No. 717,027. Patented Dec. 30, 1902.

# J. H. REDFIELD.

## ROCK DRILL.

(Application filed Nov. 9, 1901.)

(No Model.) 3 Sheets—Sheet 1.

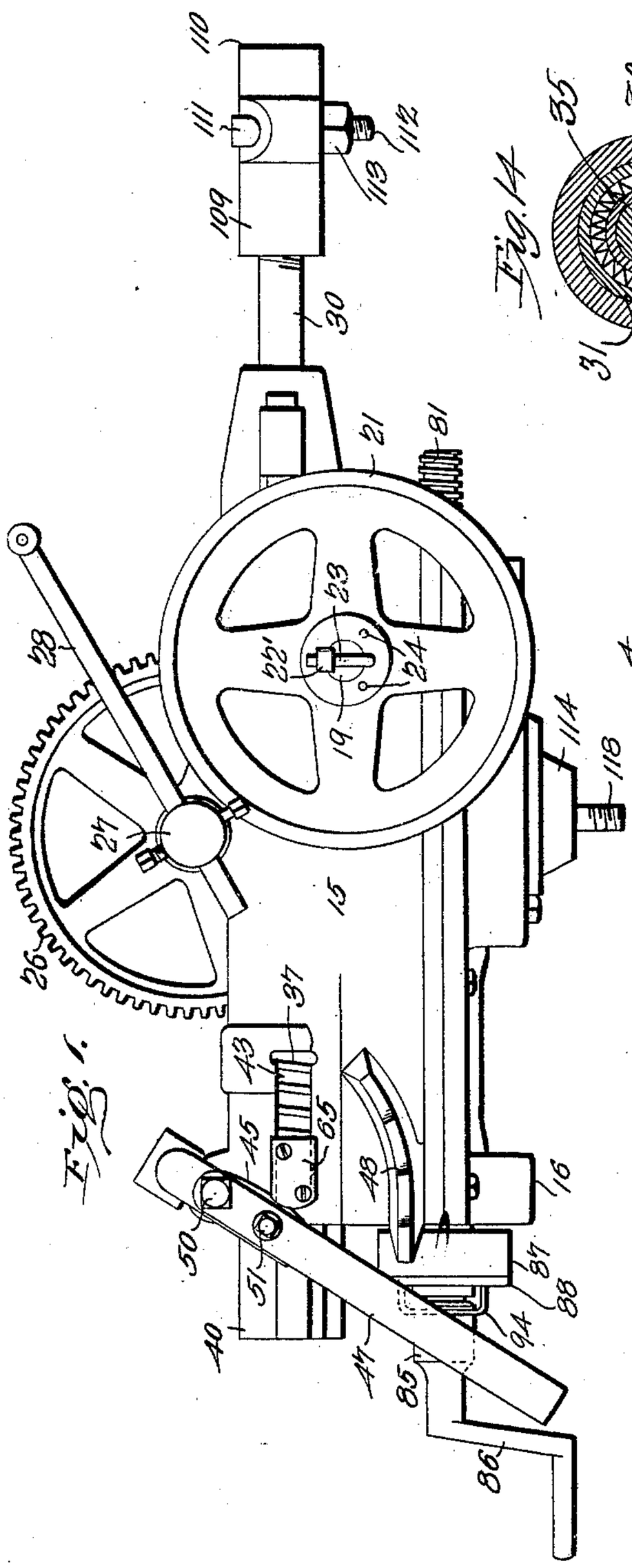

Fig. 1.



Fig. 14.

