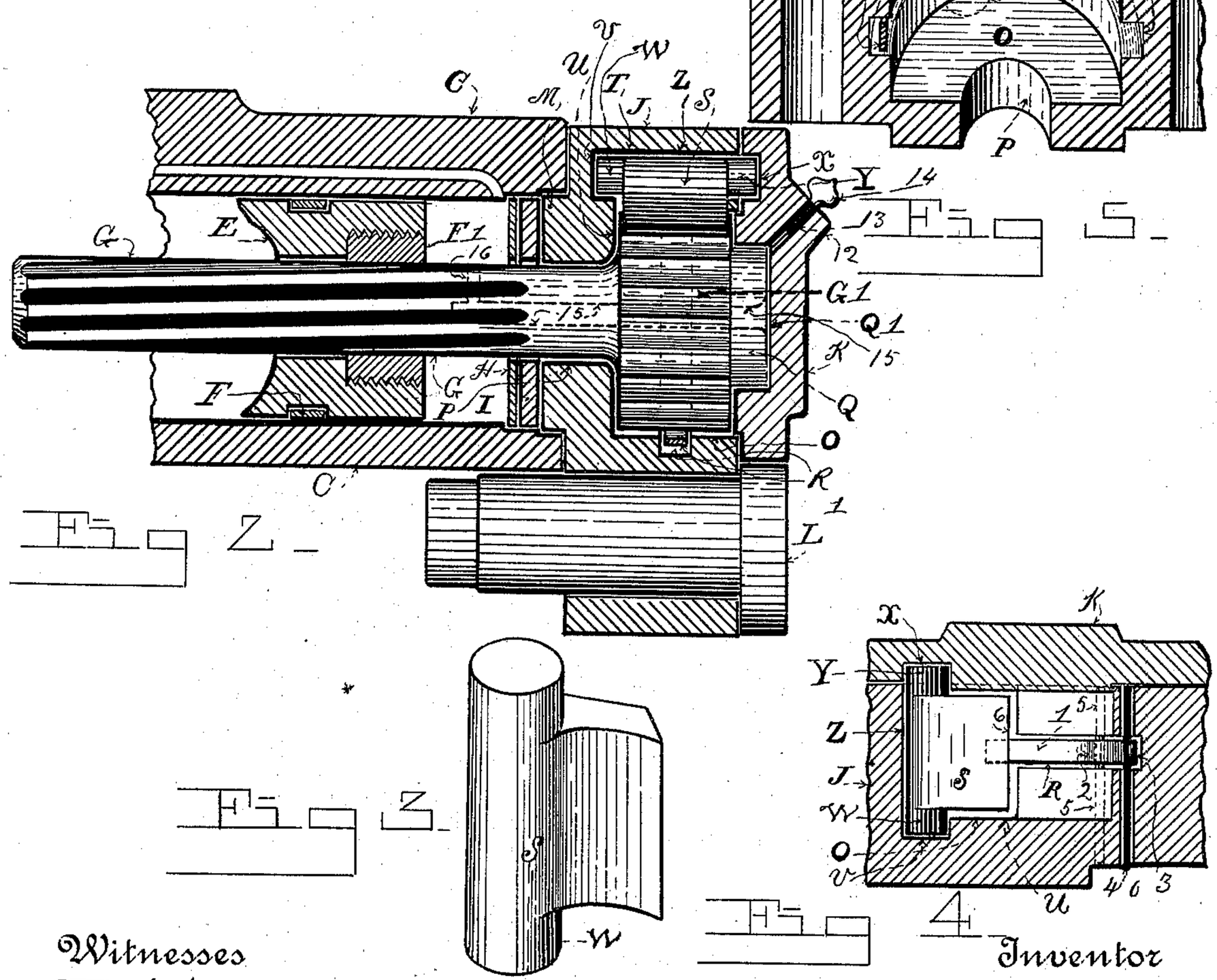

Fig 5.

Fig 2.

