No. 789,951. PATENTED MAY 16, 1905.

T. E. ADAMS.

ROCK DRILL.

APPLICATION FILED DEC. 4, 1901.

4 SHEETS—SHEET 1.

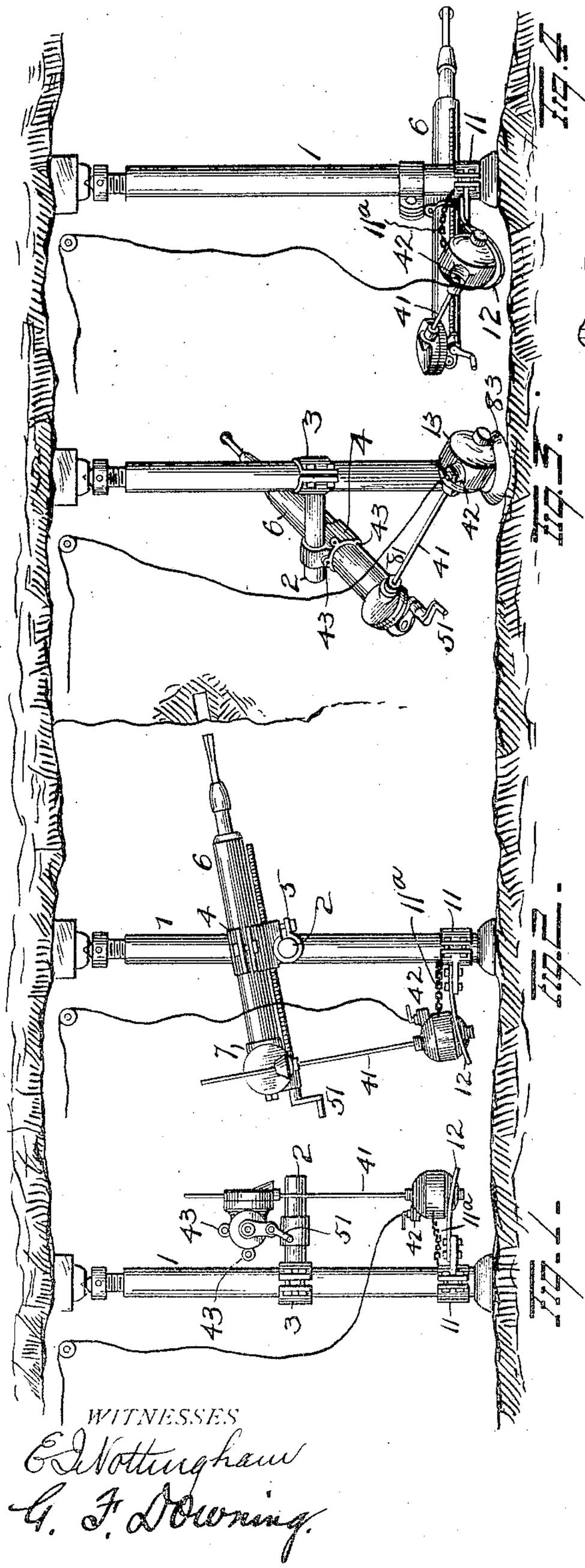

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

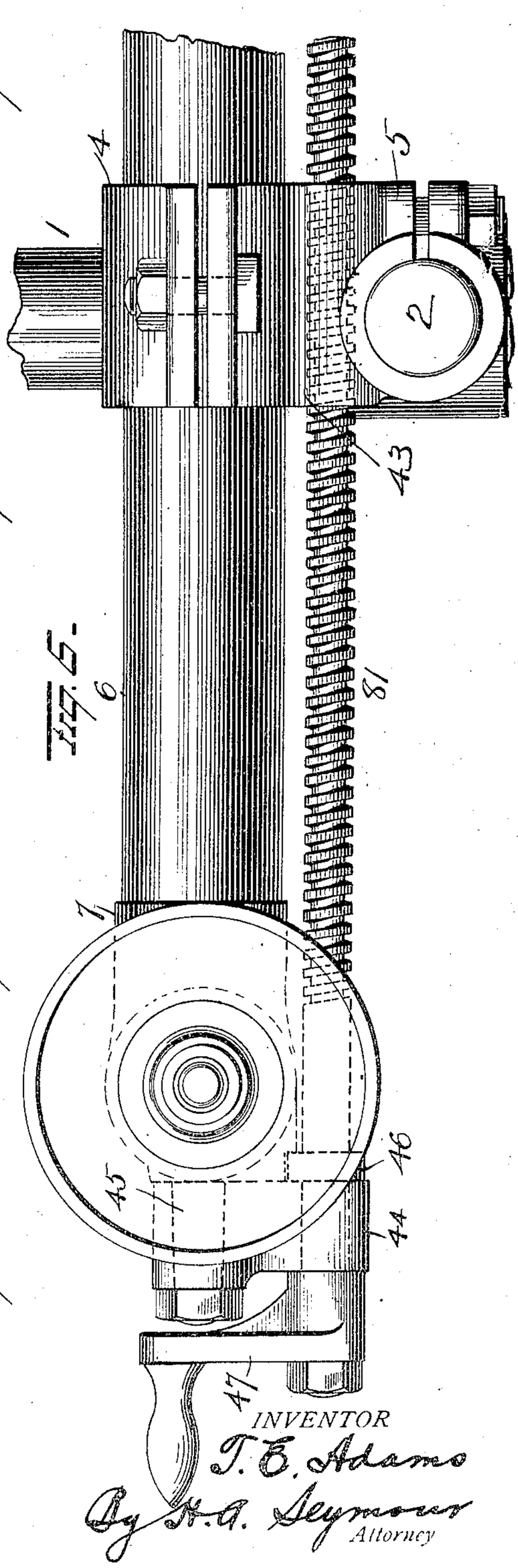

FIG. 5.

