

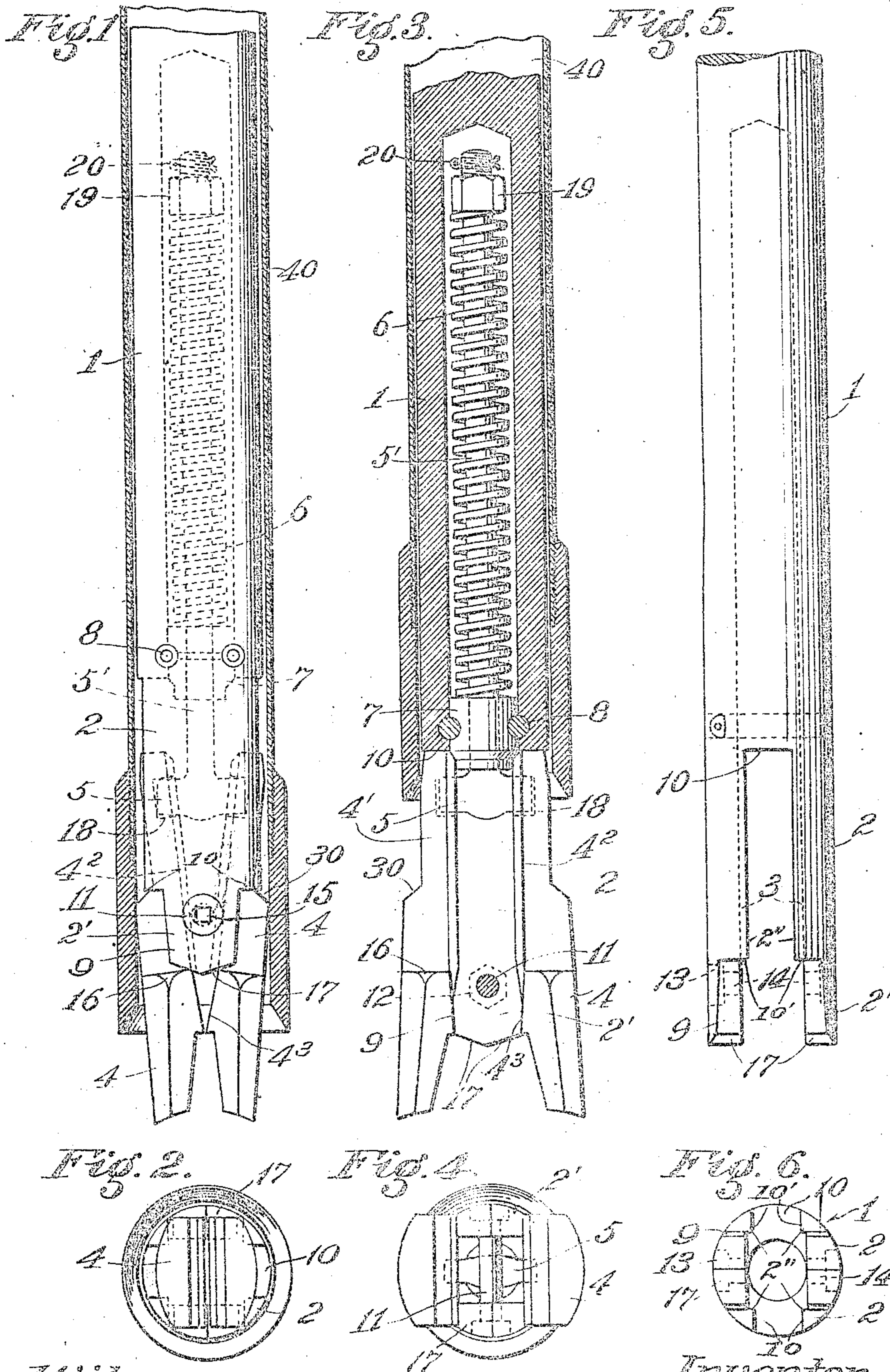
No. 827,595.

PATENTED JULY 31, 1906.

E. C. WILSON.
UNDERREAMER.

APPLICATION FILED NOV. 28, 1905.

2 SHEETS—SHEET 1.



Witnesses:

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C. J. Williams

Inventor,

Elihu C. Wilson.

By James R. Townsend
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2 SHEETS—SHEET 2.

Fig. 7.