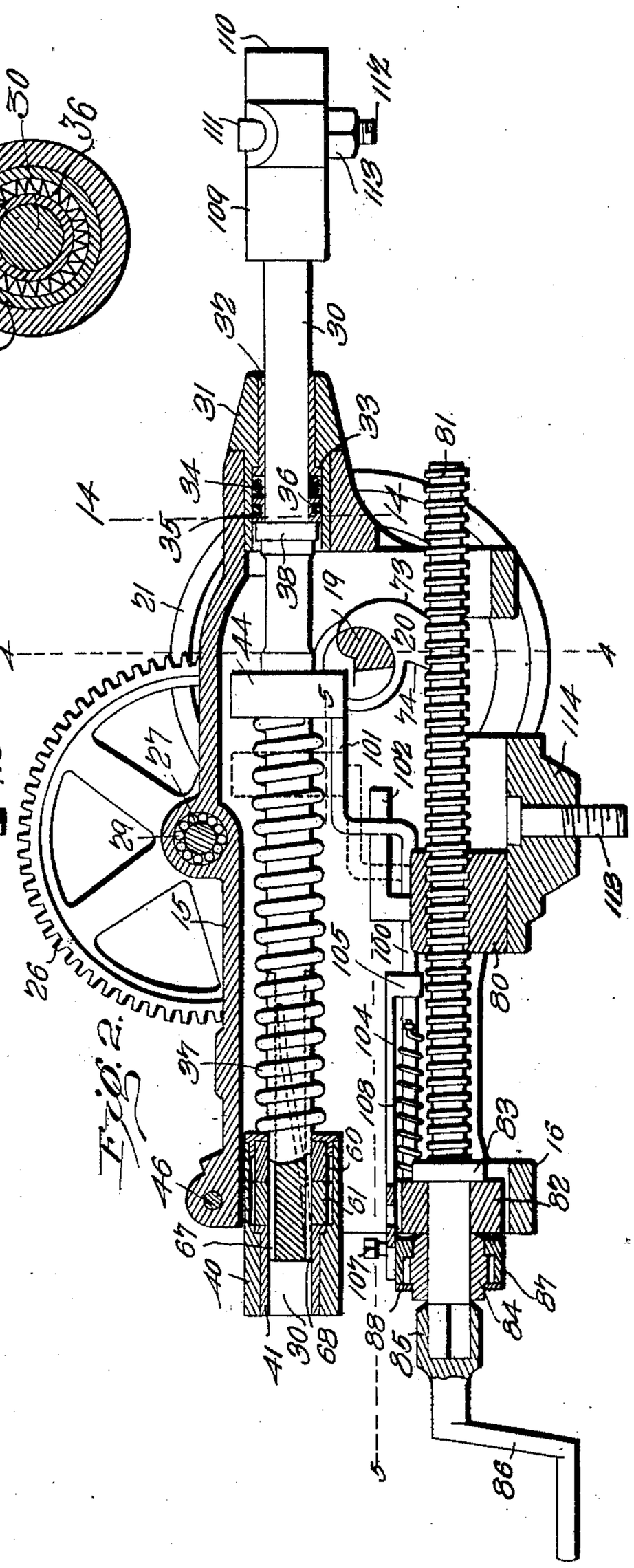

Fig. 2.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

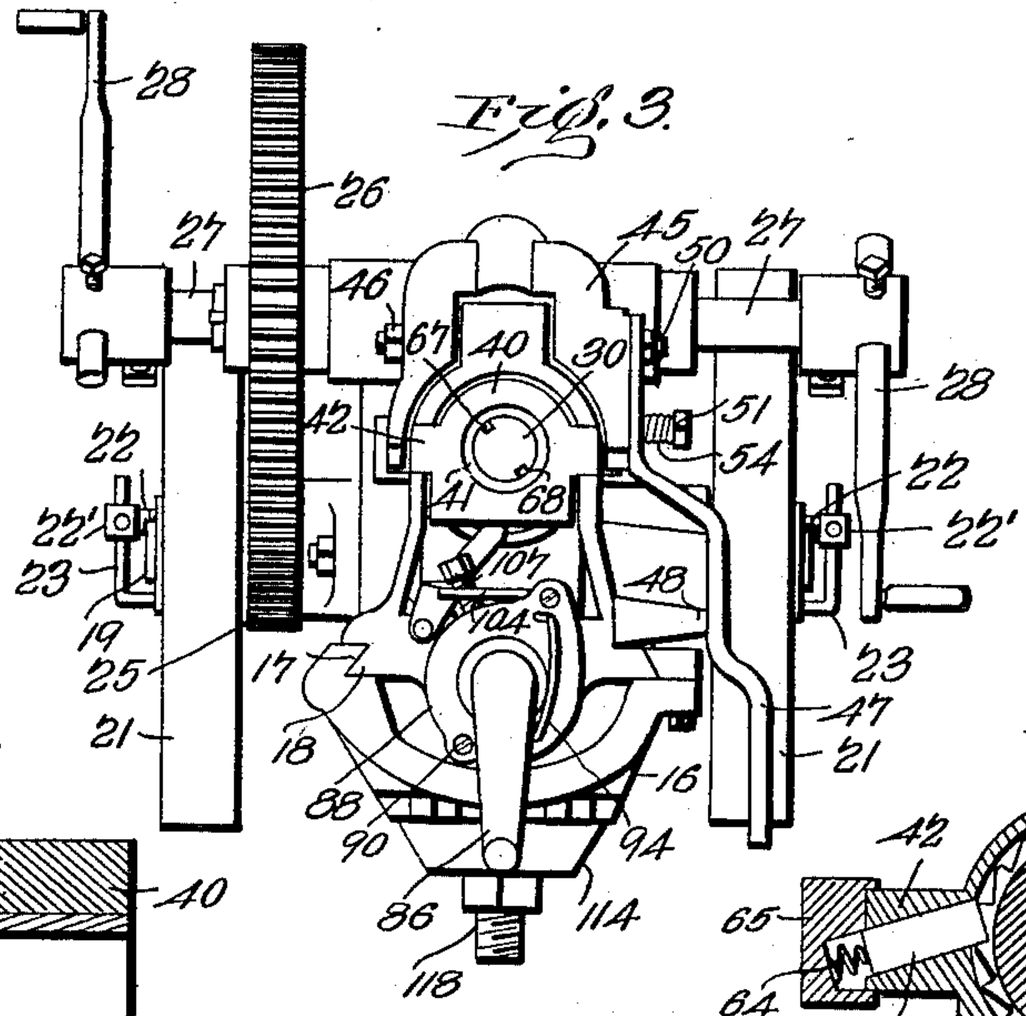



Fig. 7.

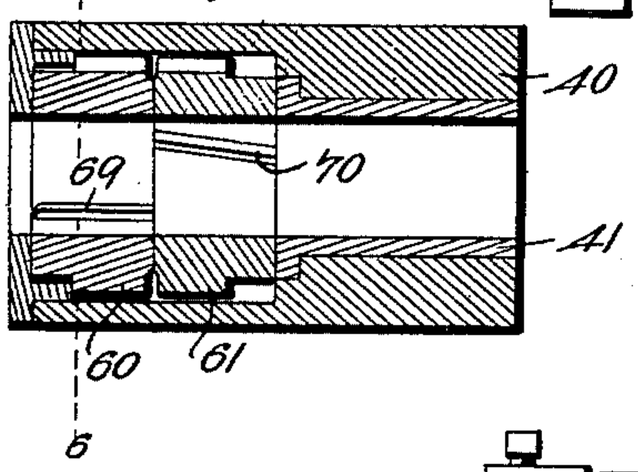



Fig. 6.