FIG. 6.

WITNESSES

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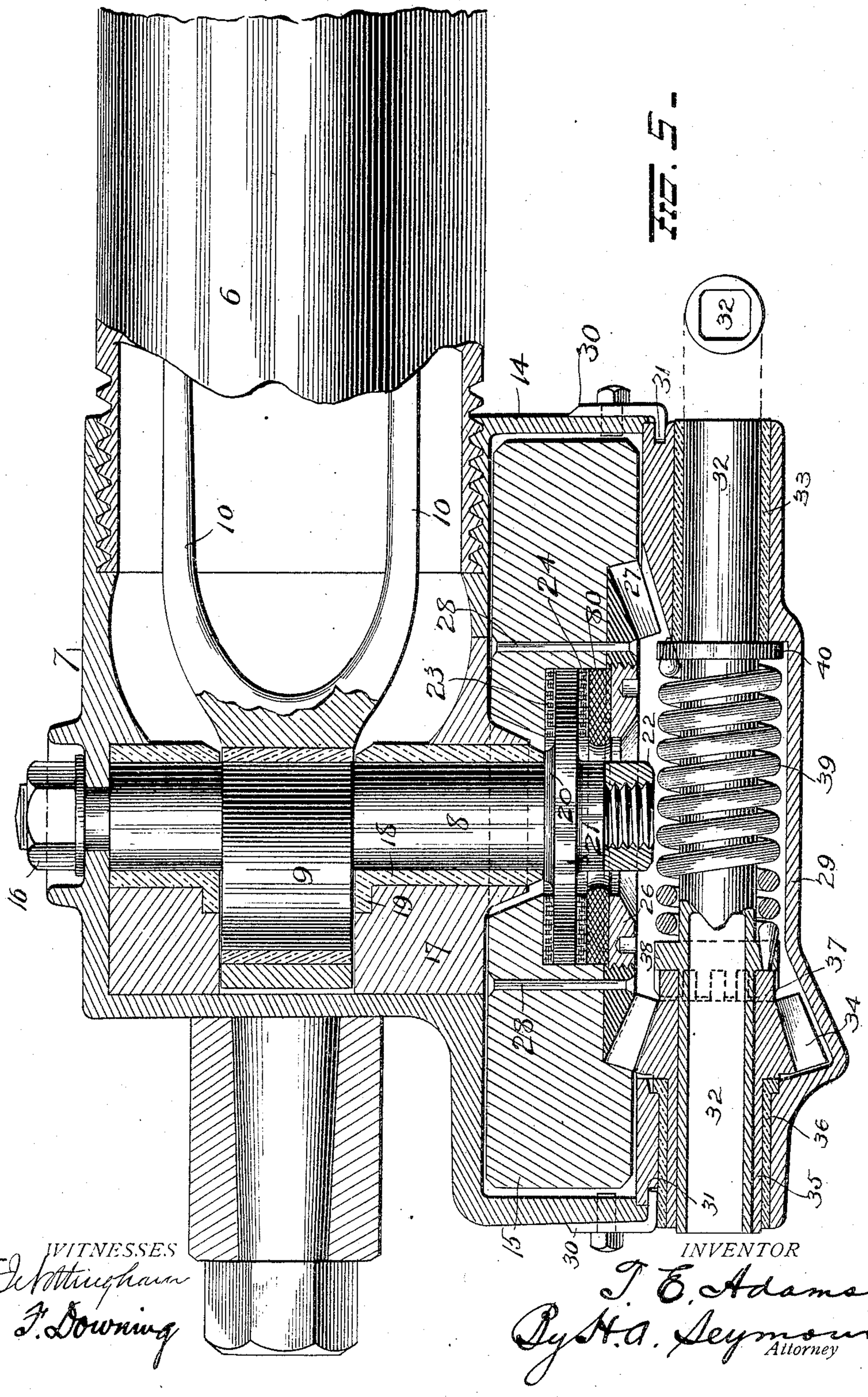
4 SHEETS—SHEET 2.

FIG. 5.



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4 SHEETS—SHEET 3.

