2 Sheets. Sheet 1.

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Stone Drill.

No. 55,307. Patented June 5, 1866.

Fig: 1.

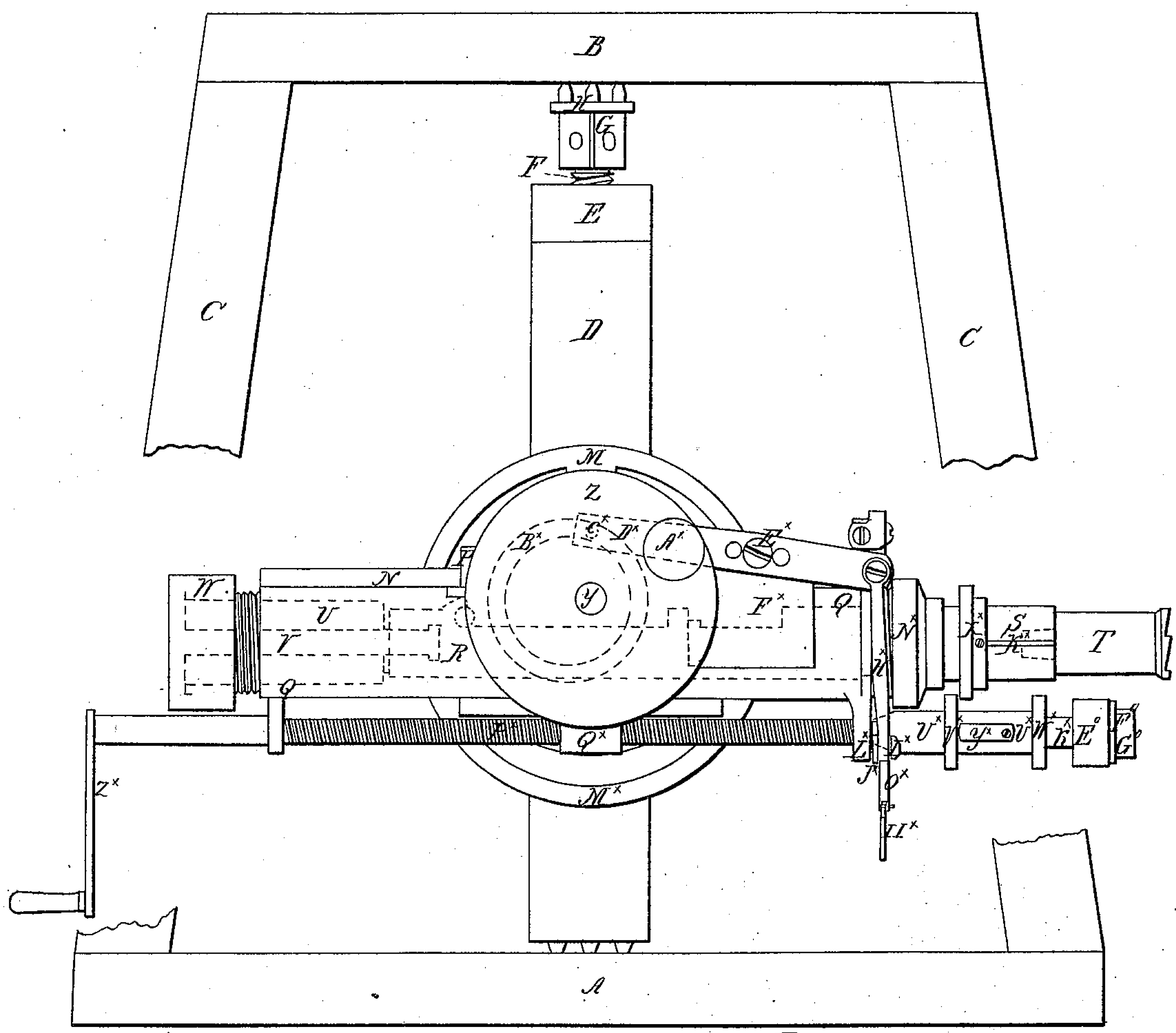


