

2 Sheets—Sheet 1.

No. 405,188.

Patented June 11, 1889.



Francis M. Ireland
 Cesar D. Chapman

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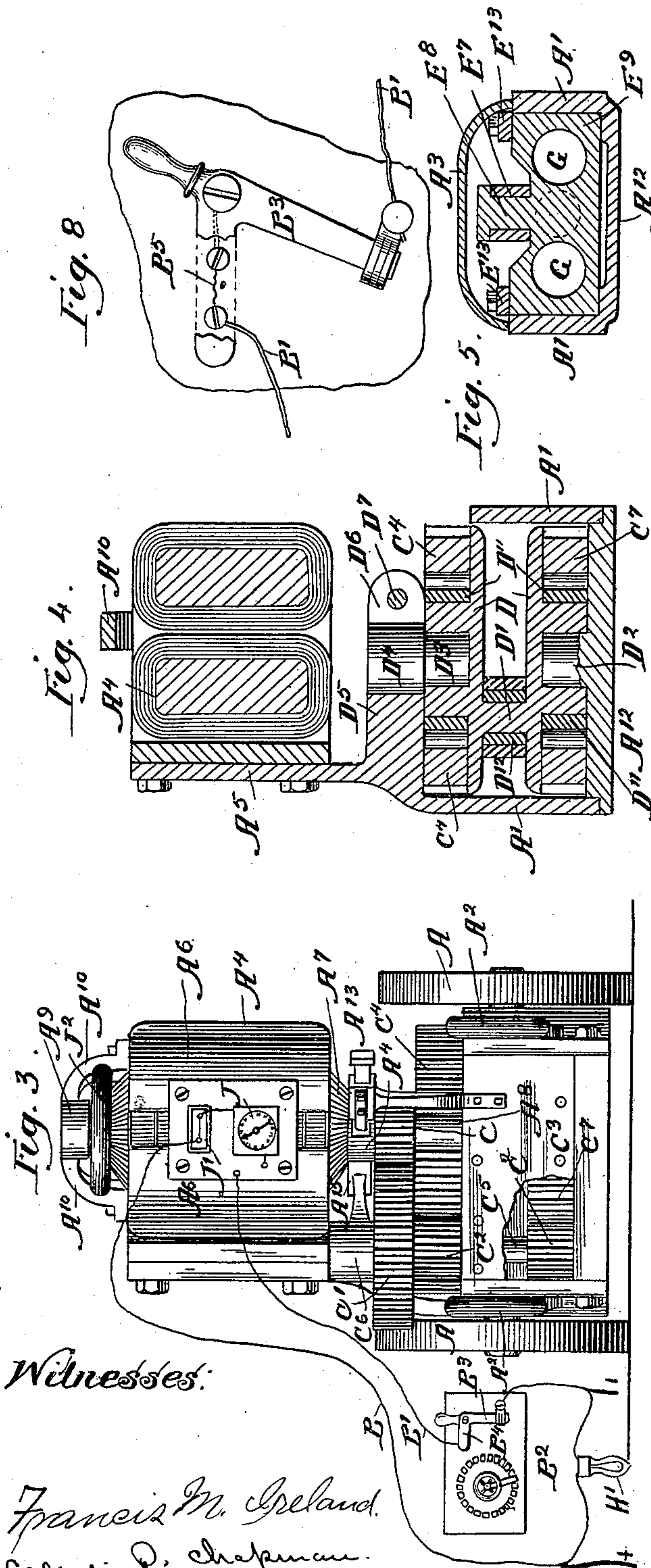
(No Model.)

