(No Model.) 4 Sheets—Sheet 1.

H. P. & G. B. JONES.

ROCK DRILL.

No. 550,074. Patented Nov. 19, 1895.

Fig: 1.

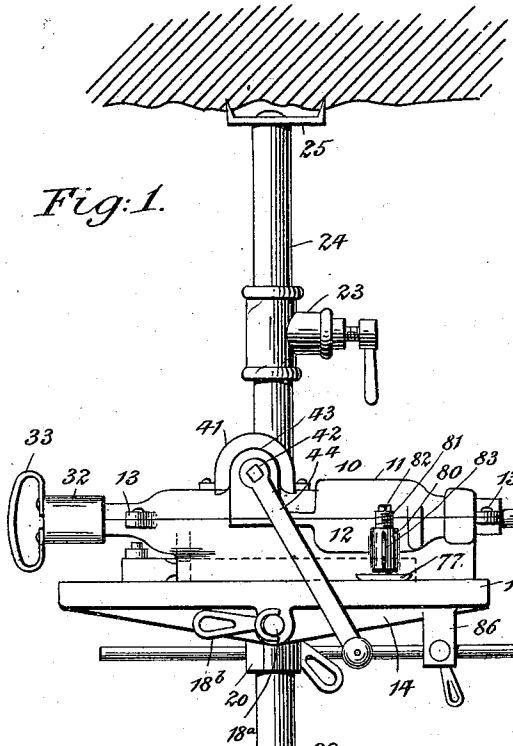

Fig: 2.

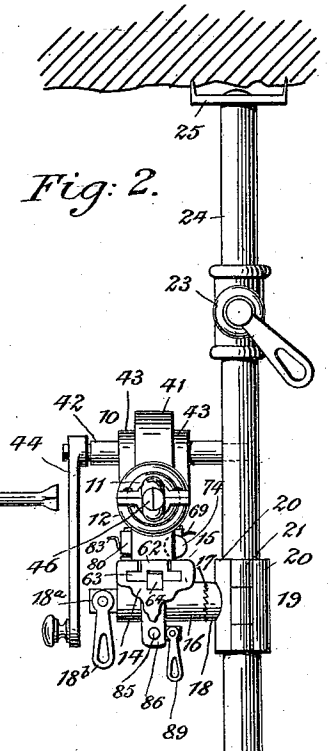

Fig: 3.

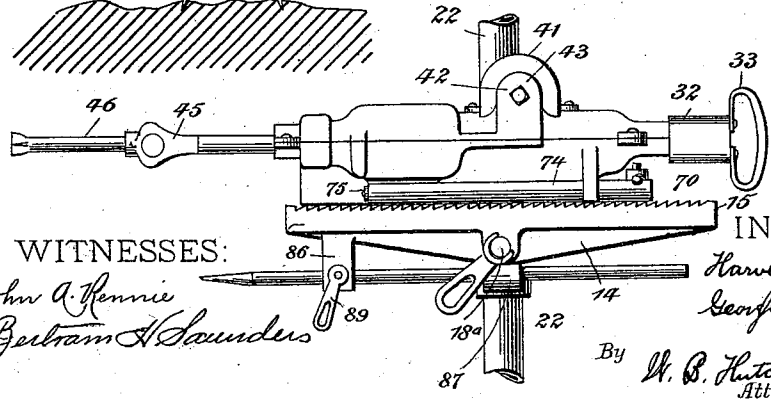

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Fig. 4.