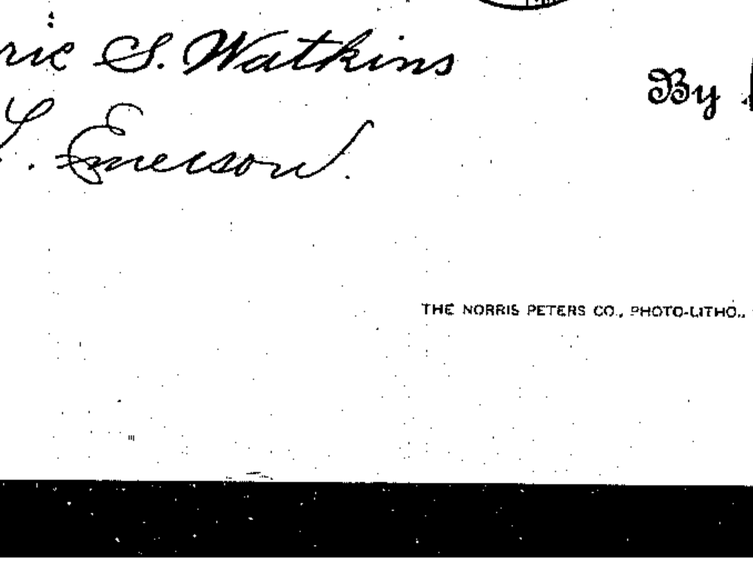

Fig 3.

Fig 4.

Witnesses
Frederic S. Watkins
Fred L. Emerson.

Inventor
John George Leyner
By his Attorney
A. S Bailey.

UNITED STATES PATENT OFFICE.

JOHN GEORGE LEYNER, OF DENVER, COLORADO.

ROTARY FEEDING DEVICE FOR ROCK-DRILLS.

SPECIFICATION forming part of Letters Patent No. 568,089, dated September 22, 1896.

Application filed October 21, 1895. Serial No. 566,356. (No model.)

To all whom it may concern:

Be it known that I, JOHN GEORGE LEYNER, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Rotary Feeding Devices for Rock-Drills; and I do 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, reference being had to the accompanying drawings, and to the letters and numerals of reference marked thereon, which form a part of this specification.

My invention relates to improvements in rotary feeding devices of rock-drilling engines.

In the present state of the art the rotary feeding mechanism of rock-drilling engines comprises a spiral rifle-bar extending through a rifle-nut secured in a hollow piston-head, a head on the outer end of the rifle-bar provided with ratchet-teeth on its periphery, which is confined in a suitable manner, which forms the rear cylinder-head of the engine-cylinder, and spring-actuated pawls arranged in the cylinder-head in engagement with the ratchet-head of the rifle-bar. The pitch of the spiral teeth of the rifle-bar is arranged relatively to the pitch of the ratchet-teeth, in order that as the piston-head reciprocates in the cylinder in one direction the rifle-bar is rotated by the piston a distance equal to the pitch of one tooth of the ratchet, which causes the pawls to ride over one tooth and engage the next, and when the piston moves in the opposite direction the pawls engage the ratchet-teeth and lock the rifle-bar, the piston, and the drill-cutting point, which is secured to the piston-rod, against rotation in the direction the piston seeks to turn it. Consequently the piston itself is rotated by turning on the rifle-bar. The drill thus rotates one tooth of the ratchet between each stroke of the piston. The drill-point is prevented from turning easily in the process of drilling holes by seams encountered in the rock. The drill-point will often strike repeatedly in a seam before it will feed enough to cut clear of it, and at each blow the piston will turn only a quarter or a half, or, possibly, two-thirds, of its regular throw, which is not enough to allow the pawls to catch a tooth. When the blows are struck, the drill-point starts forward in a straight line from the end of the amount of rotary movement it has been able to make, which is some part of its normal throw, but on its forward stroke it is turned back quickly by the seam, which causes the piston-head to whip the rifle-bar ratchet-teeth violently against the pawls, breaking their points and thereby rendering them useless and necessitating the frequent replacement by new ones. The ratchet-teeth are also broken, and not infrequently the rifle-bars themselves are twisted and broken in two.

