(No Model.) 2 Sheets—Sheet 1.

W. W. DOOLITTLE.

COLLAPSIBLE TAP.

No. 505,268. Patented Sept. 19, 1893.

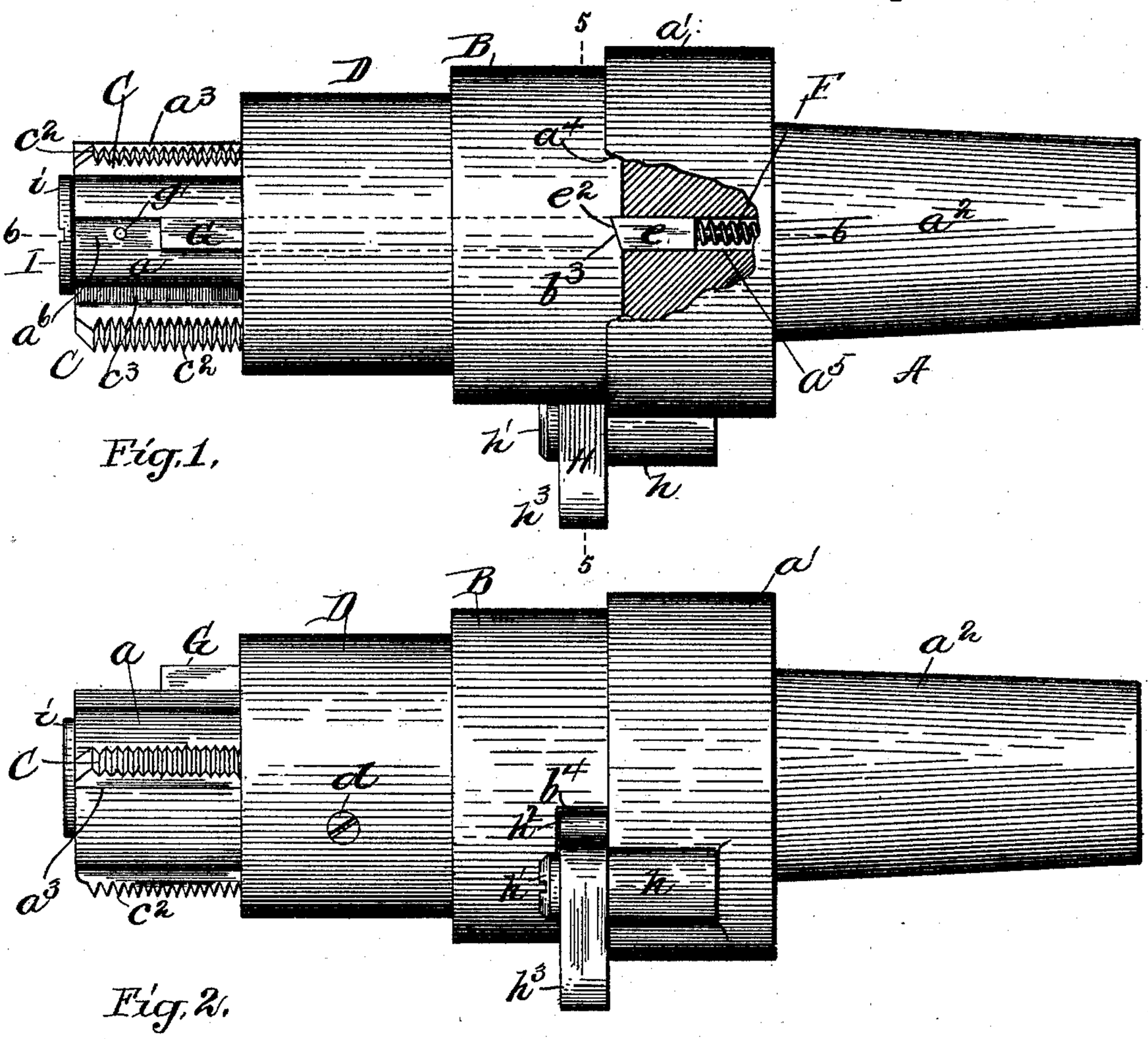

Fig. 1.

Fig. 2.

