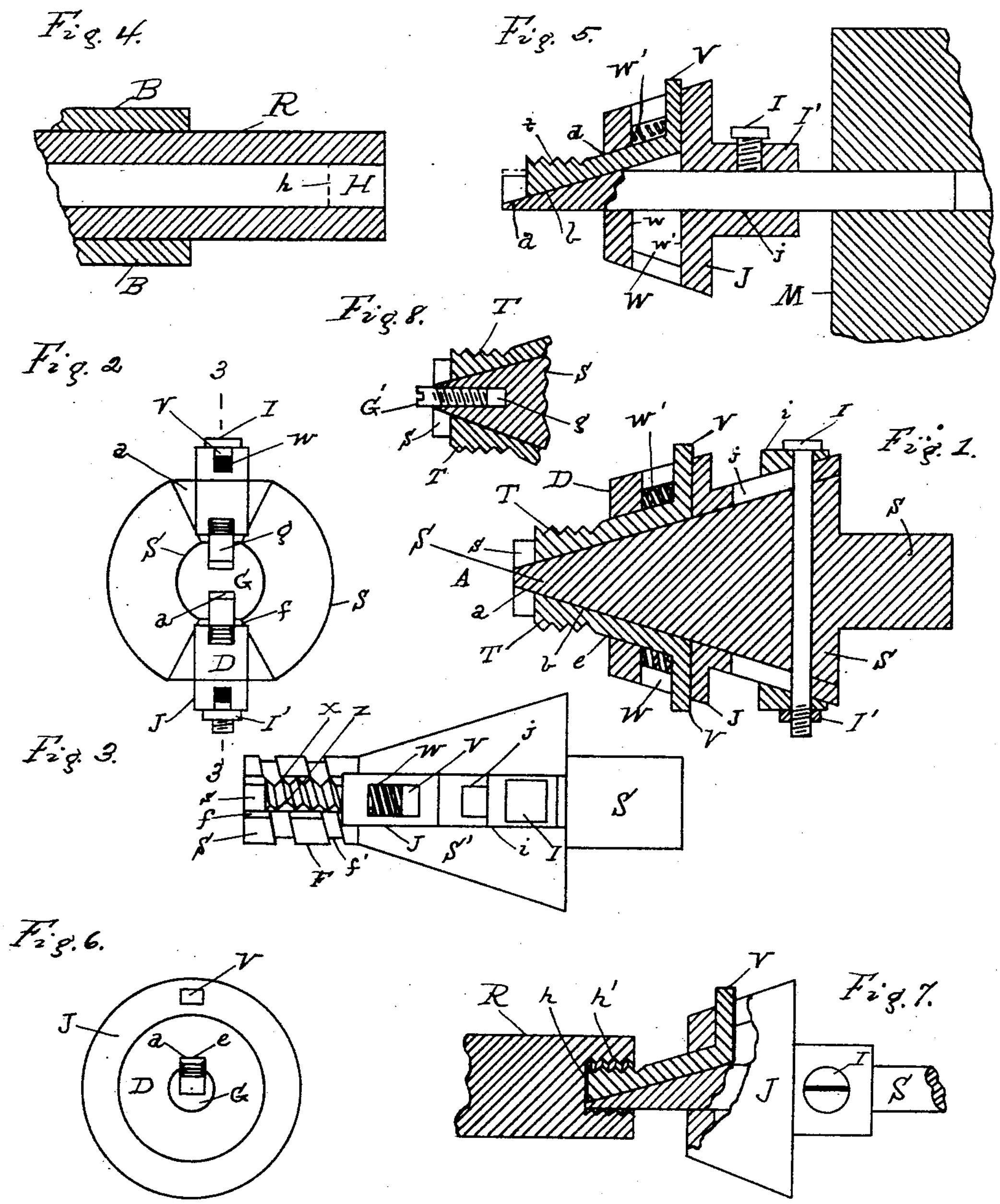
(No Model.)

F. A. ERRINGTON.

AUTOMATIC EXTENSIBLE AND COLLAPSIBLE ADJUSTABLE TAP.

No. 587,715. Patented Aug. 10, 1897.



Witnesses

Inventor

UNITED STATES PATENT OFFICE.

