May 5, 1936. F. KINZBACH 2,039,427

MILLING CUTTER

Filed Oct. 31, 1933

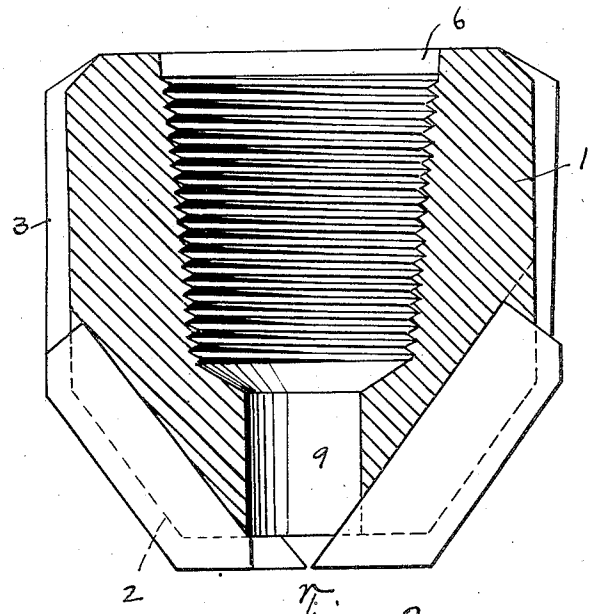


Fig. 2.

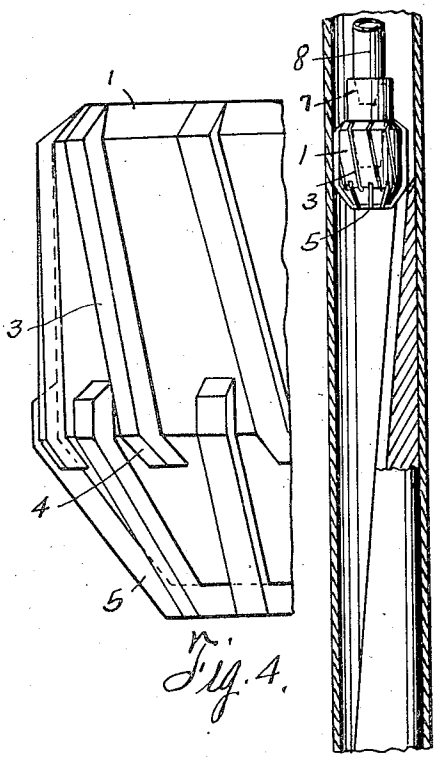


Fig. 1.

Fig. 4.

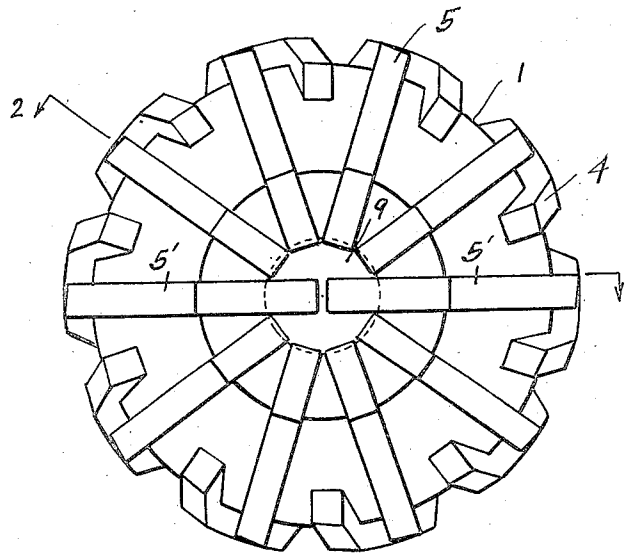


Fig. 3.

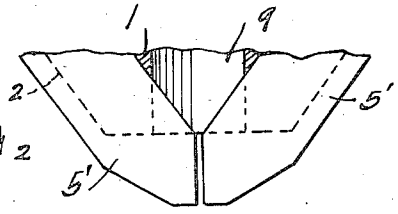


Fig. 5.

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MILLING CUTTER

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3 Claims. (Cl. 29—105)

This invention relates to a milling cutter.

One object of the invention is to provide a cutter of the character described specially designed for the purpose of perforating the side of a casing in a well bore when it becomes necessary to side track the bore in drilling a well.

In drilling a well circumstances often arise making it impossible, or undesirable to continue the original bore and it then becomes necessary to perforate the casing in the bore and form a new bore beneath the perforation. In doing this side tracking, a whip stock, of conventional construction, is secured in the casing at or near where the casing is to be perforated, said whipstock having an upwardly sloping face and the milling tool is attached to a stem and let down into the casing, and rotated between said sloping face and the side of the casing until a perforation is cut through said casing. The milling tool herein described is specially designed for said work.

Another object of the invention is to provide a milling cutter of the character described having spiralled side cutting blades, and having a tapered or beveled nose provided with end cutting blades which are staggered with respect to the side blades and are disposed in common planes with the axis of rotation of the cutter head, the adjacent ends of the side cutters and nose cutters overlapping so as to provide ample cutting edges at the point of greatest work of the tool.

