(No Model.) 2 Sheets—Sheet 1.

R. P. ELMORE & J. O. EHBETS.

HAND POWER ROCK DRILLING MACHINE.

No. 368,658. Patented Aug. 23, 1887.

Fig. 1

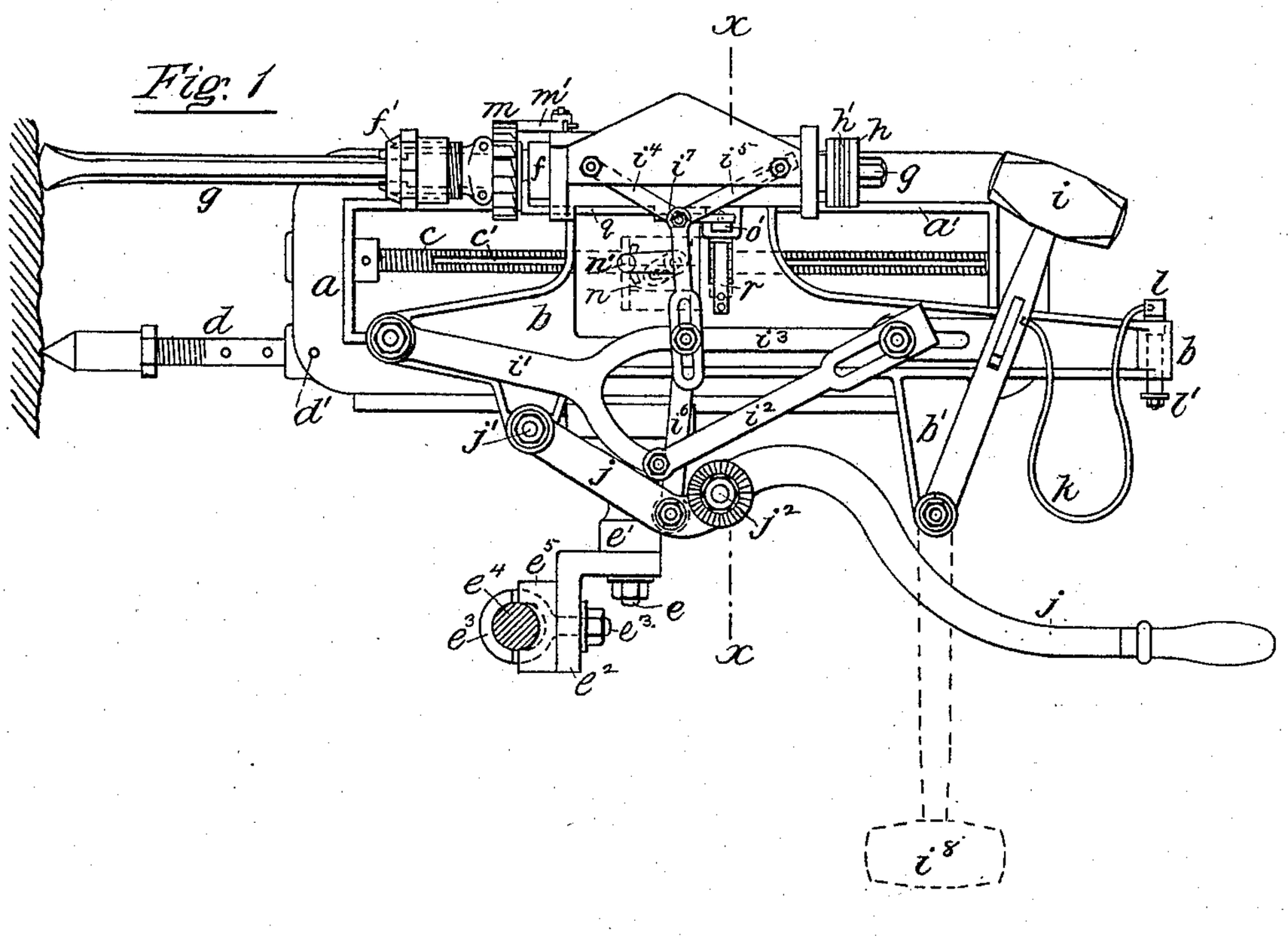
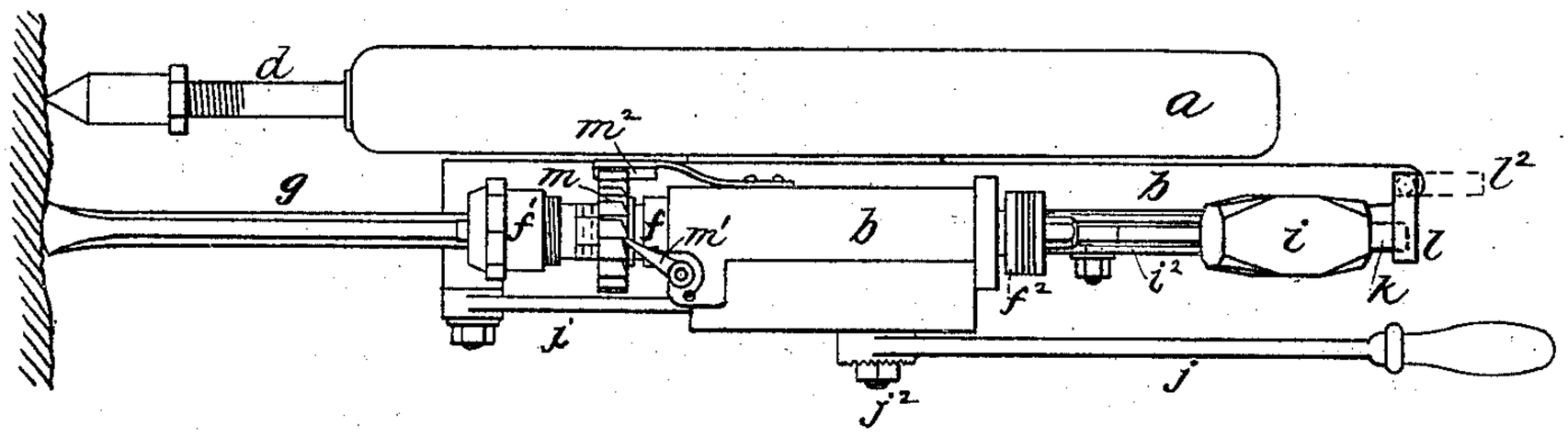