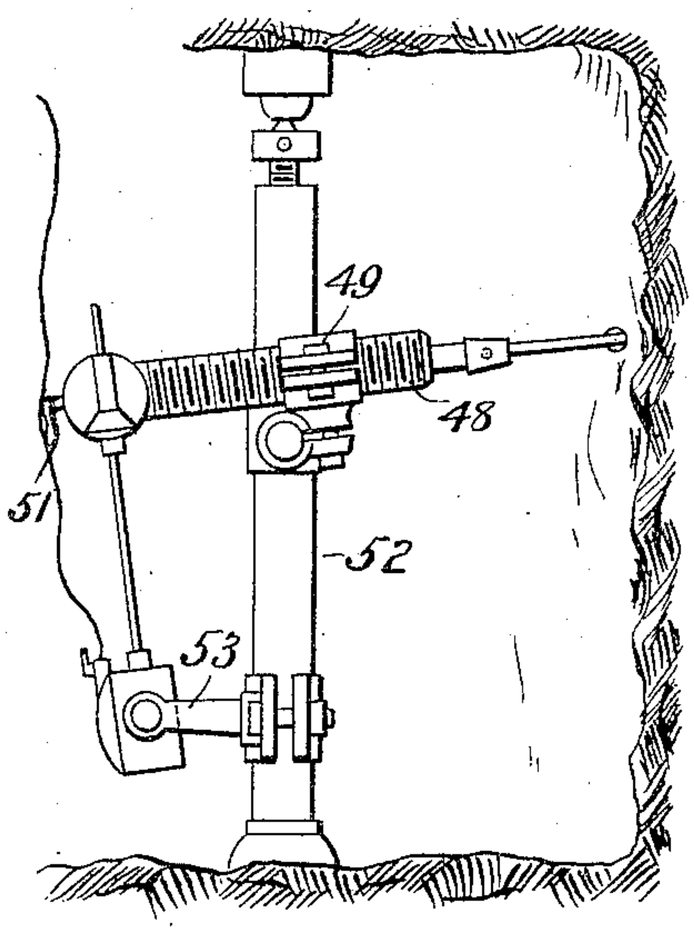

Fig. 7.

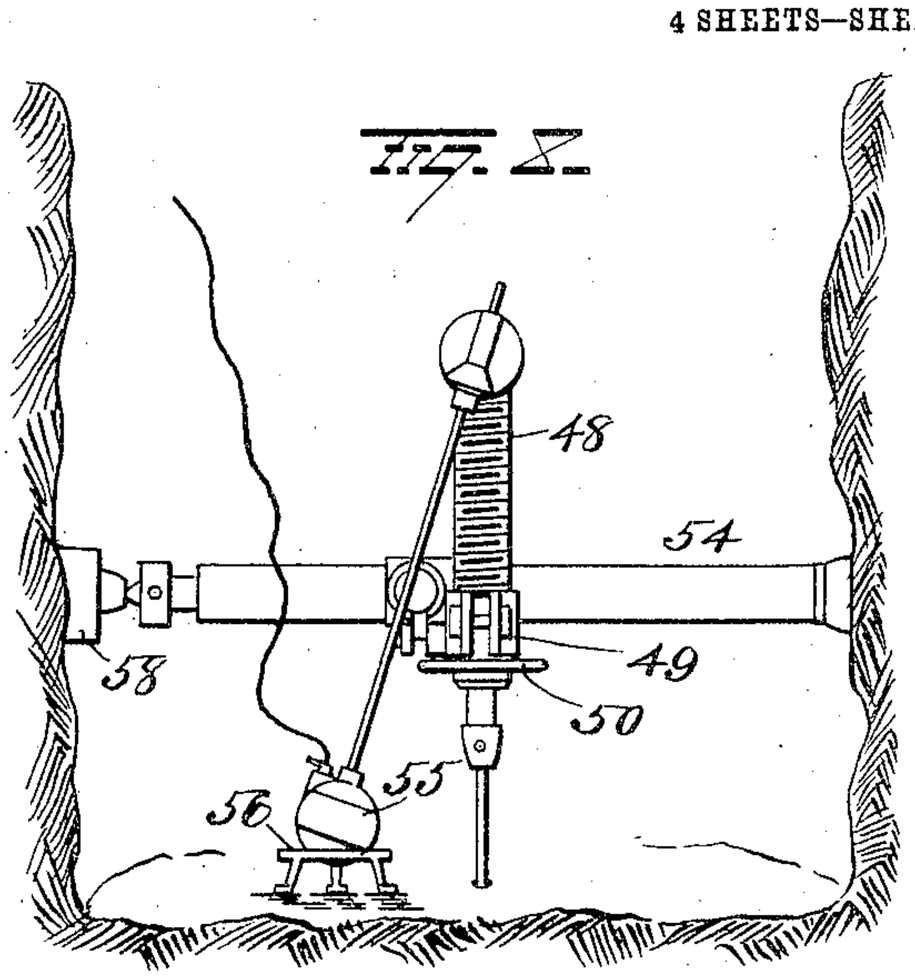

Fig. 8.

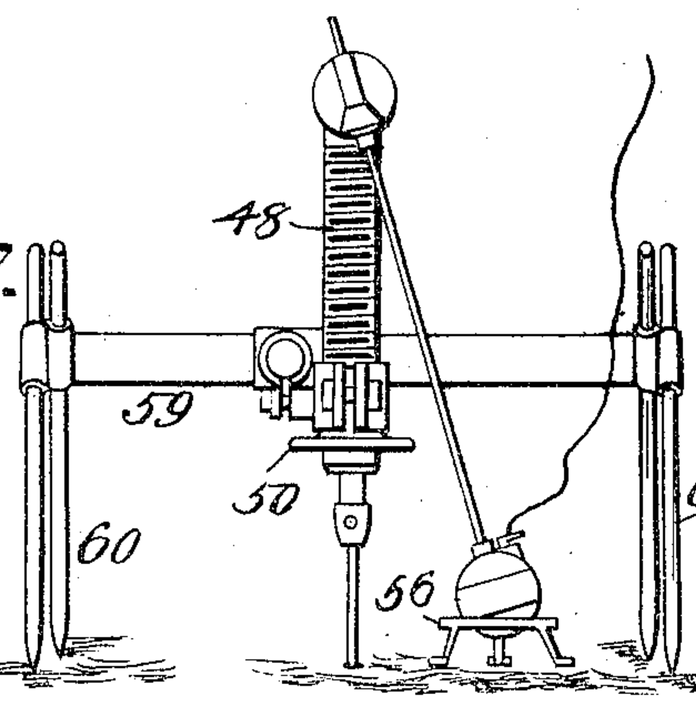

Fig. 9.

