(No Model.)

3 Sheets—Sheet 1.

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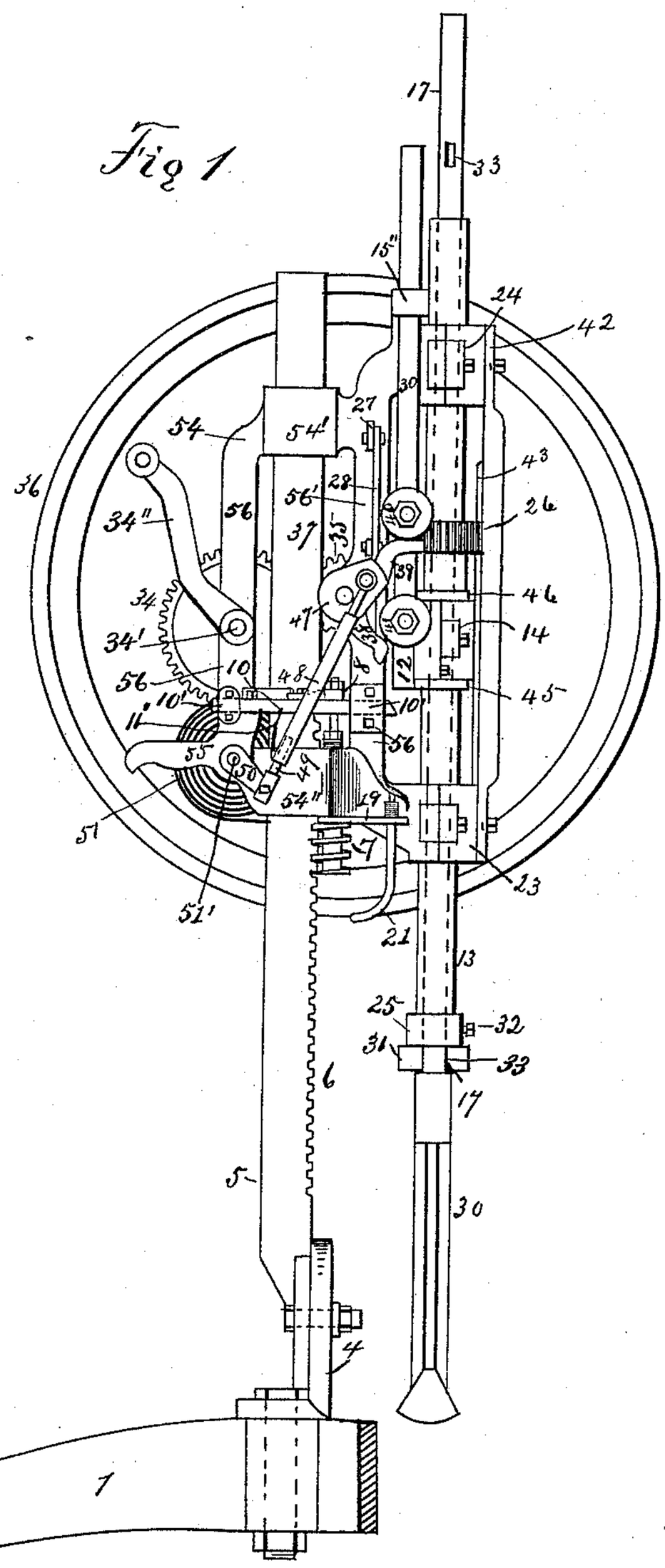
C. M. & H. DITTMAN, Administrators.

ROCK DRILL.

No. 417,004. Patented Dec. 10, 1889.

Fig 1.



Witnesses.

Geo. H. Harvey

C. S. Johnston

Inventor.

Catharine Maria Dittman and Henry Dittman administrators of Joseph F. Dittman deceased

By A. C. Johnston

attorney

(No Model.)

