

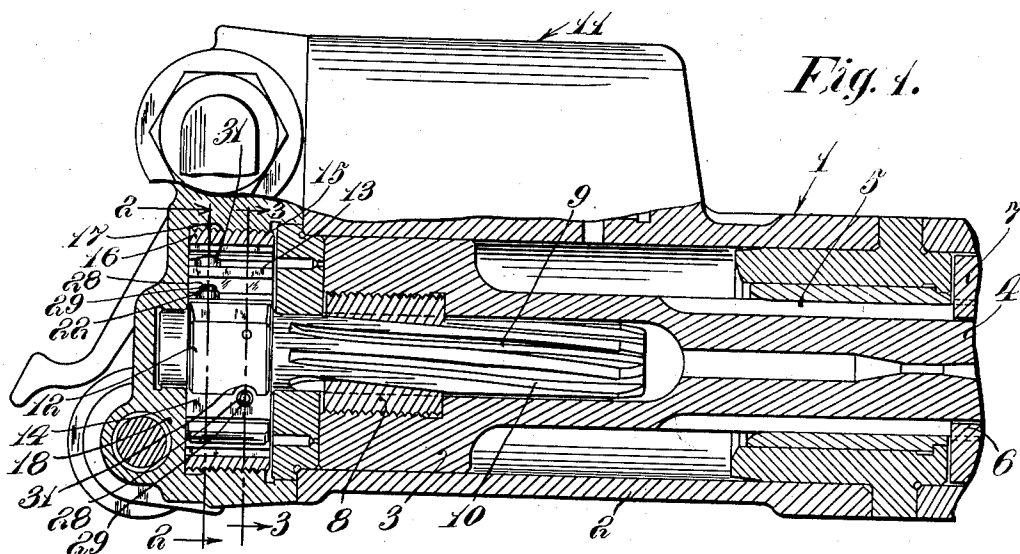
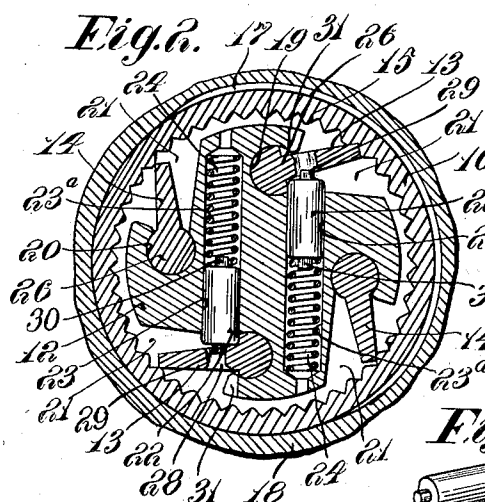
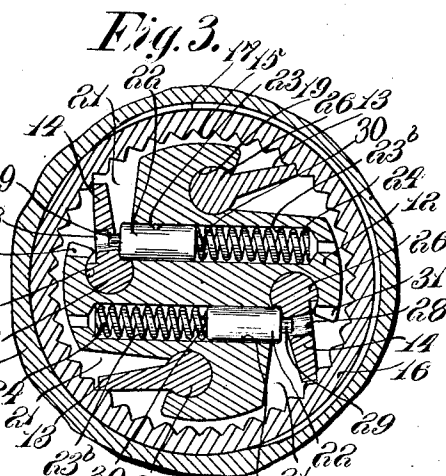
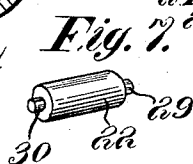
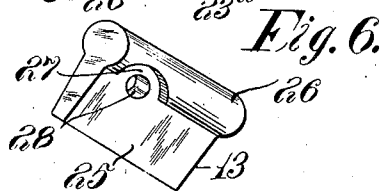
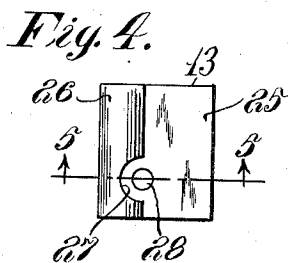
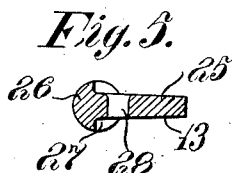
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2,153,556

RATCHET AND PAWL MECHANISM

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RATCHET AND PAWL MECHANISM

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Application May 25, 1938, Serial No. 210,003

10 Claims. (Cl. 74—577)

This invention relates to ratchet and pawl mechanisms and more particularly to ratchet and pawl mechanisms of the type especially adapted to use in hammer rock drills.

