

No. 721,009.

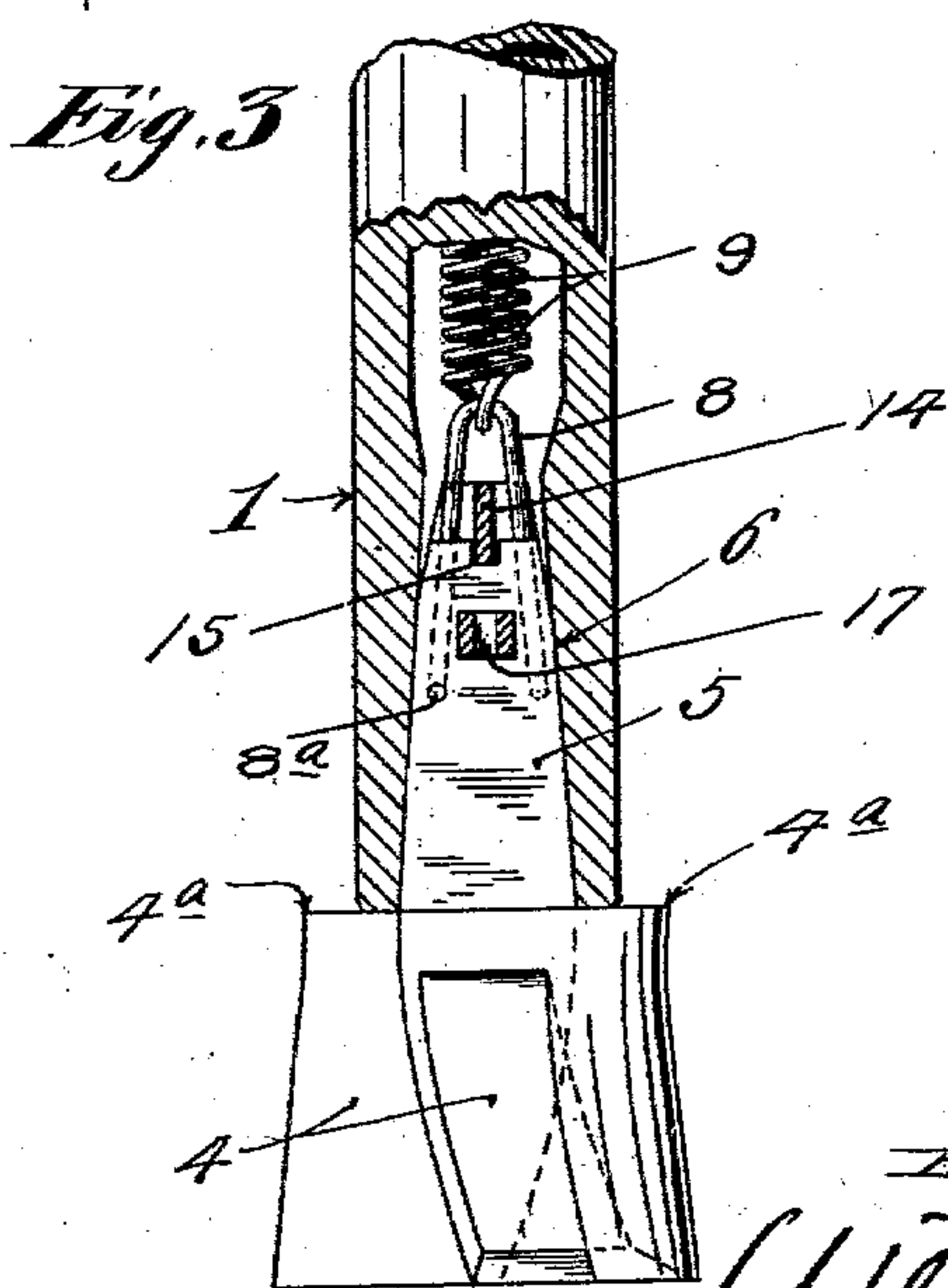