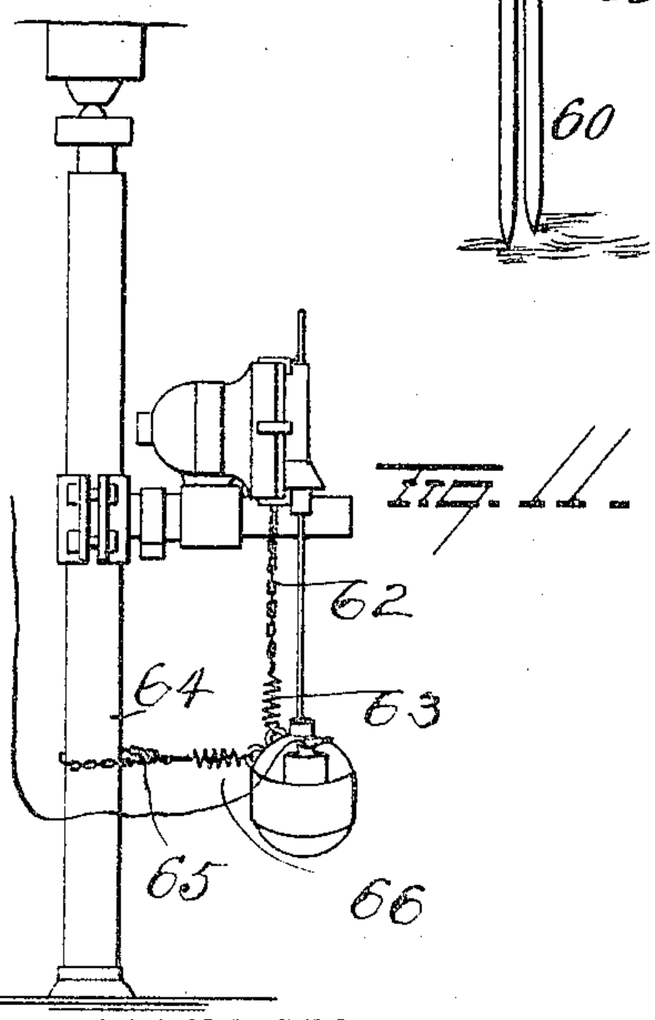

Fig. 11.

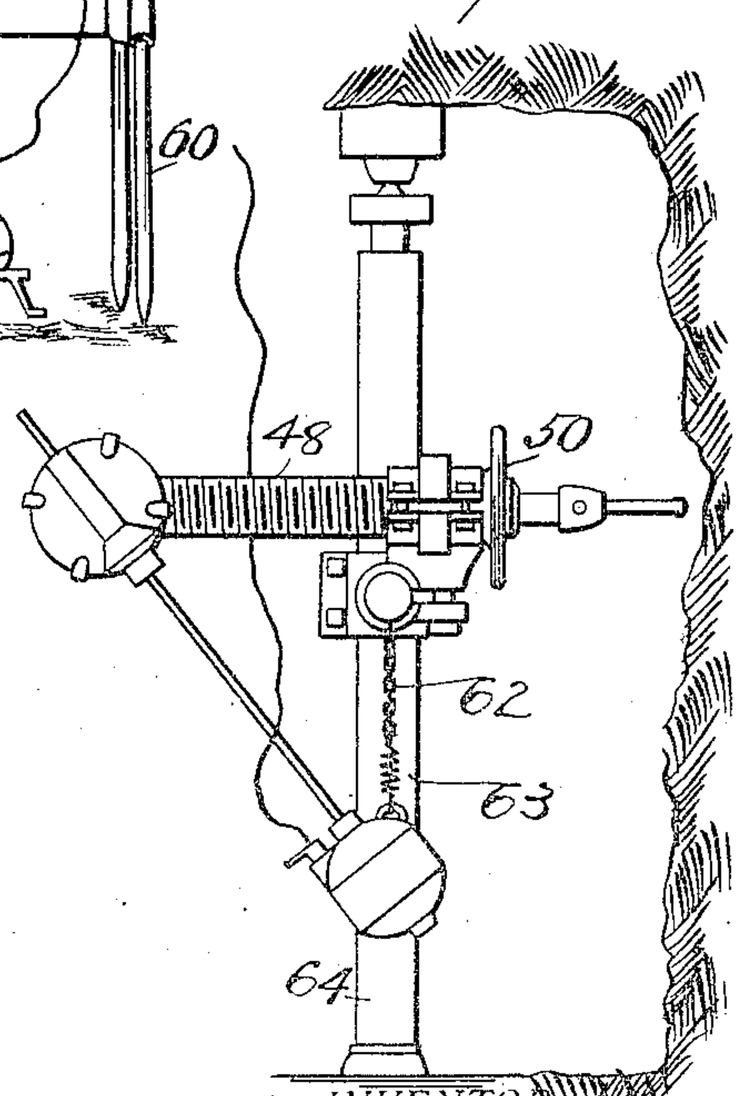

Fig. 10.