3 Sheets—Sheet 2.

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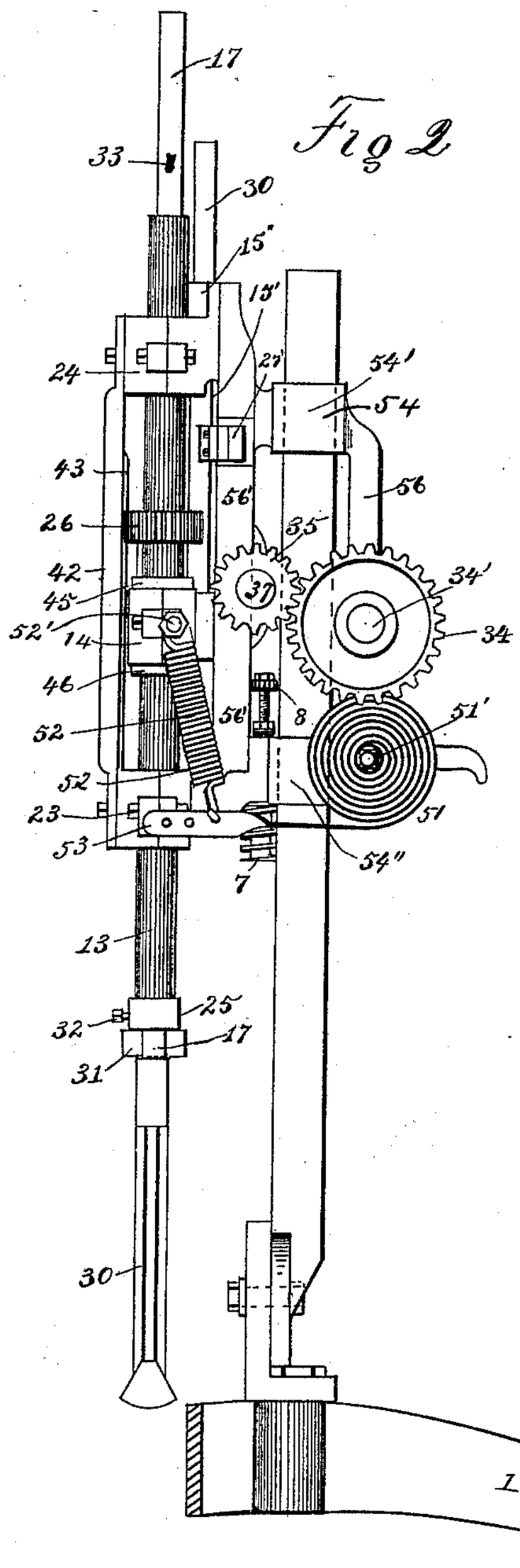
ROCK DRILL.

No. 417,004. Patented Dec. 10, 1889.

Fig 2



Witnesses:

Geo H Harvey

E. S Johnston

Inventor.

Catharine Maria Dittman and Henry Dittman administrators of Joseph F. Dittman deceased

By A C Johnston

Attorney

(No Model.)

3 Sheets—Sheet 3.

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ROCK DRILL.

No. 417,004. Patented Dec. 10, 1889.

