(No Model.) 5 Sheets—Sheet 1.

G. W. PICKETT.

ROCK DRILL.

No. 519,290. Patented May 1, 1894.

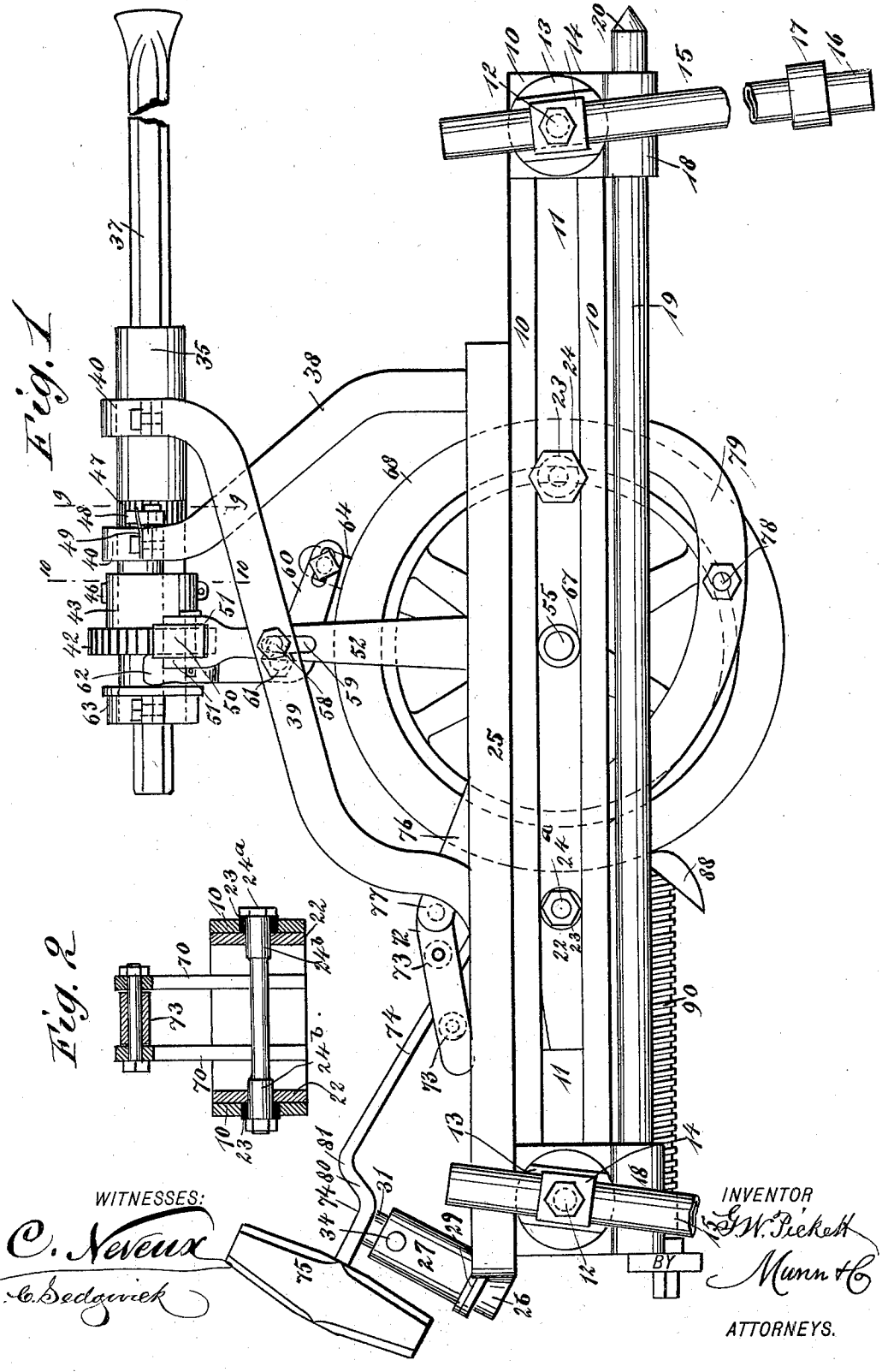

Fig. 1

Fig. 2

