No. 731,569. PATENTED JUNE 23, 1903.

J. G. HEIMRICH.

ROCK DRILLING MACHINE.

APPLICATION FILED DEC. 30, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

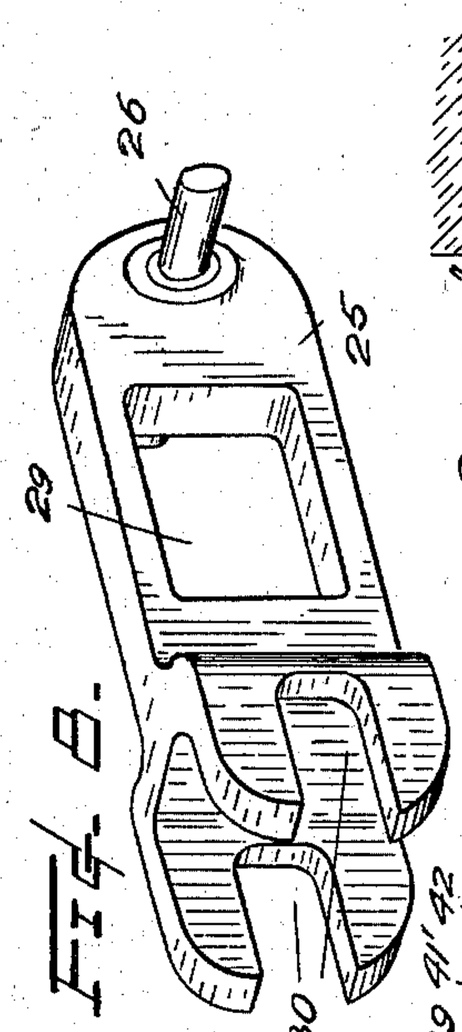

FIG. 3.

FIG. 4.

FIG. 1.

