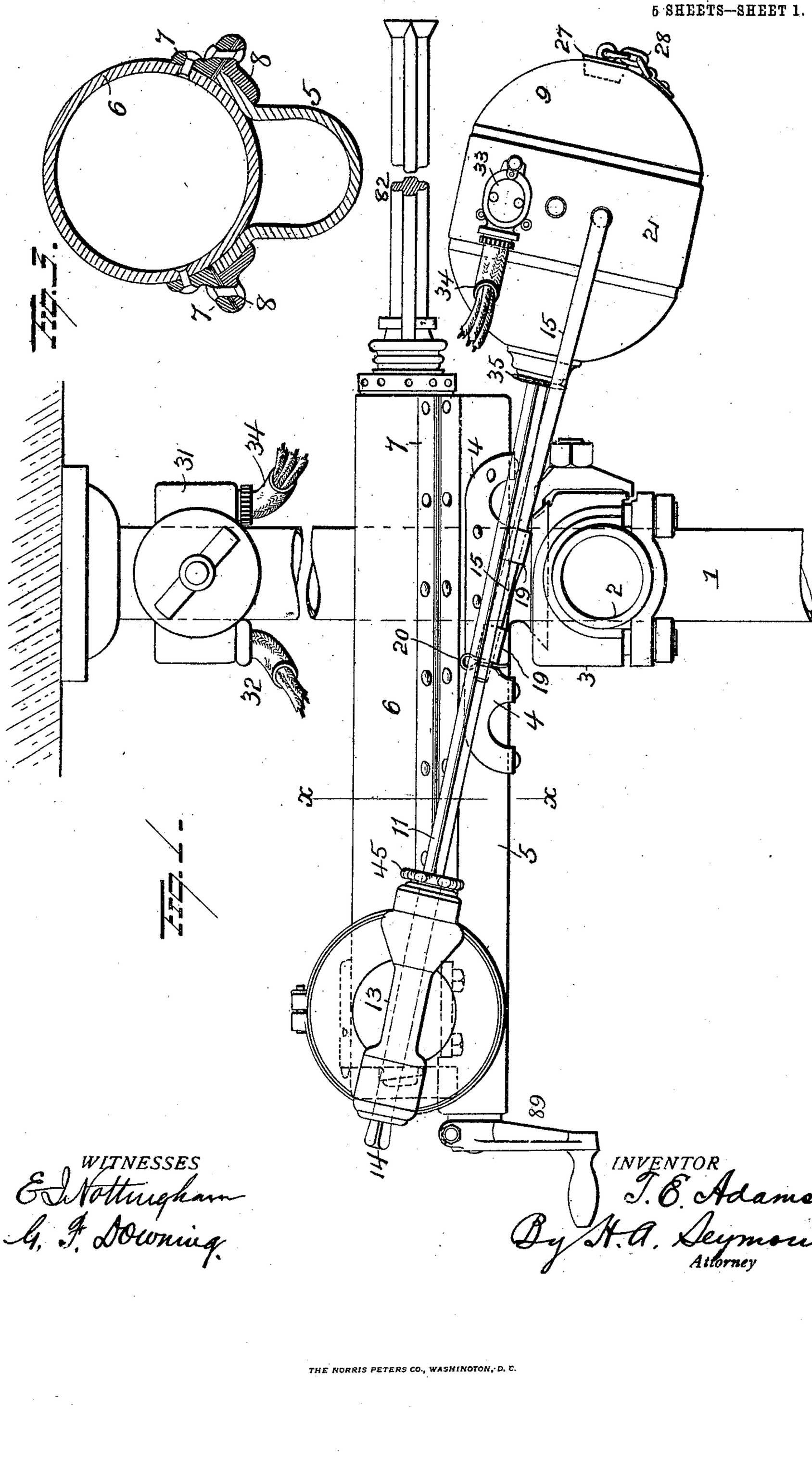
No. 840,891. PATENTED JAN. 8, 1907.

T. E. ADAMS.

DRILL.

APPLICATION FILED MAR. 9, 1904.

5 SHEETS—SHEET 1.



WITNESSES

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5 SHEETS—SHEET 2.

FIG. 1.

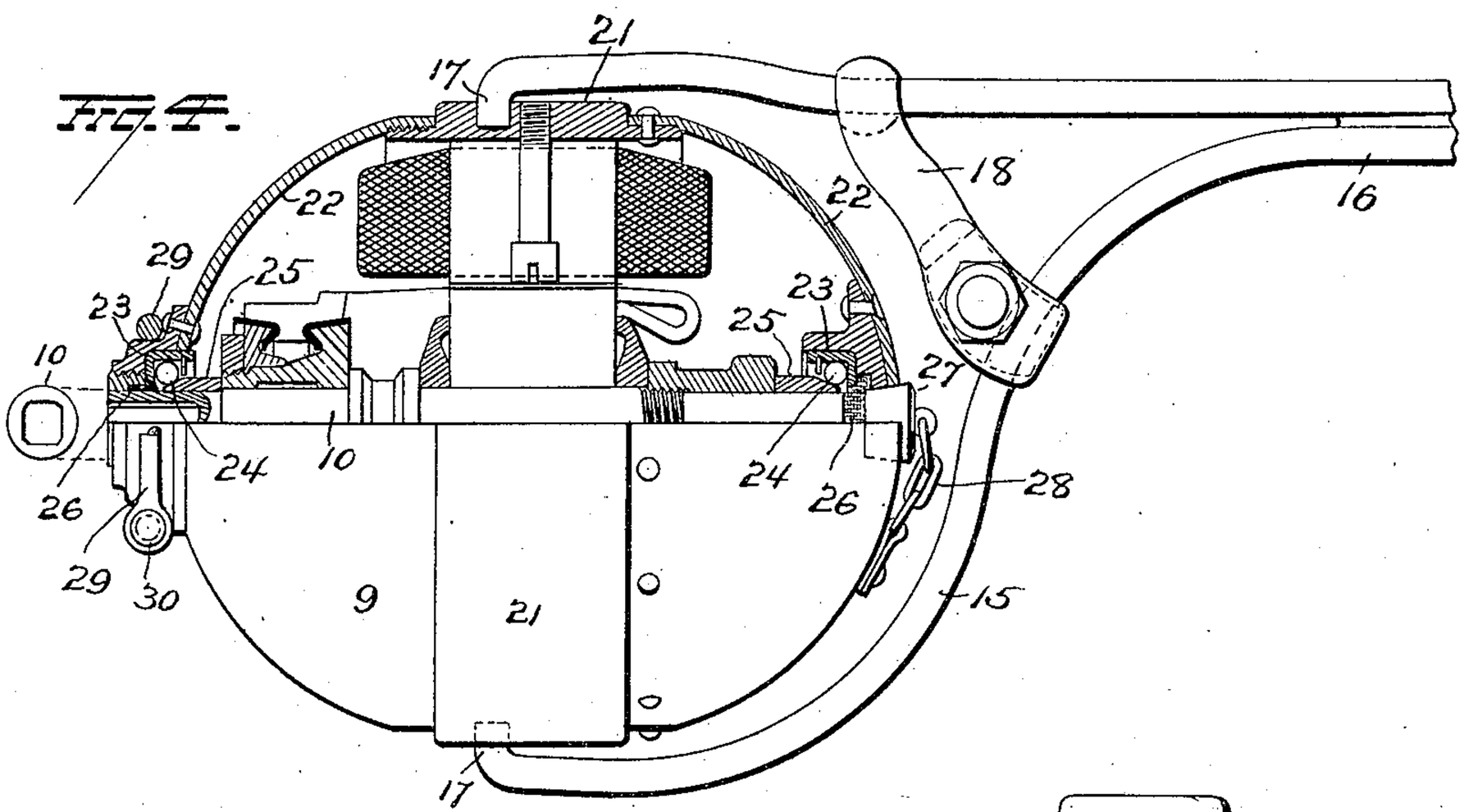
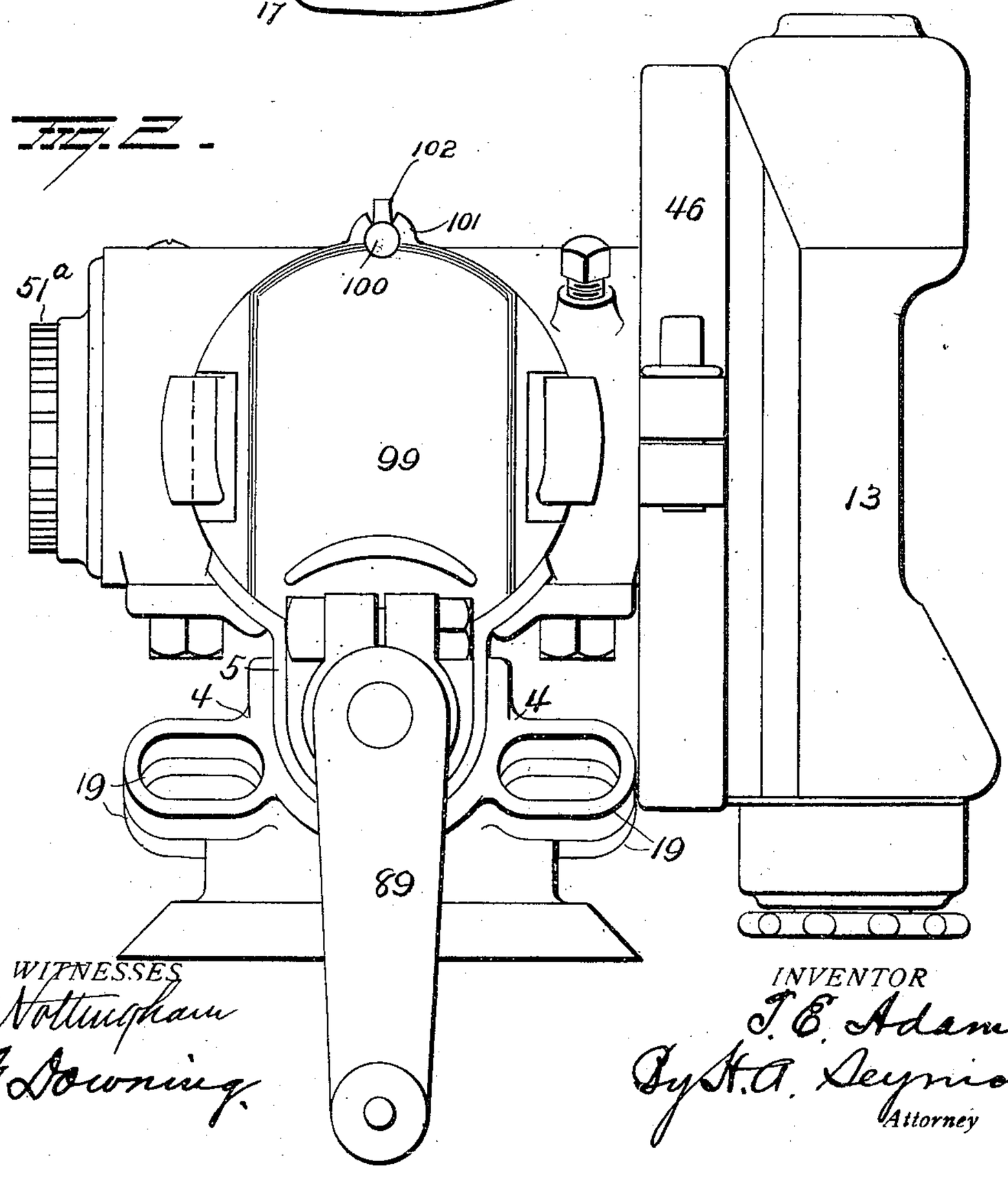


