

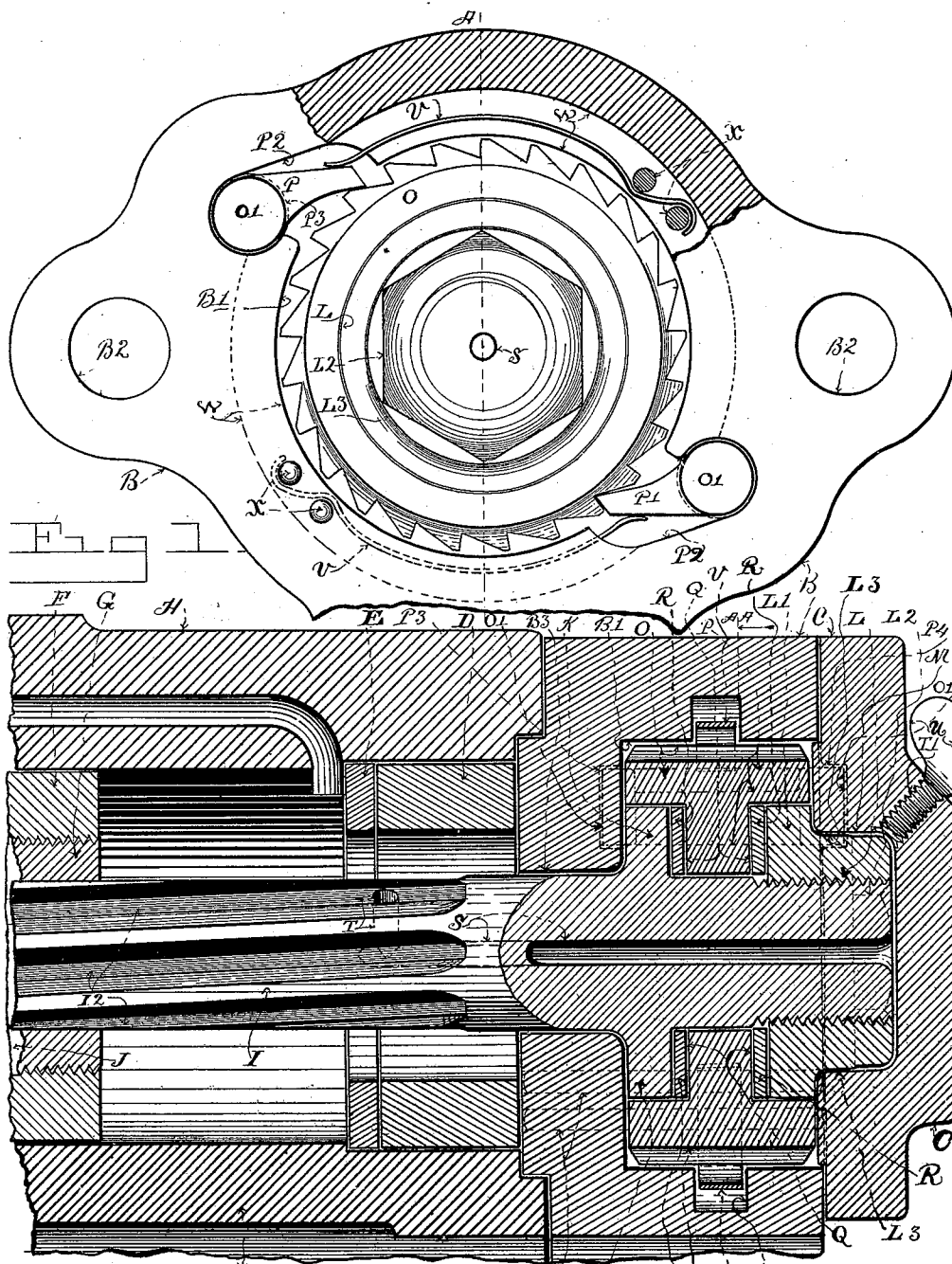
(No Model.)

J. G. LEYNER.

## SAFETY ROTARY FEED FOR ROCK DRILLS.

No. 565,474.

Patented Aug. 11, 1896.



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# UNITED STATES PATENT OFFICE.

JOHN GEORGE LEYNER, OF DENVER, COLORADO.

## SAFETY ROTARY FEED FOR ROCK-DRILLS.

SPECIFICATION forming part of Letters Patent No. 565,474, dated August 11, 1896.

Application filed October 21, 1895. Serial No. 566,357. (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 a certain new and useful Safety Rotary Feeding Device for Rock-Drilling Engines; 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 of reference marked thereon, which form a part of this specification.

