

No. 730,415.

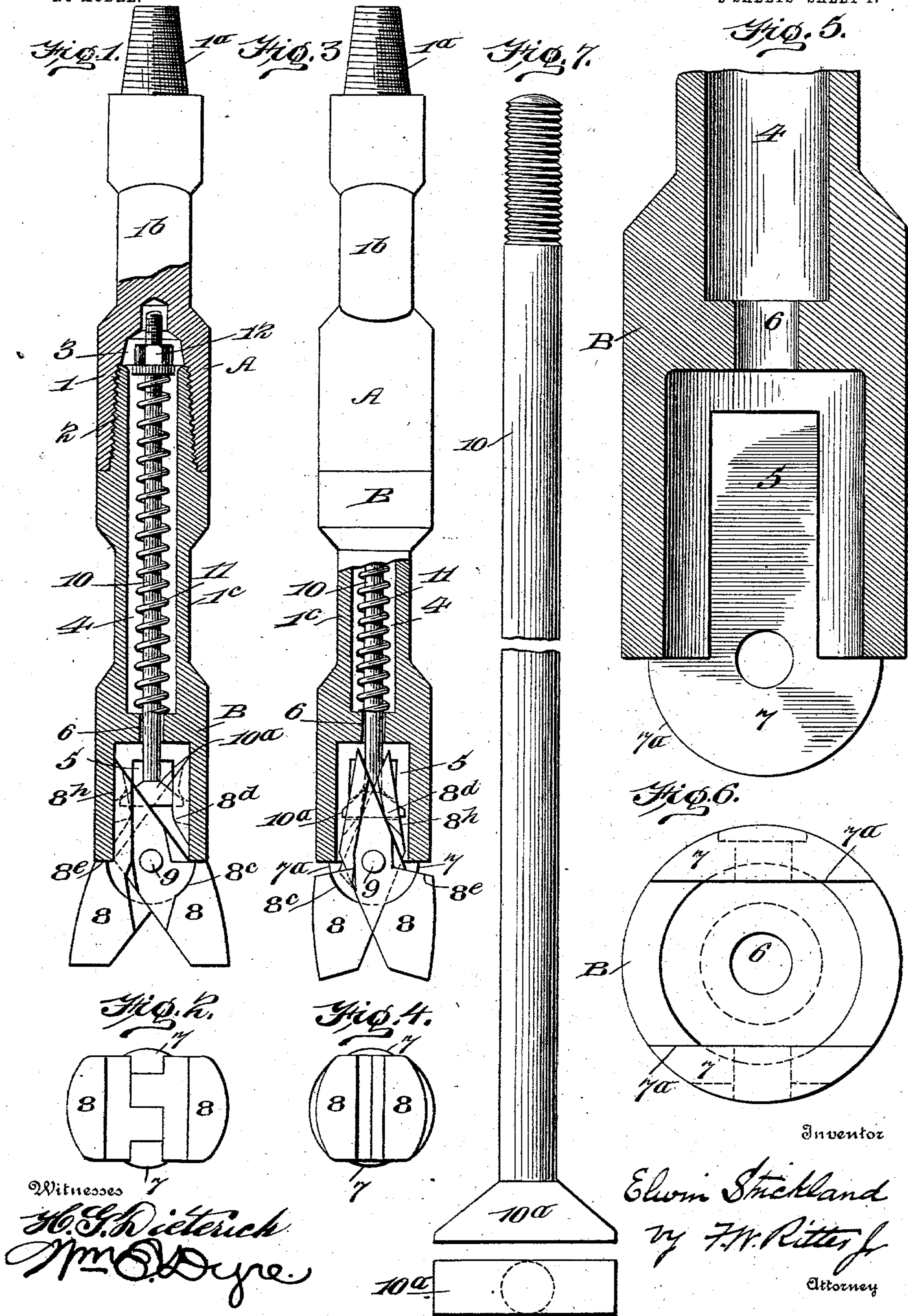
PATENTED JUNE 9, 1903.

