No. 674,881. Patented May 28, 1901.

M. SHUSTER.

ROCK DRILLING MACHINE.

(Application filed Jan. 24, 1901.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

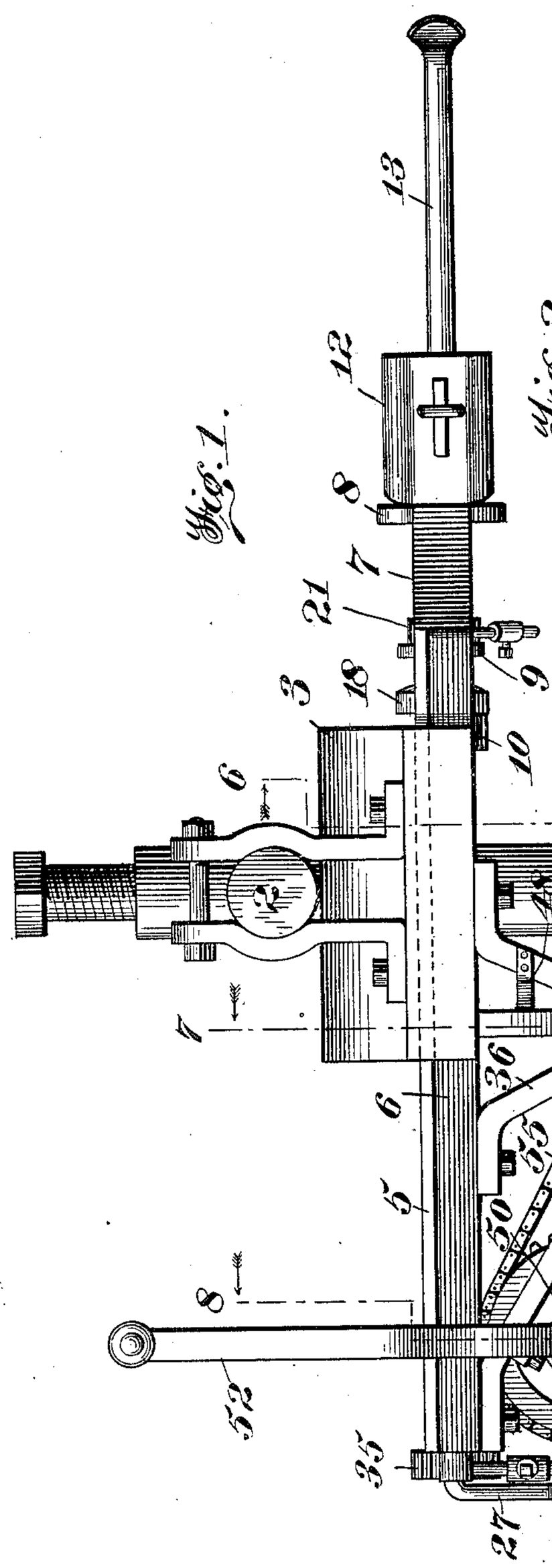
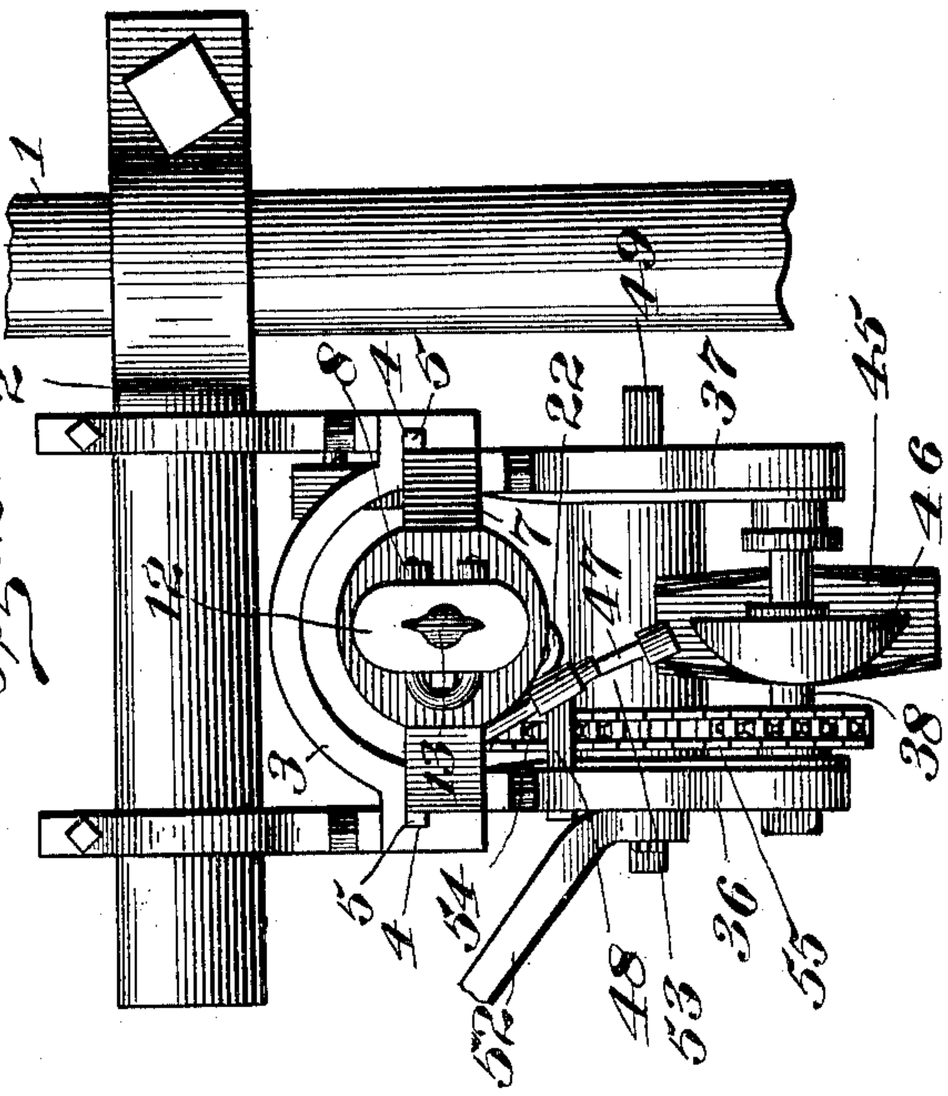


Fig. 2.