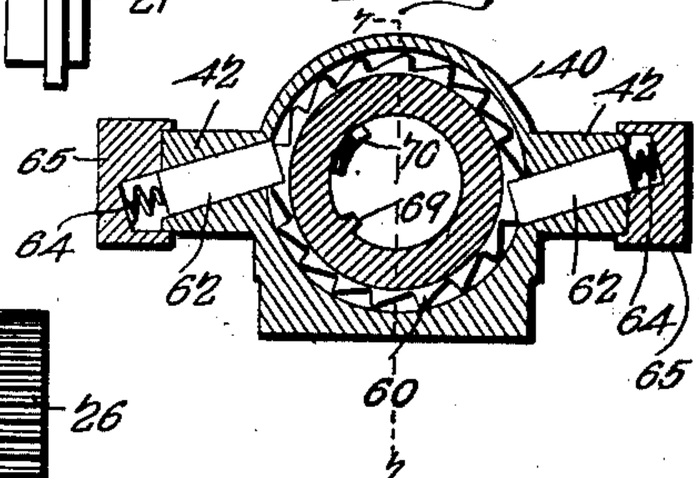



Fig. 4.

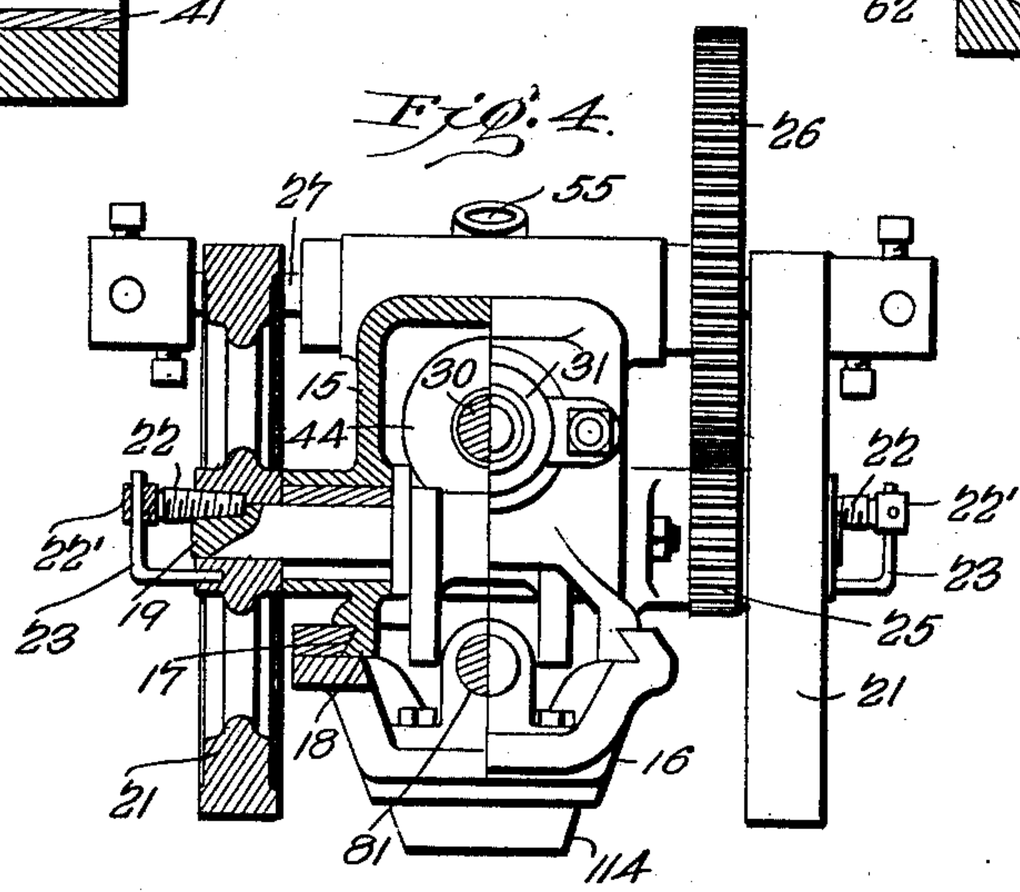
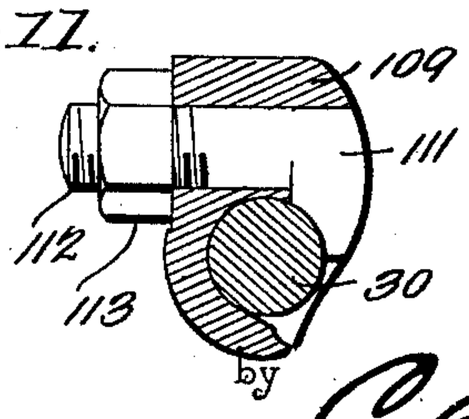



Fig. 11.

