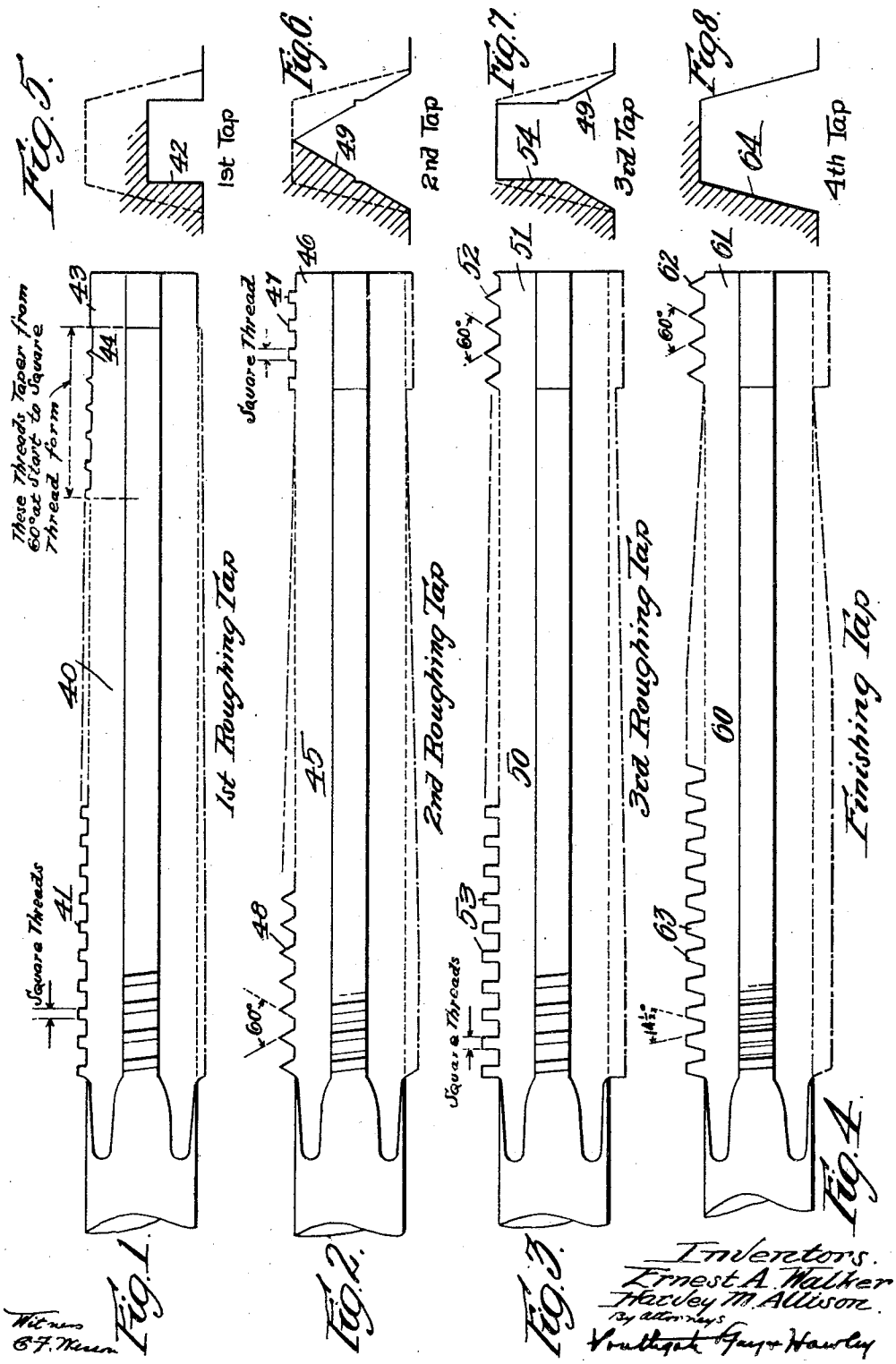
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TAP FOR CUTTING SQUARE AND ACME THREADS