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E. Robinson

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No. 674,881. Patented May 28, 1901.

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ROCK DRILLING MACHINE.

(Application filed Jan. 24, 1901.)

(No Model.) 4 Sheets—Sheet 2.

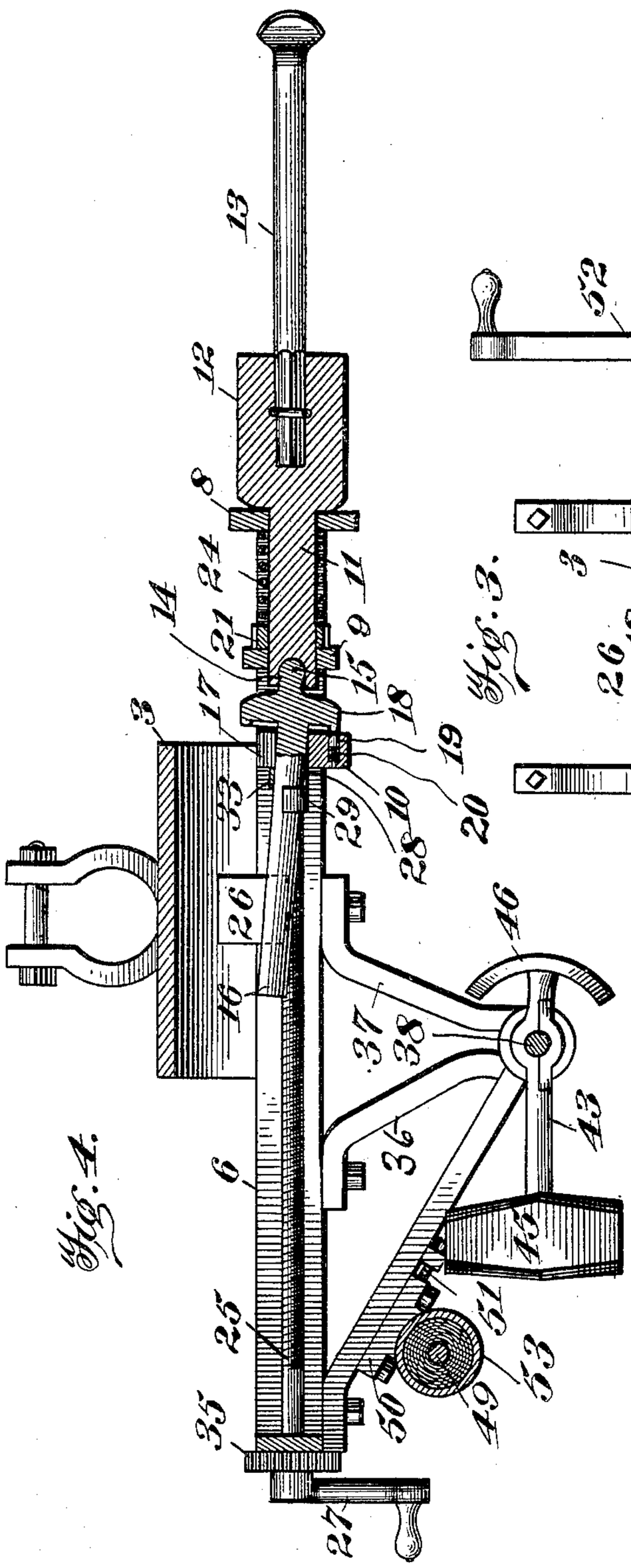

Fig. 4.