Fig. 2



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3

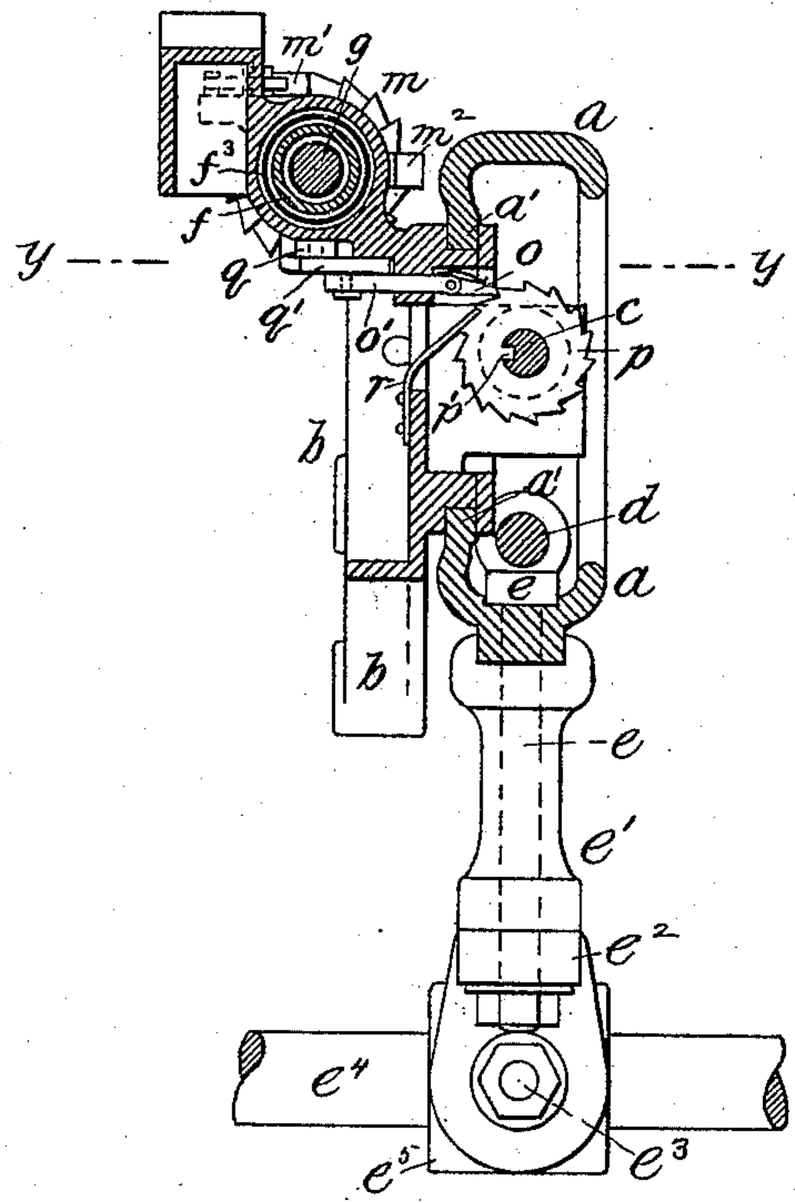


Fig. 4

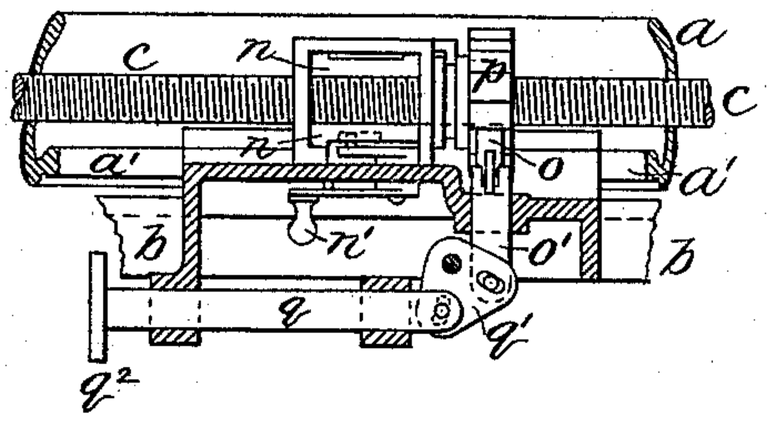
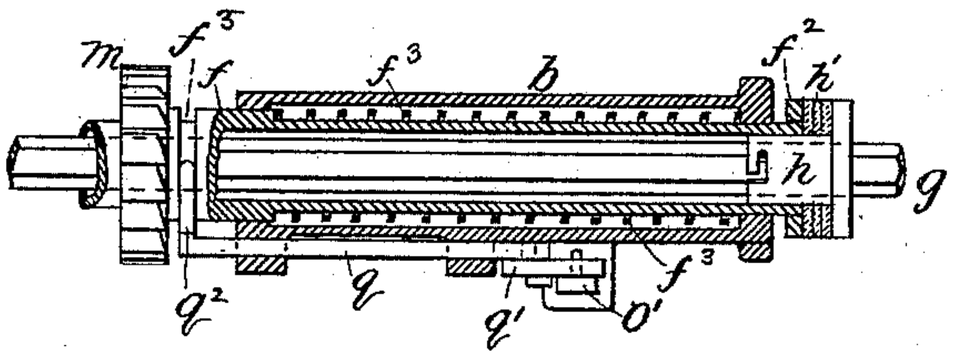


Fig. 5



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UNITED STATES PATENT OFFICE.

R. PALMER ELMORE, OF ALBERT LEA, MINNESOTA, AND JACOB O. EHBETS, OF MILWAUKEE, WISCONSIN; SAID EHBETS ASSIGNOR TO SAID ELMORE.

HAND-POWER ROCK-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 368,658, dated August 23, 1887.

Application filed September 2, 1886. Serial No. 212,474. (No model.)

