

No. 690,687.

Patented Jan. 7, 1902.

A. M. BALLÔU.

ROCK DRILL.

(Application filed May 6, 1901.)

(No Model.)

2 Sheets—Sheet 1.

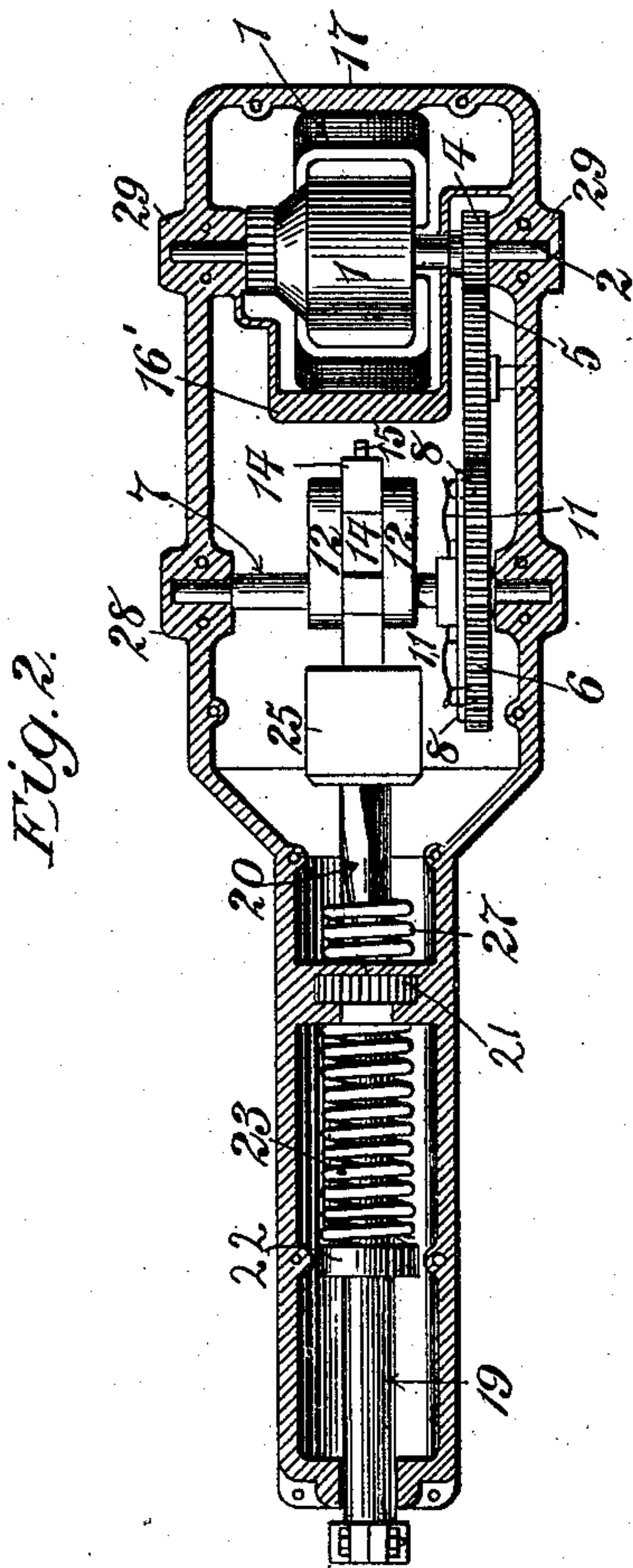
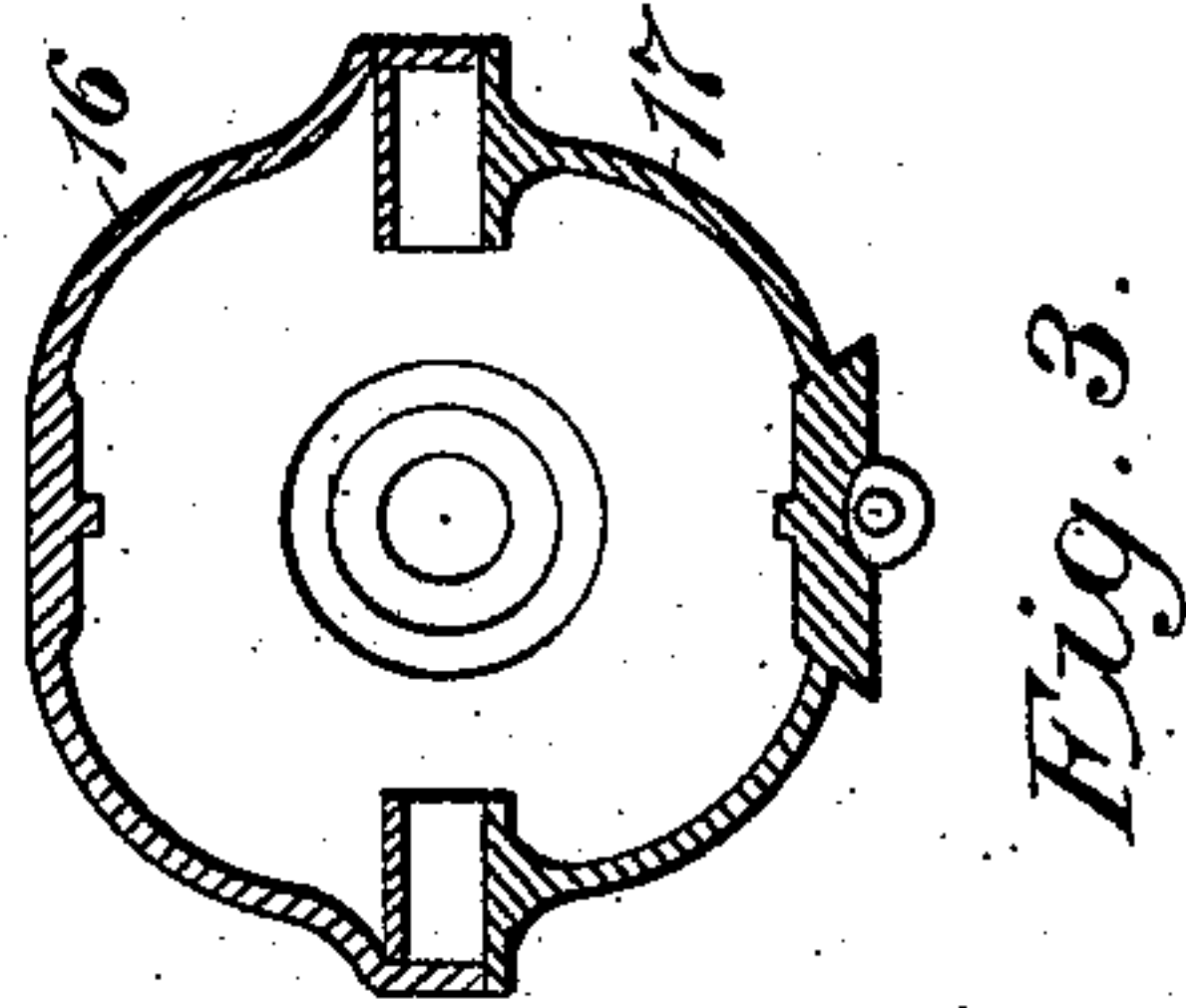