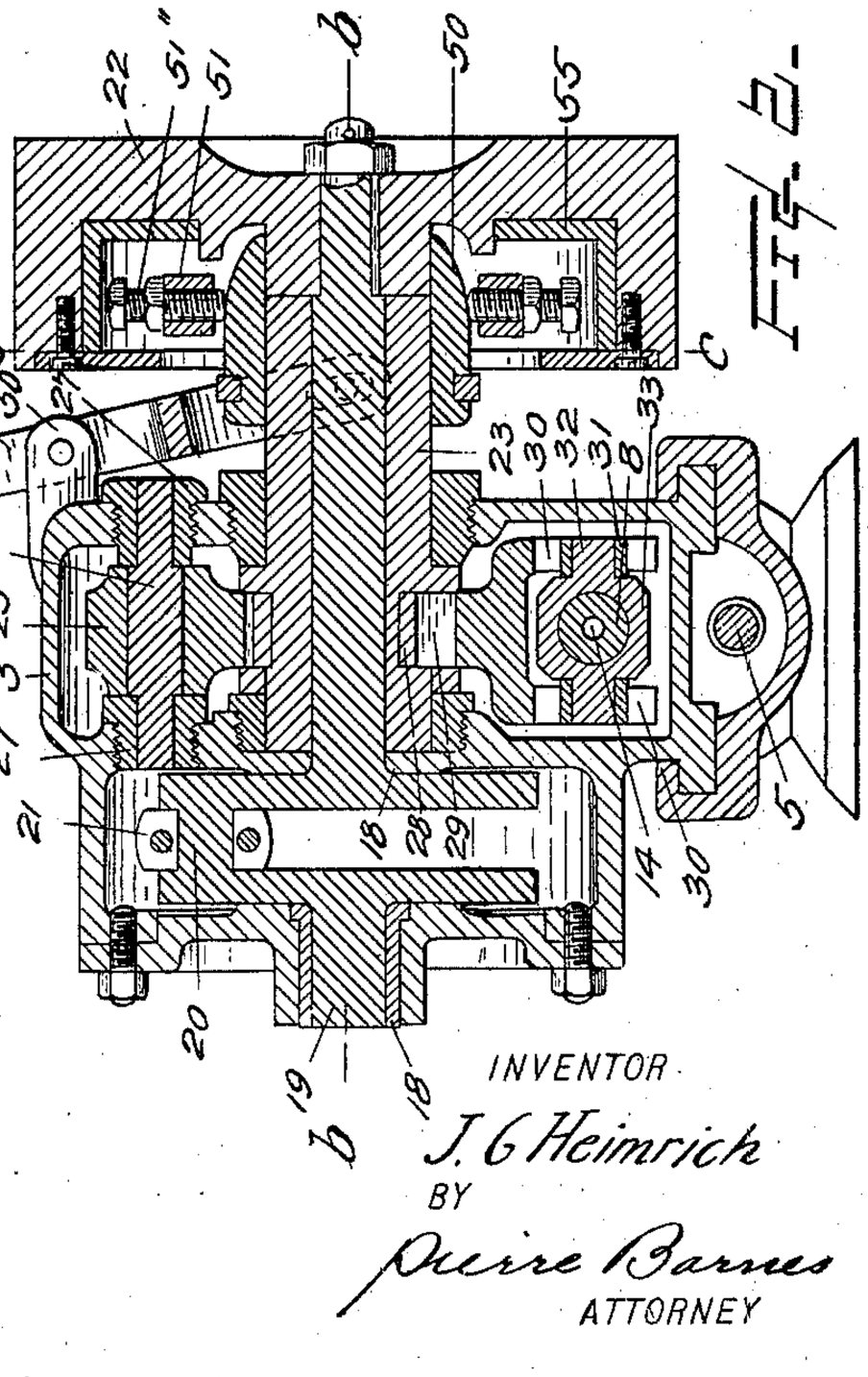

FIG. 2.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 7.

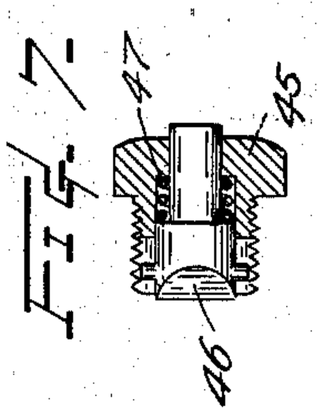


Fig. 6.

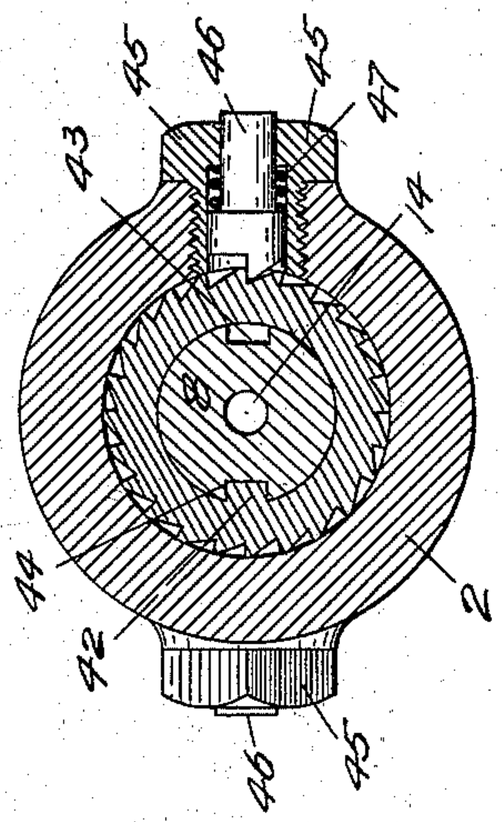


Fig. 5.

