F. A. BABCOCK.

TOOL WITH RADIALLY MOVABLE BLADES FOR CIRCULAR CUTTING.

APPLICATION FILED MAR. 28, 1912.

1,038,819.

Patented Sept. 17, 1912.

2 SHEETS—SHEET 1.

Fig. 4.

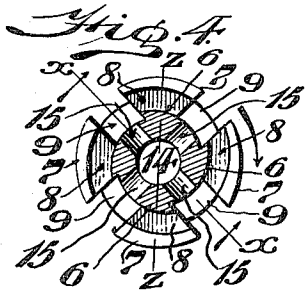


Fig. 1.

Fig. 2.

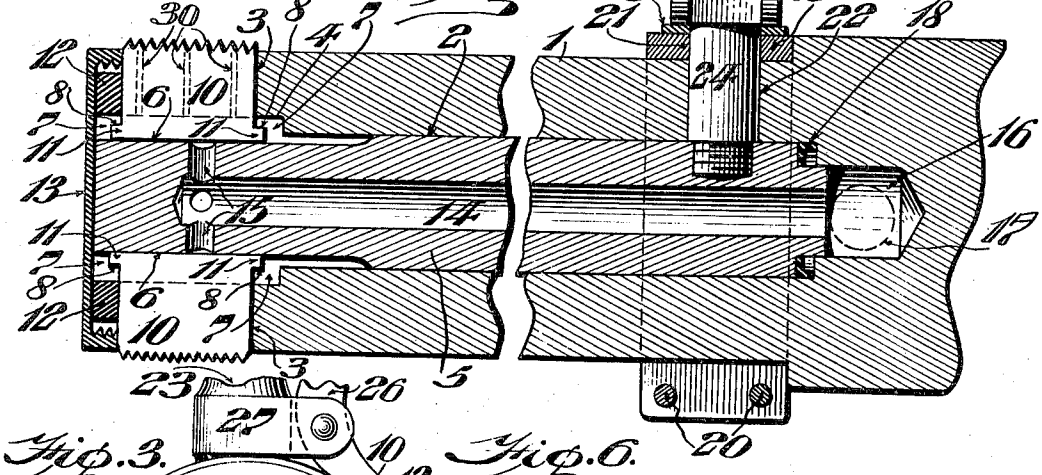


Fig. 3.

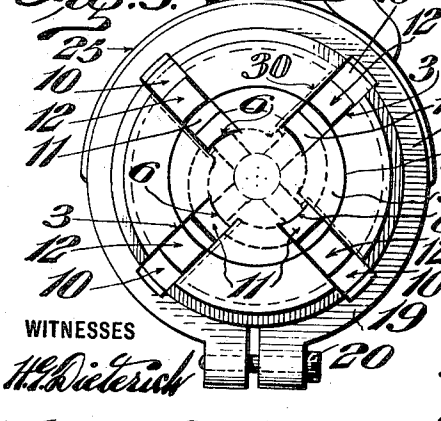


Fig. 6.

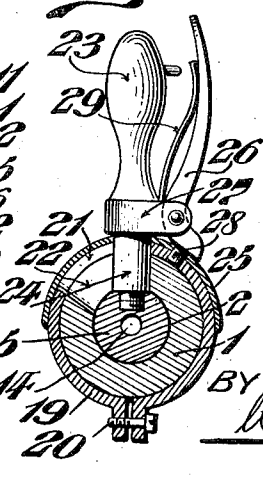
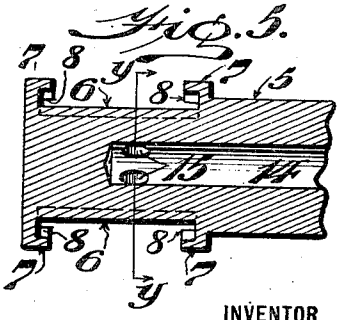


Fig. 5.



WITNESSES

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Fig. 7.