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## ROCK DRILL.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

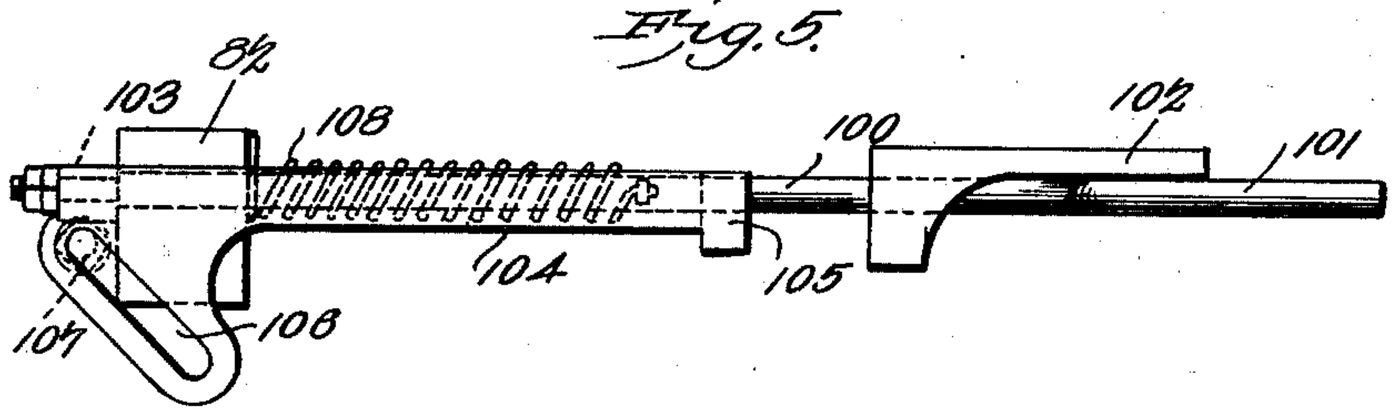



Fig. 10.

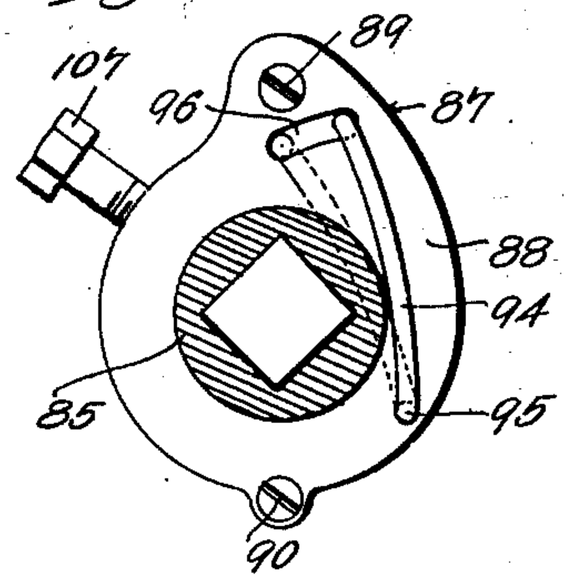



Fig. 9.

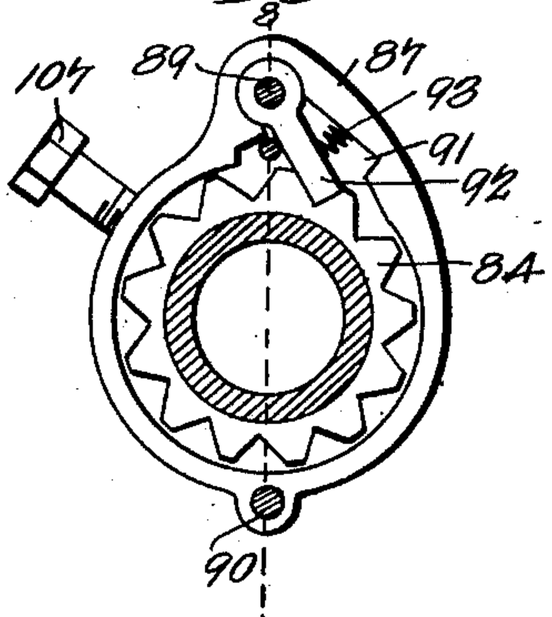
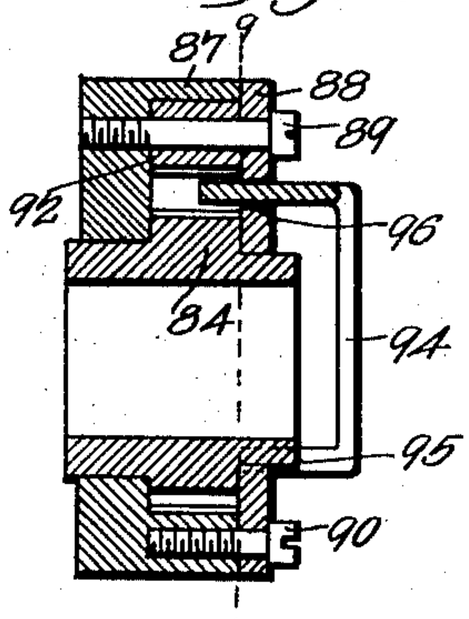



Fig. 8.