E. STRICKLAND.
UNDERREAMEER.

APPLICATION FILED SEPT. 25, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

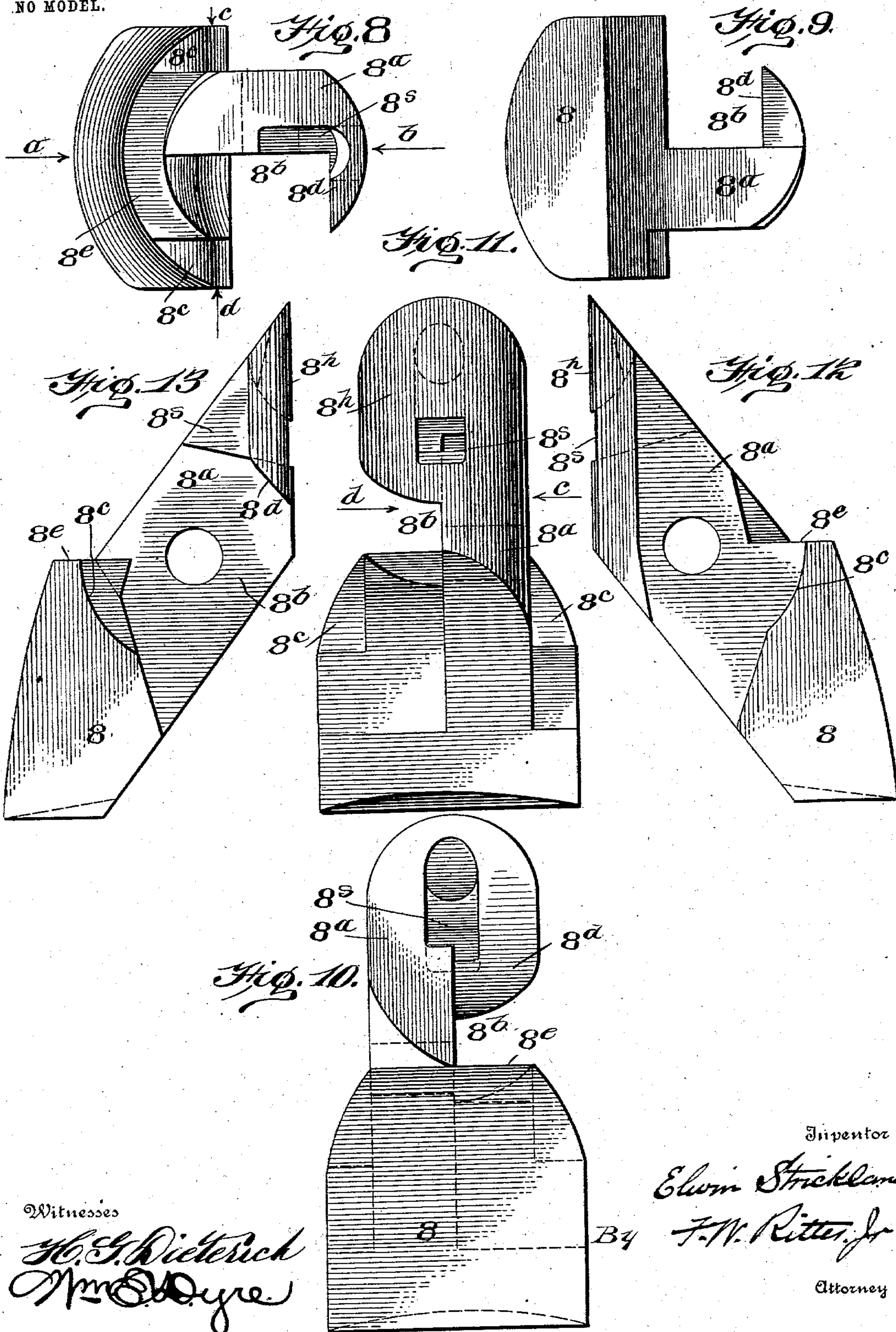


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2 SHEETS—SHEET 2.

NO MODEL.



Witnesses

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UNITED STATES PATENT OFFICE.

ELWIN STRICKLAND, OF LOS ANGELES, CALIFORNIA.

UNDERREAMER.

SPECIFICATION forming part of Letters Patent No. 730,415, dated June 9, 1903.

Application filed September 25, 1902. Serial No. 124,793. (No model.)