In the drill steel rotation mechanism of hammer rock drills, it is customary to employ a ratchet and pawl mechanism associated with the hammer piston of the drill hammer motor to effect rotation of the drill steel during one stroke of the motor piston, preferably the return stroke, and through the slipping of the pawls over the ratchet teeth, to permit the other piston stroke, preferably the working stroke, to be made without rotation of the steel. Such mechanisms commonly involve a spirally grooved rifle bar having a sliding interlocking connection with the hammer motor piston, the rifle bar formed integral with a pawl carrier and having its spirally grooved portion engaging a rifle nut fixed within the hammer piston. The pawl carrier usually carries pivoted pawls engaging the teeth of a stationary ratchet ring, and the pawls are usually held yieldingly in engagement with the ratchet teeth by spring-pressed plungers. In use, the pawls slipping over the ratchet teeth, gradually tend to wear off on their portions engaging the ratchet teeth, and the employment of reversible pawls which may be turned end for end, or otherwise rearranged, and used with another portion thereof in engagement with the ratchet teeth, therefore results in material economy. Such drilling motors of the type disclosed are commonly taken apart and cleaned at frequent intervals, and it is desirable to prevent inadvertent release of the pawls from the pawl carrier when this is not desired, upon disassembly or assembly of the motor.

An object of this invention is to provide an improved ratchet and pawl mechanism having improved means for locking the pawls against inadvertent release from their supported relation with the pawl carrier. Another object is to provide an improved pawl locking means wherein the pawls are positively locked against accidental release from the pawl carrier. A further object is to provide an improved ratchet and pawl mechanism using reversible pawls and having provision whereby the pawls may be locked against accidental release from the pawl carrier irrespective of their supported position on the pawl carrier. It is a further object to provide an improved ratchet and pawl mechanism especially adapted for use in a hammer rock drill. It is still another object of the invention to provide an improved ratchet and pawl mechanism in position and are not subject to being inadvertently released from the pawl carrier, but which may be readily released when desired. Another object is to provide an improved ratchet and pawl mechanism of the spring-pressed pawl type wherein the pawls are held in engagement with the ratchet teeth by spring-pressed plungers, and the plungers are reversible end for end with respect to the pawls, when they become worn. Other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawing there is shown for purposes of illustration one form which the invention may assume in practice.

In this drawing:—

Fig. 1 is a view in longitudinal vertical section through a hammer rock drill in which an illustrative embodiment of the invention is incorporated.

Fig. 2 is an enlarged cross sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is an enlarged cross sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a detail view of one of the pawls.

Fig. 5 is a cross sectional view taken on line 5—5 of Fig. 4.

Fig. 6 is an isometric view illustrating one of the pawls.

Fig. 7 is a perspective view of one of the spring-pressed plungers.

In this illustrative construction, there is shown a drill hammer motor, generally designated 1, having a cylinder 2 provided with a bore containing a reciprocating hammer piston 3. The hammer piston has a striking bar 4 for delivering impact blows to the shank of a conventional drill steel or other working implement. The piston striking bar has straight grooves 5 slidingly interlocked with straight keys 6 formed on a chuck member 7, the chuck structure not being fully shown, in view of its general familiarity. Fixed within the hammer piston is a rifle nut 8 having spiral keys which are slidingly interlocked with spiral grooves 9 formed on a rifle bar 10. Motive fluid is distributed to the hammer motor through means, not fully illustrated, as it is unnecessary to the disclosure of the invention, but including a distributing mechanism generally designated 11 and embodying a distributing valve means for controlling fluid flow to the motor cylinder through suitable passages, in a well known manner. Formed integrally with the rear end of the rifle bar 10 is a pawl carrier 12 which carries two pairs of pawls 13, 13 and 14, 14. These pawls, which are made symmetrical in end ele-

