No. 840,890. PATENTED JAN. 8, 1907.

T. E. ADAMS.

ROCK DRILL.

APPLICATION FILED JUNE 24, 1903.

4 SHEETS—SHEET 1.

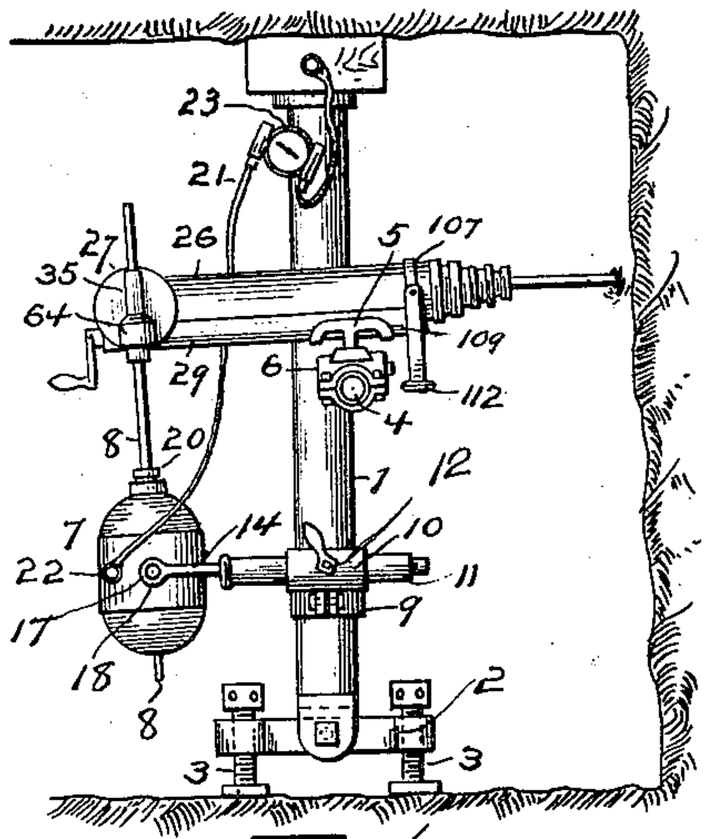


FIG. 1.

FIG. 2.

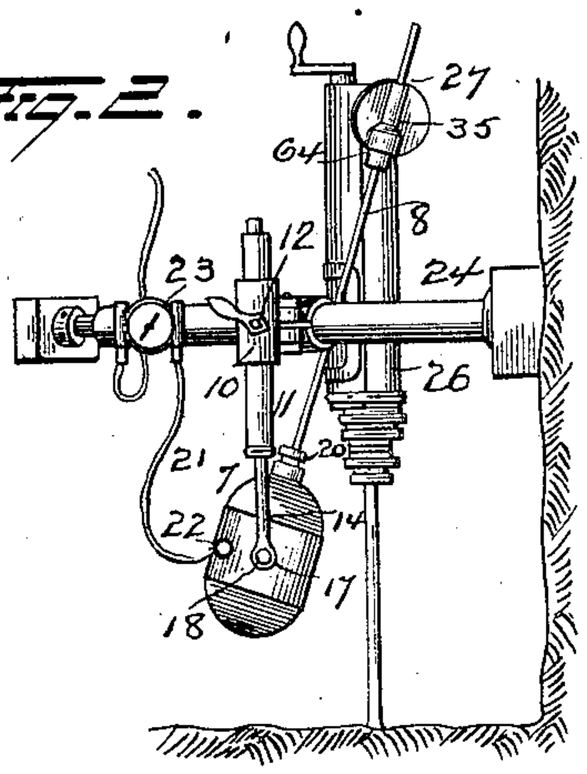


FIG. 5.

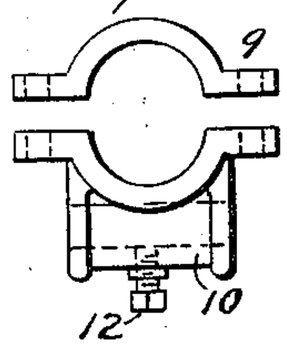


FIG. 4.

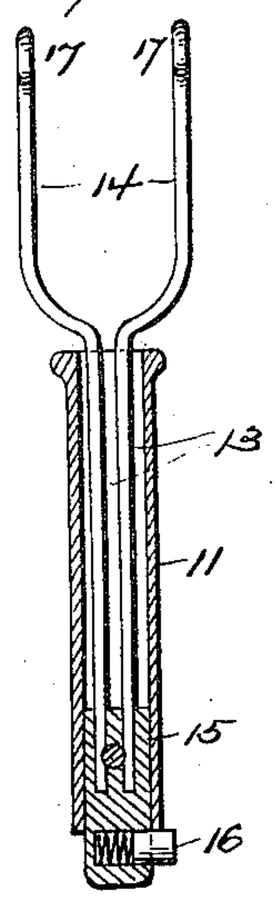
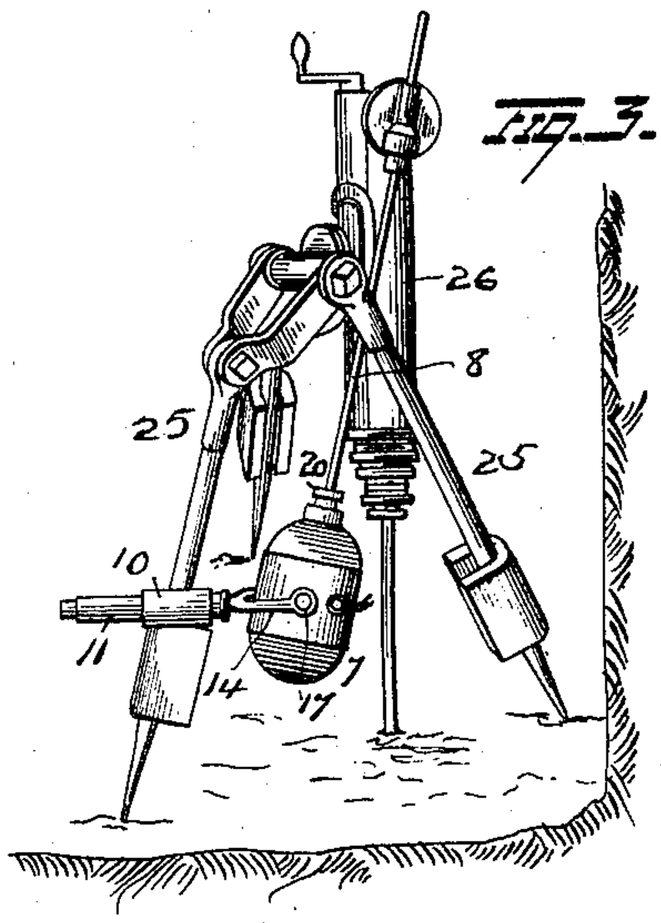


FIG. 3.