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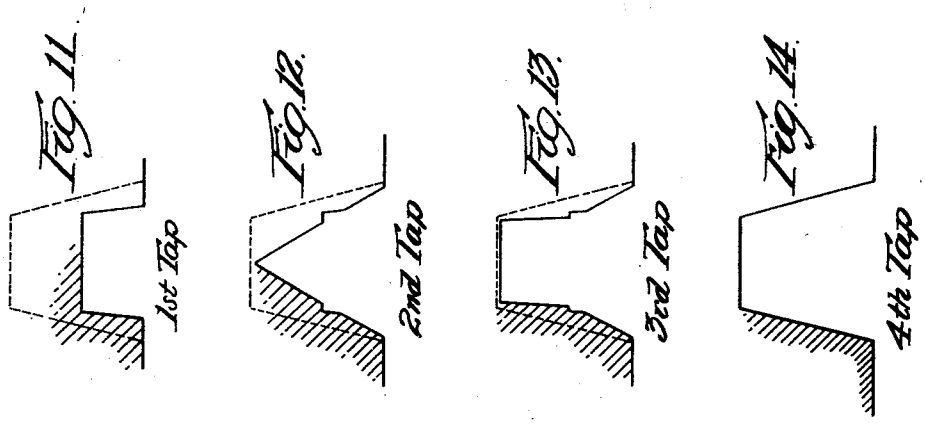
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TAP FOR CUTTING SQUARE AND ACME THREADS

Filed Dec. 22, 1926 4 Sheets-Sheet 2



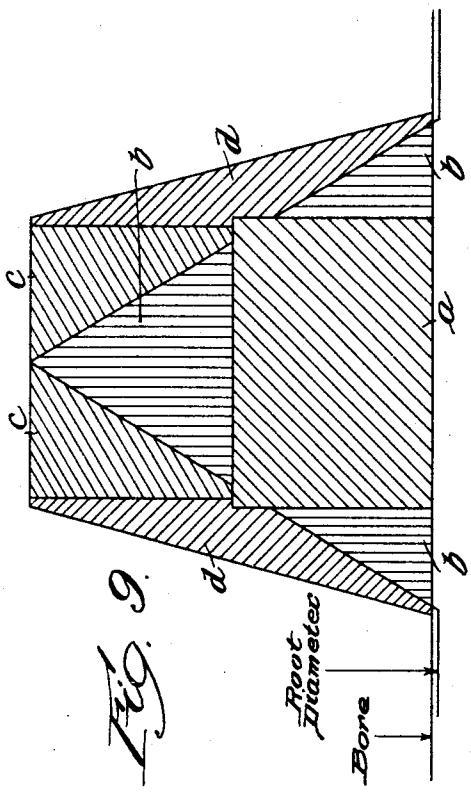


Fig. 9.

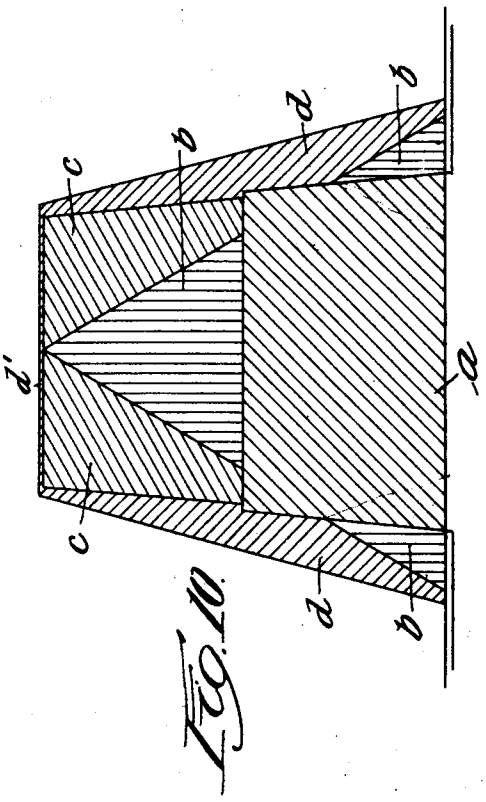


Fig. 10.

