

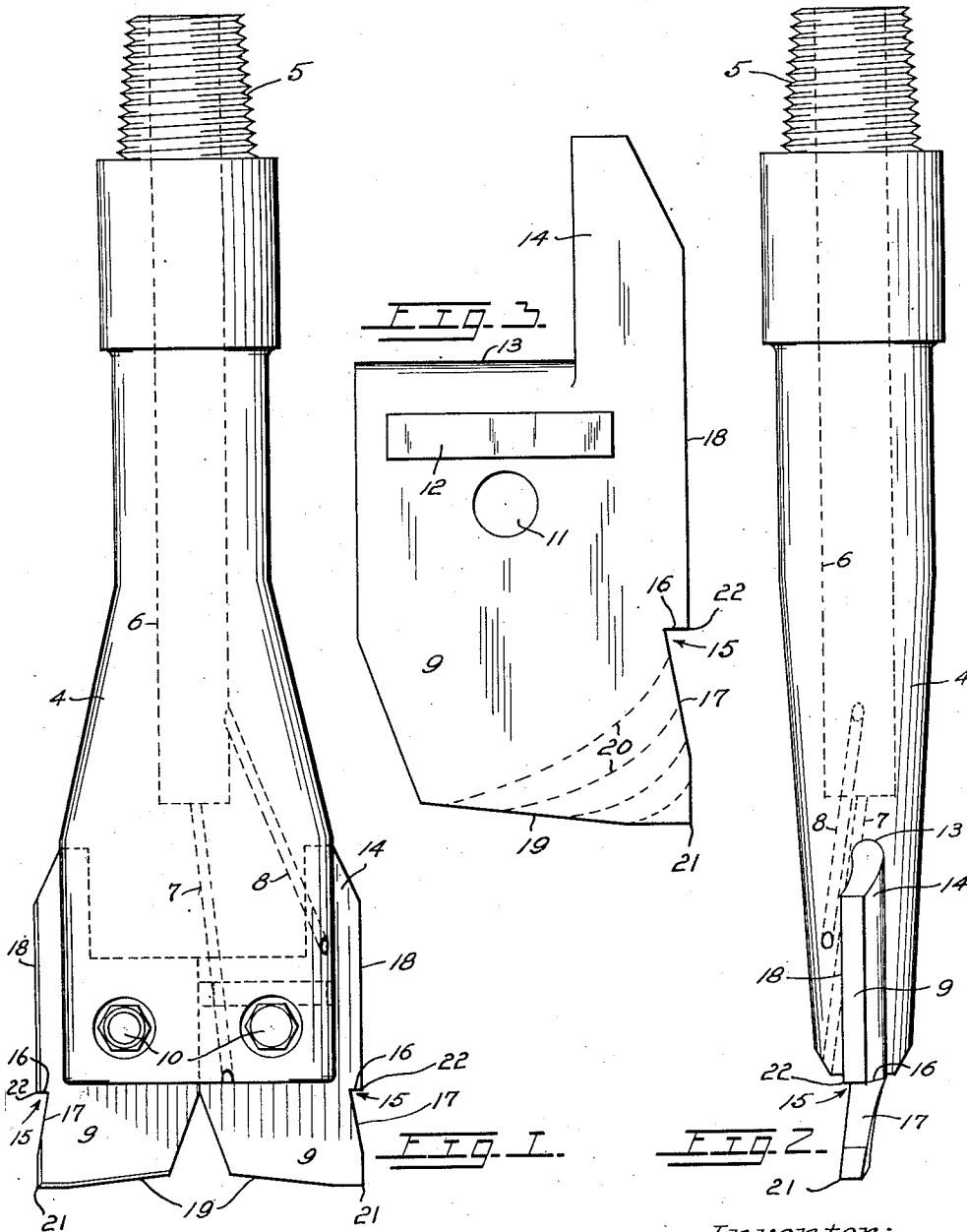
Oct. 18, 1927.

W. W. MILLS

1,645,962

DRILLING BIT

Filed Sept. 2, 1924



Inventor;  
William W. Mills,  
per *Arthur J. Farnsworth*.  
Attorney.

## UNITED STATES PATENT OFFICE.

WILLIAM W. MILLS, OF COMPTON, CALIFORNIA.

## DRILLING BIT.

Application filed September 2, 1924. Serial No. 735,413.

In this specification, and the accompanying drawing, I shall describe and show a preferred form of my invention, and specifically mention certain of its more important objects. I do not limit myself to the forms disclosed, since various changes and adaptations may be made therein without departing from the essence of my invention as hereinafter claimed; and objects and advantages, other than those specifically mentioned, are included within its scope.