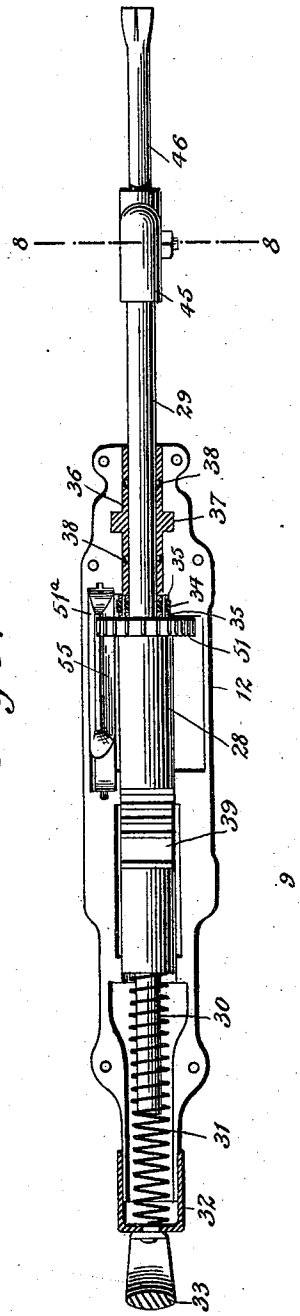
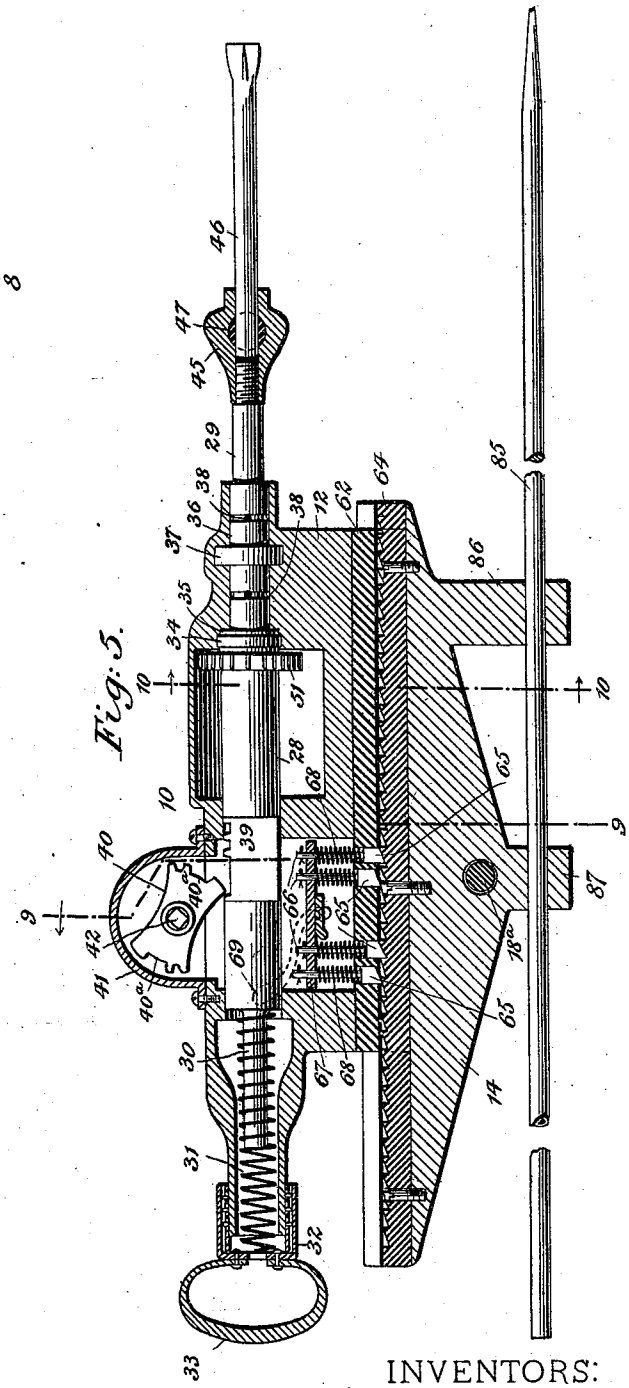


Fig. 5.



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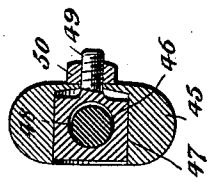

Fig. 8.