The object of my present invention is, first, to provide a drill-rotating ratchet-and-pawl feeding device which will lock the rotary feed at two or more predetermined parts of its normal intermittent throw or travel whenever from any cause the drill fails to rotate its normal distance or the full pitch of a ratchet-tooth, by which means I greatly reduce the backlash of the rifle-bar when a tooth is missed, and thus prevent the breaking of the pawls, the ratchet-teeth, and the rifle-bars; second, to provide a stronger and more durable pawl-and-ratchet rotary feeding mechanism; third, to provide means for lubricating said rotary feed mechanism. I attain these objects by the mechanism illustrated and described in the accompanying drawings and specification, in which—

Figure 1 represents a section of the rear cylinder-head of a rock-drilling engine. Fig. 2 represents a section through a fragment of a rock-drilling engine, illustrating the parts embodying the rotary feeding mechanism. Fig. 3 represents in perspective one of the ratchet-pawls. Fig. 4 represents a fragment of the cylinder-head and cover through line A of Fig. 1 in section, showing one of the pawls and its operating-spring in elevation. Fig. 5 represents a section of the cylinder-head through line B of Fig. 1.

Similar letters and numerals of reference refer to similar parts throughout the several views.

Referring to Fig. 2, C designates the cylinder; E, the piston-head; F, the piston-ring; F′, the rifle-bar nut; G, the rifle-bar; H, the back buffer-plate, and I the back buffer.

J designates the back cylinder-head, K the auxiliary back cylinder-head, and L the feed-screw nut. The back head is provided with a stepped projection M, which fits a counterbore in the end of the cylinder. It is secured to the cylinder by long bolts, which are not shown, but which pass through the holes N in the ears N′ of the head and clamp the two together with the auxiliary head and the front cylinder-head. I provide the side of the head farthest from the cylinder with a chamber O, adapted to receive flush with its face the head G′ of the rifle-bar, and through the bottom of this chamber, concentric with the bore of the cylinder, I bore a hole P, adapted to freely receive and support the rifle portion of the rifle-bar at a point adjacent to its head. I form a projecting hub Q on the head of the rifle-bar which is seated in a circular recess Q^4 in the auxiliary head, which assists to support the rifle-bar centrally in the cylinder-head.

The head of the rifle-bar is provided with ratchet-teeth, an even number of teeth being preferably cut in its circumference. The pitch of the ratchet-teeth and the spiral pitch axially of the rifles of the rifle-bar are alike, in order that the movement of the rifle-bar by the piston and the piston by the ratchet-teeth and pawls on the rifle-bar may equal the pitch of the ratchet-teeth.

The piston-head, of which only a fragment is shown, has a hole drilled in it from its rear end long enough to receive the rifled portion of the rifle-bar, and in its end a rifled nut F′, adapted to the rifles of the bar, is threadedly secured. In the center of the depth of the chamber I counterbore a circumferential slot R, and at preferably three predetermined points in the head I pivot pawls S in operative engagement with the teeth of the ratchet-head, placing the pawls in pockets T, which are formed just outside the periphery of the chamber in the rim of head. These pockets open into the chamber.

In the end of the pockets in which the head of the pawls rest and in the floor U of the chamber I make a circular recess V, in which I pivotally fit the lower trunnion W of the pawls S, and in the auxiliary head similar recesses X, in which the top trunnions Y rest, these recesses pivotally supporting, with the concentric portion of the pockets, the pawls. The pawls S are made with trunnions W and Y on each end, as shown in Fig. 3, in order that they may have a complete circular bearing at each end in addition to the back thrust-bearing Z in the concentric portion of the pockets.