WITNESSES

E. Nottingham

G. F. Downing.

INVENTOR

T. E. Adams

By H. A. Seymour

Attorney

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4 SHEETS—SHEET 2.

FIG. 1.

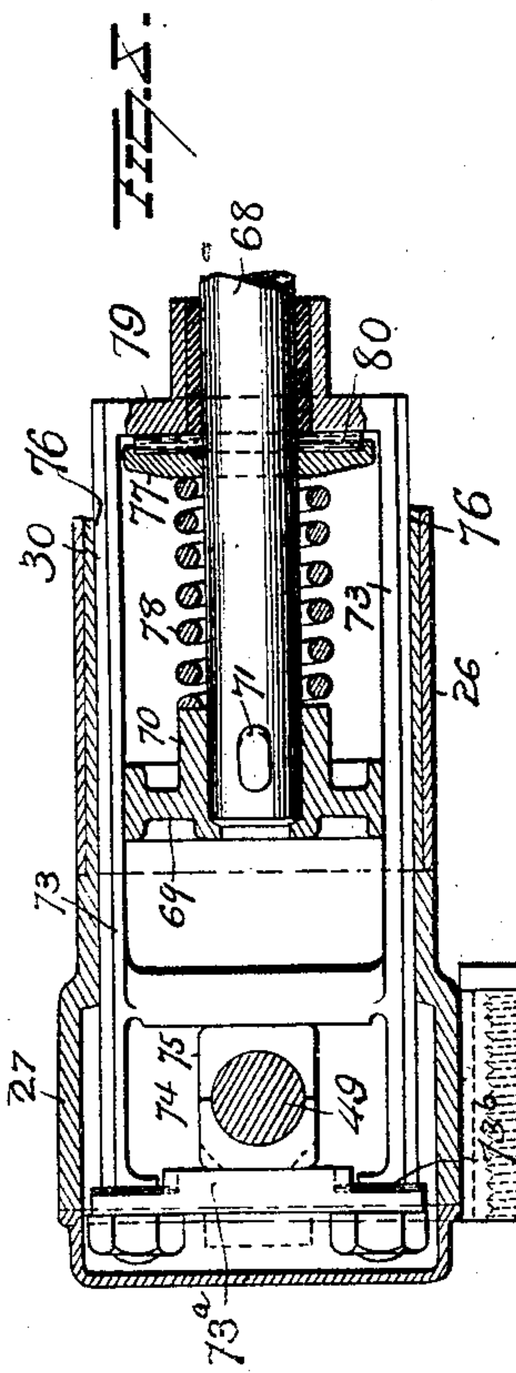

FIG. 2.

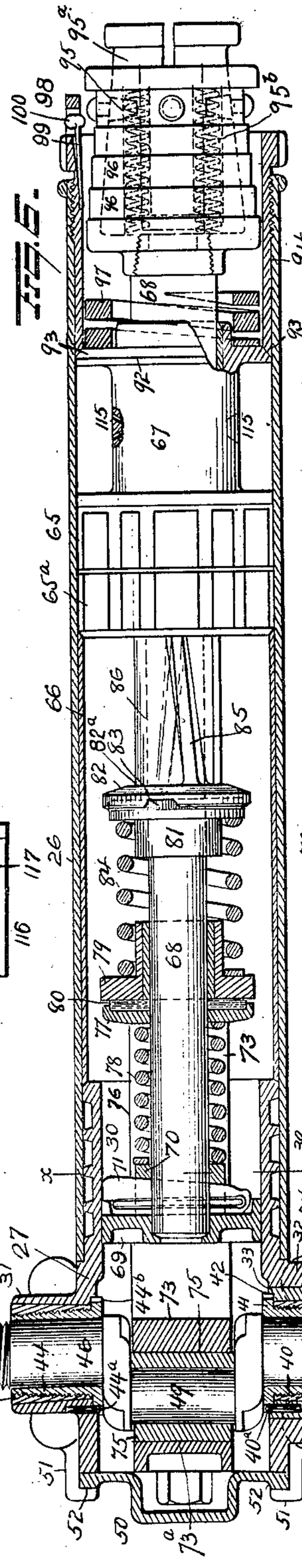

FIG. 3.