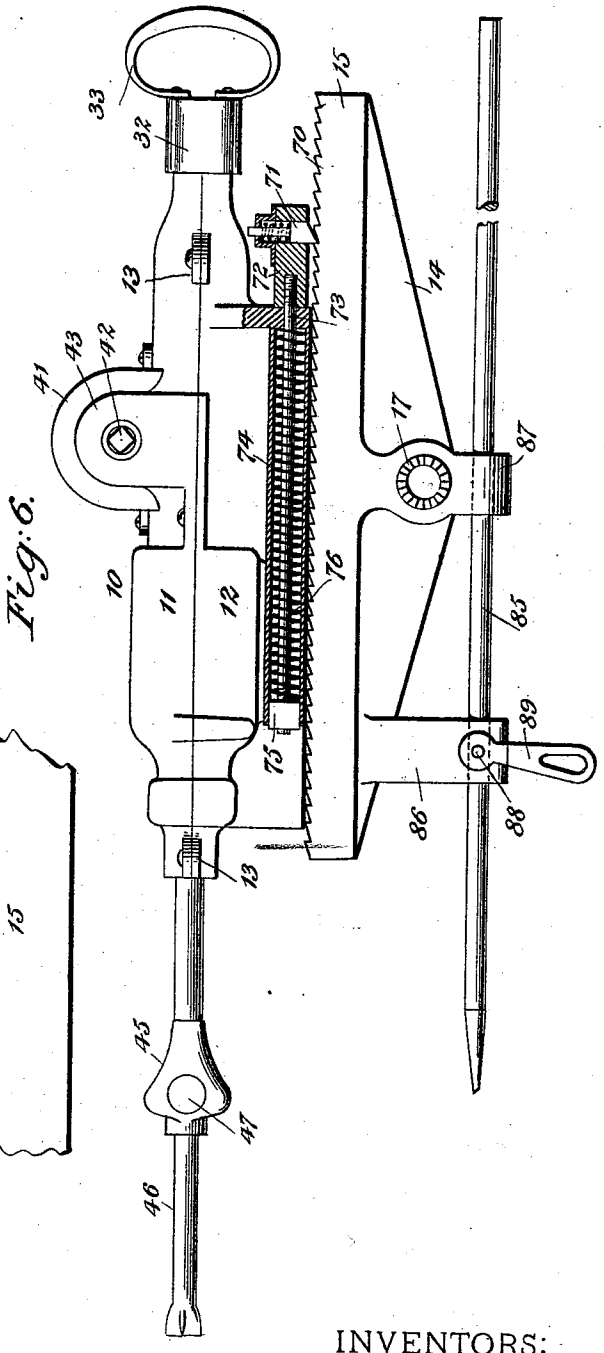

Fig. 6.

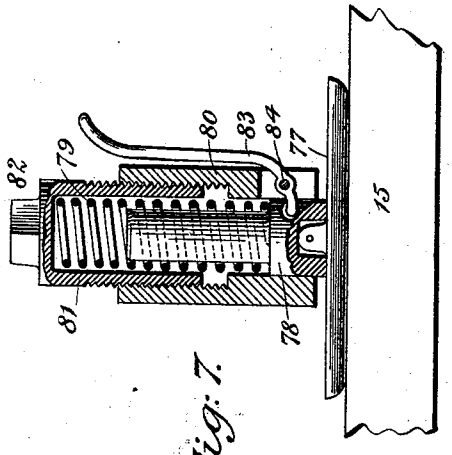

Fig. 7.

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Fig: 9.

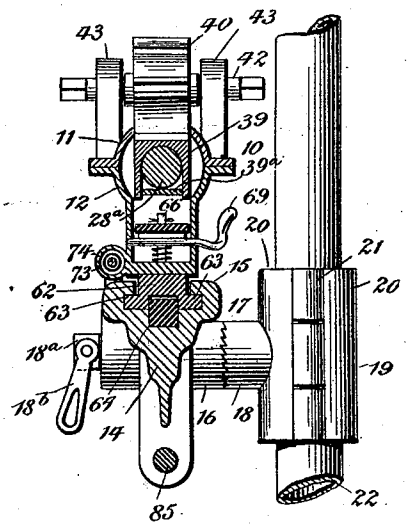


Fig: 10.

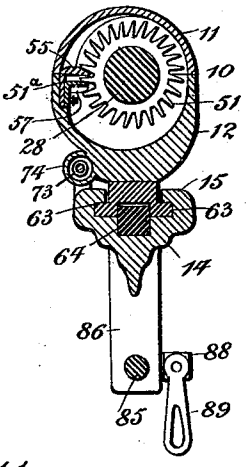


Fig: 11.