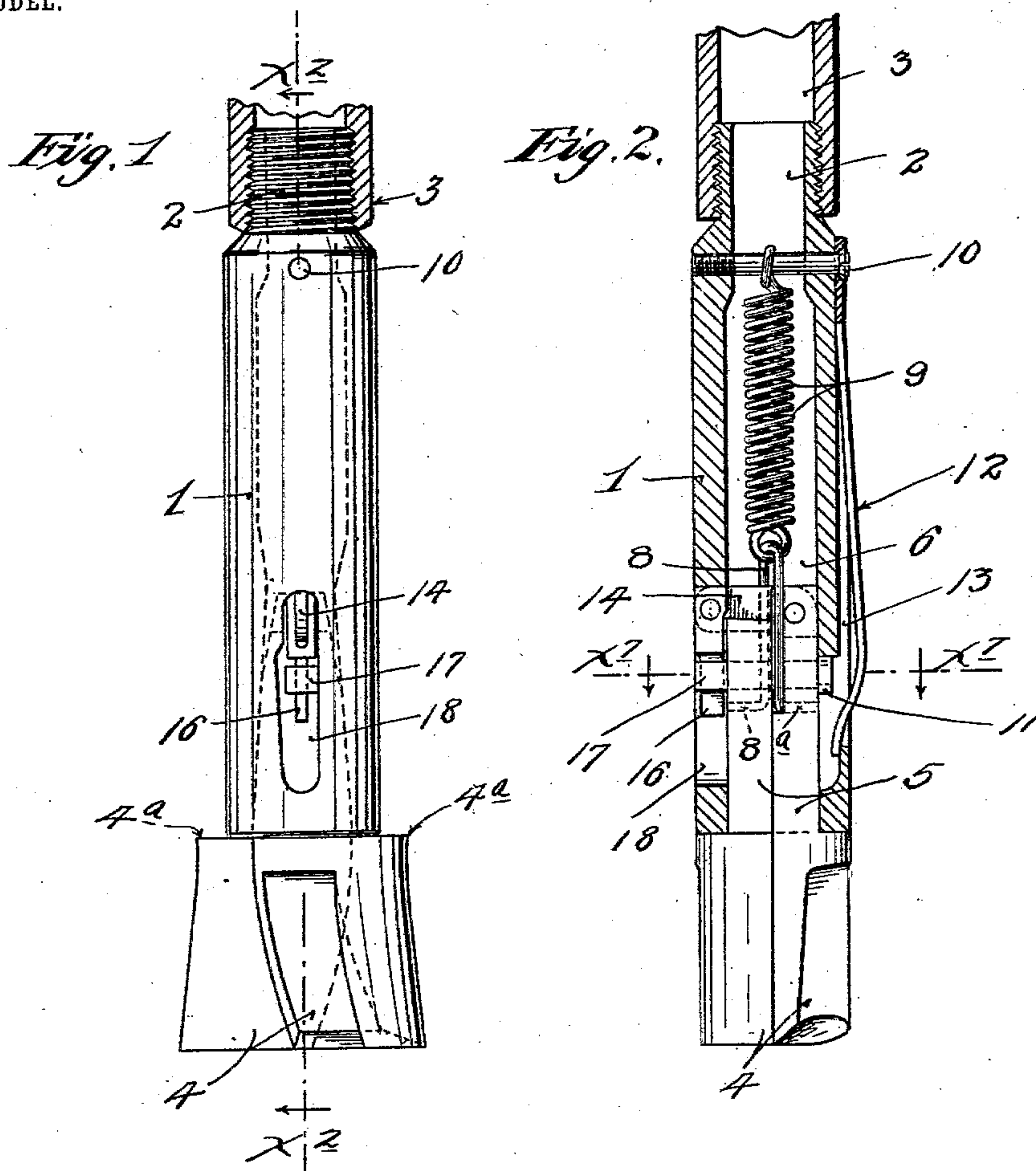
PATENTED FEB. 17, 1903.