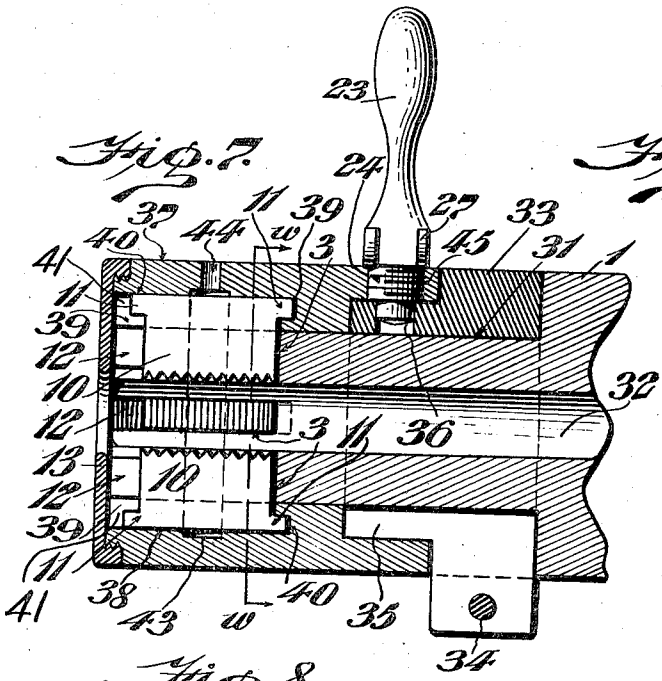


Fig. 11.

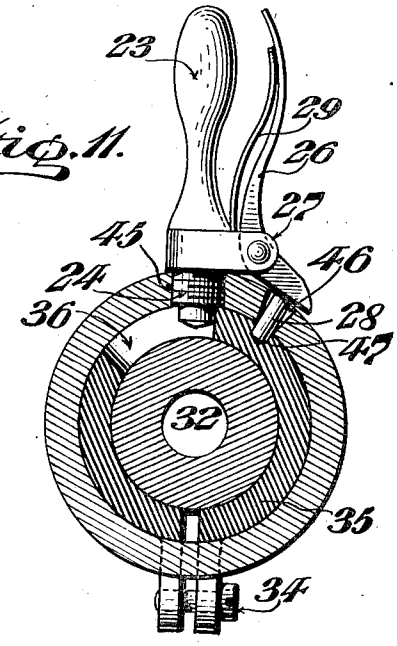


Fig. 8.

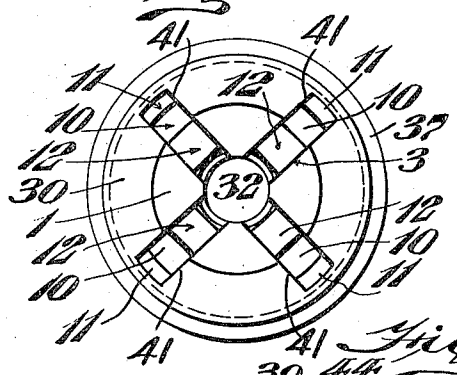


Fig. 9.

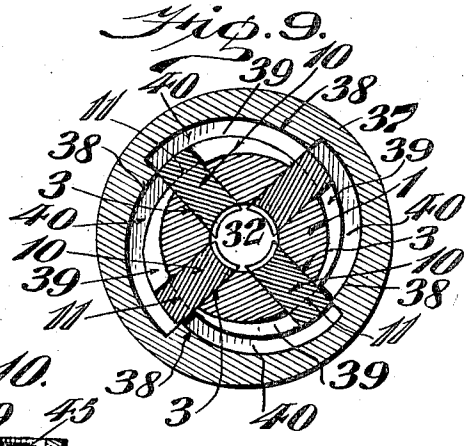
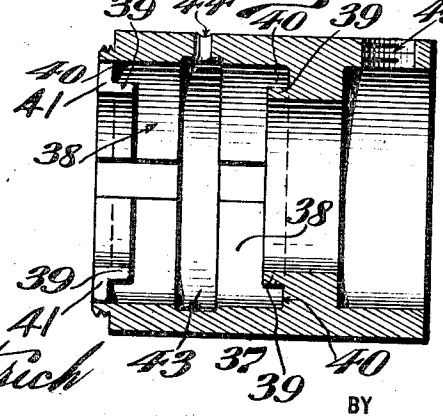


Fig. 10.



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UNITED STATES PATENT OFFICE.

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TOOL WITH RADIALLY-MOVABLE BLADES FOR CIRCULAR CUTTING.

1,038,819. Specification of Letters Patent. Patented Sept. 17, 1912.

Application filed March 28, 1912. Serial No. 686,758.

To all whom it may concern:

Be it known that I, FRED A. BABCOCK, a citizen of the United States, residing at Wyndmoor, Montgomery county, State of Pennsylvania, have invented a new and useful Tool with Radially-Movable Blades for Circular Cutting, of which the following is a specification.