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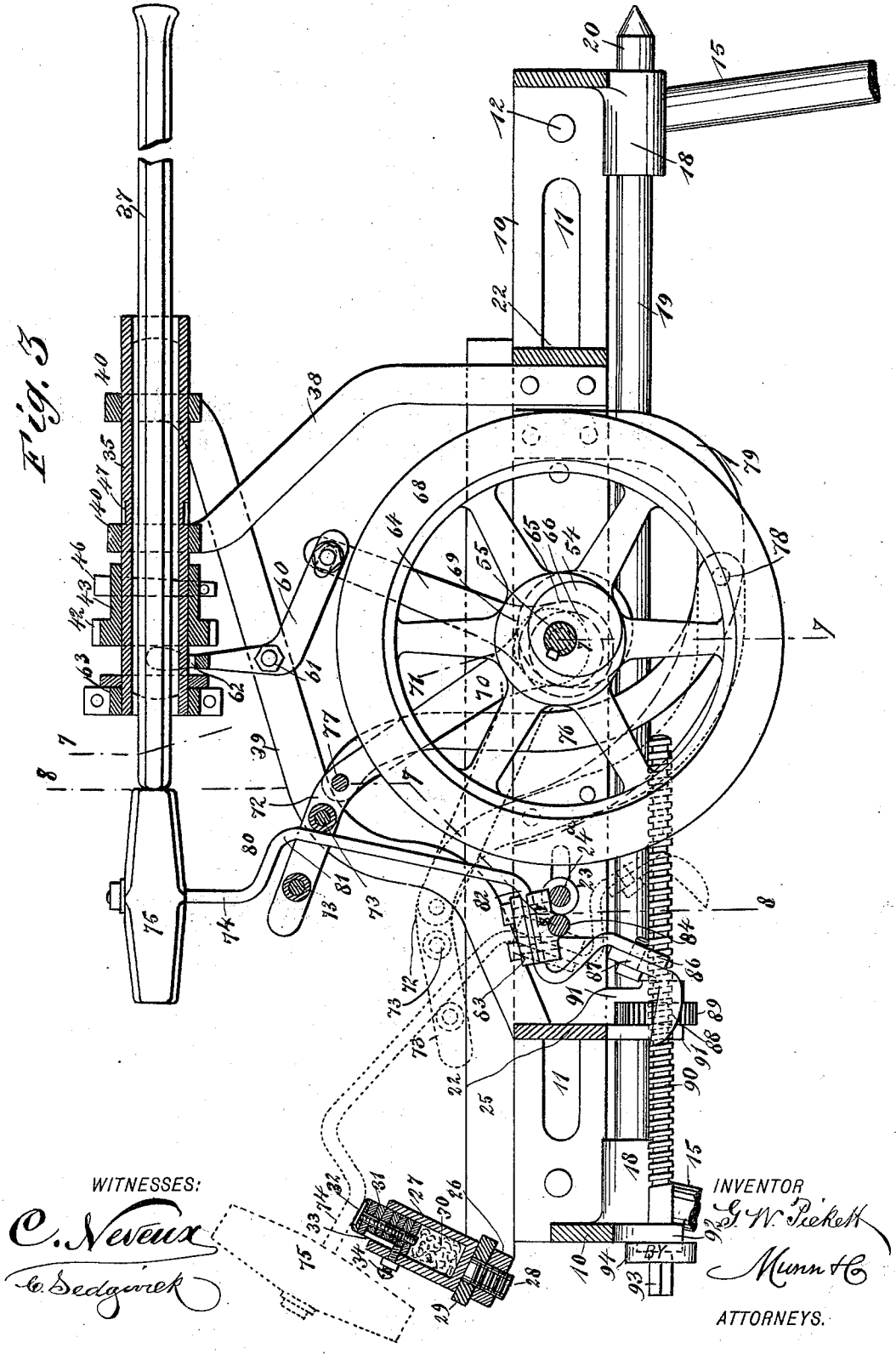
Fig. 3



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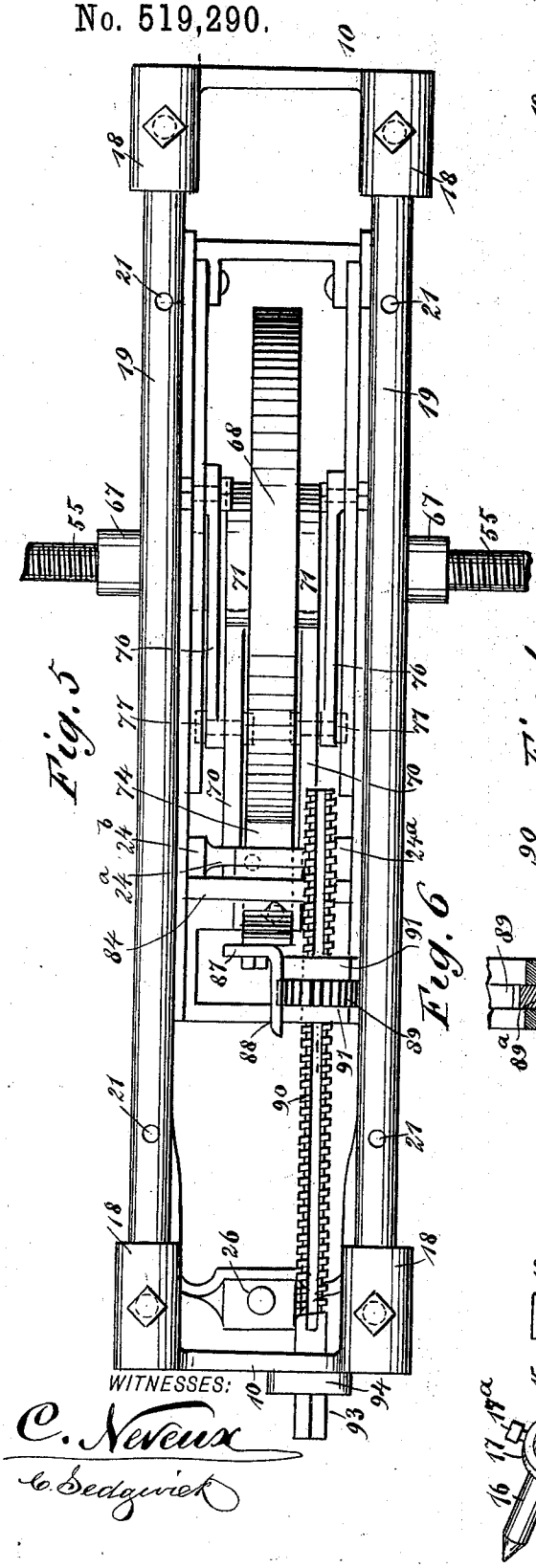