vation and in outline in side elevation, cooperate with the teeth 15 of a ratchet ring 16 which is suitably threadedly secured at 17 within a rear head block 18 of the hammer motor. The pairs of
 5 pawls 13, 13 and 14, 14 are suitably pivotally supported in sockets 19 and 20 respectively in the pawl carrier 12, these sockets being generally cylindrical and opening into spaces 21 formed by the cutting away of the periphery of the pawl
 10 carrier. Due to the formation of the walls bounding the spaces 21, the pawls have a limited range of oscillation about their pivotal axes, being free to swing outwardly a sufficient distance for full engagement with the ratchet teeth 15, but re-
 15 strained from excessive outward movement. To maintain the pawls in yielding engagement with the ratchet teeth 15, pawl-engaging plungers 22 are provided, these plungers being disposed in bores 23 extending chordally of the pawl carrier
 20 and being pressed yieldingly against the inner surfaces of the pawls by springs 24. Two of the bores, 23^a, 23^a, are herein arranged to the rear of the median transverse plane of the pawl carrier; the other two, 23^b, 23^b, forwardly of that
 25 plane. The bores 23^a, 23^a are parallel to each other, as are the bores 23^b, 23^b; and the bores 23^a, 23^a are perpendicular to lines parallel to the bores 23^b, 23^b.

Each of the pawls comprises a blade portion
 30 25 and a pivot portion 26, the latter pivotally seated in the sockets 19 and 20. The pivot portion 26 of each pawl is cut away or recessed at a point herein shown as positioned between the center and one end of the pawl, as at 27, and it
 35 will be noted that the cutting away is substantially symmetrical, extending about equal distances and with corresponding depths at opposite sides of the median longitudinal plane of the pawl. An opening 28 extends completely through
 40 the blade portion of each pawl into communication with the cut-away or recessed portions 27. Due to the symmetrical shape of the pawls, when the ratchet-teeth-engaging portions thereof become worn, the pawls may be released from their
 45 sockets and turned end for end and reinserted within the other sockets, thereby to present another portion of the pawls for engagement with the ratchet teeth.

For locking the pawls against inadvertent release from the pawl-carrier sockets, the plungers
 50 22 have the outer ends of their bodies projecting within the cut-away portions 27 in the pawls and are provided with reduced axial projections 29 extending within the openings 28, so that the
 55 plungers have positive locking engagement with the pawls. The plungers 22 are symmetrical and are provided with reduced axial projections 30 at their ends opposite the projections 29, so that when one end of the plungers becomes worn, the
 60 plungers may be turned end for end within their bores, thereby to present an unworn end for engagement with the pawls. As shown in Figs. 2 and 3, the pawl carrier is slotted at 31 in adjacency to the pawl sockets, thereby to enable
 65 insertion of the plungers 22 within their bores when the pawls are released, the slots 31 being aligned with the inner walls of the plunger bores.

The mode of operation of the improved ratchet and pawl mechanism will be clearly apparent
 70 from the description given. It will be noted that the pairs of pawls 13, 13 and 14, 14 are yieldingly pressed into cooperating relation with the ratchet teeth 15 by the spring-pressed plungers 22; and the plungers cooperating with the cut-away portions 27 and openings 28 in the pawls provide a

positive lock for preventing accidental release of the pawls from the pawl carrier sockets 19 and
 20. The reduced projections 29 on the plungers 22 cooperating with the apertures 28 and the body portions of the plungers projecting within the
 5 cut-away portions 27 in the pawls provide a positive lock for the pawls, while permitting free swinging movement of the pawls about their pivotal axes on the pawl carrier. As the parts
 10 are assembled, the cut-away portions 27 in the pawls 13, 13 are to the rear of the transverse median plane of the pawl carrier 12, and the cut-away portions in the pawls 14, 14 are in advance of that same plane. It will be noted that
 15 either pawl 13, 13 may be turned over and used in the place of either pawl 14, 14. It will also be noted that any plunger 22 may be turned end for end within its bore, so that either plunger end may engage the pawls. The pawls may be
 20 noted to be positively locked against removal, but by inserting a suitable instrument through one of the pawl apertures 28, the locking plungers may be pressed, against the pressure of the springs, inwardly within their bores a distance sufficient to
 25 clear the cut-away portions 27 and the locking apertures into which they had projected and permit removal of the pawls from the pawl carrier sockets. If desired, the cut-away portions and
 30 apertures in the pawls and the plunger bores may be arranged in the central transverse median plane of the pawl carrier so that the cut-away portions and locking apertures are located mid-way between the ends of each pawl, thereby permitting reversal of each pawl end for end within
 35 its pawl-carrier socket.

