F. C. VOLTZ.

UNDERREAMER.

APPLICATION FILED JUNE 22, 1908.

985,956. Patented Mar. 7, 1911.

Fig. 1.

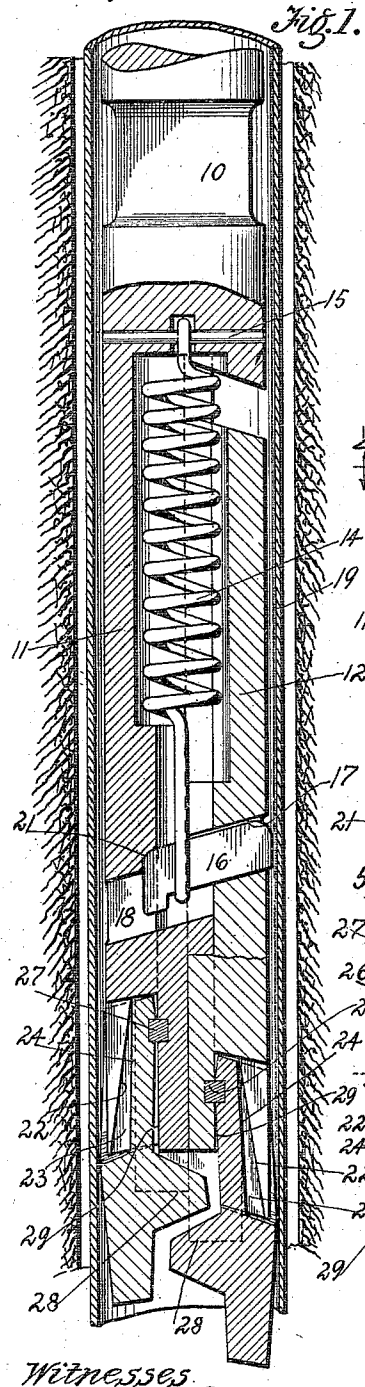


Fig. 2.

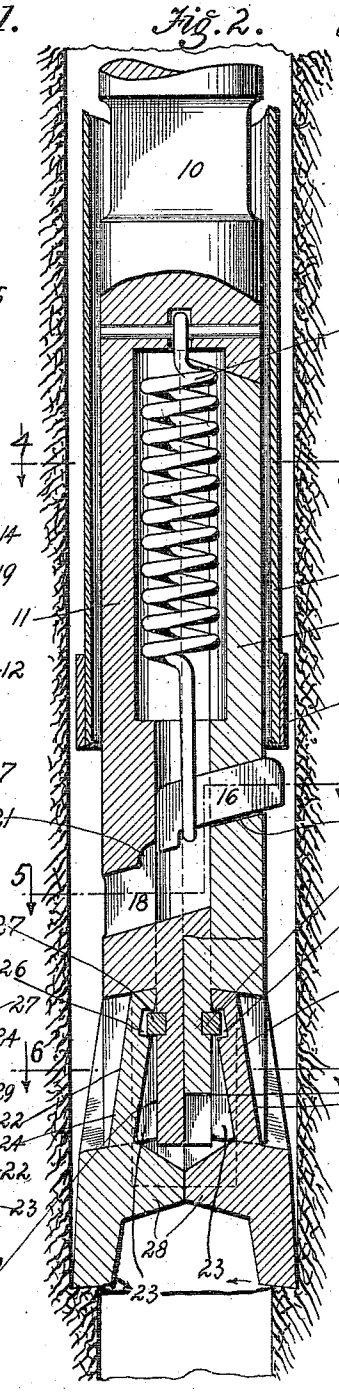


Fig. 3.

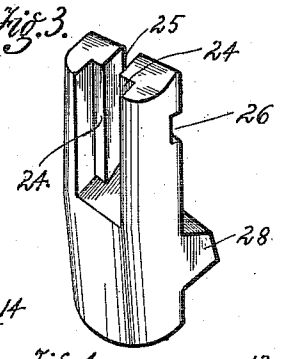


Fig. 4.

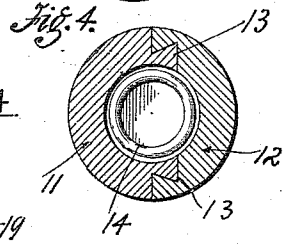


Fig. 5.

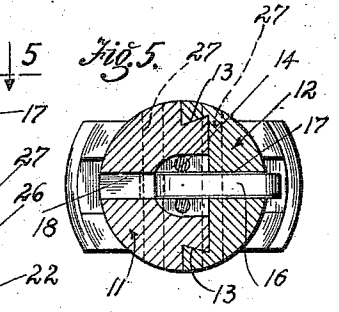
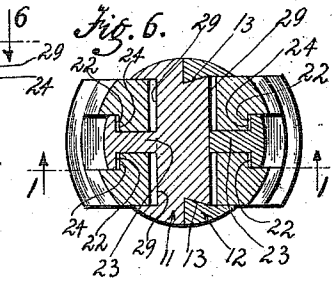


Fig. 6.



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UNITED STATES PATENT OFFICE.

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UNDERREAMER.

985,956. Specification of Letters Patent. Patented Mar. 7, 1911.

Application filed June 22, 1908. Serial No. 439,655.

To all whom it may concern:

Be it known that I, FRANK C. VOLTZ, a citizen of the United States, residing at Fullerton, in the county of Orange and State of California, have invented new and useful Improvements in Underreamers, of which the following is a specification.