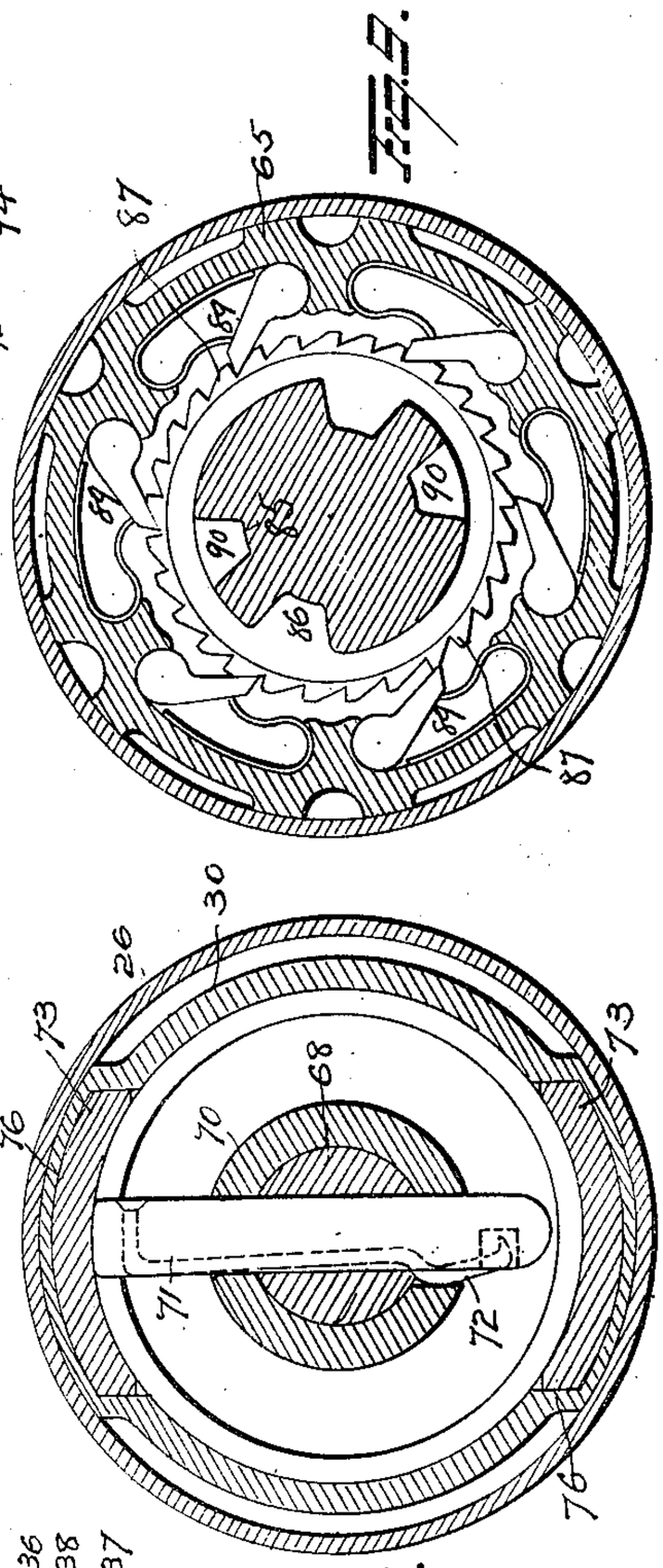

FIG. 4.

WITNESSES

E. Nottingham

G. F. Downing.

INVENTOR

T. E. Adams

By H. A. Seymour

Attorney

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4 SHEETS—SHEET 3.

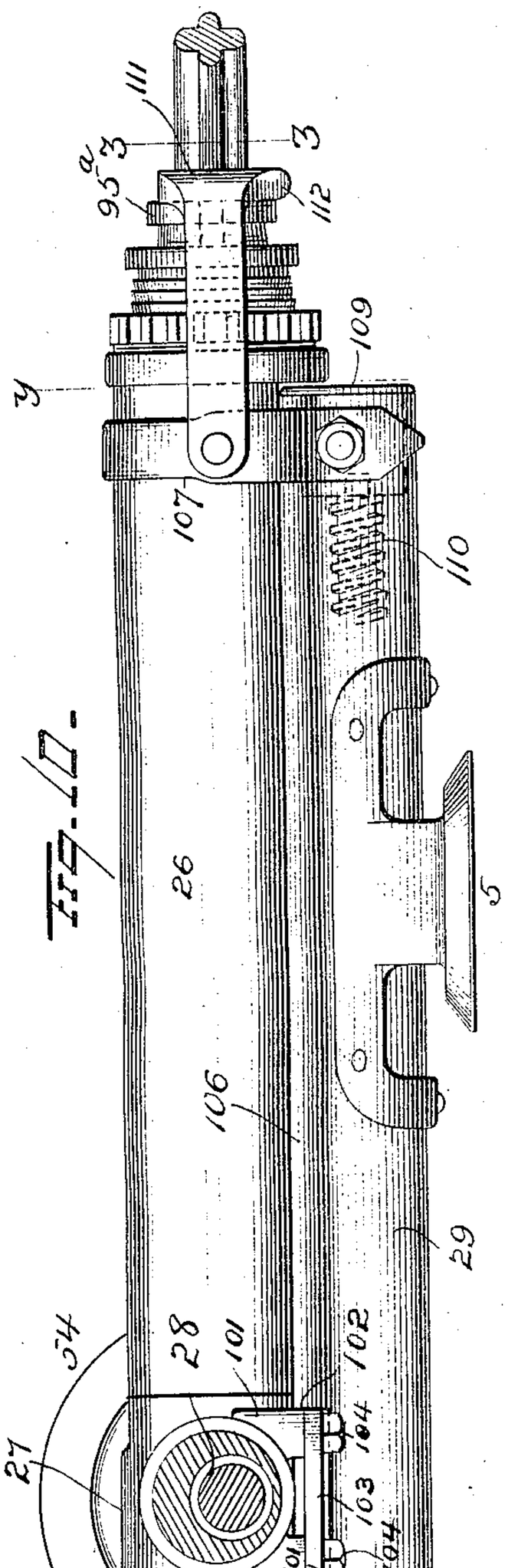

FIG. 1.

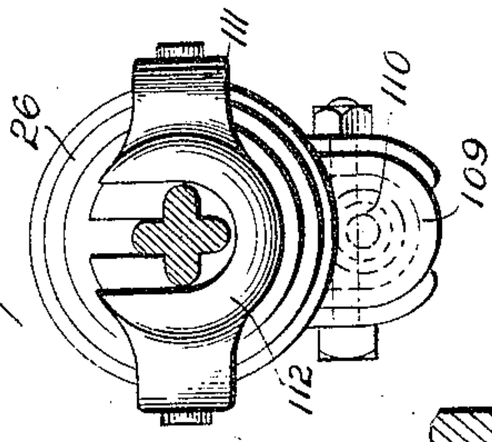

FIG. 3.

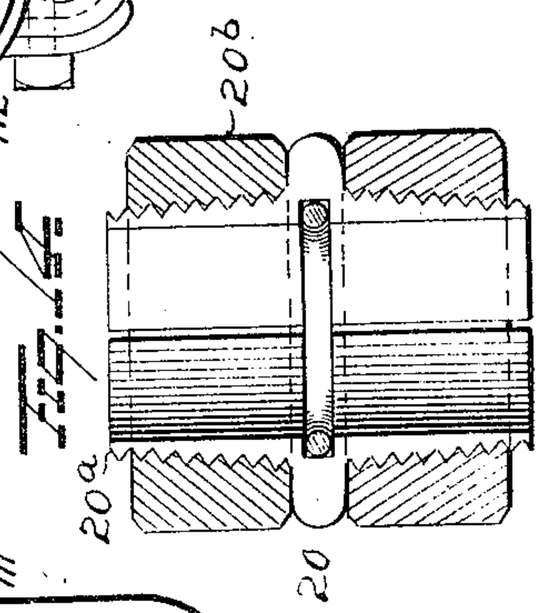

FIG. 4.

