

Feb. 6, 1951

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2,540,852

METHOD OF PIERCING NUTS AND OTHER ARTICLES

Filed July 3, 1946

2 Sheets-Sheet 1

Fig. 1.

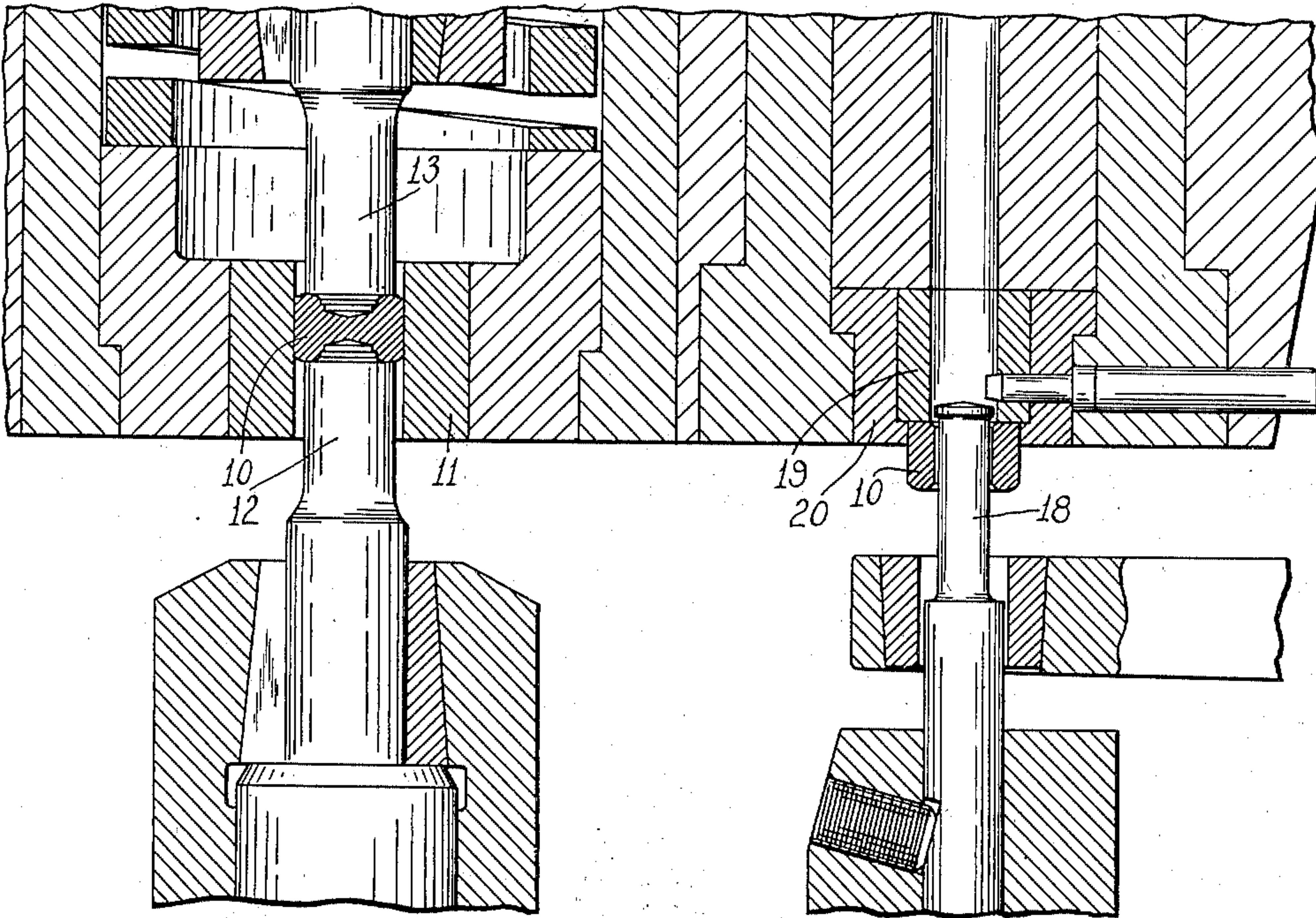
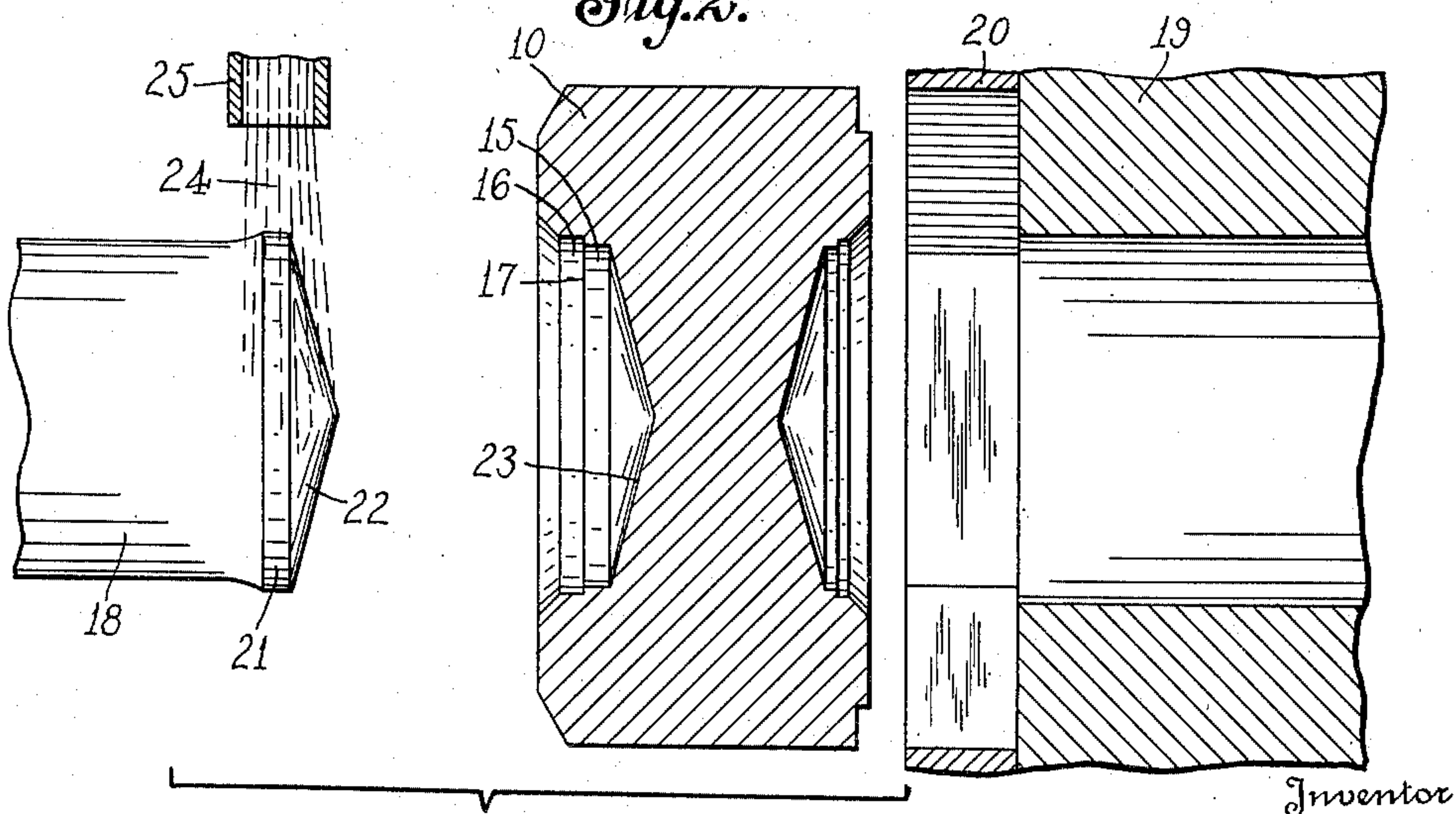


