

P. J. GREBEL.

TAP.

APPLICATION FILED AUG. 28, 1911.

1,059,453.

Patented Apr. 22, 1913.

3 SHEETS-SHEET 1.

Fig. 1.

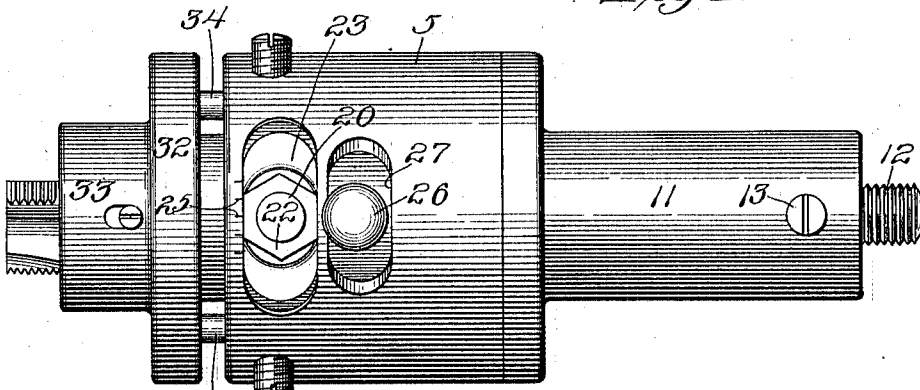


Fig. 2.

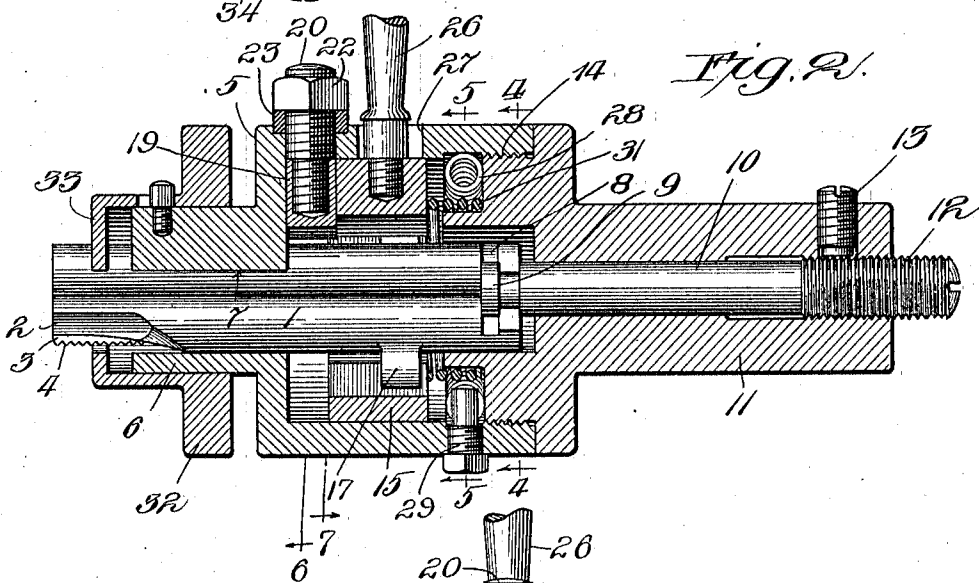
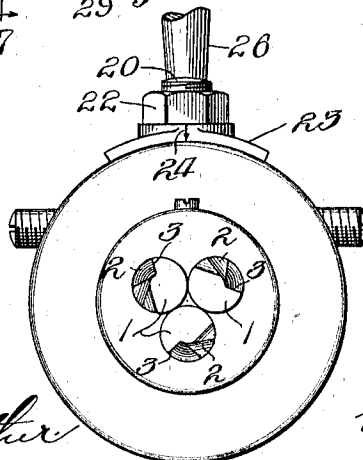


Fig. 3.