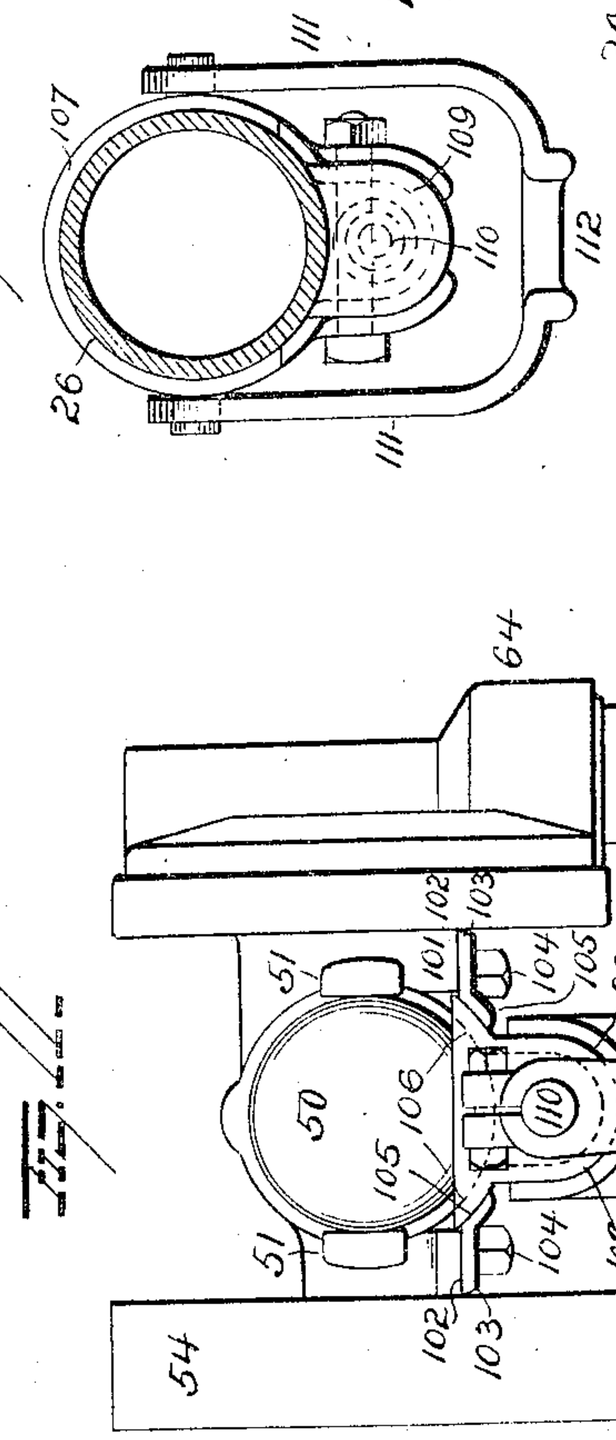

FIG. 2.

FIG. 5.

WITNESSES:

E. Nottingham

G. F. Downing

INVENTOR

T. E. Adams

By A. A. Seymour

Attorney

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T. E. ADAMS.

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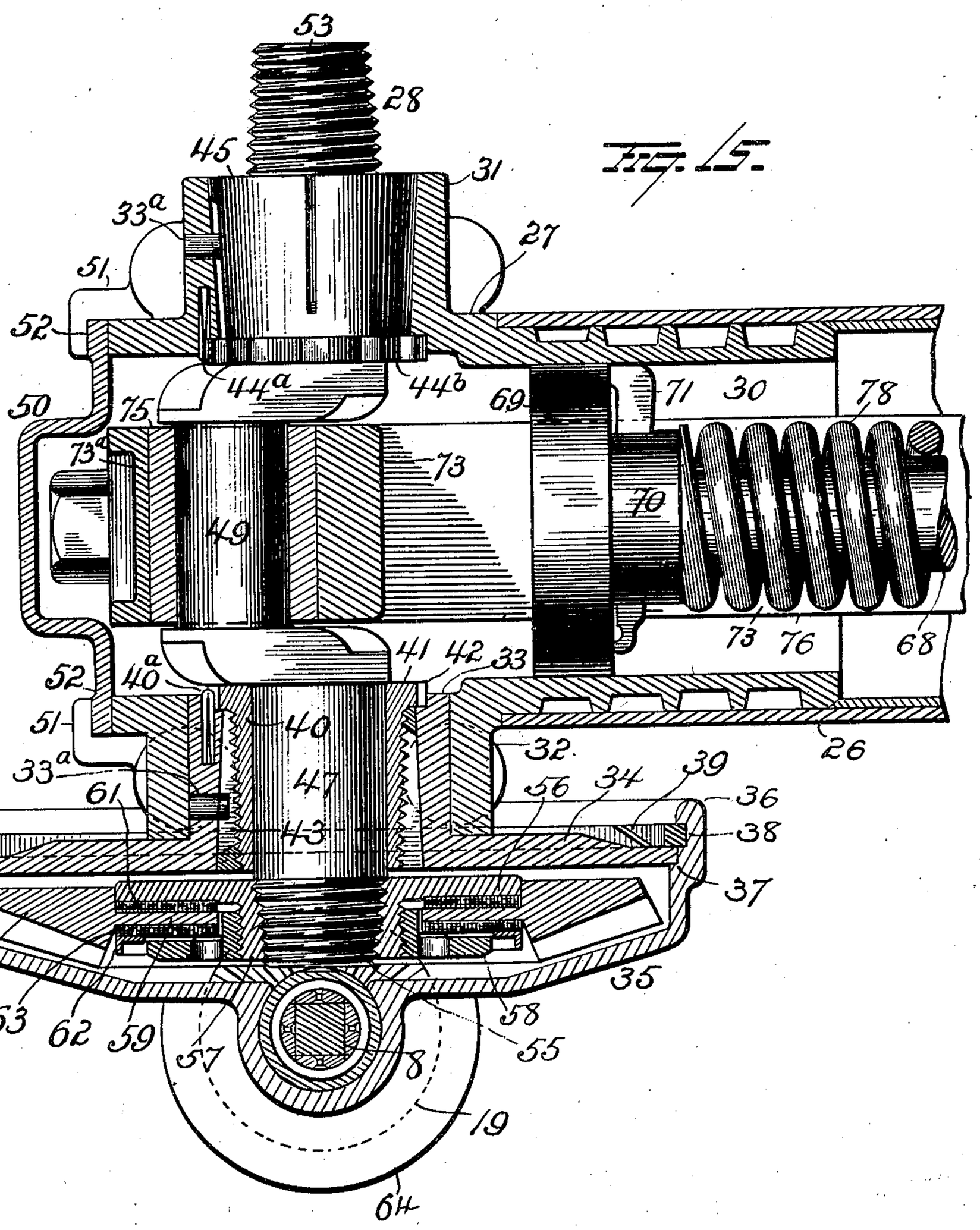
4 SHEETS—SHEET 4.

FIG. 15.



WITNESSES

E. L. Nottingham

G. F. Downing.

INVENTOR

T. E. Adams

By A. G. Seymour

Attorney

UNITED STATES PATENT OFFICE.

THOMAS EDGAR ADAMS, OF CLEVELAND, OHIO, ASSIGNOR TO THE ADAMS DRILL COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

ROCK-DRILL.