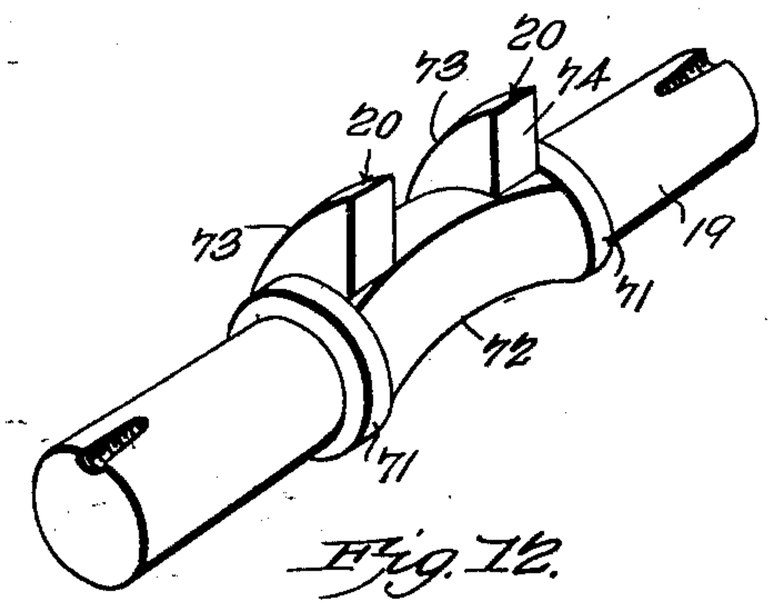




Fig. 12.

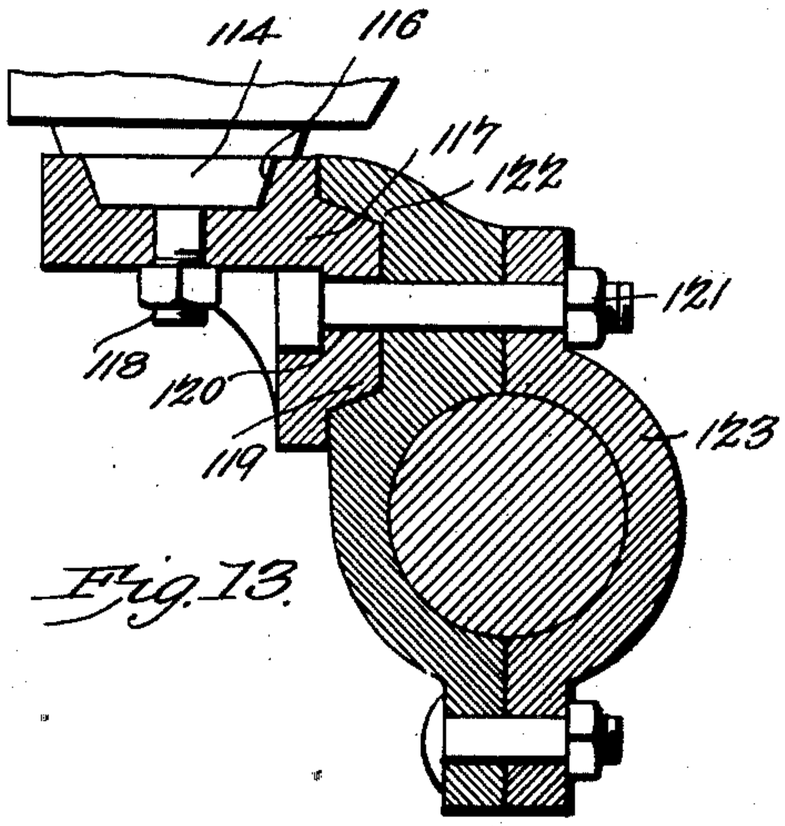



Fig. 13.

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# UNITED STATES PATENT OFFICE.

JOHN HILL REDFIELD, OF SPOKANE, WASHINGTON, ASSIGNOR OF ONE-HALF TO CHARLES GRUTT, EMIL GRUTT, AND FRED GRUTT, OF BOSSBURG, WASHINGTON.

## ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 717,027, dated December 30, 1902.

Application filed November 9, 1901. Serial No. 81,724. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN HILL REDFIELD, a citizen of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented a new and useful Rock-Drill, of which the following is a specification.

My invention relates to certain improvements in drilling-machines of that class employed in mining, quarrying, tunneling, and similar operations, and has for its object to improve, simplify, and cheapen the construction of such machines.

A further object of the invention is to provide an improved mechanism for automatically revolving the drill at the end of each stroke and, further, to provide an automatic means for gradually feeding the drill to its work, the mechanism being of such character that it will only feed when the drill is properly working and will cease feeding if the drill stops cutting.

Further objects of the invention are to provide an improved form of operating-cam for reciprocating the drill-shaft and to provide a chuck of improved construction which will permit of the removal of the drill-bit from the side of the chuck.

Further objects and advantages of the invention will be apparent from a reading of the description.

In the accompanying drawings, Figure 1 is a side elevation of a drilling-machine constructed in accordance with my invention. Fig. 2 is a transverse sectional elevation of the same. Fig. 3 is an elevation of the rear end of the machine. Fig. 4 is an elevation of the front end of the machine, a portion of the figure being in section on the line 4 4 of Fig. 2. Fig. 5 is a sectional plan view of a portion of the machine on the line 5 5 of Fig. 2. Fig. 6 is a transverse sectional elevation on the line 6 6 of Fig. 7, illustrating the construction of the mechanism for revolving the drill-shaft. Fig. 7 is a sectional elevation on the line 7 7 of Fig. 6. Fig. 8 is a detail sectional view on the line 8 8 of Fig. 9, illustrating the automatic feeding mechanism. Fig. 9 is a sectional elevation of the same on the line 9 9 of Fig. 8. Fig. 10 is an end elevation of a portion of said mechanism, illustrating the automatic disconnection of the ratchet-operating pawl when the crank-handle is applied. Fig. 11 is a transverse sectional elevation of the drill-holding chuck. Fig. 12 is a perspective view of the cam and cam-shaft detached. Fig. 13 is a detail sectional view of the carriage-clamp employed for supporting the drill in position for work. Fig. 14 is a detail sectional view illustrating the buffer-ring on the line 14 14 of Fig. 2.