FRANKLIN A. ERRINGTON, OF EDGEWATER, NEW YORK.

AUTOMATIC EXTENSIBLE AND COLLAPSIBLE ADJUSTABLE TAP.

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To all whom it may concern:

Be it known that I, FRANKLIN ALFRED ERRINGTON, a citizen of the United States, residing in the village of Edgewater, (post-office Stapleton,) county of Richmond, State of New York, have invented certain new and useful Improvements in Automatic Extensible and Collapsible Adjustable Taps, which I desire to secure by Letters Patent of the United States, as described and shown in the following specification and drawings and pointed out in the claims.

My invention relates, broadly, to means for automatically expanding the cutting-jaws of a collapsible tap to the full cutting diameter upon presenting said jaws to and pressing them against the work and for similarly collapsing said cutting-jaws by utilizing the spiral action of the angular pitch of the cutting-teeth of said jaws, in combination with the formation of the supporting part or arbor and the resistance of the work, to move said jaws longitudinally and inwardly for said purpose, together with means for adjusting the same device for holes of various diameters and depths. In contradistinction to all previously-known collapsible taps, which can be utilized for only one size hole, and which have to be expanded either by hand or by reversing the direction of rotation of the driving part, in the device here illustrated and described the jaws are rigidly supported while cutting, automatically rebound to enable them to be automatically expanded to the diameter for which they are adjusted, automatically protect themselves from jamming when the tap "bottoms," &c., and the device is consequently at all times ready to answer the will of the operator.

To these ends the invention consists in the novel details of improvement and the combination of parts, that will be more fully hereinafter set forth, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming part hereof, wherein—

Figure 1 is a vertical cross-section on the line 3 3 of Fig. 2 of a device constructed in accordance with my invention, showing the cutting-jaws T T in the "working position" ready for "bottom tapping." Fig. 2 is an end view of Fig. 1, showing the extension S' flattened to receive the clamp J upon the inclined plane *a*. Fig. 3 is a top view of Fig. 1, showing the angular pitch *x z* of the cutting-teeth *t* of jaw T, the fluting of the arbor S to facilitate the removal of the chips, the cone-like outline of extension S', &c. Fig. 4 is a vertical cross-section of a tube or pipe R with its driving or holding means B B. Fig. 5 is a cross-sectional view of the application of my invention to taps of smaller size, showing also the method of connection with driving or holding means M. Fig. 6 is an end view of Fig. 5. Fig. 7 is a sectional view of Fig. 5, showing the parts in the collapsed position after completing the threading of the "bottom hole" H in rod R, showing the device without a spring, to illustrate not only what I consider the best construction in small sizes, but the desirability of the automatic rebound where practicable; and Fig. 8 is a sectional view of the end of Fig. 1, showing arbor S with an adjustable end G' to enable the device to tap holes of varying depths without danger of breakage, &c.

In the application of my invention herein shown the letter S indicates an arbor, which has a longitudinal slot or slots *s*, formed with the bottom of said slots at an angle to the axis of said arbor to afford an inclined plane or planes *a*, having a common apex A. To obtain a wide range of adjustment, the inclined plane *a* of arbor S may be prolonged on an extension S'. The sides of the slot or slots *s* in arbor S are designed to receive the lateral cutting strain of a jaw or jaws T. The extension S' may be a simple cone rising from the periphery of the arbor S and having an apex at A common with the bottom of the slots *s*, the surface of said cone thus extending the inclined plane *a*, or the arbor S may itself be coned as a continuation of cone S', and the lateral strain of the cutting-jaws T taken up by the clamps J, being firmly secured to said cone for that purpose, or the construction of the parts may be otherwise varied without deviating from the spirit of my invention. The extension S' is here preferably shown flattened to provide a surface to receive the clamp J in the inclined plane *a*, where said clamp is securely held in place by suitable clamping means, such as the bolt I. To permit the use of the ordinary bolt for this purpose, the tapered blocks i are provided with a hole fitting bolt I and are then interposed to distribute the pressure of bolt I and increase the frictional contact between clamp J and arbor S. Where the extended range of such a device as Fig. 1 is not required, the extension S′ may be omitted or the simple construction of Figs. 5 and 7 utilized, and here it is seen that my invention permits the use of a collapsible jaw in a smaller tap than any such mechanism known to me.

