(No Model.)

R. A. FARRAR.

ROCK DRILL.

No. 455,963. Patented July 14, 1891.

Fig. 1.

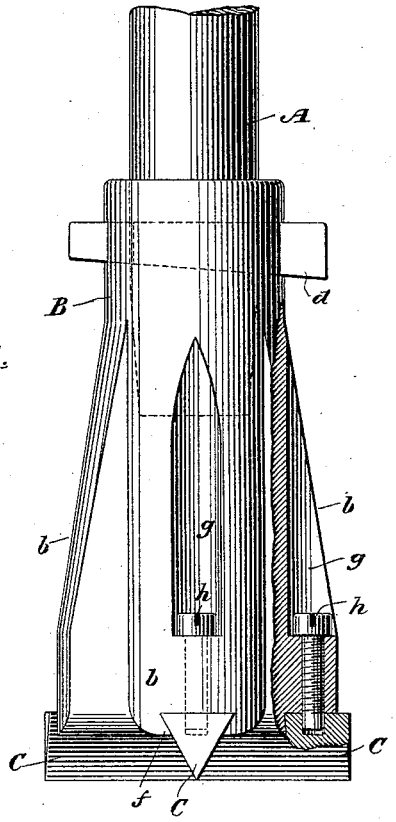


Fig. 2.

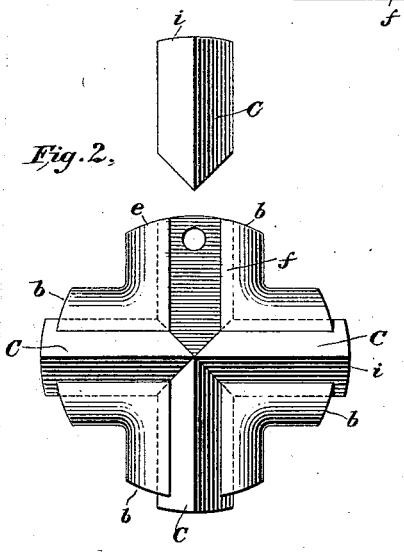
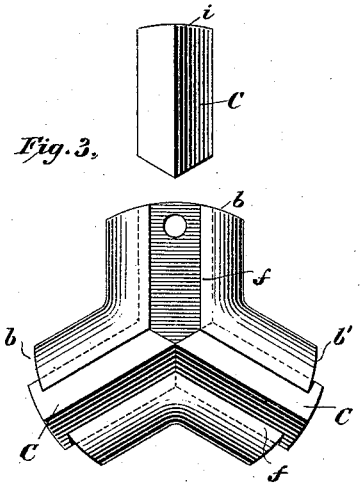


Fig. 3.



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UNITED STATES PATENT OFFICE.

RUFUS A. FARRAR, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO EDWARD W. TINGUE, OF SAME PLACE.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 455,963, dated July 14, 1891.

Application filed October 17, 1890. Serial No. 368,452. (No model.)

To all whom it may concern:

Be it known that I, RUFUS A. FARRAR, of New York city, in the county and State of New York, have invented a new and useful Improvement in Rock-Drills, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings, which form a part hereof.

This invention has reference to the construction of drills for working in rock and hard mineral substances generally.

The object of my invention is to improve the construction of such rock-drills, so as to make them more durable and efficient, to decrease the amount of labor required in keeping them in proper condition for doing work, to decrease their cost, and to increase their working efficiency in proportion to the power expended in their operation.

The best form of my invention is shown in the accompanying drawings, in which—

Figure 1 is a side elevation partly in section. Fig. 2 is a bottom or end view thereof with one of the cutters removed; and Fig. 3 is a bottom or end view of a modification of my invention, being a drill adapted to hold three cutters radiating from a common point, one of the cutters being removed.

My invention consists of certain elements more fully described and claimed in a subsequent part of this specification. Some parts of my invention, however, might be employed in a drill in which the rod and drill-head are made integral with each other.

The drill-rod A is made of any suitable form, and is tapered at the end, so as to fit into a socket in the end of the drill-head B. The rod and drill-head are securely fastened together by a pin *d* (shown in Fig. 1) or by other suitable means. By reason of the improved construction of my drill this rod need not be made of tool-steel, as in the rock-drills heretofore made, but can be made of a cheaper kind of steel. This decreases the cost of my drill considerably.