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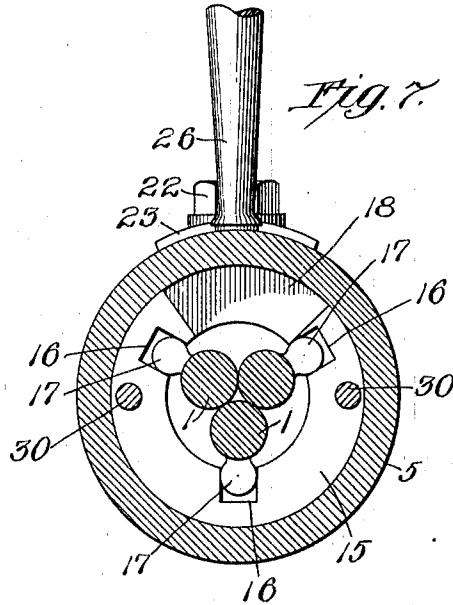
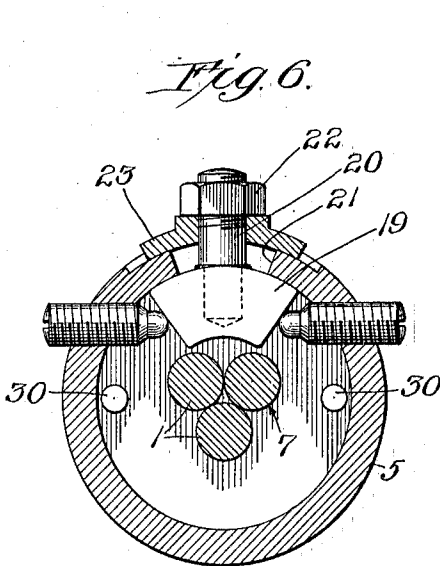
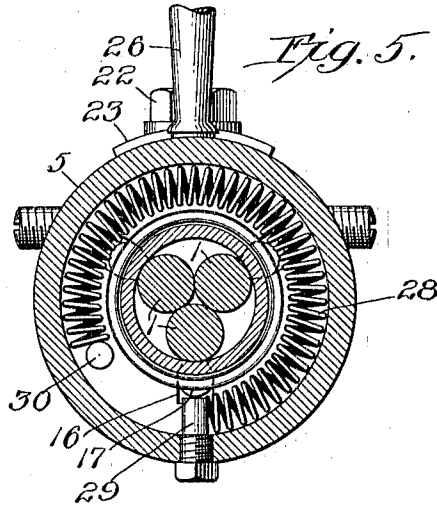
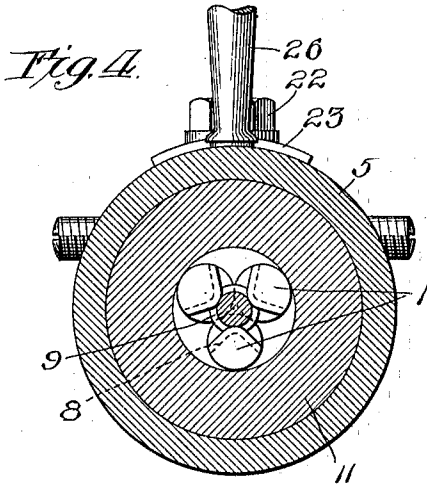
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3 SHEETS-SHEET 2.

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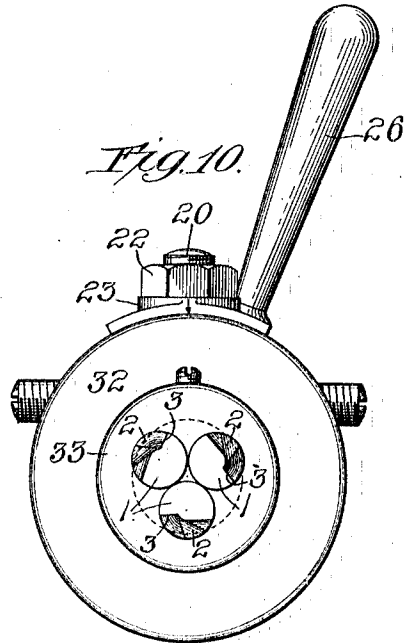
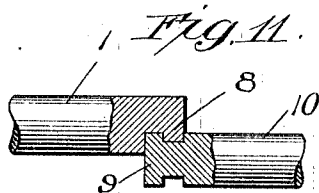
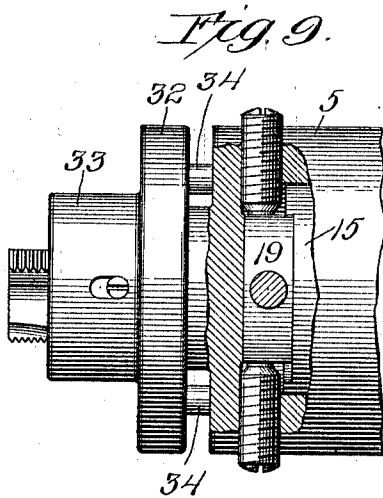
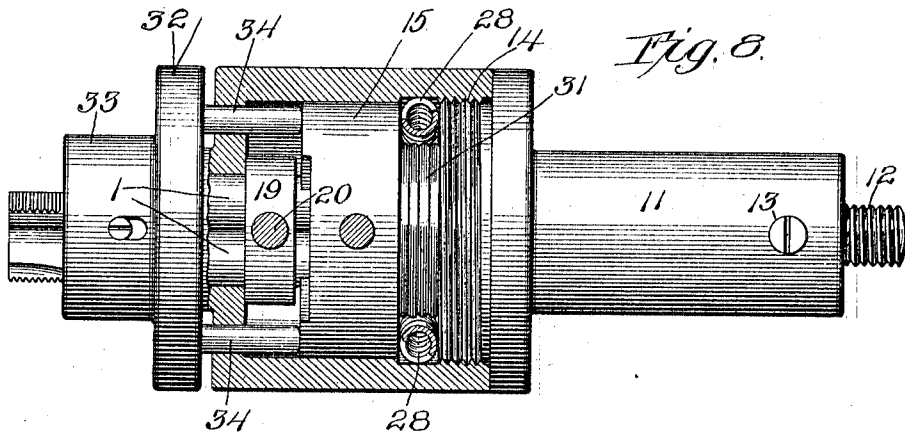
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3 SHEETS—SHEET 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

