O. A. SMITH.

TAP.

APPLICATION FILED AUG. 16, 1906. RENEWED MAR. 11, 1908.

899,916. Patented Sept. 29, 1908.

Fig. 3.

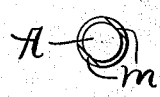


Fig. 1.

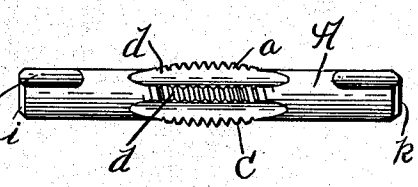


Fig. 2.

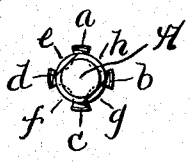


Fig. 6.



Fig. 4.

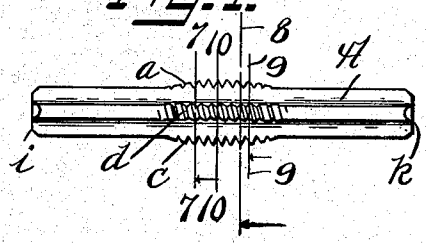


Fig. 5.

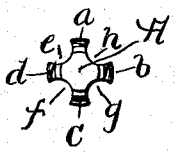


Fig. 7.

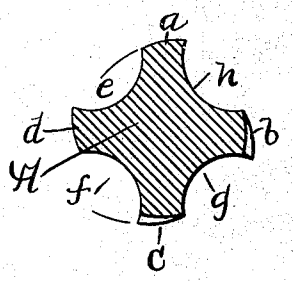


Fig. 8.

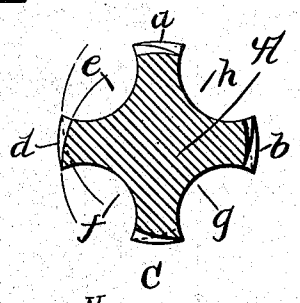


Fig. 9.

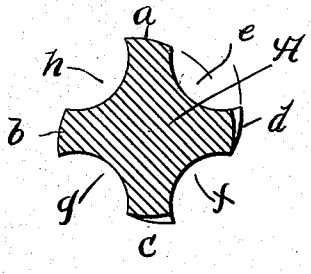
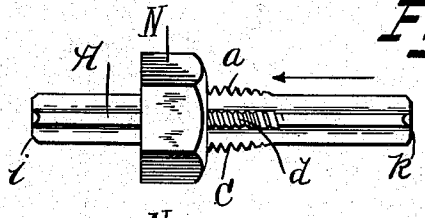


Fig. 11.



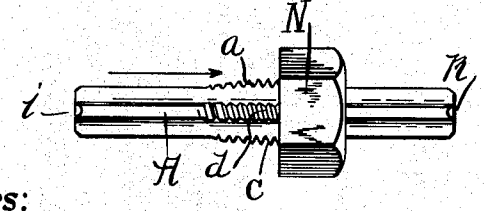


Fig. 10.

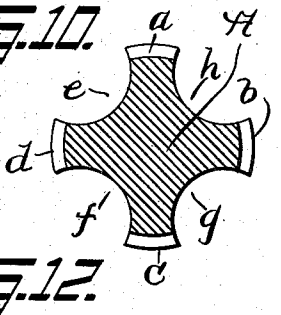


Fig. 12.

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By his Attorney:
F. W. Richards.

UNITED STATES PATENT OFFICE.

OSCAR A. SMITH, OF CLEVELAND, OHIO, ASSIGNOR TO EDWIN C. HENN, OF CLEVELAND, OHIO.

TAP.

No. 899,916. Specification of Letters Patent. Patented Sept. 29, 1908.

Application filed August 16, 1906, Serial No. 330,894. Renewed March 11, 1908. Serial No. 420,450.

To all whom it may concern:

Be it known that I, OSCAR AUGUST SMITH, a citizen of the United States, residing in Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Taps, of which the following is a specification.

This invention relates to tools for cutting threads in nuts or in the bores of any other member; and has for its object to provide a tap that will operate to cut identically the same thread upon either end being inserted in the bore and the tap given a spiral movement in the proper direction. In other words, the tap will operate in either endwise direction to cut the same thread in the bore of a member.

In the accompanying drawing, representing embodiments of my invention, Figure 1, is a plan view of one form of tap. Fig. 2 is an end view of the same. Fig. 3 is an end view of Fig. 1 showing the end portion only of the tap. Fig. 4 shows a slightly modified form of tap. Fig. 5 is an end view of the tap shown in Fig. 4. Fig. 6 is an end view of the tap shown in Fig. 4 showing the end portion only. Fig. 7 shows enlarged a section taken on the line 7—7 indicated in Fig. 4. Fig. 8 is a similar view on the line 8—8 indicated in Fig. 4. Fig. 9 is a similar view on the line 9—9 indicated in Fig. 4. Fig. 10 is a similar view taken on the line 10—10 indicated in Fig. 4. Fig. 11 shows the tap as moving endwise in one direction into a nut-blank to cut a thread therein; and Fig. 12 shows the same tap as operating in the opposite endwise direction on a nut-blank to thread the same.