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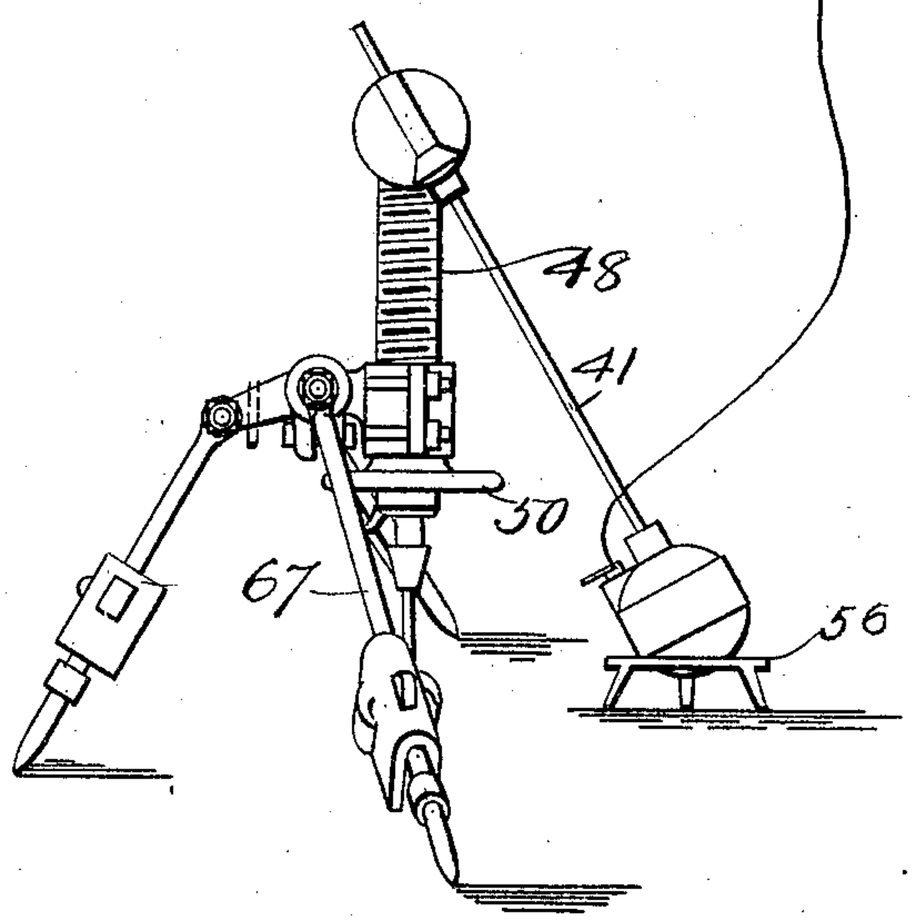
4 SHEETS—SHEET 4.

Fig. 12.



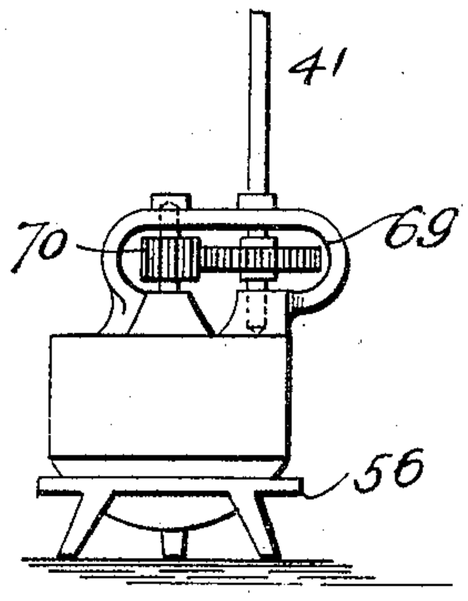


Fig. 13.

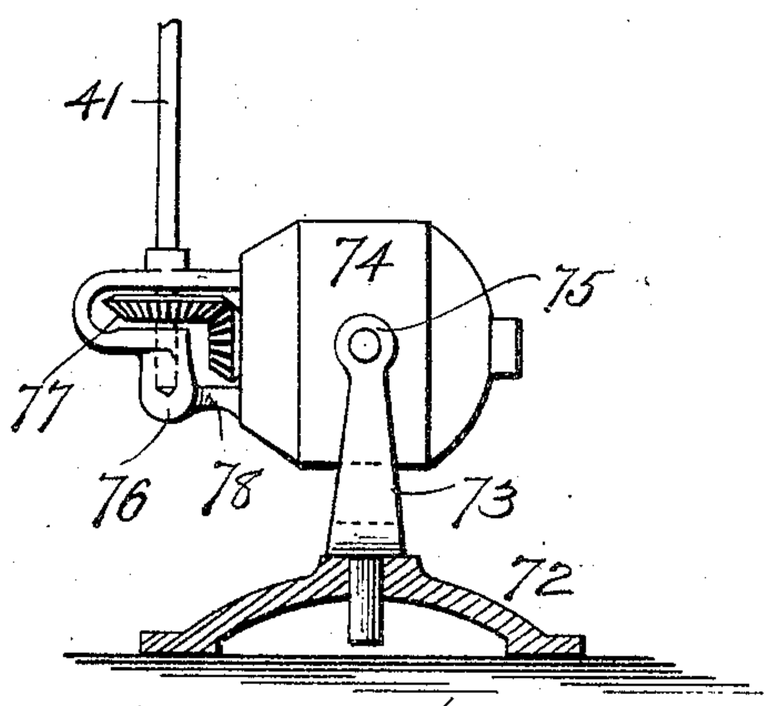


Fig. 14.