Fig. 5

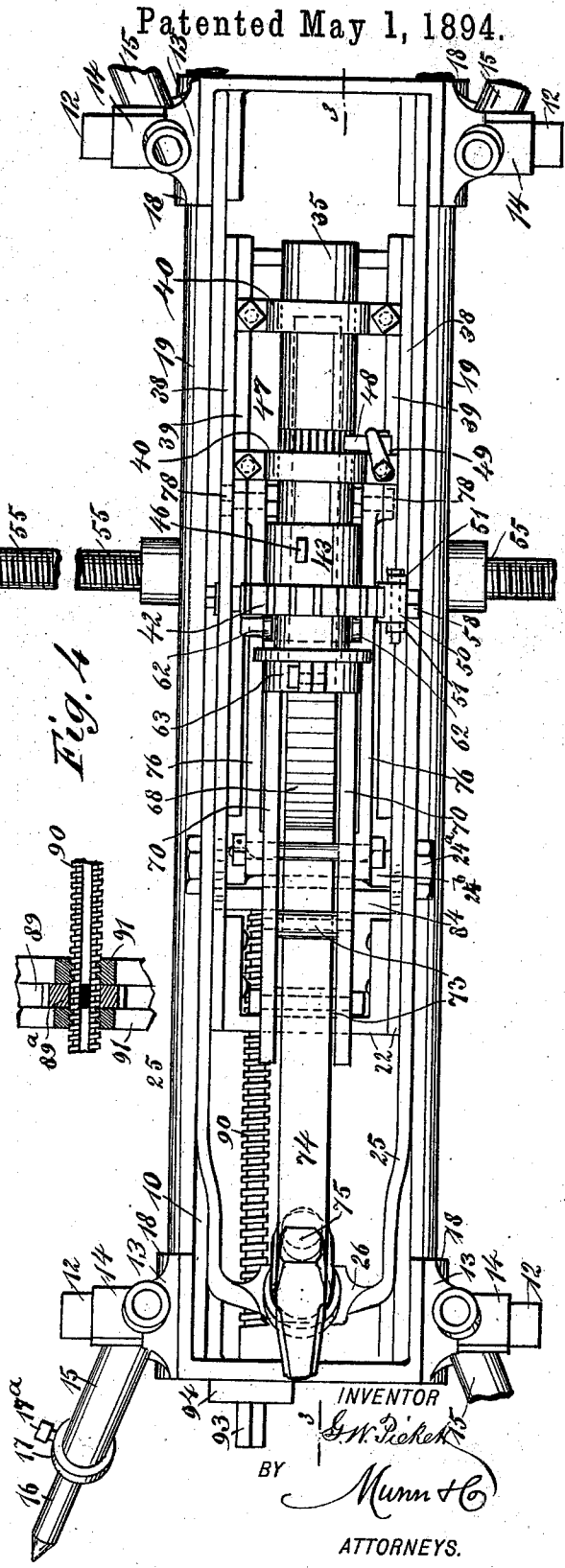

Fig. 4

Fig. 6

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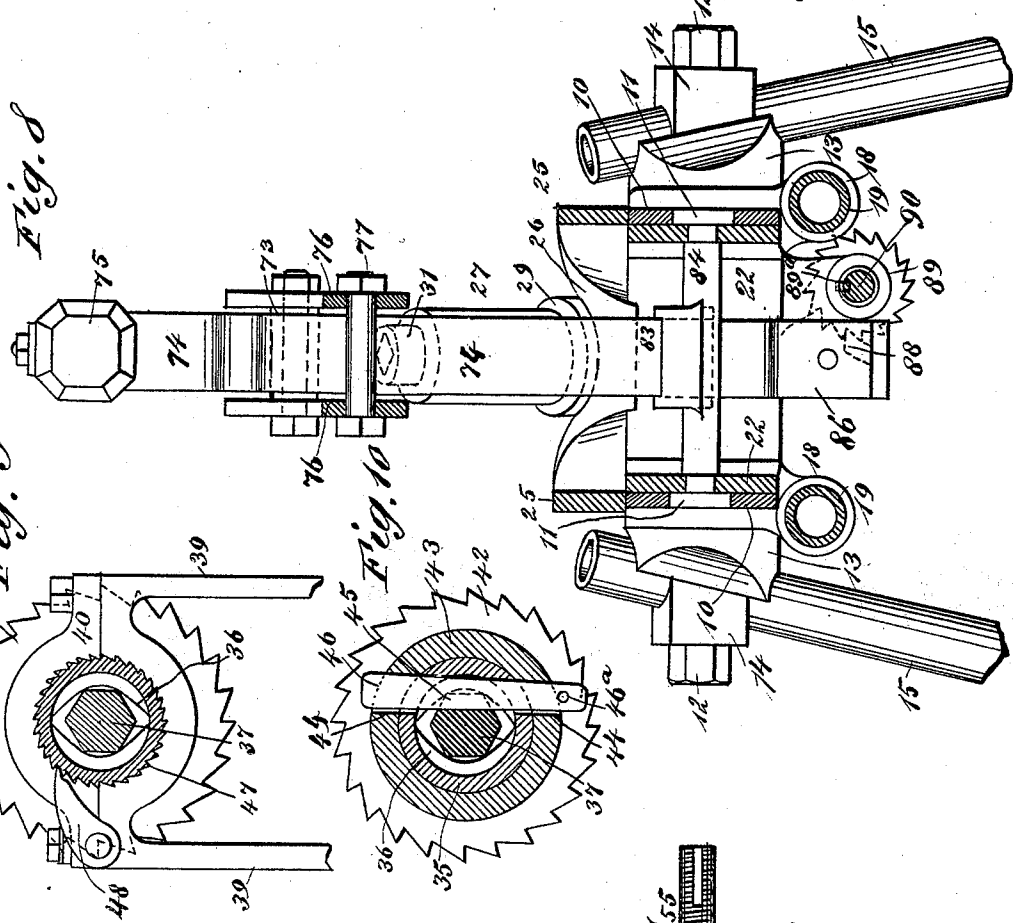

