(No Model.)

# G. W. TOWER.

## METAL BORING TOOL.

No. 359,296. Patented Mar. 15, 1887.

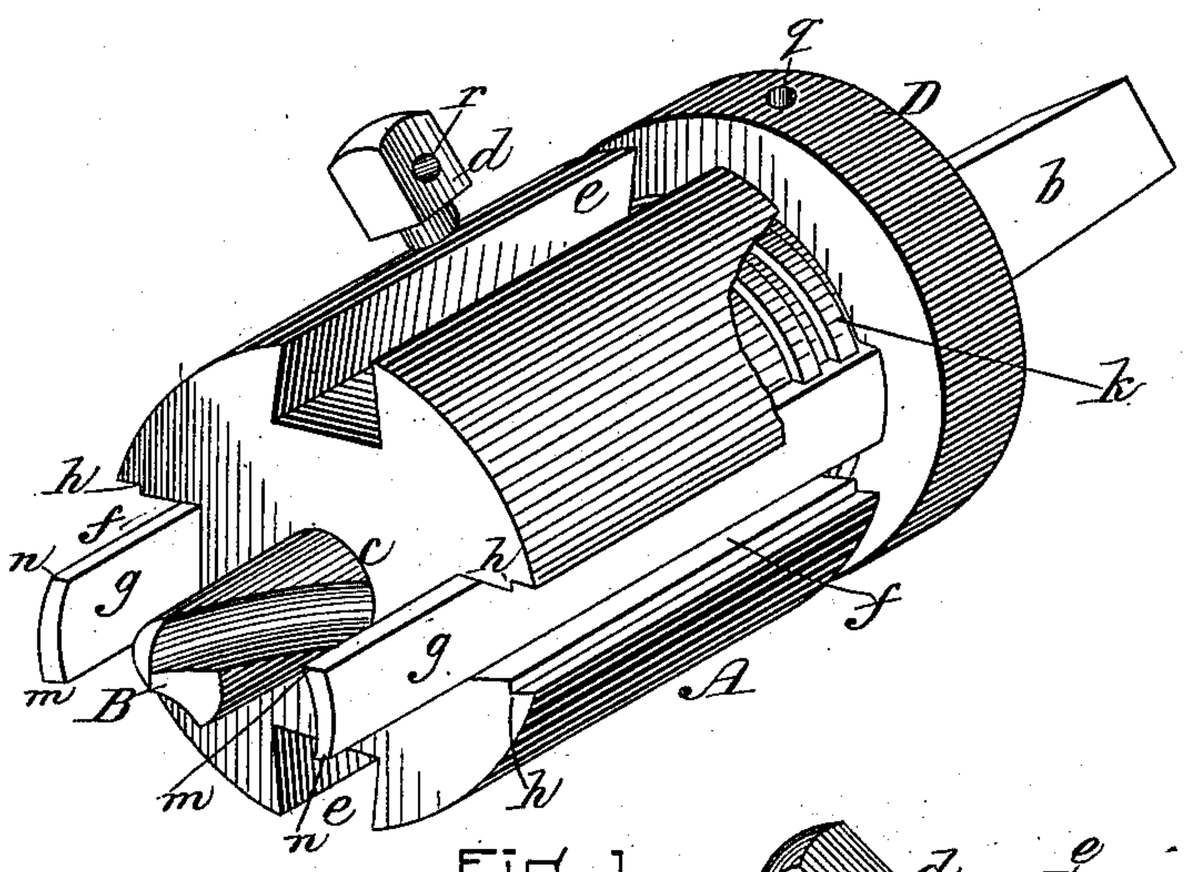


Fig. 1.