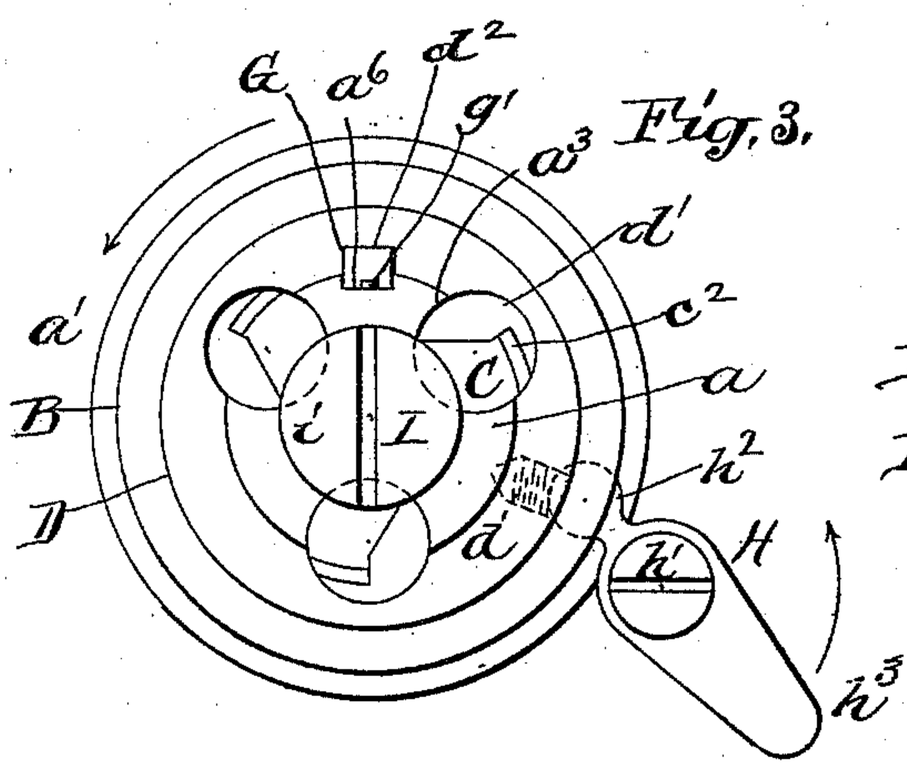

Fig. 3.

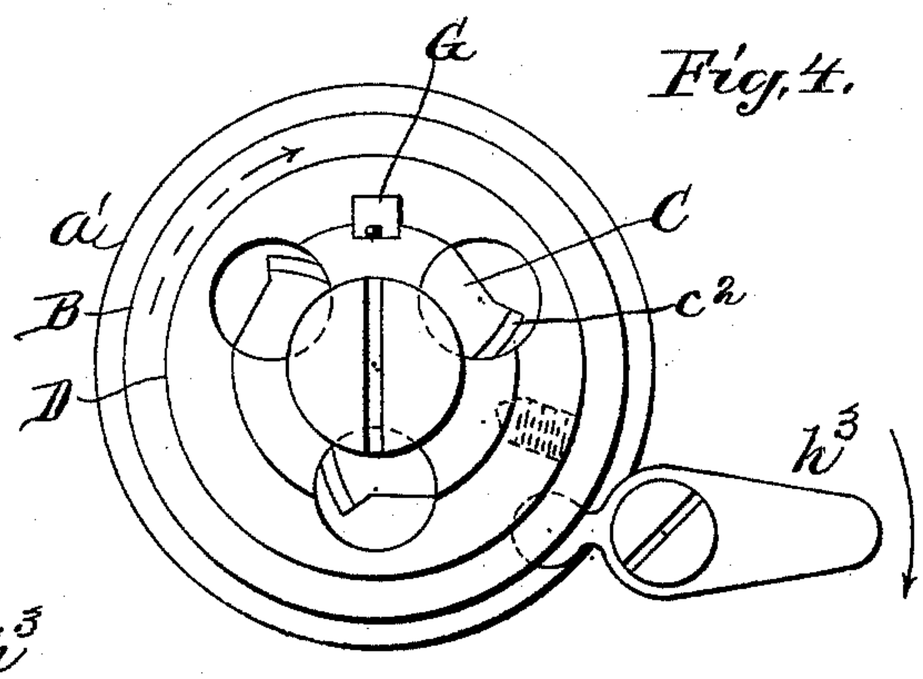

Fig. 4.

Witnesses,
W. C. Corlies
S. W. Brainard,

Inventor,
William W. Doolittle,
By Coburn & Thacher
Attys.

(No Model.)

2 Sheets—Sheet 2.

W. W. DOOLITTLE.

COLLAPSIBLE TAP.

No. 505,268. Patented Sept. 19, 1893.