R. J. BROTHEM.
DRILL.

APPLICATION FILED JUNE 6, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 4.

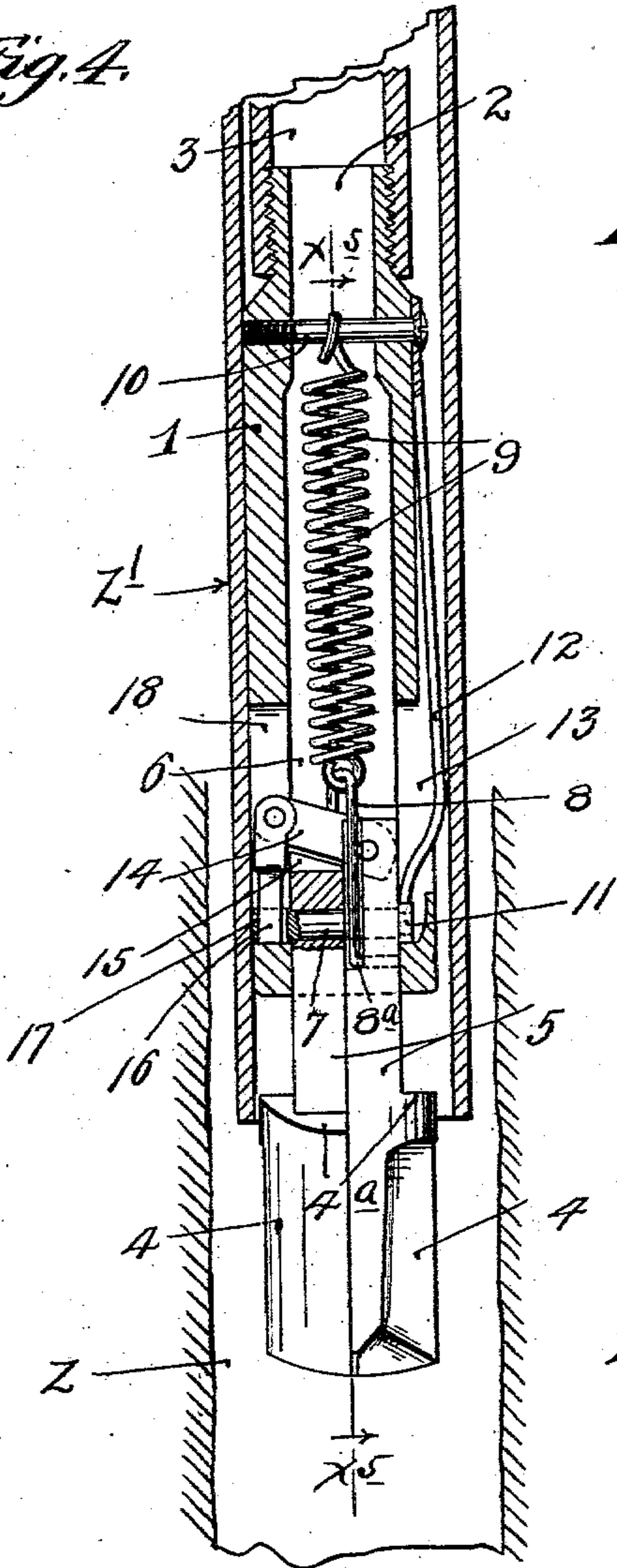


Fig. 5.