Fig. 2.



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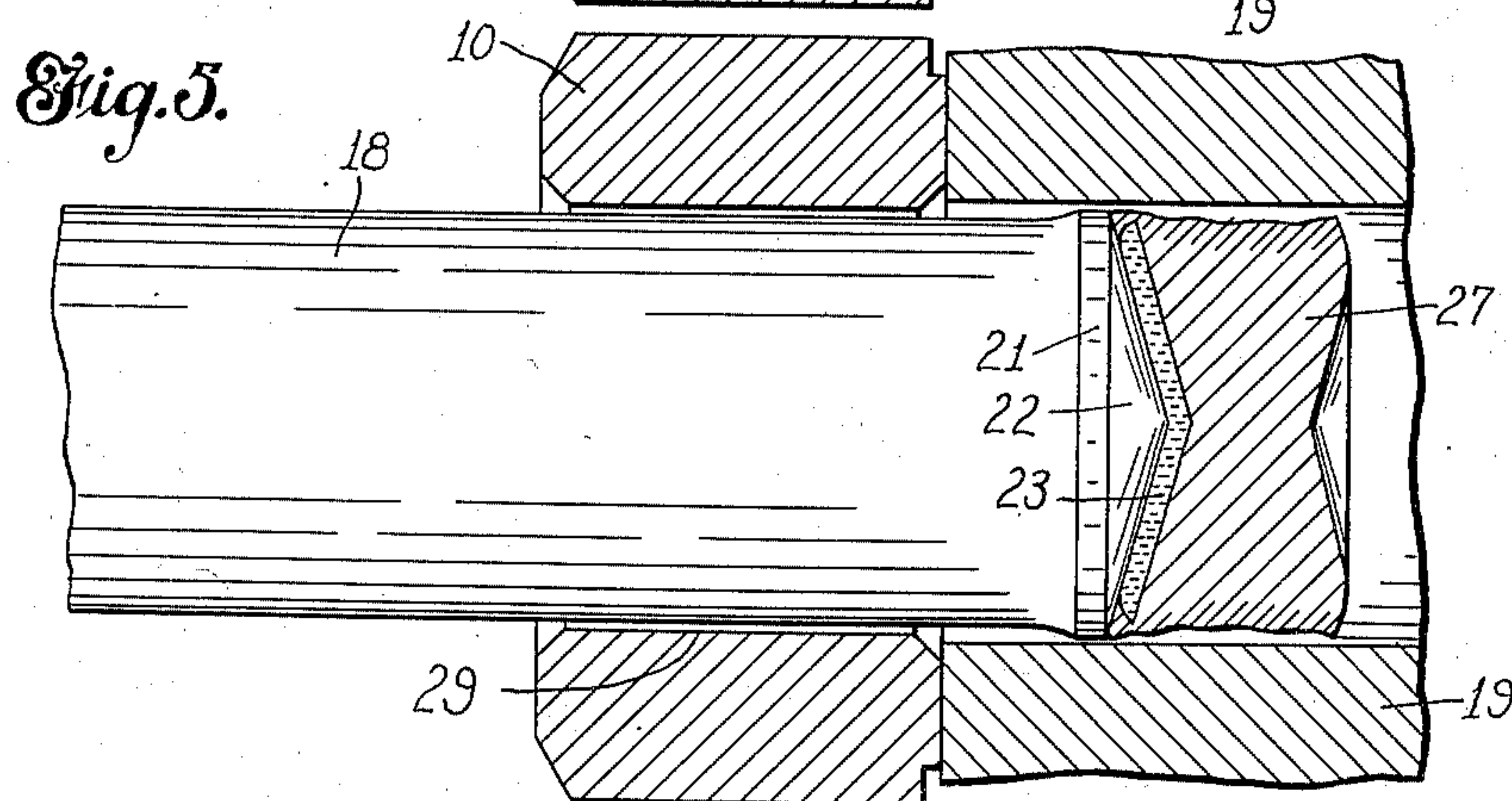