In the circumferential slot R, I arrange springs 1 to bear on the back of the pawls. I construct these springs of a blade of spring-steel and secure them resiliently in place by bending two opposite curves 2 and 3 continuous from one another and commencing from one end. The first curve 2 is then hooked around a pin 4, which is driven in a suitable hole drilled through the head. (See Figs. 1 and 4.) A second pin 5 is driven into the head in a position to register with the second curve 3. The springs are then pressed back against pins 5 and their resilient ends pressed farther back in the slot R until the pawls can be dropped into their pockets, when the springs are released and bear resiliently against the back of the pawls, holding them in operative engagement with the ratchet-teeth.

As hereinbefore stated, three or more pawls are arranged in the cylinder-head to bear at predetermined points on the ratchet-teeth of the rifle-bar, and when three pawls are shown, as in Fig. 1, I preferably arrange the pockets and pawls so that the contacting-lip 6 of the pawls will bear on the teeth at approximately three equal divisions of its pitch. The pitch is here meant to be the distance between the face of one tooth and the face of the next tooth and not the distance between the centers of the teeth. Thus when one pawl bears against a tooth, as the upper pawl 9 does in Fig. 1, the pawl 10 is located at a point which will cause it to rest on a tooth at one-third of its pitch from the last tooth it rested on, or at the point 7, and the pawl 11 will rest on a tooth at two-thirds of its pitch from the last tooth it rested on, or at the point 8. Consequently if from any cause the rotary feed fails to move a full tooth either the pawl 10 or 11 will catch a tooth and hold the rifle-bar. Should it rotate one-third or a little more, the pawl 10 will catch a tooth, and if two-thirds of its pitch the pawl 11 will catch a tooth. The backlash of the rifle-bar teeth against the pawls is thus greatly reduced, and its force, owing to the short back movement it is confined to by this arrangement of the pawls, is broken. Each pawl is designed and arranged to carry the burden of the feed; but if one is broken the others still reduce the backlash and obviate the danger of breaking the rifle-bar, which is expensive to replace.

In order to properly lubricate the operative parts of the rotary feed, I provide the auxiliary head with a boss 12, through which I drill a hole 13 to communicate with the hub Q of the rifle-bar and thread it to receive the threaded plug 14. In the end of the rifle-bar I drill a hole 15 and drill into it a hole 16 transversely to the hole 15 and from the bottom of one of the rifle-flutes. Oil inserted through the hole 13 finds its way around the ratchet teeth and pawls and into the hole 15 in the rifle-bar and out of it through the hole 16, and thus oils the rifles and the nut F′.

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

1. The combination with the ratchet-and-pawl rotary feeding mechanism of rock-drills of a cylinder-head having a suitable chamber therein adapted to support said mechanism, a circumferential slot in said chamber and

springs secured in said slot arranged to resiliently hold said pawls in operative relation to said ratchet.

2. The combination of the cylinder, the piston, the rifle-bar, the back cylinder-head having a chamber to receive the ratchet-head of said rifle-bar, a second or auxiliary cylinder-head fitting into and against the first, three holding-pawls arranged in engagement with the teeth of said ratchet-head and adapted to catch a tooth at one of three equal parts of its normal throw when it fails to move its full normal stroke, a recess in said back head adapted to receive said holding-pawls, a trunnion on each end of said pawls, recesses in the main back head adapted to receive one of the trunnions of each pawl, and recesses in said auxiliary head adapted to receive the opposite trunnion of said pawls, substantially as described.

3. The combination with the cylinder and the piston of the back cylinder-head having a chamber therein, a combined rifle-bar and ratchet-head fitted therein, a second back cylinder-head having a step fitting in said chamber and adapted to be clamped against the first-named back head, and with it against the end of the said cylinder, a hub on the end of said rifle-bar ratchet-head, a recess in the said second back head wherein said hub is journaled, holding-pawls pivotally journaled in bearings formed partly in said back head and partly in said second-named back head and arranged to bear at predetermined points on the pitch of said ratchet-teeth, a circumferential slot in the center of said chamber and springs arranged therein to hold said pawls in resilient engagement with said ratchet-teeth, substantially as described.

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

JOHN GEORGE LEYNER.

Witnesses:
FREDERIC S. WATKINS,
FRED L. EMERSON.