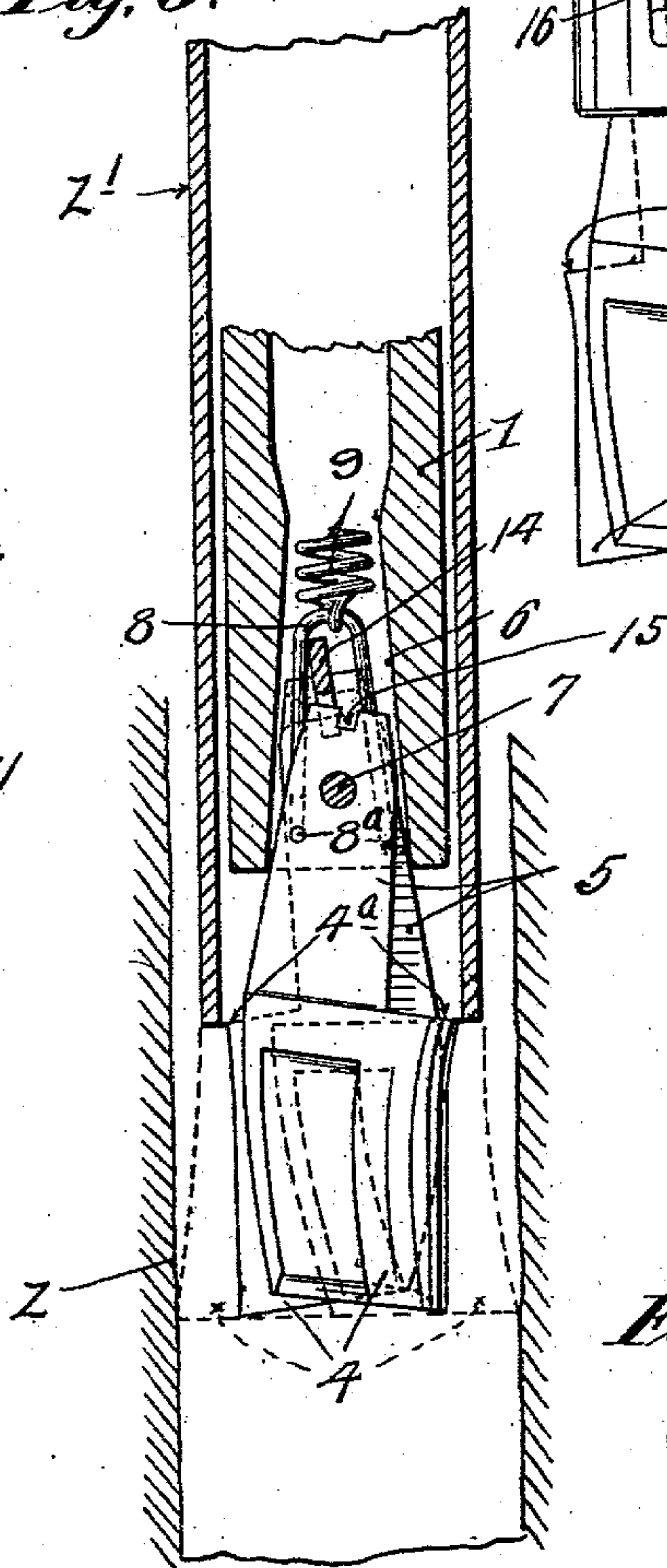


Fig. 6.