Fig. 2

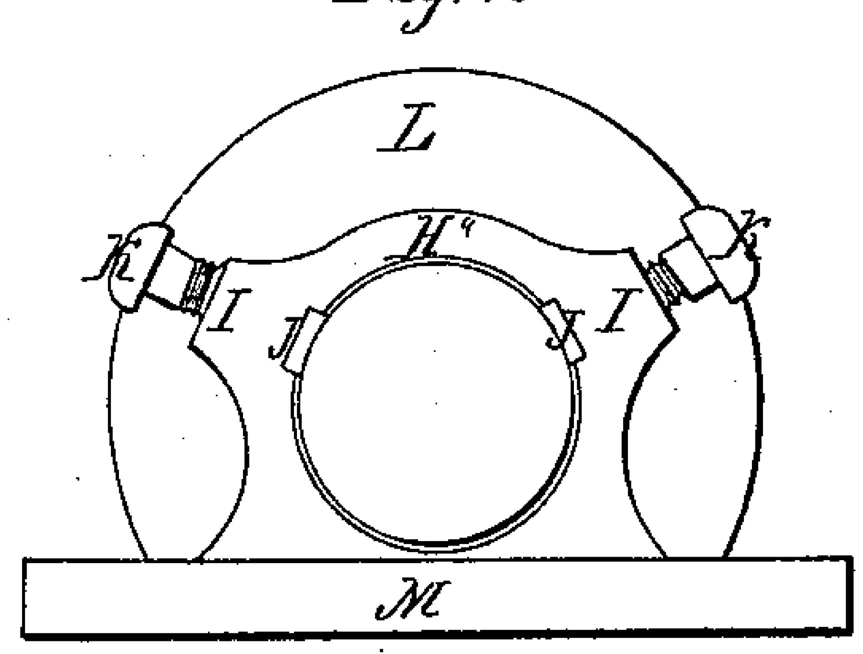
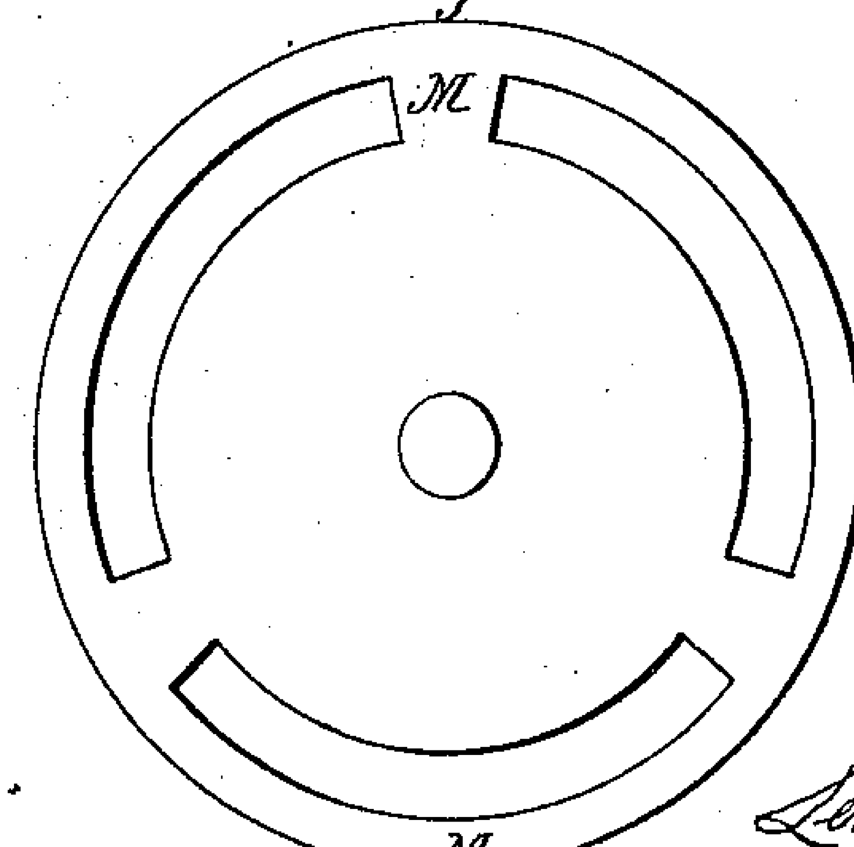


Fig. 3



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2 Sheets. Sheet 2.