Similar numerals of reference are employed to designate corresponding parts throughout the several figures of the drawings.

15 designates the main drill-frame, and 16 a supporting-carriage on which said frame is longitudinally adjustable, the carrier being provided with dovetail guides 17 for the reception of correspondingly-shaped side pieces 18 on the drill-frame.

Extending transversely through the frame and adapted to suitable bearings therein is a cam-shaft 19, carrying two cams 20, of a construction more particularly described hereinafter, and at the opposite ends of the shaft, at points outside the frame, are secured fly-wheels 21, said wheels being held to the shaft by tapered locking-screws 22, adapted to threaded openings formed partly in the shaft and partly in the hubs of the fly-wheels. The heads 22′ of the screws are provided with transverse openings, through which may pass an operating-bar 23 for convenience in tightening the screw, the end of said bar after the screw is tightened being turned into alinement with the shaft and seated in any one of a number of openings or recesses 24, arranged on the outer end of the hub of the fly-wheel. This arrangement will positively lock the fly-wheels to the shaft and prevent any displacement while the machine is in operation. On the shaft 19 is also secured a pinion 25, which intermeshes with a gear-wheel 26, mounted on a primary shaft 27, the latter being driven by power from a suitable motor or being revolved by hand through the agency of handle-cranks 28. In order to provide for the easy running of both the primary and cam shafts,

roller-bearings 29 are provided in the frame for the support of said shafts.

Extending longitudinally of the frame is a drill-shaft 30, at one end of which is a suitable chuck for the reception of the drill-bit. To the front end of the frame is bolted a tubular buffer-head 31, having a bushing 32, of bronze or a similar metal, the end of the bushing being provided with an enlarged annular flange 33, seated within an enlarged opening in the inner end of the buffer-head. The opening in the buffer-head is partly filled with a yielding packing 34, on which is placed a buffer-ring 35, the latter being held in position by a spring-ring 36, adapted to an annular groove in the periphery of the buffer-ring and in frictional contact with the inner wall of the buffer-head. This ring is adapted to receive and the packing to absorb the shock or jar resulting from the outward movement of the drill-shaft under the impulse of the actuating-spring 37, the shaft being provided with an enlarged flange 38 for contact with the buffer-ring. The opposite end of the shaft finds a bearing in an adjustable box 40, provided with a suitable bushing 41, said box being provided with diametrically-disposed side lugs 42, adapted to suitable guiding-openings 43 in the sides of the frame. At a point adjacent to the cam-shaft the drill-shaft 30 has a fixed collar 44, adapted for contact with the cams, and between said collar and the inner ends of the box 40 the compression-spring 37 is arranged. In order to adjust the tension of the spring to alter the blow of the drill in accordance with the character of the work being done, I employ a yoke-shaped lever 45, pivoted at 46 to the opposite sides of the frame, the opposite ends of said yoke being adapted to engage the rear faces of the lugs 42. To this lever is secured an operating-lever 47, arranged at one side of the frame, the intermediate portion of said lever being adapted to engage with a series of ratchet-teeth 48, formed on the side of the main frame for the purpose of locking said lever in position. The lever is attached to the yoke-shaped member by a bolt 50 in such manner that it is free to play laterally, a second bolt 51, passing through said lever and secured in the yoke member, being provided with a compression-spring 54, which tends to hold said lever in engagement with the locking-teeth. An auxiliary bar or lever may be inserted in the opening 55, arranged at the upper central portion of the yoke member to assist in the adjustment of the spring, it being understood that the closer the box 40 is moved to the collar 44 the harder will be the blow of the drill-bit.

In the box 40 are arranged two ratchet-wheels 60 61, through which the drill-shaft passes, and said ratchet-wheels are held from turning in one direction by spring-pressed pawls 62, guided in suitable openings formed in the lugs 42 at the sides of the box. The springs 64 are seated in recesses in suitable plates 65, secured to the outer ends of the lugs for convenience in assembling the parts. In the periphery of shaft 30 are formed two grooves 67 68, the groove 67 being parallel with the length of the shaft and adapted to receive a feather or spline 69, projecting inwardly from the ratchet-wheel 60, the ratchet-wheel turning with the shaft and preventing any movement in a reverse direction. The groove 68 extends helically on the shaft, its opposite ends being at about ninety degrees from each other. This groove is adapted to receive an inclined feather or spline 70, projecting inwardly from the ratchet-wheel 61, so that when the drill-shaft is moved to the rear by the operating-cams the ratchet-wheel will be turned by the engagement of the feather and inclined groove, the wheel being locked in its new position by the engaging pawls. On the inward movement of the drill-shaft against the stress of the actuating-spring 37 the drill-shaft will be revolved a short distance and locked in position by the ratchet-wheel 60 and its pawls.

In order to provide for a long and powerful stroke of the drill without a corresponding increase in the radial projection of the operating-cams, I have constructed a cam-shaft and cams of the structure more clearly shown in Fig. 12. The shaft 19 is provided with two enlarged flanges 71, forming shoulders which bear against the side frames to prevent any longitudinal displacement of said shaft. The central portion of the shaft is recessed, as at 72, to permit of the closer approach of the collar 44 to the center of the shaft. The cams 20 are provided with curved operating-faces 73 and radial faces 74, the operating-faces 73 having their starting-point at or within the circumferential line of the shaft and preferably at about the center of rotation of such shaft. I am thus enabled to procure a cam in which the action will be easy and gradual and at the same time to lengthen the stroke of the cam without undue increase in the degree of radial projection.