To all whom it may concern:

Be it known that we, R. PALMER ELMORE, of Albert Lea, county of Freeborn, State of Minnesota, and JACOB O. EHBETS, of Milwaukee, county of Milwaukee, State of Wisconsin, both citizens of the United States, have invented certain new and useful Improvements in Hand-Power Rock-Drilling Machines, of which the following is a specification.

Our invention relates to that class of hand-power rock-drilling machines in which the work is accomplished by means of a spring-acting hammer striking on the end of a drill rod or holder, when the drill is caused to bear against the rock, said drill after each impact of the hammer being withdrawn from the rock, partly rotated, and set back ready for the succeeding blow, and in which the operating parts of the machine are carried by a slide which is automatically fed forward as the cutting of the rock takes place.

Our invention has for its object to simplify and improve the various operating devices of this class of rock-drills, as exemplified in the United States Letters Patent No. 307,733, issued November 4, 1884, the general features and manner of applying the power being as shown in said Letters Patent; and it comprises the following improvements: a new catch for holding the rear end of the main or striking spring, so fitted into a square socket in the carriage and adapted to be rotated that the spring may be readily applied, said catch also acting as a stop to the hammer when the spring is removed, and when turned back being clear of the hammer to allow it to be swung out of the path of the drill for withdrawing the drill from the machine without changing the position of the machine; a removable guide in the rear end of the drill-holder, which is hollow, and a clutch attached to the front end of the holder, whereby the drill is properly guided and may be quickly applied to and removed from the machine; a ratchet-wheel with side and peripheral teeth attached to the hollow drill-holder, and an angularly-arranged pawl acting on the side teeth to partly rotate the ratchet-wheel when the holder is drawn back; a transversely-moving feed-pawl arranged to actuate a ratchet-wheel fitted on the feed-screw, and a longitudinal slide connected to and moved by the hollow drill-holder, and imparting motion to the feed-pawl through the medium of a bell-crank lever; a sliding half-nut fitted in the moving carriage so as to engage with the feed-screw which is held in the stationary main frame, and a simple lever located at the front side of the machine for raising and lowering the half-nut, and other minor improvements in the construction of the main frame and carriage, &c., all of which will now be fully described, reference being had to the accompanying drawings, in which—

Figure 1, Sheet 1, is an elevation of our improved rock-drilling machine. Fig. 2, Sheet 1, is a plan view of the same. Fig. 3, Sheet 2, is a transverse section cut on the line *x x*, Fig. 1. Fig. 4, Sheet 2, is a plan of the feeding mechanism, cut on the line *y y*, Fig. 3; and Fig. 5, Sheet 2, is a longitudinal sectional view of the drill-holder and part of the carriage.

The main frame *a* is an open rectangular casting having longitudinal guide-bearings *a' a'*, in which the carriage *b* is fitted to slide, and bearings at its ends, in which the feed-screw *c* is held, so as to rotate freely therein and have no end-play.

Through an opening in the front end of the lower part of the frame *a* is placed the steadying-bar *d*, locked to the frame by the pin *d'*, and provided with a screw-point adapted to be pressed firmly against the rock when the machine is set up for action. The bottom of the frame *a* is slotted for the reception of the bolt *e*, which passes through the standard *e'*, shaped at its upper end to embrace the guide a^2 at the bottom of the frame, and through the angle-plate e^2. A nut on the lower end of the bolt clamps the frame rigidly on the angle-plate. Through the other side of the angle-plate e^2 passes the threaded end of the eye-bolt e^3, which embraces the column or bar e^4, a half-cylindrical bearing block or washer, e^5, being located between the bar e^4 and the angle-plate. The column or bar e^4 is of the ordinary construction, and adapted to be wedged or screwed in a drift or tunnel either in a horizontal or vertical position. The universal clamp $e\ e'\ e^2\ e^3\ e^5$ is, as will be seen, of such

construction as to permit of the frame being set in any position at any angle on the column e^4.