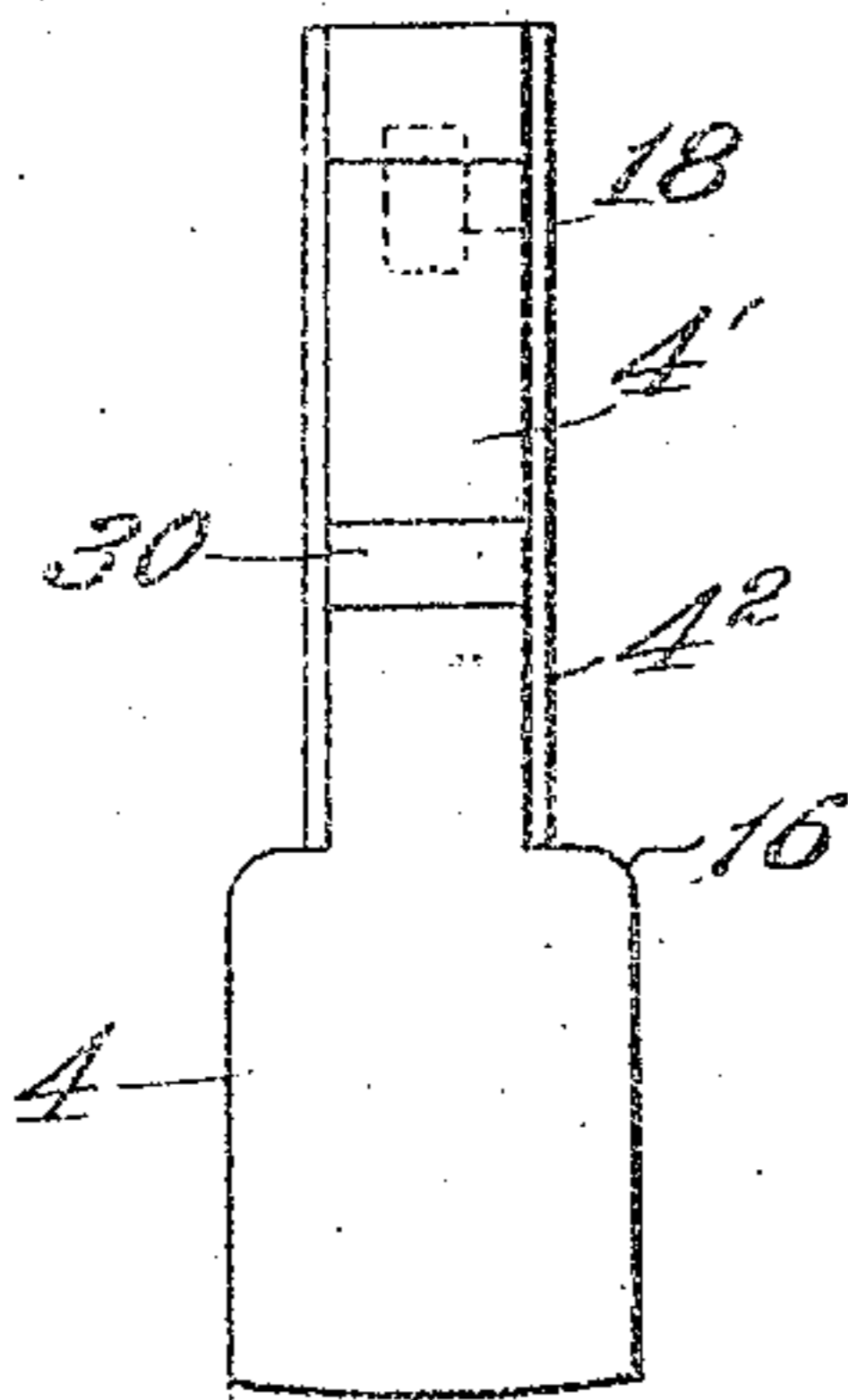


Fig. 8.