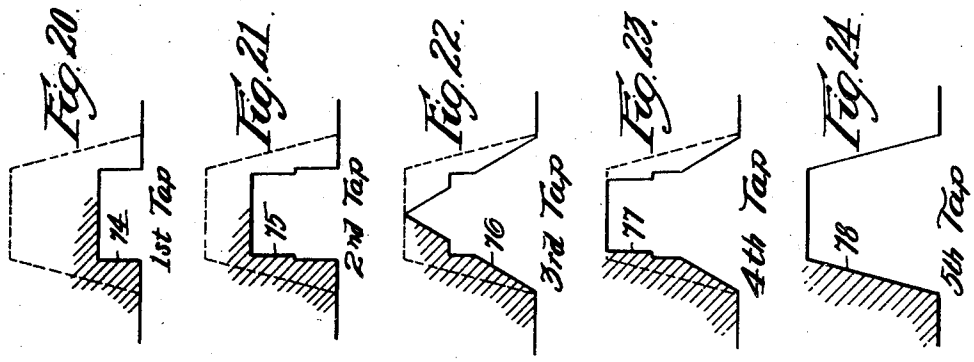
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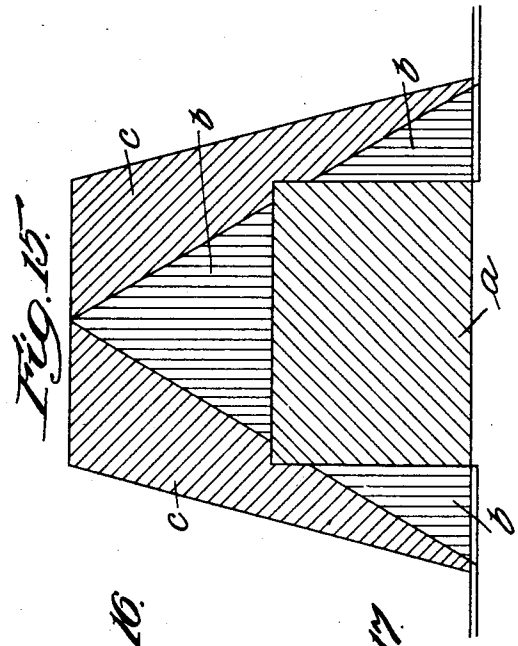
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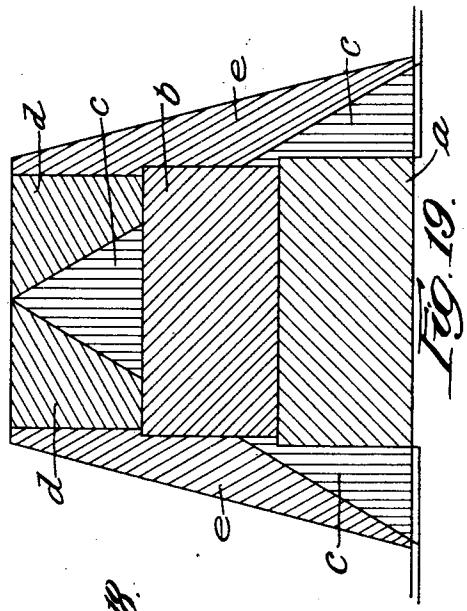
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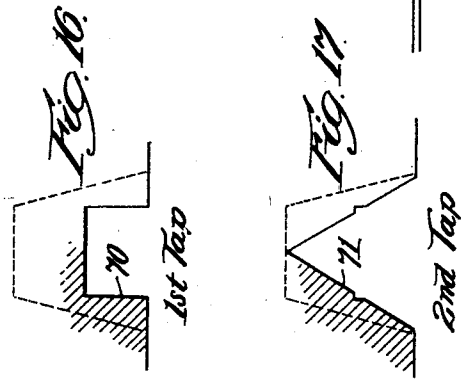
TAP FOR CUTTING SQUARE AND ACME THREADS