My invention relates to improvements in intermittent rotary feeding devices; and the object of my invention is to provide a safety ratchet-and-pawl rotary feeding device which can be adapted to any intermittent rotary feeding mechanism, but which is particularly adapted to rock-drilling engines; second, to provide a rotary feeding device in which all danger of the pawls and teeth being broken from violent backlash is entirely obviated. I attain these objects by the mechanism illustrated and described in the accompanying drawings and specification, in which—

Figure 1 represents an end elevation of such parts of a rock-drilling engine as are necessary to illustrate my safety intermittent rotary feeding device. Fig. 2 represents a sectional elevation of the parts shown in Fig. 1 on line A and of several additional fragmentary parts of a rock-drilling engine, the rifle-bar being shown partly in elevation and partly in section.

Referring to Figs. 1 and 2, B designates the back head. C designates the auxiliary head; D, the rubber buffer; E, the steel buffering; F, the piston; G, the rifle-bar nut; H, the cylinder, and I the rifle-bar. The rifle-bar is rifled into spiral grooves I<sup>2</sup> at one end. This end extends into a bore J in the center of the piston. The entrance of this bore is threaded, and a nut G is threadedly secured therein. This nut is rifled to fit freely the rifles of the rifle-bar.

Upon the rifle-bar I form a collar portion K, and on its end adjacent to said collar I cut

a thread and fit a nut L to it. The nut is provided with a circular collar-shaped bearing or shoulder-engaging portion L', which is larger than the body of the nut. I also form a hexagon or square portion L<sup>2</sup> on its end for the reception of a wrench, and also form a circular portion L<sup>3</sup> intermediate of the said hexagon and collar portion, which is adapted to bear in a bored hole M in the auxiliary head C. This bearing between the nut L and the auxiliary head forms a rear support for the rifle-bar. The back head B is provided with a circular chamber B', which extends into it from its rear or outer side, and which is closed by the auxiliary head. Both heads and also the front head and the cylinder are all clamped together by long bolts which pass through the holes B<sup>2</sup>. These bolts and also the front head are not shown. Through the center of the head I bore a hole B<sup>3</sup>, in which the rifle-bar fits and bears.

O designates the ratchet-wheel. In the present state of the art it either forms an integral part of the rifle-bar or is secured to it rigidly; but I bore a hole centrally through it to fit freely on the rifle-bar and turn it to fit freely in the chamber of the head. In the circumference of its periphery are milled preferably an uneven number of ratchet-teeth of equal pitch. The pawls P and P' are provided with trunnion portions O' at each end, which project beyond their tooth portions. The pawls are pivoted in recesses P<sup>2</sup>, milled in the head and in holes P<sup>3</sup> in the head and holes P<sup>4</sup> in the cap, which register with the milled recesses in the head and receive the trunnion ends of the pawls, as shown in dotted lines in Fig. 2, in which the holes P<sup>3</sup> and P<sup>4</sup> and pawl P are shown. The pawls are pivoted at diametrically-opposite points in the periphery of the chamber in the head, and as they are of the same length one will always engage a face of some one tooth of the ratchet-wheel and the other will rest on a tooth centrally between the face of the tooth it is resting on and the face of the adjacent tooth, providing the ratchet-wheel contains an uneven number of teeth.

Should the ratchet-wheel contain an even number of teeth, the pawls, providing they

are of the same length, should be pivoted in positions which will enable them to engage the ratchet-teeth alternately, and they will do so when the regular intermittent rotary movement of the rifle-bar and ratchet-wheel is one-half or the whole pitch of one ratchet-tooth, or of two or four complete teeth. This differential arrangement of the pawls in relation to an even or uneven number of teeth in the ratchet-wheel is essential in rock-drilling engines, for when drilling rock the drill-cutting point frequently encounters seams which lead the drill-point out of alignment, causing it to bind in the drilled hole, which not only prevents the free rotary movement of the rifle-bar and ratchet-wheel by the piston, which is effected by the piston upon its backward stroke sliding by means of its nut G on the rifle-bar and thus turning it with the ratchet-wheel away from the pawls, but when the drill strikes it follows the seam, which wrenches it out of alignment and gives it a torsional twist, which throws the piston and consequently the rifle-bar and ratchet-wheel violently against one of the pawls, and in a short time both pawls and ratchet-teeth are broken. Now if the spiral pitch of the rifles of the rifle-bar in its length is equal to or a trifle greater than the pitch of the ratchet-teeth the ratchet-wheel would be rotated one tooth upon the backward stroke of the piston and upon the forward stroke a distance equal to the spiral pitch of the rifles or of one tooth. The pitch of the rifles may be greater than the pitch of the ratchet-teeth or enough to move or rotate the ratchet two or more teeth at each stroke of the piston. This arrangement of the pawls and the teeth enables the pawls to catch and hold the ratchet at one-half its regular throw should the piston on its backward stroke fail to rotate the rifle-bar and ratchet-wheel far enough to catch a whole tooth, but would move it a little more than a half of a tooth, in which case one of the pawls, or the pawl P in Fig. 2, would catch the face of the tooth it is resting on and one-half of the normal or regular rotary feed of the drill would be held.