The prime feature of this invention consists in the provision of a longitudinally divided mandrel, in ordinary cases the mandrel being centrally divided into two sections or members, these members having a longitudinally sliding engagement with each other. Each of the sections of the mandrel has a cutter pivotally mounted thereon. These cutters are provided with lugs upon their opposing faces adapted to contact with each other when the sections of the mandrel are in one position and to thereby spread the cutters apart. When the sections of the mandrel are in the other position the lugs on the cutters pass each other and the cutters are allowed to be contracted.

Other novel features in combination with the above most salient one will appear from the following description.

In the accompanying drawings, forming a part of this specification:—Figure 1,— is a longitudinal sectional view of my under reamer showing its contracted position when passing through a well casing, the lower part of the section being taken on line 1—1 of Fig. 6. Fig. 2,— is a similar view showing the under reamer in its expanded operative position. Fig. 3,— is a perspective detail of one of the cutters. Fig. 4,— is a horizontal section taken on line 4—4 of Fig. 2. Fig. 5,— is a horizontal cross-section taken on line 5—5 of Fig. 2. Fig. 6,— is a horizontal section taken on line 6—6 of Fig. 2.

In the drawings 10 designates a mandrel whose lower end only is shown, the upper end being provided with the usual screw joint for connecting the drilling tools above. Throughout its lower portion mandrel 10 is divided into two sections or sliding members 11 and 12 along a central longitudinal plane, dove-tailed surfaces as at 13 being provided so that member 12 may have a vertical or longitudinal movement upon member 11 which is directly connected to the upper part of mandrel 10. Section 12 is normally held in its uppermost position by means of a spring 14 secured to a pin 15 at its upper end, this pin being set in the body of the mandrel. The lower end of the spring is looped around a T 16 which rests in a slot 17 cut in member 12. A slot 18 is also cut in member 11 below the normal position of key 16 so that the key may be removed by forcing member 12 downwardly.

The normal operating position of key 16 is shown in Fig. 2 and it is evident that upon pulling the under reamer upwardly into casing 19 the key will strike upon shoe 20 and member 12 will be forced downwardly as it is impossible to force the key inwardly until it reaches a position so that its inner end may pass into a locking notch 21 made in member 11 just above slot 18. This notch is just sufficiently deep to allow the key to move upwardly so that its outer end is approximately flush with the outer surface of the mandrel, the under reamer may then be pulled up through the casing as the key is held upwardly by contact with the inner surface of the casing if it should start to move downwardly. Ordinarily, however, the key is placed at such an angle that it will frictionally hold in the position shown in Fig. 1 until member 12 is moved upwardly by the striking of the cutters upon the bottom of the hole. The lower ends of both members 11 and 12 are cut to the sectional configuration shown most clearly in Fig. 6.

Upwardly facing shoulders 22 are formed on each side of radially projecting webs 23, the cutters being provided with surfaces 24 for engagement with shoulders 22 and having longitudinal slots 25 as shown clearly in Fig. 3 to pass around webs 23. The upper ends of the cutters are provided with transverse grooves 26 to engage with pins 27 placed transversely through members 11 and 12. These pins form a pivotal support for the cutters. When the cutters are in their expanded positions surfaces 24 bear directly against shoulders 22, lugs 28 holding the cutters rigidly apart as shown in Fig. 2. When member 12 is lowered as shown in Fig. 1 lugs 28 pass each other and thus allow the cutters to be contracted, and the inner surfaces of their upper portions then contact with faces 29 of members 11 and 12, these faces being opposite inwardly facing shoulders 22.

It will be seen that the essential feature of the support and connection of the cutters involves a tapered aperture into which

the upper end of a cutter may be placed, this aperture having on opposite sides faces or shoulders against which the upper parts of the cutter may rest when in either of its positions, the upper part of the cutter being made straight so as to have room to move transversely in the tapered opening in the bottom of the mandrel. This construction affords great strength with simplicity as the cutters have a large bearing surface to prevent them from being forced out of position.

It is obvious that inwardly facing shoulders 22 might be constructed without any support by webs 23 but this web is inserted to prevent the breaking of the outer portion which carries shoulder 22, the general form of web 23 and the portion carrying the shoulders being in the shape of a T.

From the foregoing description it will be seen that the essence of this invention consists in a mandrel divided longitudinally into two members which are provided with means so that they may be moved longitudinally of each other. Upon each of the members the cutter is pivotally mounted, there being means interposed to expand the cutters when they are directly opposite each other. The remaining details of construction are for the most part designed to give strength and simplicity to the invention and may be varied for different requirements.

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

1. An under-reamer comprising a mandrel divided longitudinally into two sections, cutters movably mounted on said sections, and means for moving said movable cutters into and out of operative position.

2. An under-reamer comprising a mandrel divided longitudinally into two sections, a main section and a movable section, said main section being provided with a transverse recess and a locking notch, said movable section also being provided with a transverse recess, a headed key mounted in said recess in the movable section and adapted to be removed through the recess in the main section and to engage the locking notch in said main section, said main section and said movable section being hollowed out to form a cavity between the said sections, a spring mounted in said cavity, one end of said spring being attached to the main section and the other end to said key and cutters pivotally and removably mounted on said sections.

In witness that I claim the foregoing I have hereunto subscribed my name this 9th day of June, 1908.

FRANK C. VOLTZ.

Witnesses:
EDMUND A. STRAUSE,
OLLIE PALMER.