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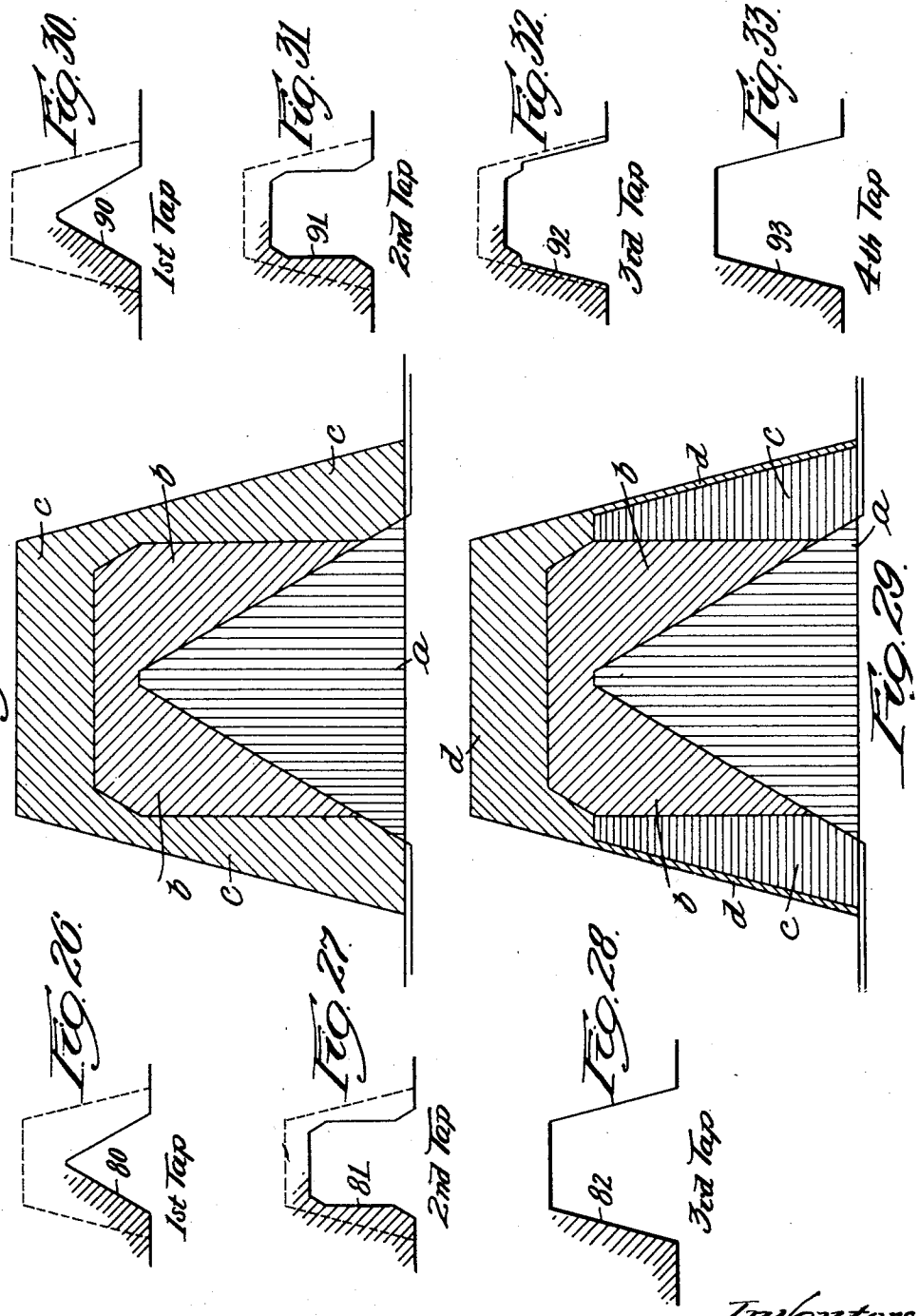
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TAP FOR CUTTING SQUARE AND ACME THREADS

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UNITED STATES PATENT OFFICE.

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TAP FOR CUTTING SQUARE AND ACME THREADS.

Application filed December 22, 1926. Serial No. 156,471.

This invention relates to taps for cutting square or Acme screw threads or other threads of similar cross section. It has been found difficult to cut such threads with taps of the usual type, on account of the extent of the surface of the cut, which produces a very heavy drag on the tap, particularly as the threads approach their full depth. Difficulty is also encountered in getting the broad-surfaced chips out of the thread.

It is the object of our invention to provide a series of taps having their cutting teeth so related that the drag on the taps, when used in a defined sequence, will be greatly reduced.

To the accomplishment of this purpose, we provide successive taps of the series with threads of very different cross section, and so designed that they will remove stock from different portions of the area to be cut away to form the threads, and will preferably remove the stock in separated portions or small chips.

A further feature of our invention relates to the provision of a pilot portion for each tap, having the thread section of a preceding tap in the series.