2 Sheets—Sheet 2.

E. A. SPERRY.
ELECTRIC MINING MACHINE.

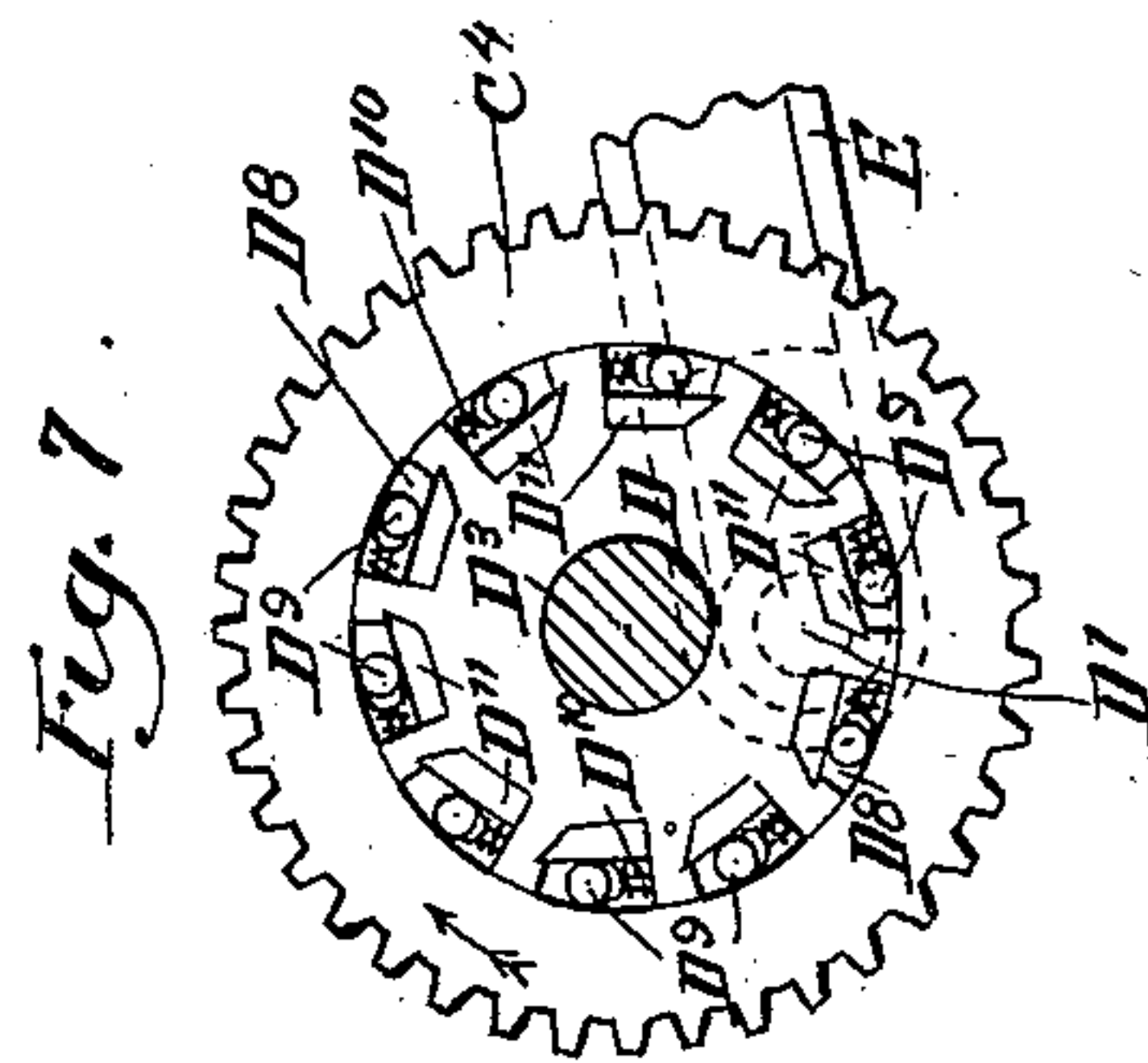
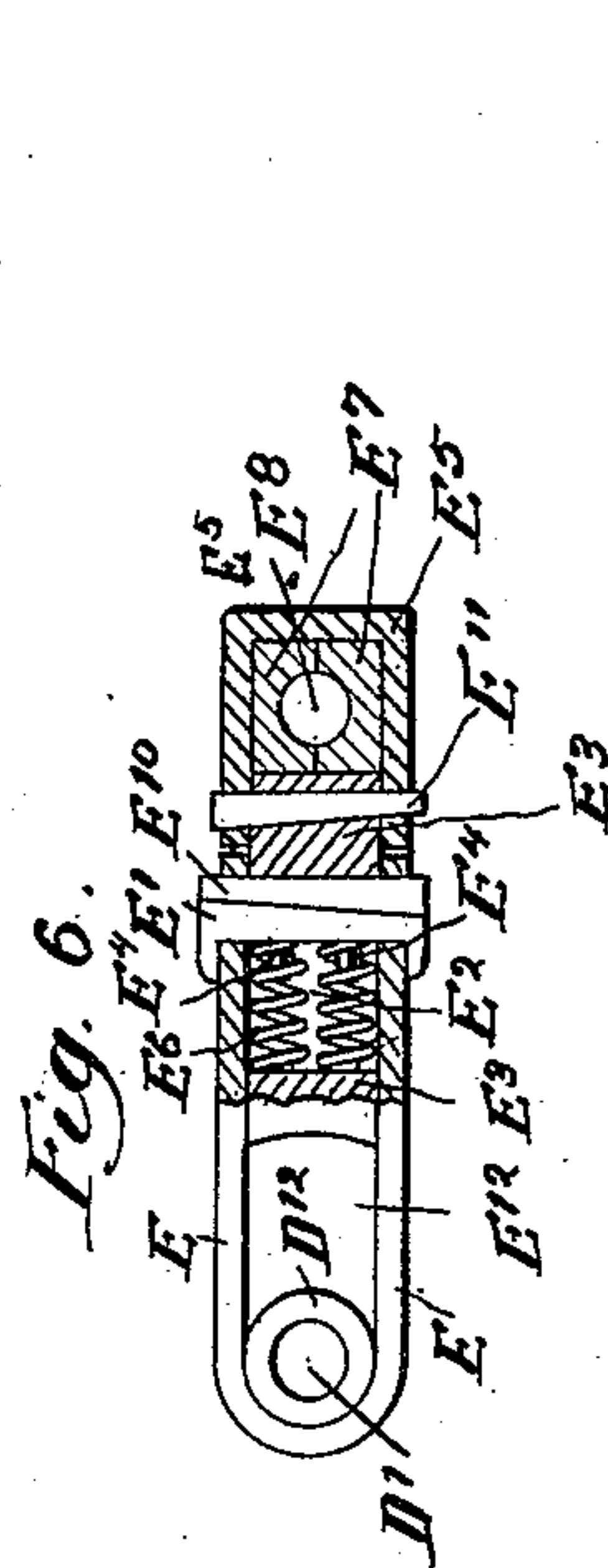
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Witnesses:

Francis M. Ireland.
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Inventor:

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UNITED STATES PATENT OFFICE.

ELMER A. SPERRY, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE SPERRY
ELECTRIC MINING MACHINE COMPANY, OF SAME PLACE.

ELECTRIC MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 405,188, dated June 11, 1889.

Application filed April 1, 1889. Serial No. 305,585. (No model.)

To all whom it may concern:

Be it known that I, ELMER A. SPERRY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Electric Mining-Machine, of which the following is a specification.

My invention relates to automatic drilling-machines, particularly for mining purposes, and has for its object to provide convenient means for drilling, and particularly for electric drills or mining-machines for coal-mining and the like. This object I accomplish by means of the mechanism illustrated in the accompanying drawings, wherein—

Figure 1 is a plan view with certain parts removed. Fig. 2 is a vertical section. Fig. 3 is a rear view. Fig. 4 is a cross-section through the line X X of Fig. 1. Fig. 5 is a cross-section on the line Y Y of Fig. 1 through the cross-head. Fig. 6 is a detail of the pitman. Fig. 7 is a detail of the clutch mechanism, and Fig. 8 is a detail of the switch.

Like parts are indicated by the same letter in all of the figures.

A A are the wheels journaled on the supporting-frame A', which frame is provided with the rear handles A² A².

A³ is a hinged front cover, which may be used to protect the working parts of the machine.

A⁴ are the field-magnets mounted on the standard A⁵, which rises from the frame of the machine.

A⁶ A⁶ are the pole-pieces inclosing the armature A⁷, which is secured on the shaft A⁸. This shaft is journaled at one end in the box A⁹, supported by the arms A¹⁰, and at the other in the foot-block A¹¹ of the machine-frame. On the shaft A⁸, which is screw-threaded at its lower end, is the nut A¹³, which, together with the end of such shaft, bears upon the block A¹¹. The armature is provided with the commutator A¹⁴, upon which bear the brushes A¹⁵ A¹⁵. These brushes are connected with the conductors B B', the conductor B' leading through the rheostat B² and switch B³, which has the arm B⁴ to normally cover the fusible conductor B⁵ in the conductor B'. On the shaft A⁸ of the armature