Fig 3

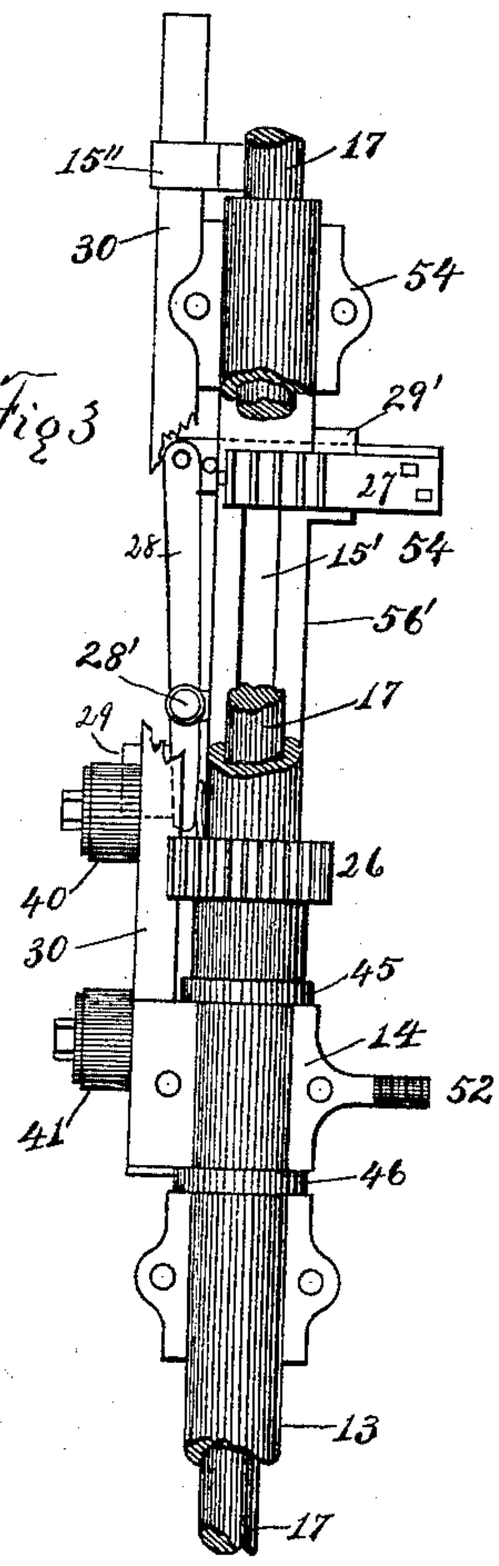


Fig 4

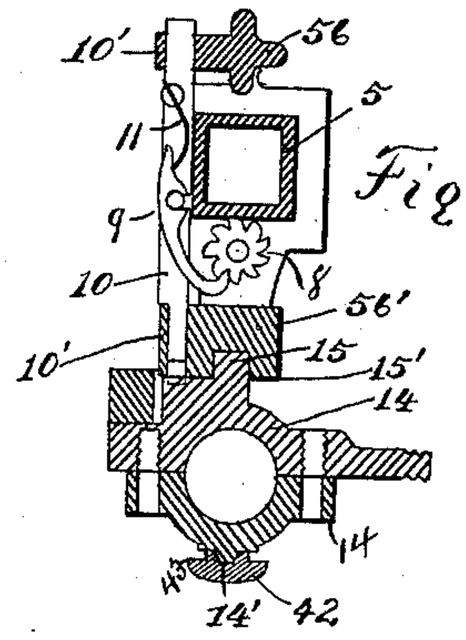


Fig 6

Fig 5

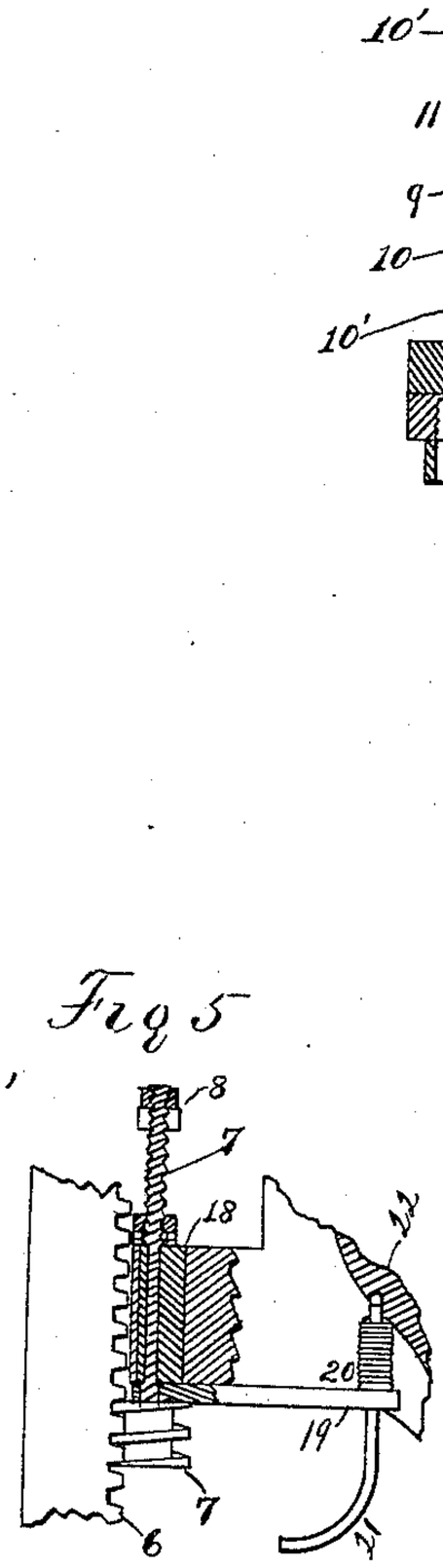


Fig 7.