A drill will frequently strike repeatedly in a seam and will be unable to feed but one-half of its regular throw at a time or at intervals of several strokes until it cuts itself free, which it would be almost impossible for it to do if it had to feed its full normal throw. Another reason for this arrangement of the pawls is that it reduces by one-half the backlash of the teeth against the pawls when the feed is insufficient to catch the next tooth. This backlash is very violent and breaks the ends of the pawls and the teeth of the ratchet, although they last longer by this arrangement than when both pawls engage the ratchet-teeth at the same time.

The object of my present invention is to entirely obviate the breaking of the pawls or ratchet-teeth from backlash, and when my

invention is used no attention need be paid to the arrangement of the pawls on this account; but it is essential that the pawls be arranged in this or in a similar manner in rock-drills in order that the drill will feed one-half of its regular rotary movement when from any cause it is prevented from feeding its whole normal throw. I counterbore into the ratchet-wheel from each side a recess Q, in which are adapted to fit on one side the collar or shoulder portion K of the rifle-bar and on the opposite side the collar portion L' of the nut L. Intermediate of the bottom of the recesses Q and the collar portion of the rifle-bar, and also intermediate of the nut and the bottom of its recess, I place washers R, which fit on the rifle-bar and in the said recesses. I preferably make these washers of vulcanized fiber. I then apply a wrench to the end of the nut and screw it with its washer against the bottom of its recess and draw the rifle-bar and its collar and washer also against it, tightening the parts tight enough to prevent the rifle-bar from turning or slipping in the ratchet-wheel under normal conditions of drilling, but not tight enough to prevent its slipping around in it when it is under severe strain. Consequently should the rifle-bar and ratchet-wheel be thrown violently back against one of the pawls the rifle-bar and nut will slip around in the ratchet-wheel on the washers and thereby destroy the effect on them the blow would otherwise have. The frictional tension between the rifle-bar and ratchet-wheel is easily and quickly adjusted to meet all requirements in a rotary feed, and especially those of drilling in either hard or soft rock.

Through the center of the rifle-bar from its rear end I drill an oil-hole S, and at right angles to it through the rifle-bar into said hole S, I drill a hole T, and also through the auxiliary head I drill and tap a hole T', in which a thumb-screw U is fitted. Oil inserted through the hole T' will oil the ratchet and pawls and also find its way through hole T and oil the rifle-bar and its nut G. The pawls are held in engagement with the ratchet by springs V. These springs are placed in a circular recess W, formed in the periphery of the chamber of the head. They are confined therein by pins X, around which they are arranged to hook. The pins are driven into the head and cross the recess. A fragment of the head in Fig. 1 is broken away on line A A of Fig. 2. In many drilling-engines in use the chamber in which the ratchet-wheel is confined opens into the back head from the cylinder side, which arrangement would dispense with the auxiliary head. Consequently the arrangement of the rear cylinder-head, and also the arrangement of the pawls in relation to the teeth of the ratchet-wheel, may be greatly varied, and in intermittent rotary feeding devices for other kinds of machinery several parts here shown can be dispensed

with and the rifle-bar would be substituted by the axle of a feed-roll or some similar device. Consequently I do not confine myself to the arrangement herein set forth.

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

1. A safety intermittent rotary feed consisting of an independent ratchet-wheel, one  
10 or more pawls arranged in operative engagement therewith, an independent axial support adapted to transmit the intermittent rotary feed of said ratchet-wheel to the object to be intermittently rotated, or from an inter-  
15 mittently-rotating object through said axial support to said ratchet-wheel, and means for securing said axial support to said ratchet-wheel to permit one part to automatically turn upon the other when said pawls and  
20 ratchet-wheel engage one another with destructive energy.

2. A safety intermittent rotary feeding device for rock-drilling engines comprising a ratchet-wheel mounted on the rifle-bar,  
25 spring-actuated pawls in operative engagement with the teeth of said ratchet-wheel and means for securing said rifle-bar to said ratchet-wheel whereby it will rotate in said ratchet-wheel when a ratchet-tooth engages  
30 a pawl with destructive energy.