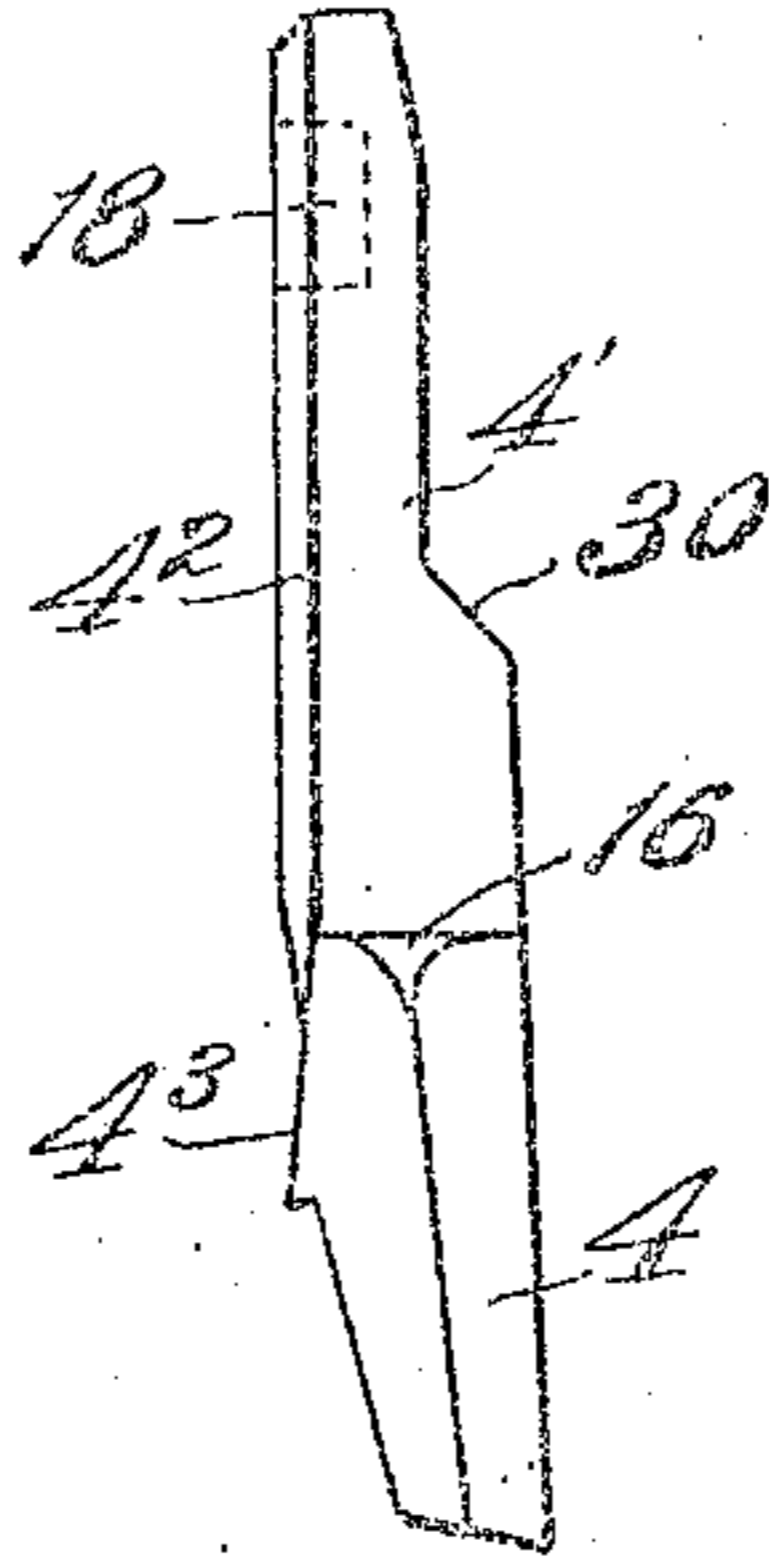


Fig. 9.