A further feature of the invention resides in the provision of a milling tool having a head and cutters, as described removably mounted therein, and provided with a central water course therethrough with the inner ends of some of the end blades projecting into the water course for the purpose described. With the above and other objects in view, this invention has particular relation to certain novel features of construction, arrangements of parts and use, an example of which is given in this specification and illustrated in accompanying drawing, wherein:—

Figure 1 shows a side elevation of the device in operation in a pipe to be perforated.

Figure 2 shows a vertical sectional view thereof taken on the line **2—2** of Figure 3,

Figure 3 shows an end view thereof.

Figure 4 shows a fragmentary side view, and,

Figure 5 shows a fragmentary vertical sectional view.

Referring now more particularly to the drawing, wherein like numerals of reference designate similar parts in each of the figures the numeral **1** designates the cutter head. This head is substantially cylindrical but its free, or nose, end is beveled or tapered, all the way around, as shown at **2**. The cylindrical portion of the head has the spiralled cutting blades **3** set in grooves in the head with their nose ends **4** slightly beveled off to conform to the pitch of the beveled portion **2**. In staggered relation with the blades **3** are the lower end blades **5, 5'**, which are set in grooves in the beveled end **2** of the head. These blades **5, 5'** are preferably straight, that is each blade lies in a plane passing through the axis of the head. The adjacent ends of the blades **3** and **5, 5'** overlap but are spaced apart thus providing ample cutting edges at the point where the most work is required, and the other ends of the blades **5, 5'** extend radially across the tapered end of said head.

One end of the head has a tapering internally threaded box **6** to receive the adjacent externally threaded portion **7** of a drill stem **8**. The head also has a central water course **9** therethrough so that flushing water may be supplied to the work and the lower ends of the blades **5** extend across the lower end of the head to the water course **9** and the lower ends of the blades **5'** extend across the lower end of the head and into said water course. If the water course were entirely open the milling tool, as it initially cuts through the pipe, might form a core, or projection, in so perforating the casing, which during operations in withdrawing and re-inserting the milling tool, might become distorted or bent inwardly and form an obstruction that would interfere with the work, or which might prevent the milling tool from making a complete perforation such as would permit side tracking therethrough. The fact that the blades **5'** project into the water course **9** will permit the transverse lower ends of the blades **5, 5'** to remove the whole of the area defined by the lower end of the cutter and prevent the formation of this core or projection in making the initial perforation.

The blades **3, 5** and **5'** are removable so that when they become broken or worn they can be removed for the insertion of the new ones, and the cutting edges of the blades **3** are slightly curved outwardly as shown so that said edges will assume an angular relation with the material being operated on and will more readily shear off said material.

While I have shown what I now consider to be the preferred form of the invention it is obvious that mechanical changes may be made therein and equivalents substituted for the parts shown

and I reserve the right to make such mechanical changes and substitutions as may be comprehended within the principle of the invention.

What I claim is:

1. A milling tool including a substantially cylindrical head having a water course therethrough, said head having threads at one end for the connection of a driving stem thereto and being tapered at the other end forming an annular beveled face, a series of side cutting blades on the cylindrical portion of the head whose lower ends overlap said face, at its upper margin only, and are beveled to conform to the shape of said beveled face and a series of end cutting blades on said beveled face whose upper ends overlap the lower end only of said cylindrical portion and are beveled to conform to the beveled lower ends of said side cutting blades, said beveled portions of said blades being staggered with respect to each other, the adjacent beveled ends of the blades of the respective series overlapping, and the other ends of said end blades extending radially across the end of the head to said water course and some of said last mentioned blades projecting into the water course.

2. A milling tool comprising a substantially cylindrical head and being externally beveled at its upper end, said head having an approximately axial water course therethrough and being threaded at its upper end for the connection of a driving member thereto, the lower end of said head being tapered, forming an annular beveled face, a series of side-cutting blades on the cylindrical portion of the head whose upper ends are beveled and whose lower ends overlap said beveled face, the overlapping portions of said blades being beveled to correspond to the bevel of said face, a series of cutting blades on said beveled face and staggered with respect to the side-cutting blades, the upper ends of said end cutting blades overlapping the lower portion of the cylindrical surface of the head, said overlapping ends of said end blades being beveled, all of said blades having flat outer surfaces which terminate in cutting edges at the forward margins of the blades, the lower portions of the end cutting blades extending approximately radially across the lower end of the head, the inner end of at least one of said end blades projecting into the water course, and the inner ends of the other end blades terminating adjacent the wall of said water course, all of said inner ends lying closely adjacent each other to completely shield the lower end of the head around the water course.

3. A milling tool comprising a substantially cylindrical head and being externally beveled at its upper end, said head having an approximately axial water course therethrough and being threaded at its upper end for the connection of a driving member thereto, the lower end of said head being tapered, forming an annular beveled face, a series of side-cutting blades on the cylindrical portion of the head whose upper ends are beveled and whose lower ends overlap said beveled face, the overlapping portions of said blades being beveled to correspond to the bevel of said face, a series of cutting blades on said beveled face and staggered with respect to the side-cutting blades, the upper ends of said end cutting blades overlapping the lower portion of the cylindrical surface of the head, said overlapping ends of said end blades being beveled, all of said blades having flat outer surfaces which terminate in cutting edges at the forward margins of the blades, the lower portions of the end cutting blades extending approximately radially across the lower end of the head, the inner portions of the end cutting blades lying adjacent to form a complete shield around the lower end of the water course.

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