To all whom it may concern:

Be it known that I, ELWIN STRICKLAND, a citizen of the United States, residing at Los Angeles, county of Los Angeles, State of California, have invented certain new and useful Improvements in Underreamers; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a partial central section of an underreamer embodying my invention, the operative parts being in elevation and the cutters expanded. Fig. 2 is a bottom plan view of Fig. 1. Fig. 3 is a partial central section, the operative parts in elevation and the cutters closed or withdrawn for insertion in the casing. Fig. 4 is a bottom plan view of Fig. 3. Fig. 5 is an enlarged longitudinal central section of the lower member of the stock, the cutters being removed. Fig. 6 is an enlarged bottom plan view of the lower member of the stock, the cutters being removed. Fig. 7 is an enlarged detached view in elevation and bottom plan of the cam-headed pull-rod. Fig. 8 is an enlarged top plan view of one of the cutters. Fig. 9 is an enlarged bottom plan view of one of the cutters. Fig. 10 is an enlarged view of the face of the cutter looking in the direction of the arrow *a*, Fig. 8. Fig. 11 is an enlarged rear view of the cutter looking in the direction of the arrow *b*, Fig. 8. Fig. 12 is an enlarged side view looking in the direction of the arrow *c*, Figs. 8 and 11. Fig. 13 is an enlarged view of the opposite side from that shown in Fig. 12 looking in the direction of the arrow *d*, Figs. 8 and 11.

Like symbols refer to like parts wherever they occur.

My invention relates to the construction of that class of devices termed "underreamers," which are employed for enlarging the diameter of Artesian wells where casing is required and the drilling is done through the casing. In this class of devices it is essential that they be capable of being inserted and withdrawn through the casing, for which purpose the cutters must be adapted to close and to be expanded, and the cutters must be so sup-

ported by the stock as to relieve the pivot of undue strains and leverage, while the stock should, preferably, sustain the force of the blow on lines parallel to the axis thereof.

In carrying out my invention and in order to obtain the hereinbefore-recited results in an underreamer, I combine with a stock crossed and interlocked pivoted cutters, (shear cutters,) the arms of which are received within a chamber, upon the inner walls of which they find seats or bearings, said arms provided with shoulders which engage the bottom of the stock, so that the pivot is relieved of strain and the force of the blow is transmitted to the stock on lines parallel to its axis, and such a construction embodies the main feature of my invention.

There are other minor features of invention which involve particular features of construction and combinations dependent thereon, all as will be hereinafter more fully pointed out.

I will now proceed to describe my invention more fully, so that others skilled in the art to which it appertains may apply the same.

In the drawings, A and B indicate, respectively, the upper and lower members of a two-part stock, which may be connected by the box-and-pin connection 1 2 or in other suitable manner. The upper member A may be provided with a pin 1^a for connection with a stem and with a wrench-seat 1^b for applying a wrench for effecting said connection as well as the connection between the members A B. The interior of the box 1 is extended centrally, as at 3, to accommodate the upper end of a pull-rod and the nut thereon.

The lower member B of the stock has the pin 2, as before noted, for connecting it with the member A and below the same a wrench-seat 1^c. Extending axially of the member B from above is the bore or central chamber 4 for the reception of a pull-rod and its spring, and extending inwardly from the bottom of the stock is a cavity or chamber 5 of greater diameter for the reception of the arms of the crossed cutters, said chambers 4 and 5 being connected by a passage 6 of smaller diameter, through which passes the spring-actuated pull-rod which controls the crossed pivoted

cutters. Extending downwardly from the bottom of the stock on opposite sides are the parallel perforated pivot-lugs 7, which not only afford support to the pivot of the crossed cutters, but also lateral support to the cutters themselves.

8 8 indicate the two cutters, oppositely disposed and provided with arms 8^a, which cross and interlock at the pivot, being provided for that purpose with the recesses 8^b. The shoulders 8^c are arcs struck on a circle having the pivot for its center to correspond with the circular edge 7^a of the pivot-lugs 7, and thus permit the expansion and closing of the cutters, while the shoulder 8^d opposite the arc-shaped shoulders 8^c is so shaped as to permit the approach of the arms 8^a (see Fig. 3) when the tool is to be introduced or withdrawn through the casing. Each of said cutters is provided on its exterior with a shoulder 8^e, adapted to engage the bottom of the stock between the pivot-lugs 7 when the cutters are expanded, (see Fig. 1,) and also with the outer bearing-face 8^h on the arm 8^a above the pivot-point where the arms extend up into the chamber 5 to engage or bear against the inner wall of the chamber 5, and said shoulders 8^e and bearing-faces 8^h of the arms, by reason of the cutters being crossed and interlocked, relieve the cutter-pivot 9 of strain and transfer the force of the blows from the cutters to the stock on lines parallel to the axis thereof. The arms 8^a above the pivot are each provided with a slot 8^s for the reception of a cam-head on the lower end of a spring-actuated pull-rod, the function of which (see Fig. 1) is to cause the projection of the cutters and force and maintain the bearing-faces 8^h of the arms 8^a in contact with the inner walls of the chamber 5 of the stock during the operation of the underreamer. For said purpose the upper wall of the slot 8^s is preferably rounded or cam-faced, (as best shown by the dotted lines, Figs. 11 and 12,) and the slot is sufficiently deep to accommodate the descent of the cam-head of the pull-rod (see Fig. 3) when the cutters are withdrawn for passing the devices into and through the casing.