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TAP.

1,059,453.

Specification of Letters Patent.

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Application filed August 28, 1911. Serial No. 646,391.

To all whom it may concern:

Be it known that I, PAUL J. GREBEL, a citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have
5 invented a certain new and useful Improvement in Taps, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use
10 the same, reference being had to the accompanying drawings, which form a part of this specification.

The primary object of my invention is to produce a simple and efficient collapsible
15 tap.

A further object of my invention is to produce a tap which may be nicely adjusted to take up wear and which may be sharpened without changing its effective diameter.
20

A further object of my invention is to produce a collapsible tap which, in working, acts the same as a one-piece tap.

A further object of my invention is to produce a collapsible tap device in which the tap will be automatically collapsed after the desired number of threads have been cut.
25

The various features of novelty whereby my invention is characterized will herein-
30 after be pointed out with particularity in the claims; but, for a full understanding of my invention and of its various objects, including those heretofore enumerated, among others, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a top plan view of a device arranged in accordance with a preferred form of my invention; Fig. 2 is a central vertical section taken through the longitudinal axis of the device shown in Fig. 1; Fig. 3 is a view looking toward the right in
40 Figs. 1 and 2; Figs. 4, 5, 6 and 7 are respectively sections on lines 4—4, 5—5, 6—6, and 7—7, of Fig. 2; Fig. 8 is a view of the device partly in plan and partly in section; Fig. 9 is a plan view of one end of the device with a portion of the casing broken away; Fig. 10 is a view similar to Fig. 3
50 showing a different position of the parts; and Fig. 11 is a detail showing the connection of one of the "chasers" or tap members with the adjusting member.
55

In the drawings I have illustrated my invention as embodied in a device having a three-part tap and, for the sake of brevity, I shall confine the detailed description to this single embodiment; but it will of course
60 be understood that my invention is not limited to the particular number of parts in the tap any more than it is to certain other structural details which I have illustrated.

The tap proper, about which the remainder of the device is built, is preferably made up of a series of cylindrical bars lying side by side in engagement with each other and having rolling contact on each other. In this way the several bars mutually support
70 each other throughout the length of the tap and therefore give to the tap substantially the stiffness and rigidity of a single solid member. A piece is cut away at one end of each of the bars so as to provide an edge
75 in which the cutting teeth may be formed. It is evident that by rolling the bars upon each other, each about its own axis, the radial distance from the axis of the tap to the cutting edges is varied. I make use of this
80 principle to secure accurate adjustment of the tap so as to obtain just the desired diameter and also for the purpose of collapsing the tap so as to permit it to be withdrawn from the tapped opening by a direct
85 axial movement; it being seen that if the rotation of each of the bars is great enough, the cutting teeth will be drawn so far toward the center of the tap that they will clear the threads which have been cut there-
90 by in the work.