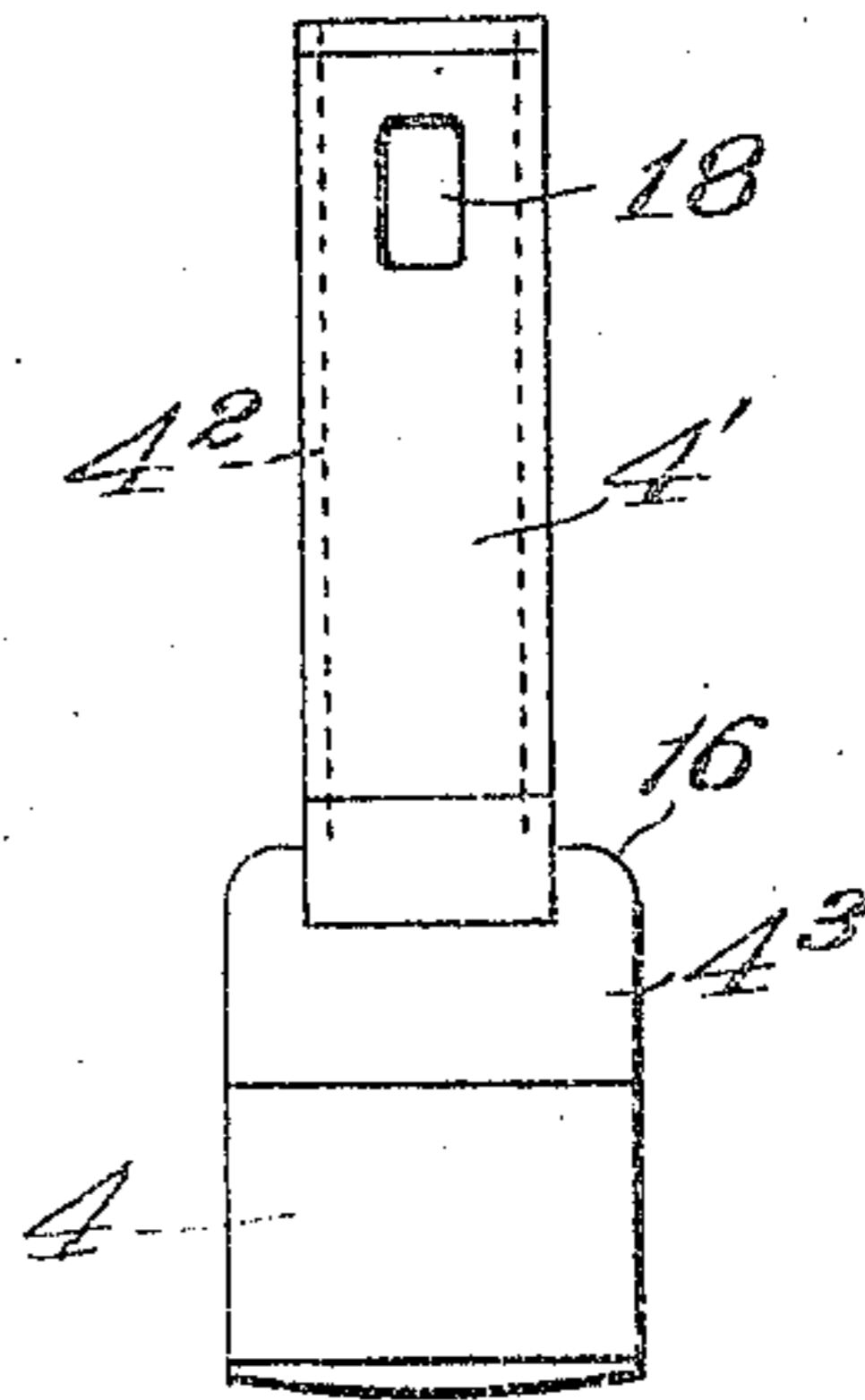


Fig. 10.

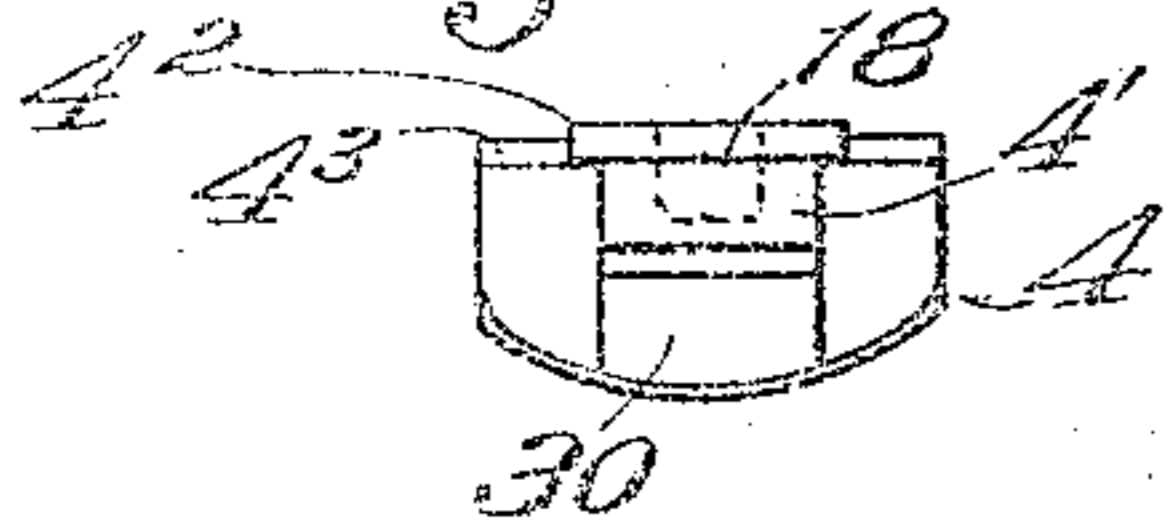


Fig. 11.