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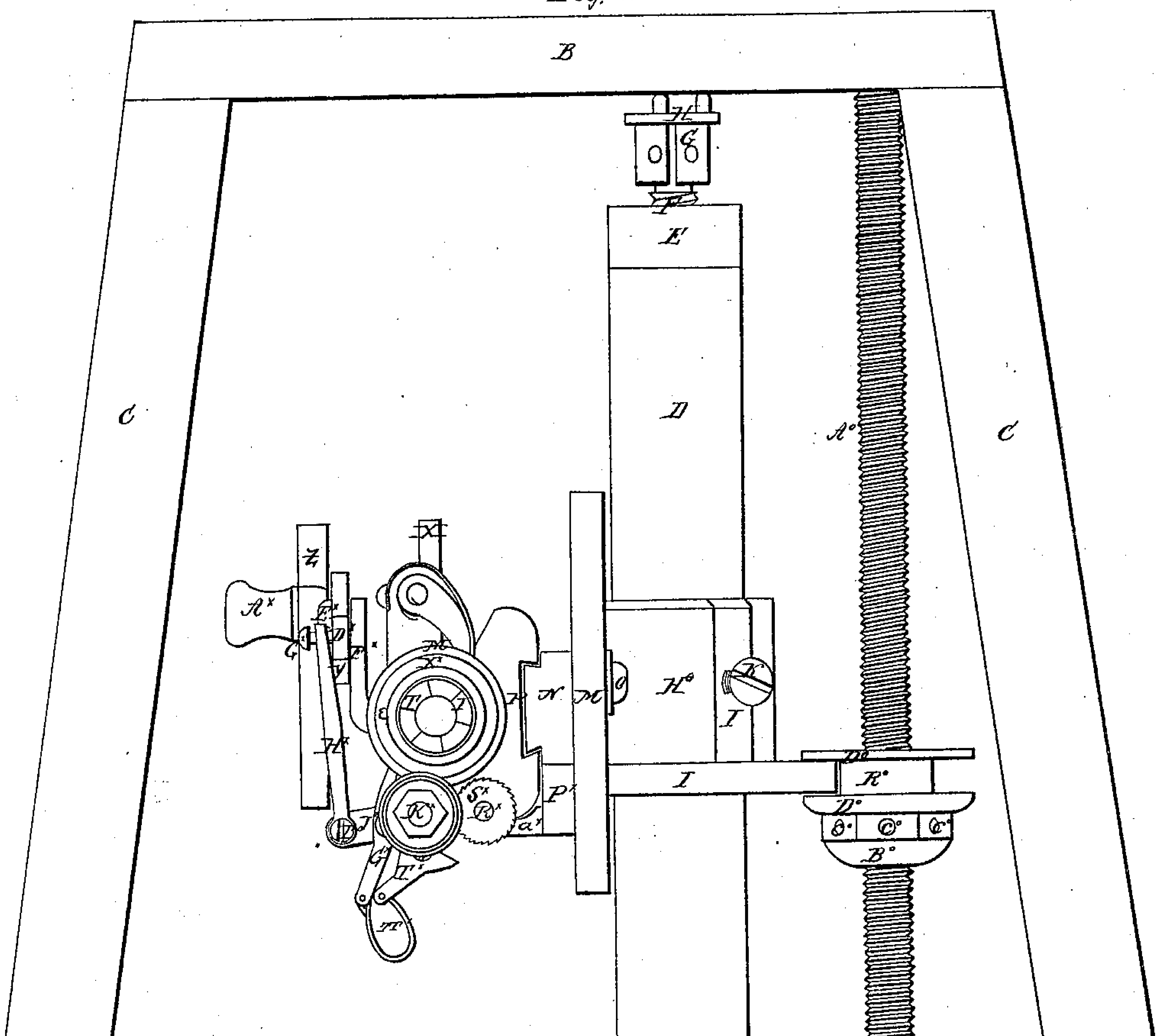
Fig. 4.



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UNITED STATES PATENT OFFICE.

LEMUEL P. JENKS AND GEORGE ARTHUR GARDNER, OF NEW YORK, N. Y.