FIG. 2.



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5 SHEETS—SHEET 3.

FIG. 5.

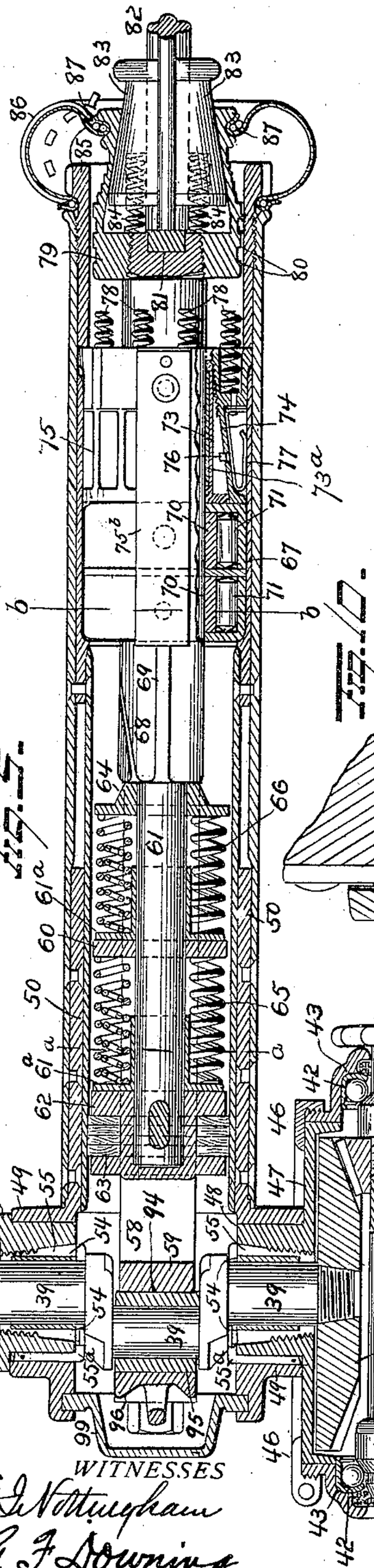


FIG. 3.

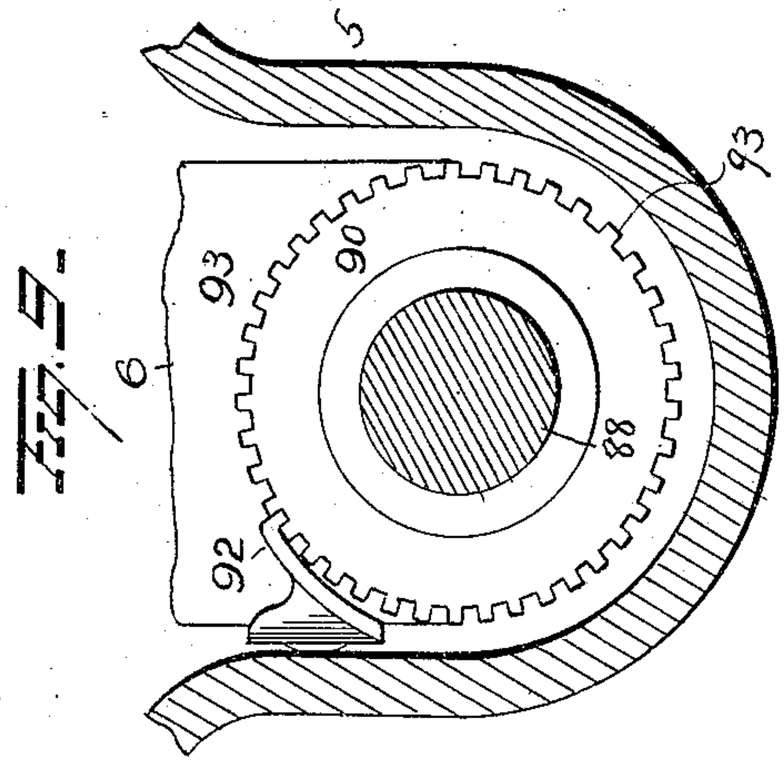


FIG. 4.