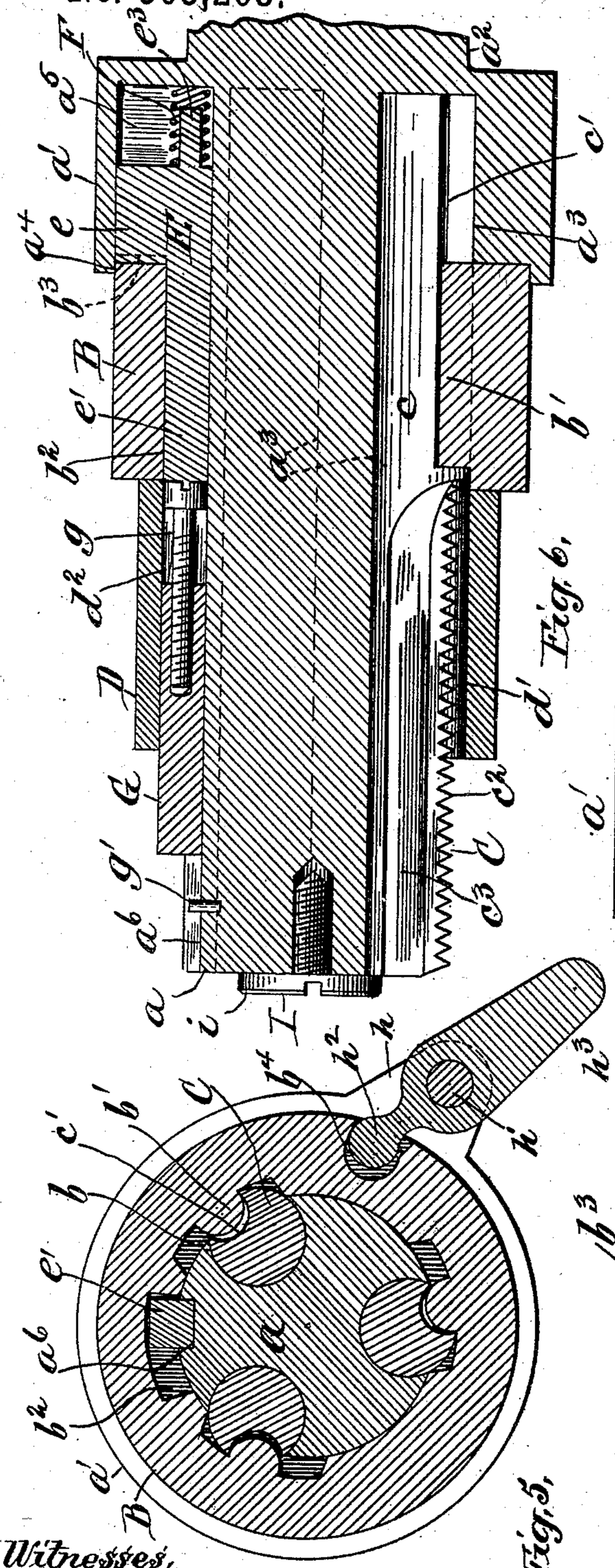

Fig. 6, Fig. 9, Fig. 10, Fig. 8, Fig. 7, Fig. 5,

Witnesses,
W. C. Curtis
S. W. Brainard.

Inventor.
William W. Doolittle.
By Coburn & Thacher
Attys.

UNITED STATES PATENT OFFICE.

WILLIAM W. DOOLITTLE, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE CRANE COMPANY, OF SAME PLACE.

COLLAPSIBLE TAP.

SPECIFICATION forming part of Letters Patent No. 505,268, dated September 19, 1893.

Application filed December 19, 1892. Serial No. 455,652. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. DOOLITTLE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Collapsible Taps, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a plan view of a tap embodying my invention, with a small portion of the top, or head, broken away; Fig. 2, a side elevation of the same; Fig. 3, a front elevation of the same with the cutters in working position; Fig. 4, a similar elevation with the cutters collapsed; Fig. 5, a cross-section of the same on the line 5—5 of Fig. 1; Fig. 6, a longitudinal section of the same on the line 6—6 of Fig. 1; Fig. 7, a rear end elevation of the cutter actuating ring detached; Fig. 8, a detail side elevation of the rear portion of the head, the surface being partially broken away; Fig. 9, a perspective view of the connecting latch, and Fig. 10, a similar view of the latch actuating slide detached.