My invention consists of a tool with radially movable blades for circular cutting and provided with a locking device for retaining the blades in working position and again withdrawing the same to remove the tool from the work.

It further consists of such tool provided with means for lubricating the blades and removing the cuttings as the tool progresses.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

The annexed drawings and the following description set forth in detail one mechanical form embodying the invention, such detail construction being but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:—Figure 1 represents a perspective view of my improved cutting tool constructed for tapping and reaming. Fig. 2 represents an axial section of the tool on an enlarged scale, taken on the line *x—x* in Fig. 4. Fig. 3 represents an end view of the tool on the same scale and with the end-cap removed. Fig. 4 represents a transverse section of the cam-core on the line *y—y* in Fig. 5. Fig. 5 represents an axial section of the cam-core on the line *z—z* in Fig. 4. Fig. 6 represents a transverse section through the locking device. Fig. 7 represents an axial section of the tool adapted as a screw-cutter. Fig. 8 represents an end view of the tool with the end-cap removed. Fig. 9 represents a transverse section on the line *w—w* in Fig. 7. Fig. 10 represents an axial section of the detached cam-sleeve. Fig. 11 represents a transverse section through the locking device.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, the reference numeral 1 indicates the spindle of the tool which may be mounted in any suitable or desired manner in a machine such as a boring mill, turret lathe or similar machine tool, to be clamped rigidly while the work is rotated. Said spindle has an axial bore, 2, and radial slots, 3, at its outer end. In the drawings the spindle is illustrated as having four slots but the number of slots may be varied according to the number of blades required. The axial bore of the spindle has an enlarged portion, 4, at the outer end, slightly longer than the slots, and each slot has one or more radial grooves or channels, 30, in both faces. A cylindrical core, 5, fits to turn in the axial bore, and the outer portion of said core is formed with ratchet-shaped cam-bulges, 6, and with corresponding oppositely projecting cam-flanges, 7, at the opposite ends of the bulges, forming cam-grooves, 8. In the illustrated form, four cam-bulges are shown and the cam-flanges are shown as each having four radial slots, 9, which may be brought to register with the radial slots in the spindle. Blades, 10, are radially movable in the radial slots in the spindle and have lugs, 11, projecting at the ends of their inner edges to engage in the cam-grooves of the cam-core while said inner edges bear against the cam-bulges upon the same. Blocks, 12, are inserted in the radial slots of the spindle to bear against the ends of the blades, and a screw-cap, 13, is screwed upon the reduced and screw-threaded end of the spindle to retain such blocks and the blades. The cam-core has an axial bore, 14, extending from near the outer end, where it has radiating channels, 15, opening in the cam-bulges, and opening at the inner end into a chamber or bore, 16, in the inner end of the axial bore of the spindle and having an oil-hole, 17, or similar means for conveying oil into said bore. The inner end of the tubular cam-core is reduced to enter the chamber, and a packing 18, is placed between the shoulders thus formed. A split clamping-ring, 19, is clamped by bolts, 20, upon the spindle, preferably at the inner end of the axial bore, and said ring and the spindle are formed with circumferential segmental slots, 21 and 22, respectively, which register with each other. A radial handle, 23, has its inner end, 24, passed through said slots to rock in the same, and secured in the cam-core. A guard, 25, surrounds a part of the split ring to cover the slot in the same, and is secured to the handle. A latch, 26, substantially L-shaped, is fulcrumed between ears, 27, upon

the handle, and has a lug, 28, on its short arm, engaging an opening in the split ring when the handle is rocked to cause the cam-core to force the blades into their extreme outward position. A spring, 29, bears against the grip-portion of the latch to snap such lug into such opening.

When the tool is to be used for tapping a bore the tool is properly secured in a machine and the work secured in a rotating head. The handle is now first turned by releasing the latch to cause the cam-grooves to draw the blades inward so that the end of the tool may enter the bore. When the tool has entered the bore, and the work is rotated the blades are gradually forced outward by turning the handle in the opposite direction to start, the cut and the blades are held in working position when the lug of the latch snaps into the opening in the split ring. Oil, water, soap-suds or alkaline solutions or other liquid lubricant are injected through the axial bore of the cam-core, to lubricate the cutting blades and to wash away the cuttings, or a current of air or steam may be blown through the bore to blow such cuttings from the blades and clear the hole wherein the tool operates. When the tool is employed as a reamer, reaming blades are substituted for the threading blades. The current of fluid thus injected will keep the blades clean and also completely clear the bore of all cuttings, so that the tool will work freely and may be employed in bores of any depth without jamming or clogging. The radial channels in the faces of the slots will admit of free passage for the fluid to the cutting faces of the blades and into the bore which is tapped or reamed.