WITNESSES

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No. 789,951. Patented May 16, 1905.

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.

SPECIFICATION forming part of Letters Patent No. 789,951, dated May 16, 1905.

Application filed December 4, 1901. Serial No. 84,699.

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 an improvement in rock-drills, one object of the invention being to cheapen the construction of rock-drills without detracting from the efficiency of the same.

A further object is to so construct a rock-drill, such as is driven by a separate motor, as to avoid the use of flexible shafting heretofore employed, and thus overcome objections incident to such shafting.

A further object is to so construct a rock-drill that it can be driven by a separate motor through the medium of a rigid drive rod or shaft.

A further object is to so connect a separate motor through the medium of a rigid drive rod or shaft with drill-operating mechanism that the latter can be adjusted to any desired angle or position without altering or affecting the operative relation between said drill-operating mechanism and the motor.

A further object is to so mount a motor and connect it by means of a rigid drive rod or shaft with the drill-operating mechanism that it will automatically adapt itself to any position to which said mechanism may be adjusted.

A further object is to so connect a separate motor to the drill mechanism through the medium of a rigid drive rod or shaft that the shock and backlash of the drill mechanism will not be transmitted to the motor.

A further object is to so connect an electric motor with drill mechanism through the medium of a rigid drive rod or shaft that the drill can be feed and the drill-body moved to project the drill in different directions without disturbing the operative relation between the motor and drill mechanism.

A further object is to provide a "friction-slip," so that a sudden stoppage of the drill by reason of sticking in the hole will not stop the driving power, and especially not stop the fly-wheel or so suddenly check it that the stored energy in the wheel will break the machine.

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, Figures 1, 2, 3, and 4 are views illustrating my improvements with the drill disposed in different positions. Fig. 5 is an enlarged detail view showing the gearing and connections between the driving rod or shaft and the drill-operating mechanism. Fig. 6 is an enlarged detail view, and Figs. 7 to 14 are views illustrating modifications.

1 represents a column or standard, to which an arm 2 is adjustably secured by means of a clamp 3. A housing 4 is adjustably secured to the arm 3 by means of a clamp 5, and this housing serves to support a drill body or barrel 6. A casing 7 is screwed upon or otherwise secured to the rear end of the body or barrel 6 and serves as a housing for the shaft 8, by means of which motion is imparted to the drill-rod through the medium of an eccentric 9 on said shaft and a pitman 10.

A bracket 11 is secured to the column or standard 1 and holds in place a spring 12, upon which an electric or other motor 13 is mounted, so as to be freely movable, and thus capable of being made to assume different positions for a purpose which will be hereinafter made apparent, and the motor is connected with the column by means of a chain 11^a, or, if desired, the motor might be mounted upon a ring 83, placed on the ground.

The casing 7 is made with a portion 14, which serves as a housing for a balance-wheel 15, and into this housing one end of the shaft 8 projects, the other end of said shaft projecting beyond the opposite face of the casing and provided with a suitable nut 16. A block 17 is disposed within the casing and serves as a bearing for the shaft 8, a bushing 18 being inserted between the shaft and the block and provided at one end with a shoulder 19 to engage a recess in the block.

The shaft 8 is provided with a shoulder 20,

against one face of which the end of the bushing 18 bears. A flange or disk 21, placed on the shaft, bears against the outer face of the shoulder 20, (or made integral therewith,) and a nut 22, screwed on the end of the shaft, holds the flange or disk 21 in place. The flange or disk 21 projects into a recess in the balance-wheel 15, and between the inner wall of said recess and the inner face of the flange or disk 21 a fiber ring 23 is located. A similar fiber ring 24 is placed against the outer face of the flange or disk 21. A rubber ring 80 or other suitable spring is placed against the outer face of the fiber ring 24 and held in place by means of a nut 26. The nut 26 is screwed within a bevel gear-wheel 27, and the latter is secured, by means of bolts 28, to the balance-wheel 15.

From the construction and arrangement of parts above described it will be seen that the balance-wheel 15 and gear-wheel 27 are connected with the shaft 8 through the medium of a friction device, so that should accident stop shaft 8 the motor would continue to run, because the friction-disk could slip and no fuse be blown nor damage done the motor owing to flood of current, as would be the case if the motor were stopped.

The outer face of the casing 7 is closed by a gear-casing 29, adapted to rotate against the casing 7 and held properly in place by means of a series of dogs 30, each of which is L-shaped and has one arm secured to the casing 7 and the other arm entering an annular groove 31 in casing 29 or otherwise secured. A tubular driving-shaft 32 extends longitudinally through the gear-casing 29, and in one end of said casing a bushing 33 is provided for the shaft 32. A bevel-pinion 34 is located within the gear-casing and mounted on the tubular shaft. The pinion 34 is provided with a sleeve or elongated hub 35, which extends to the outer end of the gear-casing, and a bushing 36 is provided for this sleeve or hub. The inner face of the pinion is provided with clutch-teeth to form one part of a crab-clutch 37, the teeth for the other part of said clutch being made on a ring 38, mounted loosely on the tubular shaft 32. A backlash-spring 39 encircles the shaft 32 and is secured at one end to the ring 38, the other end of said spring being secured to an annular flange 40, secured to said shaft at the inner end of the bushing 33. The bore of the tubular shaft 32 is made angular in cross-section for the reception of an angular driving rod or shaft 41, which is adapted to pass entirely through and be movable longitudinally in said tubular shaft 32. The other end of the drive rod or shaft 41 is coupled in any suitable manner with the armature of the motor, or it may, if desired, constitute an extension of the armature-shaft. The motor is controlled by a combined switch and rheostat 42, mounted directly upon and carried with the motor-casing, and the only electric cable required is connected with this combined switch and rheostat.