In the drawings Figs. 1 to 4 inclusive are upon one scale and Figs. 5 to 10 inclusive upon another and enlarged scale.

My invention relates to the class of taps referred to in my prior patent, No. 481,648, dated August 30, 1892, and in some general features of construction is the same as shown and described in said patent; the cutters are substantially the same and are in like manner mounted in grooves in the holder, and there is a ring, or band, surrounding these two parts, while the cutters are oscillated, to be turned in and out of working adjustment, by a differential movement between the holder and this ring; but the means and method of effecting the collapse are different from that in my said prior patent and some of the parts are somewhat different in construction.

The object of my invention is to automatically collapse the tap by the required turning of the cutters, without reversing the rotary movement of the tool.

I will now give a detailed description of the construction and operation of a tap in which I have embodied my invention in one practical way, and will then point out definitely in claims following this description the particular improvements which I believe I have invented, and which I desire to secure by Letters Patent.

In the drawings A represents the head and cutter-holder of the tap, which in this instance are made in one piece, or general head, the cutter-holder a running about the length of the device and having an enlargement a' at its rear end, forming a kind of head at this extremity and provided with a shank, or stem, a^2 extending from the back thereof for fastening the tap to the mandrel. In the part a which is cylindrical, there are cut in the surface longitudinal grooves a^3, which extend along the entire length of this portion of the head, and are also carried into the enlarged portion a' and nearly through the same but leaving a covering, or cap, inclosing them in this part, as seen in Figs. 6 and 8. These grooves are like those in the cutter-head of my prior patent, that is, they are circular in cross-section and the contour of this cross-section is something greater than half of the circle on which the grooves are struck. A ring, or collar, B is mounted loosely on this holder just in front of the head portion a', as seen in Figs. 1 and 2. This ring is slightly less in diameter than a', and the latter is cut out a little, thus providing a seat for the ring, with a short flange a^4 projecting just over the edge thereof. A device is also provided whereby the ring and head may be connected and disconnected, which will be described presently.

The cutters C are almost identically the same as those described and shown in my said prior patent. The cutter-head is of considerable length, so as to provide for long cutters, the latter when new being of a length corresponding to the grooves in the holder, which, as already stated extend about the entire length thereof. The cutters are made from small cylinders which conform in size to the grooves in the cutter-holder. The rear end of each cutter is left in cylinder form, so that there is quite a section c, at this end of the original size and shape of the cutter blank, except as hereinafter described, which is adapted to be seated in one of the grooves in the cutter-head. In one side of this cyl-

inder section there is cut a shallow longitudinal groove c', which is also concave in cross-section. Just in front of this groove and on the same side of the cylinder, the latter is cut away slightly to the front extremity thereof, and there is formed on this part a section c^2 of cutting teeth, running lengthwise of the cylinder and being slightly depressed or lying slightly within the circumference of the cylinder proper. At one side and in front of this toothed section the body of the cylinder is cut out still more, so as to form a rather deep groove c^3 extending the length of the toothed section, and being almost in line with the groove c', while the line of cutting-teeth is almost outside the latter.