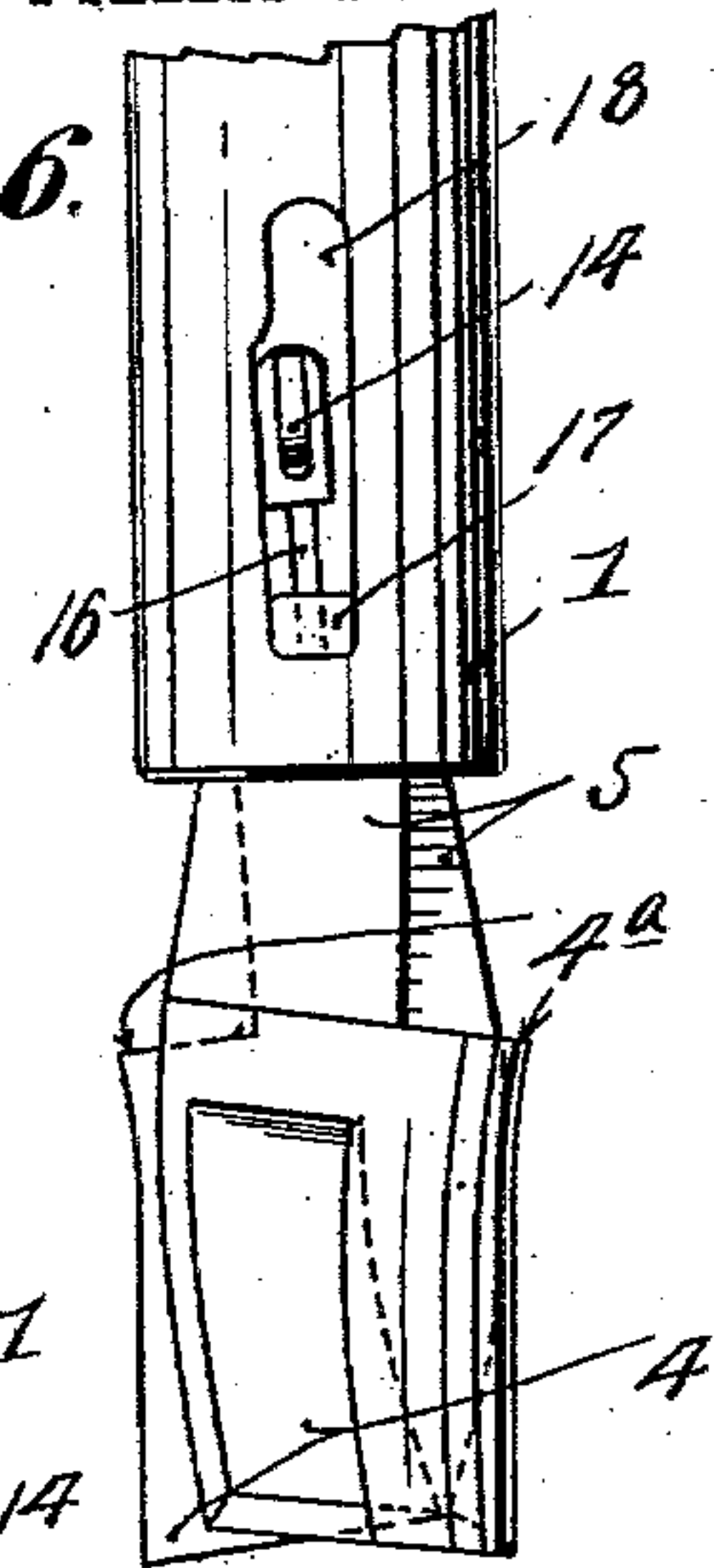


Fig. 7.