The drill-head B is solid and is made of machinery-steel or steel castings or wrought-iron and is provided with a solid central portion or body greater in diameter than the diameter of the drill-rod to which it is attached, and with wings *b* projecting radially from the central portion or body of the drill-head and gradually tapering toward the end of the drill-head to which the rod is fastened. The drill-head may be provided with three or more of these projecting wings. These wings are placed at equal distances around the axis of the drill-head, so that the same space or angle is formed between any two adjacent wings. Thus where the drill-head is made with four wings, as shown in Fig. 1, the adjacent wings are at right angles to each other, whereas where the drill-head is made with three wings, as shown in Fig. 3, the adjacent wings are at an angle of about one hundred and twenty degrees to each other. The tapering side or surface of each wing is also rounded at its outer end, as shown in Fig. 2 at *e*, so that the corners or edges of the wing will not come into contact with the sides of the hole that is being bored. The face of the drill-head is provided with undercut grooves, which extend transversely of the axis of the drill-head and along the middle line of the face of each wing *b* and intersect at the center of the face of the drill-head. These grooves are adapted to receive the cutters. I prefer to round off the overhanging portions or lips *f* of each wing, which form the walls of the grooves, as shown in the drawings. Each wing *b* is provided with a recess *g* in its side (shown in Fig. 1) to receive the screw *h* for fastening the cutters in place. This recess is made of such a depth that the head of the screw *h* will not project outwardly beyond the plane or line of the rounded part of the tapering surface of the wing. (Shown at *e* in Fig. 2.)

The cutters C are triangular in cross-section and are fitted to slide in the grooves in the face of the drill-head, so as to be removable. These cutters therefore have their broad bases in contact with the solid drill-head. Their inner ends are shaped so as to exactly fit one another when the cutters are slid into the grooves in the face of the drill-head, thus forming three or more cutting-edges meeting at the center of the face of the drill-head and projecting radially therefrom. If desired, these cutters could be slightly beveled at their inner ends, so as to admit a punch or similar device for the purpose of forcing the cutters apart and out of

the drill-head. The cutting-edges of these cutters are all in the same plane and are at right angles to the direction of the blow. These cutters are made of such a length as to project beyond the outer surface of the wings of the drill-head, as shown in the drawings. The distance to which they project varies somewhat in different sizes of drills; but I prefer to have them project about three-sixteenths of an inch. The cutters are preferably made of the best hardened steel. They are preferably all made of the same length for a given size of drill-head, although in the form shown in Figs. 1 and 2, instead of using four cutters of the same length, three cutters could be used, one being long enough to extend entirely across the face of the drill-head, as if two of the cutters shown in Fig. 2 were made in a single piece. The outer ends of the cutters are also preferably rounded, as shown at *i* in Fig. 2. Each cutter is provided with a hole on its under side, into which the end of the screw *h* may be made to project by screwing up the screw *h*. This serves to hold the cutter in place and prevent its slipping out of the drill-head while the drill is in use. The hole must be made of such a depth with reference to the length of the screw that the end of the screw cannot bear against the cutter in the direction of the length of the screw, but can only bear sidewise against the cutter to prevent its displacement.

Many and important advantages are secured by my improvement.

The cutters, being made separately, can be made of the very best hardened or highly-tempered steel, while the drill head and rod can be made of much cheaper material, thus greatly reducing the cost of the drill. The separate cutters can be handled and manipulated so much more easily than a rod of tool-steel—such as was used in the old style of drill in general use—that the cutting-edges can be given a higher temper and can be made superior in every way to the old style of cutting-edges and yet at a less cost. Thus actual experiment has shown that whereas this old form of drill will only cut about a foot and a half of rock before requiring redressing, my improved drill will cut with one set of cutters twelve feet of rock without redressing or resharpening of any kind. In this old drill when the cutting-edges had been worn down so that they could no longer be used new cutting-edges were formed on the drill by swaging the end of the drill back to its former shape, and thus forming new cutting-edges, and then tempering them. This required considerable time and work and was expensive. In my drill when one set of cutters is worn out I simply replace them with another set at a cost not more than one-third as much as the cost of swaging a drill as above explained. Moreover, the length of the drill rod in these old drills is constantly reduced. The length of my drill-rod is never affected.

My cutters, being triangular in shape, can be more readily made and present a broad bearing-surface to bear against the drill-head and to support the cutting-edge.

In my improved drill the cutters are very firmly supported throughout their entire length, which is of the utmost importance in such a drill, as the drill is in actual use made to deliver from two hundred to three hundred blows per minute with a force of from five hundred to a thousand pounds. The cutters have broad bases, which are supported by the solid central portion of the drill-head and the solid wings projecting therefrom. As the wings of the drill-head taper gradually toward and into the solid central portion of the drill-head, and this in turn is directly supported by the solid drill-rod, every portion of the cutters is supported by a continuous unbroken line of solid metal. This gives great strength to the drill.