A band, or collar, D is fitted upon the cutter-head just in front of the loose ring B and is fastened to the head by means of a screw d, or any other suitable device. It is provided with grooves d' on its interior surface running lengthwise thereof, for the accommodation of the cutters, which, of course, normally stand out somewhat beyond the circumference of the holder, and so this fixed collar must be provided with the said grooves, for the reception of the projecting portion of the cutters and the oscillation therein of the latter. This fixed collar provides protection for the cutters and also serves as a stop at the front of the loose band; in one sense it is a dust ring. The loose ring B is provided with a series of wide shallow grooves b cut in the inner surface thereof, and extending the length of the ring. These correspond in number with the cutter-seats in the holder, and about midway of the width of each there is left a section uncut, so as to form a kind of rib b' running midway of the groove, which is adapted to fit into the longitudinal groove c' in one of the cutters; the rib being of circular contour conforms to the said groove. The said ring is also provided with a groove b^2 running parallel with the grooves b and arranged between two of the latter, as seen in Fig. 5. This groove is for the purpose of determining the oscillation of the ring on the holder, or of the latter within the former, as will be presently described. Now, this loose ring in its normal mounting, as seen in Fig. 6, surrounds the cylindrical ends, or shanks, of the cutters and engages with the latter by means of the ribs, as just described. Obviously, any differential movement between this loose ring and the cutter-holder will oscillate the cutters themselves in one direction or the other, whereby they are either turned up into working position, or turned back into a corresponding position, just the same as set forth in my prior patent. I will now describe a mechanism, whereby such differential movement is effected automatically, and without reversing, or even stopping, the rotation of the tap. A latch, or pawl, E is constructed and adapted to connect the loose ring B with the head a' of the holder. This latch is constructed with a rectangular head e, which is adapted to be fitted in a similar rectangular seat a^5 sunk into the head a' from the inner face thereof, as seen in Figs. 1 and 6. Beyond this head the latch is cut down very considerably and projects out underneath the loose ring, the seat for the latch in this portion of the holder being a shallow groove a^6, which runs out to the front end of the latter. This smaller section, or shank, e' extends out just underneath the loose ring, as seen in Fig. 6. The head of the latch is provided with a beveled face e^2, whereby it is adapted to engage with a notch b^3 in the rear edge of the ring B, the latter being arranged so as to embrace the shank of the latch within its groove b^2, as seen in Fig. 5. This latch, or pawl, is free to slide in its seat longitudinally of the holder, and is provided at its rear end with a pin, or lug, e^3, which serves to support a coiled spring F arranged in the seat space in the rear of the sliding latch and acting normally to thrust the latch outward and cause it to engage with the notch in the loose ring, as seen in Figs. 1 and 6. In order to disengage the latch from the ring, I provide a slide G, which is set in the long seat groove a^6 in front of the latch and underneath the fixed ring, or band, D, which is provided with a longitudinal groove d^2, for this purpose, as seen in Fig. 6, and the slide projects normally in front beyond the fixed ring, so that its front end will extend out on the cutting portion of the tap, as seen in Figs. 1, 2 and 6. In the rear end of this slide is set a screw g, the head of which is intended to rest against the front end of the latch shank, so that a pressure on the outer, or front, end of the slide will act to force the latch inward and so disengage it from the loose band D. The screw g, being adjustable in the slide, the extent of the projection of the latter beyond the fixed band can be nicely regulated, so that the point on the tap where the slide stops at rest can be determined with great accuracy. A pin g' may be set in the track of the slide, and just in front thereof, to limit its forward movement, and so prevent its slipping off from under the fixed band.

In the outer surface of the loose band B, and near the rear edge thereof, there is cut a shallow socket b^4. A lever H is pivoted to the head of the holder, there being, as shown in the drawings, a rib h raised on the surface of the latter, which device forms a bearing for the pivot pin h' of the lever. The inner short arm h^2 of this lever is adapted to enter the socket in the surface of the ring B, just described, so that the vibration of the lever will, obviously, oscillate the said band with reference to the cutter-head and holder. The tail h^3 of the lever extends out some little distance beyond the pivot, so that it may be engaged by any suitable device for swinging the lever on said pivot.

The operation is as follows: The sliding latch, or pawl, is put in its seat and the loose band slipped over the holder in place against the head thereof. The slide is arranged in

its seat and the protecting band is slipped over the holder against the loose band and secured in place. The cutters C are slid into their seats from the front end of the holder, either before or after the bands are mounted in place, and a screw-button I, seated in the front end of the cutter-holder, is turned into place, its broad disk *i* reaching over the ends of the cutters, as seen in Fig. 3, thereby securing them in position. The lever H is turned down in the position shown in Fig. 3, which sets the cutter-head and movable band relatively to each other, so that the teeth of the cutters stand in the elevated and outward position, as seen in said Fig. 3, which is their working adjustment. The parts are now in position and adjustment, as seen in Figs. 1, 2 and 6. The tool is now rotated, as usual, by any suitable means and the ordinary operation of tapping is performed in the usual way. But the parts are so adjusted, with reference to the work, that a little before the desired operation of tapping is completed the article being tapped will strike the projecting end of the slide G; the latter will be forced back by the continued operation of tapping, thereby gradually forcing back the sliding latch, or pawl, until finally the latter is completely disengaged from the movable ring. It is intended that this disengagement shall take place just at the completion of the operation of tapping.

It will be seen that the sole means by which the cutters are held up, so that their teeth are in working position, is the movable ring secured to the head; otherwise the cutters would oscillate backward by the resistance of the work against the teeth, immediately upon being brought into contact therewith and so turn into a collasped position. Now, the moment the ring is released from the head, as just described above, there is no longer anything to hold the cutters up to work, and hence, they will turn backward against the resistance of the latter, as just explained, to the extent that the oscillation of the freed band is permitted. This oscillation of the band is determined by the groove which embraces the slide G, as seen in Fig. 5, and is sufficient to permit the cutters to turn backward in their seats far enough to throw the teeth entirely out of cutting position, as seen in Fig. 4.