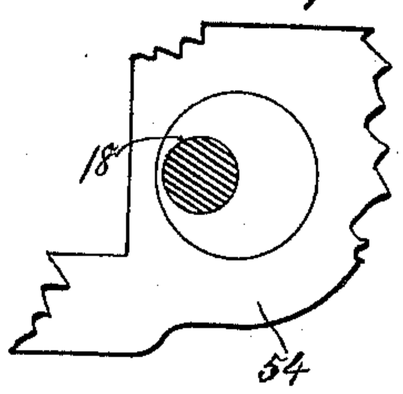
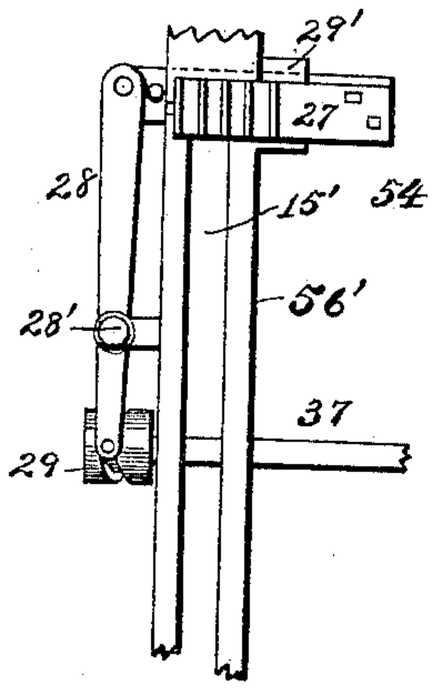


Fig. 8.



Witnesses:

Geo. H. Harvey

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Inventor.

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By A. C. Johnston

Attorney

UNITED STATES PATENT OFFICE.

CATHARINE MARIA DITTMAN AND HENRY DITTMAN, OF PITTSBURG, PENNSYLVANIA, ADMINISTRATORS OF JOSEPH F. DITTMAN, DECEASED.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 417,004, dated December 10, 1889.

Application filed August 9, 1889. Serial No. 320,302. (No model.)

To all whom it may concern:

Be it known that JOSEPH F. DITTMAN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, invented certain new and useful Improvements in Rock-Drills, of which the following is a description.

This invention relates to improvements in that class of rock-drills which employ a reciprocating drill-rod that is adapted to be rotated a limited distance at each reciprocating movement thereof; and the object of this invention is to improve the mechanisms for imparting such reciprocating and axial movements to the drill-rod, as well as to provide means for readily throwing the machine out of gear to enable it to be returned to its normal position for drilling another aperture into the rock, to provide means for adjusting the drill-rod longitudinally within the contrivance by which it is carried, to enable said drill-rod to be adjusted for cutting holes of different depths, and to provide improved means for giving to the drill-rod a powerful downward stroke.

With these primary ends in view and such others as pertain to this invention, an upright supporting-column is provided, which is adjustably mounted on a suitable base, and on said column is supported a traveling or movable frame which carries the reciprocating drill-rod and the various operating mechanisms of the machine. This carrying-frame is mounted on the upright supporting-column so as to move longitudinally thereon, and it is adapted to be fed or moved a limited distance at each downward stroke of the drill-rod by feed mechanism which is controlled and operated by the drill-rod. This feed mechanism consists, essentially, of an endless feed-screw which is axially journaled in the lower end of the adjustable carrying-frame and is geared to a rack on the upright supporting-column, the upper extremity of said screw having a ratchet-wheel fixed thereto. With this ratchet-wheel engages a spring-pressed feeding-pawl, which is pivoted on and carried by an endwise-movable horizontal bar or rod supported in aligned bearings on the main frame, and this bar or rod has one end thereof normally projected or forced—as, for instance, by a spring—into the path of a trip device, which is carried by the vertically-reciprocating drill-rod, whereby when the drill-rod and the trip carried thereby descends the trip impinges against the endwise-movable horizontal bar and forces the latter rearward a limited distance, which movement of the bar operates the feeding-pawl carried by the bar to turn or rotate the ratchet-wheel and the endless screw a sufficient distance to lower the main frame on the upright supporting-column. After the trip passes the bar and the latter is released therefrom the bar is automatically returned to its normal position and the feeding-pawl engages the succeeding tooth of the ratchet-wheel, so that the parts are in condition for operation on the following downstroke of the drill-rod. When the carrying-frame has been lowered the desired distance or to the lower limit of the rack, the feed-screw can be disengaged from the rack to enable the carrying-frame to be elevated manually on the supporting-column, which disengagement is accomplished by the following mechanism: The shank or end of the feed-screw is fitted in an eccentric-sleeve that is journaled in the carrying-frame, and on its lower face or end said sleeve carries a horizontal arm, which in turn has a vertically-movable locking-handle at its outer end, said handle being controlled by a coiled spring which normally forces one end thereof into a slot or aperture on the main frame, so as to lock said handle, the horizontal arm in which it is supported, and the eccentric sleeve in place. To disengage the feed-screw from the rack on the supporting-column, the handle is drawn down against the tension of the spring to withdraw its upper end from the slot or aperture, and the handle and arm are turned away from the carrying-frame, which movement of the arm turns the eccentric-sleeve axially and throws the feed-screw laterally from the rack on the supporting upright column, thus disengaging the screw from the rack and permitting the carrying-frame to be readily elevated on the supporting-column. The drill-rod is carried by and arranged longitudinally within a vertical tubular mandrel, and this mandrel is supported and guided in suitable bearings or