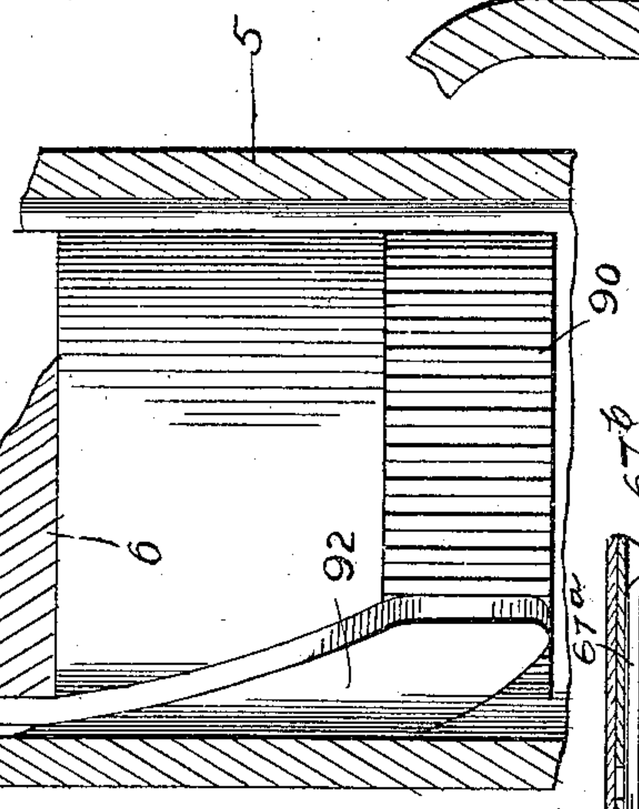
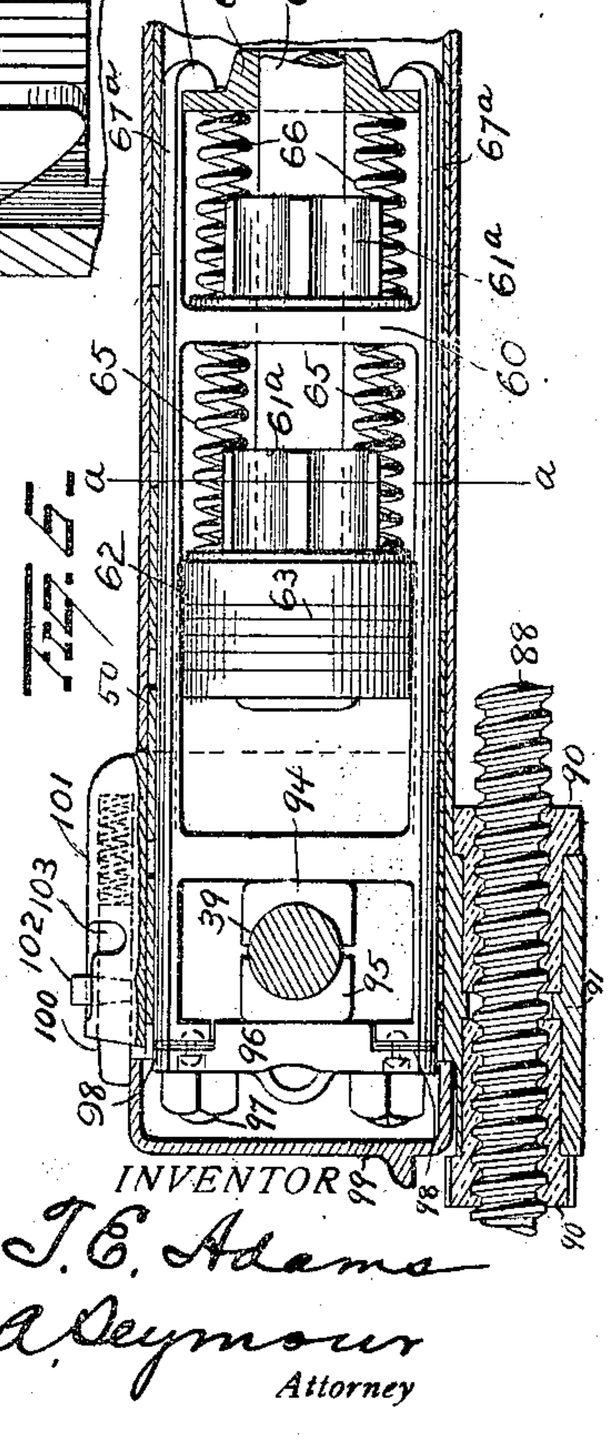


FIG. 6.



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5 SHEETS—SHEET 4.

FIG. 7.

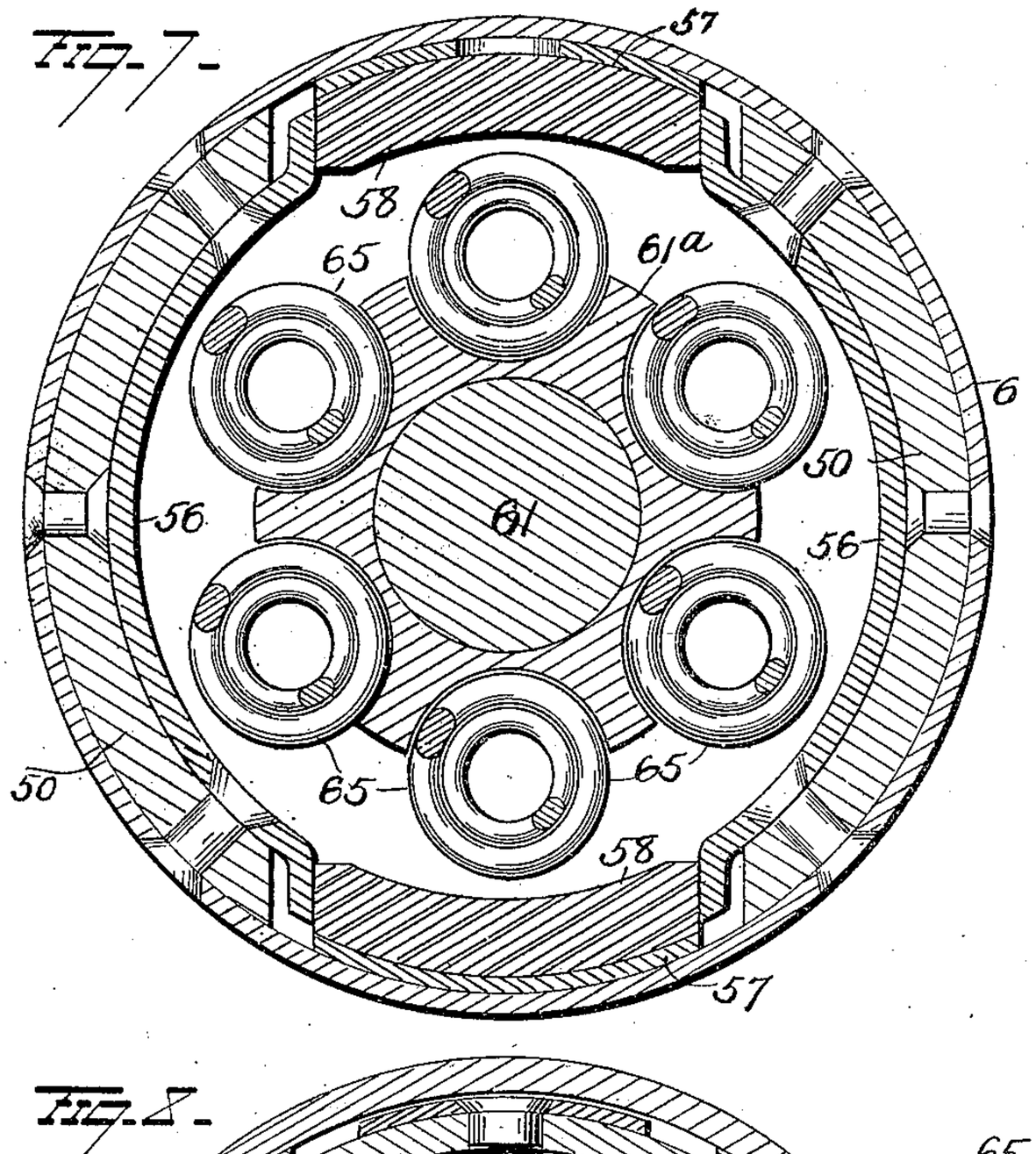


FIG. 8.