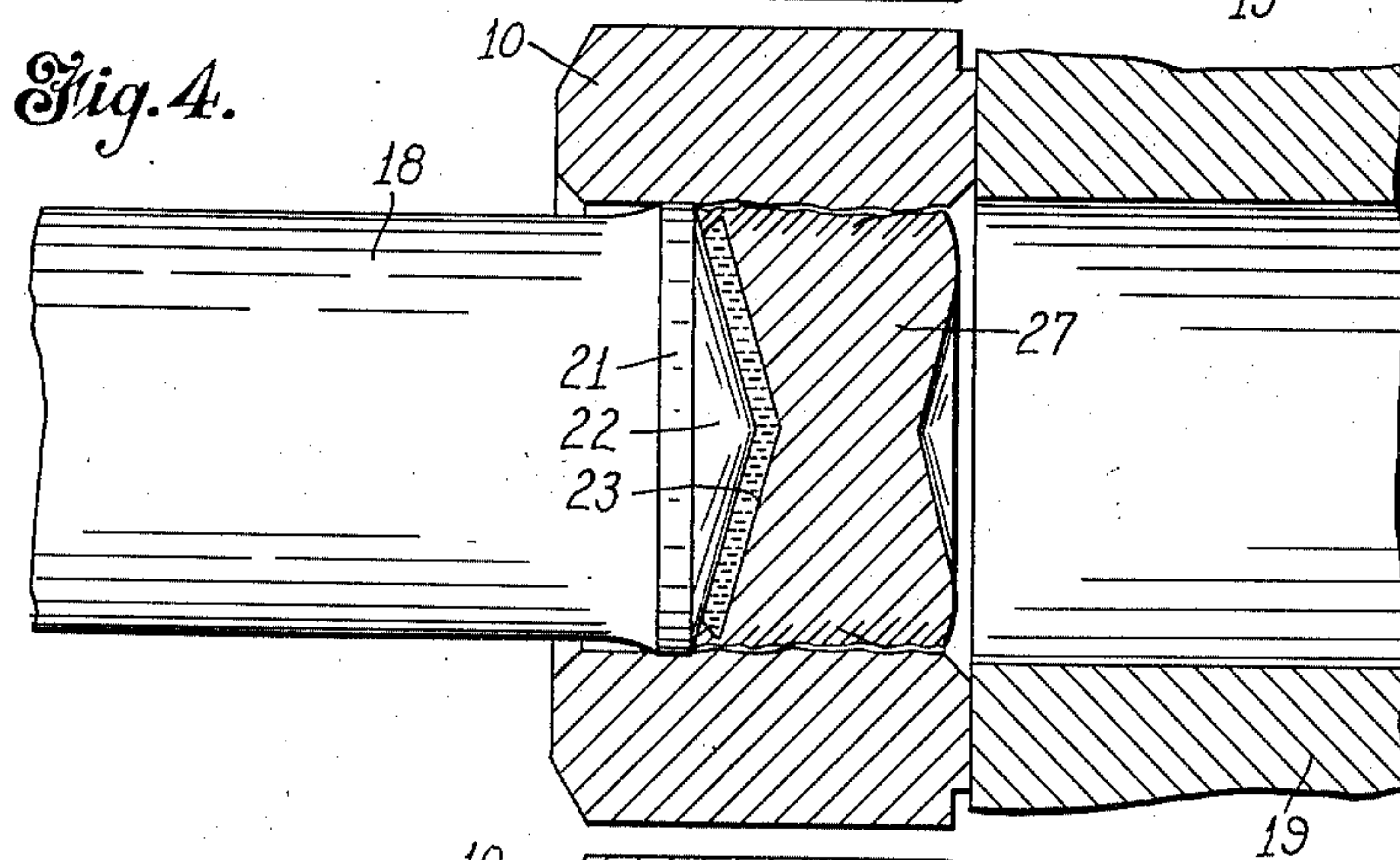
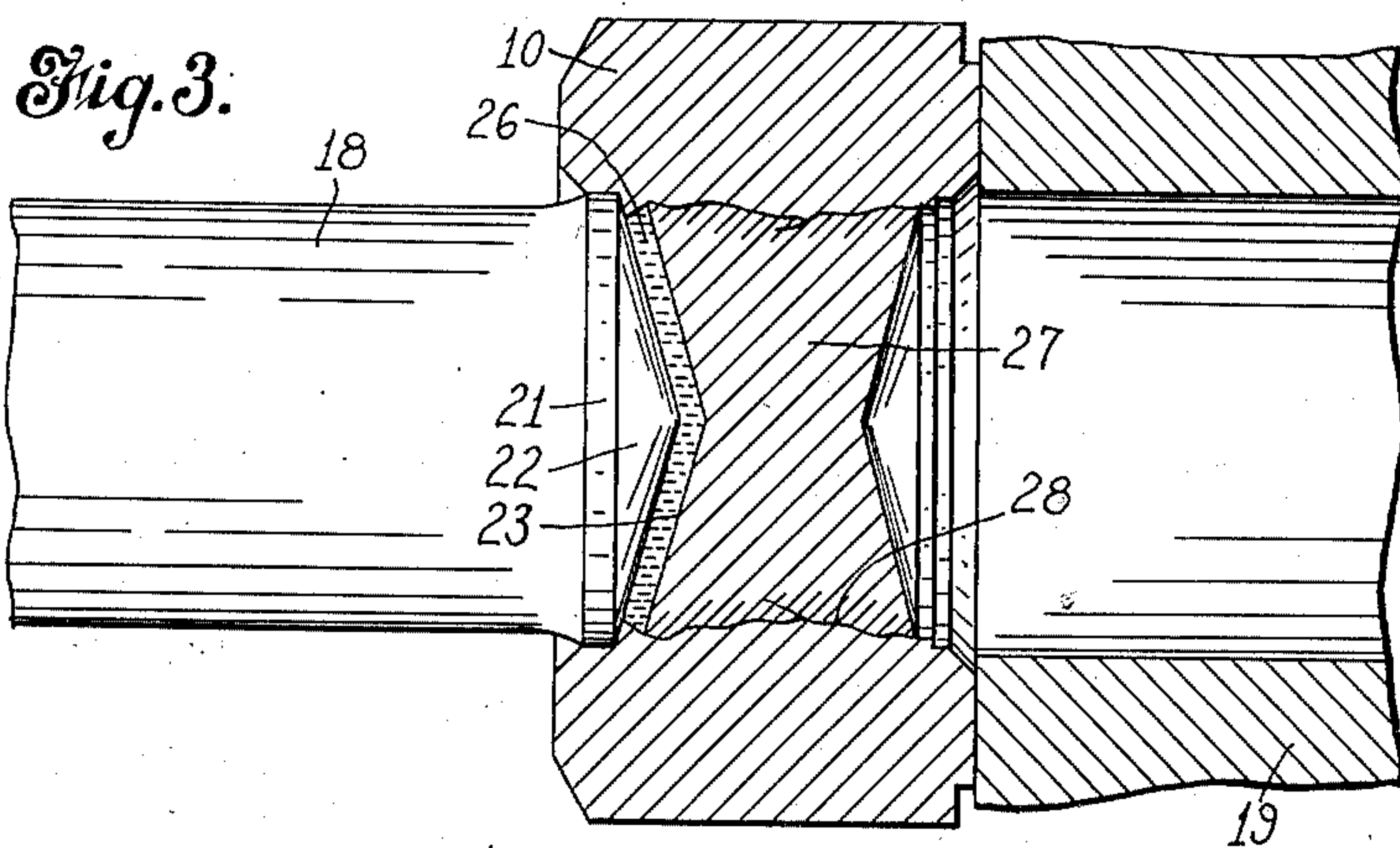
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2 Sheets-Sheet 2