The carriage *b*, which carries all the operating parts of the machine, is made in one piece, having all the bearings, &c., for the mechanism formed integral therewith. In its upper part is formed the cylindrical cavity, in which is fitted to rotate and slide the hollow drill-holder *f*, which is provided at one end with the chuck *f'*, composed of hinged jaws, and a screw-sleeve for forcing the jaws onto the drill *g*, and at the other end with a large head or collar, f^2, which is held against the end of the carriage by the coil-spring f^3, surrounding the hollow drill-holder *f*. The hole through the holder *f* is large enough to allow the cutting-edge of the drill *g* to pass through it, so that the drill may be withdrawn from the rock and removed from the machine without disturbing the adjustment of the machine; and as the blow-receiving end of the drill is smaller than its cutting end, the sleeve *h* is fitted in the end of the hollow holder *f* to hold the drill centrally therein. On this sleeve *h* are placed the elastic washers *h'*, located between its head and the collar f^2 of the drill-holder, to counteract or deaden the effects of blows of the hammer when the machine is not provided with a drill. This sleeve *h* is provided with a bayonet-slot adapted to catch over a pin in the hollow holder, as shown at Fig. 5, to permit of its ready removal and replacement when the drill is being changed.

The hammer *i* is pivoted at the lower end of its handle to the bracket-piece *b'*, formed integral with the carriage *b*, thus making a more rigid connection therefor than the curved arm provided for the purpose in the before-mentioned patent. The toggle-levers $i' i^2 i^3$, for operating the hammer, and the toggle-levers $i^4 i^5$, for moving the drill back away from the rock by acting against the head f^2 of the drill-holder, and the links $i^6 i^7$, are constructed and actuated in substantially the same manner as in the before-mentioned Letters Patent, the operating-handle in this patent being a lever of the first order, while the handle *j* of our machine is a lever of the second order, with its fulcrum at *j'* on a projection from the carriage *b*. The handle *j* is made with a double curve, and is jointed at j^2, the two parts being held together by a bolt passing through them, their adjacent faces having locking-teeth. These locking-teeth are formed on both sides of the detachable part of the handle, so that either side of it may be attached to the other part. This construction, with the double curve given the handle, permits of its being set in any position relatively to the machine that is most convenient for actuating it, in whatever position the machine may be placed on the column e^4.

The improved device for holding the rear end of the main spring *k* consists of the inverted-L-catch, *l*, set in a vertical hole formed in the extreme rear end of the carriage *b*. This hole is rectangular at its upper end, and the vertical part of the piece *l* has a rectangular shoulder just below its horizontal part, but is cylindrical throughout the remainder of its length, so that when it is raised up to the limit of its motion, determined by the collar or washer *l'*, it is free to be rotated, thus allowing of the ready insertion or removal of the spring between or from it and the hammer-shaft, the bent ends of the spring fitting into recesses formed in the hammer-shaft and the piece *l*, as shown in Figs. 1 and 2, the square part of the hole in the carriage then holding the piece *l* securely in this position. When the spring *k* is removed, the piece *l*, by being set back in the position shown by the full lines in Fig. 2, acts as a stop for the hammer *i*, and when turned around, as shown by the dotted lines l^2, the hammer *i* is free to fall down, as shown by the dotted lines i^8, Fig. 1, allowing a free passage for the removal of the drill from the rear of the machine, as before described.

To impart an intermittent motion to the drill, the drill-holder *f* is provided with a ratchet-wheel, *m*, having peripheral and side teeth, and on the top of the carriage *b* is pivoted, in an angular position, the spring pawl or dog *m'*, the end of which catches into the side teeth of the wheel *m*, so that as the drill-holder is moved back it is caused by said pawl *m'* to be partly rotated. A retention-spring catch, m^2, secured to the carriage *b*, holds the drill-holder as it is rotated by engaging with the peripheral teeth of the wheel *m*.

The carriage *b* is locked in any desired position relatively to the main frame *a* by the half-nut *n*, fitted to slide vertically without rotation in guides on the carriage *b*, and operated to engage the feed-screw *c* by means of the lever-handle *n'*, located at the front side of the machine, so as to be easily accessible to the operator. The handle *n'* is provided with a crank-pin, which engages in a slot formed in the side of the half-nut *n*.