No. 840,890. Specification of Letters Patent. Patented Jan. 8, 1907.

Application filed June 24, 1903. Serial No. 162,925.

To all whom it may concern;

Be it known that I, THOMAS EDGAR ADAMS, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Rock-Drills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in rock-drills, one object of the invention being to construct a rock-drill in such manner as to reduce the weight thereof to a minimum and to reduce liability of breakage to a minimum.

A further object is to construct the apparatus in such manner as to prevent the entrance of grit to the bearing of the drill-rod in the nose.

A further object is to provide means whereby the operator can be informed of the proper position of the drill to cause the drill-rod to make the most effective stroke.

A further object is to so attach the drill-body to the guide-shell that great rigidity can be secured and so that the wear can be readily taken up.

A further object is to provide simple and efficient means for securing the removable parts of the drill in place.

A further object is to provide simple and efficient means for mounting the driving-motor.

A further object is to construct the drill in such manner that the bearings of the drill-rod can be separated to a maximum extent for the purpose of resisting side strains.

A further object is to improve the general construction and efficiency of a rock-drill of the type to which my invention relates.

A further object is to provide improved means for preventing shock to the motor when the latter is connected with the drill-operating mechanism through the medium of a rigid driving-rod.

With these objects in view the invention consists in certain novel features of construction and combinations and arrangements of parts as hereinafter set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is an elevation showing the manner of mounting the drill and motor on a vertical standard. Fig. 2 is a view in perspective showing the manner of mounting the drill and motor on a horizontal bar with the drill disposed vertically. Fig. 3 is a view illustrating the drill and motor supported by a tripod. Figs. 4 and 5 are detail views of the yielding adjustable motor-support. Fig. 6 is a sectional view of the drill and operating mechanism therefor. Fig. 7 is a cross-section on the line *x x* of Fig. 6. Fig. 8 is a sectional view taken at right angles to Fig. 6, showing portions of the drill-operating mechanism. Fig. 9 is a sectional view of the ratchet device. Fig. 10 is a side elevation of the drill. Fig. 11 is a rear end view of the same. Fig. 12 is a section on the line *y y* of Fig. 10. Fig. 13 is a section on the line *z z* of Fig. 10. Fig. 14 is a detail view of the hand-tightening collar 20. Fig. 15 is enlarged detail view, partly in section, of the rear portion of the apparatus.

1 represents a column or standard adapted at its upper end to engage the roof of a tunnel or other support. A cross-bar 2 is pivotally attached between its ends to the lower end of the column or standard, and at the ends of said cross-bar adjustable feet 3 are provided. The column or standard 1 is provided at a point between ends with an arm 4, which will be secured adjustably thereto by means of a suitable clamp, and this arm serves as a support for the drill, the base-bracket 5 of the latter being secured to a bracket 6, clamped to the arm 4.

The drill-rod is operated by a crank-shaft driven by suitable gearing, (all of which will be hereinafter described in detail,) and said gearing is driven by a motor 7, through the the medium of a rigid driving-rod 8. It is important in order to prevent shock to the motor that the latter shall be flexibly mounted, and it is also desirable that such mounting shall be adjustable and capable of permitting free movements of the motor to accommodate itself and the rigid driving-rod to the varying positions, which may be given to the drill. To accomplish these results, the devices now to be described are quite efficient. A clamp 9 is secured at any desired point on the column 1, and this clamp is provided with a sleeve 10, through which a tubular bar 11 is passed. The sleeve 10 may

be provided with a set-screw 12 for holding the tubular bar at any desired adjustment. The arms 13 of a spring-fork 14 are inserted into the bar 11 and secured at their rear ends to a block 15, located loosely within said bar. The block 15 projects beyond the rear end of the tubular bar 11 and provided with a spring-pressed catch 16, adapted to engage the rear end of bar 11 and prevent the escape of the spring-fork without interfering with any rotative movement which might be imparted to said fork. The spring-fork is provided at the free ends of its arms with eyes 17, which constitute bearings for the trunnions 18 of motor 7, or the ends of the spring-arms may be bent to enter holes in the motor-casing. It will be observed that the motor-support comprises the sleeve 10, carried by the clamp 9, the tubular bar 11, and the spring-fork 14, the motor being pivotally mounted directly in the latter. With such a support and mounting the motor can swing freely on its trunnions, and it can turn freely in a direction at right angles to the axis of said trunnions, the spring-fork being for this purpose freely revoluble in the tubular bar 11. The motor can also be adjusted relatively to the standard by moving the tubular bar 11 longitudinally through the sleeve 10. I prefer to employ an electric motor, although other forms of motor might be employed. When an electric motor is employed, the rigid driving-rod will be passed through the armature of the motor and may have longitudinal movement through the same. The driving-rod (which is angular in cross-section) also passes through the gear 19 of the drill-operating gearing and may have a longitudinal movement through the same. Thus the driving-rod 8 may have a free longitudinal movement through the armature of the motor or the gear-wheel 19; but of course it must be fixed with relation to one or the other. In Fig. 1 I have shown a hand-tightening collar 20, which serves to prevent the driving-rod from slipping through the armature-shaft. This collar could, however, be used to secure the driving-rod from slipping through gear 19 and said driving-rod permitted to have free longitudinal movement through the armature-shaft of the motor. The device 20 may consist of a series of sections 20^a, made slightly conical on the exterior and threaded for the reception of nuts 20^b, to cause the sections 20^b to clamp the drill-rod and prevent the latter from slipping through the motor. The flexible conductors 21 can be conveniently connected with the motor by means of a plug 22, inserted into a socket in the motor-casing, the necessary electrical connection with the coils of the motor being effected in any suitable manner within said casing. The starting box or rheostat 23 for the motor can be conveniently secured to the column 1, near the upper end thereof, and the conductors electrically connected therewith by means of removable plugs.