My invention relates to drilling bits, particularly to bits adapted for the drilling of deep wells. Among the principal objects of my invention are; first, to provide blades of such character that "the drag" on the bit due to wear will be relatively small and constant; second, to provide means whereby the gauge of the drill hole may be kept substantially uniform and largely independent of the shape of the drilling edge of the bit resulting from wear; third, to provide blades of such shape that, in effect, the drilling clearance will be largely maintained irrespective of the shape to which the cutting edges may be worn; and fourth, to accomplish the above objects in a construction of great simplicity and relatively small cost.

My objects are attained in the manner illustrated in the accompanying drawing, in which—

Figure 1 is a side elevation of my complete improved tool;

Figure 2 is a similar elevation of the tool revolved about its axis ninety degrees from the position shown in Figure 1;

And, Figure 3 is an enlarged side elevation of one of the cutting blades by itself.

Similar reference numerals refer to similar parts throughout the several views.

It is well understood by those familiar with the art of earth drilling that the principal wear occurs at the outer points of the drilling edges. This is due to the greater amount of material encountered at these points by reason of the greater radius and cutting speed. Consequently, the outer corners of the cutting edges quickly become rounded. The rounding not only increases the length and cutting resistance of the edges, but introduces a wedging effect tending further to increase "the drag" on the tool string. Furthermore, the gauge of the drill hole becomes smaller and smaller as the cutting point wears off, so that reaming

operations have to be resorted to from time to time to maintain the gauge of the drill hole and allow depth-drilling to proceed.

In my improved tool I provide a body portion 4 of relatively cheap material such as ordinary cast steel and of very rugged construction adapted for the severe duty that such tools are subjected to. As ordinarily made, this body portion is provided with a taper screw-threaded "pin" 5 adapted for attachment to the ordinary type of tool joint. The body also is provided with interior passages indicated by dotted lines 6, 7, and 8, whereby circulating water may be discharged, in front and adjacent to each of the cutting edges of the tool.

Within the body a pair of cutting blades 9 of high grade heat-treated steel are removably mounted as by bolts 10 passing through bolts holes 11 in the blades. I find it a convenient and satisfactory construction to use a transverse key or feather 12 integral with the blades and a corresponding slot in the body, the blades being inserted transversely in a radial direction. Resistance to the cutting pressure of the blades may be taken up by this key or feather or, if preferred, the pressure may be resisted by the upper edge 13 of the blades. The upstanding portion 14 may be added if desired to assist in the blade alignment and to resist the radial pressure due to reaming.

It is preferable to flatten the lower portion of the body and to make it fan-shaped as illustrated. This lower portion is bifurcated, of course, for the accommodation of the blades.

A distinguishing feature of the present invention resides in notching the lower portion of the outer edges of the blades as shown at 15. Various forms of notches may be employed, but I prefer to use the V-notch illustrated. This notch is formed by cutting an edge straight inward at 16 with a sloping portion 17 extending nearly to the outer corner of the blade as originally formed. The edge 18 of such a blade is parallel to the axis of revolution of the tool and adapted for reaming to maintain the gauge of the drill hole. The depth-drilling is accomplished by means of edge 19.

The wear on blades of the character described is represented in successive stages by the dotted lines 20. The corner 21 will very soon become rounded and as the wear pro-

gresses the depth-cutting edge becomes curved upwardly as shown by lines 20. The reaming edge 18 has comparatively little to do and its effective cutting radius is, therefore, maintained for a relatively long time. Like the depth-cutting edge, the wear on the reaming edge occurs first and chiefly at point 22 which becomes rounded, but inasmuch as this edge is not subjected to radial pressure and encounters a relatively small amount of material, due to the comparative shallowness of the cut, the rounding does not take place very quickly. Furthermore, the upper portions of reaming edge 18 are subjected to very little wear and maintain their gauge throughout the effective life of the blade.

The length of the depth-cutting edge of the blade cannot be increased by wear beyond the length of the upper dotted line 20 when the blade is considered completely worn out. At that time this depth-cutting edge is seen to be only slightly longer than that of the blade when new, and, therefore, the drag has only been increased a slight amount. The rounding of the blade does not introduce any binding due to loss of gauge for the reason that reaming edge 18 constantly maintains the gauge of the hole.

Furthermore, the V-notch 15 provides clearance for the reaming edge.

The construction, operation and advantages of my invention will be readily understood from the foregoing description. I desire, however, to point out particularly the fact that, on account of the comparatively small projection of the blades from the tool body that this construction requires, it is possible to employ thin blades that are relatively inexpensive and which may be scrapped when sufficiently worn without much loss. The tool body itself can be used indefinitely.

I claim as my invention:

1. A drilling bit having a lower cutting end, and cutting sides extending straight upwardly therefrom; said sides having V-notches therein of which the upper edges are substantially perpendicular to the sides.

2. A drilling bit comprising a body, and removable blades extending laterally and from the lower end thereof; said blades having lower cutting ends, and cutting sides extending straight upwardly therefrom; and said sides having V-notches therein of which the upper edges are substantially perpendicular to the sides.

WILLIAM W. MILLS.