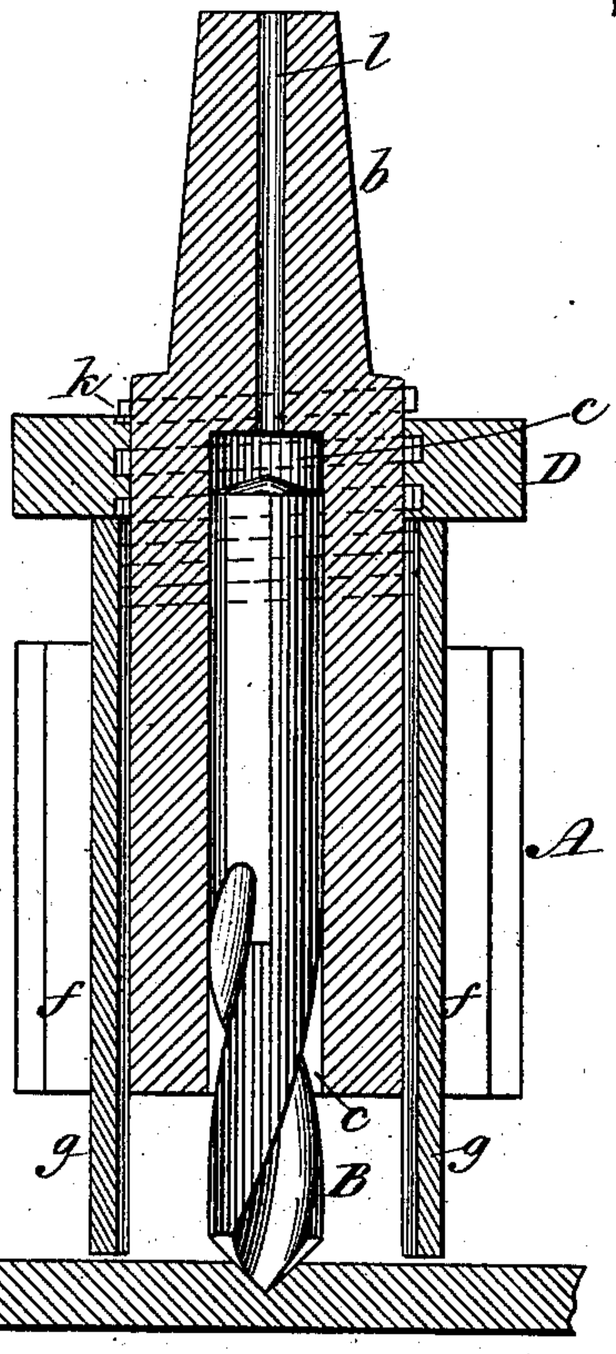


Fig. 2.

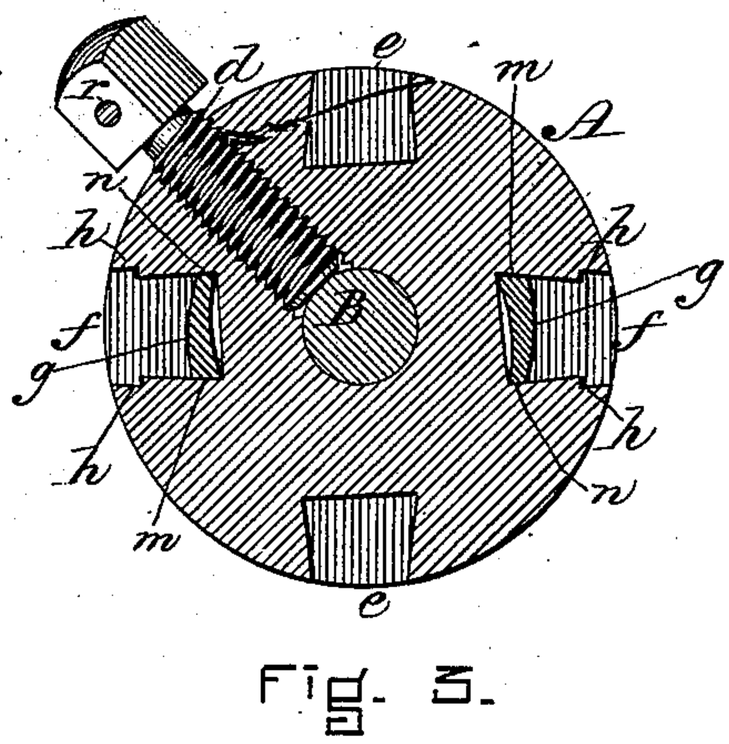


Fig. 3.