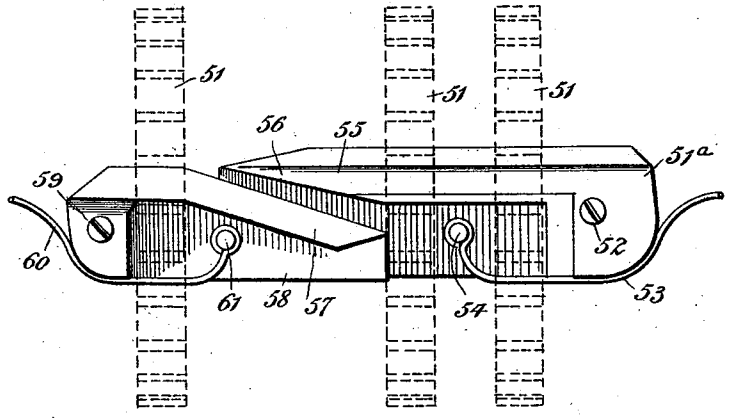
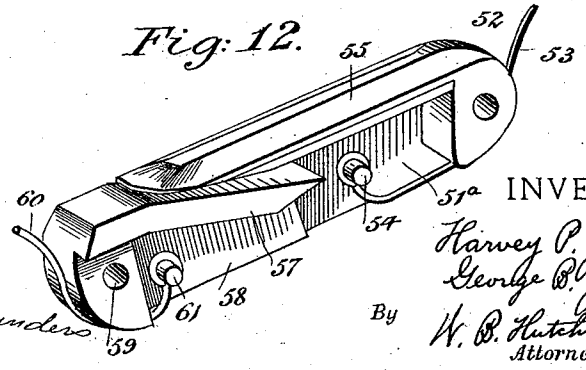


Fig: 12.



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UNITED STATES PATENT OFFICE.

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ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 550,074, dated November 19, 1895.

Application filed March 14, 1895. Serial No. 541,665. (No model.)

To all whom it may concern:

Be it known that we, HARVEY P. JONES, of Denver, in the county of Arapahoe and State of Colorado, and GEORGE B. JONES, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rock-Drills, of which the following is a full, clear, and exact description.

Our invention relates to improvements in rock-drills; and the object of our invention is to produce a quick, light, strong, and durable drill, which can be easily operated, which can be adjusted so as to drill a hole at any desired angle, and particularly to produce a drill which is self-feeding and which has a simple locking and turning device adapted to rigidly lock the drill at the end of its forward stroke and to turn it on its back stroke, thus moving the drill in substantially the same way that it is worked by hand and locking it in such a manner that a perfectly true and even hole is drilled. This function of locking the drill is of particular importance, because where there is any play or wabble to the drill it is likely to move laterally to a certain extent in the hole and leave projecting points, which as they accumulate choke the hole and prevent the drill from being efficiently used.

To these ends our invention consists of certain features of construction and combinations of parts, which will be hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of our improved drill, showing it in position for use. Fig. 2 is an end view of the same. Fig. 3 is a detail side elevation showing the opposite side to that illustrated in Fig. 1. Fig. 4 is a sectional plan of the drill, showing the upper half of the drill-frame removed. Fig. 5 is a central vertical longitudinal section of the drill. Fig. 6 is an enlarged detail side elevation, partly in section, illustrating the supplemental feed on one side of the machine. Fig. 7 is a detail sectional elevation showing the supplemental feed on the opposite side of the machine from that shown in Fig. 6. Fig. 8 is a detail cross-section on the line 8 8 of Fig. 4, showing the construction of the drill-holding chuck. Fig. 9 is a cross-section on the line 9 9 of Fig. 5. Fig. 10 is a cross-section on the line 10 10 of Fig. 5. Fig. 11 is an enlarged detail view, partly diagrammatic, showing the device for locking and turning the drill; and Fig. 12 is a detail perspective view of the device shown in Fig. 11.

The machine is in a general way like the one illustrated in Letters Patent of the United States No. 531,043, dated December 18, 1894, and the novel improvements will be hereinafter fully specified.