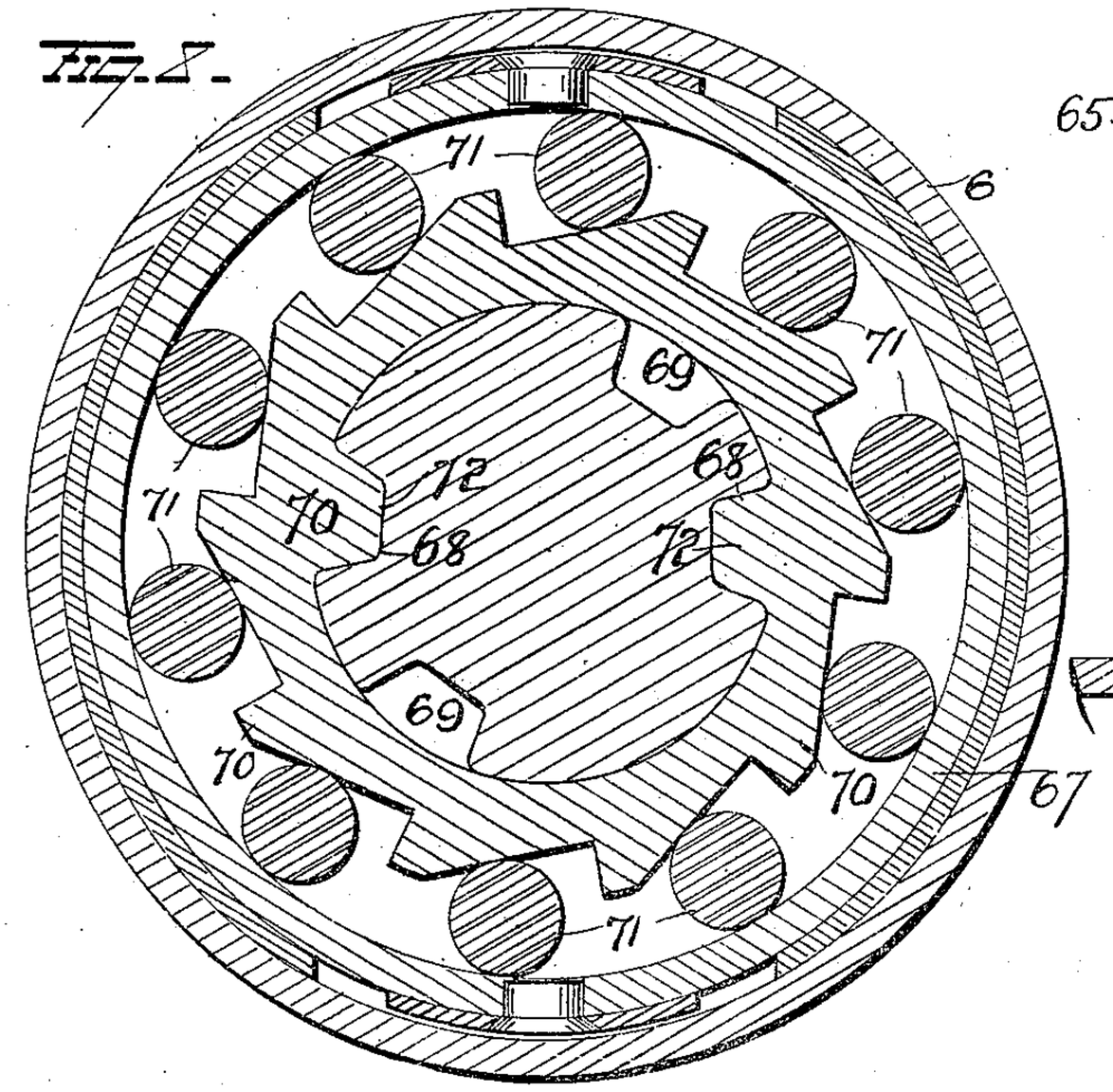
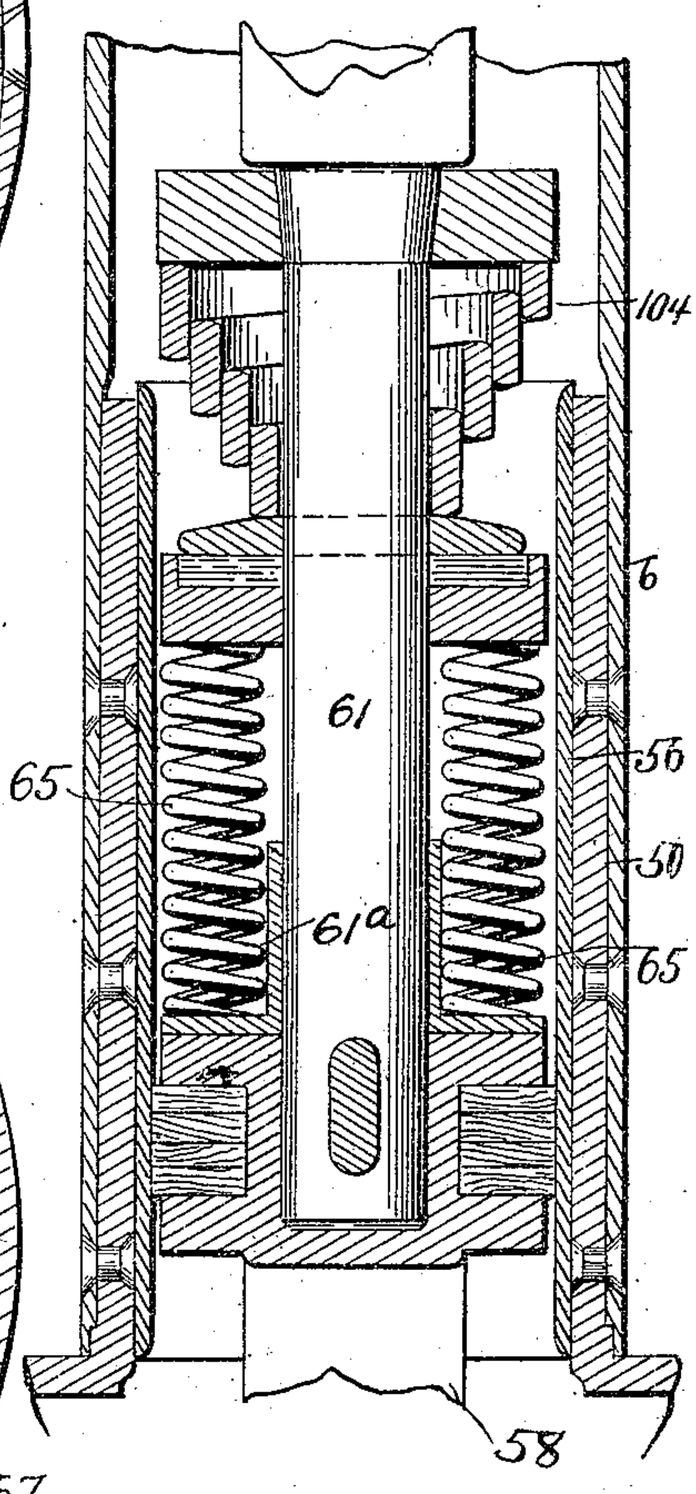


FIG. 11.



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6 SHEETS—SHEET 6.

FIG. 12.