The back of cutting-jaw T is sloped or beveled at an angle to its cutting-face t to bring said cutting-face parallel or in the proper working position with the axis of the arbor S, although the serrated cutting-face of a "plug-tap" may itself be tapered somewhat where it first encounters the work or be otherwise irregularly formed, as is customary in such and similar tools. The inclined top e of cutting-jaw T is shown parallel with the back b of said jaw and is provided with a projection or lug V. The cutting diameter of the teeth t is regulated by the position of the surface w' of the clamp J, which receives the thrust of the lug V. The lug V is for the purpose of controlling the longitudinal movement of the jaw T. The cutting-teeth t of the jaw T are formed at any desired angle or spiral pitch x z to the axis of arbor S, and upon the rotation of either arbor S or the work R, (either having an equivalent effect,) after one or more threads h' have been cut in the work and the longitudinal movement of arbor S is stopped, (by the end G of said arbor encountering the bottom of the hole h or otherwise,) said angular pitch of said cutting-teeth will operate to move said jaw T independently along said inclined plane a, and the resistance of the metal to the cut of said teeth will tend to press the beveled back b of said jaw against the inclined plane a, and the cutting-jaw T will thereby be moved automatically along and down the inclined plane a until the teeth t are freed from the back pressure exerted by their angular pitch while rotating against the threads that have been cut and the tap will be in its collapsed position (see Fig. 7) ready to be withdrawn from the work.

By the lug V encountering the surface w of clamp J when the tap is withdrawn the cutting-jaw T is prevented from escaping from its proper position upon arbor S, the distance between the surfaces w and w' of slot W being at least equal to the distance traveled longitudinally by jaw T in moving from its working to its collapsed position, (see Figs. 5 and 7,) and it is advisable to have said space or slot somewhat exceed said distance as a margin of safety, as the longitudinal back pressure of the angular pitch of the teeth against the threads that they have already cut, while here utilized to move said jaws independently to collapse the tap, would serve to strip said threads or break said jaws if said teeth t were not clear of the threads h' before lug V encountered the surface w or the end G met the bottom of the hole h after the longitudinal movement of arbor S is stopped by end G, face D, or otherwise.

As shown in Fig. 7, after the jaw T has been collapsed it will remain collapsed until the serrated teeth t are again projected beyond the arbor S, and that if only slightly raised beyond said periphery they will then expand to their normal working position upon being pressed against the work. In the smaller sizes the sensitiveness of the threads and the ease with which the single jaw can be manipulated, especially when the work revolves and the tool is non-rotary, as on a turret-lathe, make the simple construction of Fig. 7 the most desirable. When the tap is to be used on a drill-press, where the tool revolves and the work is stationary, it is desirable to have the jaws rebound automatically to a sufficient degree to extend them beyond the periphery of arbor S to enable them to encounter the edge of the hole H, and thus be pressed backward and expanded outward to their normal cutting size. This automatic rebound should be so slight as to avoid stripping or unduly wearing the threads h' after the jaws are collapsed, and yet sufficient to move the jaws to a position where they can be automatically readjusted to the cut by pressure against the work, and for this purpose I have inserted spiral springs W′ in space or slot W between projection or lug V and the surface w, (see Figs. 1 and 5,) although the spring might be otherwise arranged for the same purpose. This spring is preferably shown shorter than the distance between the surfaces w and the lug V when the jaw T is in full working position, so that the action of the spring is very slight when the tap is collapsed, yet is most powerfully exerted when the tap is being withdrawn from the work, so that when the jaw T clears the threads h' the spring will cause the jaw to rebound sufficiently to be readily and automatically reëxpanded, as previously explained. Thus it will be seen that while this automatic rebound is desirable in many cases yet it is not an essential to the coaction of the other improvements of my invention, which are operative without this feature under many useful conditions.