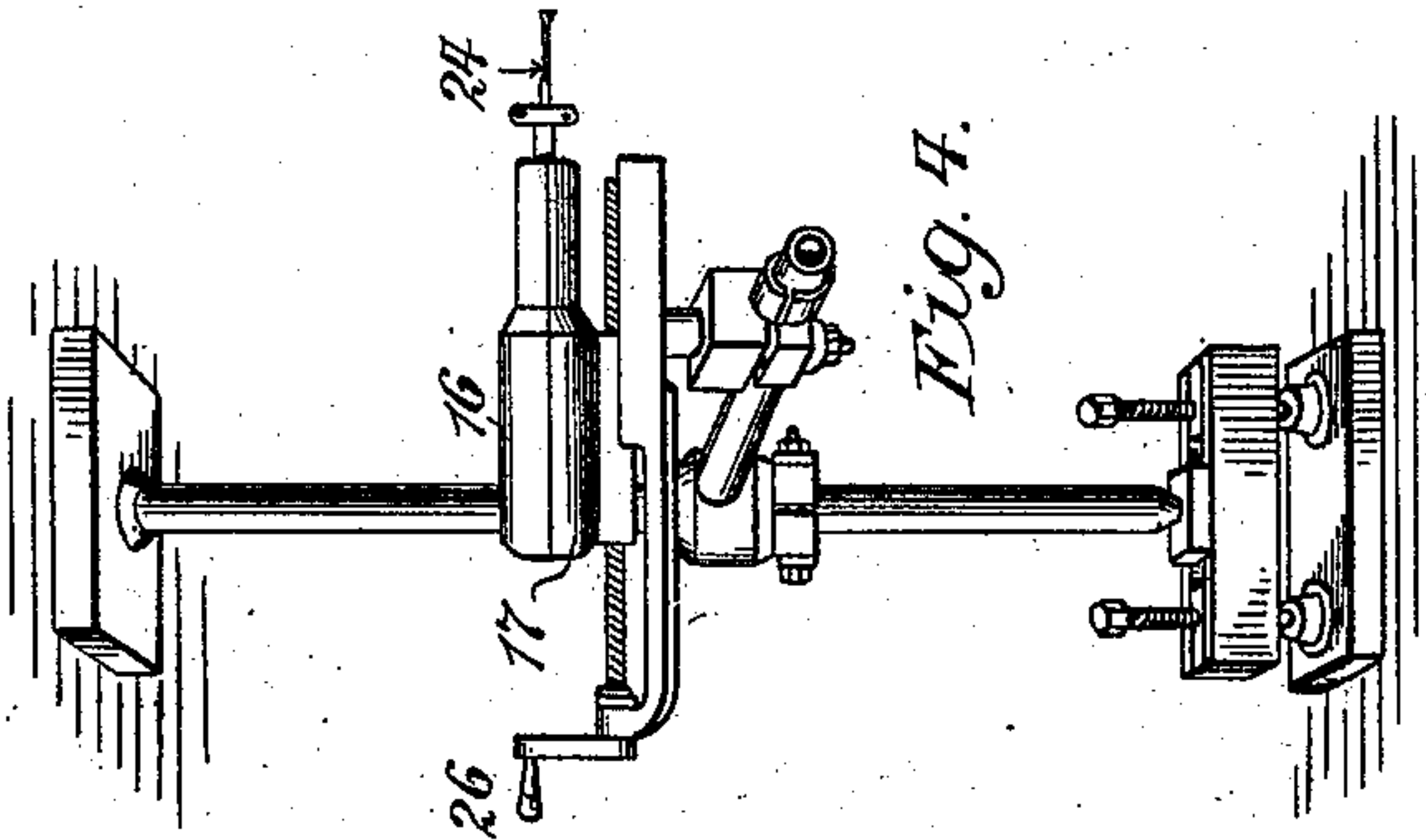
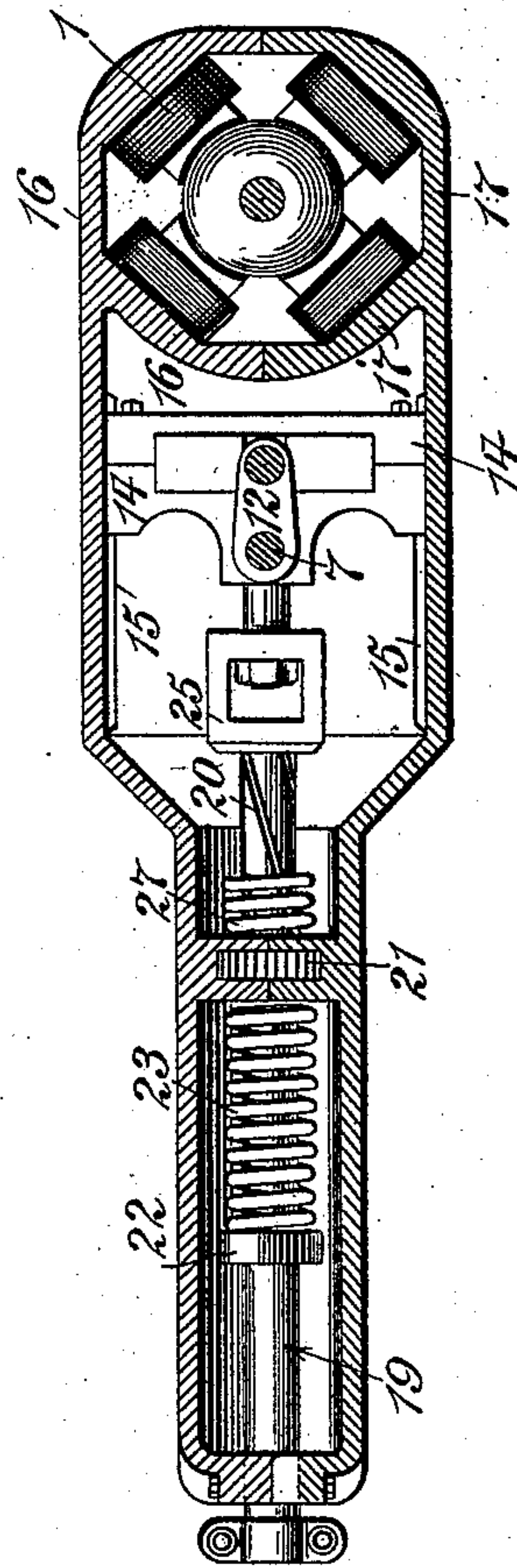