In Fig. 2 I have illustrated the manner of mounting the drill and motor on a horizontal bar 24 when it is desired to operate the drill vertically, and in Fig. 3 the drill is shown supported in a vertical position and supported by a tripod 25, the horizontal bar in one case, and the tripod in the other, serving to support the drill, the motor, and the starting-box. The drill-body comprises a tube or barrel 26, continuous throughout its length, and a housing 27, in which the crank-shaft 28 is mounted. The drill-body is mounted upon a guide-shell 29, made of sheet-steel, the latter being supported, through the medium of the base-bracket, by the column or standard 1 (or the horizontal bar or the tripod) in the manner hereinbefore explained. The housing 27 is made with a cylindrical extension 30, which enters the rear end of the barrel or body 26. The housing 27 is also made with laterally-projecting hollow bosses 31 32, the latter having a much larger internal diameter than the former. A sleeve 33, projecting at right angles from a plate 34, is mounted in the larger tubular boss 32 of the housing, and said plate 34 constitutes one wall of a gear-casing 35. This gear-casing is made with a peripheral flange 36, projecting beyond the periphery of the plate 34 and having a shoulder 37 bearing against said plate. The flange 36 of the gear-casing is made in its inner face with a groove 38 for the reception of a spring-ring 39, which overhangs the face of the plate 34 and serves to connect the gear-casing with said plate in a manner to permit the former to turn. The sleeve 33 is made internally with a conical bore having its greatest diameter at the outer end of the sleeve. A slotted gun-metal bushing 40 is also located within the sleeve 33 and provided with an externally-threaded conical wall tapering toward the outer end of said bushing, the latter being provided at its inner end with an annular flange 41, having wrench-holes 42. Between the sleeve 33 and bushing 40 a split adjusting-sleeve 43 is located. This adjusting-sleeve is conical in shape and is prevented from turning in the sleeve 33 by means of a suitably-located spline or pin 33^a, fast on sleeve, entering a slot in sleeve 43. The conical adjusting-sleeve 43 is threaded internally to mesh with the threads on the bushing 40. From this construction and arrangement of parts it will be seen that when the bushing 40 is turned by means of a suitable wrench the adjusting-sleeve will be moved longitudinally and being conical and seated in the similarly-shaped bore of the sleeve 33 will cause the bushing to be contracted to compensate for wear. The tubular boss 31 is also made with a conical bore, and the bushing 44 and adjustable sleeve 45

are arranged therein and coöperate to effect adjustment of the bushing in precisely the same manner as above explained in connection with bushing 40, adjustable sleeve 43, and sleeve 33. Split pins 40 connect wrench-notches 42 of bushing 40 with sleeve 33, and similar pins 44[a] connect holes 44[b] of bushing 44 with boss 31. The sleeve 45 is slotted, as clearly shown in Fig. 15, and the slotting of the bushings 40 and 44 is similar to that of the sleeve 45.

The journals 46 47 of the crank-shaft are mounted in the bushing 40 and 44, the crank 49 of said shaft being located within the chamber formed by the housing 27. The rear end of the housing is closed by a removable head 50, held in place by gibs 51 on the housing, and in order that the head shall be secured oil-tight to the housing wedge-keys 52 are employed and cast integral with the head 50. The journal 46 of the crank-shaft is provided with a threaded shank 53 for the reception of a fly-wheel 54, and the journal 47 of said shaft is provided with a threaded shank 55, which projects into the gear-casing 35. A disk 56 is located within the gear-casing and provided with an internally-threaded hub 57 to screw onto the shank 55, and this hub is threaded externally for the reception of a threaded ring or nut 58. An annular flange 59 on a bevel-gear 60 is disposed between the disk 56 and the ring or nut 58 and between said flange and disk fiber-washer 61 is located. A spring-plate 62 is located upon the nut 58 and between said plate and the flange 59 of the gear vulcanized fiber-washer 63 is disposed, all forming an adjustable friction slip or drive. The gear-casing 35 is provided with a lateral enlargement 64, in which the bevel-gear 19 is mounted and arranged to mesh with the bevel-gear 60. The gear 19 is made with an angular bore for the passage of the angular driving-rod 8.

Within the barrel 26 ratchet-casings 65 65[a], carrying ratchet devices, for a purpose hereinafter explained, are located and spaced from the cylindrical extension 30 of the housing 27 by a spacing-sleeve or stop 66. Forwardly beyond the ratchet-casings a nose-bushing 67 is located and connected to the ratchet-casings by arms 67[a], the space between said bushing and the inner wall of the barrel constituting a lubricant-chamber, the lubricant from this chamber being permitted to enter the bushing through suitable ducts 115. The nose-bushing 67 is thus located near the forward end of the drill-body and serves as a forward bearing for the drill-rod 68. The rear bearing for the drill-rod is located within the cylindrical extension 30 of the housing 27 and is effected through the medium of a cross-head or piston 69, mounted to move in said cylindrical extension 30. The cross-head or piston 69 is provided with a hub 70 for the reception of the end of the drill-rod. The hub 70 and rod 68 are provided with alined slots for the passage of a key 71, having a spring locking-finger 72. In connecting the crank 49 with the drill-rod a draw-bar 73, made in the form of a yoke, is employed. At its rear end this draw-bar is made with an elongated transverse opening or crank-pin slot 74, in which a bushing 75 on the crank-pin 49 slides. The bushing 75 is made in two parts, the meeting faces of which can be filed to compensate for wear. The rear strap 73[a] of the draw-bar is made removable and separated from the ends of the draw-bar arms by washers 73[b], which may be removed one at a time to compensate for wear in the crank-pin slot 74. From the crank the draw-bar extends forwardly into barrel 26, the respective members of the draw-bar passing through guide-grooves 76 in the cylindrical extension 30, as shown in Fig. 7. At its forward end the draw-bar or yoke 73 is provided with a cross-head 79, which embraces the drill-rod 68 some distance from its rear end. A coiled spring 78, embracing the drill-rod, bears at one end against the ring or washer 77 and at the other end against the hub 70 of the piston 69, so that when the draw-bar 73 is moved rearwardly by the crank 49 the drill-rod will be withdrawn. The piston 69 and cylindrical extension not only serve as a rear bearing for the drill-rod, but the piston will also operate to throw lubricant on the crank at all times, but especially when the drill is disposed vertically for sinking.

The end of the draw-bar 73 farthest from the crank forms the cross-head 79, loosely embracing the rod 68, and between said cross-head 79 and ring or washer 77 a flexible washer 80, preferably of leather, is disposed. Spaced forwardly on the drill-rod from the cross-head 79 is a similar but loose collar 81, and adjacent to the latter a recessed ring or washer 82 (the same in construction as the ring or washer 77) is located and bears against a shoulder 82[a] on the drill-rod. A yielding washer 83, preferably of leather, is located in the recessed ring, so as to be disposed between said ring and the collar 81, (this construction being the same as shown in section at 77–79 and 80, Fig. 6.) A spring 84 (preferably heavier than the spring 78) is located between the cross-head 79 and collar 81. The collar 81 prevents contact of the spring 84 with the leather washer 83, and this protects said washer from injury, which would occur if the spring 84 were permitted to bear directly against the leather washer. It is also found in practice that the leather washers serve to prevent deterioration of the spring, which might otherwise occur on account of crystallization due to vibration. In sinking the positions of the large and small springs may be reversed.