guides on the main carrying-frame. The mandrel is provided at intermediate points of its length with two collars, which are spaced a suitable distance apart to receive between themselves a cross-head, which is confined against endwise play on said mandrel by the collars thereon. This cross-head is fitted loosely on the mandrel, so that the latter can turn or rotate axially therein, and the cross-head moves with or partakes of the longitudinal reciprocating motion of the mandrel and drill-rod, the cross-head being confined against axial rotation or movement with the mandrel and drill-rod because it engages with and slides in vertical guides on the carrying-frame. To the reciprocating cross-head, which moves longitudinally with the mandrel and the drill-rod, is secured or fixed the lower extremity of a vertical rod or bar which is arranged parallel with and laterally of the mandrel, the upper end of said rod or bar being guided in a fixed guide on the carrying-frame, and this vertical bar or rod, which moves with the cross-head and the mandrel, carries two friction-rollers, which are spaced a short distance from each other, and against which rollers act lifters or arms. These lifters or arms are arranged one below the other and are carried by a short driving-shaft that is suitably journaled in the carrying-frame, the driving-shaft also carrying a balance or fly wheel and a gear, which gear meshes with another gear on a power-shaft having a crank adapted to be rotated by hand to drive the operating mechanisms of the machine. The mechanism for imparting a limited rotary motion to the mandrel consists of an endwise-movable rack, which is arranged in a suitable guide in the upper part of the carrying-frame, and one end of this rack is connected to the upper end of a lever which is fulcrumed to the main frame and has its lower end acted on by a cam which operates to move the lever, so as to slide the rack back and forth in a line at right angles to the vertical play or movement of the mandrel. The reciprocating mandrel carries a gear which is fixed thereon, and when the mandrel and cross-head thereon are elevated by the lifters on the disk of the driving-shaft, this gear meshes with the rack, which rack is then operated by the lever and cam so as to turn or rotate the gear and mandrel on their axes, the gear when it is disengaged from the rack and on the downstroke of the mandrel having one or more of its teeth fitted in a guide-groove on the carrying-frame, which gear thus serves to prevent the mandrel from turning axially on its downstroke. The device for imparting a downstroke to the mandrel and drill-rod after they have been lifted consists of a coiled-spring band which has one end attached to the carrying-frame and its other end attached to an axial shaft which is journaled in the carrying-frame, and this shaft has at one end an arm, to which is connected a link, the opposite end of said link being connected or pivoted to a rotating crank at a point some distance from its axis, whereby the link and arm serve to compress the spring-band around its shaft when the cam-lifters operate to elevate the mandrel. To the mandrel is connected through the medium of the cross-head, which moves therewith, one end of a coiled spring, the other end of which spring is connected to the end of the spring-band attached to the carrying-frame, whereby when the mandrel is lifted the spring-band is contracted around its shaft and the coiled spring distended, so that when the mandrel is released from the lifters the tension of these two springs is at once relaxed to cause them to exert a strong pull on the mandrel and impart to the latter a powerful downstroke. The drill-rod is provided at intermediate points of its length with transverse apertures, in one of which fits a transverse key that impinges or bears against the lower end of the hollow or tubular mandrel to prevent the drill-rod from moving endwise in the mandrel under the shock or jar of the drill when it is violently impelled against the rock being drilled, and the drill-rod is clamped to the mandrel by means of one or more set-screws, so as to rotate or turn therewith. By means of the transverse apertures in the drill-rod, the removable key, and the binding-screw the drill-rod can be adjusted longitudinally in the mandrel, without changing or adjusting any of the operative mechanisms of the machine, to adapt the drill to enter holes of different depths.

To enable others to more readily understand this invention, we will now proceed to a detailed description thereof in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of a rock-drill constructed in accordance with this invention. Fig. 2 is a similar elevation taken from the opposite side of the machine. Fig. 3 is a detail view of a part of the mandrel, the drill-rod, and their adjunctive devices. Fig. 4 is a horizontal detail sectional view through a part of the main carrying-frame and the cross-head, showing the endwise-movable horizontal bar and the feeding-pawl in plan. Fig. 5 is a detail view, partly in side elevation and in section, to show the means for disengaging the feed-screw from the rack on the upright supporting-column; and Figs. 6 and 7 are detail views in plan and horizontal section, respectively, of the cam for throwing the endless feed-screw into and out of gear with the rack on the supporting-column. Fig. 8 is a detail view in elevation showing the cam 29, the lever 28, and rack 27 for rotating the mandrel when the latter is elevated.