Fig. 1.



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2 Sheets—Sheet 2.

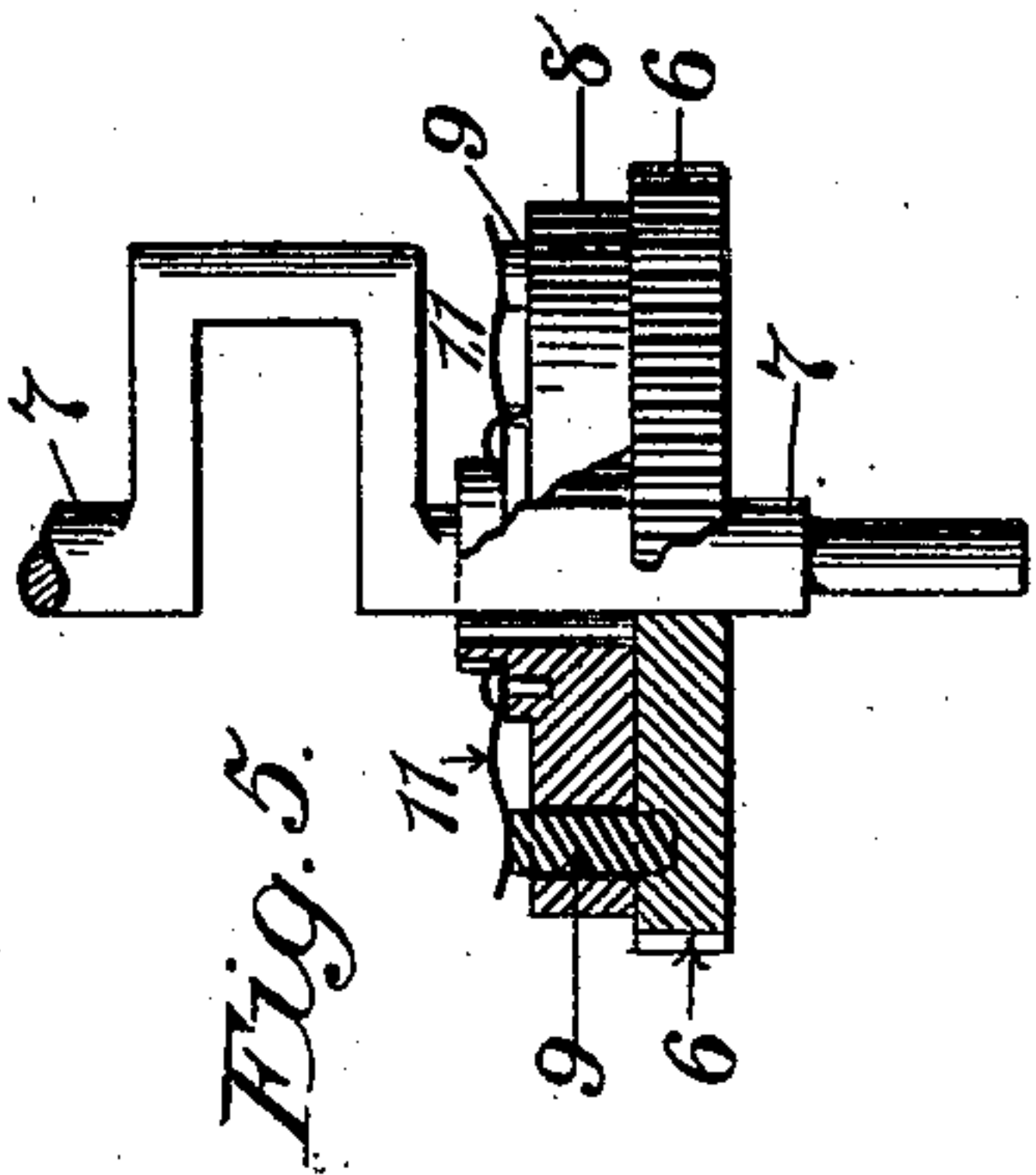


Fig. 5.

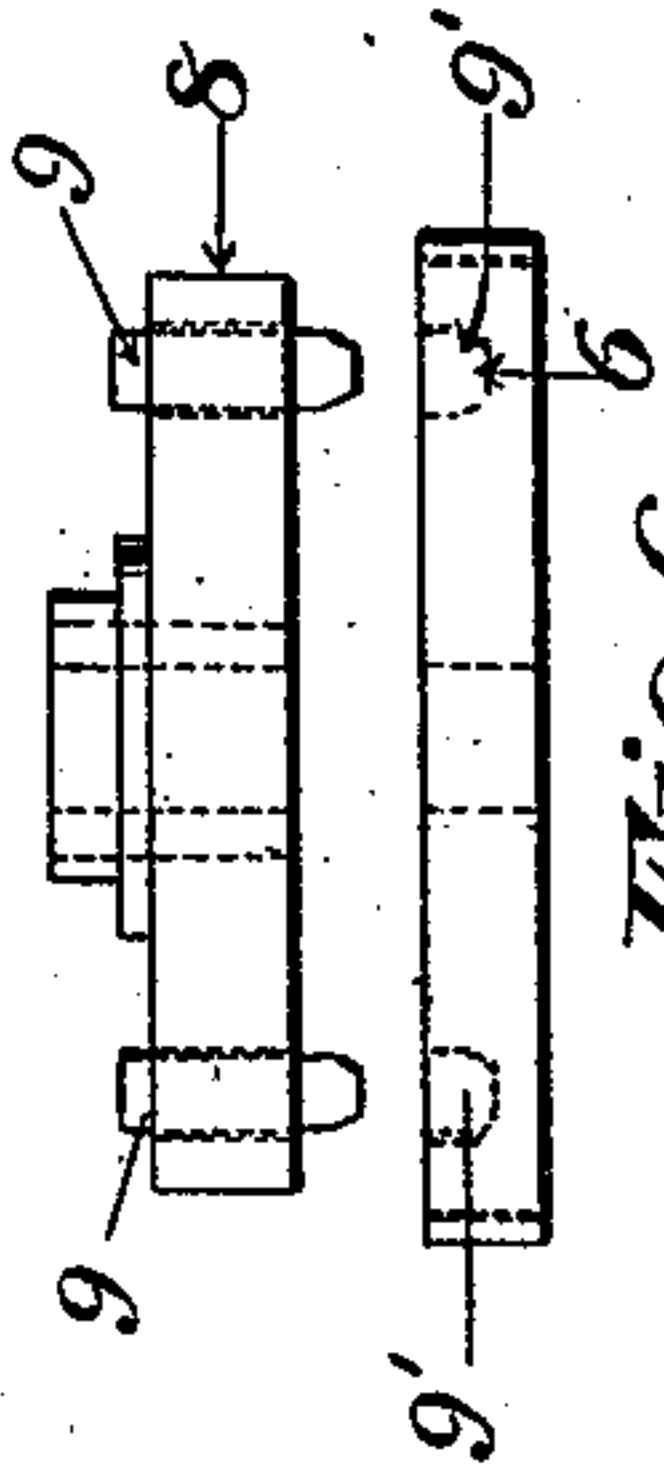


Fig. 6.

Fig. 7.