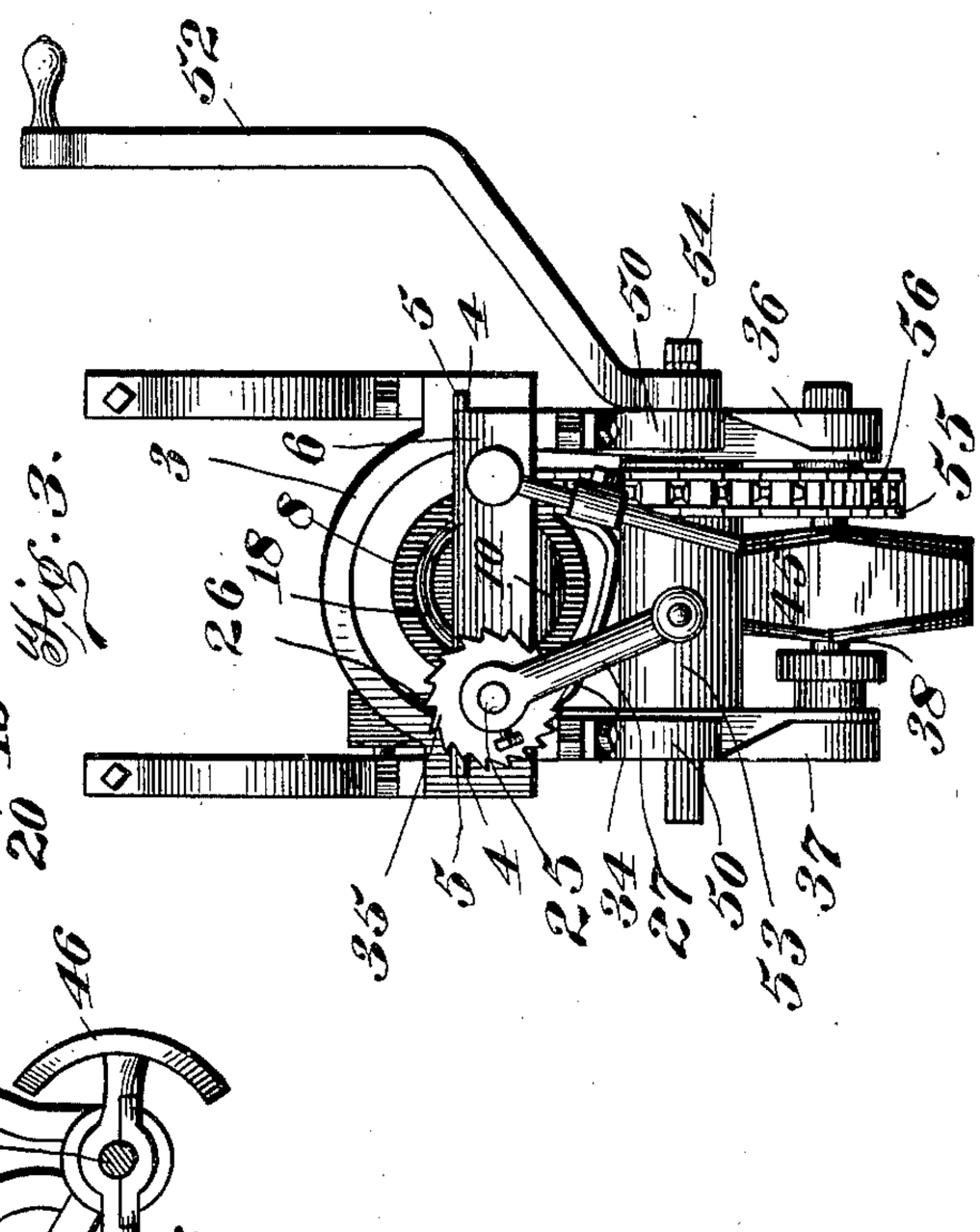

Fig. 3.

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No. 674,881. Patented May 28, 1901.

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ROCK DRILLING MACHINE.

(Application filed Jan. 24, 1901.)

(No Model.) 4 Sheets—Sheet 3.

Fig. 6.

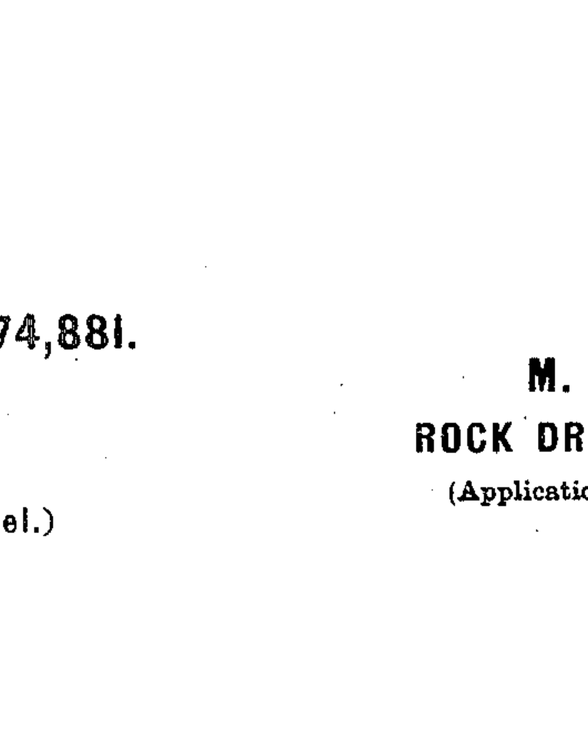


Fig. 7.