The drill-frame, as previously described, is mounted in a carriage 16, and in said carriage is a fixed nut 80, through which passes an adjusting-screw 81. The outer end of the adjusting-screw is adapted to a bearing in a lug 82, forming part of the drill-frame, and is held from longitudinal movement independent of the frame by a fixed collar 83, carried by the screw at one side of the lug, and a ratchet-wheel 84, secured to the screw on the opposite side of said lug. The extreme end of the screw-spindle is rectangular or polygonal in form and adapted for the reception of the socket end 85 of a cranked wrench 86, which may be applied to the screw when it is desired to reverse the movement of the drill-frame or to adjust the latter to working position when the drilling is started. On the hub of the ratchet-wheel is loosely mounted a cup 87, which extends over the periphery of the ratchet-wheel, a suitable cover-plate

88 being mounted on the hub of the wheel at the opposite side of the ratchet-teeth and secured to the cup by screws 89 90. At one side of the cup is a recess 91, in which is situated a pawl 92, mounted on the screw 89 and normally pressed into engagement with the ratchet-teeth by a small compression-spring 93. At a point outside the cup the cover-plate is provided with a lever 94, pivoted at 95 and having its opposite end bent at a right angle and passing through a curved slot 96 in the cover-plate to a point within the cup. The central portion of the lever lies close to the rectangular or polygonal end of the screw-spindle, and its free end is normally in contact with that side of the pawl 92 opposite the compression-spring 93. The function of this lever is to automatically disengage the pawl from the teeth of the ratchet-wheel when the socket end 85 of the wrench is placed on the end of the screw-spindle, the end of the socket member being inclined and acting as a cam to force the lever to one side while the wrench is being placed in position.

100 represents a bar having a cranked end portion 101 in the path of movement of the collar 44, the vertical portion of said bar being in contact with and partly guided by an inclined arm 102, which acts to move the cranked end of the bar from contact with the collar before the latter has reached the full limit of its rearward movement. The opposite end of the bar is secured to a depending lug 103 of a cam-plate 104, a second lug 105 on said cam-plate being provided with a suitable guiding-opening for said bar. The cam-plate extends partly over the cup 87 and is provided with an inclined slot or cam 106 for the reception of a pin 107, projecting from said cup. The bar is surrounded by a helical spring 108, secured at one end to the lug 82 and at its opposite end to the bar, said spring acting both as a torsion and compression spring, its torsional stress keeping the vertical portion of the bar in contact with the inclined face 102 and its longitudinal stress acting to return said bar and cam-plate to the forward position after each rearward thrust by the collar 44. The operation of this portion of the mechanism will be readily understood. At each rearward movement of the collar 44 under the action of the cams 20 the bar 101 will be moved to the rear, causing the inclined slot of the cam-plate to effect a rotatable movement of the cup 87 through the medium of the pin 107. This movement causes the engaging pawl 92 to move the ratchet-wheel and the screw-spindle for an angular distance equal to the length of one or more teeth. The rearward movement of the bar, however, is not the same as that of the collar 44, the inclined face of the arm 102 causing the cranked end of the arm to move beyond the periphery of the collar and to be disengaged therefrom before the collar reaches the limit of its rearward movement. The compression-spring 108 then returns the bar to its initial position in readiness for the return of the collar, and when the latter has finally reached its full forward position the torsional action of the spring causes the cranked end 101 of the bar to again move into the path of the collar.

In drills of this class as ordinarily constructed the drill-frame must be moved rearwardly on its carriage to disengage the drill-chuck from the bit, and in order to avoid this undesirable feature I employ a chuck of the character more clearly shown in Figs. 1 and 11.

The rear end of the chuck 109 is secured by screw-threads or in any other suitable manner to the end of the drill-shaft. The forward end of the chuck is provided with a socket 110 for engagement with the shank or tang of the drill, and the side of said socket is open, so that the drill may be moved laterally. To confine bit in place, I employ a clamping-jaw 111, having a threaded shank 112, passing through a suitable guiding-opening in the body of the chuck, a nut 113 being placed on said threaded shank to draw the clamping-jaw tightly against the shank of the bit, and thus confine the latter within the receiving-socket.

The drill-carriage is so supported as to be capable of movement at any angle, and for this purpose I form on the carriage a circular boss 114, having inclined walls and adapted to be received within a similarly-shaped socket or seat 116, formed in a joint member 117, the two parts being confined together in any position of circumferential adjustment by a securing-bolt 118. The clamping member 117 is substantially right angle in contour, the seat or socket 116 being formed in one of its arms and the outer face of the opposite arm being provided with a circular boss 119, having inclined walls, and the rear face of this member being provided with a socket 120 for the reception of the head of a bolt 121, which serves to secure said member in a seat or socket 122, formed in one member of a two-part clamp 123, adapted to be secured on the ordinary supporting-bar by which the drill is held in working position. This universal joint permits of the adjustment of the drill at any desired angle and at the same time is useful in that it permits of a tilting or sidewise movement of the drill carriage and frame to turn the latter to one side or the other in order to remove long drills out of deep holes without the necessity of reversing the feeding-screw, as is usually the case.

Although the construction herein described, and illustrated in the accompanying drawings, is the preferred form of the machine, it is obvious that many changes in the form, proportions, size, and minor detail of construction may be made without departing from the spirit or sacrificing any of the advantages of my invention.