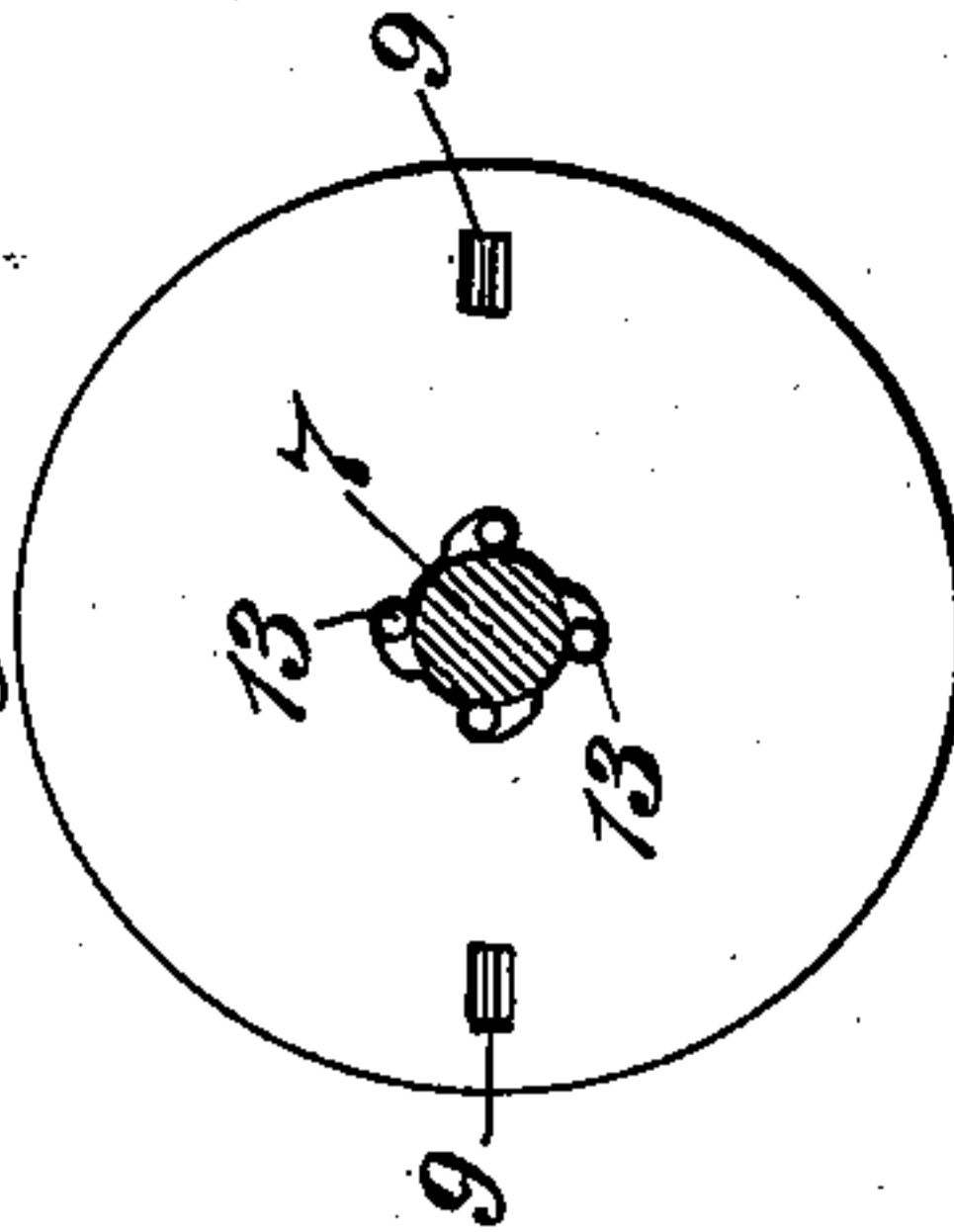


Fig. 8.

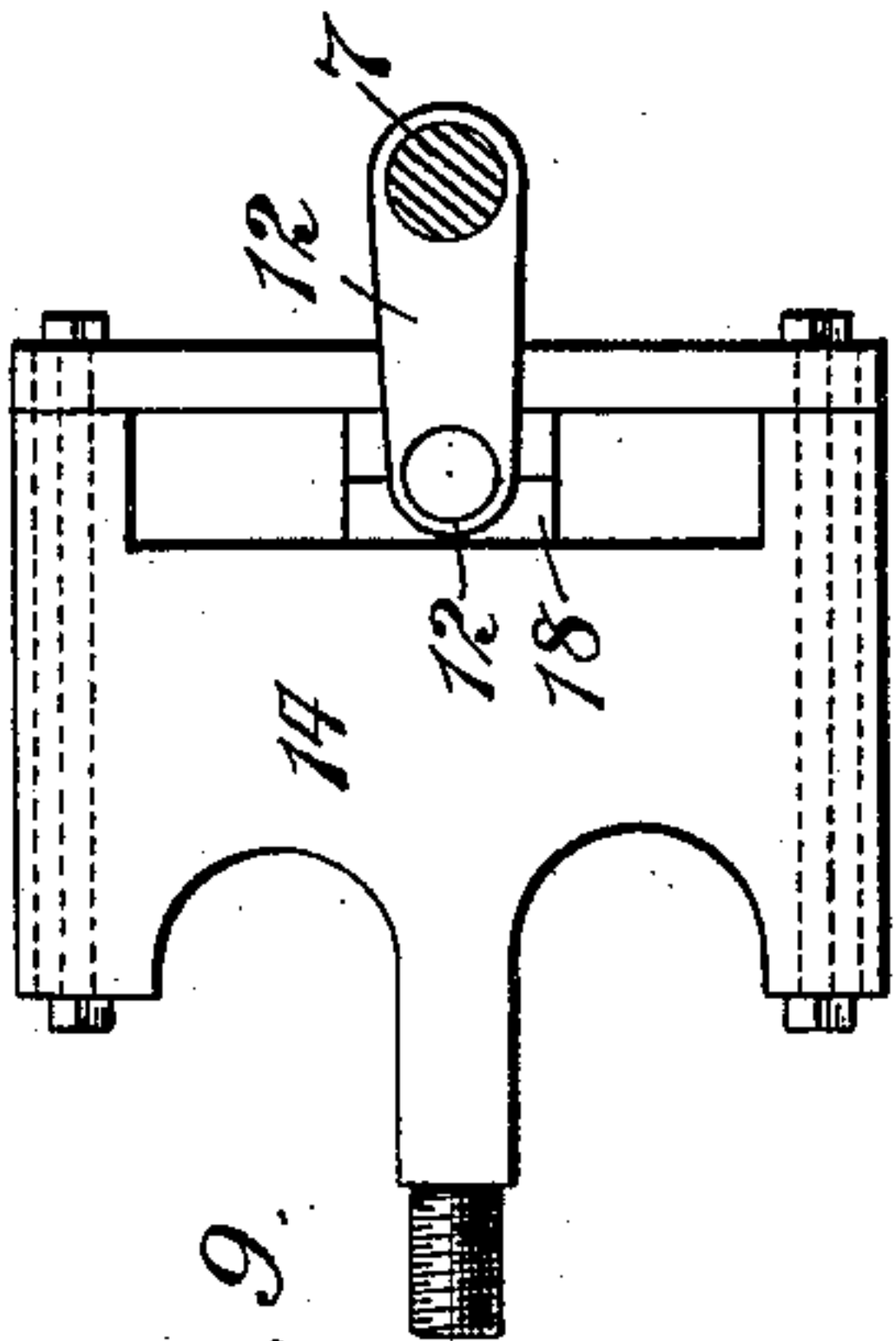


Fig. 9.