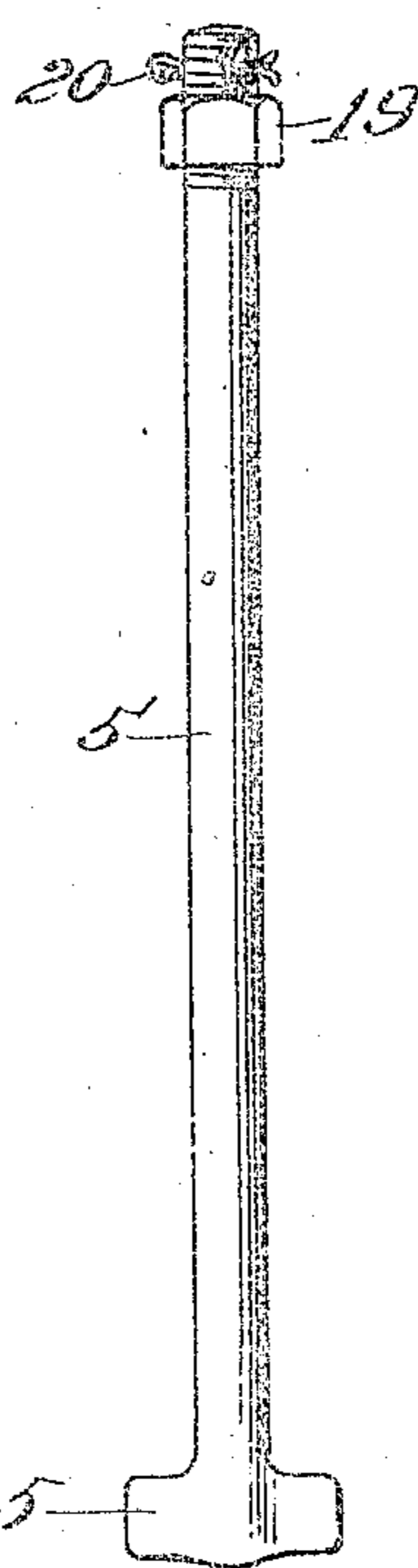


Fig. 12.

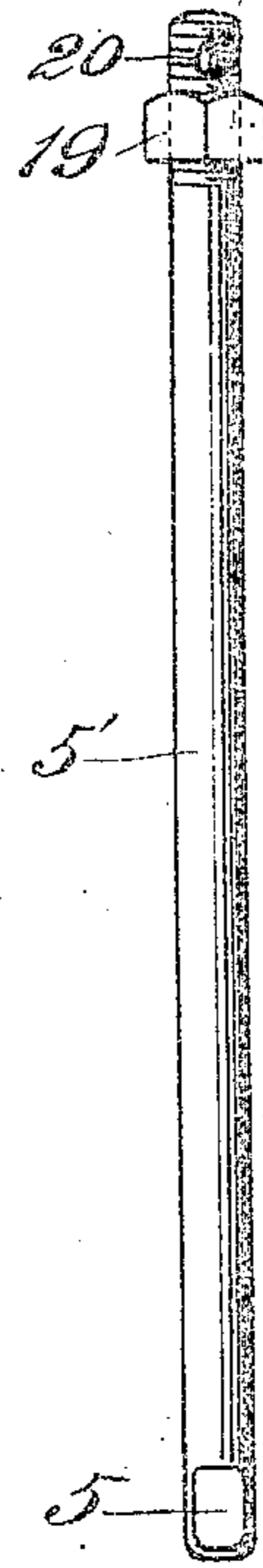


Fig. 13.