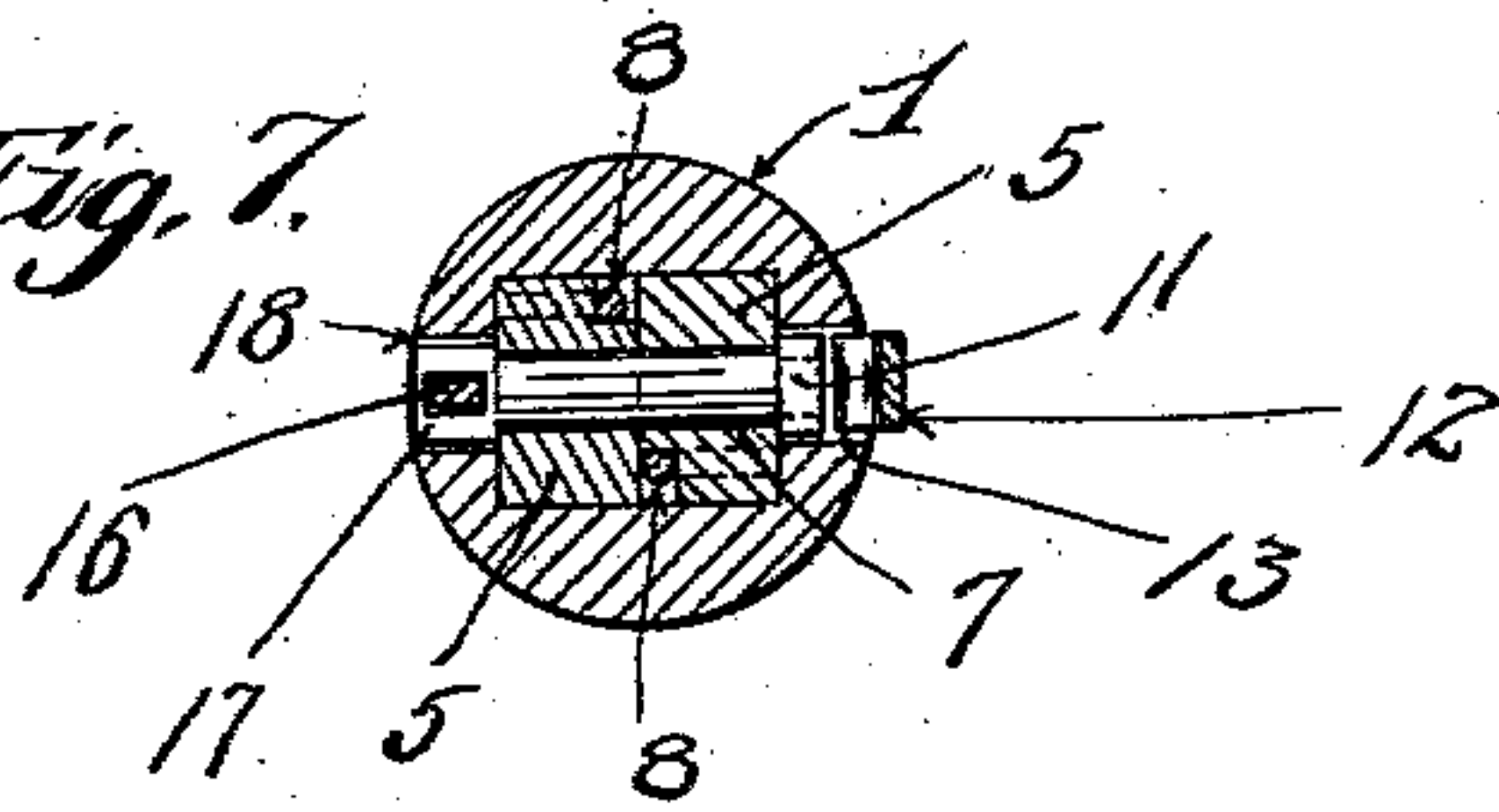
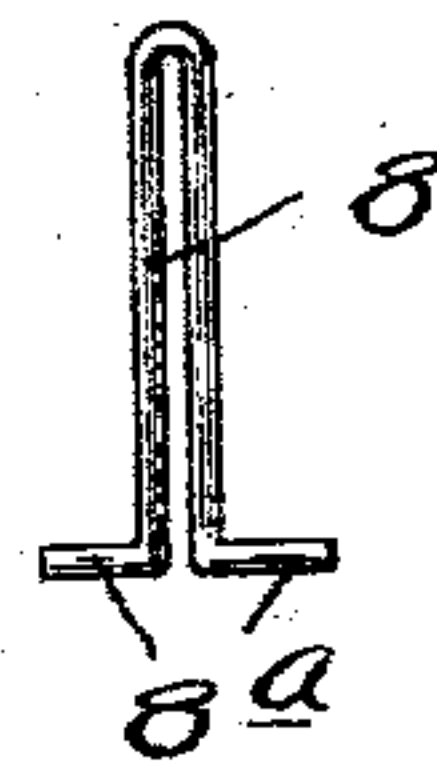


Fig. 8.