Fig. 10.

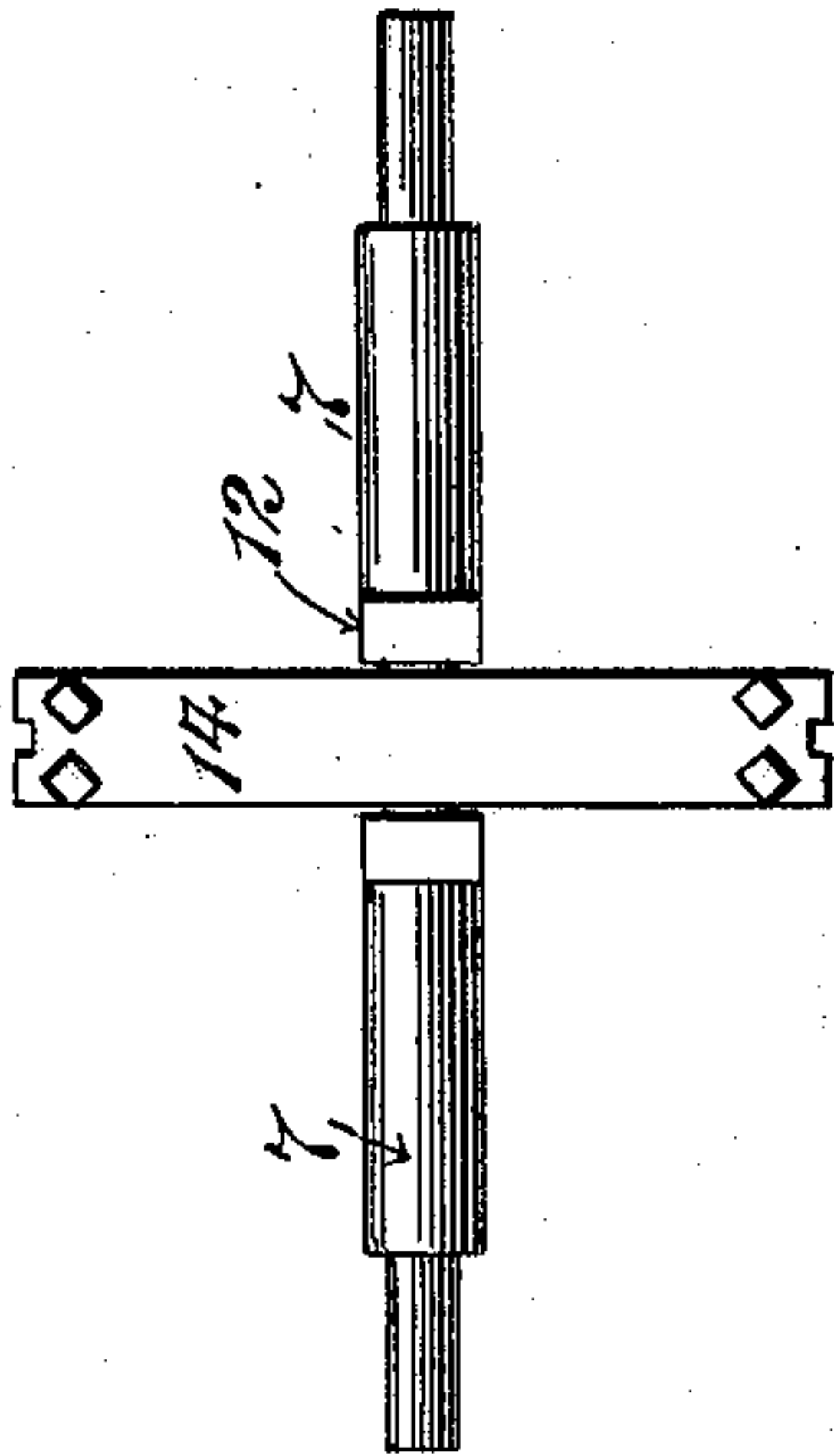


Fig. 11.