IMPROVEMENT IN ROCK-DRILLS.

Specification forming part of Letters Patent No. **55,307**, dated June 5, 1866.

To all whom it may concern:

Be it known that we, LEMUEL P. JENKS, of Boston, Suffolk county, State of Massachusetts, and GEO. ARTHUR GARDNER, of New York city and State, have invented a new and Improved Machine for Drilling Holes in Rocks; and we do hereby declare that the following is a full and exact description of the same, taken in connection with the accompanying drawings, with letters of reference marked thereon, which, taken together, form our specification.

The nature of our invention is that of a machine for making holes in rocks and coal by percussion, for use in blasting, splitting, and other purposes.

In the drawings annexed, Figure 1, Plate I, is a side view of the machine. Figs. 2 and 3, Plate I, are portions of the same hereinafter more particularly described. Fig. 4, Plate II, is a front view of the machine.

In the drawings, A, Figs. 1 and 4, is a platform square in shape. (Seen edgewise in the drawings.) B, Figs. 1 and 4, is a shelf or cover attached to the platform A by four uprights. (Two, marked C C, respectively, shown in Figs. 1 and 4.) D, Figs. 1 and 4, is a cylindrical upright beam, of metal or wood, called the "standard," having three sharp pegs or feet at the bottom and a cap, E, Figs. 1 and 4, fastened firmly to the top. In the top of this cap E is a female screw, through which passes into the standard D and up toward the cover or shelf B a screw, F, Figs. 1 and 4. This screw has attached to its upper end a square block, called the "screw-block," G, Figs. 1 and 4, having two holes crossing each other and passing horizontally through the center of it. Around plate H, Figs. 1 and 4, is fixed to the screw-block G, and turns loosely on it. This plate H is armed with three sharpened pegs, like the feet at the bottom of the standard. The holes in the block G are for the purpose of insertion of a bar or rod by which, the standard being put in any desirable place, the screw F is turned, and the sharpened pegs at the upper and lower ends of the standard B are forced into the platform A and the shelf B, (or, in practice, into the roof and bottom of a mining-tunnel or its frame.) We sometimes place this screw F at the bottom of the standard, or at both bottom and top.

H′, Figs. 4 and 2, (seen from above at Fig. 2,) is called the "standard-block," and is a metallic cylinder sliding up and down on the standard D. This block has projections I I, Fig. 2, and I, Fig. 4. These projections are opposite to two gibs or flat bars of metal, (seen in Fig. 2, marked J J,) sliding in grooves on the inner surface of the standard-block H. These gibs J J are screwed up to the standard D by means of two screws, K K, Fig. 2, and K, Fig. 4, and by these means the block H, with its attachments, is held in place. The block H has attached to its lower end a plate, L, Figs. 2 and 4, forming a horizontal flange. To the side of the block H is also firmly attached (cast, like the flange L, in the same piece) a circular plate or thick disk, M M, Figs. 1 and 3, and M, Figs. 2 and 4. The disk M M has three concentric slots near the periphery, each in the shape of the segment of a circle. (Seen in Fig. 3.) In the center of this disk M (see Fig. 3) is a pin, upon which hangs by its center and turns loosely the slide N, Figs. 1 and 4. This slide N can be inclined in any direction, and bears from one to four or more screws. One is seen in Fig. 4, (marked O,) with its washer, which screws pass through the segmental slots in the disk M M, and, being tightened, hold the slide in any position desired. This slide N bears the drill, and by this means the drill is placed and held at any desirable angle. On a dovetailed projection from the slide N (seen in Fig. 4) slides back and forward the body or frame of the machine, held to the slide N by a block, P, Figs. 1 and 4, called the "quill-slide," cast on the side of the drill-frame. This quill-slide P bears a hollow cylinder, Q Q, Fig. 1, called the "quill." In the inside of the quill slides loosely up and down the cross-head R. (Seen in dashed lines in Fig. 1.) This cross-head R bears at its right-hand side (see Fig. 1) a solid steel mandrel or cylindrical block, S, Fig. 1, which mandrel bears at its end a steel drill, T. (In this case a tubular drill, hereinafter more particularly described.) At the left-hand end, Fig. 1, the quill contains an india-rubber spring, U, (seen in dashed lines in Fig. 1,) supported by a spindle, V, (dashed lines, Fig. 1,) which spindle is supported by a cap, called the "spring-cap," W, Fig. 1, screwed on the left-hand end of the quill. The cross-head R has a longitudinal slot through the center, through which slot passes a cam, X, Fig. 4, borne by a shaft, Y, Figs. 1 and 4, which shaft Y is secured by appropriate boxes to the top of the quill Q Q. The shaft Y also bears a wheel, which answers as a fly-wheel, Z, Figs. 1 and 4. A handle, $A^{\times}$, Figs. 1 and 4, is attached to the fly-wheel Z, by means of which rotation is communicated to the machine. We sometimes use a steam-cylinder attached to the side or to the upper side of the quill, its piston-rod having a connecting-rod attached to the fly-wheel Z, and sometimes we rotate the fly-wheel Z by means of a band connected with other machinery.