It will be seen that the entire operation is automatic and that the rotation of the tap is continued right along in the same direction in which ordinary work is performed. When it is desired to resume work the lever H is swung on its pivot from the position seen in Fig. 4 to that in Fig. 3, by which movement the ring is turned forward, thereby oscillating the cutters forward into working position, and the spring latch, or pawl, under the influence of its spring, slides into engagement again with the ring, and the tap is in working order. The lever may be actuated by an attendant, or any suitable fixed stop may be provided, against which the lever will strike when in the position seen in Fig. 4, and be turned down into position, in Fig. 3, in which it will pass the stop. In the latter case the whole operation of collapsing and resetting the tap will be automatic, but the automatic resetting is not of very great importance.

In all details of special devices, and special construction and arrangement of the same, it is not necessary that the description and drawings herein should be followed without change, for there may be many mechanical variations in these details, without departing from the controlling plan of operation upon which the tool is intended to operate, as herein set forth; and such changes I contemplate in the practical application of the invention.

This invention is also applicable to threading dies in its main features of construction and operation. In such case, however, the parts must, of course, be reversed in relative position; the cutters must be inside a hollow holder and the movable ring must be connected thereto by pins, or some like device, passing down through the holder to engage with the cutters; and such other mechanical changes as are necessary to adapt the invention to this relative change in the cutters and holder must be made.

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

1. In a collapsible tap, a cylindrical holder provided with longitudinal grooves, in combination with cylindrical cutters mounted in said grooves, and automatic mechanism whereby said cutters may be turned in their seats to position of collapse automatically and without stopping the normal rotation of the tap, substantially as described.

2. In a collapsible tap, the cutter-holder *a* with enlargement, or head, *a'* and longitudinal grooves a^3, in combination with cylindrical cutters C seated in said grooves, a loose band B mounted on the cutter-holder around the cutters and connected to the latter, a stop device to limit the oscillation of the band on the holder, and a connecting device whereby the loose ring may be connected and disconnected with the head of the holder, substantially as described.

3. In a collapsible tap, a cylindrical cutter-holder provided with longitudinal grooves a^3, in combination with cylindrical cutters C seated in said grooves, a loose band B mounted on the cutter-holder around the cutters and connected to the latter, a stop device to limit the oscillation of the band on the holder, a device for connecting and disconnecting said band on the holder, and mechanism whereby said connecting device is operated automatically, without stopping the tap, substantially as described.

4. In a collapsible tap, the cutter-holder *a* provided with head *a'* and grooves a^3, in combination with cylindrical cutters C having grooves *c'*, band B mounted loosely on the

holder and provided with ribs q' adapted to engage with the cutters, and spring latch E acting normally to connect said band with the head a', substantially as described.

5. In a collapsible tap, a cylindrical cutter-holder a and head a' provided with grooves a^3, in combination with cylindrical cutters C, loose band B connected to said cutters and having a limited oscillation around their holder, the spring latch E, and actuating slide G adapted to be operated while the tap is in motion, substantially as described.

6. In a collapsible tap, the main head A provided with longitudinal grooves a^5, in combination with the cylindrical cutters C provided with toothed section c^2 and grooves c', c^3, a loose band B provided with ribs b', adapted to engage with the cutter grooves c', and with a groove b^2, the spring latch E, seated in the head, adapted to engage with the loose band and having a shank e' passing underneath the band B in the groove b^2 therein, a collar D fixed on the cutter-holder and provided with groove d^2, and the slide G seated underneath the fixed band D and arranged to slide back and forth in said groove therein, substantially as described.

7. In a collapsible tap, a cylindrical holder provided with longitudinal grooves a^3, in combination with cylindrical cutters C seated therein, a loose band B surrounding said cutters and connected thereto, a stop adapted to limit the oscillation of said band, an automatic mechanism for disconnecting the band and holder, and a device for returning the band to working position, substantially as described.

8. In a collapsible tap, the cutter-holder a and end head a', in combination with cylindrical cutters C mounted in grooves in said holder, the loose band B surrounding and connected to the cutters, the spring latch E arranged to connect the said band with the head a', and the lever H pivoted to the head and engaging with the loose band, substantially as described.

WILLIAM W. DOOLITTLE.

Witnesses:

ROBERT C. PAGE,

W. C. CORLIES.