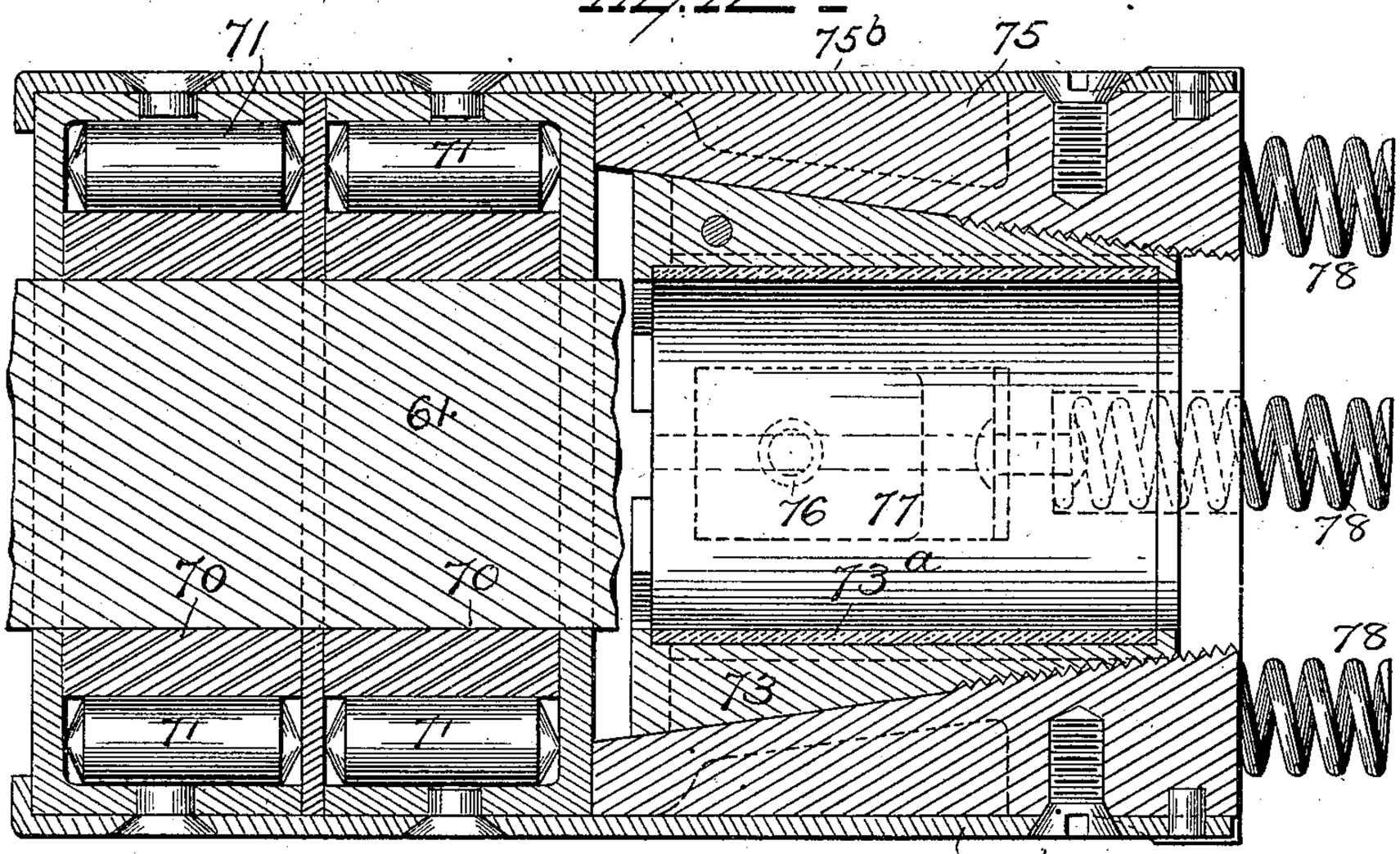
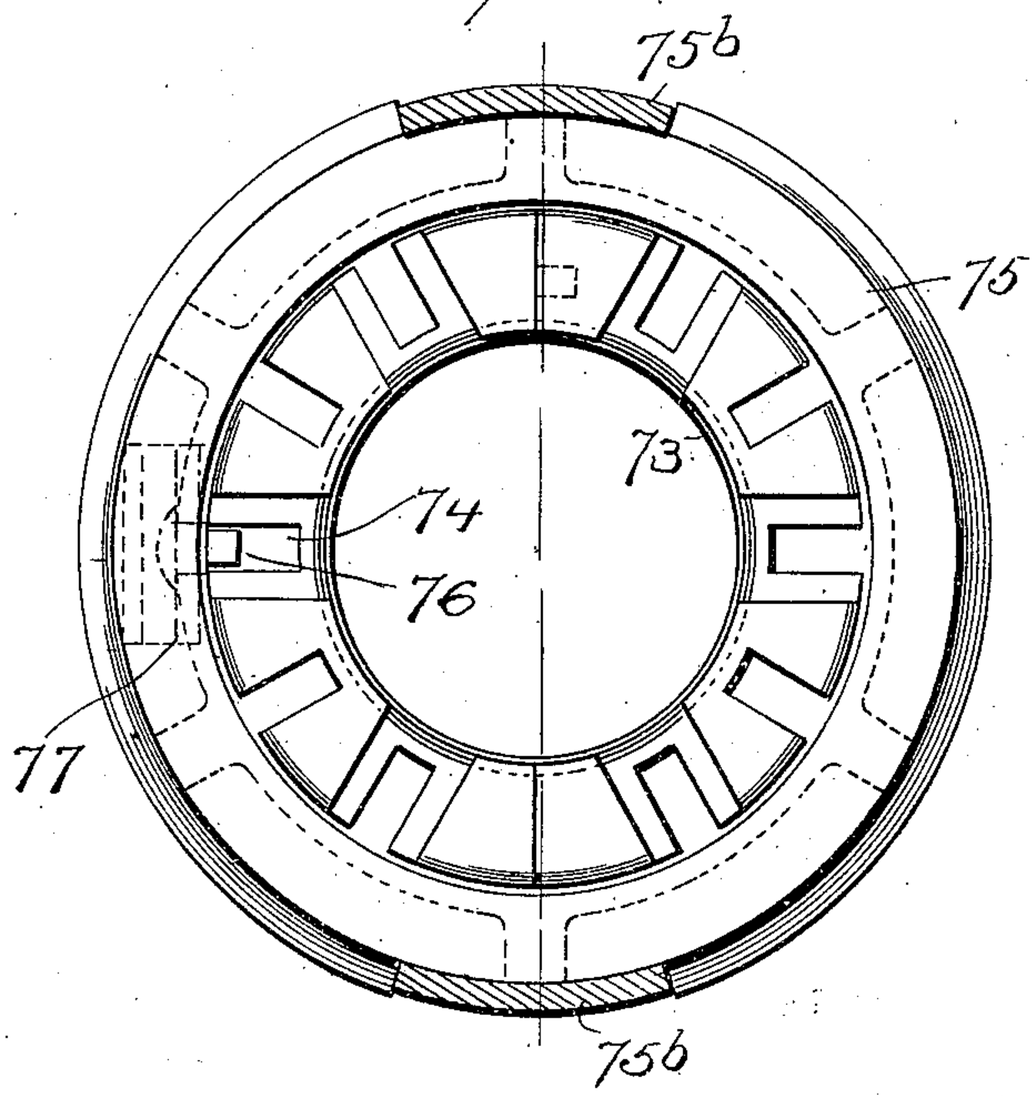


FIG. 13.



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UNITED STATES PATENT OFFICE.

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

DRILL.

No. 840,891. Specification of Letters Patent. Patented Jan. 8, 1907.

Application filed March 9, 1904. Serial No. 197,351.

To all whom it may concern:

Be it known that I, THOMAS EDGAR ADAMS, a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in 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 an improvement in drills, and more particularly to improved mounting for the motor operating the same, the object of the invention being to elastically support the motor in such a manner as to protect the same from vibrations of the drill and permit the motor to be supported on either side of the device as preferred.

A further object is to provide improved mounting of the drill drive-shaft, permitting the motor to remain stationary and the drive-shaft to feed longitudinally through the motor-case or the drill connections to move longitudinally on the drive-shaft.

A further object is to provide an improved construction of drill proper with improved gang-spring formation therein.