The machine is provided with a frame or shell 10, which is of a generally cylindrical shape, and is made up of two parts 11 and 12, which have meeting flanges 13 bolted together, and this frame or shell is mounted, in a manner hereinafter specified, on a bed 14, which has a flat top portion 15, and is provided with a transverse sleeve 16, having one end serrated, as shown at 17, to engage corresponding teeth or serrations on the hub 18, which projects from a clamp 19, which clamp comprises two oppositely-arranged jaws 20, hinged at one edge, as shown at 21, and adapted to be fastened at the other in any convenient manner, so as to fasten the clamp to the standard 22, which is adapted to be arranged vertically, or may be held at other angles, and which has at the top a fastening device 23, which it is not necessary to show in detail, this fastening device engaging an extensible end 24 of the standard, which carries a rigid claw 25, adapted to engage an adjacent wall and hold one end of the standard, while the lower end of the standard has a rod 26, adapted to be mounted on a second claw 27. The hub 18 has a projecting bolt 18^a, which projects through the sleeve 16, and is operated by a handle 18^b, so that by loosening the bolt the sleeve 16 and the bed 15 may be turned and by tightening the bolt the sleeve is locked to the hub 18 and the bed 14 held rigidly in position. Any other suitable device may be used for fastening the bed without affecting the principle of the invention.

In the frame or shell 10 of the machine is a reciprocating hammer 28, which moves

longitudinally, and which has its forward end reduced, as shown at 29, so as to protrude from the forward end of the frame or shell 10, while the rear end of the hammer is also reduced, as shown at 30, and encircled by a spiral spring 31, the tension of which is such as to throw the hammer forward to the position shown in Fig. 5. The rear end of this spring 31 rests against the back end of a cap 32, which is provided with a handle 33, and which locks with a bayonet-joint to the rear end of the frame or shell 10; but this joint is not shown or described in detail because the cap may be fastened to the frame in any suitable and convenient manner. The handle 33 may be used to work the cap 32 and also to handle the drill.

The front end of the main portion of the hammer 28 when thrown forward strikes a cushion or buffer comprising a central portion 34, of rubber, and end collars 35, of metal, this buffer being held in the front end of the frame 10, as shown clearly in Fig. 5, and it absorbs a portion of the shock when the hammer is thrown forward and assists by its recoil in the feed of the machine, as will be more fully specified below. The reduced front end 29 of the hammer slides through a sleeve or box 36, which is held in the front end of the frame or shell 10 and has a collar 37 to prevent it from moving endwise, while around it are grooves 38 with transverse holes extending from them to the core of the box to receive oil, as shown clearly in Figs. 4 and 5. The collar serves as a bearing for the hammer end, and as this part wears more quickly than most other parts of the machine the box 36 is an important feature of the invention, because it can be readily removed when worn and another one substituted for it without interfering with other parts of the machine.

The hammer 28 has a reduced cylindrical central portion 28^a, (see Fig. 9,) on which rides a rack-saddle 39, which is U-shaped in cross-section, as shown in Fig. 9, and which may be made of hardened metal, the under side of the rack being filled by the plug 39^a (see Fig. 9) after the rack-saddle is adjusted on the hammer. The rack is engaged by a mutilated gear 40, which has a comparatively-large blank space 40^a to come opposite certain portions of the rack-teeth, so that when the hammer 28 recoils there will be no friction against it, as the teeth on the rack will move through the blank space of the mutilated gear. It will be seen that the rack permits the hammer to turn without disturbing the position of the rack and that if it becomes worn it may be taken off readily and a new rack substituted. The mutilated gear 40^a is inclosed in a case 41 and carried by a shaft 42, which is journaled transversely in bearings 43 and has squared ends to receive crank-handles 44, by which the shaft and gear may be turned.

All the above construction, with the exception of the box 36 and the rack-saddle 39, is substantially like that shown in our former patent referred to above.

At the front end of the reduced part 29 of the hammer is a chuck 45, which screws to the hammer and which carries the drill 46, which may be of any usual construction. The drill enters the front end of the chuck and passes through a yoke 47, the bore of which is slightly oblong, (see Fig. 8,) and the yoke has at one side a bolt 49, which projects through the side of the chuck and is engaged by a nut 50, by tightening which the yoke 47 is moved laterally and the drill 46 bound securely in the chuck, after which the drill and hammer are practically one piece, so that the blow of the hammer and drill is an extremely solid one.