Fig. 8

Fig. 9

Fig. 10

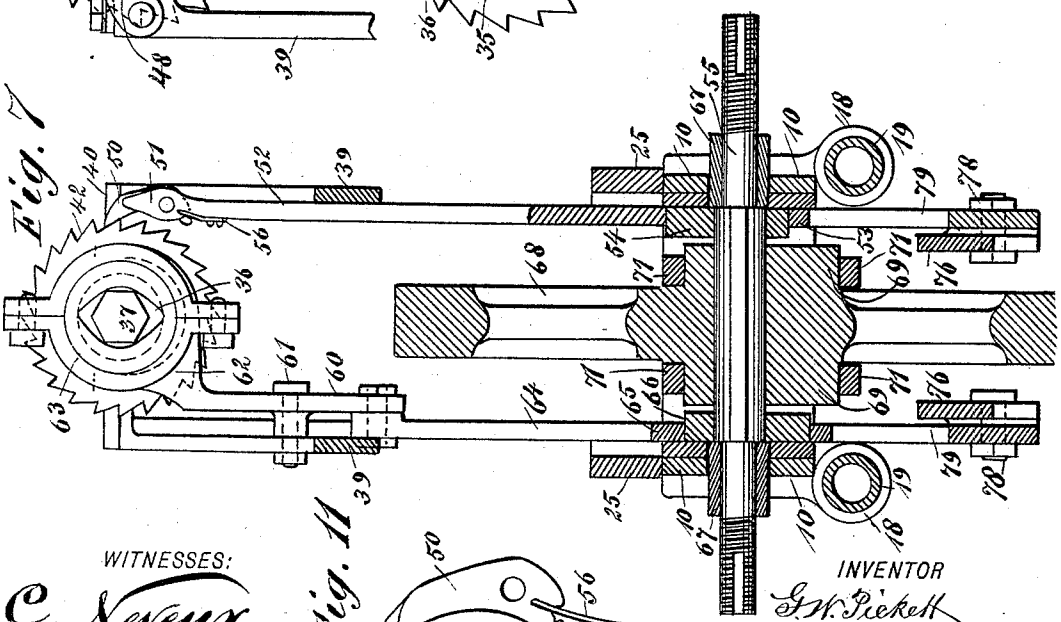

Fig. 7

Fig. 11

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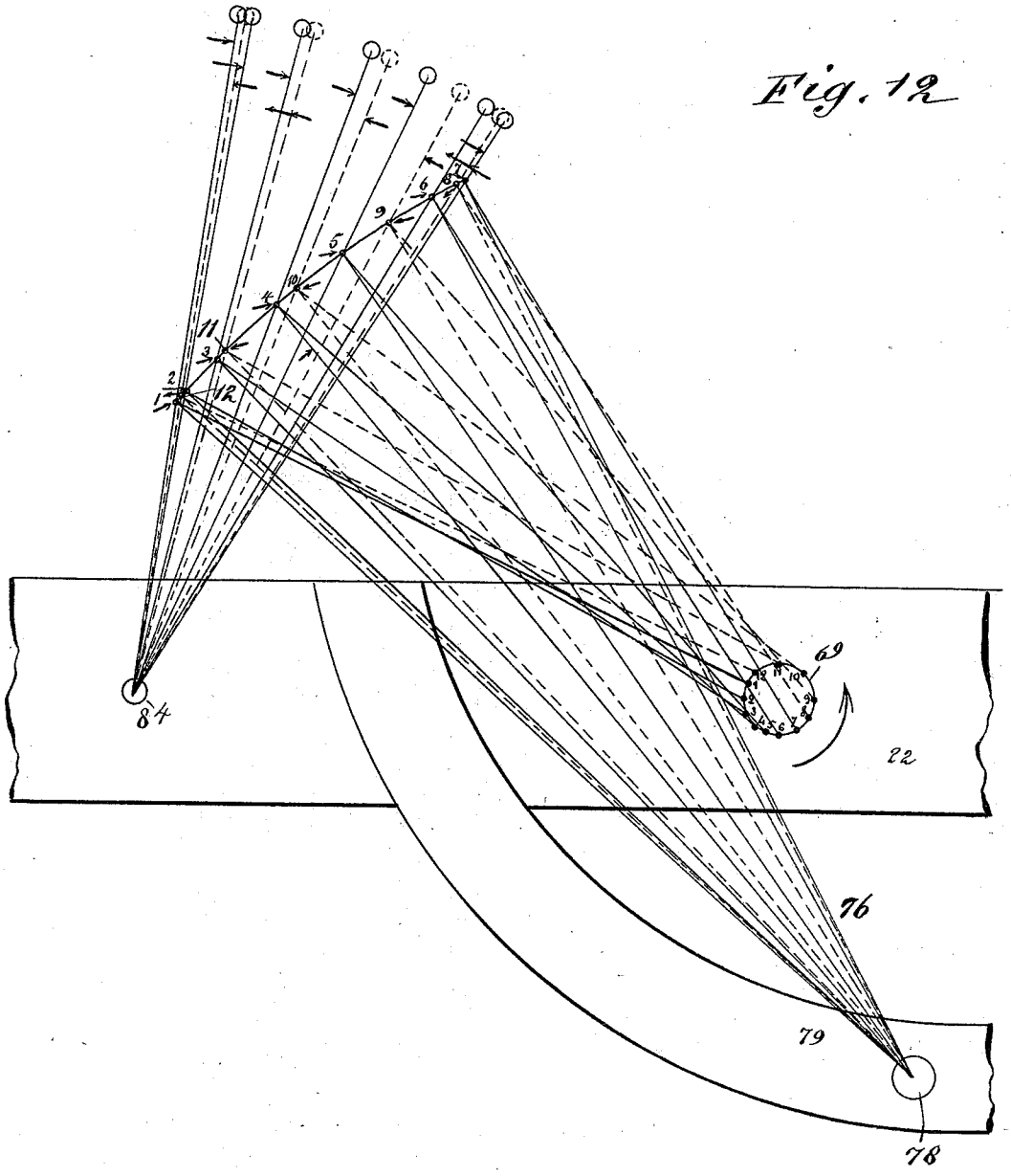
ROCK DRILL.

No. 519,290. Patented May 1, 1894.

Fig. 12.



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UNITED STATES PATENT OFFICE.

GEORGE W. PICKETT, OF DENVER, COLORADO, ASSIGNOR OF NINE-SIXTEENTHS TO SAMUEL LESEM, OF SAME PLACE.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 519,290, dated May 1, 1894.

Application filed June 13, 1893. Serial No. 477,431. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. PICKETT, of Denver, in the county of Arapahoe and State of Colorado, have invented a new and Improved Rock-Drill, of which the following is a full, clear, and exact description.

My invention relates to improvements in rock drills, and the object of my invention is to produce a substantial and durable machine which is comparatively light and compact, which carries a drill in such a way as to turn it after every stroke of the hammer in much the same manner as is done by hand, which is also adapted to automatically throw the drill forward and back after each blow of the hammer upon it so as to avoid choking, which is provided with a swinging hammer and mechanism for swinging it in very much the same way as it would be swung by hand, which is adapted to work in any desired position, which is provided with automatic feed mechanism for holding the drill constantly to its work, and which is adapted to deliver rapid and powerful blows upon the drill so as to cause it to be quickly driven into a rock.

To these ends my invention consists in a drill, the construction of 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 broken side elevation of the machine with a drill in position therein. Fig. 2 is a detail cross section through the stationary and movable frames, and showing in detail, the arrangement of the hammer arms. Fig. 3 is a vertical longitudinal section on the line 3—3 in Fig. 4, and with the hammer