With these objects in view the invention consists in certain novel features of construction and combinations and arrangements of parts, as will be more fully hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in side elevation, illustrating my improvements with dust-guard 86 omitted. Fig. 2 is an end view thereof with position of parts slightly changed. Fig. 3 is a view in section on the line *x x* of Fig. 1 with working parts of drill removed. Fig. 4 is a view, half in horizontal section and half in plan, of my improved motor-casing and spring for support therefor. Fig. 5 is a view in longitudinal section of the drill. Fig. 6 is a partial longitudinal section at right angles to Fig. 5, showing the interior movable parts in elevation. Fig. 7 is a view in cross-section on the line *a a* of Fig. 5. Fig. 8 is a view in cross-section on the line *b b* of Fig. 5. Figs. 9 and 10 are views in end and side elevation of my improved nut-locking mechanism with casing in section; and Fig. 11 is a view in longitudinal section, illustrating a modified construction of drill. Fig. 12 is an enlarged sectional view through the nose-bushing. Fig. 13 is a transverse sectional view through the nose-bushing.

1 represents a column having an arm 2 thereon projecting at right angles thereto and supporting a clamping-sleeve 3, to which an elongated bracket 4 is securely clamped, and said bracket is secured to drill-guide 5 or made integral with it, said bracket and guide forming a drill-support.

6 represents the tubular drill casing or barrel having angle-iron bars 7 secured longitudinally along the same and in turn secured to bars 8, between which and casing 6 the upper edges of guide 5 are located to securely hold the drill in position and yet permitting free longitudinal movement thereof. These bars 7 and 8 are separated by shims, which can be removed to compensate for wear.

9 represents my improved motor-casing having a hollow shaft 10 extending longitudinally through the same and made with an angular bore to receive the angular drive-shaft 11 and permitting longitudinal movement of the shaft through the armature, yet always keyed or locked to rotate therewith. The other end of the shaft 11 extends through the angular bore of a hollow shaft 12, supported in gear-case 13, and this shaft 12 and gear-case 13 can move on the shaft. To prevent sliding movement of the drive-shaft 11 through the shaft 12, an enlargement 14 is provided on the end of the shaft. When the motor-casing is in a higher plane than the shaft 12, the drive-shaft 11 can be reversed, with its enlarged end 14 at the far end of the motor-casing.

The casing 9 is supported by a spring-fork 15. (Shown most clearly in Fig. 4.) This fork comprises a spring-rod bent between its ends and its members extended side by side for considerable distance, as shown at 16, where said members are preferably welded together. One member of the fork is comparatively straight, while the other is curved outward and around the casing, and both ends are bent inward, forming trunnions 17, projecting into sockets in opposite sides of the casing, and the members of the fork are secured in this position by a clamp 18, connecting them, as shown in Fig. 4. By so shaping the spring-fork the motor-casing is held thereby in a uniformly central position

regardless of the side of bracket 4 to which the fork may be secured. The bracket 4 is made on both sides with alined integral rings 19, through which (on either side of the bracket) the end of the fork is passed and secured against displacement by means of a cotter-pin 20, passed through a hole near the end of the fork and bearing against one of the rings 19. By so constructing my improvements the fork can be adjusted or reversed on the casing and can be secured at either side of the bracket, which is found most desirable, according to the work being done.

The casing 9 comprises a metal ring 21, having threaded annular projections at both ends to receive semispherical metal shells 22, one of which is securely riveted to the ring 21, while the other is internally screw-threaded to screw onto the threaded end of the ring and permit removal of this shell for inspection of the motor whenever desired.

Angular rings or sleeves 23, each having an inwardly-projecting flange at one end, are secured in ring-castings at the ends of the casing and form runways for balls 24, against which the journals 25 of hollow armature 10 turns. The casting-ring at one end is located inside the casing and the casting-ring at the other end is located outside the casing, and both are recessed to receive a series of dust-excluding felt washers or disks 26, disposed behind the bearing rings or sleeves 23. A plug 27 is inserted in one open end of the casing to exclude dirt, water, &c. when the passage of shaft 11 completely therethrough is not necessary, and the plug is preferably connected to the casing by a short chain 28 to prevent losing the same. Around the casting-ring at the other end of casing 9 a ring 29 is loosely mounted and is provided with a pin 30 to receive a rope or like device to raise the motor up the face of rock, &c.

On column 1 a starting-box 31 is located and is adapted to receive a removable line-plug 32 at one side, and its opposite side is connected with the motor contact-box 33 by a flexible tube 34, containing the necessary wires for conveying current to the motor. If air or steam is used, box 31 would be utilized for valve mechanism.

A leather or fiber washer 35 is located around shaft 11 at the end of motor-casing 9, and as it rotates with shaft 11 at the speed of the motor it will throw mud and water to the side, preventing its entrance into the motor-casing.

The hollow shaft 12 above referred to is inclosed in the casing 13, and a beveled pinion 37, secured thereon near one end meshes with a beveled gear 38, secured to the end, of a crank-shaft 39, mounted across the end of drill casing or barrel 6 and supported in bearings, which will be more fully hereinafter described. Shaft 12 is provided with enlargements 40 having beveled shoulders 41 to run against balls 42, mounted in angle-rings or runways 43, secured in casing 13, and packing 44 is provided in said casing to exclude dirt and grit and retain lubricant. The journal at one end of shaft 12 projects beyond the gear-casing 13 and is made with an annular enlargement 45, which will owing to its rapid rotation throw off all dirt and water and prevent its entrance into the gear-casing, and said enlargement 45 is made with a series of projections to permit manual manipulation of said shaft 12 and gearing, even though the operator's hands be covered with grease.

Gear-casing 13 is screwed into a clamping-ring 46 and secured by the latter to a disk 47, forming the inner wall of the gear-casing, and said disk is made with a central journal 48, mounted to turn in a bearing-sleeve 49, extending at right angles to a cylindrical shell 50, securely riveted in the drill-barrel 6, as clearly shown. Said shell 50 has two of these bearing-sleeves 49 in alinement with each other, the second of said sleeves 49 having cylindrical block 51 mounted therein, and a plug 51[a] is screwed into the recessed end of said block and supports ball-bearings 53, surrounding a spherical enlargement 52 on one end of the crank-shaft 39, to withstand end thrust. Journal 48 and block 51 are both made with conical bores screw-threaded to engage the threaded portion of conical split bushings 54, in which the crank-shaft 39 is mounted to turn. Each bushing 54 is made with a series of grooves 55, and each bearing-block 51 is provided, in which a key 55[a] is located and adapted to enter any one of said grooves in the bushing to lock the latter.

In the shell 50 a bushing is removably secured, forming curved side shoes 56 and top and bottom shoes 57, of case-hardened steel, and forming guide-recesses for a yoke 58, having a bearing 59 on the crank of shaft 39, and the other end of the yoke is secured to a cross-head or disk 60, having an opening to receive the drill-rod 61. Secured on the inner end of drill-rod 61 is a piston 62, having a series of rawhide, fiber, or other non-metallic split washers 63 engaging the face of the drill-bushing.

Beyond the cross-head 60 a disk 64 is located on the drill-rod 61, and an annular series of gang-springs 65 and 66, respectively, are located between the piston 62 and cross-head 60 and between the latter and the disk 64, and said springs are maintained in their proper positions by the curved pockets of star-wheels 61[a], loose on drill-rod 61. Between the head 60 and disk or ring 64 forwardly-projecting arms 67[a] on the yoke or draw-bar are provided, with hooks 67[b] projecting over the face of disk 64 to retain the latter in position. The gangs of springs comprise each a series of larger coiled springs, inclosing or surrounding smaller and shorter

coiled springs of the same or varying lengths and by so forming them—namely, of a series of comparatively weak springs, each having reinforcing-springs brought into action when the first-mentioned springs are partially compressed—gives to the drill the ideal blow, the stroke being long and unchecked, and hits the rods more forcibly than if checked by the back springs before hitting. Should the bit stick in the rock, a slight compression of the reinforcing-springs will withdraw the bit, although the per cent. of overload be very great. While the pull is great, it is still elastic. No springs are pulled hard home or broken, and the vibration of the machine is very much lessened. The weakening, due to crystallization, is reduced, and the noise of operation is much less than with drills as heretofore constructed.