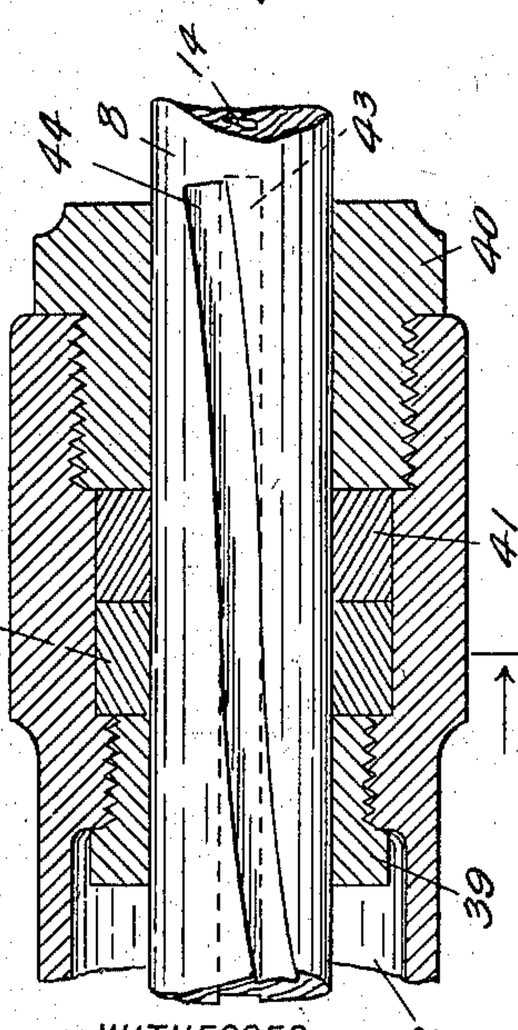
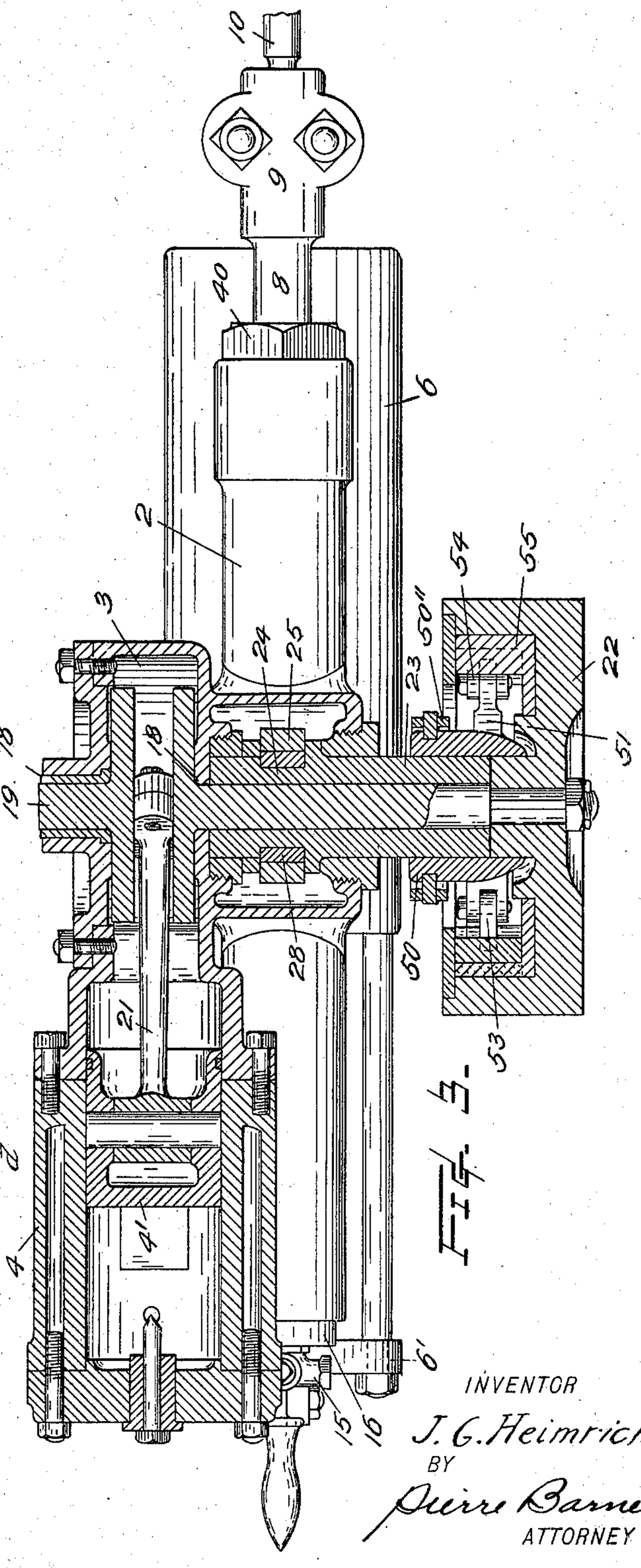


