B. Hotchkiss,

Screw-Threading Machine

No. 55,493. Patented June 12, 1866.

Fig: 1.

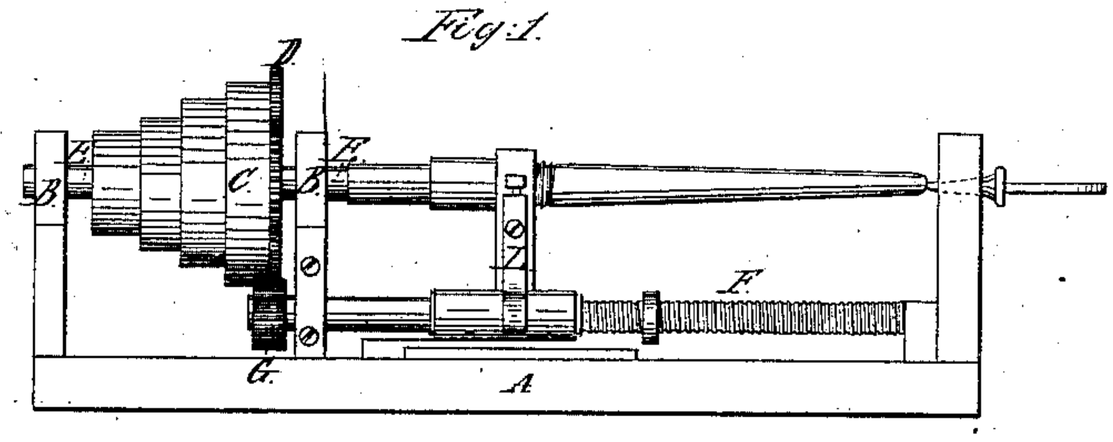


Fig: 2.

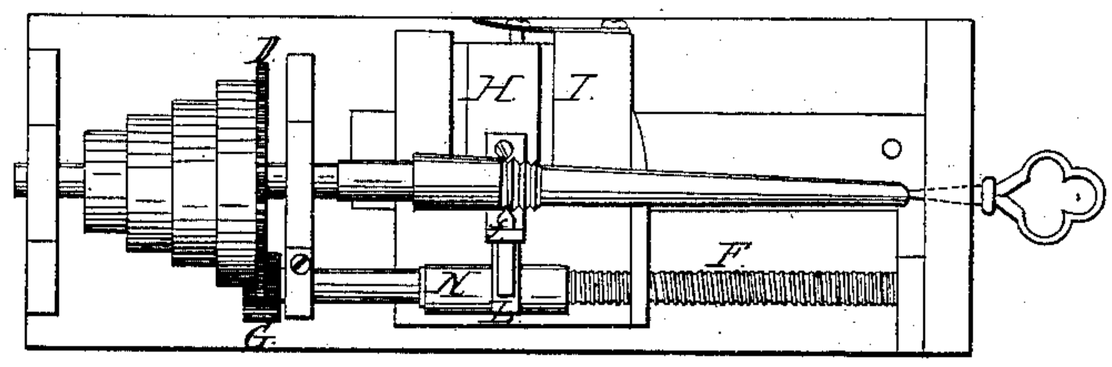
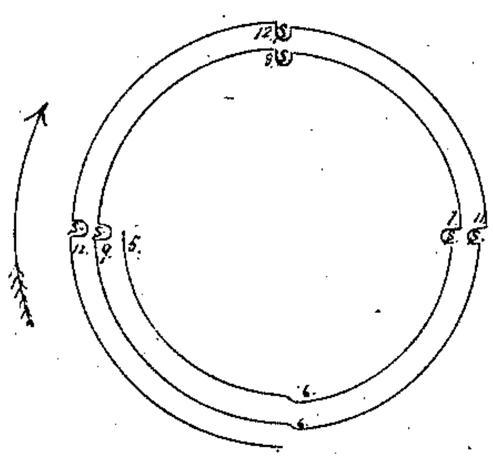
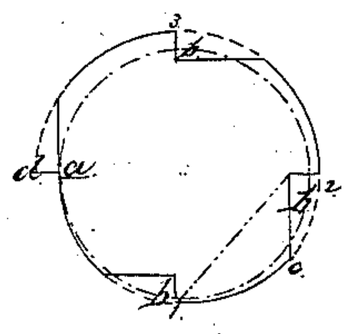
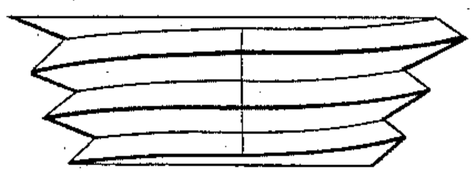


Fig: 3.







Witnesses;

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UNITED STATES PATENT OFFICE.

BENNET HOTCHKISS, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN THE CONSTRUCTION OF SCREW-TAPS.

Specification forming part of Letters Patent No. **55,493**, dated June 12, 1866.

To all whom it may concern:

Be it known that I, BENNET HOTCHKISS, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Taps and Dies; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a side view, and in Fig. 2 a top view, of an apparatus for forming taps and dies, and in Figs, 3, 4, and 5 diagrams to illustrate my invention and its advantages.

My invention relates to an improvement in the form of taps and dies, and is alike applicable to the construction of reamers.