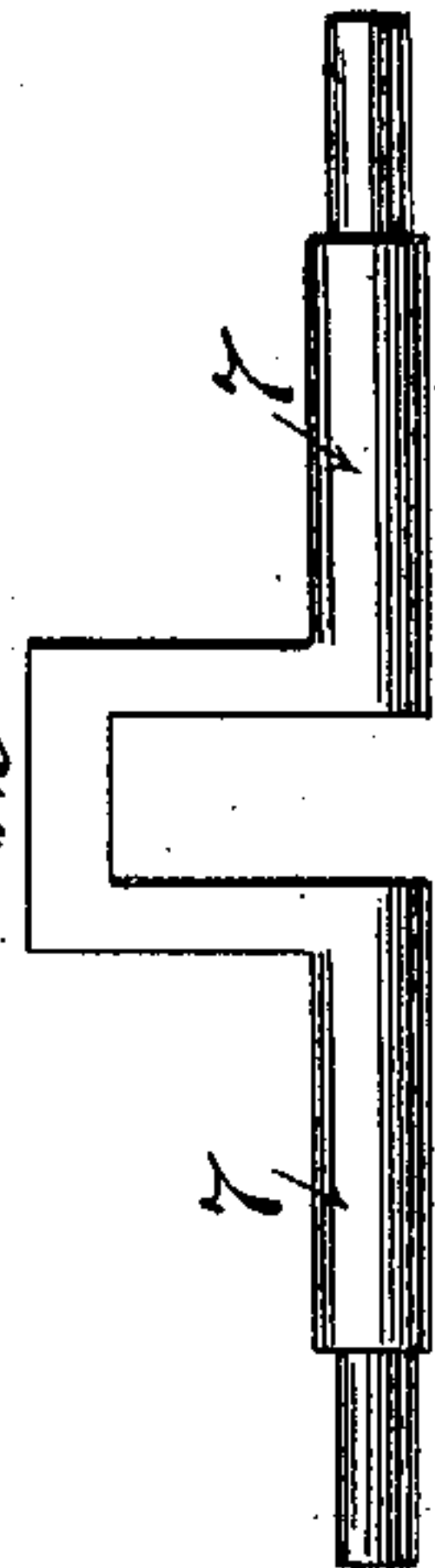


Fig. 14.

Fig. 12.

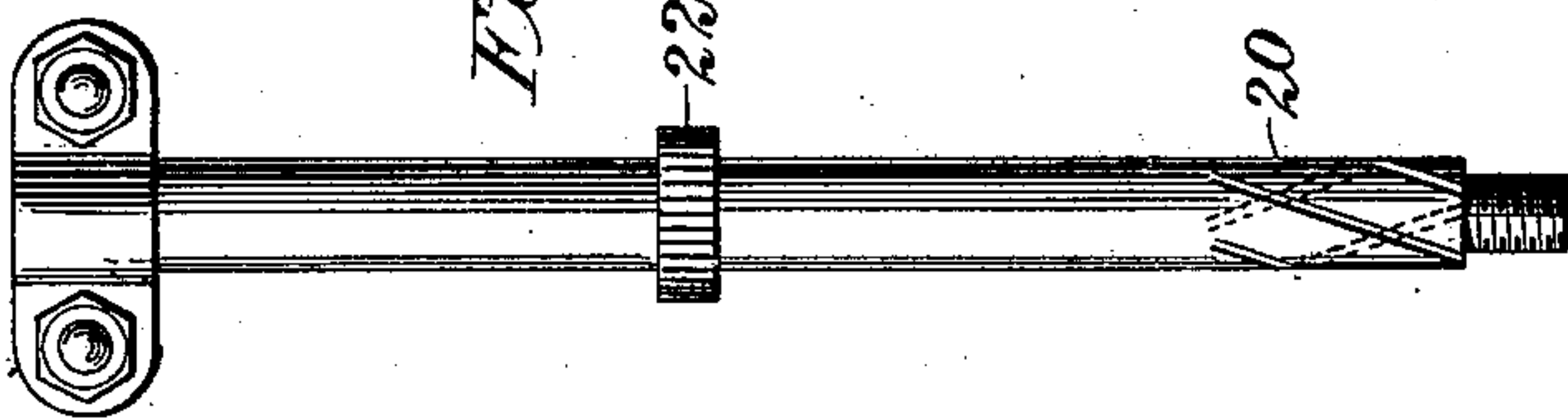
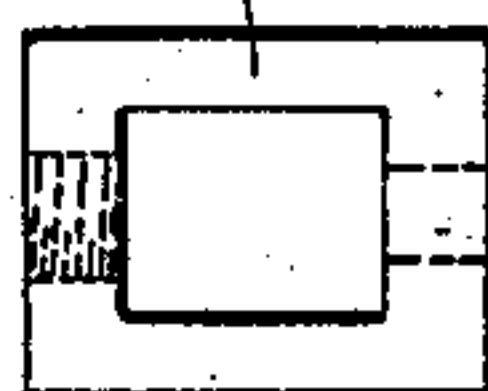


Fig. 13.



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UNITED STATES PATENT OFFICE.

ALVIN M. BALLOU, OF DENVER, COLORADO.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 690,687, dated January 7, 1902.

Application filed May 6, 1901. Serial No. 58,916. (No model.)

To all whom it may concern:

Be it known that I, ALVIN M. BALLOU, a citizen of the United States of America, and a resident of Denver, county of Arapahoe, and State of Colorado, have invented certain new and useful Improvements in Rock-Drills, of which the following is a specification.

The present invention relates generally to means for drilling rocks, and more particularly to an electric percussion rock-drill.

The object of the invention is to provide a superior substitute for the ordinary air-drill, but adapted to be operated by electric power with equal flexibility of action and efficient results. Obvious advantages follow from the nature of my invention as herein disclosed.

The organization comprising the invention embraces leading features which are important singly and in combination. Compactness is obtained by such a construction that both the motor and all the mechanism except the end of the drilling-tool are completely inclosed in and protected by a shell formed in two parts clamped together. The motor is so located as to be in direct line of the blow of the drill. The exterior view resembles an ordinary air rock-drill and is mounted in substantially the same manner upon a standard.