in contact with the drill. Fig. 4 is a broken plan view of the machine. Fig. 5 is an inverted plan of the same, but with the legs removed. Fig. 6 is a detail sectional view showing the arrangement of the adjusting screw, its threaded supports and the ratchet which operates it. Fig. 7 is a cross section on the line 7—7 in Fig. 3. Fig. 8 is a cross section on the line 8—8 in Fig. 3. Fig. 9 is an enlarged cross section through the drill holder, on the line 9—9 in Fig. 1. Fig. 10 is a detail section of the drill holder on the line 10—10 in Fig. 1. Fig. 11 is a detail perspective view of the pawl which actuates the ratchet of the drill holder; and Fig. 12 is a diagram showing the movements of the hammer actuating levers.

The machine is provided with an elongated rectangular main frame 10, which is slotted longitudinally on the sides, as shown at 11, and which at the corners has journaled on sustaining bolts 12, the two-part boxes 13 and 14, which are adapted to be clamped together by the bolt, and which are likewise fastened by the bolt to the legs 15. These legs have extensible lower ends 16 which telescope into the upper portions, and the legs 15 have terminal collars 17, through which extend set screws 17^a (see Fig. 4) by which the lower portions of the legs are fastened in their places. This construction enables the legs to be adjusted so as to hold the machine at any necessary height, and the boxes 13 and 14 and legs 15 may be swung and again fastened in place so as to extend the legs at any desired angle. In this way the machine may be thoroughly braced, and if it is necessary, each leg may be extended at a different angle from any other. The construction also enables the legs to be turned completely over and the machine tipped bottom side up so as to bring the drill down close to the level on which it works, and enable a hole to be drilled in this part of the adjacent rock. It will be seen, too, that the legs at one end may, if necessary, be made longer or shorter than those at the other end.