In Figs. 7 to 10, inclusive, another embodiment of my invention is illustrated, in which the tool is employed as a thread-cutter. In said form the spindle 1 has a reduced end, 31, formed with an axial bore, 32, and with the radial slots 3, in which the blades 10, having the lugs 11 at the ends of their cam-contacting edges, slide radially. Blocks, 12, fit in the ends of the slots and bear against the outer ends of the blades. A split sleeve, 33, is clamped upon the reduced portion of the spindle by means of a clamping bolt, 34, and the outer portion 35, of said sleeve is reduced and formed with a circumferential segmental slot, 36. A cam-sleeve, 37, is fitted to rotate upon the reduced end of the spindle and upon the reduced end of the split ring, and the outer portion of the interior of said sleeve has cam-bulges, 38, corresponding to the radial slots in the spindle, and oppositely projecting cam-flanges, 39, at the ends of said cam-bulges to form with the latter cam-grooves, 40, into which the lugs at the ends of the blades engage. The cam-flange at the end of the sleeve has slots, 41, which may be brought to register with the slots in the spindle, so that the blades may be slipped into or out of the slots from the end of the tool. A screw-cap 13 is screwed onto the end of the cam-element and has in this form of tool a central opening, 42, for the insertion of the bolt or rod to be threaded. The interior of the cam-sleeve between the cam-flanges, has an annular groove, 43, having an oil-hole, 44, through the sleeve. Said oil-hole may be suitably connected to a source of a suitable lubricant or air under pressure, similar to such connection in the above described device, and the function of the fluid current is similar. A handle, 23, similar to that in the former construction, has a portion of its inner end, 24, screw-threaded, and screwed through an opening, 45, in the inner end of the cam-sleeve, and the innermost portion of said inner end is smooth and movable in the segmental slot of the sleeve secured upon the spindle. The handle is provided with the latch 26, pivoted between the ears 27 and having the lug 28 and spring 29, like the handle in the first-described form, and the lug of the latch passes through a hole, 46, in the cam-sleeve and engages a hole, 47, in the sleeve on the spindle when the blades engage the work. The operation of the second tool is similar to that of the first device but reversed, the blades moving inward to the work instead of outward. The blades are moved inward and outward by rocking the cam-element in its relation to the slotted spindle-element by means of the handle, and the handle is locked by the latch when the blades engage the work.

By constructing the blades with lugs at both ends and the cam-element with cam-flanges engaging both of said lugs on each blade, the blades are maintained true during their radial movement and all tilting of the blades is prevented. The radial slots in the outer cam-flange admit of the blades being inserted in their slots in the spindle-element when said former slots are brought to register with said latter slots, thereby admitting of such flange being integral with the cam-element, thus simplifying the construction of the tool and reducing the number of its parts. All that is necessary to remove and reinsert a blade is to remove the cap and a block, draw the blade out and replace it and then replace the block and cap.

As tools of this character are subject to considerable strain and are usually not attended by skilled machinists, it is evident that simplicity of construction with the accompanying strength, is quite important.

Other modes of applying the principle of my invention may be employed for the mode herein explained. Change may therefore

be made as regards the mechanism thus disclosed, provided the principles of construction set forth, respectively, in the following claim are employed:

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

In a tool with radially movable blades for circular cutting, a spindle element formed with radial slots having open outer ends, a cam-element supported by said spindle-element and formed with cam-bulges and with circumferential cam-flanges at the opposite ends of said bulges and having cam-grooves upon their opposed faces corresponding to said cam-bulges and the outer flange having slots corresponding to the slots in the spindle-element, one of said elements rotatable in its relation to the other, blades radially movable in the slots of the spindle-element and having lugs at both ends engaging the cam-grooves and having their edges bearing against the cam-bulges, a cap secured to bear against the ends of the spindle and cam element to close the ends of the slots therein, and means for rotating the movable element.

FRED A. BABCOCK.

Witnesses:
C. D. McVAY,
M. C. Fox.