That portion of the drill-rod which passes through the ratchet-casings is provided with a spiral groove 85 and a straight groove 86. Within the ratchet-casings the drill-rod is surrounded by two ratchet-wheels 87. One of the ratchet-wheels 87 is locked against rotation in one direction by spring-pressed dogs 89, pivotally supported in the casing 65, and the other ratchet-wheel 87 is locked against rotation in the same direction by similar dogs supported in the casing 65ª. One of the ratchet-wheels is provided with a lug 90, which engages the spiral groove 85 in the drill-rod. The other ratchet-wheel (in the ratchet-casing 65ª) is provided with a lug to enter the straight groove 86 of the drill-rod. Hence as said drill-rod is moved forwardly in the performance of its functions it moves in a direct line, since the ratchet devices in casing 65ª prevent its rotation, and the lug in the ratchet-wheel in this casing moves in the straight groove in said drill-rod. During the backward stroke the engagement of the lug 90 of the ratchet-wheel in casing 65 with the spiral groove 85 in the drill-rod will cause the latter to turn, the nose-bushing 67, which, (as before stated, is keyed or otherwise secured to the ratchet casings,) is provided at its forward end with a flange 92, having a beveled or tapering peripheral wall 93. A sleeve 94, threaded throughout a portion of its length, is inserted into the forward end of the barrel or body 26, the latter being provided with internal threads for the accommodation of the threads of said sleeve. The rear end of the sleeve 94 is made with a beveled or tapered portion 95, which has frictional contact with the beveled or tapered peripheral wall 93 on the flange of the nose-bushing 67. With such a construction when the drill-rod makes its rearward stroke the movement of the lug 90 of the ratchet-wheel in casing 65 in the spiral groove 85 in the drill-rod will tend to cause said ratchet-wheel to turn and through the engagement of the dogs carried by the casing 65 cause the latter also to tend to turn. The nose-bushing 67 being keyed to the ratchet-casing, said bushing will also turn, and by frictional contact of the beveled wall of the flange 92 with the beveled end of sleeve 94 the latter will be turned and made to tighten in its threaded connection with the barrel or body 26. When the nose-bushing shall have thus been turned sufficiently to cause the sleeve 94 to have been made perfectly tight within the body or barrel 26, the perfect alinement of the ratchet-casings and nose-bushing will be insured. After the sleeve shall have been tightened as above explained further rotation of the nose-bushing and the ratchet-casing will be prevented, the ratchet-casing being effectually locked against rotation. With this condition, during the further backward movement of the drill-rod, the cooperation of the lug 90 with the spiral groove in said drill-rod will cause the latter to turn as the drill-rod, and the drill carried thereby, recedes. Of course a spanner-wrench will be used to tighten the sleeve in the first instance.

A drill-chuck 95, having a general conical shape, is secured to the forward end of the drill-rod and is adapted to enter the drill-body 26. The chuck 95 is not out of the barrel on extreme forward stroke, but fits neatly to exclude dust and is provided with a series of peripheral ribs 96, the function of which is to discharge any chippings which may find their way into the drill-body, and thus prevent them from entering the bearing of the drill-rod in the nose-bushing. A buffing-spring 97 for the chuck is located within the sleeve 94 and bears against the flange of the nose-bushing.

The body of the chuck 95 is made with a conical interior and receives therein a series of jaws 95ª, having curved and inclined outer faces. These jaws are normally pressed outwardly by springs 95ᵇ and made to clamp the tool.

It is desirable that some means be provided by means of which the operator can be informed whether or not the drill-rod is making its maximum stroke. For this purpose I provide an indicator 98. This comprises a spring-arm 99, secured at one end in the forward portion of the barrel 26 and provided at its forward end with a ball or enlargement 100, adapted to project through an opening in the wall of said barrel 26. With such construction when the drill moves to the full end of its stroke the chuck will strike the ball or enlargement 100 and cause it to rise, so as to be viewed by the operator and indicate to him that the drill-rod is making its maximum stroke.

It has been hereinbefore stated that the drill-body is mounted upon the sheet-steel guide-shell 29. The manner of effecting this mounting and feeding the drill will now be explained. The drill-body, or, more strictly speaking, the housing 27, is provided with enlargements 101, having flat bottom faces 102, disposed somewhat below the upper edge of the guide-shell. Plates 103 have flat bearings against the flat faces 102 and are secured to the enlargements 101 by means of bolts 104. The plates 103 are made with lips 105, which bear against the under faces of the laterally-projecting portions 106 of the guide-shell and act as guides for the latter. With such construction wear between the plates 103 and the guide-shell can be readily compensated for by removing said plates and filing the faces 102 and then replacing said plates. The drill-body is guided at its forward end by means of a strap 107, made to embrace the drill-body and secured at its ends to the guide-shell. Within

the respective ends of the guide-shell blocks 108 109 are located, and in these blocks a feed-screw 110 is swiveled, the threaded portion of said screw passing through a threaded nut 117 in lug or arm 116, depending from the drill-body. The feed-screw is provided at one end with a suitable crank 114, by means of which to turn it.

A yoke 111 is pivotally attached to the strap 107 and is constructed at its free end with a cross-head 112, adapted to engage the jaws of the chuck and depress the same for the purpose of permitting the insertion or withdrawal of the tool. Normally the yoke 111 will swing freely, as shown in Fig. 12, or held out of the way or made detachable.

With the yoke 111 in the position shown in Figs. 10 and 13 the cross-head 112 of said yoke bears against the forward ends of the jaws 95[a]. Should the drill-barrel 26 be now fed forwardly by operating the handle 114, the jaws of the chuck will be prevented from forward movement by the yoke 111, and hence the said chuck-jaws will be caused to move backwardly within the chuck-body against the resistance of the springs 95[b], and the tool will in this way be released, permitting its ready removal.

Various slight changes might be made in the details of my invention without departing from the spirit thereof or limiting its scope, and hence I do not wish to limit myself to the precise details herein set forth.

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

1. The combination with a drill-guide, a drill-body movable thereon, and drill-operating mechanism carried by the drill-body, of a motor-support, a motor pivotally mounted on said support, means for effecting angular adjustment of said motor-support and a rigid driving-shaft connecting the motor with the drill-operating mechanism.

2. In a motor-driven tool-operating machine, a support, a shiftable carrier thereon, and tool-actuating mechanism operatively associated with the carrier including a motor, and means independent of said carrier for cushioning said motor.

3. The combination with a drill-support and drill mechanism, of a rotary motor, an elastic supporting device pivotally connected to the motor and connected with said support and a rigid driving-shaft connecting said motor with the gearing of the drill mechanism.

4. The combination with a drill-support, of a motor, a spring secured to said support and pivotally connected to the motor at its free end, a drill in said support and a rigid driving-shaft connecting the motor and drill.