At the corners of the main frame and on the under side are horizontal lugs 18 having longitudinal bores therein, and fastened in the lugs are tubes 19, which are parallel with each other and extend longitudinally of the machine, and in these tubes are held sliding rods 20 with pointed ends, as shown in Fig. 3, and the tubes are provided with holes 21, (see Fig. 5) in which bolts may be inserted so as to fasten the slide rods in place. These slide rods may be adjusted against the rock which is to be drilled, and they may also be extended so as to serve as legs in case it is necessary to stand the machine on end. The rods may be extended from either end of the tubes as desired.

A frame 22, which is also of rectangular

shape, is held to slide longitudinally in the frame 10, and it is provided on the sides with rollers which run in the slots 11 of the main frame, these rollers being held in place by bolts 24 and 24ª, the latter extending entirely across the machine, as shown in Fig. 2, and having enlarged end portions 24ᵇ, which contact with the bearing roller or shaft of the hammer shank and serve to strengthen the same, as shown best in Fig. 3.

Secured to the upper edge of the sliding frame 22 is a U-shaped frame 25, the side members of which slide upon the top edges of the frame 10, and the closed end of this frame extends rearward beyond the frame 22, and is bent at an angle to the side pieces of the frame, as shown at 26 in Figs. 1 and 3. This bent end 26 serves as a support for the cushion socket 27, which is open at its upper end and has at its lower end a threaded bolt 28, which screws into a hole in the end 26 of the frame 25, and suitable washers 29 may be inserted between the frame and the socket so as to hold the socket solid and at the right height. In the bottom of the socket is a cushion 30 of wool, this being desirable because it is hard to compress it so that it will stay compressed, and upon the wool cushion is a second cushion 31, formed of united washers of either leather or rubber, preferably the latter, and the washers are held together by a screw 32.

The cushion 31 is substantially solid, and it has in one side a groove 33, which receives the inner end of a screw 34 which projects through the walls of the socket 27, and the screw prevents the cushion from being accidentally displaced. The cushion 31 receives the hammer shank on the return movement of the hammer after it has struck the drill, as hereinafter described, and the two cushions 30 and 31 absorb the shock of the blow and increase thereby the durability of the machine.

The drill holder, which consists of a sleeve 35 having ellipsoidal openings 36 to receive the drill 37, is held parallel with the frame 10, and above the frame when the latter is in its normal position, the drill holder being supported by bent arms 38 and 39, which extend upward on opposite sides and from the end portions of the sliding frame 22, the upper ends of these arms being formed into boxes 40, which securely hold the drill holder and in which it may turn. The revoluble movement of the drill holder and consequently of the drill, is produced by means of the ratchet wheel 42, which has an elongated hub 43. The hub 43 of the ratchet wheel and the adjacent parts of the drill holder are provided with transverse bores 44 on nearly diametrically opposite sides, and the drill 37 is provided on one side with a transverse groove 45, which is adapted to register with the transverse bores, and to fasten the drill in place a key 46 is used, which extends through the bores and groove, the key being perforated at its lower end, as shown at 46ª, so as to receive an ordinary split pin to prevent its removal. This construction is clearly shown in Fig. 10. The drill holder, after being moved by the ratchet wheel, is prevented from turning back by a pawl 48, which engages the teeth 47 on the body of the drill holder and which is held in engagement with the teeth by a spring 49. This construction is best shown in Fig. 9.

The ratchet wheel 42 is turned by a pawl 50, which is shown in detail in Fig. 11, and this pawl is pivoted between ears 51 on the upper end of a lever 52, which extends vertically downward and has its lower end formed into an eccentric strap 53, which rides upon an eccentric 54 on the transverse driving shaft 55, as shown in Figs. 1, 3 and 7. It will thus be seen that every revolution of the driving shaft will cause the eccentric 54 to be turned, the lever 52 to be raised, and the ratchet wheel 42 and drill holder 35 to be turned the distance of one tooth of the ratchet wheel. As the driving shaft causes the hammer to strike a blow at every revolution, it follows that the drill will be turned after each blow of the hammer so as to bring it in proper position to receive the next blow. The pawl 50 is held in engagement with the ratchet wheel by a spring 56, which is secured to the inner side of the lever 52, and which presses against a depending shank on the pawl, and the movement of the pawl is limited by the side lugs 57 which strike the ears 51 of the lever. The lever 52 is guided and held in place by a bolt 58, which is fastened to one of the arms 39 and extends through a longitudinal slot 59 in the lever.

The drill holder and drill are given a back-and-forth movement after each blow of the hammer so as to enable the drill to be easily turned and prevent it from choking, and this is effected by means of an elbow lever 60 (see Fig. 3) which is fulcrumed, as shown at 61, on one of the side arms 39. The upper end of this lever terminates in a fork 62, which straddles the drill holder and is held between the ratchet wheel 42 and the collar 63 on the end of the drill holder. The lower end of the lever 60 is pivotally connected with an upwardly-extending arm 64, the lower end of which is formed into an eccentric strap 65 (see Fig. 7) and rides upon an eccentric 66 on the driving shaft 55. It will thus be seen that the eccentric, when turned, will cause the arm 64 to be moved up and down, and the lever 60 being tilted, drives the drill holder backward and then forward again to its work.