As shown, the clamp or clamps J have a slot j, permitting them to be moved up and down the inclined plane a to adjust the cutting diameter of teeth t. In Figs. 5 and 7 the bore of the hub I′ of the clamp J performs the office of the above-mentioned slot j. This range is particularly valuable when the device is to be used as a pipe-tap, as it enables the same mechanism to thread several sizes of pipe, which is believed to be a novel feature in a collapsible tap. The recess or slot W should be of sufficient length to allow the longitudinal movement of lug V of jaw T, as above described, and to enable said jaw T to be readily controlled by hand the slot W is extended up through the surface of clamp J and the lug V projected beyond said clamp, so that it can be readily grasped by the operator. When used as a pipe-tap, the face D of the clamp J may be used to regulate the depth the arbor S goes into the hole H of a pipe R and by arresting the longitudinal movement of arbor S permit the jaw T to collapse automatically, as above described; and when used on a bottom hole, as *h*, in rod R, Fig. 7, the end G of arbor S operates to produce the same effect. Both the end G or the face D may be made adjustable by such means as shown in Fig. 8, where the screw or stop-piece G' is moved out of or into the hole *g'* to collapse the jaws T sooner or later, as desired.

To explain the coaction of the several parts, as herein shown, the arbor S, Fig. 5, is adapted for connection with suitable holding or driving means M, and the tube or rod R may be similarly held or driven by the means B. Where the means M for holding arbor S are connected with the longitudinally-movable rotative spindle of a drill-press, and the means B with the stationary jaws of a chuck to hold the tube R rigidly, the arbor S will be moved forward and rotated to the right (to the left for left-hand threads) and the cutting-jaw T presented to one side of the bore H. Then the surface F of arbor S (or the opposite jaws in the case of two or more jaws, as in Fig. 1) will be pressed against the other side of said hole, and the continued longitudinal pressure on the arbor S and the rotation of the tap will cut the threads *h'*. When the end G or G' of spindle S (or face D of clamp J in the case of a pipe or through hole H, Fig. 4) encounters the bottom *h* of bore H, (see Fig. 7,) the continued rotation of the tap will enable the angular pitch of its teeth to coact with the threads already cut to move the jaw T longitudinally, as above described, and collapse the cutting-teeth of said jaw until they clear the work, where they may revolve harmlessly until the arbor S is moved backward from the work, when the lug V engages the surface *w* (or spring W') and the whole device is withdrawn without reversing the motion of the rotating part, which in this case would be the arbor S, which at all stages of the operation continues to rotate in the same direction as originally started. As the jaws T continue to revolve it is difficult, if not impossible, to expand them by hand without stopping the machine, and it is therefore desirable to have them rebound sufficiently after leaving the hole H to enable them to encounter the edge of the next hole H upon being again presented to the work, and this may be accomplished by spring W' or similar means for this purpose, as explained above.

Where the means M for holding arbor S is the longitudinally-movable non-rotary turret of a turret-lathe and the means B for holding the work R the rotative jaws of a chuck that connect the work R with the rotative live-head of said lathe or similar machine, the arbor S would not rotate, but be simply pressed against and into the hole H, and as the rod R revolved against the teeth *t* the threads *h'* would be cut, as heretofore, the only difference being that the arbor S is not rotated in this case and the work is, whereas in the previous case the arbor S rotated and the work did not. In this last position on a turret-lathe it will be seen that as the jaw or jaws T do not rotate the operator can readily expand them by his hand on the lug V sufficiently to enable them to encounter the edge of the hole H when again presented to the work R, should it not be desirable for any reason to employ the spring W' for that purpose. (See Fig. 7.)

The ability to regrind the parts and reset them in their respective places to a nicety makes the simplicity of my device particularly desirable, while the movable clamp and the rigidity obtained by having the jaws at all times during their cutting action supported by a fixed arbor S, with its inclined plane *a*, secure an accuracy and evenness of cut and a readiness of adjustment not heretofore met with in devices having an independently-movable supporting-piece instead of my independently-movable cutting-jaw.

While my invention is here shown as applied to a serrated jaw, it is obvious that it is equally applicable to any description of cutting-jaw.

Having now described my invention, what I claim is—

1. The combination of an arbor, a cutting-jaw connected to rotate therewith, retaining means to preserve the connection of said jaw with said arbor, said arbor having variations in its diameter under said jaw to coact with similar variations in the depth of said jaw, and said jaw being longitudinally movable independently both of said arbor and of said retaining means for such a distance as will enable said jaw to expand to or collapse from the cutting position, substantially as described.