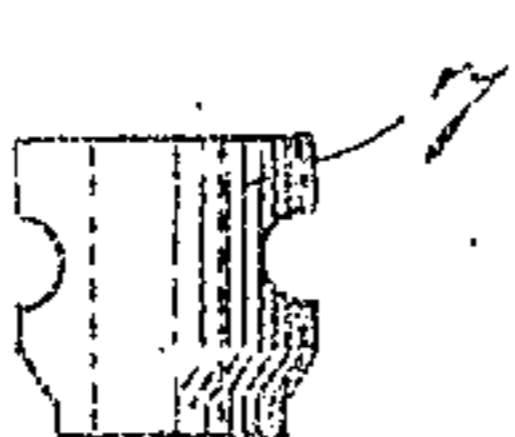
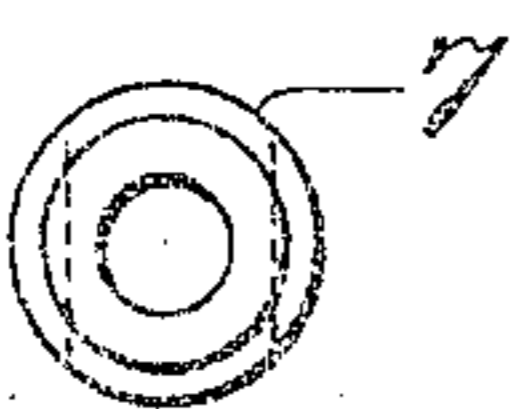


Fig. 14.



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UNITED STATES PATENT OFFICE.

ELIHU C. WILSON, OF BAKERSFIELD, CALIFORNIA.

UNDERREAMER.

No. 827,595.

Specification of Letters Patent.

Patented July 31, 1906.

Application filed November 28, 1905. Serial No. 229,380.

To all whom it may concern:

Be it known that I, ELIHU C. WILSON, a citizen of the United States, residing at Bakersfield, in the county of Kern and State of California, have invented a new and useful Underreamer, of which the following is a specification.

Objects of this invention are to provide an underreamer of superior strength and of superior width and expansion of cutters so as to enable reaming as great a portion of the circumference of the hole as possible at each stroke, to insure greater safety against losing the cutters from the body while reaming, to avoid the necessity of a middle joint in the mandrel or reamer body, and to leave a maximum open space between the cutters to receive the loose material or sludge at the bottom of the well or other opening during the operation of drilling.

By this invention it is possible to increase the strength of the cross or T which suspends the cutters.

In this invention a cross or T formed of a single forging is provided for suspending the cutters.

Another decided advantage is simplicity and convenience of attaching and removing the cutters and suspending devices from the reamer-body.

Another advantage is facility of collapsing the cutters. I so construct the mouth of the underreamer as to dispense with stock between the collapsed cutters, thus enabling the cutters to close together. This feature makes extreme expansion possible and makes the use of maximum amount of stock in shanks of cutters possible, thus insuring maximum strength of cutters.

The accompanying drawings illustrate the invention.

Figure 1 is a view of the underreamer in a casing just before it has passed through the shoe of the casing, the parts being collapsed. Fig. 2 is a view looking at the bottom of Fig. 1. Fig. 3 is a view of this newly-invented underreamer in a well, the same having just passed through the casing-shoe and expanded for reaming the hole below. Portions are shown in mid-section. Fig. 4 is a view looking at the bottom of Fig. 3. Fig. 5 is a view of the reamer-body at right angles to Figs. 1 and 2. Fig. 6 is a view looking at the bottom of Fig. 5. Fig. 7 is a front view of a cutter detached. Fig. 8 is an edge view of a cutter at right angles to Fig. 7. Fig. 9 is a

view of the inside or back of the cutter. Fig. 10 is a view looking down on the top of the cutter. Fig. 11 is a view of the cross. Fig. 12 is a view of the cross at right angles to Fig. 11. Fig. 13 is a side view of the spring seat-block detached. Fig. 14 is a bottom view of the same.

1 designates a hollow body of an underreamer terminating in prongs 2, forming a fork, said prongs having shoulders 2' on their inner faces to form ways 3 for cutters. Said prongs are provided with and terminate in downwardly-projecting lugs 2' to spread the cutters apart.

4 designates the cutters, which are interchangeable; 4', the cutter-shank; 4², bearing-shoulders of the cutters to engage inside the ways 3; 4³, expansion bearing-faces of the cutters on the sides of said cutters.

The inner faces of the prongs 2 are parallel, and the sides or shoulders 2', which form the ways 3, are also parallel. The cutter-shank 4' and its bearing-shoulders 4² are straight—that is to say, the sides or edges thereof are parallel and fit the ways 3.