The driving shaft 55 projects outward through the slots 11 in opposite sides of the main frame 10, and it is provided with collars 67 which turn snugly in the slots, and the outer ends of the shaft are screw-threaded to enable a driving pulley to be screwed thereon, but the pulleys may be attached in any other convenient way, and any suitable mechanism may be used for turning the shaft. On the center of the driving shaft is a heavy fly wheel 68,

which steadies the movement of the shaft, and on the hub of this wheel at opposite ends are produced eccentrics 69, upon which ride the eccentric straps 71 formed on the lower end of the hammer arms or levers 70. These levers extend upward and rearward from the eccentrics, being held parallel with each other as shown in Figs. 1, 2 and 3, and the arms near their outer ends are bent slightly downward, as shown at 72, and journaled near the free ends of the arms are parallel rollers 73, between which extends the shank 74 of the hammer 75, and the pressure of the rollers upon the hammer shank causes the hammer to be thrown forward and back according to the position and movement of the arms. The hammer arms or levers are guided and caused to act in the proper manner so as to deliver a sharp blow upon the drill by means of the eccentrics above referred to, and also by the guiding levers 76, which are arranged on opposite sides of the sliding frame 22, the upper ends of these levers being pivoted as shown at 77, to the hammer arms or levers, near the bends 72 of the latter, and the levers 76 are curved downward and forward, and are pivoted, as shown at 78, between depending brackets 79 on opposite sides of the frame 22.

By reference to Fig. 3, it will be seen that the points 78 at which the guiding levers 76 are pivoted, are beneath and forward of the driving shaft 55 and cams 69 which carry the levers 70, but the levers 70 and 76 swing for a certain distance in the arc of the same circle and the movements of the two levers cause the hammers to be thrown violently forward and then quickly back at the correct time, the swing of the hammer being coincident with the arc of the circle represented by the swinging of the levers 70 and 76. The action of the levers and hammer is fully illustrated in the diagram in Fig. 12, and will be explained in describing the operation of the machine.

The hammer shank 74 near its upper end, is bent forward, as shown at 80, then downward as shown at 81, so as to extend between the rollers 73 at nearly right angles to the rollers, and at a point adjacent to the frame 22, the shank is again bent rearward and clamped firmly in a box 83, which is seated on a cross shaft or roller 84, and the latter is journaled in the sides of the frame 22. After passing through the box 83, the shank extends downward and is provided at its lower end with a straight portion 86, on which is fastened the shank 87 of a pawl 88, the pawl extending at nearly right angles to the shank, as shown clearly in Fig. 5, and this pawl is adapted to engage the teeth of a ratchet wheel 89 which turns transversely in the lower portion of the frame, and which is keyed by means of a key 89^a (see Fig. 6) to the longitudinal screw 90, this screw being threaded into supporting brackets or lugs 91 on the lower portion of the frame 22, and turning also loosely at its rear end in a lug 92 on the under side of the main frame 10. The rear end of the screw is squared, as shown at 93, and provided with a collar 94, which abuts with the lug 92, and when necessary, a wrench may be applied to the squared end of the screw so that the screw may be turned and the sliding frame 22 moved longitudinally and brought into the desired position. The screw is moved automatically, however, when the machine is in operation by the contact of the pawl 88 with the ratchet wheel 89. This wheel, as before remarked, is keyed and not threaded on the screw and is held between the lugs 91, and at every stroke of the hammer the pawl 88 is turned back, as shown in Fig. 5, when the hammer is at the end of its stroke, and the ratchet wheel and screw turned the distance of one tooth and the frame 22 moved up so as to compensate for the advance of the drill, caused by the impact of the hammer upon it.

The operation of the machine is as follows: The frame 10 is brought into position to bring the point of the drill 37 against the rock to be drilled, and as before remarked, the position of the frame may be such that the drill may be brought into any desired angle. This being done the driving shaft 55 is then set in motion. At the first movement of the shaft the hammer 75, the shank of which lies upon the cushion 31 may be started, this being effected by means of the eccentrics 69, the hammer arms or levers 70, and the guiding levers 76. By reference to Fig. 12, the movement of the hammer can be more easily traced. In this figure, the position of the eccentric 69, the pivots 78 and the levers 76, and the pivot 84 of the hammer shank are all indicated by their appropriate numbers from 1 to 12, and in the diagram the forward movement of the several parts is indicated by full lines and the return movement by broken lines. At the beginning of the movement the eccentrics 69 will be in the position shown by the line 1, and the hammer shank 74 in the position indicated by the same number, but at the outer end of the line. When the cams 69 turn in the direction of the arrow their first movement to the point 2 is downward and toward the pivot of the levers 76, and the levers 76 are compelled to move, but cannot move downward as the length of the lever 70 will not permit it, and consequently the levers 76 are carried forward and the rear roller 73 of the hammer arms striking the shank 74, of the hammer, causes the hammer to be raised slightly. The continued movement of the cams or eccentrics 69 to the point 3, moves forward the levers 70 a little more, and the levers 76 are thrown upward in an increased ratio, as shown clearly in the diagram, so that the hammer shank advances to the position shown at the outer point 3, and this movement is continued until the eccentrics 69 reach their most forward movement, which is indicated by the number 7 on the diagram. The confinued movement of the cams or ec-