Referring now to the drawings 1, 1, 1 represent three cylindrical bars lying side by side in engagement with each other. Sections are cut away at the sides of the
95 bars at corresponding ends as indicated at 2. This produces cutting edges as indicated at 3, and in these cutting edges are formed the teeth 4 of the tap. The several bars are held in proper relation to each other within
100 a suitable casing 5 which has preferably an elongated neck 6 at one end thereof for the purpose of giving a bearing surface of considerable length. The bearing opening 7 through the neck preferably takes just the
105 shape of the cross section of the assembled bars, thereby causing the proper relation between the bars to be maintained at all times. Each of the bars is provided with a hook 8 at the end opposite that having the teeth, 110

the several hooks being adapted to engage with a head 9 on the end of an adjusting stem 10; the parts being so proportioned that when the three bars and the adjusting stem are assembled together with the several hooks hooked over the head of the adjusting stem, relative axial movements between the several parts is prevented but each part is free to rotate about its own axis.

10 The elements which I have heretofore described are so proportioned that the cutting ends of the several bars project out beyond the neck of the casing when the bars are assembled in the casing with the adjusting member extending out through the back of the casing. The adjusting member preferably extends through an elongated neck 11 which forms the shank by which the tool is held, the outer end of the stem being screw-threaded as at 12 so as to permit it to be screwed in and out for the purpose of varying the extent to which the tap projects beyond the casing. After the desired longitudinal adjustment has been obtained the adjusting stem may be locked in place by means of a suitable set screw 13.

It will of course be understood that the casing may be formed in as many pieces as may be desired, this being a matter which depends upon the methods of manufacture and the manner in which it is desired to assemble the various parts. In the arrangement shown the casing is in the form of a cylindrical member having at one end an integral head provided with the neck 6, the other end of the casing being open and being closed when the parts are assembled by means of the shank 11 which is screw-threaded into the open end of the casing as indicated at 14. As will hereafter appear, this arrangement necessitates the withdrawal of the members of the tap through the rear of the casing. If desired, however, the neck 6 may be bushed, the bearing opening 7 being arranged in the bushing and the diameter of the bushing being great enough to permit the withdrawal of the tap members with the bushing. Such a bushing will also have the advantage of being a replaceable member for which a new one may be substituted whenever the bearing becomes worn.

Surrounding the tap at a point within the casing is a heavy collar 15 which is free to rotate through a limited angle about the axis of the tap and has also a limited movement in the longitudinal direction. As will be seen most clearly from Figs. 2 and 7, the member 15 is provided with a series of internal longitudinal grooves or channels 16 corresponding in number with the number of bars in the tap. Each of the bars has a rounded lug 17 which extends into one of the grooves or channels in the surrounding collar. This arrangement permits the collar to be moved in the longitudinal direction with-

out disturbing the tap elements but if the collar is rotated each of the tap elements will be swung about its own axis. It will thus be seen that by turning the collar in one direction or the other the cutting teeth on the tap will be moved in or out depending upon the direction in which the collar is turned, this manipulation of the collar serving to bring the tap from a working position to a collapsed position and vice versa.

75 In the front face of the collar is a shallow segmental notch 18 large enough to receive loosely a segmental block 19 rigidly secured within the casing directly in front of the collar. It will be seen that when the collar is turned so as to bring the notch opposite the block 18 and is then pushed forward so that the block is received in the notch, the collar and consequently the tap elements are locked against rotary movements, this being the condition in which the parts are placed during the cutting operation. After a hole has been tapped the collar is slid back and is then free to be turned so as to collapse the tap and permit its withdrawal from the tapped opening. It is not necessary that the block fit snugly into the notch because the tap turns only in one direction during the cutting process and therefore, if there is a slight lost motion between the block and the collar, this will be taken up at the beginning of the cutting process and the tap elements will thereafter be rigidly held. I make use of the block 19 to adjust the diameter of the tap within limits depending upon the size of the tool. It will be seen that by shifting the angular position of the block in one direction, the collar will be brought to rest with the cutting teeth of the tap a little closer to the center of the tap than before and consequently the effective diameter of the tap is reduced. By shifting the block angularly in the opposite direction the turning of the collar and of the tap elements is not arrested until the cutting edges have traveled outward away from the center of the tap so that the effective diameter of the tap is greater than it was before. The adjustment of the block 19 may conveniently be effected by securing the block in place by means of a stud 20 which passes through an elongated slot 21 in the casing. By loosening the stud, or a nut thereon, the block may be shifted angularly within the limits of the slot, and may then be locked again in its adjusted position. In the arrangement shown the stud is provided with a nut 22 on its outer end and a curved washer 23 is placed between the casing and the nut. The washer may be provided with a suitable index 24 which coöperates with a graduated scale 25 on the casing, thereby enabling the workman to set the block rapidly and accurately. The collar may be moved both angularly and longitudinally by means of a

suitable handle 26 secured thereto and projecting upwardly out of the casing through an elongated slot 27 which is also wide enough to permit a limited movement of the handle longitudinally of the casing. By means of the handle the tap elements may be turned in either direction and may be locked together in the manner heretofore explained.