Like numerals of reference denote corresponding parts in all the figures of the drawings, referring to which—

1 designates the base of the improved rock-drill, which can be fixed in any desired horizontal position on the surface of the ground or rock by means of feet 2, which are adjust-

ably secured or clamped to the base by set-screws 3. Upon this base 1 is adjustably mounted, as at 4, an upright supporting-column 5, which can be set at any desired angle with relation to the base, and which can be held in a steady fixed position—as, for instance, by a slotted segment and binding-screw; but as the means for holding the column in position does not form an essential part of the present invention, it is not deemed necessary to illustrate the same in the accompanying drawings. Upon this upright supporting-column is movably mounted a vertically-sliding carrying-frame 54, which consists, essentially, of two vertical bars 56 56′, which are connected together by suitable transverse arms, the aligned bearings 54′ 54″, which fit and slide over the upright supporting-column 5, the bearings or guides 23 24, arranged on one side of the frame, in vertical alignment with each other, to receive the vertically-reciprocating drill-mandrel, and a vertical bar 42, which is arranged parallel with the bar 56′ of the carrying-frame, and is detachably secured, as by bolts, to the aligned bearings 23 24 of the frame, as shown.

In the lower transverse arm of the carrying-frame, at a point between the bearings 54″ and 23, is journaled or fitted an axially-turning eccentric-sleeve 18, through which passes the shank or stem of an endless feed-screw 7, so that said screw is carried by the eccentric-sleeve, and the position of which screw with relation to a rack 6 on the supporting-column 5 can be determined by the eccentric-sleeve. The eccentric-sleeve is normally held in such position that the feed-screw engages with the rack by means of a horizontal arm 19, that is secured to the lower face or end of the eccentric-sleeve, a vertically-movable locking-handle, which is fitted in the outer end of the arm and is adapted to enter a slot or aperture 22 in the lower transverse arm of the frame, as indicated in Fig. 5, said locking-handle being normally projected or forced into said aperture or slot by a coiled spring, which fits around the upper end of the handle. By depressing the handle against the tension of the spring to withdraw its upper end from the aperture or slot 22 the arm 19 can be drawn away from the frame 54, and thus turn the eccentric-sleeve 18 therein, which operates to withdraw the feed-screw from engagement with the rack 6, whereby the frame 54 can be adjusted or moved longitudinally on the upright supporting-column.

The feed-screw is automatically operated to move the carrying-frame a limited distance downward on the supporting-column at each reciprocating movement of the drill-rod and its mandrel, the mechanism for accomplishing which automatic movement of the carrying-frame being as follows: To the upper extremity of the stem or shank of the feed-screw is secured a ratchet-wheel 8, (see Fig. 4,) with which ratchet engages a feeding-pawl 9, that is pivoted to and carried by a horizontal endwise-movable bar 10, mounted so as to slide in aligned bearings or guides 10′ on the bars 56 56′ of the carrying-frame. This feeding-pawl is normally held in engagement with the ratchet-wheel by a spring 11, which is also fixed to the reciprocating bar 10, and when this bar is forced in one direction the pawl is drawn so as to turn the ratchet-wheel one tooth, and thus rotate the feed-screw for a limited distance, the feeding-pawl engaging with the succeeding tooth of the ratchet when the horizontal bar 10 is returned to its normal position. This horizontal reciprocating bar is normally projected into the path of a trip 12 by means of a spring 11′, and said trip 12 is carried by a reciprocating cross-head 14, that moves vertically with the drill-mandrel 13, the end of the bar 10 being beveled to adapt the trip 12 to readily clear the same when the drill rod and mandrel descend.

The drill-rod 17 carries a drill 30, of any preferred form, at its lower end, and said drill-rod is arranged longitudinally within and carried by a tubular mandrel 13, said drill-rod being adjustable longitudinally within the mandrel. The drill-rod is clamped to the mandrel by means of a binding-screw 32, so as to rotate axially with the mandrel, and in order to prevent the drill-rod from moving longitudinally within the mandrel under the shock or jar of the blow of the drill which is forcibly impelled against the rock, a key 31 is provided, which is fitted in one of a series of transverse slots 33, formed at suitable intervals in the drill-rod, said key bearing or impinging against a collar 25 on the lower extremity of the tubular mandrel. It is obvious that the drill-rod can be adjusted longitudinally within the hollow mandrel to adapt the drill-rod to enter holes of varying depths by removing the key 31 and releasing the clamping-screw 32, when said rod can be moved longitudinally within the mandrel and again secured thereto by again inserting the key in one of the slots 33 in the rod, so as to impinge against the end of the mandrel and turning the clamping-screw against the rod.