centrics 69 then causes the levers 70 to be pushed backward, and the return movement of the levers 70 and 76 and the hammer shank 74 is effected. The cams 69 are arranged in such a way that during the beginning of the forward stroke and the beginning of the back stroke, the movement of the levers is very limited, but through the remainder of the stroke the levers 70 are thrown quickly forward and the levers 76 thrown violently upward so that the rear roller acting on the hammer shank, causes the hammer to strike a violent blow on the drill 37. When the levers are pushed back, the forward roller 73 acts on the hammer shank and throws the hammer back on the cushion 31.

From the foregoing description it will be seen that a very effective blow is produced upon the drill and that the hammer has a long swing occasioned by the peculiar arrangement of the levers. After the hammer has delivered a blow, and just before it strikes again upon the drill 37, the eccentric 66 rises and actuates the arm 64 and elbow lever 60, so as to move the drill holder 35 backward and forward, and while this movement is taking place the eccentric 54 also rises and actuates the lever 52, which causes the pawl 50 to engage the ratchet wheel 42 and turn the drill holder and drill the distance of one tooth on the ratchet wheel. At almost the same instant, the pawl 88, being thrown backward by the forward movement of the hammer, just before the hammer strikes the drill will engage the ratchet wheel 89 and turn the screw 90, so that the screw will feed forward the sliding frame or carriage 22, and cause the point of the drill to be brought up firmly against the rock. The above movements will take place at every revolution of the driving wheel, and consequently rapid blows will be delivered upon the drill and a hole quickly made in the rock.

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

1. A rock drill, comprising a main frame, a sliding frame held to move thereon, a revoluble and slidable drill holder carried by the sliding frame, a swinging hammer held to strike the drill in the holder, a lever mechanism slidably connected with the hammer shank for operating the hammer a revoluble driving shaft adapted to operate the hammer levers, a lever mechanism operated by the driving shaft for feeding the drill holder forward and back after each blow of the hammer, a ratchet mechanism operated by the driving shaft and adapted to turn the drill holder, and a screw mechanism operated by the mechanism of the hammer and adapted to feed forward the sliding frame at each blow of the hammer, substantially as described.

2. A rock drill, comprising a supporting frame, a revoluble and longitudinally movable drill holder carried by the frame and adapted to receive a drill, a revoluble driving shaft journaled in the frame, a swinging hammer arranged behind the drill holder and adapted to engage the drill, an eccentric-operated lever mechanism driven by the driving shaft and slidably connected with the hammer shank to swing the hammer, a ratchet mechanism operated by the driving shaft and arranged to turn the drill holder after each blow of the hammer, and a lever mechanism operated by the driving shaft for moving the drill holder and drill forward and back at each blow of the hammer, substantially as described.

3. A rock drill, comprising a main frame, a sliding frame held to move in the main frame and provided with drilling mechanism employing a swinging hammer, a screw operatively connected with the two frames and adapted by turning to move the sliding frame, a ratchet wheel keyed to the screw, and a pawl carried by the hammer shank and adapted to engage the ratchet wheel and turn the screw at each swing of the hammer, substantially as described.

4. In a rock drill, the combination with a pivoted hammer, of an eccentrically operated lever mechanism connected with and sliding on the hammer shank, substantially as described.

5. In a rock drill, the combination with a pivoted hammer, of an eccentrically operated lever mechanism having between the outer ends of two members of the same spaced stops, between which the hammer shank projects, substantially as described.

6. In a rock drill, the combination with a pivoted hammer shank, of eccentric-operated levers having spaced stops between their outer ends and between which the hammer shank projects, and pivoted guide levers having their upper ends pivoted to the eccentric-operated levers, substantially as herein shown and described.

7. A rock drill, comprising a supporting frame, a driving shaft therein provided with eccentrics, a drill holder supported on the frame, a swinging hammer pivoted in the frame and adapted to strike a drill in the holder, the hammer arms or levers carried by the eccentrics and having rollers arranged before and behind the shank of the hammer, and guiding levers pivoted to the hammer levers and to a point on the frame forward of the driving shaft, substantially as described.

8. In a rock drill, the combination of the swinging hammer having a depending shank, the driving shaft having eccentrics thereon, the hammer levers carried by the eccentrics and arranged to embrace the hammer shank, and the guiding levers pivoted independently of and parallel with the driving shaft and also pivotally connected with the hammer levers, substantially as described.

9. In a rock drill, the combination with a main frame, and a sliding frame carried by said main frame, of a pivoted hammer, means for operating the hammer, a screw for operat-

ing the sliding frame, and a pawl and ratchet mechanism for operating the screw, the pawl being secured to the hammer shank, substantially as described.

10. In a rock drill, the combination, with the swinging hammer, of a socket arranged in the path of the hammer shank, a wool cushion arranged within the socket, and a substantially solid cushion held upon the wool cushion and adapted to engage the hammer shank on the return movement of the hammer, substantially as described.

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