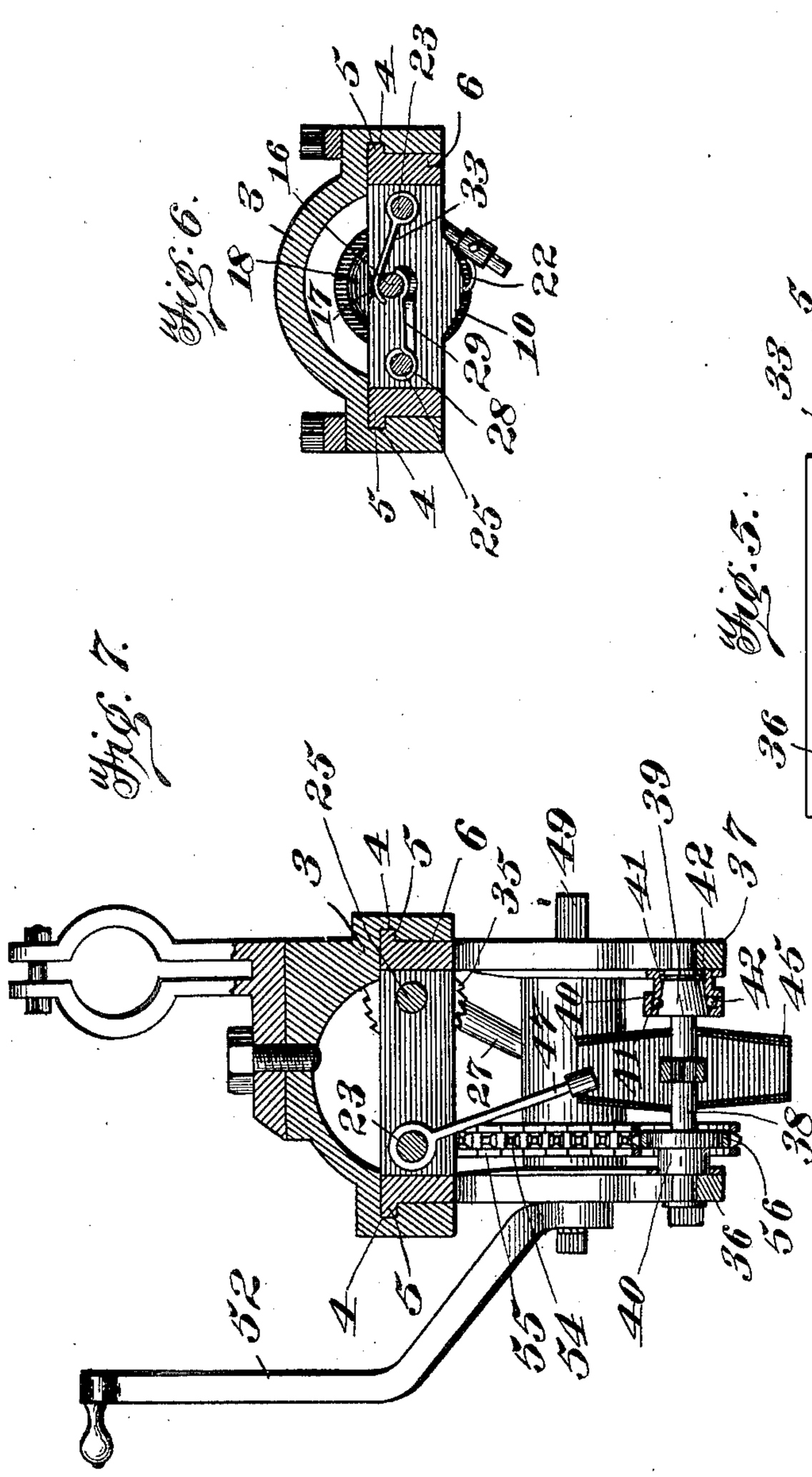
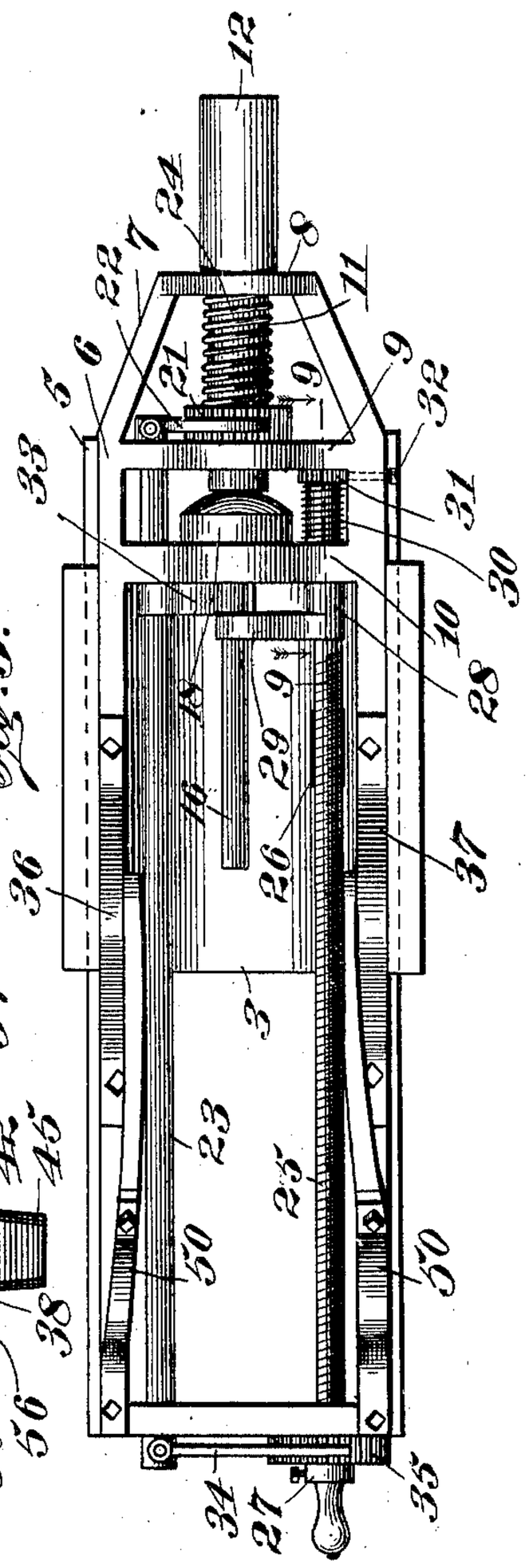


Fig. 5.



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No. 674,881. Patented May 28, 1901.

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ROCK DRILLING MACHINE.

(Application filed Jan. 24, 1901.)

(No Model.) 4 Sheets—Sheet 4.

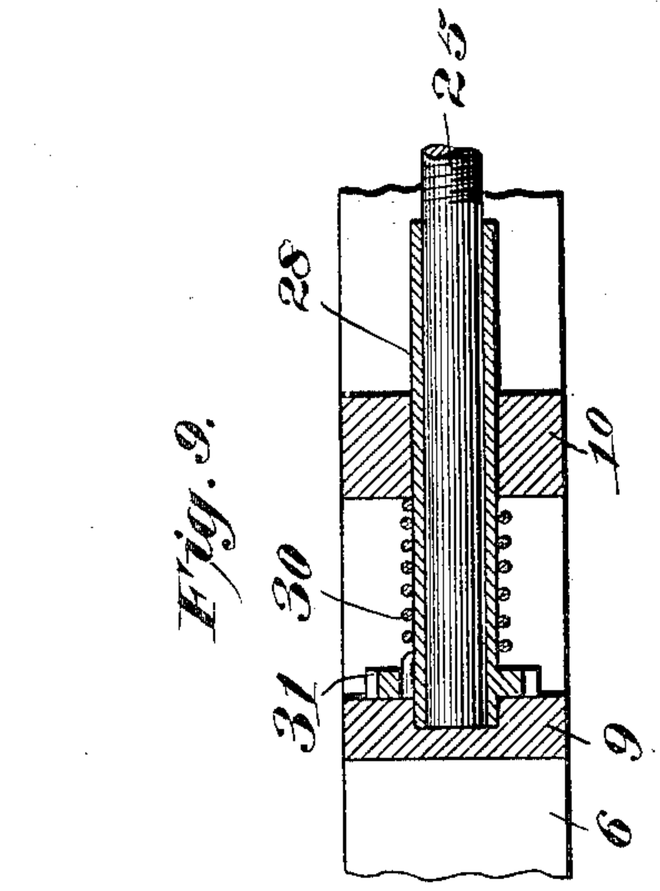

Fig. 9.