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METHOD OF PIERCING NUTS AND OTHER ARTICLES

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6 Claims. (Cl. 10—86)

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This invention relates to a method for piercing or punching openings in metallic articles such as nuts, for example, and while the invention is illustrated in connection with a method of making nuts or nut blanks in a progressive nut-forming machine, such, for example, as shown in my application Serial No. 589,634, filed April 21, 1945, it will be understood that it is not to be limited to this use, but may be employed in any situation where it is desired to punch or pierce an opening through a relatively thick metallic work-piece.

In the method of making nuts, for example, it is more or less common practice to form the nut blank into its final, or substantially its final, shape, and then pierce out the center of the workpiece with a suitable punch to form the opening through the blank. Also it is not unusual at some step in the formation of the blank to indent the workpiece upon one or both faces thereof, these indentations being separated by a slug or web of metal which is afterwards broken out by the operation of the punch. This indenting of the blank leaves less metal for the punch to force out, and hence reduces the work required of the punch.

I have discovered that by maintaining a heavy film or cushion of oil between the end of the punch and the opposing face of the work, the results achieved in the piercing operation may be greatly improved. This may be readily effected, when the work is first indented upon the face engaged by the punch, as the oil may be trapped in this indentation and act as a cushion between the punch and the work, the effort of the punch being transmitted to the work through the cushion of oil, this transmitted effort serving to crack out the slug or break it loose from the surrounding metal of the nut to a large extent, rather than by the direct contact of the punch with the work.

Moreover, a second advantage is achieved by my method in that, when the trapped oil has broken out the slug ahead of the piercing punch, the oil will be released laterally to some extent, and flow between the broken out slug and the wall of the opening formed in the nut, and thus lubricate the path of the punch. Thus, not only does the punch itself have to remove a very small amount of metal from the wall of the opening, that is to say, the metal left on the wall by the slug which has been previously broken out by the oil, but the path of the punch is well lubricated so that the result is that the wall of the opening is smooth and finished, and does not exhibit a

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more or less rough surface, as would such an opening formed in the ordinary way.

One object of the present invention is to provide a new and improved method of piercing openings in metal work-pieces.

A further object of the invention is to provide a new and improved method of piercing openings in nuts or like metal workpieces, so that a smooth, clean hole will be effected by the punching operation.

A still further object of the invention is to provide a new and improved method of punching openings in metal, by a piercing or punching operation, such that the work required of the piercing tool will be greatly reduced and a clean, smooth hole will be obtained.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a cross-sectional view of two stations of a progressive nut-forming machine illustrating my improved method;

Fig. 2 is a sectional view of the parts of the machine and the work at the beginning of the piercing operation; and

Figs. 3, 4 and 5 are sectional views showing the progressive steps in my improved method during the advance of the punch or piercing tool.

To illustrate a preferred embodiment of my invention, I have shown in the drawings certain steps in a method of making a nut or similar article, although it will be understood that the novel method herein described and claimed is independent of the particular apparatus shown, and also may be employed in punching openings in articles other than nuts.

In Fig. 1 of the drawings I have shown in sectional view two stations of a machine for effecting two of the later steps in the formation of a nut. For example, at the left-hand side of Fig. 1 a nut blank 10 is shown within a die 11, the nut being operated upon by punches 12 and 13. In this operation the nut blank 10 is forced into the die 11 so that it may be given its final external shape, which may be hexagonal, and is also indented in both upper and lower faces by the projections on the end faces of the punches 12 and 13.

The nut as formed by the operation above described is shown in sectional view in Fig. 2, and it will be noted that the indentation or recess in the forward face of the nut consists of two parts. The inner part 15 is somewhat smaller than the outer part 16, leaving a step or shoulder 17 between the outer and inner parts. While the in-

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vention is not limited to the formation of an indentation or recess of this particular shape, I have found such a recess to be desirable, in that, with the inner portion of the recess smaller than the outer portion, the cushion of oil may be readily trapped within the inner portion by the punch.

The nut blank 10 is now moved to the station at the right-hand side of Fig. 1, where it will be pierced by the punch 18, the nut being supported by an anvil 19 held in a retainer die 20, which may also embrace and hold against expansion the rear portion of the blank.

As shown in Fig. 2, the punch is provided at its working end with a slightly enlarged portion 21, which portion smoothes the wall of the opening formed in the blank as the punch progresses therethrough. The punch is likewise provided with a conical end portion 22 complementary to the conical lower portion 23 of the recess 15 in the blank. As previously stated, oil is introduced into the recess 15 between the punch and the opposed surface of the work. This may be done in any manner found desirable, but I have found it quite satisfactory to advance the punch through a stream of lubricant, such as shown at 24 in Fig. 2, the lubricant issuing from a pipe 25. The movement of the punch toward the nut 10 will carry this lubricant into the recess or indentation in the face of the opening, with the results about to be described.

As shown in Fig. 2, the nut blank 10 is held in position between the withdrawn punch 18 and the anvil 19. The punch is now advanced, and, contacting the nut blank, drives it against the anvil. The continuing movement of the punch forces the latter into the outer portion 16 of the recess in the nut, and against the shoulder 17, as shown, for example, in Fig. 3.