Fig. 4.



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No. 731,569. Patented June 23, 1903.

UNITED STATES PATENT OFFICE.

JOHN G. HEIMRICH, OF SEATTLE, WASHINGTON, ASSIGNOR OF ONE-HALF TO JOHN HEIMRICH, OF SEATTLE, WASHINGTON.

ROCK-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 731,569, dated June 23, 1903.

Application filed December 30, 1902. Serial No. 137,090. (No model.)

To all whom it may concern:

Be it known that I, JOHN G. HEIMRICH, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Rock-Drilling Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in machine rock-drills, and more particularly to drills driven by a motor integrally connected to the drill-frame.

The objects of the invention are to provide, first, means for cushioning with springs the connection between the drill-ram and the motor; second, means for engaging the drill-ram between a striking-spring and a recoil or buffer spring to cause the drill to strike a vibratory blow; third, means to start the engine independently of the drill proper and allow the drill-ram to be thrown into or out of operative engagement with the motor, as desired, relieving the apparatus of concussive strain on the parts when the drill strikes the rock and also where the drill should stick fast.

A still further object of the invention is the provision of means for injecting water to the face of the drill-hole, thereby preventing the drill being clogged or stuck fast in the hole, a very annoying and expensive condition common to other machines.

Heretofore it has been customary in machines of this character to employ for motive power compressed air or electricity conveyed to the machine from a considerable distance, which necessitates the use of complicated machinery, lines of pipes or wiring, and a loss of energy in transmission, while in my invention the power is applied directly to the drill, thus not only reducing the cost of the apparatus to a minimum, but utilizing the power to the fullest extent.

With these and other objects in view my invention consists in certain novel details of construction and combination of parts, as will be hereinafter fully described, and finally pointed out in the claims.

Reference being had to the annexed drawings, forming a part of this specification, Figure 1 is a longitudinal vertical section of a rock-drilling machine embodying my improvements. Fig. 2 is a cross-section of same, taken on line *a a* of Fig. 1. Fig. 3 is a horizontal section on line *b b* of Figs. 1 and 2. Fig. 4 is a vertical section on line *c c* of Fig. 2. Fig. 5 is an enlarged fragmentary view of the front end of the frame, showing the ram-turning mechanism; and Fig. 6 is a cross-section on line *d d* of Fig. 5. Fig. 7 is a detached sectional view of a detail shown in Fig. 6. Fig. 8 is a perspective view of the ram-actuating lever.

In the said drawings the numeral 2 indicates the tubular chambered portion, and 3 the crank-casing of the frame, to which is rigidly connected the cylinder of a driving-motor 4. A feed-screw 5, supported by a yoke 6′, connected by stay-rods from the shell 6, moves the frame forward or back, as required, by being rotated in a nut 7, secured to the frame. Extending axially through the part 2 of the frame is a ram 8, provided at its forward end with the usual socket 9 for the reception of the shank of a drill 10 and having at its opposite or rear end a threaded reduced portion 11, which is screwed into a threaded socket 12 of a piston 13, reciprocable in a cylindrical pump-chamber 14 of the frame and made water-tight therein by packing-rings 13′.