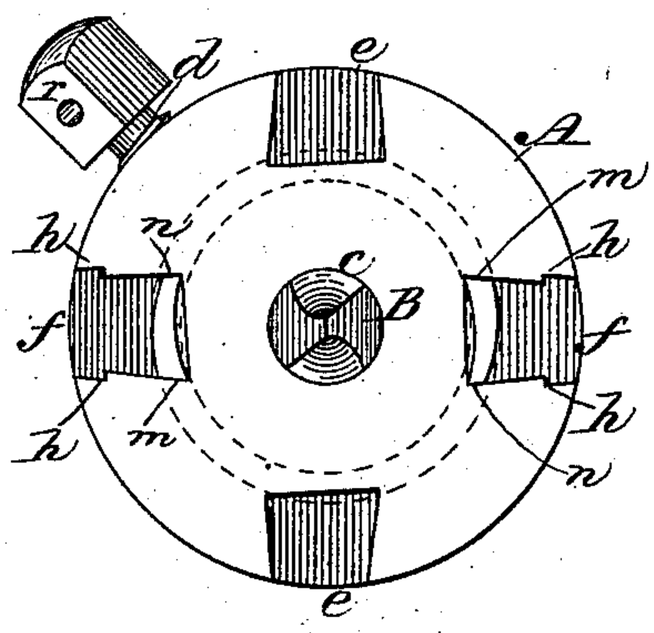


Fig. 4.

WITNESSES.

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# UNITED STATES PATENT OFFICE.

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## METAL-BORING TOOL.

SPECIFICATION forming part of Letters Patent No. 359,296, dated March 15, 1887.

Application filed December 16, 1886. Serial No. 221,810. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. TOWER, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Metal-Boring Tools, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a perspective view of my improved metal-boring tool. Fig. 2 is a longitudinal section of the same. Fig. 3 is a transverse section of the same. Fig. 4 is an elevation of the front end of the same.

My invention relates to certain improvements in that class of boring-tools which are used principally for boring large holes in metal plates, or where a smaller hole has been previously made boring a larger one from the same center to take its place; and my invention consists in certain novel combinations of parts and details of construction, as hereinafter set forth and specifically claimed, whereby a more effective and desirable tool of this character is produced than is now in common use.

In the said drawings, A represents the stock or main portion of the boring-tool, which is of cylindrical form, but may be of other shape, if preferred. This stock is provided at its rear end with a shank, *b*, which is adapted to fit a corresponding socket in the machine employed for rotating the said tool, which can be used either with a hand or power machine, according to the nature of the work to be performed.

At the center of the stock A is formed an axial aperture or socket, *c*, within which is fitted a drill, B, which is adapted to slide longitudinally within said aperture, and when adjusted in the desired position may be clamped securely in place by means of the set-screw *d*.

Around the circumference of the stock A are formed a series of longitudinal grooves, *e f*, within two opposite ones of which are placed the outer cutters, *g*, which bore the hole in the metal by cutting an annular channel therein as the stock A is rotated, these cutters being made adjustable within the grooves *e f* in the direction of their length, whereby they are adapted to project out more or less from the front end of the stock A in accordance with the thickness of the metal in which the hole is to be bored.

The bottoms of the pairs of grooves *e* and *f* are at different distances from the center, and the grooves *f* are provided with shoulders *h*, whereby each of these latter grooves is adapted to hold a cutter at two different distances from the center, and in this manner the cutters *g* can be placed at three different distances from the center to bore holes of as many different diameters. The cutters *g* may, however, be made adjustable radially toward and from the center in any suitable manner other than that shown, in order that they may be set to bore a hole of any desired diameter within the limits of the adjustment.

The rear portion of the stock A is turned down, and is provided with a screw-thread, *k*, over which turns a nut, D, against which bear the inner ends of the sliding cutters *g*, and thus by turning this nut D forward or backward on the screw-thread the cutters *g* may be adjusted longitudinally to cause them to project more or less from the front end of the stock A, in accordance with the thickness of the metal to be bored or cut through. This longitudinal adjustment is an important advantage in a tool of this description, as it is always desirable to have the front ends of the cutters as near to the face of the stock as possible, to afford a better support and render them stiffer. Therefore, when a thin piece of metal is to be bored, the nut D can be turned to enable the cutters to be pushed in so as to project out only a sufficient distance to perform their work, while when a thicker piece is to be bored the nut can be turned to project the cutters farther out, as required. This longitudinal adjustment of the cutters also enables them to be advanced as they become shorter from wear.

*l* is a hole extending from the bottom of the drill-aperture *c* rearwardly through the shank *b*, through which a pin (not shown) can be passed to force out the drill B in case it should stick in the aperture *c*, and this pin, when removed from the hole *l*, can be used to turn the nut D by placing one end in the hole *q* or the set-screw *d*, the head of which is provided with a hole, *r*.