In the forward portion of the drill-barrel a ratchet-casing 67 is secured, and the drill-rod where it passes through the ratchet-casing is enlarged and made on opposite sides with spiral grooves 68 and straight grooves 69. Within the ratchet-casing the drill-rod is surrounded by two ratchet-wheels 70. Both ratchet-wheels 70 are locked against rotation in the same direction by rollers 71, mounted between the casing and inclined faces of the ratchet-wheels. One of the ratchet-wheels is provided with lugs 72, which enter the spiral grooves 68, and the other ratchet-wheel has similar lugs projecting into the straight grooves 69. Hence it will be seen that as said drill-rod is moved forwardly it moves in a direct line, since one of the ratchet-wheels prevents its rotation, as its lugs 72 are in the straight grooves 69 of the drill-rod, the spiral grooves 68 turning the other ratchet-wheel, and when the drill-rod begins its inward stroke the ratchet-wheel having its lugs 72 in the spiral grooves 68 cannot turn in the reverse direction, and the drill-rod must therefore turn sharply, the other ratchet-wheel having its lugs in the straight grooves turning with the drill and permitting this movement of the rod.

Adjacent to the end of the ratchet-casing is a nose-bushing comprising an inner sleeve or bushing 73, having an inner face or lining of rawhide, fiber, or other suitable non-metallic substance 73[a]. The outer face of said bushing is made conical, grooved longitudinally at various points, as shown at 74, and screw-threaded at one end and split longitudinally. Around the bushing is a metal sleeve 75, having a conical bore and internally screw-threaded to engage the threads of the bushing and tighten or loosen the same, and this sleeve is provided with an opening to receive a pin 76 to enter any of the grooves 74 and lock the sleeve and bushing together, and a spring-arm 77 is located in recesses in the outer face of the sleeve 75. The bushing-sleeve 75 and ratchet-case 67 are connected together by means of the spring-arms 75[b].

The forward end of sleeve 75 is recessed to seat an annular series of coiled springs 78, normally spaced from the chuck 79 on the end of the drill-rod. This chuck is made tapering toward its outer end both internally and externally and is made on its exterior with a series of peripheral ribs 80, having sliding bearing in the drill-casing. The rear end of the chuck-body is made with a conical hole having a threaded wall to receive the threaded conical end of drill-rod 61. A block 81, of hardened steel, is set into the end of the drill-rod and serves as an abutment for the rear end of the drill-steel or tool 82. The steel or tool 82 is held in the chuck 1 by means of a series of jaws 83, each adapted at its inner edge to engage the tool, which latter is made angular in cross-section, and the jaws are so shaped to grasp the tool in a manner to prevent its turning. Each jaw 83 is made with a tapering exterior, so that all the jaws coöperate to form a truncated cone. A socket is made in each jaw for the reception of a spring 84, the rear ends of which bear against the head of the chuck-body and tend to force outward the jaws and cause them, through their coöperation with the conical interior of the chuck body, to tightly grasp the drill tool or steel.

Between the enlarged end of a threaded sleeve 85 in the drill-barrel 6 and the end of said barrel one end of a flexible dirt-shield 86 is securely clamped, and the outer end of said shield is secured in a groove in the chuck-body by a wire or lacing 87. In fact, both ends of the shield may have clamping wires or lacings, as shown. This shield may be of light metal or of leather, fabric, or any other material which will not interfere with the operation of the chuck and yet absolutely exclude dirt from the end of the drill. The drill is fed forward by a screw 88, mounted in the drill-guide and having an operating crank-arm 89 on its outer end. This screw 88 passes through two nuts 90, secured in a depending sleeve 91 on the drill-barrel and parallel therewith. One of these nuts is held stationary at all times, while the other, the one at the extreme end of the drill, is adapted to be turned to separate the nuts and take up wear of the screw, and a suitable spring locking-dog 92 is secured to the drill-barrel 6 and engages between any of an annular series of teeth 93 on the enlarged end of said adjustable nut to securely lock the nut at any adjustment.

The yoke or draw-bar is provided with an adjustable bearing on the crank-shaft, which comprises a bearing-block 94 in the yoke or draw-bar and a coöperating-block 95, bearing against a bar 96, secured to the yoke or draw-bar by screws 97, and between said bar and yoke a series of shims 98 are located and

adapted to be removed one at a time to compensate for wear of the bearing-blocks.

The rear end of the drill-barrel is closed by a removable cap 99, having flanged sides to enter grooves in the cylinder or shell 50 and adapted to fit a recess in the bottom thereof, and a spring-pressed bolt 100 springs over the top of said rear end cap 99 and secures it against displacement. This bolt 100 is mounted to slide in a guide 101 on top of the drill-barrel and has a lug 102 at one side to enter a notch 103 in the guide and hold the bolt out of locking position.

In Fig. 11 I illustrate a modification in which instead of employing gang-springs at opposite sides of the cross-head I employ a volute spring 104 between the cross-head and washer on the drill-rod. While I have shown the gear-casing 13 at one side of the drill-barrel, it is to be understood that it can be easily reversed and located at the other side, if desired.

A great many slight changes might be made in the general form and arrangement of the parts described without departing from my invention, and hence I would have it understood that I do not restrict myself to the precise details set forth, but consider myself at liberty to make such slight changes and alterations as fairly fall within the spirit and scope of my invention.

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 adjustably connecting said support with the drill-guide, and a rigid driving-shaft connecting the motor with the drill-operating mechanism.

2. The combination with the guide-shell of a rock-drill or similar machine, of an electric motor yieldingly suspended therefrom, and an operative connection between the motor and the drill, including telescoping parts whereby the connection is extensible to compensate for the back-and-forth movement of the drill-body on the guide-shell.

3. The combination with a drill, a guide-shell and an electric motor, of a cushion connection between the guide-shell and the motor whereby the latter is yieldingly suspended on the shell to prevent or overcome the vibration incident to the operation of the drill.

4. The combination of a drill, a guide-shell and a motor, of a cushion connection between the guide-shell and motor for arresting the vibrations which would otherwise be communicated from the drill to the motor during the operation of the drill.

5. The combination with a guide-shell, a drill-body thereon and drill-operating mechanism, of a motor having a yielding support connected with the guide-shell, and driving means connecting the motor with the drill-operating mechanism.

6. The combination with a guide-shell, a drill-body movable thereon and drill-operating mechanism, of a motor, a yielding support between the motor and guide-shell and driving means between the motor and drill-operating mechanism.

7. The combination with a guide-shell, a drill-body thereon and drill-operating mechanism carried by the drill-body, of a motor, yielding means suspending the motor from the guide-shell, a rigid driving-shaft, means for operatively connecting said driving-shaft with the motor and drill-operating mechanism, and means for maintaining the bearings of said driving-shaft in alinement with each other when the drill-body is moved.

8. The combination with a drill-support, a drill carried thereby and supported to move thereon, and gearing for operating said drill, of a motor-casing, a motor therein, a spring-fork connected with said support at one end and supporting the motor-casing at its other end, and a shaft connecting the shaft of the motor with the gearing of the drill.

9. The combination with a drill support and guide, of a drill mounted to move longitudinally on said support, alined rings or eyes on said support, a spring-fork secured in said eyes at one end, a motor supported between the spring-arms of the fork at its outer end, and a shaft connecting the motor with the gearing of the drill.

10. The combination with a drill-support, a drill therein, and gearing for operating said drill, of a motor-casing, a motor in said casing, a spring-fork supporting said motor-casing at one end and secured to the support at its other end, and a shaft connecting the shaft of the motor with the gearing and movable longitudinally through both.

11. The combination with a drill-support, a drill-guide secured in said support or made integral therewith, a drill movable longitudinally in said guide, a hollow shaft having an angular bore, and a gear on said shaft transmitting motion to the drill, of a motor-casing, a motor therein, a hollow shaft in said motor having an angular bore, and elastic support for said motor-casing, an angular shaft located in the angular bore of the hollow shaft and means for limiting longitudinal movement of the shaft through the hollow shaft of motor.