5. In a drill, the combination with a support and a drill mechanism, of a motor, a rigid driving-rod connecting the motor with the drill mechanism, a spring-yoke in which said motor is mounted, means for adjusting said spring-yoke, and means for supporting said yoke independently of the drill mechanism.

6. In a drill, the combination with a support and drill mechanism, of a motor, a bar, means for supporting said bar and permitting its longitudinal adjustment, a mounting for the motor flexibly supported by said bar, and a rigid driving-rod connecting the motor with the drill mechanism.

7. In a drill, the combination with a support and drill mechanism, of a tubular bar, means for supporting said tubular bar and permitting its longitudinal adjustment, a device flexibly supported by said tubular bar, a motor mounted in said device, and a rigid driving-rod connecting the motor with the drill mechanism.

8. In a drill, the combination with a support and drill mechanism, of a tubular bar, a flexible yoke revolubly mounted in said tubular bar, a motor mounted in said flexible yoke and a rigid driving-rod connecting said motor with the drill mechanism.

9. In a drill, the combination with a support, and drill mechanism, of a tubular bar movable longitudinally through said support, means for adjustably securing said bar to the support, a yoke flexibly mounted in said bar, means for permitting the removal of said yoke, a motor mounted in said yoke and a rigid driving-rod connecting the motor with the drill mechanism.

10. In a drill, the combination with a support and drill mechanism, of a bracket secured to said support, a sleeve on said bracket a tubular bar movable longitudinally through said sleeve, means for securing the tubular bar at any desired adjustment in the sleeve, a yoke flexibly carried by the tubular bar, a motor mounted in said yoke and a rigid driving-rod connecting said motor with the drill mechanism.

11. In a drill the combination with a support and drill mechanism including a gear having an opening in its center, of a motor, a support for the motor, a rigid driving-rod passing completely through both the gear and the rotary member of the motor and means for preventing longitudinal movement of the driving-rod, with respect to one of the rotary devices through which it passes and permitting free longitudinal movement of said driving-rod through the other rotary member.

12. In a drill, the combination with a support, and drill mechanism, of a motor mechanism, a support therefor, a rigid driving-rod adapted to have longitudinal movement relatively to said motor mechanism and drill mechanism and constructed to transmit motion from the former to the latter, and a thumb-nut or collar for locking the driving-

rod against longitudinal movement relatively to one of said mechanisms.

13. In a drill, the combination with a guide-shell, a drill-body mounted to move thereon, a housing at the rear end of said drill-body, lateral bearing-sleeves on said drill-body, and a drill-operating shaft mounted in said lateral bearing-sleeves, of depending enlargements on each of said lateral bearing-sleeves, removable plates secured to said enlargements and lips on said removable plates projecting under the upper edges of the guide-shell.

14. In a drill, the combination with a guide-shell, a drill-body longitudinally movable thereon, a drill-rod, means for operating the drill-rod and a chuck on the end of the drill-rod, of a pivoted yoke connected with the guide-shell and adapted to be made to engage the jaws of the chuck for the purpose of opening the same for the insertion or withdrawal of a tool, when the drill-body is fed forwardly.

15. In a drill, the combination with a barrel and a drill-rod therein, of a housing, a cylindrical extension on said housing projecting into the barrel, a cross-head on the drill-rod movable in said cylindrical extension, a crank-shaft in the housing, and a draw-bar connected at one end with said crank-shaft, passing through said cylindrical extension and connected at its forward end with the drill-rod at a point forward of the cross-head.

16. In a drill, the combination with a drill-body and a drill-rod, of a cylinder in the rear end of the drill-body, said cylinder having oppositely-disposed internal grooves or recesses, a crank-shaft, and a draw-bar connected at one end with said crank-shaft, passing through the grooves or recesses in the cylinder and connected at its forward end with the drill-rod.

17. In a drill, the combination with a barrel, a housing at the rear end thereof and a crank-shaft in said housing, of a drill-rod in the barrel, a cross-head secured to said drill-rod, a draw-bar connected with the crank-shaft and provided at its forward end with a cross-head embracing the drill-rod and a spring between said cross-head and cross-head.

18. In a drill, the combination with a housing and adjustable bushings in the walls thereof, of a crank-shaft having its journals mounted in said bushings, means for adjusting said bushings for wear, a drill-rod and a draw-bar connecting said crank-shaft and drill-rod.

19. In a drill, the combination with a housing, a crank-shaft therein, a drill-rod, and a draw-bar connecting the crank-shaft with the drill-rod, of a plate on said housing, a gear-casing revolubly mounted on said plate, a gear in said casing secured to the crank-shaft, a second gear mounted in said casing and meshing with the first-mentioned gear, a rigid drive-rod passing through said second gear, and a motor with which said rigid drive-rod is directly connected.

20. In a drill, the combination with a housing, a crank-shaft therein, and a drill-rod connected with said crank-shaft, of a plate mounted on said housing, a gear-casing, a spring-ring removably and revolubly connecting said gear-casing with said plate, and gearing in said casing.

21. In a drill, the combination with a drill-body and a drill-rod having a spiral groove, of a sleeve screwed into the forward end of the drill-body, a ratchet device in the drill-body and having one of its members engaging the spiral groove in the drill-rod, and a nose-bushing for the drill-rod keyed to the other member of said ratchet device, said nose-bushing having frictional contact with the rear end of the sleeve in forward end of the drill-body.

22. In a rock-drill, the combination of a barrel, a drill-rod therein and a chuck secured to the forward end of the drill-rod to operate within the forward end of the barrel and exclude dust from the drill-rod.

23. In a rock-drill, the combination of a barrel, a nose-bushing therein, a drill-rod movable longitudinally through the nose-bushing, and a chuck on the end of the drill-rod and movable longitudinally in the forward end of the barrel, said chuck adapted to exclude dust from the portion of the drill-rod which passes through and beyond the nose-bushing.

24. In a rock-drill, the combination with a guide-shell, of a drill barrel or body mounted thereon and provided with means at its sides engaging and movable against the under face of said guide-shell.

25. In a rock-drill, the combination with a drill body or barrel having enlargements at respective sides, of a guide-shell on which said drill body or barrel is mounted and plates secured to said enlargements and movable against the under face of the guide-shell.

26. In a rock-drill, the combination with a sheet-steel guide-shell and a longitudinally-movable drill-body mounted thereon, of guiding means projecting from the sides of the drill-body, embracing the sides of the guide-shell and movable against the under face of said guide-shell.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS EDGAR ADAMS.

Witnesses:

H. S. JENKINS,

JOHN R. ORPUTT.