The tubular mandrel 13 is fitted so as to slide freely in the aligned guides 23 24, and at intermediate points of its length it is provided with two fixed collars 45 46, which are spaced apart a suitable distance to receive between themselves the reciprocating cross-head 14. This cross-head has a central axial passage or bore (see Fig. 4) through which the tubular drill-mandrel passes, so that the cross-head is fitted loosely on the mandrel to adapt the latter to turn axially in said cross-head. The cross-head is limited to reciprocating movement longitudinally of the carrying-frame by means of flanges 14 15, which are arranged on opposite sides of the cross-head, (see Fig. 4,) said flanges being fitted in longitudinal guides or ways 15′ 43, formed in the opposing faces of the bars 56′ and 42 of

the carrying-frame, the guides or ways being formed either by grooves in the bars or by cleats or flanges thereon, the upper extremities of the flanges which form the guide or way 43 on the bar 42 terminating at points a suitable distance below the upper guide 24 of the drill-mandrel, so that a gear-wheel 26 on said mandrel can turn on its axis without interference from the guide or way 43 when said mandrel is elevated, as will more fully appear presently.

The mechanism for lifting the mandrel and the drill-rod carried by the mandrel will now be described. To the reciprocating cross-head is attached the lower end of a vertical bar or rod 30, the upper extremity of which is fitted and guided in fixed guide 15″ on the carrying-frame, and said vertical bar or rod 30 carries two friction-rollers 40 41, which are loosely journaled on suitable pins or shafts fixed to the bar or rod. Against these friction-rollers impinge the curved surfaces of the lifters 38 39, which are arranged one below the other, and are carried by a single rotary disk 47, which is common to both lifters.

This disk 47 is fixed to one end of a rotary driving-shaft 37, that is suitably journaled on the bar 56′ of the carrying-frame, the opposite end of which shaft carries a fly or balance wheel 36. The driving-shaft 37 is driven from a power-shaft 34′ by means of intermeshing-gears 34 35, fixed to the power and driving shafts, respectively, and said power-shaft is journaled on the bar 56 of the carrying-frame, and has a crank 34″, by which the shaft can be conveniently rotated by hand. It is obvious that when the crank is turned the two shafts and the cam 47 are rotated, and that the lifters impinge against the friction-rollers to raise the rod or bar 30, the cross-head, and the drill-mandrel.

In order to adapt the lifters 38 39 of the rotary driving-shaft 37 to lift the reciprocating mandrel a sufficient distance and cause the pinion 26 on said mandrel to clear the longitudinal guide 43 of the carrying-frame, said lifters 38 39 are arranged radially with relation to the shaft 37, so that the lifters stand at different angles to the shaft, and are adapted to successively engage or contact with the friction-rollers 40 41. Thus the lifter 39 first engages with the friction-roller 40 to elevate the cross-head and mandrel a part of the upward movement, and before the lifter 39 passes the friction-roller 40 the lifter 38 engages the roller 41 and operates to elevate the cross-head and mandrel to the limit of their upward movement, as will be readily understood.

The drill-mandrel is provided with a gear-wheel 26, one or more teeth of which fit in the guide 43 of the bar 42 when the mandrel is lowered and during the downstroke of the mandrel, in order to adapt the gear-wheel and guide to hold the mandrel against rotation when moving longitudinally in the frame, and when the mandrel is elevated to its highest point the gear-wheel is disengaged from the guide 43, and the mandrel is turned axially a limited distance in order to adjust or rotate the drill 30 on the drill-rod. This axial rotation of the mandrel is accomplished by a sliding or horizontally-movable rack 27, which is guided in a guide 29 on the bar 56′ of the frame, one end of said rack being pivotally connected to the upper end of a vertically-disposed lever 28, which is fulcrumed near its lower end, as at 28′, to said frame, the lower end of the lever being operated on by a cam 29, fixed to the driving-shaft 37. As the mandrel is elevated by the lifters the cam 29 operates to adjust the rack, so that one end thereof engages with the pinion 26 on the mandrel as it reaches its highest point and the pinion is disengaged from the guide 43, and while the mandrel is in its elevated position and before the lifters are released therefrom the cam 29 is turned to move the rack endwise, which operates to turn the pinion 26 and the drill-mandrel before the mandrel is forcibly impelled downward, the pinion 26 again engaging with the guide 43 when the mandrel descends.