It may here be stated that the diameter of the portion 21 of the punch is at least as large, or slightly larger than the diameter of the portion 16 of the recess, so that the punch will fit tightly into this portion of the recess structure, trapping a cushion of oil between the end of the punch and the slug or web of material at the center of the nut, this cushion being indicated at 26 in Fig. 3. It will be seen that the oil is completely trapped within the recess, and that further progress of the punch will effect pressure on the slug 27 through this cushion of oil, thus exerting pressure evenly over the surface of the slug, and cracking it out in advance of the punch, as shown by the cleavage line 23.

In Fig. 4 of the drawings the punch has been advanced to a slightly further extent, and it will be seen that the slug 27 has been completely cracked out, that is, has been broken away from the wall of the nut blank, leaving, however, a small amount of metal along this wall to be cleaned out by further advance of the punch. It is this reduction of the amount of metal to be cleaned from the wall of the opening by the punch that makes it possible for the punch to form an opening in the blank, having a clean, smooth wall.

Also when the slug has been cracked out or broken away from the blank, as shown in Fig. 4, the trapped oil will be released laterally to some extent, as the slug is free to move away from the end of the punch, and will thus flow to the walls of the opening and lubricate amply the path of the punch. This liberation of the trapped oil when the slug has broken free from the blank so that the oil may effect lubrication of the walls of the opening, also contributes to the formation of the smooth, clean wall by the punch.

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In Fig. 5 of the drawings, the punch has been advanced entirely through the blank, the slug being shown ahead of the punch, within the opening in the anvil 19, and the blank, as shown, having the clean, smooth opening 29 left by the passage of the punch therethrough. It will now be necessary only to thread this opening to complete the manufacture of the article.

While I have shown and described a preferred method of carrying out my improved process, it is to be understood that it is not to be limited to all of the details shown nor the exact steps set forth, but is capable of modification and variation within the spirit of the invention and the scope of the claims.

What I claim is:

1. The method of forming an opening in a metallic workpiece which comprises indenting the work on one face thereof to form an indentation approximating, in diameter, the diameter of the desired opening, confining a quantity of oil between a punch and the bottom of said indentation and then driving the punch forwardly to break out the slug between the bottom of said indentation and the opposite face of the work by pressure of the confined oil on the slug and then continuing the movement of the punch to expel the slug from the workpiece.

2. The method of forming an opening in a metallic workpiece, which comprises indenting both faces of the work to leave a slug of metal between the bottom of said indentations, the indentations, adjacent the faces of the workpiece, being of a diameter approximating that of the desired opening, introducing a quantity of oil into one of said indentations, and then driving a punch into the latter to break out the slug by pressure of the oil on the slug while confining the oil between the punch and the work and expel the slug from the work.

3. The method of forming an opening in a metallic workpiece, which comprises indenting both faces of the work to leave a slug of metal between the bottom of said indentations, the indentations, adjacent the faces of the workpiece, being of a diameter approximating that of the desired opening, introducing a quantity of oil into one of said indentations, and then driving a punch into the latter to confine the oil therein and maintain a cushion of oil between the end of the punch and the opposing surface of the work, while breaking out the slug from the surrounding metal.

4. The method of forming an opening in a metallic workpiece, which comprises indenting both faces of the work to leave a slug of metal between the bottom of said indentations, the indentations, adjacent the faces of the workpiece, being of a diameter approximating that of the desired opening, introducing a quantity of oil into one of said indentations, then driving a punch into the latter to confine the oil therein and maintain a cushion of oil between the end of the punch and the opposing surface of the work, while breaking out the slug, and driving the oil ahead of the punch after the slug is broken out to lubricate the wall of the opening ahead of the punch and expel the slug from the work.

5. The method of forming an opening in a metallic workpiece, which comprises indenting the work on one face thereof to form a stepped recess, the outer portion of which is larger than the inner, introducing oil into the recess and driving a punch into the recess to drive out, and expel from the work, the slug of metal between the bottom thereof and the opposite face of the

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work, the punch fitting tightly in the outer portion of the recess to confine the oil in the inner portion thereof and maintain a cushion of oil between the punch and the adjacent face of the work.

6. A method as in claim 1 wherein the side wall of the indentation is provided with an inwardly-projecting annular shoulder having an internal diameter less than the diameter of the punch whereby the latter engages the shoulder and confines the oil in that part of the indentation forwardly of the shoulder.

RICHARD LESTER WILCOX.

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