The housing 4, through which the drill body or barrel 6 passes, is provided with a series of threaded holes 43, through any one of which (according to the adjustment of the apparatus and to suit the convenience of the operator) a threaded feed-rod 81 is passed. The rear end of the feed-rod is swiveled in a block 44, secured to a stud 45, projecting from the casing 7. On one side of the block 44 the feed-rod is provided with a flange or collar 46 to prevent longitudinal movement of said rod, and the latter is provided at its end with a crank-arm 47, by means of which to operate it.

From the construction and arrangement of parts above described it will be seen that the drill-body can be readily adjusted to different positions for the purpose of projecting the drill in any desired direction and that the rigid driving-rod will always be in operative relation to the motor and drill mechanism. By the use of the rotatable gear-case 29 the respective bearings of the rigid driving-rod will be maintained in alinement with each other. Whenever the drill-body is adjusted, the connection of the drill mechanism with the motor will automatically adapt itself to the change position of said drill-body, and the use of a flexible shaft is entirely avoided. Furthermore, by means of my improvements the motor and driving-rod will be relieved of all jar and backlash.

Experience has shown that in a tunnel working room is limited. After drilling is done all tools have usually been removed, and after the blast they have been brought back again; but the working space will be found to be filled with broken rock, much of which must be removed before drilling can be resumed. I am able with the apparatus herein described to set up the column and its brackets, mount the drill and motor, and begin drilling the holes while the rubbish is being taken away, and then I can drill the bottom holes. A motor with a flexible shaft and switch-cables, as heretofore employed, requires cleared space much larger than the rigid drive-rod employed by me, and no switch-cables such as heretofore used are necessary.

While the motor is being operated upon a column or tripod or any of the various kinds of "bar-bearings" in which it is in metallic contact with the drill, the jar renders it necessary to have some elastic medium between the support and the motor; but when the work is progressing to the drilling of the lower holes in the tunnel the motor in certain cramped positions may be laid upon the ground and prevented from rolling, either by the blocking effect of the casing of the switch and rheostat or by other convenient means; but as the rock will not transmit the sharp vibrations that the metallic support would the elastic mounting of the motor becomes of

less importance between the motor and the supporting earth and rock than when the motor is mounted on the standard, bar, or tripod. Hence a support, such as a ring or stool mounted upon the ground, may be employed for supporting the motor when the lower holes are to be bored. Instead of the form of apparatus hereinbefore described, and shown in Figs. 1 to 6, I may employ the constructions shown in Figs. 7 to 14. In these latter views the drill-body 48 is screw-threaded externally and passes through an internally-threaded sleeve swiveled in the housing 49. This sleeve may be turned by a hand-wheel 50, Figs. 8, 9, 10, or it may be turned by gearing operated by a rod having a crank-arm 51 in rear of the casing which incloses the drill-driving mechanism, all of which is fully described and illustrated in my application for patent, Serial No. 79,832, filed October 24, 1901.

In the construction shown in Fig. 7 the motor-casing is illustrated as being angular instead of spherical, as shown by other figures of the drawings, and has a universal connection with the standard 52, being pivotally mounted in a bracket 53, having a swivel connection with the standard.

In Fig. 8 the drill is shown mounted on a horizontally-disposed bar 54 and disposed to drill lower or bottom holes in the tunnel, the motor 55 being mounted to rock on a stool 56, disposed on the ground.

In Fig. 9 the drill is shown mounted on a horizontal bar 59, supported at its ends by legs 60, and the motor mounted on a stool on the ground.

In the construction shown in Figs. 10 and 11 the motor is shown suspended by a flexible and yielding device, such as a chain 62 and a spring 63, and is anchored to the standard 64 by a similar flexible and yielding device, consisting of a chain 65 and a spring 66.

In Fig. 12 the device is shown mounted on a tripod 67, and the support for the motor may be a stool 56, located on the ground.

Instead of securing the driving rod or shaft 41 to or making it an extension of the armature-shaft of the motor it may be connected with the armature-shaft through the medium of spur-gears 69 and 70, as shown in Fig. 13, and the motor-casing may be made with a hemispherical bottom to rock on a stool 56, as shown in this figure.

When the motor is to be mounted on the ground, the construction shown in Fig. 14 may be adopted, if desired. In this construction a base 72 is provided, and on this base a bracket 73 is revolubly mounted. The motor 74 is supported by trunnions 75, mounted in the bracket 73. A gear-casing 76 is revolubly mounted on the motor-casing and has a bearing for one end of the driving rod or shaft 41. A bevel-gear 77 is secured to the driving-shaft 41 and meshes with a bevel-gear 78 on the armature-shaft of the motor, both of said gears being located within the revoluble gear-casing.