The aforesaid ram, piston, and drill are provided with axial conduits 14^a, 14′, and 14″, respectively, for the passage of water therethrough from the pump-chamber to the striking end of the drill. Connection is made between a receptacle containing a supply of water and the pump-chamber by a flexible pipe, (not shown in the drawings,) having a suitable foot-valve therein through an opening of a three-way cock 15, screwed into the pump-head 16. The said cock furnishes means to not only regulate the quantity of water supplied to the pump, but by reversing the same the water is shut off and communication made with the atmosphere through another opening thereof, thus preventing a vacuum being formed in the pump when the water is cut off. 17 is a spring-actuated check or suction valve positioned in the piston to prevent the backflow of water during the forward travel of the ram and admitting it freely upon the return stroke.

Arranged transversely of and seated in suitable bearings 18 of the machine-frame is a shaft 19, provided near one end with a crank-pin 20, which is connected by a rod 21 with the engine-piston 4′ and having at its opposite end a fly-wheel 22. A sleeve 23, loosely mounted on the said shaft, is provided with an integral collar 24 eccentric of its axis and forming a crank-pin, as it were, for a lever 25, vibrating about a pivotal pin 26, which oscillates in bushings 27 of the frame.

28 is a boxing for the eccentric and is slidable in an elongated aperture 29 of the lever. The end of the lever opposite to the said pivotal connection is bifurcated and provided with slots 30 in its extremities for carrying slide-boxes 31 to receive projecting trunnions 32 of a cross-head 33, that is fitted loosely on the said ram. Spiral springs 34 and 35 are interposed, respectively, between the cross-head and the end 13″ of the piston and a collar 36, bearing against a tapering shoulder 8′ of the ram. These springs furnish connection between the swinging end of the lever and the ram, whereby the latter is resiliently reciprocated thereby.

37 is a spring located between the pump-piston and the pump-head, which on the back stroke of the ram is compressed and in its reaction starts the reverse or advance stroke.

38 is a buffer-spring placed about the ram near the front end of the frame and by engaging the collar 36 intercepts the blow to prevent the end of the ram-chamber being struck when through any cause the machine has been improperly set as to distance from the rock. Guide-nuts 39 and 40 are provided to keep the ram in alinement and between which nuts I position mechanism for regulating the rotation of the ram and its drill. Such turning mechanism comprises two ratchet-wheels 41 and 41′, having each an internal projecting feather 42, which engage with straight and spiral grooves or keyways 43 and 44, respectively, of the ram. Screwed radially into the frame are sockets 45, containing pawl-plungers 46, severally pressed by springs 47 into engagement with ratchet-teeth of said wheels and prevent their revolving in but a single direction. When the ram is drawn back, the spiral groove is operative with one of the ratchet-wheels, which being prevented from rotating by its pawl-plunger imparts a partial turn to the ram, while the other ratchet-wheel is inoperative and turns coincidently with the ram by reason of its internal feather being carried with the straight slot and its pawl passing freely over the teeth of its wheel. When the ram, however, is impelled forward, the ram is restrained by the straight groove and its ratchet-wheel from turning and delivers a straight or non-rotative blow.

The aforementioned sleeve 23 is coupled to the shaft 19 by any suitable clutch; but I prefer to make such connection to the said fly-wheel rather than directly to the shaft, and the device illustrated in Figs. 2, 3, and 4 being quick and positive in its action is well adapted to the purpose I will proceed to describe. It comprises a cone 50, splined to the said sleeve, so as to rotate therewith, but movable longitudinally thereof by a forked lever 50″, which is fulcrumed to a support 50′, attached to the frame under the ends of adjustable stud-bolts 51″, screwed through levers 51 to force frictional blocks 52 against the inside of the said fly-wheel to couple the sleeve and shaft together. The last-named levers are pivotally connected to the friction-blocks by swinging links 53 and hinged at their opposite ends to lugs 54 of a spider 55, loosely fitted inside the fly-wheel. This arrangement of the normally loose sleeve with the clutch device makes it possible to start the ram slowly and gradually accelerate its speed without undue strain or shocks upon the operating parts and also to stop the ram when, for instance, it is desired to change drills without stopping the engine.