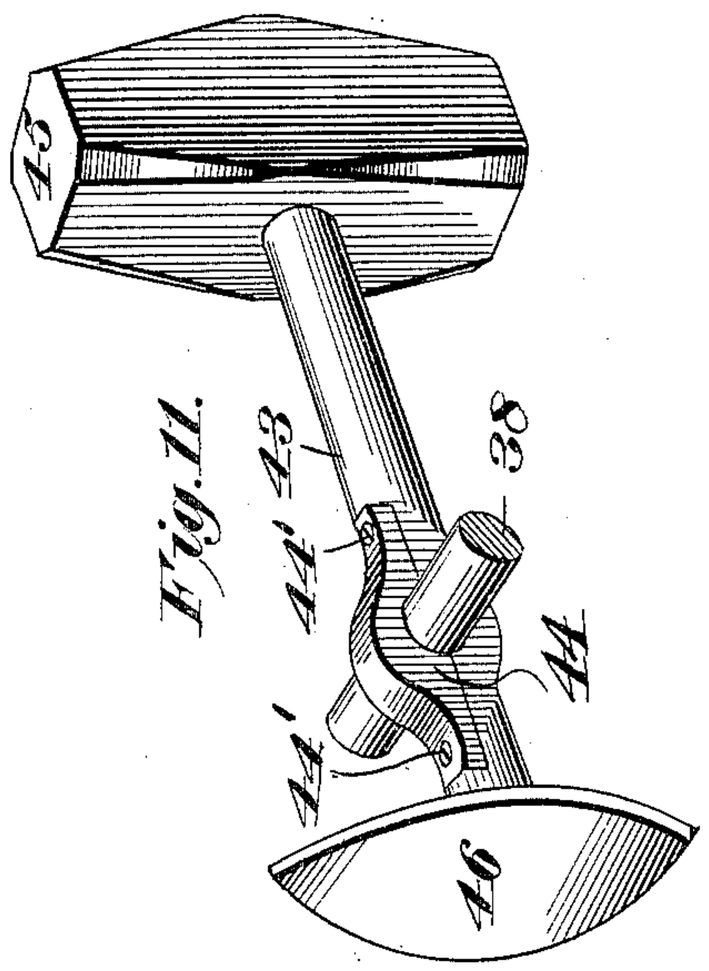

Fig. 11.

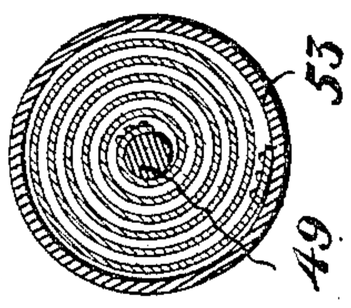

Fig. 13.

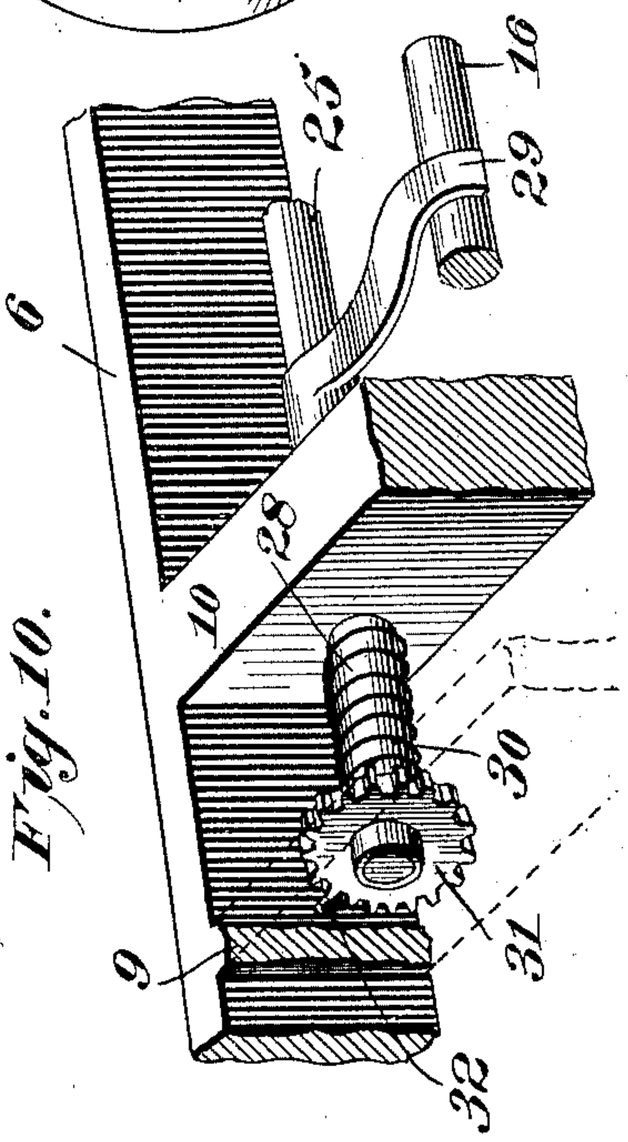

Fig. 10.