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UNITED STATES PATENT OFFICE.

RALPH J. BROTHEM, OF HENDRUM, MINNESOTA.

DRILL.

SPECIFICATION forming part of Letters Patent No. 721,009, dated February 17, 1903.

Application filed June 6, 1902. Serial No. 110,435. (No model.)

To all whom it may concern:

Be it known that I, RALPH J. BROTHEM, a citizen of the United States, residing at Hendrum, in the county of Norman and State of Minnesota, have invented certain new and useful Improvements in Drills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide an improved expansion-drill or boring-tool especially adapted for boring wells; and to this end the invention consists of the novel devices and combinations of devices herein-after described, and defined in the claims.

The improved device is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

As is well known, it is customary in boring wells to employ a tubular casing to prevent caving in of the small hole which is drilled. This casing must follow closely after the tool, and the tool must of course be capable of drilling a hole large enough to freely admit the casing. The tool must also be capable of expansion and contraction, so that when contracted it may be inserted and withdrawn through the tubular casing.

In my invention I accomplish the above results by simple and efficient mechanism, the preferred form of which is illustrated in the accompanying drawings.

Figure 1 shows my improved drill or boring-tool in side elevation. Fig. 2 is a section on the line $x^2 x^2$ of Fig. 1. Fig. 3 is a view corresponding to Fig. 1, but with some parts sectioned and others broken away. Fig. 4 is a view corresponding to Fig. 2, but showing the drill inserted into a casing-tube and showing the parts of the drill in different adjustment. Fig. 5 is a section on the line $x^5 x^5$ of Fig. 4. Fig. 6 is a detail in side elevation corresponding in the position of the parts to Fig. 5, some parts being broken away. Fig. 7 is a section on the line $x^7 x^7$ of Fig. 2, and Fig. 8 is a detail view of the jaw-closing spring.

The character z indicates a well-hole which is being bored, and the character z' indicates an incasing tube or pipe.

The head or body of the tool 1 is of cylindrical form and is adapted to slide very freely within the casing z' . At its upper end it is formed with a reduced and screw-threaded shank 2, to which the tool-operating pipe 3 is detachably secured.

The chisels or cutters 4 overlap the one with the other at their flat inner faces and are provided with tapered stems 5, which fit in a tapered socket 6 in the lower end of the head 1 and are pivotally connected by a bolt or pin 7. When the stems 5 are drawn into the socket 6, the cutters 4 are held distended laterally or expanded beyond the sides of the head 1 far enough to cut or drill a hole of greater diameter than the casing z' . When the cutters are thus distended, shoulders 4^a at the upper ends thereof project beyond the sides of the head 1, as shown in Figs. 1 and 3.

The character 8 indicates a U-shaped spring or staple-like link, the ends of which are turned outward at 8^a and are inserted into suitable seats formed one in each stem 5. This spring 8 tends to draw the cutters inward.

Mounted within the head 1 is a quite strong coiled spring 9, one end of which is attached to the spring-staple 8 and the other end of which is anchored to a screw or pin 10, shown as passed diametrically through the upper end of the head 1. This spring 9 exerts considerable force, tending to draw the stems 5 upward into close engagement with the socket 6, and thus to keep the cutters 4 distended or spread out, as shown in Figs. 1 and 3.

The bolt or pin 7 is provided at one end with a head 11, which coöperates with a latch-spring 12, the upper end of which, as shown, is secured by the said screw 10 and the free end of which works in a recess 13, cut in the side of the head 1 just above the said head 11. The purpose and action of this spring 12 will be considered in the description of the operation.

A lock-dog afforded by a short link 14 is pivoted to the extreme upper end of one of the stems 5 and engageable with the notch 15 in the extreme upper end of the other stem to lock the cutters in their distended or spread positions. A tripping-plunger 16, pivoted to the free end of the dog or link 14, works freely through a perforation in a head 17, shown as formed integral with the pivot bolt or pin 7.