It will be seen that each cutter, which is curved in the direction of its width, as seen in

Figs. 1 and 4, is thicker on one side than the other, causing the cutting-edge *m* to be of the greatest width, the curved face of the cutter gradually diminishing in thickness from *m* to *n*, while the bottoms of the grooves *e* and *f* and the shoulders *h* are lower or nearer the center on one side than the other, which causes the cutters to be inclined slightly in the direction of their width, whereby the inner curved surface of the cutter is made eccentric to the path of rotation, and thus prevented from bearing against the inner wall of the groove being cut in the metal, a perfect "relief" or clearance being thus afforded on both sides of the cutters, as shown by dotted lines in Fig. 4, and undue friction thus avoided.

In using my improved boring-tool the center drill, B, is first set a little in advance of the outer cutters, *g*, and clamped by means of the set-screw *d*. The tool is then rotated until the point of the drill has penetrated the metal to a sufficient depth, as seen in Fig. 2, to prevent any possibility of its slipping, when the outer cutters, *g*, will begin to act upon the metal to bore the hole by cutting an annular channel in the metal, as above described, the center drill, B, serving as a guide to keep the tool in its proper central position while the cutters *g* are performing their work. As soon as the drill B has bored a guide-socket for itself of sufficient depth in the metal, the set-screw *d* is preferably loosened slightly to enable the drill B to be pressed farther back into its socket *c*, as the outer cutters, *g*, cut deeper into the metal, thus avoiding the necessity of boring through the metal with the drill B, and consequently reducing to a minimum the power required to operate the tool, while the liability of either of the cutters falling through the metal when the hole is nearly bored and catching is entirely avoided, thus preventing breakage of the cutters from this cause—an event of frequent occurrence with tools of this description as heretofore constructed. The set-screw *d* must, however, be adjusted to bear on the drill with sufficient friction to prevent its point from slipping out of the socket first bored in the metal as the tool advances. If desired, a spring may be introduced between the set-screw *d* and the drill B, in order to produce a yielding pressure thereon, which will render it easier to produce the necessary amount of friction on the drill to keep its point in the cavity of the metal, and yet allow it to slide back as the tool advances.

By merely drilling a socket or guide-cavity with the center drill, B, instead of allowing it to bore entirely through the metal, a very great advantage is gained when drilling on a curved or uneven surface, as the drill B serves to guide the outer cutters, *g*, both vertically and horizontally, thus preventing them from following the curved or uneven surface of the metal, and also preventing a cutter from suddenly dropping into a blow-hole or flaw in the metal which might be exposed as the cutters advanced, and thus interfere with the rotation of the tool. It is obvious, however, that whenever desired the drill B may be allowed to remain tightly clamped in place within the stock A, to allow it to bore through the metal simultaneously with the outer cutters, *g*, and when a small hole of the same diameter as the center drill has been previously bored and it is desired to enlarge it the drill B is first drawn out a little distance in advance of the cutters *g* and then inserted within the hole, when it will form a perfect guide for the tool, as the cutters bore the larger hole around and concentric with the small one, as required.

I am aware that cutters having the side on which the cutting-edge is formed of greater thickness than the opposite side are not new; hence I make no broad claim to cutters of this description.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a metal-boring tool, the combination, with the stock A, having a central guide-drill, B, made adjustable longitudinally in an axial socket or aperture in said stock, of the outer cutters, *g*, made adjustable longitudinally in suitable guideways, and the nut D, turning on a screw-thread at the rear of the stock and bearing against the rear ends of the cutters *g*, whereby the said cutters may be adjusted to project more or less from the face of the stock A, substantially as and for the purpose set forth.

2. In a metal-boring tool, the combination, with a stock, A, having a central guide-drill, B, made adjustable longitudinally in an axial socket or aperture in said stock, of the outer cutters, *g*, made adjustable longitudinally in suitable guideways in said stock, said cutters being curved transversely and having the side on which the cutting-edge is formed of greater thickness than the opposite side, whereby a relief is formed, substantially as described.

3. In a metal-boring tool, the combination, with a stock, A, having a central guide-drill, B, made adjustable longitudinally in an axial socket or aperture in said stock, of the outer cutters, *g*, made adjustable longitudinally in guide-grooves in said stock, said grooves having their bottoms or shoulders lower or nearer the center on one side than the other, whereby the inner curved surfaces of the cutters are made eccentric to the path of rotation, and said cutters having the side on which the cutting-edge is formed of greater thickness than the opposite edge, whereby a relief or clearance is formed on both sides of the cutters, substantially as set forth.

Witness my hand this 13th day of December, A. D. 1886.

GEORGE W. TOWER.

In presence of—
P. E. TESCHEMACHER,
A. C. DELANO.