April 26, 1932. L. A. FRAYER 1,855,668

THREAD ROLLING DIE

Filed July 21, 1930

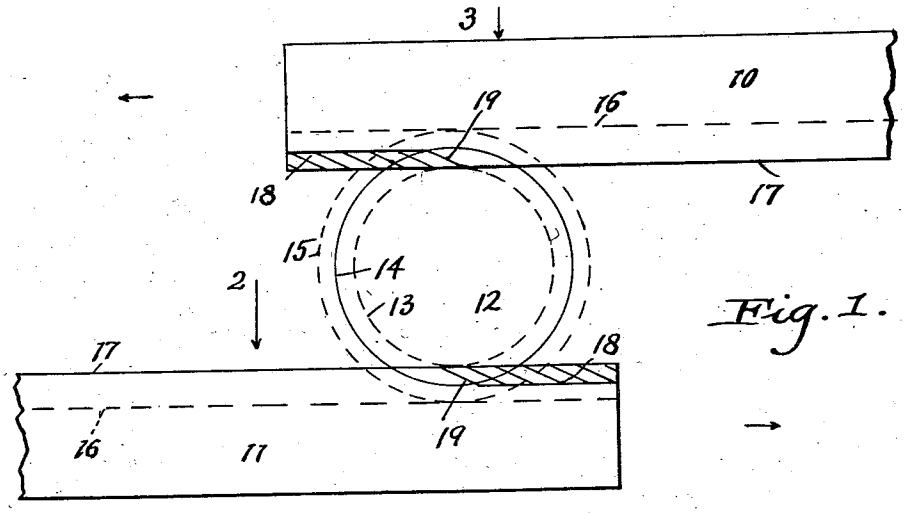


Fig. 1.

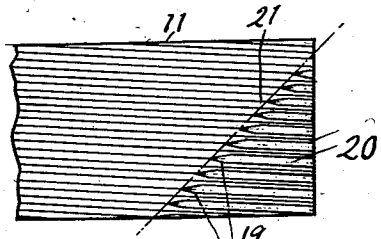


Fig. 2.

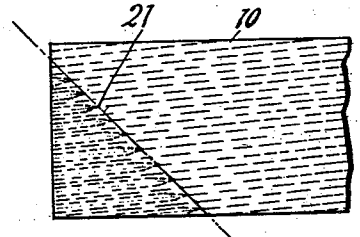


Fig. 3.

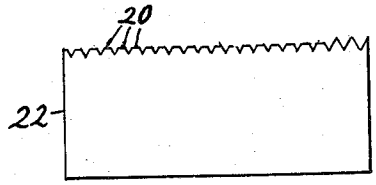


Fig. 5.

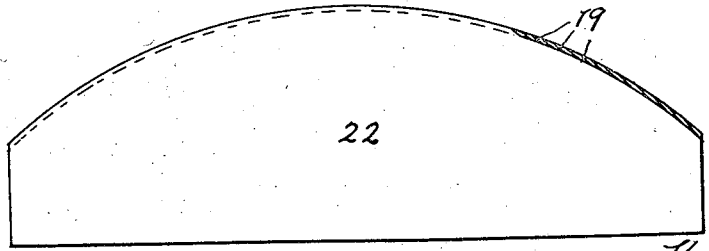


Fig. 4.

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UNITED STATES PATENT OFFICE

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THREAD ROLLING DIE

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This invention relates to improvements in thread rolling dies, that is, dies for rolling threads into bolt and screw blanks and the like.

One object of the invention is the provision of a die so constructed as to reduce the load upon the machine in which it is used and to greatly decrease the wear upon the die and thereby lengthen its life.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which

Figure 1 is an elevational view, more or less diagrammatic in character, showing a pair of dies embodying the invention in operative relation with a piece of stock to be threaded.

Fig. 2 is a fragmental plan view of the lower die of Fig. 1, looking in the direction of arrow 2.

Fig. 3 is a plan view of the upper die looking in the direction of arrow 3.

Fig. 4 is a side elevational view of a circular die embodying the invention, and

Fig. 5 is an end view of the entering end of the die of Fig. 4.

Dies of the general character herein referred to as previously employed have been so constructed that as the forward end of each individual thread is brought into contact with the work it throws up a small lump of metal which has to be ironed out, so to speak, when that portion of the stock comes into contact with the other die. To smooth out these lumps of metal not only requires considerable power, but their engagement with the threads of the dies on the further rotation of the stock produces local wear on the dies and greatly shortens the life of the latter.

In threading machines employing dies of this kind, stock of a diameter approximately equal to the pitch diameter of the finished article is ordinarily employed. I have discovered that if the teeth of the die at the entering end of the latter are reduced or removed to a level which corresponds approximately to the pitch line of the threads of the finished article, these reduced portions will stand in the way of the aforesaid lumps of metal and will deflect that metal sidewise into the grooves between the teeth where it properly belongs. By this simple expedient I have obtained a quite remarkable increase in the life of a die, a matter of vital importance in the economical operation of threading machines, and I have also decreased to a considerable extent the amount of power necessary for the operation of such machines.