From the foregoing description, it will be obvious that there are provided reversible pawls
 40 having provision whereby they may be locked against accidental removal irrespective of the manner in which they are assembled in the pawl carrier. It will further be noted that there is
 45 provided positive, readily releasable, locking means cooperating with the pawls. It will also be noted that there are provided locking plungers which are reversible end for end within their
 50 respective bores. It will be noted, moreover, that if desired but two pawls may be used; there here being four pawls used in order that the minimum angle of advance may be reduced; and other pairs of pawls could be added if needed. The particular arrangement, using diametrically opposite
 55 pawls in pairs, is not essential. It will be observed that the structure is simple, requires a minimum number of different parts, and is of a rugged construction, and is very well adapted for its intended purpose.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this
 60 form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by
 65 Letters Patent is:

1. In a ratchet and pawl mechanism, in combination, a ratchet ring, a pawl carrier arranged within said ratchet ring, pawls pivotally mounted
 70 on said pawl carrier and engageable with the teeth of said ratchet ring, and plungers mounted on said pawl carrier and yieldingly pressed into engagement with said pawls for yieldingly urging
 75 the latter into engagement with the ratchet teeth, said plungers having locking projections and said

pawls having openings extending therethrough and within which said locking projections project.

2. In a ratchet and pawl mechanism, in combination, a ratchet ring, a pawl carrier arranged within said ratchet ring, pawls pivotally mounted on said pawl carrier and engageable with the teeth of said ratchet ring, and plungers mounted on said pawl carrier and yieldingly pressed into engagement with said pawls for yieldingly urging the latter into engagement with the ratchet teeth, said plungers having locking projections and said pawls having openings extending therethrough and within which said locking projections project, said pawls also having cut-away portions for receiving the body portions of said plungers.

3. In a ratchet and pawl mechanism, in combination, a ratchet ring, a pawl carrier arranged within said ratchet ring, pawls pivotally mounted on said pawl carrier and engageable with the teeth of said ratchet ring, said pawls having pivot portions and projecting blade portions, said blade portions engaging said ratchet teeth, and plungers mounted on said pawl carrier and yieldingly pressed into engagement with said pawls for yieldingly urging the latter into engagement with the ratchet teeth, said plungers having locking projections and said blade portions of said pawls having openings extending therethrough and within which said locking projections project.

4. In a ratchet and pawl mechanism, in combination, a ratchet ring, a pawl carrier arranged within said ratchet ring, pawls pivotally mounted on said pawl carrier and engageable with the teeth of said ratchet ring, said pawls having pivot portions and projecting blade portions, said blade portions engaging said ratchet teeth, and plungers mounted on said pawl carrier and yieldingly pressed into engagement with said pawls for yieldingly urging the latter into engagement with the ratchet teeth, said plungers having locking projections and said blade portions of said pawls having openings extending therethrough and within which said locking projections project, said pivot portions of said pawls having cut-away portions for receiving the body portions of said plungers.

5. As an article of manufacture, a reversible pawl having a generally cylindrical pivot portion and a blade portion providing symmetrically disposed opposite edges adapted to cooperate with the teeth of a ratchet ring, said pawl having locking portions in its opposite sides.

6. As an article of manufacture, a reversible pawl having a generally cylindrical pivot portion and a blade portion providing symmetrically disposed opposite edges adapted to cooperate with the teeth of a ratchet ring, said pawl having cut-away portions providing locking recesses in its opposite sides.

7. As an article of manufacture, a reversible pawl having a generally cylindrical pivot portion and a blade portion providing symmetrically disposed opposite edges adapted to cooperate with the teeth of a ratchet ring, said pawl having cut-away portions providing locking recesses in its opposite sides, and a locking aperture extending through said blade portion into communication with said cut-away portions.

8. As an article of manufacture, a reversible plunger adapted to be pressed yieldingly into engagement with a pawl and having pawl locking portions at its opposite ends.

9. As an article of manufacture, a reversible plunger adapted to be pressed yieldingly into engagement with a pawl and having reduced pawl locking projections at its opposite ends.

10. In combination, in a ratchet and pawl mechanism, a ratchet element, a concentric pawl carrier, pawl seats in said pawl carrier, pawls pivotally carried in said seats, and yieldingly mounted pawl locking plungers arranged at opposite sides of the median transverse plane of said pawl carrier and cooperating one with each of said pawls, said pawls each, at opposite sides thereof, recessed for cooperation with a locking plunger, said recesses in each pawl substantially opposite each other, and a recess at one side of a pawl cooperating with a plunger at one side of said median transverse plane and, upon reversal of said pawl, the aligned recess cooperating with a plunger at the opposite side of such plane.

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