10 indicates a pull-rod, provided at its lower end with a cam-head 10^a, of general triangular form, adapted by its opposite arms to engage in the cam-slots 8^s in the arms 8^a of the cutters 8. This pull-rod occupies the axis of the stock and extends from lower chamber 5 thereof through passage 6 into upper or spring chamber 4, where it is encircled by a spiral spring 11, the upper threaded end of said pull-rod 10 being provided with a nut 12, which confines the pull-rod, bears on the upper end of the spring, and may be manipulated to increase or decrease the force exerted by the spring on the pull-rod and through said pull-rod on the arms 8^a of the cutters 8 above the pivot 9 thereof.

65 The construction of the several parts of the

underreamer being substantially such as hereinbefore pointed out, the parts may be assembled by first crossing and interlocking the arms 8^a of the cutters 8, then with the cutters expanded introducing the cam-head 10^a of pull-rod 10 into the cam-slots 8^s of the cutter-arms 8^a, next closing the cutter-arms (see Fig. 3) and introducing the pull-rod and cutter-arms 8^a axially into the stock until the pivot 9 can be inserted through the pivot-holes of dependent lugs 7 and through the cutters, after which the spiral spring 11 may be introduced into chamber 4 around the pull-rod and the nut 12 applied to said pull-rod to confine it and the spiral spring, and, finally, the members A and B of the stock may be screwed together, which completes the device.

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

1. In an underreamer, the combination with a cutter-stock having a cavity at its lower end, of crossed and interlocked cutters pivoted on the stock and having shoulders which engage the lower end of the stock and arms which extend into and engage the inner walls of the stock, substantially as and for the purposes specified.

2. In an underreamer, the combination with a cutter-stock having a cavity at its lower end, of crossed and interlocked pivoted cutters having shoulders which engage the cutter-stock in the plane of the pivot and arms above the pivot which extend into the cavity of the cutter-stock, substantially as and for the purposes specified.

3. In an underreamer, the combination with a cutter-stock having a cavity at its lower end, of crossed and interlocked cutters pivoted on the cutter-stock having shoulders which engage the cutter-stock and arms which extend into the cutter-stock, and means for exerting a yielding tension on the arms of the cutters above the pivot, substantially as and for the purposes specified.

4. In an underreamer, the combination with a cutter-stock having a cavity in its lower end, of crossed and pivoted cutters having shoulders which engage the cutter-stock and arms which extend into the cavity of the cutter-stock, and a spring-actuated pull-rod connected with the arms of the cutters above the pivot, substantially as and for the purposes specified.

5. In an underreamer, the combination with a cutter-stock, of crossed and pivoted cutters having cam-slots above the pivot thereof, and a spring-actuated pull-rod having a cam-head which engages the cam-slots of the cutters, substantially as and for the purposes specified.

6. In an underreamer, the combination with a separable cutter-stock, the lower member of which has an axially-disposed spring-cham-

ber above and a cavity in its lower end, of
crossed pivoted cutters having shoulders
which engage the cutter-stock and arms
which extend into the cavity thereof, a cen-
5 trally-disposed pull-rod which engages the
cutter-arms, and a spring which encircles and
engages the pull-rod, substantially as and for
the purposes specified.

In testimony whereof I affix my signature,
in presence of two witnesses, this 13th day of 10
September, 1902.

ELWIN STRICKLAND.

Witnesses:

WILLIAM H. EASTMAN,
HOWARD A. THORNTON.