is the pinion C, meshing with the gear C', whose shaft C⁵ is journaled below in like manner as the shaft A⁸, and above in the frame-bar C⁶. The shaft A⁸ and the shaft of the gear C', which latter shaft also carries the pinions C², are similarly journaled, passing each through the back plate C³, which serves as a guide, as indicated in Fig. 2. The back plate C³ is secured to and forms part of the frame of the machine. One pinion C² meshes with the large gear C⁴, which is similar to a gear C⁷. This latter gear is driven by a pinion C² and on the same shaft C⁵. The crank consists of the two plates D D, secured together by the crank-pin D', the lower pivoted on the trunnion D², rising from the base-plate A¹² of the frame, and the upper on the trunnion D³, projecting from the cylinder D⁴, which is secured in the cross-piece D⁵ of the frame, being held thereto by the strap D⁶ and pin D⁷. Between the gear C⁴ and the inner annular flange of the pieces D D are the pockets D⁸ D⁸, wider at one end than at the other, and having in each a roller D⁹, normally forced toward the smaller end of such pocket by the spring D¹⁰.

D¹¹ are plates set into the body of the plates D to form a hard bearing-surface for such rollers.

D¹² is a friction-collar encircling the crank-pin D'. E is a strap encircling such collar on such crank-pin D' and provided with a cross-bar E', which passes through a slot E² in the piece E³, and is provided with pins E⁴ E⁴, which project and center the spiral springs E⁶ E⁶. These springs bear against the cross-bar E' of the strap E and the end of the slot E². The strap E⁵ passes about the block composed of the two portions E⁷ E⁷, which encircle the pin E⁸ on the end of the reciprocating head E⁹.

E¹⁰ is a key to hold the cross-bar E', and E¹¹ is a pin to secure the ends of the strap E⁵. These several straps together constitute an elastic pitman pivoted at one end to the reciprocating head E⁹ and at the other to the crank-pin D' and composed, substantially, of two elastically-connected portions. The space between the curved portion of the strap or straps E E and the end of the piece E³ constitutes what I term the "lost-motion slot"

E¹². The cross-head E⁹ is contained in the forward portion of the frame between the forward side pieces of the frame A' and the forward part of the bottom portion A¹², and travels upon these parts as a bearing and is held down in position by the guiding-straps E¹³ E¹³. To this cross-head is secured the reciprocating rod F, which passes through an aperture in the forward part F' of the frame. To this part F' is secured a cylinder F², containing the spiral spring F³, the inner end of which rests against the frame part F'. About the forward part of this rod F is a guiding-collar F⁴ and an end F⁵, through which passes the key F⁶ to secure the drill F⁷, which is shaped as shown—bifurcated at its end in side view and curved on one side, so as to bring the point in line with the axis of the rod, as shown in Fig. 2. In this cross-head E⁹ are two cavities G, having each an aperture G', with a valve G² thereover, and adapted to receive the piston G³, secured on the forward part of the frame.

H is a funnel-shaped guard containing the lamp H', supported on the spring H² and provided at its outer extremity with a gauze protector H³.

J is an indicator with hand and dial, and J' is an incandescing conductor, which indicates the condition of the current in the dark.

J² is a balance-wheel which controls the motions of the armature.

The use and operation of my invention are as follows: The machine, constructed substantially as shown, is supported, preferably, at its center of gravity on the wheels, and is presented to the work by the operator, who seizes the handles in the rear. A current of electricity is provided by means of suitable conductors and is controlled as to its quantity and application by means of the switch and rheostat. Its character is determined by means of the indicators on the rear of the machine, the one being visible in the dark and the other capable of use in the light. A suitable current being provided and turned on by the operator, the armature rotates, and with it its shaft, thus rotating the pinion thereon. This pinion drives the meshing gear on the shaft C⁵, and hence the pinion C² and its accompanying pinion C³, which pinions intermesh with the large gears C⁴ and C⁷, thus driving them in the direction of the arrow in Fig. 7. As these gears are driven forward the rollers D⁹ are forced into the contracted portions of their respective slots, and the crank-plates D and their connected parts are locked to and carried with the gears C⁴ and C⁷ in their forward rotation, thus retracting the elastic pitman, and with it the cross-head E⁹ and rod F, and contracting the working-spring F³. As soon as the crank-pin D' has passed the center the accumulated energy of the spring F³ will tend to move the rod F forward with greater rapidity than it would have if rigidly secured to the gear C⁴, and hence the crank-plates tend to rotate in the same direction as