It is desirable that devices of this kind shall be more or less automatic, thereby decreasing the time required to tap an opening and leaving the workman as free as possible to give his attention elsewhere. To this end I have provided means whereby the tap will be automatically collapsed whenever a predetermined number of threads have been cut in a piece of work, the tap being again placed in its cutting condition and locked there upon a simple manipulation by the workman of the handle 26. In the arrangement shown there is placed behind the collar 15 a coiled spring 28 one end of which bears against a stop 29 fixed to the casing and the other end of which bears against a pin or stop 30 projecting rearwardly from the collar. The spring is made long enough so that when placed in position it is under an initial tension and the stops are so located that the tension of the spring is exerted in the direction to collapse the tap. A second spring 31 is placed between the collar and the rear end of the casing, this spring being also under an initial tension and tending simply to push the collar forward. Slidably mounted on the neck 6 of the casing is a follower 22 which has an inwardly extending flange 33 extending into proximity to the tap. Normally the flange 33 is at some distance in front of the front end of the neck so that the follower as a whole may be moved back a limited distance. Projecting back from the follower, preferably at diametrically opposed points, are pins 34 which extend through the front wall of the casing and engage with the front face of the ring or collar 15. The movement of the follower is sufficient to permit the pins, when the follower is pushed back, to force the collar away from the stop block, leaving the collar free to turn. As soon as the collar is free from the block the spring 28 expands and rotates the collar as far as it will go, thus collapsing the tap. When the pressure upon the follower is removed the spring 31 moves the collar forward until its front face strikes the block 19. However, the notch in the collar no longer registers with the block and therefore the collar and the block are not interlocked with each other. To replace the tap in working condition it is only necessary for the workman to swing the handle 26 from the position indicated in Fig. 10 toward or past the position indicated in Fig. 3, this bringing the notch into registration

with the block and the spring 31 thereupon forcing the collar forward far enough to seat the block into the notch and thus lock the elements of the tap in their working position. It will of course be understood that the tap is adjusted by means of the adjusting stem so that it projects just far enough beyond the flange of the follower to cause the follower to be engaged by the work and forced back so as to collapse the tap just as the tapping of the hole in the work is completed. It will thus be seen that the tap automatically disengages itself from the work at the end of the tapping operation and is held in its collapsed condition until the workman pulls upon the handle 26. In this way there is no danger that the tap will become reengaged with the work after it has once been disengaged therefrom and consequently the tap may be drawn out of the work or the work drawn away from the tap without paying any further attention to the tap. Similarly after the workman pulls the handle for the purpose of expanding the tap again, he is not required to pay any further attention to the tap because it is automatically locked and stays in the locked condition until it is released automatically through the operation of the follower or manually by a backward pull upon the handle 26.

It will thus be seen that I have provided a simple and efficient collapsible tap which is almost wholly automatic in its action; which obviates the necessity of unscrewing the work from the tap; and which permits the tap to be adjusted accurately to take up wear. It will furthermore be seen that I have provided means whereby the number of threads to be cut may be varied quickly and conveniently. There is a further advantage which I have found in operation and that is that the tap keeps itself clean. The large chips which are cut out by a tap usually drop out of the way but, particularly in the softer metals, there is a fine dust which collects between the cutting teeth and, if left there, clogs the tap. In my arrangement there is a short quick backward turning movement of the cutting teeth as the tap is collapsed and I have found that this effectually removes the dust and keeps the tap clean. The cutting edges on the tap elements or "chasers" may be made as long as is desired so that whenever it is necessary to sharpen the tap a little can be ground off the end thereof and the whole tap may then be pushed forward a distance equal to the depth of the portion ground off. Thus the effective diameter of the tap is not decreased but instead a sharp cutting edge is formed at the end of the tap and an entirely new tooth or part of a tooth is brought out into the cutting zone by bodily shifting the tap forward.