The hammer 28 is provided with a ratchet-wheel 51, by which it is turned, and this ratchet-wheel is engaged by a pawl 51^a, which is pivoted on the inner side of the frame or shell 10, as shown at 52, and is pressed normally downward by a spring 53, one end of which is held to the shell while the other engages a stud 54 or equivalent abutment on the pawl. The pawl 51^a has a side flange 55, which is held normally parallel with the drill-hammer, and enters between the teeth of the ratchet-wheel 51, the flange at the free end of the pawl being inclined, as shown at 56 in Fig. 11, so as to lie nearly parallel with the inclined flange 57 of the switch-pawl 58, which is arranged at one end of the pawl 51^a and is pivoted at the end opposite the pawl 51^a, as shown at 59. The switch-pawl 58 is normally pressed downward by a spring 60, which engages the frame or shell 10, and a stud or equivalent abutment 61 on the switch-pawl 58.

It will be seen that when the hammer 28 slides forward the flange 55 of the pawl 51^a is straddled by two of the teeth of the ratchet-wheel 51, so that the hammer and drill at the end of it are accurately guided and are held absolutely rigid, so that as the drill strikes the rock it cannot turn and delivers, therefore, a very effective blow. When, however, the drill and hammer slide back, the movement is perfectly even and the hammer and drill are not turned until the switch-pawl 58 is reached, when two of the teeth of the ratchet-wheel 51 straddle the flange 57 of the switch-pawl 58^a, and, ascending the inclined flange of the pawl, the ratchet-wheel, hammer, and drill are turned the necessary distance, so that on the next forward stroke of the hammer and drill the latter is caused to strike in a new place. It will be seen that this movement is very positive and accurate, that the drill is automatically turned and securely locked; but we do not confine our invention to the mechanism shown for effecting this result, for, while various devices have been used to turn the drill, nothing, to our knowledge, has ever been found to lock it as it strikes the rock, and we claim, broadly, therefore, any device for this purpose.

The drill-frame or shell 10 has on the under side a slide-bar 62, which moves in the slotted top of the bed 14, and which has side flanges 63 dovetailed into the bed to prevent the displacement of the slide-bar and the frame which it carries. The slide-bar moves over a track 64, which is fastened rigidly in the bed 14, but which may be made longitudinally adjustable, if desired. This track has ratchet-teeth on its upper side, the pitch of the teeth being toward the front end of the machine, and the teeth engage pawls 65, which are carried by the drill-frame and project downward through the slide-bar 62, these pawls being arranged in series, as shown in Fig. 5, so that when one pawl is against the shoulder of a tooth on the track the next pawl will be a little removed from the shoulder of its tooth, the next pawl still farther removed, and the outer pawl farther still, this arrangement making it certain that one pawl will always be in abutment with a tooth on the track, and thus the forward feed of the drill-frame and drill is rendered certain and positive, as will appear more clearly from the description of the operation of the machine. These pawls have upwardly-extending shanks 66, which project through a plate 67 in a recess of the drill-frame 10, (see Fig. 5,) and the pawls are pressed into engagement with the track by springs 68, while they may be removed from such engagement by means of a crank-handle 69, which is journaled in one side of the drill-frame and engages the plate 66. The top 15 of the bed 14 is provided with a row of ratchet-teeth 70 on one side, (see Figs. 3 and 6,) which teeth are engaged by a pawl 71, carried by a head 72, which is fastened to a rod 73, which slides in a spring-barrel 74, which is fast on the frame 10, and the rod 73 has at one end an abutment 75, which is pressed by a spring 76, held within the barrel.

The object of the above-described mechanism is to supplement the feed of the machine, and, as illustrated, it is adapted for use when the drill is in a nearly-vertical position to prevent the drill from feeding too rapidly, this being effected because the pawl 71 engages the ratchet-teeth, and the drill, therefore, feeds down against the tension of the spring 76. If, however, this construction was to be used to assist the upfeed of the machine, the pitch of the teeth 70 would be reversed and the pawl 71 would be placed in a reverse position.

On the opposite side of the drill-frame is a supplemental feeding device, (shown in Fig. 7,) which works frictionally, but which has practically the same function as the mechanism just described. As here shown, the friction-shoe 77 is adapted to engage the top 15 of the bed 14, this shoe being pivoted to a plunger 78, which is pressed toward the bed by a spring 79, which is inclosed in a two-part case 80 and 81, the part 80 being fast to the frame, while the part 81 screws into the part 80 and has a wrench-head 82 thereon to facilitate its turning. The friction-shoe is lifted out of engagement with the bed-top 15 by a lever 83, which is fulcrumed on the part 80 of the case, as shown at 84 in Fig. 7, and the tension of the spring 79, which presses against the shoe, can be regulated by adjusting the part 81 of the case. If desired, this construction (shown in Fig. 7) may be used on both sides of the machine, and by throwing the friction-shoe out of engagement with the bed-top 15 the drill feeds freely, while by placing the shoe in engagement with the said bed-top the drill feeds less freely, thus adjusting the machine for drilling downward, and by regulating the part 81 of the case the tension of the spring 79 and pressure of the shoe 77 may be regulated to adapt the drill for use in more or less inclined positions.