2. The combination of an arbor, a cutting-jaw connected to rotate therewith, a clamp connected with said arbor to retain said jaw thereon, said arbor having variations in its diameter under said jaw to coact with similar variations in the depth of said jaw, and said jaw being longitudinally movable independently both of said arbor and of said clamp for such a distance as will enable said jaw to expand to or collapse from the cutting position, substantially as described.

3. The combination of an arbor, a cutting-jaw connected to rotate therewith, said arbor having variations in its diameter under said jaw to coact with similar variations in the depth of said jaw, and a clamp connected with said arbor to retain said jaw thereon, said jaw and one of said other parts having respectively the one a slot and the other a projection meshing with said slot, the longitudinal dimension of said slot being sufficiently

greater than the corresponding dimension of said projection to permit said jaw to move longitudinally independently of both said arbor and said clamp for such a distance as will enable said jaw to expand to or collapse from the cutting position, substantially as described.

4. The combination of an arbor, a cutting-jaw connected to rotate with said arbor, corresponding variations in the diameter of said arbor under said jaw and in the depth of said jaw, a clamp adjustable longitudinally on said arbor, and means to fasten said clamp rigidly to said arbor at certain intervals in the length of the latter to vary the position of said jaw thereupon, said jaw being movable longitudinally independently both of said arbor and of said clamp for such a distance as will enable said jaw to expand to or collapse from the cutting position, substantially as described.

5. The combination of an arbor, a longitudinally-movable cutting-jaw connected to rotate therewith, said jaw having teeth extending at an angle to the axis of said arbor, said arbor having variations in its diameter under said jaw to coact with similar variations in the depth of said jaw, retaining means to hold said jaw in connection with said arbor, and a stop-piece to coact with said parts to cause said jaw to move longitudinally along said arbor during operation to collapse automatically, substantially as described.

6. The combination of an arbor, a longitudinally-movable cutting-jaw connected to rotate therewith, said jaw having teeth extending at an angle to the axis of said arbor, said arbor having variations in its diameter under said jaw to coact with similar variations in the depth of said jaw, a clamp to retain said jaw in connection with said arbor, and a stop-piece connected with said arbor and projecting beyond said jaw to cause said jaw to move longitudinally along said arbor during operation to collapse automatically, substantially as described.

7. The combination of an arbor, a cutting-jaw connected to rotate therewith, one of said parts being movable longitudinally independently of the other, said arbor having variations in its diameter under said jaw to coact with similar variations in the depth of said jaw, retaining means to hold said jaw in connection with said arbor, and a spring to coact with said parts to cause said jaw to rebound automatically from the collapsed position, substantially as described.

8. The combination of an arbor, a cutting-jaw connected to rotate therewith, one of said parts being movable longitudinally independently of the other, said arbor having variations in its diameter under said jaw to coact with similar variations in the depth of said jaw, a clamp to retain said jaw in connection with said arbor, and a spring located between said parts to cause said jaw to rebound automatically from the collapsed position, substantially as described.

9. The combination of an arbor, a cutting-jaw connected to rotate therewith, one of said parts being movable longitudinally independently of the other, said arbor having variations in its diameter under said jaw to coact with similar variations in the depth of said jaw, a clamp to hold said jaw in connection with said arbor, one of said parts having a slot and another of said parts having a projection or lug meshing therewith, the longitudinal dimension of said slot being greater than the corresponding dimension of said lug, and a spring located between said parts to cause said jaw to rebound automatically from the collapsed position, substantially as described.

10. The combination of an arbor, a longitudinally-movable cutting-jaw connected to rotate therewith, said arbor having variations in its diameter under said jaw to coact with similar variations in the depth of said jaw, a clamp having a slot W, passing through it, said jaw having a lug V, passing through said slot W, in said clamp and extending beyond the surface of said clamp, said slot W, being of greater length than the corresponding dimension of said lug V, substantially as described.

F. A. ERRINGTON.

Witnesses:
THEODOR D. WILSON,
BENJ. W. EATON.