In Fig. 1 of the drawings, 10 and 11 represent flat upper and lower dies which are adapted to move in the direction of the arrows for rolling threads into a piece of stock indicated at 12. On this figure the root circle of the finished article is indicated at 13, the pitch circle at 14 and the outer circle of the threads at 15. The circumference of the stock used will correspond substantially with the circle 14. The root line of the threads of the dies is indicated at 16 and the outer line at 17. Normally the two die pieces 10 and 11 are caused to move relatively in opposite directions, means being provided to permit the stock 12 to rotate upon its own axis.

As indicated at 18, the teeth of the dies at the entering end of each die are cut away, or their height otherwise reduced to a level about half the height of the teeth, that is a level corresponding approximately with that of the pitch circle of the finished articles. At the juncture between the reduced and unreduced portions of each tooth, there is preferably a beveled surface 19 which is substantially triangular, as indicated in Fig. 2. Preferably, also, the outer surfaces of the reduced teeth beyond the triangular surfaces 19 are elongated flat surfaces 20 with parallel sides. In the present instance, these latter surfaces lie in a plane parallel with the lines 16 and 17, but, while this is desirable, I do not regard it as essential. One feature which is essential, however, is that the teeth at or just beyond the surfaces 19 shall be approximately one-half full height.

The reduction in the height of the teeth on the die is effected by a machining or a grinding operation. In performing this op-

eration, I prefer to cut down the height of all teeth beyond a diagonal line 21 across the die near the entering end thereof, although I may position this line 21 so as to leave one or two teeth of full height at the end surface of the die, as shown in Figs. 2 and 3.

In Figs. 4 and 5 I have shown the invention applied to a die 22 having a working face formed on an arc of a circle, the die being adapted to be mounted in a rotating die holder. A pair of holders each carrying a die 22 are connected for rotation in the same direction, the stock being rolled between them in an opposite direction. The two dies of each pair are duplicates, just as are the two dies of Fig. 1. In Fig. 5, which is an end view of one of the rotary dies, the greater number of teeth are shown reduced, but at the right there are several teeth which are of full height, just as in the case of the flat dies previously described.

The dies herein disclosed are mounted in pairs in suitable machines for reciprocating or rotating the dies, as the case may be. When a piece of stock is engaged by the dies, it rolls upon the reduced portions of the die threads, the distance between these portions in the two dies being the same approximately as the diameter of the stock. One by one the full height teeth of each die engage and roll threads into the stock, the metal pressed up by the outer half of each thread crowding an equivalent amount of metal into the lower part of the groove of the die on either side of that thread. As the full height teeth advance toward the work and push their way into the metal of the blank, they do not force a lump of that metal forward as heretofore, because the reduced portions of the teeth are in the way of such movement. The grooves of the die on either side of the tooth in question are the only places available for the displaced metal to go, and hence that is where it does go. Consequently there are no projecting masses of metal thrown up to be later pressed down again, as has been the case heretofore.

While in the foregoing description and in the accompanying drawings I have disclosed more or less in detail one specific embodiment of the invention, I desire it to be understood that such detailed disclosure has been resorted to primarily for the purpose of fully illustrating the invention, and that it is not to be construed as amounting to any limitations upon the scope thereof.

Having thus described my invention, I claim:

1. In a die for rolling threads, a series of teeth adapted to form threads in stock rolled thereover, the portions of said teeth for a substantial distance at the entering end of the die being flatted and reduced to a level approximately corresponding to the pitch line of the threads of the finished article, whereby the flatted and reduced portions deflect metal thrown up by the ends of the cutting portions of the teeth.

2. In a die for rolling threads, a series of teeth adapted to form threads in stock rolled thereover, the upper portions of said teeth for a substantial distance beyond a diagonal line across the entering end of the die being removed, whereby the entering ends of the teeth are reduced to a level no higher than that which would correspond approximately with the pitch line of the threads of the finished article.

3. In a die for rolling threads, a series of teeth adapted to form threads in stock rolled thereover, the outer portions of certain of the teeth for a substantial distance at the entering end of the die being removed to a level no higher than that which would correspond approximately with the pitch line of the threads of the finished article.

4. In a pair of cooperating dies for rolling threads, a series of teeth on each die having full height portions adapted to form complete threads in stock rolled thereover, and having lower height portions extending for a substantial distance in advance of said full height portions adapted to engage the work in advance of said full height portions, said lower height portions of the two dies being spaced apart a distance substantially equal to the diameter of the blank and being thereby adapted to engage the stock and prevent the throwing up of metal by the forward extremities of said full height portions.

In testimony whereof, I hereunto affix my signature.

LEE A. FRAYER.