As a guide and brace for the drill the guide-rod 85 is used, which extends through lugs 86 and 87 on the under side of the bed 14, this rod having a pointed end to enter a hole in the wall or rock which is being drilled, and the guide-rod is held parallel with the drill 46. The rod 85 is fastened by means of a bolt 88 and handle 89, the bolt extending through the lug 86 and impinging on the rod 85, this being the common means of fastening similar devices.

The operation of the machine is as follows: The drill-frame 10 is adjusted on the standard 22 at the desired angle, the standard having been previously fastened, as shown in Fig. 1, and the drill-frame is then pushed forward, so as to bring the point of the drill against the rock to be drilled, and the rod 85 is adjusted in a hole drilled in the rock to receive it. The operator then grasps the crank-handles 44 and turns them continuously, thus turning the mutilated gear 40, the teeth of which engage the rack 39 and push the rack and hammer 28 back against the tension of the spring 31; but as the teeth of the gear 40 leave the rack the spring 31 throws the hammer 28 violently forward and brings the drill 46 forcibly against the rock. The continued movement of the gear causes it to again engage the rack 39; but if it engages before or during the recoil the blank space 40^a on the gear and the corresponding space on the rack provide for the necessary slack or lost motion of the hammer. As the hammer 28 comes back on the return stroke, the teeth of the ratchet-wheel 51 thereon, which are astride the flange 55 of the pawl 51^a, engage the inclined flange 57 of the switch-pawl 58 and ride up the said flange, thus turning the ratchet-wheel, drill, and hammer, and on the next forward stroke of the hammer the teeth slide readily over the reduced free end of the flange 55, so that as the drill strikes the rock it is securely locked by the pawl 51^a. When the hammer slides forward, it strikes the buffer, comprising the elastic washer 34 and collars 35, and the buffer thus absorbs a portion of the shock, and the hammer and frame 10 have a tendency to recoil, which recoil is

checked by the pawls 65 on the toothed track 64, and thus a second forward recoil takes place which carries the drill-frame and drill forward till the point of the drill is against the rock which is being drilled.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. In a rock drill, the combination, with the reciprocating hammer having a reduced cylindrical portion, of the rack saddle riding on the said reduced portion, and a gear to engage the saddle, substantially as described.

2. In a rock drill, the combination, with the reciprocating drill, of a ratchet wheel to turn the drill, a pawl to engage the ratchet wheel and on which the ratchet wheel slides, and a second switch pawl arranged to engage and turn the ratchet wheel by the sliding movement of the latter, substantially as described.

3. In a rock drill, the combination, with the reciprocating drill, of the ratchet wheel to turn the drill, a pawl having a side flange to enter between the teeth of the ratchet wheel, and a switch pawl pivoted at the end of the first pawl and provided with an inclined flange to engage and turn the ratchet wheel, substantially as described.

4. In a rock drill, the combination, with the reciprocating drill and the ratchet wheel to turn it, of the locking pawl having a side flange to engage the teeth of the ratchet wheel, the flange being tapered at one end, and a switch pawl pivoted at the end of the locking pawl and having an inclined flange extending opposite the tapering end of the locking pawl and adapted to engage and turn the ratchet wheel, substantially as described.

5. In a rock drill, the combination, with the supporting bed and the drill carrying frame slidable on the bed, of the spring pressed friction shoe on the frame to engage the bed, a device to throw the shoe out of engagement with the bed, and means for regulating the pressure of the shoe, substantially as described.

6. In a rock drill, the combination, with the supporting bed and the drill carrying frame slidable thereon, of the friction shoe carried by the frame and engaging the bed, a spring to press the shoe into engagement with the bed, a lever to move the shoe from the bed, and a screw mechanism to regulate the tension of the spring, substantially as described.

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