Our invention further relates to arrangements and combinations of parts which will be hereinafter pointed out and more particularly set forth in the appended claims.

Several forms of the invention are shown in the drawings in which

Figs. 1, 2, 3 and 4 show the four taps comprising a set for producing a finished thread according to one embodiment of our invention;

Figs. 5, 6, 7 and 8 are detailed views showing the successive cuts produced by the taps shown in Figs. 1, 2, 3 and 4 respectively;

Fig. 9 is a diagrammatic view showing the different parts of the finished thread section which are removed by each of the successive taps shown in Figs. 1 to 4;

Fig. 10 is a view similar to Fig. 9, but showing the parts removed by each of a slightly different series of four taps;

Figs. 11, 12, 13 and 14 show the cuts produced by the four successive taps in forming the thread indicated in Fig. 10;

Fig. 15 is a view similar to Fig. 9, but showing a thread produced by a set of three taps only;

Figs. 16, 17 and 18 show the cuts produced by the three successive taps in forming the thread shown in Fig. 15;

Fig. 19 is a view similar to Fig. 9, but showing the parts removed by each of a set of five taps;

Figs. 20 to 24 inclusive show the cuts produced by the five successive taps in producing the thread shown in Fig. 19;

Fig. 25 shows the parts of the thread removed by a series of three taps, somewhat different in section from those indicated in Fig. 15;

Figs. 26, 27 and 28 show the cuts produced by the three successive taps in forming the thread shown in Fig. 25;

Fig. 29 shows the parts removed by each of a set of four taps somewhat different in section from the taps producing the cuts indicated in Fig. 9; and

Figs. 30 to 33 indicate the cuts made by the four successive taps in forming the thread shown in Fig. 29.

Referring particularly to Figs. 1 to 8, we have shown our invention as embodied in a series of four taps adapted to produce an Acme screw thread. The roughing tap 40 shown in Fig. 1 is provided with square threads 41 of relatively small cross section, which produce a cut as shown at 42 in Fig. 5. The tap 40 is preferably provided with a plain pilot or entering portion 43 and with starting threads which have a V-section near the outer end of the tap, as indicated at 44, and increase gradually to the square section indicated at 41. A tap thus formed readily enters the hole to be threaded and the thread is easily started and cut to the form indicated at 42 (Fig. 5).

The second roughing tap 45 (Fig. 2) is provided with a pilot portion 46 having square threads 47 adapted to enter the threads 42 (Fig. 5) cut by the first tap 40. The cutting teeth 48 of the tap 45 are triangular in cross section and produce a cut such as is indicated at 49 in Fig. 6. The third roughing tap 50 has a pilot portion 51 having V-shaped threads 52 to fit the opening 49 (Fig. 6) and having square cutting threads 53 producing the opening 54 indicated in Fig. 7.

The finishing tap 60 has a pilot portion 61 with V-shaped threads 62 similar to the threads of the third roughing tap 50, it be-

ing possible to use the V-shaped pilot threads as the outer portion of the cut 49 remains unchanged, as indicated in Fig. 7. The full sized threads 63 of the tap 60 produce the finished thread section indicated at 64 in Fig. 8.

In Fig. 9, we have indicated the portions of stock removed by the different taps of the series, the portion *a* being removed by the first tap, the three portions *b* being removed by the second tap, the two portions *c* being removed by the third tap, and the two portions *d* being removed by the fourth or finishing tap.

It will thus be seen that the amount of stock removed by the successive taps is to a considerable extent equalized and that no one of the taps is required to cut away the stock over the entire surface of the thread. Furthermore, the parts removed by the later taps are in small chips taken from the separate areas *b*, *c* or *d*, and do not tend to clog the cut, as has previously happened. The strain on the different taps is thus much reduced and it is possible to operate them at increased speed, at the same time reducing the breakage of taps.

Obviously the amount of stock removed by the several taps may be equal as considered with respect to all taps or it may be equalized as between any pair of taps. In other words, taps 1 and 2 may take out substantially equal volumes and taps 3 and 4 take out a different volume, but equal to each other or all of the taps may each take out substantially the same amount of stock.