the arrow, but with greater rapidity than the gears C⁴ and C⁷. This tendency loosens the rollers D⁹, and hence frees the crank-plates from the gears, and the rod F is free to be forced forward by the spring F³, and with it is carried the drill F⁷. This drill, shaped as shown, delivers a most effective blow directly from the axis of the rod F. The slot E¹² permits the crank-pin D' to make its circuit until the two gears C⁴ and C⁷ are again locked to such crank-plates without the said crank-pin giving any positive motion to the pitman and rod F. In short, the pitman and rod F are forced upward by the spring alone through the remainder of the stroke, or until the parts are again connected, so as to recompress the spring. If the stroke be delivered through a short distance, the inertia of the machine is such that before the unexpended energy of the spring can be put forth to push back the machine—which it would do—the rapidly-rotating crank-plates, moving under the influence of the spring, owing to their momentum, will have brought the crank-pin to such a position as that it will engage the strap E at its bend and thus instantly begin the operation of recompressing the spring again. To avoid the evils of the considerable blow of the crank-pin against the strap at this point, the elastic pitman, or pitman composed, as shown, of the two portions—one connected with the crank-pin, the other with the cross-head pin, and the two connected through the medium of the springs E⁶, against which they respectively pull in opposite directions—is provided. The air-cushion in the cross-head prevents injury to the operative parts when the blow is not delivered elsewhere. The electric light in the forward end of the machine, supported on a spring, so as not to be easily shattered, delivers a light at the working-point.

The arrangement of the fusible conductor B⁵ beneath the arm B⁴ of the switch is such as to make it impossible for such fuse to be removed or replaced while the circuit is closed. The electric light in the front of the machine I term a "search-light," and the same may be attached to the working-circuit, as indicated diagrammatically in Fig. 3.

I have spoken of the driving mechanism for the drill, and this term must be understood to mean the mechanism which compresses the spring which ultimately drives the drill. The interior of the funnel-shaped lamp-protector serves as a reflector.

It will be readily understood that the machine may be operated either in series or multiple-arc-circuit relation. In the latter case a constant potential is used, and should the motor be stopped from the binding of its parts, or otherwise, its counter electric-motor force would be wholly or partially nullified, with the effect that a powerful current would tend to flow through the motor, tending to destroy its insulation by burning. I have devised a current-indicator by means of which this abnormal flow may be detected and the

motor disconnected from circuit before any injury is sustained thereby. The object of having the outer end of the inclosing-cylinder open is to facilitate the removal of the guide-collar, spring, and other wearing parts. This collar is independent and removable, and when worn out can be replaced.

The electric or spring-energizing motor, designed to energize the spring or other driving-motor, should catch the drill and begin its work of energy-storing for the next stroke at substantially the end of the effective stroke of the drill, leaving no time for pushing back the miner, and hence I have devised the clutch mechanism to re-engage the driving-motor as soon as the drill has delivered its blow.

I refer to my application of even date herewith, Serial No. 305,585, and my application filed prior thereto, and I here expressly disclaim the matters claimed in said applications.

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

1. In a mining-machine, the combination of a suitable supporting-frame with a drill, a driving-motor for said drill, an electric motor to energize said driving-motor, and an intermittently and irregularly operating catch consisting in part of a pitman attached to and moving with the drill or drill-rod, said catch adapted to intermittently connect the two motors, so that their re-engagement is dependent upon the length or duration of the effective stroke of the drill.

2. In a mining-machine, the combination of a suitable supporting-frame with a drill, a driving-motor for said drill, an electric motor to energize said driving-motor, and an intermittently and irregularly operating catch consisting in part of a slotted pitman attached to and moving with the drill or drill-rod, said catch adapted to intermittently connect the two motors, so that their re-engagement is dependent upon the length or duration of the effective stroke of the drill.

3. In a mining-machine, the combination of a suitable supporting-frame with a drill, a driving-spring for said drill, an electric motor to energize said spring, and an intermittently and irregularly operating catch consisting in part of a slotted pitman attached to and moving with the drill or drill-rod, said catch adapted to intermittently connect the spring and motors, so that their re-engagement is dependent upon the length or duration of the effective stroke of the drill.