By means of the spring U and the fly-wheel Z the advance and recession of the cross-head, mandrel, and drill are secured. The rotation of the drill after each stroke is thus effected.

On the inside or quill side of the fly-wheel Z is a circular slot, $B^{\times}$, Fig. 1, eccentric to the fly-wheel, (seen in Fig. 1 in dashed lines.) When the fly-wheel Z rotates a peg or pin, $C^{\times}$, Fig. 1, is caused to play up and down. This pin $C^{\times}$ is fastened to the end of the bar $D^{\times}$, called the "rocker-bar," Figs. 1 and 4, which bar is supported by the screw-head pin $E^{\times}$, Figs. 1 and 4, screwing into the bar-support $F^{\times}$, Figs. 1 and 4, which latter is a projection on the side of the quill Q Q, and runs upward to a proper height, as seen in Fig. 4. The other end of the bar $D^{\times}$ has attached to it by the screw-head pin $G^{\times}$, Figs. 1 and 4, a rounded bar, $H^{\times}$, Figs. 1 and 4, called the "pawl-bar." This pawl-bar $H^{\times}$ hangs nearly perpendicularly, and is attached at its lower end, by means of the screw-head pin $I^{\times}$, to a horizontally-placed flat bar, $J^{\times}$, called the "second pawl-bar," Figs. 1 and 4, which bar $J^{\times}$ is supported by and plays loosely on the shaft $K^{\times}$, Figs. 1 and 4. This shaft $K^{\times}$ is screwed at one end firmly to the projection $L^{\times}$, Fig. 1, which proceeds downward from the lower side of the quill Q Q. This pawl-bar $J^{\times}$ moves up and down by means of its attachments above described, when the fly-wheel Z, rotating, causes the eccentric slot $B^{\times}$ to work up and down the pin $C^{\times}$.

By this means the intermittent rotation of the mandrel S and its attached drill T is effected. It is done in this manner: At the drill end of the quill Q Q is a cap, $M^{\times}$, Figs. 1 and 4, screwed onto the end of the quill Q Q. Inside of this cap $M^{\times}$ is a ratchet-wheel (not represented) enveloping the mandrel S, which ratchet-wheel has a pin in it working in the slot $N^{\times}$, Fig. 1, the rotation of this ratchet-wheel thus effecting the rotation of the mandrel and drill. The ratchet-wheel is rotated by the up-and-down motion of the pawl $O^{\times}$, called the "turning pawl," Fig. 4, attached by its appropriate screw-head pin to the pawl-bar $J^{\times}$, Fig. 4.

The feeding forward of the drill is thus effected: The slide N, Figs. 1 and 4, has a projection, $P^{\times}$, Fig. 4, proceeding downward from its lower part to the side, at the lower end of which is firmly fixed a block called the "feed-block," $Q^{\times}$, Figs. 1 and 4. This feed-block $Q^{\times}$ has in it a female screw, through which passes in a horizontal direction the screw called the "feed-screw," $R^{\times}$, Figs. 1 and 4, which is attached by its ends to the two projections from the bottom of the quill Q Q. (See Fig. 1.) The screw $R^{\times}$ has attached to it at its lower end (the drill end) a ratchet-wheel, $S^{\times}$, Fig. 4. This ratchet-wheel $S^{\times}$ is rotated intermittently by means of the pawl called the "feed-pawl," $T^{\times}$, Fig. 4, which is suspended by its appropriate screw-head pin to the pawl-bar $J^{\times}$, as seen in Fig. 4, and the ratchet-wheel $S^{\times}$ being thus rotated, the screw $R^{\times}$, to which it is attached, also rotates and screws forward the quill Q Q, with its attachments, including the mandrel and drill.