3. The combination with the cylinder, the piston and the cylinder-head, of a rifle-bar in operative engagement with said piston and journaled in said cylinder-head, a ratchet-  
35 wheel freely mounted on said rifle-bar and seated in a suitable chamber in said cylinder-head, spring-actuated holding-pawls arranged in operative engagement with the teeth of said ratchet-wheel, and means where-  
40 by said rifle-bar is connected to said ratchet-wheel to turn therein when one or more teeth thereof engages one or more pawls by backlash movement of more than normal force, substantially as described.

4. A safety intermittent rotary feeding device comprising a ratchet-wheel, one or more  
45 pawls in operative engagement therewith, an independent axle, shaft, or ratchet-supporting journal, and means for securing said axle or shaft to said ratchet-wheel so that one part  
50 may slip and turn upon the other.

5. A safety intermittent rotary feeding mechanism for rock-drilling engines comprising a rifle-bar having an enlarged collar portion thereon forming an abutting shoulder  
55 and journaled in the rear cylinder-head, a thread upon the end of said rifle-bar adjacent to said shoulder portion, a nut threaded to said end, a ratchet-wheel fitting loosely on said rifle-bar, one or more washers between  
60 said shoulder portion of said rifle-bar and said ratchet-wheel between said nut and ratchet-wheel, and spring-actuated pawls arranged in engagement with said ratchet-wheel, sub-  
65 stantially as described.

6. The combination in a safety intermittent rotary feed device for rock-drills, of the rifle-bar having a shoulder portion, a threaded end adjacent thereto, a nut fitting said end, a  
70 ratchet-wheel mounted on said rifle-bar, a recess in each side of said ratchet-wheel concentric to said rifle-bar, one of which is adapted to receive said shouldered portion thereof, and the other the engaging surface and end  
75 of said nut, friction-washers preferably of vulcanized rubber interposed in said recesses between said shoulder of rifle-bar and said ratchet-wheel and between said nut and said  
80 ratchet-wheel, means for tightening said nut to establish a frictional connection between said rifle-bar and said ratchet-wheel, means  
85 for supporting said rifle-bar on each side of said ratchet-wheel and for supporting said ratchet-wheel, spring-actuated pawls in operative engagement with said ratchet-wheel  
and a piston and nut in engagement with said rifle-bar.

7. The combination in a safety intermittent rotary feed for rock-drills, of the cylinder-head, the rifle-bar having the abutting shoulder,  
90 the friction-washer, the ratchet-wheel mounted on said rifle-bar, the spring-actuated pawls in engagement therewith, the nut threaded to the end of said rifle-bar having a  
95 wrench-receiving end and a circular portion adjacent thereto, the auxiliary cylinder-head, a recess therein adapted to receive said circular portion and support said nut and the  
100 rear end of said rifle-bar and the cylinder and the piston, the several parts being combined substantially as herein set forth and described.

8. In a safety intermittent rotary feed for rock-drilling engines, the combination of the cylinder, the piston, the rifle-bar, the ratchet-  
105 wheel, the spring-actuated pawls, the rear cylinder-head adapted to receive and support said rifle-bar and said ratchet-wheel, and the pawls and the friction-washers, the auxiliary head having a recess therein and the nut  
110 adapted to frictionally connect said rifle-bar and ratchet-wheel together whereby one may slip upon the other and relieve said ratchet-teeth and said pawls from destructive concussions, and to journal in said auxiliary  
115 head, substantially as described.

9. The combination in a safety intermittent rotary feed for rock-drilling engines with the cylinder, the piston, of the rifle-bar, the back  
120 head, the washers, the clamping-nut, the ratchet-wheel and the pawls arranged in differential relation to the teeth of said ratchet-wheel, substantially as described.

10. The combination in a safety intermittent rotary feed for rock-drilling engines, of the  
125 cylinder, the piston, the rubber and steel buffers, the rifle-bar having an enlarged collar or shoulder portion and a clamping-nut, the friction-washers, the ratchet-wheel adapted to be frictionally clamped to said rifle-bar,  
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the back head, the auxiliary head, and the  
spring-actuated pawls arranged in differen-  
tial relation to the teeth of said ratchet-wheel  
whereby one pawl is in operative engagement  
5 with the face of some one tooth of said  
ratchet-wheel and the other pawl is in opera-  
tive engagement with one tooth at a prede-  
termined point in its pitch, the several parts

being constructed, combined and arranged  
substantially as herein set forth. 10

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

JOHN GEORGE LEYNER.

Witnesses:

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FRED L. EMERSON.