12. The combination with a drill-support, a drill therein, and a gear transmitting motion to the drill, of alined eyes or rings on opposite sides of the support, a spring-fork, a motor-casing, a motor in said casing, said fork having lugs or trunnions to enter pockets in opposite sides of the casing, a clamp to hold the fork in such engaging position, and

said fork bent to one side of its center and located in the eyes or rings at either side of the support, a pin securing the fork in the rings, and a shaft connecting the motor with the drill-gear.

13. The combination with a drill, a hollow shaft having an angular bore, and a gear on said shaft for transmitting motion to the drill, of a motor-casing, a motor therein, a shaft in the motor having an angular bore, an angular shaft located in the hollow shaft of motor, and a removable plug in the motor-casing limiting the longitudinal movement of the shaft through the motor-shaft.

14. The combination with a drill, of a motor-casing having a motor therein, a shaft connecting the motor and drill and a slip-fit disk or washer on said shaft near the motor-casing and adapted to throw off all dirt, water, &c., preventing its entrance into the motor-casing.

15. The combination with a drill, of a shaft for driving the same, and a rotary motor to turn said shaft, of a casing inclosing the motor, a spring-fork supporting the casing, and comprising a spring-rod bent together between its ends and flared at its ends to receive the casing, one rod or end but slightly curved and the other given a compound curvature, to centrally dispose the casing regardless of which side of a support, the fork is secured.

16. The combination with a column, an arm projecting at right angles thereto, a drill support and guide on said arm, a drill in said guide, and a hollow shaft having a gear thereon transmitting motion to the drill, of a spring-fork secured at one end to the support, a rotary motor supported at the free ends of said spring-fork, and a shaft connecting the hollow shaft and motor.

17. The combination with drill mechanism, gearing connected therewith and a rigid driving-shaft connected with said gearing, of a rotary motor, a tubular shaft for said motor mounted in the motor-casing and having an angular bore for the reception of the rigid driving-shaft, and a flexible support for the motor.

18. In a drill mechanism, the combination with a crank-shaft, a gear thereon, a driving-shaft, and a pinion on said drive-shaft meshing with said gear, of a casing inclosing said gears, and adapted to turn, journals on said drive-shaft, ball-bearings in the casing around said journals, and an enlargement on one journal where it projects outside of the casing to throw off dirt and water preventing its entrance into the casing, and knobs around said enlargement.

19. In a drill, the combination with a crank-shaft, a drill-barrel, a drill-rod and a yoke or draw-bar connecting the crank-shaft and rod, of a piston on said rod in the drill-barrel, and split washers of yielding material on said piston engaging the barrel of the drill.

20. In a drill, the combination, with a barrel, of a cylindrical casing in said barrel having sleeves at opposite sides, a crank-shaft mounted in bearings in said sleeves, a drill-rod in the barrel, a piston on said rod, a yoke or draw-bar, a shell in said barrel having opposite recesses to receive a yoke or draw-bar, a cross-head connecting said yoke or draw-bar with the drill-rod, and a non-metallic packing around the piston engaging the shell and holding the drill-rod true.

21. In a drill, the combination with a drill-rod, of a piston thereon, a cross-head loose on the rod, a draw-bar to operate said cross-head, a gang of coiled springs between the piston and cross-head, comprising longer and shorter springs surrounded one by the other.

22. In a drill, the combination with a drill-rod, and a driving cross-head loose on said rod, a piston secured on the rod at one side of the cross-head, a ring or disk on the rod at the other side of the cross-head, a gang of coiled springs between the cross-head and piston comprising long and short springs, the shorter springs surrounded by the longer, and elastic connection between the cross-head and ring or disk.

23. In a drill, the combination with a drill-rod, an operating cross-head loose on the rod, a piston secured on the rod at one side of the cross-head, a ring or disk on the rod at the other side of the cross-head, of gangs of springs located between the cross-head and piston and cross-head and ring or disk, and comprising long and short coiled springs nested together.

24. The combination with a drill-support and drill mechanism, of a rotary motor, an elastic supporting device pivotally connected to the motor, means for removably attaching said elastic supporting device at either side of the drill mechanism, gearing connected with the drill mechanism, means for supporting said gearing at either side of the drill mechanism and a rigid driving-shaft connecting said motor with the gearing of the drill mechanism.

25. The combination of a drill-body, a motor-support, a motor pivotally mounted therein, a common support sustaining said drill-body and motor-support, drill mechanism in the drill-body, gearing for transmitting motion to said mechanism and a rigid driving-shaft connecting the motor with said gearing.

26. The combination with a drill-body, of a drill-rod, a nose-bushing through which the drill-rod passes, a chuck on the end of the drill-rod and a plurality of small springs mounted in the nose-bushing and terminating behind the chuck.

27. The combination of a drill, a rod therein, a series of small springs around the drill-

rod to cushion the same, and a star or spacing wheel around the rod having curved pockets to receive the springs.

28. In a motor-driven tool-operating machine, the combination with a supporting device, of a shiftable carrier thereon, and tool-operating mechanism operatively associated with said carrier including a yieldably-supported motor mounted on the supporting device, and a slidably-connected motor-shaft whereby the parts may adjust themselves in consonance with the shifting of the carrier.

29. In a motor-driven tool-operating machine, the combination with a supporting device, of a shiftable carrier thereon, and tool-operating mechanism operatively associated with said carrier including a yieldably-supported motor mounted on the supporting device, gearing on the shiftable carrier, and a slidably-connected motor-shaft operatively associated with said gearing whereby the parts may be shifted in consonance with the shifting of the carrier.

30. In a motor-driven tool-operating machine, the combination with a supporting device, of tool-operating mechanism thereon, including a motor, a motor-shaft, intermeshing gearing connected to said shaft, and means for yieldably mounting the motor comprising cushioned bearings at opposite sides thereof.

31. In a motor-driven tool-operating machine, the combination with a supporting device, of a shiftable carrier thereon, and tool-operating mechanism operatively associated with said carrier including a motor, and means for yieldably mounting the motor on the supporting device comprising spring pivot-bearings at opposite sides thereof.

32. In a motor-driven tool-operating machine, the combination with a supporting device, of a shiftable carrier thereon, and tool-operating mechanism operatively associated with said carrier including a motor, and means independent of the shiftable carrier for movably mounting the motor on the supporting device and cushioning the same relative thereto.

33. In a motor-driven tool-operating machine, a support, a shiftable carrier operatively associated therewith, and tool-operating mechanism operatively associated with the carrier including a motor yieldably mounted on the support independently of said carrier and a rigid shaft for the motor.

34. In a motor-driven tool-operating machine, a support, a shiftable carrier operatively associated therewith, and tool-operating mechanism operatively associated with the carrier including a motor pivotally mounted on the support independently of the carrier and a rigid shaft for the motor.

35. In a motor-driven tool-operating machine, a support, a shiftable carrier operatively associated therewith, and tool-operating mechanism operatively associated with the carrier including a motor movably mounted on the support independently of the carrier and a rigid shaft for the motor.

36. 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 yieldably mounted on said support independently of the carrier, a motor-shaft, and a tool-spindle operatively connected with said shaft, the operating parts being rigid but movably related whereby they may adjust themselves in consonance with the shifting of the carrier.

37. 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 yieldably mounted on said support independently of the carrier, a rigid motor-shaft, and a tool-spindle operatively connected with said shaft, the motor and its shaft being movably related to the other operating parts whereby they may adjust themselves in consonance with the shifting of the carrier.

38. In a motor-driven tool-operating machine, the combination with a supporting device, of tool-operating mechanism thereon including a motor, means for yieldably mounting the motor comprising spring-bearings at opposite sides thereof, and a rigid shaft for the motor mounted whereby the same and the motor may adjust themselves relative to the other parts of the operating mechanism when the motor yields with its bearings.

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

THOMAS EDGAR ADAMS.

Witnesses:
R. H. CRAFT,
J. H. WORBS.