In Figs. 10 to 14, we have indicated the results produced by a somewhat similar series of four taps, the thread sections of the different taps being somewhat varied, however, from those shown in Figs. 1 to 9. The extent of the cut after using each of the successive taps is clearly indicated in Figs. 11, 12, 13 and 14, and the parts of the thread section removed by each of the taps is indicated by the letters *a*, *b*, *c* and *d* in Fig. 10, as previously described.

Attention is called to the fact that the first and third taps produce slightly tapering rather than rectangular sections, as indicated in Figs. 11 and 13 and also by the cross sectional areas *a* and *c* in Fig. 10. Attention is also called to the small root portion *d'* which is left at the bottom of the thread, to be removed by the fourth or finishing tap at the same time that the portions *d* at the sides of the thread are removed.

In Figs. 15 to 18, we have indicated an Acme thread produced by a series of three taps, the portion *a* being removed by the first tap, as indicated at 70 in Fig. 16, the three portions *b* being removed by the second tap, as indicated at 71 in Fig. 17, and the two portions *c* being removed by the third tap to form the finished thread, as indicated at 72 in Fig. 18.

In Figs. 19 to 24, we have shown a thread produced by the successive use of five different taps. The portion *a* in Fig. 19 is removed by the first tap, as indicated at 74 in Fig. 20. The portion *b* is removed by the second tap, as indicated at 75 in Fig. 21. The three portions *c* are removed by the third tap, as indicated at 76 in Fig. 22. The two portions *d* are removed by the fourth tap, as indicated at 77 in Fig. 23, and the two portions *e* are removed by the finishing tap, as indicated at 78 in Fig. 24.

In Figs. 25 to 28, we have indicated the production of an Acme thread by a series of three taps somewhat different in section from those shown in Figs. 15 to 18. In this series, the portion *a* removed by the first tap, as indicated at 80 in Fig. 26, is of triangular cross section, the portion *b* removed by the second tap, as indicated at 81 in Fig. 27, is of approximately rectangular cross section, while the portion *c* removed by the third or finishing tap produces the finished thread, as indicated at 82 in Fig. 28.

In Figs. 29 to 33, a series of four taps are shown, somewhat similar to the series of three taps last described. The first tap removes the triangular portion *a*, as indicated at 90 in Fig. 30, the second tap removes the portions *b* and produces a substantially rectangular cut, as indicated at 91 in Fig. 31. The third tap removes the portion *c*, producing the tapering cut indicated at 92 in Fig. 32, and the fourth tap removes the portions *d* to produce the finished thread, as indicated at 93 in Fig. 33.

It will be evident that many other combinations of taps may be produced, both by varying the number of taps in the series and by varying the thread section of the successive taps, without departing from the spirit and scope of our invention, an important feature of which resides in providing successive taps with threads of substantially different cross section, so that the continuity of the cut produced by successive taps will be broken up, and so that the stock will be removed in relatively small chips which are easily severed. These small chips are also much easier to clear from the tapped hole and do not tend to wedge into the hole and resist the action of the tap, as often occurs when successive taps of substantially the same outline are employed. The breaking up of the chips into relatively small parts and the removing of the stock without taking single cuts over widely extended areas are extremely important features of our invention.

Having described several forms of our invention and the advantages thereof, we do

not wish to be limited to the details herein disclosed otherwise than as set forth in the claims, but what we do claim is:—

1. A series of taps for cutting a screw-thread, said taps being designed for successive use in predetermined order and certain succeeding taps being effective to remove substantially equalized portions of material of substantially different sectional configuration.

2. A series of taps for cutting a screw thread, said taps being designed for successive use in predetermined order, and certain taps being effective to remove a volume of stock from the thread substantially equal to the volume removed by the preceding tap, said stock being removed in relatively small chips having slight tendency to clog the hole.

3. A series of taps for cutting a screw thread, the said taps being designed for successive use in a predetermined order, the second and each succeeding tap removing separated parts of the thread to be cut, thus greatly reducing the size of the chips cut by the taps and facilitating clearance thereof, certain taps removing a volume of stock substantially equal to that removed by its preceding tap.

4. A series of taps for cutting screw threads, said taps being designed for successive use in pre-determined order and certain succeeding taps being effective to remove substantially equalized portions of material from the screw thread.

In testimony whereof we have hereunto affixed our signatures.

ERNEST A. WALKER.
HARVEY M. ALLISON.