When the nut *n* is set away from the screw *c*, the carriage *b* may be slid freely in the frame *a*, and when it is locked in contact with the screw the carriage is automatically moved forward by the rotation of the screw *c* in the half-nut *n*, the screw-actuating device consisting of the spring-pawl *o*, carried by the transverse slide *o'*, which acts on the teeth of the ratchet-wheel *p*, fitted to rotate in a bearing on the carriage *b* without end-play, and provided with a key or spline, *p'*, fitting into a slot, *c'*, formed longitudinally in the screw *c*. The transverse slide *o'* is actuated by the longitudinal slide *q*, through the medium of the bell-crank lever *q'*; and this slide *q* is caused to move with the drill-holder *f* by its upturned or forked end q^2 engaging in a circumferential groove, f^5, formed in the drill-holder *f*. A retention-spring, *r*, holds the ratchet-wheel *p* in position for the pawl *o* to take hold of its teeth successively. The pawl *o*, after acting on a tooth of the ratchet-wheel *p*, and thereby rotating the screw *c* and moving the carriage forward a short dis-

tance, does not engage with the succeeding tooth until the drill carried by the drill-holder *f* has cut away the rock sufficiently to allow the holder to move forward to such an extent as to permit the pawl *o* to fall over the edge of the succeeding tooth, the number of cutting actions of the drill to accomplish this work being determined by the resistance offered by the rock acted upon.

Having now described the construction and operation of our improvements in hand-power rock-drilling machines, what we claim, and desire to secure by Letters Patent, is—

1. In a rock-drilling machine, in combination, an oscillating hammer, a catch or spring holder so fitted in the frame as to occupy two positions, in one locked behind the hammer and in the other out of the path of the same, and a spring held between the catch and the hammer when the catch is in its locked position, substantially as set forth.

2. In a rock-drilling machine having a longitudinally-moving drill-holder and a feeding-screw parallel therewith, the combination, with the drill-holder and feeding-screw, of a slide actuated by the drill-holder, a ratchet-wheel surrounding and provided with means for imparting rotary motion to the screw, a transverse slide and feed-pawl arranged to act on the ratchet-wheel, and a connection between the longitudinal and transverse slides, whereby they are caused to move in unison, substantially as and for the purpose set forth.

3. In combination, the hammer *i*, the spring *k*, the L-catch *l*, and the rear end of the carriage *b*, provided with a square socket-hole, substantially as and for the purpose set forth.

4. The double-curved handle formed of two pieces, in combination with locking-teeth formed on their adjacent connecting-faces, one of the pieces having said locking-teeth on both of its sides, and a connecting-bolt, substantially as and for the purpose set forth.

5. In combination, the hollow drill-holder *f*, the chuck *f'*, secured to its front end, the collar f^2 at its rear end, and the guide-sleeve *h*, provided with the elastic washers *h'*, detachably fitted in its rear end, substantially as and for the purpose set forth.

6. The combination, with the main frame *a* and screw *c*, of the carriage *b*, sliding half-nut *n*, fitted in guides at the rear side of the carriage, and the handle *n'*, located on the front of the carriage and provided with a crank-pin acting in a slot in the nut, substantially as and for the purpose set forth.

7. In combination, the drill-holder *f*, the slide *q*, the bell-crank *q'*, the slide *o'*, the pawl *o*, the ratchet-wheel *p*, and the screw *c*, substantially as and for the purpose set forth.

8. The combination, with the main frame *a* and grooved screw *c*, of the carriage *b*, the ratchet-wheel *p*, having a spline, *p'*, the pawl *o*, the slide *o'*, the bell-crank lever *q'*, the forked slide *q*, and the circumferentially-grooved drill-holder, substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand at New York, county and State of New York, this 13th day of August, 1886.

R. PALMER ELMORE.

Witnesses:
H. D. WILLIAMS,
ALFRED SHEDLOCK.

In testimony whereof I have hereunto set my hand at Milwaukee, county of Milwaukee, State of Wisconsin, this 18th day of August, 1886.

JACOB O. EHBETS.

Witnesses:
EDW. F. BYRON,
H. W. HUBBARD.