All drills are apt to stick in a crevice during operation; but I have provided for the automatic release of the drill by a shortening of the stroke without injury to the mechanism. By a combination of clutches, springs, and feeding devices I am enabled to drill rocks electromechanically in a practical, quick, and efficient manner without injury to the rock-drill. To this end the motor is geared, through an idle wheel, to a shaft which compresses a spring repeatedly and rapidly and automatically releases the spring to do the actual work of drilling, thereby throwing a substantially constant load upon the motor. To permit this action, I have a kind of compound clutch which will release the drill intermittently, as the case requires.

The details are best understood by reference to the accompanying drawings.

Figure 1 is a central sectional elevation of the complete device. Fig. 2 is a central sectional plan of said device. Fig. 3 is a cross-section at the line A B in Fig. 2. Fig. 4 is a perspective view of the drill mounted upon

a standard ready for operation. Figs. 5, 6, 7, and 8 are different views of the clutch, which is also visible in Fig. 2. Figs. 9, 10, and 11 show the cross-head and crank. Figs. 12, 13, and 14 show separate parts for turning the drill when driven forward by the spring.

The motor is represented at 1 and is provided on its shaft 2 with a driving-pinion 4, which gears with an idle wheel 5, which in turn gears with a wheel 6, loose on the shaft 7. The wheel 6 is, however, adapted to be locked to a disk 8 in the following manner: There are wedge-shaped or beveled keys 9 passing through the disk 8 and projecting into tapered holes 10 in the disk 8, and these keys are pressed therein by springs 11, which are carried on the disk 8. It is now evident that the rotation of the wheel 6 in the absence of too much resistance will cause the rotation of the disk 8, and for a reason now to be mentioned the shaft 7, with its crank 12, will also be rotated, because of the friction-rollers 13, which clutch the shaft 7 in one direction but not in the other by the well-known principle of balls in a wedge-shaped opening between the shaft 7 and the disk 8.

The crank 12 is pivoted to the cross-head 14, which is movable on guides 15, which are on the inside of the shell or casing, formed in two parts 16 and 17. The pin of the crank 12 for this purpose passes through the block 18, movable up and down in the cross-head 14, which is connected to a plunger 19 by a rifled groove portion 20, having a rifled nut 21 surrounding it and held in the casing for the purpose of rotating the plunger 19 when propelled longitudinally. The plunger has a shoulder 22, between which and the casing is a spring 23, adapted to be compressed when the plunger, with the tool 24, is drawn in.

25 is a link for fastening the cross-head 14 to the rifled portion 20.

Upon turning the armature of the motor by an electric current the shaft 2 rotates and by means of gearing 2 and 5 constantly rotates the wheel 6. The keys 9 are forced into the holes 9' in the wheel 6, thereby locking the disk 8 to the wheel 6, and the two rotate together. In view of the roller-clutch 13 the shaft 7 and crank 12 also rotate and draw inward the plunger 19 a full stroke, at the same

time forcibly pressing the spring 23. This spring 23 maintains the shaft 7 clutched to the disk 8 until the plunger 19 has only just passed the center for the return stroke. Instantly the spring 23 pulls forward the crank 12, which causes a release of the friction-rolls 13 from the shaft 7, and the plunger therefore jumps forward with a drilling blow, and at the same time turns on its axis. Although the gear-wheel 6 continues to rotate, the shaft 7 comes to rest; but quickly the friction-rolls grip the shaft 7 again and the blow is repeated, and so the operation continues indefinitely.

Should the bit stick in a crevice or seam or yielding place in the rock and be withdrawn only a part of the complete distance of the stroke, the loose keys 9, being tapered and under strain, will be forced out of the grooves 9', thereby permitting the wheel 6 to continue its rotation, and if any tension had been placed upon the spring 23 the plunger 19 would be driven forward. The disk 8 would soon be in such a position where it would be engaged with the wheel 6 by means of the keys 9, and another pull would be applied to the drill, and this operation would be repeated until the drill was released.

It is evident that the springs 11 may be of such strength and so adjusted as not to cause an overload on the motor 1.

Should the operator not feed the drill fast enough by means of the handle 26, the spring 27 on the rifled portion 20 will receive the shock of the link 25. On the other hand, if the operator feeds the drill too fast no harm will be done, because I allow a certain play in link 25 at the connection of the cross-head 14 with the plunger.

The interior of the casing is divided into two parts by the webs 16' and 17', separating the motor 1 from the rest of the mechanism, so that the same may operate in oil, if de-

sired, so as to protect the armature and field-magnet.

28 represents bearings for the shaft 7, formed in the casing, and 29 similar bearings for the shaft 2.

I claim as my invention—

1. In an electromechanical rock-drill, the combination of a driving-wheel 6, having holes, a disk provided with loose tapered keys and with springs holding said keys in said holes, and a shaft, upon which said wheel is loose and upon which said disk is mounted with friction-rolls for permitting rotation in one direction and not in the other, a motor for driving said wheel, a crank on said shaft, and a plunger for holding a bit connected up with said crank against the resistance of the spring.

2. An electromechanical rock-drill, consisting of the combination of a driving-wheel 6, having holes, a disk provided with loose tapered keys and with springs holding said keys in said holes, a shaft, upon which said wheel is loose and upon which said disk is mounted with friction-rolls for permitting rotation in one direction and not in the other, a crank upon said shaft, a plunger for holding a bit, a cross-head movable to and fro and connecting said crank to said plunger, means for rotating said plunger during its longitudinal movement, a spring acting to drive out said plunger and adapted to be compressed by the turning of said crank, a link 25 connecting said cross-head to said plunger, and a spring 27 in front of said link to act as a cushion.

In testimony whereof I have hereunto subscribed my name this 27th day of April, 1901.

ALVIN M. BALLOU. [L. S.]

Witnesses:

A. W. ALLEN,
F. C. MARSH.