The contrivance for regulating the feed forward in correspondence with the progress of the drill into the rock is now to be described: The horizontally-placed shaft $K^{\times}$, Figs. 1 and 4, bears a hollow cylinder, called the "regulator-cylinder," $U^{\times}$ $U^{\times}$, Fig. 1, with two rings, $V^{\times}$ $W^{\times}$, Fig. 1, firmly fastened to it. This regulator-cylinder $U^{\times}$ plays loosely upon the shaft $K^{\times}$, but has a spring, $Y^{\times}$, Fig. 1, (sometimes more are used,) fastened to it by a screw, which spring passes through a slot in the regulator-cylinder $U^{\times}$ and bears at one end upon the shaft $K^{\times}$. The object of this spring is to retain the regulator-cylinder $U^{\times}$ wherever it is placed. At the upper end (toward the fly-wheel) this cylinder $U^{\times}$ is beveled or chamfered off, as seen in dashed lines in Fig. 1. When the cylinder $U^{\times}$ is pressed back (by means to be described) up as close as it will go to the quill Q Q, or to the projection from the quill, $L^{\times}$, Fig. 1, this beveled part slips against the feed-pawl $T^{\times}$, Fig. 4, and pressing it down throws it out of play away from its ratchet-wheel $S^{\times}$. Thus the ratchet-wheel $S^{\times}$ and its screw-shaft $R^{\times}$ cannot rotate until, by the regulator-cylinder $U^{\times}$ being pushed forward in the direction of the drill, the feed-pawl $T^{\times}$ is allowed to act.

The means by which the regulator-cylinder $U^{\times}$ is pushed back and forward are these: On the mandrel S, Fig. 1, is a ring, $X^{\times}$, Figs. 1 and 4, tightly fixed to the mandrel by a set-screw, Figs. 1 and 4. As the mandrel, with the drill, makes a recession in obedience to the action of the cam X, Fig. 4, this ring $X^{\times}$ strikes against the ring $V^{\times}$ of the regulator-cylinder $U^{\times}$, and thus, as above described, throws the feeding-pawl $T^{\times}$, Fig. 4, out of play. When, however, the mandrel advances at the time the blow is given by the drill, if the drill gets its full stroke, having pierced its way into the rock, the ring $X^{\times}$ on the mandrel strikes the ring $W^{\times}$ on the regulator-cylinder $U^{\times}$, and thus draws the regulator-cylinder $U^{\times}$ away from the feeding-pawl $T^{\times}$, allowing it to work upon the ratchet-wheel $S^{\times}$, Fig. 4, and thus rotating the feeding-screw $R^{\times}$, Fig. 1. If the drill has not pierced its way into the rock sufficient to allow the mandrel to get its full stroke, the feed-pawl T× remains quiescent and the screw R× does not rotate. The quill Q Q therefore remains stationary without feeding forward till, the drill having made its full way into the rock, there is a necessity of feeding forward.

We sometimes, instead of placing the regulator in the position shown, attach a projection to the under side of the cross-head, this projection passing through a slot in the under side of the quill, and answering the purpose of the ring X× on the mandrel. The regulator is arranged then in substantially the same manner, except that the bevel on the regulator-cylinder is, of course, placed on the opposite end of the regulator-cylinder to the end named in the above description. This is merely a modification of our present arrangement, and the effect is simply to change the location of the regulating contrivance, which, in some positions, might be desirable.

The crank Z×, with its handle, Fig. 1, is attached to the feed-screw R× for the purpose of rotating this feed-screw, and thus adjusting the distance of the drill from the rock; also for the purpose of withdrawing the drill from the rock when it is necessary to change the drill.