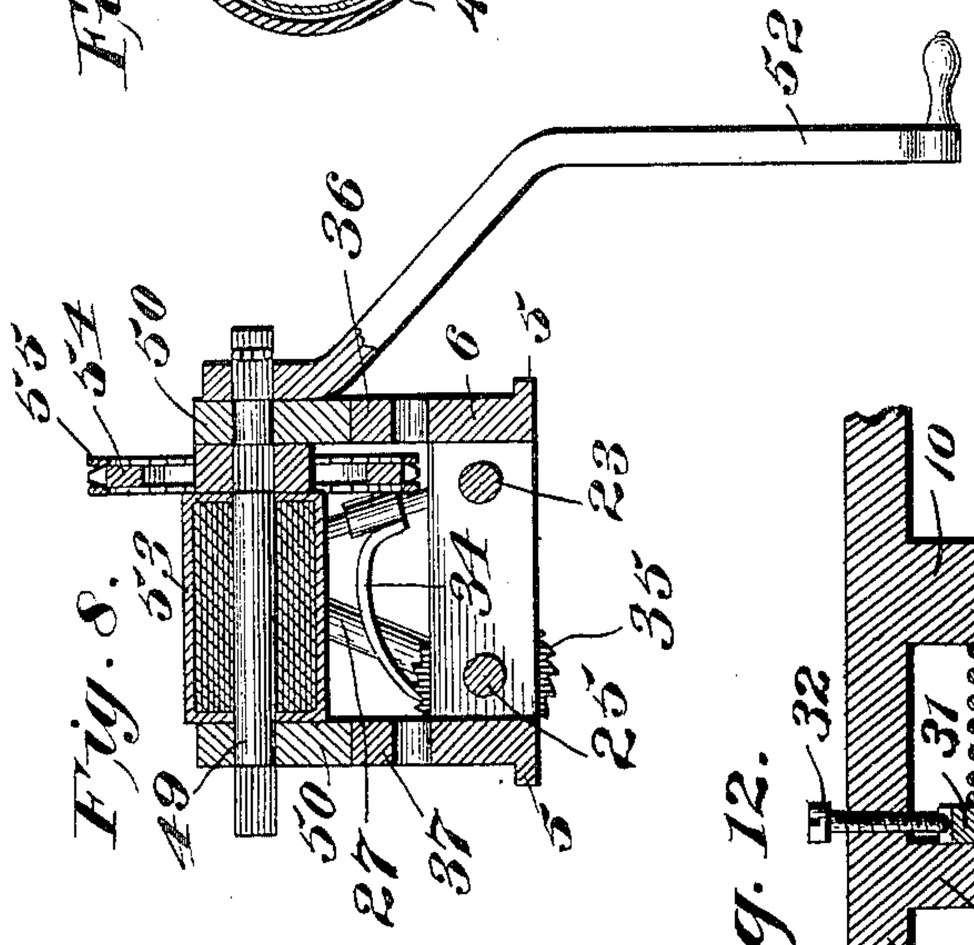

Fig. 8.

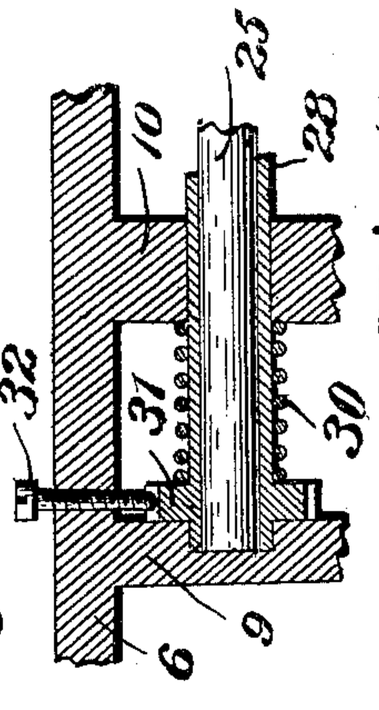

Fig. 12.

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UNITED STATES PATENT OFFICE.

MARTIN SHUSTER, OF GREATFALLS, MONTANA.

ROCK-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 674,881, dated May 28, 1901.

Application filed January 24, 1901. Serial No. 44,596. (No model.)

To all whom it may concern:

Be it known that I, MARTIN SHUSTER, a citizen of the United States, residing at Greatfalls, in the county of Cascade and State of Montana, have invented certain new and useful Improvements in Rock-Drilling Machines; and I do 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 transportable rock-drilling machines.

The objects of the invention are to provide a rock-drilling apparatus which shall be simple and durable in construction, comparatively inexpensive of production, and adapted to be operated by hand or other power; to provide simple and effective mechanism for turning the drill at each stroke thereof; to provide an improved construction of striking mechanism and means for bringing the intermediate connections between the same and the drill-rod into and out of operative position; to provide means for relieving the hand of the operator and the various parts of the apparatus from the jars produced by concussion, and to generally simplify and cheapen the construction, render more efficient the operation, and increase the durability and practical efficiency of drilling-machines of this type.

With these and other minor objects in view the invention consists of certain novel features of construction, combination, and arrangement of parts, as will be hereinafter more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a side elevation of a rock-drilling machine embodying my invention. Fig. 2 is a front end elevation thereof. Fig. 3 is a rear end elevation. Fig 4 is a vertical longitudinal section. Fig. 5 is a top plan view of the carriage and parts carried thereby. Figs. 6, 7, and 8 are detail cross-sectional views taken, respectively, on lines 6 6, 7 7, and 8 8 of Fig. 1. Fig. 9 is an enlarged detail longitudinal section on line 9 9 of Fig. 5. Fig. 10 is a detail perspective view of the pressure-sleeve and coöperating parts. Fig. 11 is a similar view of the hammer and connecting parts. Fig. 12 is a detail view of the spring 30, ratchet-wheel 31, holding-screw 32, and cooperating parts of the frame or carriage. Fig. 13 is a cross-section through the spring-barrel.

Like reference characters designate corresponding parts throughout the several views.

The numeral 1 in the drawings represents a supporting-standard, on which is adjustably mounted an arm 2, carrying a swiveled bracket 3, which supports the drill mechanism and is provided with guideways 4 for the reception of guide-ribs 5 on the sides of the drill frame or carriage 6. The bracket is adjustably mounted in such a manner as to support the carriage 6 and drill at any desired height on the said standard and to and from said standard and at any desired angle of inclination from the horizontal. The bracket 3 is concavo-convex in form and has its concaved side facing the frame or carriage 6 to provide for the free operation of the hammer, hereinafter described, whereby the drill is operated. The said frame or carriage 6 is of oblong rectangular form and is provided at its forward end with converged sides or portions 7, forming a narrow front bearing 8. Adjacent to and in rear of this front bearing are parallel cross-bars 9 and 10. In the front bearing 8 and cross-bar 9 is slidably and rotatably mounted a stem 11 of the drill-head or socket 12, which is provided with suitable fastening means for securing the drill 13 therein. The stem 11 is provided at its rear end with a recess or socket 14, which is adapted to receive a head 15 upon the forward end of a striking-pin 16, thus providing a ball-and-socket joint between said stem and pin to adapt the drill-head and its said stem to turn independently of the pin 16. The pin 16 is mounted to slide vertically and longitudinally of the carriage 6 in a slot or open bearing 17, formed in the upper side or edge of the cross-bar 10, and is provided at its forward end, just in rear of the said head 15, with an annular socketed flange or keeper 18. In the cross-bar 10, in axial alinement with the pin 16 and below the same, is mounted a sliding catch 19, which is normally held projected by a spring 20. This catch is adapted to engage the keeper 18 when the striking-pin is depressed to hold it in position for contact with the hammer and to release the pin after the hammer strikes it, in

a manner hereinafter described. The stem 11 of the drill-head 12 carries a ratchet-wheel 21, which is adapted to be acted upon by a pawl 22, carried by a rock-shaft 23, extending longitudinally of the carriage and journaled at its front end in the two cross-bars 9 and 10 and at its rear end in the rear end wall of the carriage. The purpose of this pawl-and-ratchet connection between the stem of the drill-head and the rock-shaft is to provide for turning the drill-head at each stroke of the hammer. The striking-pin 16 and drill-head are forced outwardly, so as to slide in their bearings, by the hammer when the latter comes in contact with the pin against the tension of a retracting spiral spring 24, applied upon the stem 11 between the bearing 8 and cross-bar 9, and this spring serves as a retracting medium to restore the parts to their normal position.