5 is a cross, 5' the stem of the cross, and 6 the spring which actuates the cross. The parts 5 5' constitute spring-actuated means for actuating the cutters to expand the same.

7 is a block forming a seat for the spring 6. One or more dowel-pins 8 may be provided as means for holding the block or spring-seat 7 in place.

9 designates the spreading bearings for holding the cutters 4 apart, and 10 the down-thrust bearings for the cutters. The down-thrust bearings 10' are in the nature of shoulders formed by the edges of the forks at the base of the lugs 2'. The prongs 2 of the body are of substantially one thickness throughout, excepting that they are reduced at their lower ends to form lugs for spreading the cutters 4 apart. The edges of the lugs 2' for the spreading bearings 9 and the prongs terminate abruptly in the shoulders 10' at the base of the lugs 2'. This construction affords the necessary operative structure with maximum strength for minimum weight of body.

11 is a detachable cross-piece in the form of a bolt secured by a nut 12. 13 is an angular socket in the outer face of one of the forks around the bolt-hole 14 in said fork. The nut 12 is conformed to the angular socket, and the bolt 11 is provided with an angular socket 15 in its head to receive a wrench (not shown) for screwing the bolt into the nut.

The expansion bearing-faces 4³ terminate at their upper ends in rounded corners or bearings 16 to ride more readily over the beveled end faces 17 of the downwardly-projecting lugs 2' to engage said bearings for expanding the cutters.

18 designates recesses in the inner faces of the cutters for engaging the ends of the cross 5.

19 and 20 indicate the usual tension-nut for the spring 6 and the cotter-pin for securing the same.

To assemble the underreamer, the block 7 will first be placed on the stem 5' of the cross 5, and the spring 6 is then adjusted and secured in place by the nut 19 and cotter-pin 20. Then the cutters are placed on the ends, respectively, of the cross 5, which seat in the recesses 18 therefor. Then the parts thus assembled are inserted into the hollow mandrel and brought into the position shown in Fig. 3, whereupon the dowel-pins 8 are inserted and the cross-piece formed of the bolt 11 is then inserted. The nut 12 is placed in its angular socket 13, and the bolt or cross-piece 11 is then screwed home. The underreamer is then in condition for operation.

To use the underreamer, the cutters will be drawn down below the downwardly-projecting lugs 2', thus collapsing the same into the position shown in Fig. 1, whereupon the underreamer will be inserted into the pipe or casing in the usual manner and allowed to descend. When it has passed through the shoe, as shown in Fig. 3, the spring operates in the usual manner to draw the cross 5 up, thus bringing the cutters into the expanded position shown in Fig. 3. The rounded shoulders 16 ride readily over the beveled faces 17, and the upper ends of the cutter-stems seat against the downthrust bearings 10, and the bearing-shoulders 4² of the cutters engage the ways 3 of the fork prongs or members 2, thereby being solidly held during the operation of underreaming. The spreading bearings 9 of the lugs 2' engage the expansion bearing-faces 4³ of the cutters at the same time, so that the tool is practically a unit during the operation of underreaming.

30 designates the usual shoulders on the cutters for drawing the same in when the tool is removed through the pipe or casing 40.

It is advisable that the lower ends of the forks 2 should not form downthrust bearings for the cutters, as there would otherwise be a tendency of crystallization of said forks, which is avoided by making the downthrust bearings at 10 only.

The cross-piece 11 serves as a brace for the prongs of the fork and prevents accidental removal of the cutters and T or cross 5.

It is to be noted that by the construction shown the cutters are quickly expanded at the initial upward movement of the same

after escaping the shoe of the casing 40, and that immediately thereafter the cutters are solidly held in the straight and parallel ways 3, and that when the cutters are fully drawn up they seat on the downthrust bearings 10 and the spreading bearings 9, while the shanks are rigidly held throughout their length. Said spreading bearings are on the lugs 2', which constitute wedges for wedging the cutters apart, and said bearings are at the sides of the lower ends of the body, thus engaging the outer edges of the cutters to hold the cutters apart and leaving an open space between the middle portions of the cutters for a greater distance upward from the lower ends of the cutters than would be the case were the cutters held apart by any intermediate portion between the lugs.

I term the cutters "shouldered cutters," for the reason that the rounded corners 16, which extend away from the shank at right angles thereto, are in the nature of shoulders, the inner faces 4³ of which engage the spreading faces 9 of the side lugs 2' to brace the cutters and hold them apart.