Although I illustrate and describe a reciprocating driving-engine, it is apparent that a rotary or other suitable motor may be used instead without departing from the spirit of the invention or sacrificing its advantages, and in the use of rotary motors of any kind the same would, unless its speed was excessive, be preferably connected directly to the driving-shaft.

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

1. In a rock-drilling machine, the combination with the frame having a cylindrical body portion, a ram reciprocally mounted in said body portion, a cross-head loosely mounted on said ram, spring connections between the cross-head and the ram, a lever pivotally connected adjacent to one end to said frame and provided with an elongated aperture intermediate of its length, sliding connection between the cross-head and the end of the said lever opposite its pivotal end, a shaft extending transversely through the frame, a motor secured to the frame, and the connection between the motor and the shaft; of a sleeve loosely mounted on said shaft and passing through the said aperture of the lever, an eccentric integral with the sleeve, and positioned within the said aperture, a boxing for said eccentric, and means to couple the said shaft to the said sleeve.

2. In a rock-drilling machine, the combination with the frame, a reciprocal ram mounted in said frame, a cross-head slidable longitudinally upon said ram, springs interposed between said cross-head and stops upon the ram, means to impart a partial rotation to said ram on the back stroke thereof, a motor secured integrally to said frame, a shaft extending transversely across said frame, and connection between said motor and said shaft, of means to engage or disengage said shaft with the said cross-head, such means comprising a sleeve provided integrally with an

eccentric portion loosely mounted upon said shaft, a cone splined to and slidably mounted upon said sleeve, means to move the said cone longitudinally of the sleeve, levers carrying blocks adapted to frictionally engage a chambered fly-wheel fixedly secured to the said shaft, said blocks, adjustment-screws in said levers, a lever pivotally connected adjacent one end to the frame and engaging with its opposite end the said cross-head, and a boxing positioned in an elongated aperture intermediate the length of the lever for said eccentric of the sleeve.

3. In a rock-drilling machine, in combination, the frame having a cylindrical chambered portion terminating in a pump-cylinder, a ram reciprocally mounted in the frame and provided with a reduced end, a piston secured to said reduced end, a drill socketed in the end of the ram opposite to the said piston axial conduits passing through the said ram, piston and drill, a cross-head slidably mounted on said ram, a motor connected integrally with the frame, operative connections between the motor and the said cross-head, a spring interposed between the cross-head and the end of the said piston, a spring between the cross-head and a collar seated upon a shoulder of the ram, a spring positioned in said pump-cylinder between the head thereof and the piston, and a buffer-spring seated upon the advance end of the said chamber of the body and adapted to intercept the forward motion of the said ram by being engaged by said collar of the ram.

4. The herein-described rock-drilling machine, comprising a frame, a motor integrally connected to said frame, a shaft having a fly-wheel fixedly secured thereto, connection between said motor and shaft for rotating the same, a sleeve loosely mounted on said shaft, a cone splined to said sleeve, means to move said cone longitudinally of said sleeve whereby a friction device is forced into or out of engagement with the said fly-wheel, said friction device, a ram provided, respectively, with a straight and a spiral groove reciprocally mounted in said frame, a cross-head slidable upon the ram, resilient connections between the cross-head and the ram, a lever having a bifurcated end carrying boxes in which are journaled lateral trunnions of said cross-head, pivotal connection between the other end of the lever and the frame, an elongated aperture intermediate the ends of said lever, a boxing slidable in said aperture and forming journal-bearing for an eccentric provided on said sleeve, a piston secured to the rear end of said ram and operating in a pump-chamber of the frame, said pump-chamber, connection between said pump-chamber and the atmosphere or a water-supply, axial conduits in the said piston, ram and the drill, socketed in the ram, a check-valve positioned in the piston-conduit, a spring between head of the pump-chamber and the piston, ratchet-wheels having internal projecting feathers to engage with the said grooves of the ram, and a spring-actuated pawl-plunger for each of said ratchet-wheels, substantially as and for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN G. HEIMRICH.

Witnesses:
P. C. DORMITZER,
PIERRE BARNES.