Another advantage resulting from my improvement is that there is little or no frictional wear upon the drill-head, except what is caused by the broken or powdered rock which is forced up past the drill-head. One drill-head therefore lasts a long time. Moreover, the drill-head can be made of machinery-steel, steel castings, or wrought-iron instead of tool-steel, as formerly, thus reducing the cost of the drill. The wear from friction is chiefly confined to the cutters themselves, which by reason of their being made as described can be tempered and hardened in the best possible manner to withstand such friction. The drill-rod itself is not worn by friction or reduced in length by swaging. As the cutters are made to fit and bear against one another at their inner ends, they present a substantially continuous cutting edge, thus protecting the drill-head, and support one another against any side strains which might tend to force them sidewise out of their positions in the drill-head.

Any one of the three parts—the rod, the head, or the cutters—can be renewed without renewing the other parts. If but one cutter is broken, it can be replaced without removing the other cutters. These short cutters can be made in large quantities at small expense. My cutters can be made with a cutting-edge having an angle of sixty degrees, whereas in the old rock-drills the cutting-edges could not be made, practically, at an angle of less than ninety degrees by reason of the difficulty of forming the cutting-edges upon the drill edge itself.

Having now described my invention, what I desire to secure by Letters Patent is—

1. In a rock-drill, the combination of a solid drill-head provided with three or more wings projecting radially from the central portion of the drill-head and having grooves in its face running transversely of the axis of the drill-head and extending along the middle line of each wing and intersecting at the center of the face of the drill-head, and removable cutters fitting in said grooves and

bearing against and fitting one another at their inner ends and adapted to slide in said grooves, substantially as described.

2. In a rock-drill, the combination of a solid drill-head provided with three or more wings projecting radially from the central portion of the drill-head and having undercut grooves in its face running transversely of the axis of the drill-head and extending along the middle line of each wing and intersecting at the center of the face of the drill-head, and removable cutters triangular in cross-section fitting in said grooves and bearing against and fitting one another at their inner ends and having their cutting-edges in substantially the same plane and their broad bases in contact with the solid drill-head and adapted to slide in said grooves, substantially as described.

3. In a rock-drill, the combination of a solid drill-head provided with three or more wings projecting radially from the central portion of the drill-head and having undercut grooves in its face running transversely of the axis of the drill-head and extending along the middle line of each wing and intersecting at the center of the face of the drill-head, and removable cutters triangular in cross-section fitting in said grooves and bearing against and fitting one another at their inner ends and having their cutting-edges in substantially the same plane and their bases in contact with the solid drill-head and adapted to slide in said grooves, each of said cutters being longer than the groove into which it fits, whereby the cutters project beyond the sides of the drill-head, substantially as described.

4. In a rock-drill, the combination of a solid drill-head provided with three or more wings projecting radially from the central portion of the drill-head and having undercut grooves in its face running transversely of the axis of the drill-head and extending along the middle line of each wing and intersecting at the center of the face of the drill-head, and removable cutters triangular in cross-section fitting in said grooves and bearing against and fitting one another at their inner ends and having their cutting-edges in substantially the same plane and their bases in contact with the solid drill-head and adapted to slide in said grooves, each of said cutters being longer than the groove into which it fits, whereby the cutters project beyond the sides of the drill-head, and each cutter being rounded at its outer end, substantially as described.

5. A rock-drill consisting of a solid drill-rod, a separate solid drill-head consisting of a central portion of greater diameter than the drill-rod, and three or more tapering wings projecting radially from this central portion, the drill-head having grooves in its face running transversely of the axis of the drill-head and extending along the middle line of each wing and intersecting at the center of the face of the drill-head, and removable cutters fitting in said grooves and adapted to slide therein, and means for holding said cutters in place, substantially as described.

6. In a rock-drill, the combination of a solid drill-head provided with three or more tapering wings projecting radially from the central portion of the drill-head and having undercut grooves in its face running transversely of the axis of the drill-head and extending along the middle line of each wing and meeting at or near the center of the face of the drill-head, each wing having a recess in its side to receive the fastening-screw, and removable cutters fitting in said grooves and adapted to slide therein, each cutter being longer than the groove into which it fits and being provided with a hole on its under side to receive the end of the fastening-screw, and fastening-screws adapted to fit into the recesses in the sides of the wings of the drill-head and to be screwed through the end of the drill-head, so as to project into the holes in the cutters, substantially as described.

7. A rock-drill consisting of a drill-rod, a separate solid drill-head provided with three or more tapering wings projecting radially from the central portion of the drill-head and having undercut grooves in their faces running transversely of the axis of the drill-head and extending along the middle line of said wings and intersecting at the center of the face of the drill-head, and removable cutters fitting in said grooves and adapted to slide therein, each cutter being longer than the groove into which it fits, and suitable means for holding the cutters in place, substantially as described.

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