The tap is provided with a circular series of longitudinal extending cutter members, in the present instance four such cutters being shown, but obviously a greater or less number could be used. In Fig. 1 is shown a shank A provided with four cutter members, *a*, *b*, *c* and *d*, which cutter members are separated by flutes *e*, *f*, *g*, and *h*. Heretofore, taps have been constructed with the cutters having full threads at the portion last to engage the bore of the blank, while the thread at the end portion that first engages the bore, is reduced, or has its apex or ridge ground down or cut away; that is, the cutters are tapered from the end or entering portion, increasing in thread height or outside diameter from the end portion upward to where the teeth are fully formed.

In the present invention, the cutters have the teeth the full height or outer diameter at the intermediate portion or middle part of each cutter member, while the teeth are tapered from this middle portion towards each end of the cutter member. That is, the diameter of the teeth of the cutter portion decreases from the middle portion of the cutter towards each end thereof. By reason of this construction, the tap can have either end of the cutter portion inserted in a nut blank or the bore of any member, and be passed entirely through the member; while another nut or member can have the same tap inserted from its opposite end, the tap being now rotated in the opposite direction, and the thread formed in the second nut will be identical with that formed in the first nut.

In the forms of tap at present in use, the threads at the smaller reduced end, that first engages the nut blank, are given an inclination or rake that extends backward or in the reverse direction of the rotation of the tap to produce the thread. This will produce a cutting member that will have clearance, whereby its transverse cutting edge, which is a portion of the flute, will operate to remove the metal more easily to start the thread. In the present invention, the reduced portion of the cutters at both ends of the cutting part of the tap are given a rake, but the rake at the two ends will extend in opposite directions. This for the reason that when either end is inserted in the nut-blank, as for instance the end *i* in the nut N in Fig. 11, the reduced cutter teeth will have a negative rake in the direction of rotation. But when the end *k* of the tap is first passed into the nut blank N and the tap is rotated in the opposite direction, the teeth on the reduced portion of the tap adjacent the end *k* will have a negative rake, and this will be in the opposite rotative direction to that of the reduced teeth at the other end of the cutter portion. Fig. 7 indicates the rake given to the teeth of the cutter adjacent the end *i*, while Fig. 9 indicates the reverse rake given to the reduced teeth at the end of the cutter adjacent the end *k*. At the middle portion of the tap as indicated in Fig. 10, the teeth are preferably of uniform diameter at, or equidistant from the axis, no rake being given to them.

This form of tap is of particular importance when used in an automatic machine, wherein nut blanks are successively fed to a

certain place, and there tapped by the operation of the machine. With such a machine, it is desirable to form a double end tap, having the cutter portion at the intermediate part of the shank, as shown in the drawings. With such a machine, the tap can be introduced into the nut-blank from one end, and spirally advanced to cut the thread; and then the endwise movement of the tap is continued to pass entirely through the blank. Thereupon the blank is ejected, and another blank secured in the same position. Then the tap can be moved back through the same path as before in the opposite spiral direction, being given a reverse rotative movement. This will have the effect of producing identically the same thread in the second nut blank as was produced in the first; and so on, a large number of blanks can be successively tapped, one being threaded at each endwise movement of the tap. An application for patent on such a nut tapping machine was filed by me on the 24th day of August, 1906, Serial Number 331,825.

The shank of the tap may have the flutes *e*, *f*, *g* and *h* continued to each end, as indicated in Figs. 4 and those following. Or, if desired, the shank of the tap may be cylindrical, but have reduced portions *m* at each end, as shown in Figs. 1 and 3, for engaging in the sockets of two opposed operating members.

Having thus described my invention, I claim:

1. A tap comprising an integral double ended shank having the rigid cutter portion formed at the intermediate part of the shank, the diameter of the spiral threads decreasing from the middle of the cutter portion toward each end of such portion, the separate cutters or teeth at one end of each of the longitudinal cutter members having a circumferential rake, the separate cutters or teeth at the opposite end of the cutter portion being given a circumferential rake extending in a rotative direction the opposite to that at the other end.

2. A tap comprising an integral double ended shank having the rigid separate cutters or teeth at one end of each of the longitudinal cutter members of the tap given a circumferential rake, the separate cutters or teeth at the opposite end of the cutter portion being given a circumferential rake extending in a rotative direction the opposite to that at the other end, the cutters or teeth at the middle part of the longitudinal cutting members, being of substantially uniform height or outside diameter throughout their peripheral length.

3. A tap comprising a shank having a plurality of sets of cutters, each set tapered from the middle part thereof toward the end of the cutters, the teeth at one end of each set having a different rake or inclination from the teeth at the opposite end of the same set, whereby said tap is operative to cut the same thread starting from either end of said tap.

4. A tap comprising a shank having a set of cutters, the teeth at one end of each set having a different rake or inclination from the teeth at the opposite end thereof and said teeth constructed to enter a blank, whereby said tap is operative to cut the same starting from either end of said tap.

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