The drill-mandrel, rod, and drill are forcibly impelled downward by means of a spring-band 51 and a coiled spring 52. The spring-band has one end thereof attached to the frame 54, (see Fig. 2,) and the other end is secured to an axial shaft 51′, which is suitably journaled in the lower end of the frame, and one end of this shaft carries a rotating arm 50, having a projecting pin 49, which fits in a socket in the lower end of a link 48, the opposite end of which link is pivotally connected to the rotary cam 47 at a point some distance from the axis thereof. One end of the coiled spring 52 is connected to the spring-band near its point of attachment to the frame, and the opposite end of said coiled spring is attached to an arm 52′ on the reciprocating cross-head 14. When the reciprocating mandrel 13 and cross-head 14 are elevated by the lifters, the coiled spring is distended, and during the elevation of the mandrel the shaft 51′ of the spring-band is rotated by its connection with the cam 47, so as to compress said spring around the shaft, whereby when the mandrel is released from the lifters the combined tension of the coiled spring and spring-bands operate to forcibly impel the mandrel downward and violently throw the drill against the rock.

The operation and advantages of the invention will be readily understood and appreciated by those skilled in the art from the foregoing description taken in connection with the drawings.

We are aware that changes in the form and proportion of parts of the mechanism herein shown and described as an embodiment of this invention can be made without departing from the spirit or sacrificing the advantages thereof, and we would therefore

have it understood that we do hold ourselves to make such modifications as fairly fall within the scope of the invention.

Having thus fully described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a rock-drill, the combination of a carrying-frame having the longitudinal guides or ways, a reciprocating mandrel carrying a gear-pinion which is fitted in the longitudinal guides to hold said mandrel against axial rotation during a part of its reciprocating movement, a cross-head carried by the mandrel, lifters which act against devices on the cross-head to elevate the same, a sliding horizontal rack adapted to gear with said pinion on the mandrel, and means for operating the rack, substantially as described.

2. In a rock-drill, the combination of an upright column, a carrying-frame mounted thereon and having a reciprocating drill-mandrel, a feed-screw journaled in said frame to gear with a rack on the upright column and having a ratchet secured to its upper extremity, an endwise-movable bar supported in a horizontal position on guides of the frame and arranged to move in a line substantially at right angles to the vertically-reciprocating mandrel, a spring for normally projecting one end of said bar into the path of a part on said vertically-reciprocating mandrel, and a feeding-pawl carried by the reciprocating bar and engaging with the ratchet of the feed-screw, substantially as described.

3. In a rock-drill, the combination of a supporting-column, a carrying-frame having a drill-mandrel, a feed-screw adapted to gear with a rack on the column and carrying a ratchet-wheel, an endwise-movable bar arranged normally in the path of a trip on the mandrel and carrying a feeding-pawl which engages the ratchet-wheel, an eccentric-sleeve which carries the feed-screw, and means for adjusting and locking the eccentric-sleeve, substantially as described.

4. In a rock-drill, a tubular reciprocating mandrel, a drill-rod arranged longitudinally within the mandrel and provided with a transverse key arranged to normally bear against one end of the mandrel, and means for rigidly clamping the drill-rod to the mandrel, whereby the transverse key serves to prevent endwise displacement of the drill-rod in the mandrel under the impact or shock of the drill, as set forth.

5. In a rock-drill, a tubular reciprocating mandrel, a transversely-slotted drill-rod adjustable longitudinally within said mandrel, a binding-screw for clamping the drill-rod to the mandrel, and a removable key which fits in one of the series of transverse slots in the drill-rod and bears against one end of the mandrel, substantially as described, for the purpose set forth.

6. In a rock-drill, the combination of a carrying-frame, a reciprocating mandrel, a cross-head fitted loosely on the mandrel, so as to move therewith, and guided by longitudinal ways on the frame, the rotary shaft having the lifters for raising the cross-head and mandrel, a spring-band mounted on an axial shaft which is driven through intermediate connections with the cam, and a coiled spring connected to the spring band and the reciprocating cross-head, substantially as described.

In testimony whereof we have hereunto set our hands this 16th day of May, A. D. 1889.

CATHARINE MARIA DITTMAN,
HENRY DITTMAN,
Administrators of said Joseph F. Dittman, deceased.

Witnesses:
A. C. JOHNSTON,
C. S. JOHNSTON.