What I claim is—

1. An underreamer-body terminating in prongs having projecting lugs at their lower ends with spreading bearings 9 for holding the cutters apart.

2. An underreamer-body terminating in prongs and provided with upper and lower bearings for the cutters, said prongs having projecting lugs, the edges of which form lower bearings for holding the cutters apart, and the ends of said lugs having beveled end faces.

3. An underreamer-body terminating in prongs the inner faces of which are provided with straight parallel ways, the ends of said prongs terminating in lugs below said ways to spread and hold the cutters apart.

4. An underreamer-body terminating in prongs forming a fork, said prongs having shoulders on their inner faces to form ways for the cutters.

5. A hollow underreamer-body terminating in prongs forming a fork having shoulders on the inner faces to form ways for the cutters, cutters in said ways, a cross in said hollow body for operating said cutters, a spring for operating the cross, a block in the body to form a seat for said spring, and one or more dowel-pins securing the block in place.

6. A hollow underreamer-body, cutters, a cross inside the hollow body for operating said cutters, a spring for operating said cross, a block in said body forming a seat for said spring, and one or more dowel-pins for holding the block in place, said block and pins being located entirely above the head of the cross.

7. A hollow underreamer-body terminating in prongs forming a fork and provided with ways and downthrust bearings for cut-

ters, cutters in said ways engaging said bearings, a cross for operating said cutters, a spring for actuating said cross, a block forming a guide for the stem of the cross and a
 5 seat for the cross-actuating spring, its lower end terminating above the head of the cross and projecting below the downthrust bearings to hold the upper ends of the cutters apart, and means for holding the block in the
 10 reamer-body.

8. A hollow underreamer-body terminating in prongs forming a fork, said prongs having shoulders on their inner faces to form ways, cutters in said ways, means for operating the cutters, and a detachable cross-piece
 15 connecting the ends of the fork.

9. An underreamer-body terminating in prongs forming a fork and provided with shoulders on the inner faces of the prongs
 20 which form cutter-ways and terminate in downwardly-projecting lugs, and cutters mounted between the prongs of said fork and having shoulders inside the fork and faces to bear on the projecting lugs.

25 10. An underreamer-body terminating in prongs having projecting lugs at their lower ends to hold the cutters apart.

11. An underreamer-body terminating in prongs forming a fork having beveled faces
 30 at the ends of its prongs, cutters having shoulders to ride over said beveled faces, and means for suspending said cutters in said body.

12. An underreamer-body terminating in
 35 prongs forming a fork, the ends of said prongs being provided with lugs to spread the cutters apart.

13. An underreamer-body terminating in prongs forming a fork, said prongs having
 40 shoulders on the inner faces to form ways for the cutters, and said prongs terminating in lugs to act as spreaders for the cutters.

14. A hollow underreamer-body terminat-

ing in prongs forming a fork, said prongs terminating in lugs for spreading the cutters, 45 said lugs having beveled ends to engage bearings on cutters to expand cutters.

15. An underreamer-body terminating in prongs forming a fork, said prongs terminating in lugs or projections, said lugs having 50 beveled faces or bearings to expand the cutters, and also faces or bearings for the cutters to rest on after they have expanded to a normal position for reaming.

16. An underreamer-cutter having two 55 shoulders and a bearing-face on the inner side of each of the two shoulders of the cutter.

17. An underreamer-cutter having a shank and a shoulder on either side of the shank of the cutter, each of said shoulders projecting 60 at right angles to the shank of the cutter and having a bearing-face on its inner side.

18. An underreamer having a body terminating in a fork, and cutters suspended between the prongs of the fork, the ends of said 65 prongs constituting wedges to wedge between the cutters.

19. An underreamer comprising a body terminating in two prongs, and cutters each having two shoulders and a bearing-face on 70 the inner side of each of the two shoulders to engage said prongs.

20. An underreamer comprising a body terminating in prongs the inner faces of which are provided with straight parallel ways, and 75 cutters having straight shanks fitting said ways, the ends of said prongs terminating in lugs below said ways to spread and hold the cutters apart.

In testimony whereof I have hereunto set 80 my hand at Bakersfield, California, this 20th day of November, 1905.

ELIHU C. WILSON.

In presence of—

H. I. TUPMAN,

T. E. KLOPSTEIN.