4. In a mining-machine, the combination of a suitable supporting-frame with a drill, a driving-motor for said drill, a motor to energize said driving-motor, and an intermittently and irregularly operating catch consisting in part of a pitman attached to and moving with the drill or drill-rod, said catch adapted to intermittently connect the two motors, so that their re-engagement is dependent upon the

length or duration of the effective stroke of the drill.

5. In a drilling-machine, the combination of a drill with a rod to which it is secured, a spring encircling said rod, and a free collar on the end of such rod bearing against the end of the drill proper, said spring bearing at its end, respectively, against such collar and the fixed portion of the machine.

6. In a drilling-machine, the combination of a drill, a rod to which it is secured, a spring encircling such rod, a free collar on the end of such rod bearing against the end of the drill proper, said spring bearing at its end, respectively, against such collar and a fixed portion of the machine, and a spring inclosing and protecting cylinder.

7. In a drilling-machine, the combination of the drill with a rod to which it is secured, a spring encircling such rod, a cylinder inclosing such spring and rod, and a guiding-collar about such rod within such cylinder and bearing on one side against the end of the drill proper and on the other against the end of the spring.

8. In a drilling-machine, the combination of a drill with a reciprocating pitman therefor, two driving gear-wheels on opposite sides of said pitman, a clutch to connect said pitman and gear-wheels, an actuating-motor for said gear-wheels, and a frame to support such parts in operative position.

9. In a drilling-machine, the combination of a drill with a reciprocating pitman therefor, two driving gear-wheels on opposite sides of said pitman, a clutch to connect said pitman and gear-wheels, an actuating electric motor for said gear-wheels, and a frame to support such parts in operative position.

10. In a drilling-machine, the combination of a drill with a reciprocating pitman therefor, two crank-plates connected with said pitman and on opposite sides thereof, a clutch whereby the pitman and plates are connected, an actuating-motor to drive such plates, and a frame to support such parts in operative position.

11. In a drilling-machine, the combination of a drill with a pitman, crank-plates on opposite sides thereof, a clutch to connect the pitman and plates, an actuating electric motor to drive such plates, and a frame to support such parts in operative position.

12. In a drilling-machine, the combination of a drill with a pitman, a crank plate and pin, a driving-wheel, a motor to actuate the same, and a clutch between such crank-plate and driving-wheel on each side of the pin.

13. In a drilling-machine, the combination of a drill with a pitman, a crank plate and pin, a driving-wheel, a motor to actuate the same, and a release between such crank-plate and driving-wheel on each side of the pin.

14. In a drilling-machine, the combination of the drill-actuating mechanism with a frame on which the same is supported, a spring

which encircles and drives the drill, an outwardly open-ended inclosing-cylinder therefor secured to such frame, and a removable drill-guide within such cylinder.

5 15. In a drilling-machine, the combination of a drill with a driving-spring, a pitman connected with such drill at one end and provided with a long slot at the other end, a crank whose pin engages such slot, a driving-
10 shaft to which such crank is attached, and means for driving the same so that the pitman may move independent of the crank during a portion of its stroke.

15 16. In a drilling-machine, the combination of a drill with a spring adapted to force the drill forward, a pitman connected with such drill at one end and provided with a long slot at the other, a crank whose pin engages such slot, a driving-shaft to which such crank is
20 attached, means for driving the same, and a clutch connecting said crank to said shaft so as to lock them together when one moves faster than the other and release them when their relative speed tendency changes.

17. In a drilling-machine, the combination 25 of a suitable supporting-frame with a drill, means for driving the same, including the shaft, a crank on said shaft connected to other parts of the driving mechanism, and a clutch which locks the shaft and the crank together 30 when one moves faster than the other and releases them when their relative speed tendencies change.

18. In a drilling-machine, the combination of a drill with an electric motor for driving 35 the same, an electric-current indicator consisting of two elements, one adapted to be read in the light and the other in the dark, and a suitable supporting-frame on which the parts are secured.

Signed this 30th day of March, 1889.

ELMER A. SPERRY.

In presence of—

FRANCIS W. PARKER,
CELESTE P. CHAPMAN.