Heretofore it has been the practice to turn taps perfectly round, cutting the thread thereon and forming a cutting-edge by removing a portion of the tap, so as to leave an angle in the thread thus formed. The body of the tap back of the one cutting-point to the next increases in diameter, so that the metal from one cutting-point to the next above is forced away by the pressure of the thread between the two points, which makes the thread cut in a nut by such a tap always of smaller diameter than the original bore of the nut, so that when the nut is bored preparatory to tapping it is necessary to bore it larger than the internal diameter of the thread to be cut, and thus forcing its way, as the tap thus constructed does, a greatly increased amount of friction is produced. To overcome these difficulties is the object of my invention; and to enable others to construct taps, &c., in accordance with my improvement, I will proceed to describe the same as illustrated in the accompanying drawings.

I will first, by the diagram seen in Fig. 5, illustrate the common construction, being thereby better enabled to show the advantages of my improvement. The red line denotes the diameter of the tap at the point *a*, where the thread is commenced to be cut, and in black is shown the increase of diameter from that point to the same relative point *d*, on the next thread above. The diagrams represent a taper much greater than could be practicably used. This is done in order to more clearly illustrate my improvement, and its advantages are proportionate to these diagrams.

In forming a tap on which the thread is to be cut it is made of a regular taper and the thread cut thereon. We are therefore to suppose that the taper of the tap is such that its diameter increases in a single thread, as from *a* to *d*. After the thread has been cut, to form the cutting-angles 1 2 3 a portion of the tap *b* is cut away, which being done, the tap is ready for use.

Beginning to cut, say, at the point 1, the cutting-point is followed by the thread upon the tap to the point *c*. The diameter of the thread so following constantly increasing forces the metal to make way for its increase, the point 2 cutting only so much as the increase of the diameter at that point more than from the point *c*, and so on, each portion of the tap in like manner forcing its way. It may be said that cutting the tap away, as denoted by the blue line, would prevent this crushing of the metal; to which it is replied that to form a good thread it is necessary that some portion of the thread upon the tap should follow the cutter.

Therefore, my invention, by which a tap is thus constructed, consists in forming the tap so that the thread which follows the first cutting-point, and between that and the second cutting-point, shall be of the same diameter as the tap at the first cutting-point, and that between the second and third cutting-points the same diameter as at the second, and so on, each section of the thread just filling the space cut by the cutter which it follows—that is to say, in Fig. 3, 5 being the first cutting-point, the thread between that point and the second cutting-point, 6, is the same diameter as at the cutting-point 5, and that section between the cutting-points 6 and 7 the same diameter as at 6, and so on. Thus the thread of the tap will just fill the thread cut by its own cutter.

I have described my invention as more particularly for taps; but I do not wish it to be understood as for taps only, as dies for cutting screws I form in like manner, and in the construction of reamers I apply the same principle, so that as the reamer cuts it is followed by its own body just filling the space cut, and thus insures a perfectly-round hole.

To thus form the blank I employ an appa-

ratus, which I illustrate in Figs. 1 and 2, in which—

A is the bed-plate supporting in bearings B pulleys C and a toothed wheel, D, upon a spindle, E. F is the feeding-screw, driven by the toothed wheel D, working in the pinion G. The relative proportion between the wheels D and G should be in accordance with the number of cutting-points required—that is to say, if four cutting-points, the wheel G should be one-fourth the diameter of the wheel D.

f, the cutter, is attached to a slide, H, so as to slide transversely upon a slide, I, which moves longitudinally by attachment to the screw F. The slide H is connected to the screw by a strap, L, around a cam, N, which at each revolution draws the cutter from the blank being turned, so that, supposing the cutter to commence cutting at the point 5, it will cut upon the taper tap being turned of an even diameter to the point 6. At this point the cam draws the cutter from the tap, and beginning again to cut at the same point, 6, (see Fig. 3,) leaves a shoulder and cuts again to the point 7. There again the cutter is drawn out and cuts to 8, where it is again drawn out and cuts to point 9, at each point leaving a similar shoulder. Thus the cutter continues being withdrawn in proportion as the tap is more or less tapering or conical.

As the reason for so withdrawing the cutter and permitting it again to advance may not be clear, I would here state that were the cutter to move in a continuous line, as for ordinary turning, the thread cut upon the taper tap would continually increase in diameter; but as the object of my invention is only accomplished by making the thread so cut of an equal diameter from cutting-point to cutting-point, it is necessary that the cutter advance toward the center of the spindle from each cutting-point to the next by so much as the diameter of the tap increases from the one cutting-point to the next, then withdraw to the surface, and again advance.

Thus formed in the machine, if it is designed for a reamer, remove it from the machine, and at each shoulder groove the blank, as seen at *s*, Fig. 3, which forms a cutting-angle, and thus I have produced the most perfect reamer which can be formed, it having been done with mathematical precision. If for a tap, cut the thread upon the blank while in the machine and by the same apparatus, which being done, remove from the machine and groove in like manner as described for the reamer. If to form a screw-cutting die, the operation described should be reversed in like manner as is done in common screw-cutting engines. Therefore,

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

Forming reamers, taps, and dies substantially in the manner and for the purpose herein set forth.

BENNET HOTCHKISS.

Witnesses:

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M. A. HINE.