The frame or carriage 6 is fed forwardly or rearwardly to maintain the drill in operating position or to withdraw the same by means of a screw-shaft 25, extending parallel with, but on the opposite side of, the carriage from the rock-shaft 23 and adapted to engage a threaded boss or half-nut 26, secured upon the bracket 3, which boss may be made adjustable, if desired, so as to be moved toward and from said shaft to compensate for wear. The screw-shaft is provided at its rear end with a crank-handle 27 for operating it and is journaled at its said rear end in the rear end wall of the carriage and at its forward end in a pressure-sleeve 28, journaled in the cross-bars 9 and 10. This sleeve is provided at its rear end with a finger 29, which is adapted to come in contact with the under side of the rear portion of the pin 16 to move the same upward within its bearing 17, so as to throw it out of the path of movement of the hammer. This finger is normally held in contact with the pin by a spring 30, encompassing the sleeve 29, and to provide for increasing or diminishing the tension of said spring the sleeve carries a ratchet-wheel 31, which is engaged by a holding-screw 32, mounted in the carriage 6. By releasing this screw and adjusting the sleeve and finger in one direction or the other and then tightening the screw to engage the alining tooth of the ratchet-wheel it will be obvious that the finger may be made to bear with greater or less force upon the pin 16. Coöperating with the finger 29 is a similar finger 33, carried by the rock-shaft 23, which acts upon the upper side of the rear portion of the pin 16 in opposition to the pressure of the finger 29 to force the pin 16 downward to bring it into the path of the hammer against the tension of the spring 30. This operation is automatically effected by the rotation of the hammer, as will appear hereinafter. The rock-shaft is also automatically operated to bring the pawl 22 into engagement with the ratchet-wheel 21 to turn the drill-head and drill at each part revolution of the screw-shaft 25. This is effected by the provision of a feed-pawl 34 upon the rear end of the rock-shaft and adapted to engage a ratchet-wheel 35 upon the rear end of the screw-shaft. The teeth of this ratchet-wheel are so disposed that at each part revolution of the screw-shaft the rock-shaft will be vibrated to cause the pawl 22 to engage the ratchet-wheel 21 and effect a partial rotation of the drill-head and drill in an obvious manner. This vibratory movement of the rock-shaft is not, however, sufficient to bring the finger 33 into contact with the pin 16. Hence the latter is not depressed by the aforementioned movement of the rock-shaft.

Depending from the sides of the carriage 6, at the center and rear end of the latter, are inclined bearing-arms 36 and 37, which connect at or about the center of the carriage. At this point of junction of the two sets of arms bearings are provided to receive an axle 38, carrying cones 39, mounted within hubs or sleeves 40, provided with cups 41, coacting with the said cones to form races for antifriction-balls 42. On this axle is mounted an arm 43, having a recess to receive a clamping-block 44, which clamps it to said axle, and carrying at its outer or free end a rotating hammer 45, which is adapted at each revolution to strike the pin 16 for actuating the drill. Screws or other suitable fastenings 44′ are provided to secure the block 44 to said arm 43. The pin 16, as before stated, is normally held in a plane out of the path of the hammer 45 by the finger 29, acted upon by the pressure-spring 30, and is forced downwardly against the pressure of said finger and spring into the path of the hammer by the finger 33 on the rock-shaft 23. To operate the finger 33 to move the pin 16 to the position stated, I provide a contact-piece 46, which in the present instance is formed integrally with the arm 43, but may be made independent thereof and secured directly to the axle 38. This contact-piece is adapted to contact at each revolution of the hammer with the lower end of a vibrating arm 47, secured to and hanging pendent from the rock-shaft 23. This arm 47 is limited in its inward movement by a stop 48 upon the carriage 6 and is adapted to be forced outwardly by the said contact-piece 46, so as to turn the shaft 23 to bring the finger 33 into contact with the pin 16 to force the latter down into a position to be struck by the hammer against the pressure of the finger 29. When the contact-piece 46 clears the vibrating arm 47, however, and the finger 33 is no longer forcibly held in contact with the pin 16, the pressure of the finger 29 will again force the contact-piece up and out of the path of movement of the hammer, thereby retracting the finger 33 and bringing the vibrating arm 47 into position to be again engaged by the contact-piece 46, which position the parts maintain until the said contact-piece again moves the said arm 47 outwardly, as will be clearly understood. By employing a striking device in the form of a rotary ham-

mer it will be seen that a continous movement of the striking element is insured and a powerful blow provided for.

It will of course be understood that in the operation of the parts above described for throwing the pin 16 into and out of engaged position the keeper 18 on said pin is engaged by the sliding catch 19 when the pin is depressed, thus holding the pin in the path of movement of the hammer against the pressure of the finger 29. When the hammer strikes the pin, however, the keeper 18 is forced forward and out of engagement with the catch 19, thus allowing the finger 29 to again force the pin out of operative position. The hammer is rotated through the medium of gearing consisting of a drive-shaft 49, journaled in sliding bearings 50, mounted on the arms 37, set-screws 51 being provided to adjust said bearing to take up any slack in the chain. This shaft is provided at one end with a crank-handle 52 for hand operation, or it may carry a pawl or gear for connection with suitable power-gear, if desired. A spring barrel or hub 53 is mounted on the drive-shaft 41 and carries a sprocket-wheel 54, which is connected by a chain 55 with a sprocket-pinion 56 on the hub or sleeve 40, whereby motion is communicated to the latter and to the hammer 45. I preferably so proportion the parts of the gearing that each revolution of the sprocket-wheel 54 will cause four revolutions of the hub or sleeve 40, by which the hammer 45 is adapted to make four strokes for each rotary movement of the crank-handle 52. The purpose of employing the spring-barrel 53 is to compensate for any irregular back motion or checking of the operation of the drive-gearing and also to absorb vibration produced by the shocks of concussion, and thus relieve the drive-shaft of strain and prevent jars or shocks from being transmitted to the hand of the operator. By adjusting the set-screws 51 the drive-shaft 49 may be adjusted toward and from the axle 38 to tighten or loosen up the sprocket-chain 55, as desired. Instead of chain-and-sprocket gearing I may employ spur-gearing or any other gearing suitable for communicating motion between said parts.