Other slight changes might be made in the details of construction 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. A rock-drill, comprising a pivotally-mounted, longitudinally-movable drill-body, a drill-rod and operating mechanism for the drill-rod carried by the drill-body, a motor independent of the drill-body, mounted to rock, and a rigid drive-rod extending from said motor to said operating mechanism.

2. In a drill, the combination with an adjustable support, a longitudinally-movable drill-body mounted on said support, and drill-operating mechanism carried by said drill-body, of a motor independent of the drill-body and mounted to rock, a rigid drive-rod extending from the motor to the drill-operating mechanism, and means for maintaining the respective bearings of the drive-rod in alinement with each other.

3. In a drill, the combination with a drill-body, and drill-operating mechanism carried thereby, of a motor, a spring-support for the motor sustaining said motor so as to permit it to rock, a rigid drive-rod extending from the motor to said operating mechanism, and means for maintaining the bearings of said drive-rod in alinement with each other when the drill-body is moved.

4. The combination with a drill-body, a drill-gearing carried by said drill-body, and a casing revolubly mounted on said drill-body and inclosing a portion of said gearing, a motor mounted to rock, and a rigid driving-shaft extending from the motor to the gearing in the revoluble casing and movable longitudinally relatively to one of said parts.

5. In a drill, the combination with a column, a drill-body adjustably supported thereby and drill mechanism carried by the drill-body, of a separate motor, a spring-arm adjustably secured to the column, a rigid drive-rod extending from the motor to the drill-operating mechanism and means for maintaining alinement of the bearings of said drive-rod.

6. In a drill, the combination with a column, a drill-body supported thereby and drill mechanism carried by the drill-body, of a separate motor, a spring secured to the column and supporting said motor, a chain connecting the motor with the column and a rigid driving-rod connecting the motor and drill mechanism.

7. In a drill, the combination with a drill-body, a housing embracing said drill-body and permitting longitudinal movement of the latter, said housing having a series of threaded

openings parallel with the drill-body and means for supporting said housing, of a stud projecting rearwardly from on the rear end of the drill-body, a block adjustably supported by and depending from said projection, and a feed-screw swiveled in said block and adapted to pass through any one of the threaded openings in the housing.

8. In a drill, the combination with a drill-body, a support therefor, means for adjusting said drill-body to different angles relatively to said support and drill-operating mechanism carried by said drill-body, of a motor, a separate mounting for said motor permitting the same to rock bodily in any direction, a rigid driving-rod extending from said motor to the drill-operating mechanism and means on the drill-body for permitting longitudinal and transverse adjustment of said driving-rod.

9. In a drill, the combination with a drill-body, drill-operating mechanism, and a gear-wheel connected with said operating mechanism, of a casing rotatable at right angles to said gear-wheel, a hollow shaft mounted in said casing, a pinion on said hollow shaft and meshing with the gear-wheel, a motor mounted to rock in any direction and a rigid drive-rod connected directly to the rotating member of the motor and entering the hollow shaft.

10. In a drill, the combination with a casing secured thereto, a drill-operating shaft mounted in said casing and a gear-wheel connected with said shaft, of a gear-case revolubly mounted on said first-mentioned casing, a shaft mounted in the gear-casing, a pinion mounted loosely on the last-mentioned shaft and meshing with the gear-wheel, a spring mounted on said last-mentioned shaft and secured at one end thereto and a clutch connecting the other end of said spring with the pinion.

11. In a drill, the combination with a drill-body, a casing secured thereto and a gear-case having rotative relation with said casing, said gear-case having an annular groove, of dogs secured to the casing and entering the groove in the gear-case, a drill-operating shaft mounted in the casing, a driving-shaft mounted in the gear-case and gearing between said shafts.

12. In a drill, the combination with a drill-body, a casing secured thereto and a drill-operating shaft mounted transversely in the drill-body and projecting into said casing, a balance-wheel secured to said shaft within said casing, a gear-wheel secured to said balance-wheel, a driving-shaft, a pinion carried thereby and meshing with said gear-wheel, and a bearing device for the driving-shaft rotatively connected with said casing.

13. In a drill, the combination with a drill-body, a drill-operating shaft and a driving-shaft, of a balance-wheel, a gear-wheel secured rigidly to the balance-wheel, a friction device connecting said gear-wheel with the operating-shaft and a pinion on the driving-shaft and meshing with said gear-wheel.

14. In a drill, the combination with a drill-body, a drill-operating shaft and a driving-shaft, of a balance-wheel having a recess, a flange on the drill-operating rod and entering the recess in the balance-wheel, fiber rings bearing against the respective faces of said flange, a yielding ring bearing against one of said fiber rings, a nut securing said parts in place, a gear-wheel secured to the balance-wheel and a pinion on the driving-shaft and meshing with the gear-wheel.

15. In a drill, the combination of a drill-body, a casing secured thereto, a block in said casing, a drill-operating shaft mounted in said casing and block, a gear-wheel connected with said shaft, a gear-case, means for removably connecting said gear-case with the casing, a driving-shaft mounted in the gear-case and a pinion on the driving-shaft and meshing with said gear-wheel.

16. In a drill, the combination with a support and drill-operating mechanism mounted thereon, of an independent motor-support, a motor mounted to rock on said support, a rigid driving connection between said motor and drill-operating mechanism, and means for permitting automatic adjustment of the drill-operating mechanism relatively to the rigid driving connection.

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

THOMAS EDGAR ADAMS.

Witnesses:

JOHN D. ERTEL,

C. J. CRABLE.