Having thus described my invention, what I claim is—

1. The combination with a drill-shaft having a fixed collar, of a cam-shaft recessed intermediate of its length to permit the passage of said collar, and a cam mounted on said shaft and having an operating-face extending approximately from the axis of rotation of said shaft.

2. The combination with a drill-shaft having a fixed collar, of a cam-shaft having in one of its sides a recess to permit the approach of the periphery of the collar to a point adjacent to the center of rotation of the shaft, a pair of actuating-cams mounted on the shaft at each side of the recess, said cams each having a curved operating-face and a straight radial face, the curved face extending approximately from the center of rotation of the shaft, and the radial face being substantially in alinement with the recess of the cam-shaft, substantially as specified.

3. The combination with a drill-rod and means for reciprocating the same, of a guiding-box for said drill-rod, a supporting-frame for the drill-rod and the box, a pivoted yoke carried by the frame and adapted for contact with said box, an operating-handle on said yoke, and a series of ratchet-teeth for holding said handle in an adjusted position, substantially as specified.

4. The combination with a frame having side slots or openings, of a drill rod or shaft carried thereby, a box or casing adapted for the support of the inner end of the drill-rod, opposite guiding-lugs formed on said box or casing and projecting through said side slots or openings, a compression-spring surrounding the drill-shaft and having one end bearing against said box or casing, a pivoted yoke having its ends in operative contact with said lugs, an operating-lever carried by said yoke and movable laterally with respect to the yoke, a spring tending to keep the lever and yoke in contact, and a series of ratchet-teeth adapted to engage said lever and hold the same in an adjusted position, substantially as specified.

5. The combination with a frame having side slots or openings, of a drill-shaft, a box or casing adapted for the support of the inner ends of the drill-shaft, opposite guiding lugs formed on said box or casing and projecting through said side slots or openings, ratchet-wheels carried by the box or casing and adapted for operative engagement with the drill-shaft to effect the rotation of said drill-shaft, locking-pawls guided in suitable openings in said lugs and engaging with the ratchet-wheels, removable end plates formed on said lugs, and pawl-springs adapted to recessed seats in said plates, substantially as specified.

6. The combination in a drill, of the carriage, a fixed nut carried thereby, the drill-frame, a drill-shaft carried thereby, a fixed collar carried by said drill-shaft, a screw carried by the frame and adapted to the said nut, a ratchet-wheel secured to said screw, a cup or casing surrounding said ratchet-wheel, a pawl carried by said cup or casing for engagement with the ratchet-wheel, a longitudinally-movable bar or plate having an inclined slot adapted to receive a pin projecting from the cup, and means for connecting the drill-shaft to said bar or plate, substantially as specified.

7. A feed mechanism for a drill, comprising a fixed nut, a screw in engagement therewith, a ratchet-wheel secured to the screw, a cup or casing surrounding the ratchet-wheel and guided on the hub thereof, a pawl carried by the cup or casing and engaging said ratchet-wheel, a radially-projecting pin on said cup or casing, a slotted cam-plate movable independently of the drill-frame and engaging said projecting pin, means for positively moving said cam-plate in one direction, and a spring for effecting the movement of the cam-plate in the opposite direction.

8. The combination of the carriage, a fixed nut carried thereby, a frame, a drill-shaft supported by the frame, means for reciprocating said shaft, a fixed collar carried by the shaft, a screw carried by the frame and adapted to engage said nut, a ratchet-wheel carried by the screw, a cup or casing surrounding said ratchet-wheel, a pawl carried by the cup or casing and engaging said ratchet-wheel, a radially-projecting pin on said cup or casing, a longitudinally-movable bar or plate having an inclined slot for the reception of said pin, a cranked arm carrying said bar or plate and having one of its ends normally in the path of movement of the fixed collar of the drill-shaft, an inclined arm adapted to act on said cranked bar, and a combined torsion and compression spring carried by said bar, substantially as specified.

9. The combination of the drill-shaft having a fixed limit of movement, a collar fixed to said drill-shaft, a feed-screw, a ratchet-wheel secured thereto, a cup or casing surrounding the ratchet-wheel, a pawl carried by said cup or casing and engaging said ratchet-wheel, a radially-projecting pin on said cup or casing, a longitudinally-movable cam-plate having a slot for engagement with said pin, a bar operatively connected to the cam-plate and having one end disposed in the path of movement of the collar of the drill-shaft and mechanism for disengaging said operating-bar from the collar before the latter has reached its limit of rearward movement, substantially as specified.

10. The combination of the feed-screw having a rectangular or polygonal end, a ratchet-wheel secured to said feed-screw, a cup or casing surrounding said ratchet-wheel, a pawl carried by said cup or casing and adapted to engage the ratchet-wheel, and a pivoted lever carried by the cup or casing and having one of its ends in position to engage said pawl, said lever having an intermediate portion in proximity to the rectangular end of the feed-screw and adapted to be engaged by the socket end of a hand-tool to effect the disengage-

ment of the pawl from the ratchet-wheel, substantially as specified.

11. The combination with an open-sided drill-chuck to permit lateral engagement and disengagement of the chuck and drill, of a drill-engaging bolt having an enlarged head adapted to fit partially over the open side of the chuck, and a nut for locking said bolt in position, substantially as specified.

12. A drill-chuck having an open side to permit lateral engagement of the chuck and drill, a bolt having a threaded end and an enlarged head for engaging the drill-shank, and a nut for locking said bolt in position, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN HILL REDFIELD.

Witnesses:
N. T. JOHNSON,
F. M. ELLSWORTH.