In operation it will be clear from the foregoing description, taken in connection with the accompanying drawings, that the frame or carriage 6 may be adjusted upon the standard 1 to operate at any desired height thereon and at any desired angle thereto and is fed forth as the drilling operation progresses by the rotation of the screw-shaft, which is under the entire control of the operator. The hammer is kept in constant motion by rotating the crank-handle 52, and as it reaches its lowest point in its path of revolution the contact-piece 46 comes into engagement with the vibrating arm 47 and operates the rock-shaft 23 to force the finger 33 into engagement with the pin 16, by which the latter is depressed and the catch 19 caused to engage the keeper 18 to hold the pin in such position. The hammer 45 then comes in contact with the rear end of the pin and forces it forward, by which a forward motion is also communicated to the drill-head 12 and drill 13. The keeper 18 is by this movement forced out of engagement with the catch 19, and the finger 29 thereupon forces the pin upward and retracts the finger 33 and restores the vibrating arm 47 to its normal position. At the same time the retracting-spring 24 forces the drill-head and pin backward into their normal position. In the operation of the drill in this manner the carriage is fed forward as the drill cuts its way by operating the screw-shaft 25, and at the same time the rock-shaft is vibrated, through the medium of the feed-pawl 34 and ratchet-wheel 35, to impart a turning or twisting movement to the drill. It will thus be seen that a simple, durable, powerful, and easily-operated drilling apparatus is provided and that by its use rock and other drilling may be rapidly effected.

While the preferred embodiment of the invention is as herein disclosed, it will of course be understood that modifications may be made within the scope of the invention without departing from the spirit or sacrificing any of the advantages thereof.

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

1. In a drilling-machine of the character described, the combination, with a frame or carriage and operating mechanism, of a drill-head, a striking-pin movably connected to the drill-head, a rotating hammer, and means for moving the said striking-pin into and out of the path of movement of the hammer, substantially as set forth.

2. In a drilling-machine of the character described, the combination, with a frame or carriage and driving-gearing, of a drill-head, a striking-pin having a ball-and-socket connection with the drill-head, a hammer, and means for moving the pin into and out of the path of movement of the hammer, substantially as set forth.

3. In a drilling-machine of the character described, the combination, with a frame or carriage and drive-gearing, of a drill-head, a striking-pin having a ball-and-socket connection with the drill-head, a hammer, means for moving the striking-pin into and out of the path of the hammer and means for turning the drill-head, substantially as set forth.

4. In a drilling-machine of the character described, the combination, with a frame or carriage and drive-gearing, of a drill-head mounted to oscillate and to reciprocate in said carriage, a rotating hammer, a striking-pin adapted to be engaged by the hammer and having a ball-and-socket connection with the drill-head, means for normally holding the striking-pin out of the path of movement of the hammer, means for moving the striking-pin into the path of movement of the hammer, and a catch device for holding the strik-

ing-pin in the last-mentioned position until struck by the hammer, substantially as set forth.

5. In a drilling-machine of the character described, the combination, with a frame or carriage and drive-gearing, of a drill-head, a hammer, a striking-pin adapted to be engaged by the hammer and movably connected to the drill-head, means for moving the striking-pin into and out of the path of movement of the hammer, and a catch for holding said pin in the path of movement of the hammer until struck by the hammer, substantially as set forth.

6. In a drilling-machine of the character described, the combination, with a frame or carriage and drive-gearing, of a drill-head, a hammer, a striking-pin movably connected to the drill-head and adapted to be engaged by the hammer, and means for moving said pin into and out of the path of movement of the hammer, substantially as set forth.

7. In a drilling-machine of the character described, the combination, with a frame or carriage and drive-gearing, of a drill-head, a rotating hammer, a striking-pin adapted to be engaged by the hammer and movably connected to the drill-head, means for normally holding the striking-pin out of the path of movement of the hammer and further means automatically operated by the rotation of the hammer for moving the striking-pin into the path of movement of the hammer at a predetermined point in the said path of revolution of the latter, substantially as set forth.

8. In a drilling-machine of the character described, the combination, with a frame or carriage and drive-gearing, of a drill-head, a rotating hammer, a striking-pin adapted to be engaged by the hammer and movably connected to the drill-head, a spring-actuated finger for normally holding the pin out of the path of movement of the hammer, a rock-shaft, a finger carried by the rock-shaft to engage the pin and force the latter into the path of revolution of the hammer against the pressure of the first-mentioned finger, and coacting devices on the rock-shaft and hammer mechanism for operating said shaft to bring the pin thereon into operative position, substantially as set forth.

9. In a drilling-machine of the character described, the combination, with a frame or carriage and drive mechanism, of a drill-head, a hammer, a striking-pin movably connected to the drill-head and adapted to be engaged by the hammer, a feed-shaft for moving the carriage, means for normally holding the striking-pin out of the path of movement of the hammer, a rock-shaft provided with means for moving the striking-pin into the path of movement of the hammer against the resistance of the first-mentioned means, coacting devices between the rock-shaft and drill-head to turn the latter, coacting devices between the rock-shaft and hammer mechanism to throw the said means for operating the striking-pin into action, and coöperating means between the feed-shaft and rock-shaft to operate the latter to turn said drill-head, substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

MARTIN SHUSTER.

Witnesses:
AUGUST MUNDRY,
WILLIAM A. WIEGAND.