The contrivance for lifting and lowering the drill is now to be described. This is represented in Fig. 4.

A^0, Fig. 4, is a stout upright screw, provided at its upper and lower ends with appropriate bearings, which screw is placed, looking at Fig. 1, a short distance behind the standard D. In Fig. 4, the end view, it is seen at the side of the standard D. This screw A^0 we sometimes arrange to rotate; but the one represented does not turn, but bears upon it a large nut, called the "lifting-nut," B^0 B^0, Fig. 4, which latter has six holes in it, (three, C^0 C^0 C^0, are seen in Fig. 4,) which, by means of the insertion of a rod or bar, are used to turn the nut B^0 B^0 round. We sometimes use a bevel-gear for this purpose instead of the bar and holes C^0, &c. Two flanges, D^0 D^0, Fig. 4, are firmly fastened to the nut, which flanges come one above and the other below the flange L of the standard-block H, Fig. 4.

It will be seen that the rotation of the lifting-nut B^0 B^0 one way or the other lifts or lowers the whole drill-machine.

We sometimes make a screw of the standard D, using the nut B^0 B^0 and dispensing with the screw A^0.

E^0, Fig. 1, is a cylindrical rubber spring borne on the regulator-shaft K×. F^0 is a washer, and G^0 is a nut, on the end of the shaft K×. The use of this piece of rubber E^0 is as a buffer for the mandrel and drill (the ring X× impinging upon the regulator-ring W×) when the drill reaches any accidental cavity in the rock, the rubber E^0 absorbing the momentum of the shock.

It remains only to describe the drill. Solid drills are used with this machine at pleasure; but the present drill is what we call a "tubular drill." It is marked T in Fig. 1 and T T in Fig. 2, and consists of a hollow cylinder (see Fig. 4) closed at the upper end, and having a projection (seen in dashed lines in Fig. 1) which enters into the mandrel S. The lower end bears six cutting-points, Fig. 4. Three are shown in the side view of Fig. 1. We do not confine ourselves to any special mode of making these points; but in the present case have made them like what is known to machinists as a "burr-reamer."

The object of the longitudinal aperture is to leave a core of stone unpulverized.

The operation of the machine is this: The standard D (with the machine) being put in the desired place, it is firmly fixed by means of the screw-block G. By means of the lifting-nut B^0 the machine is elevated or lowered to the desired position. The screw O being loosened, the rotation of the slide N inclines the machinery to the desired angle. The screw O is then tightened. The drill T being then placed in position, the cam X is turned (by means of the handle A×) so as to permit the cross-head and the mandrel S (and drill T) to slide to its extreme extent of protrusion. If the drill does not then touch the rock, then, by means of the crank (and its handle) Z×, the quill Q Q, with its attachments, is screwed down till the rock is touched. Rotation is then communicated, by means of the handle A×, to the fly-wheel Z and the cam X, which latter, impinging on the cross-head, presses it (with the mandrel and drill attached) back against the spring. At the same time, by means of the eccentric slot B×, the pin C×, the rocker-bar D×, and the attachments connected therewith, hereinabove fully described, the pawl Q× rotates the mandrel S and its attached drill, while the feeding-pawl T× feeds forward the quill Q Q and all that it bears. The cam rotating, the pressure backward is taken away, the spring resumes its normal shape, and the drill T is thrown violently against the rock.

The action of the regulator takes place both at the advance and recession of the drill, and has been heretofore fully described.

What we claim herein as of our own invention, and desire to secure by Letters Patent, is—

1. Suspending the machine bearing slide N upon the same center with the disk M, in combination with the arrangement whereby the slide N can be fastened at any angle, substantially as described.

2. The standard-block H′, in combination with the gibs or friction-pieces J J, when the same is used with rock-drills and constructed, substantially as shown, for the purpose of giving universality of motion horizontally, all substantially as described.

3. Regulating the feed of a rock-drilling machine toward the rock, according to the extent of penetration of the drill into the same, by the arrangement constructed and used substantially as described.

4. The arrangement of a screw-shaft and nut for the purpose of raising and lowering the machine, when used with rock-drills and constructed substantially as described.

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Witnesses:
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