While I have illustrated and described only a single preferred form of my invention, I do not desire to be limited to the particular structural details thus illustrated and described; but intend to cover all forms and arrangements which fall within the terms employed in the definitions of my invention constituting the appended claims.

I claim:

1. In a device of the character described, a tap comprising a plurality of cylindrical members, a casing having bearings therein for supporting said members in rolling contact with each other, corresponding ends of said members projecting from said casing and having cutting edges thereon, means for locking said members against relative rotary movements with the cutting edges in cutting positions, and means for rolling said members on each other when in unlocked condition so as to swing said cutting edges inwardly toward the axis of the tap.

2. In a device of the character described, a tap comprising a plurality of cylindrical members, a casing having bearings therein for supporting said members in rolling contact with each other, corresponding ends of said members projecting from said casing and having cutting edges thereon, means for locking said members against relative rotary movements with the cutting edges in cutting positions, a work-engaged part co-operating with said means to unlock said members, and means for rolling said members on each other when in unlocked condition so as to swing said cutting edges inwardly toward the axis of the tap.

3. In a device of the character described, a casing, a tap divided longitudinally into a plurality of members each supported in said casing so as to be revoluble about an axis parallel with the axis of the tap and slidable longitudinally, one end of the tap projecting beyond the casing and having cutting edges thereon, a member carried by the casing and adjustable in the direction of the axis of said tap, a connection between the latter member and the members of the tap holding them against relative longitudinal movement and permitting relative turning movements, and means for turning the members of the tap relative to each other so as to bring the cutting edges into working positions or carry them inwardly toward the axis of the tap into inoperative positions.

4. In a device of the character described, a casing, a tap mounted in the casing and projecting therefrom at one end, said tap comprising a plurality of cylindrical members lying side by side in engagement with each other, means for holding the members of the tap against longitudinal movement, a collar surrounding said tap at a point within the casing, said collar having a limited

turning movement about the axis of the tap and a limited movement longitudinally of the tap, coöperating shoulders on the collar and on the casing arranged to be interlocked with each other upon a longitudinal movement of the collar, a spring tending normally to hold the collar in the position in which said shoulders are interlocked, a spring tending normally to rotate said collar, said collar being provided with a plurality of internal longitudinal grooves or recesses, lugs on the members of the tap projecting into and having a sliding fit in said grooves or recesses, and a work-engaged part coöperating with said collar to move it longitudinally far enough to bring said shoulders out of engagement with each other.

5. In a device of the character described, a casing, a tap comprising a series of cylindrical members lying side by side in engagement with each other and each revolubly supported in said casing, one end of each of said members projecting beyond the casing and having cutting edges thereon, a member carried by the casing and adjustable in the direction of the axis of said tap, a connection between the latter member and the members of the tap holding them against relative longitudinal movement and permitting relative turning movements, and means for rolling the members of the tap upon each other so as to bring the cutting edges into working positions or carry them inwardly into inoperative positions.

6. In a device of the character described, a casing, a tap mounted in the casing and projecting therefrom at one end, said tap comprising a plurality of cylindrical members lying side by side in engagement with each other, means for holding the members of the tap against longitudinal movement, a collar surrounding said tap at a point within the casing, said collar having a limited movement longitudinally of the tap, coöperating shoulders on the collar and on the casing arranged to be interlocked with each other upon a longitudinal movement of the collar, said collar being provided with a plurality of longitudinal grooves or recesses, lugs on the members of the tap projecting into and having a sliding fit in said grooves or recesses, and means for actuating said collar.

7. In a device of the character described, a tap comprising a plurality of cylindrical members lying side by side in engagement with each other, a casing surrounding one end of said members and having bearings therein for maintaining said members revolubly in contact with each other, the other end of said members having cutting edges.

8. A tap comprising a series of cylindrical members lying side by side in engagement with each other and having cutting edges

on corresponding ends, and means for holding said members in revoluble engagement with each other.

5 9. A tap comprising a member having a cylindrical bore therethrough and a plurality of cylindrical members lying within said bore and each making contact with the others and with the wall of the bore, cor-

responding ends of said cylindrical members being provided with cutting edges. 10

In testimony whereof, I sign this specification in the presence of two witnesses.

PAUL J. GREBEL.

Witnesses:

WM. F. FREUDENREICH,
RUBY V. BRYDGES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."