The left-hand side of the head 1 as viewed in Fig. 4 is slotted or cut away at 18 to afford clearance for the tripping-plunger 16 and free end of the dog 14.

5 The operation in applying the drill or tool to working position and removing the same through the casing or tube z' is as follows: The cutters are drawn out from the head 1 and forced together, as shown in Fig. 6; and
 10 the free end of the latch-spring 12 is pressed inward back of the head 11 of the bolt 7, thereby holding the said cutters drawn outward, as shown in said Fig. 6. While the spring is thus still pressed inward, the tool
 15 is inserted into the casing z' , and it will be noted by reference to Fig. 4 that the said spring 12 is so bulged outward near its free end that it will be held in its operative position as long as it remains in said casing. Hence
 20 it is evident that the tool may be readily forced downward through the casing. When the tool has been forced downward so that its cutters 4 and the spring 12 are carried below the extreme lower end of the casing, the
 25 said spring under its own tension will fly outward out of engagement with the head 11, thereby permitting the spring 9 to draw the stems 5 upward into the socket 6 and force the cutters outward into the positions indi-
 30 cated by dotted lines in Fig. 5.

It should be noted that when the cutters are drawn downward from the head 1, as indicated in Figs. 4 and 5, the lower end of the tripping-plunger 16, striking the lower ex-
 35 tremity of the slot 18, raises the dog 14 out of engagement with the notch 15 and unlocks the two stems 5 the one from the other. From this it follows that the two cutters 4 will be held spread out until they are drawn
 40 outward from the head 1 nearly or quite to their extreme positions. When the stems 5 are drawn into the socket 6 nearly or quite to their extreme position, the upper end of the tripping-plunger 16 will strike the upper
 45 extremity of the slot 18, and thereby force the dog 14 again into engagement with the notch 15.

To withdraw the tool from working position, force is applied to draw the same up-
 50 ward, thereby carrying the shoulders 4^a of the cutters 4 against the extreme lower end of the casing z' , and thus pulling the stems 5 out of the socket 6 until they again reach the positions indicated by dotted lines in

Fig. 5 and by full lines in Fig. 6, whereupon 55 the dog 14 will be again released from the notch 15, the cutters will be forced together or inward, and the latch-spring 12 will be again engaged by the head or lug 11, thereby permitting the tool to be freely drawn up- 60 ward and outward through the casing.

It will of course be understood that the tool above described is capable of considerable modification within the scope of my inven- 65 tion as herein set forth and claimed. While it is desirable that the spring-staple 8 or some other spring should exert a force tending to close the cutters up, still this is not neces- 70 sary, for the reason that the shoulders 4^a being located outward of the pivot 7 will when pressed upon tend to close up the cutters.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In an expansion-drill or boring-tool, the combination with the head or body of a pair 75 of cutters having projecting stems pivotally connected at the upper ends and fitting a socket formed in the lower end of said head or body, a spring normally holding said stems within said socket and in turn holding said 80 cutters distended, and a lock-dog normally lockingsaid stems against pivotal movement, which dog is released when the stems are withdrawn from said socket nearly or quite 85 to their extreme positions.

2. In an expansion-drill or boring-tool, the combination with a head or body, of a pair of cutters having projecting stems pivoted at their inner ends and fitting a socket formed in the lower end of said head or body, a spring 90 normally holding said stems within said socket and in turn holding said cutters distended, a lock-dog pivoted to one of said stems and engageable with a notch in the other stem to lock said stem against pivotal 95 movements, and a plunger pivoted to the free end of said dog and working in a slot in said head or body to release said dog when said stems are drawn out and lock the same to- 100 gether when the said stems are drawn into said socket, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

RALPH J. BROTHEM.

Witnesses:

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 THEO. S. NELSON.