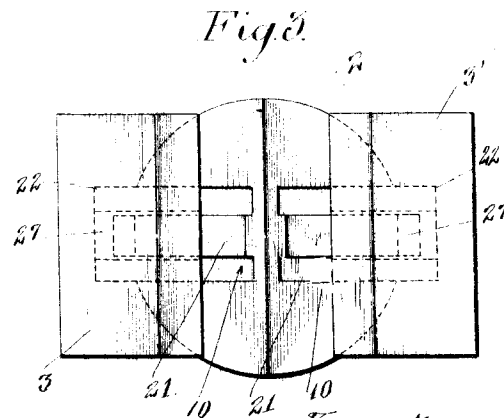
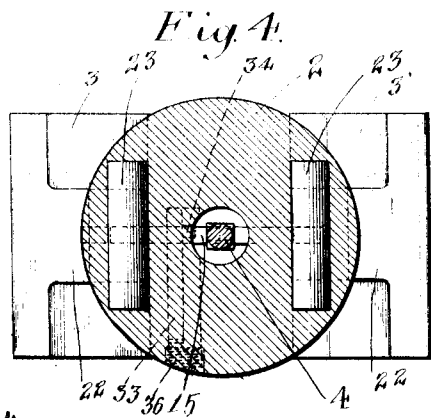
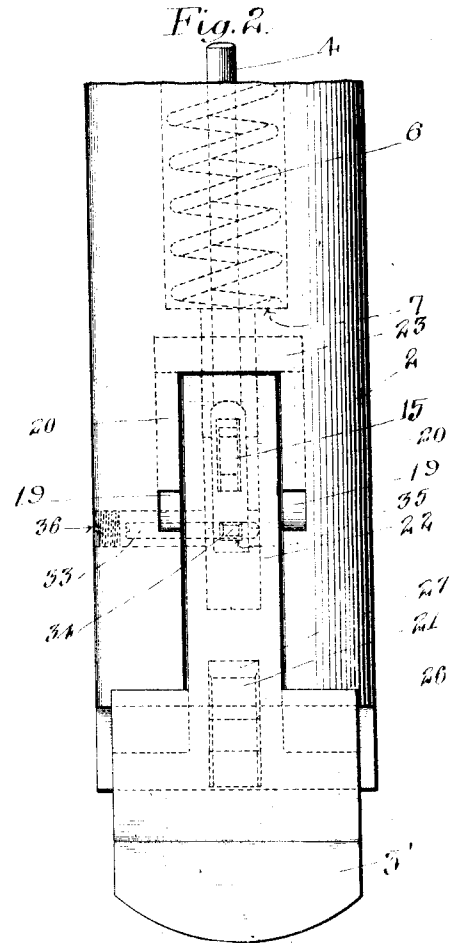
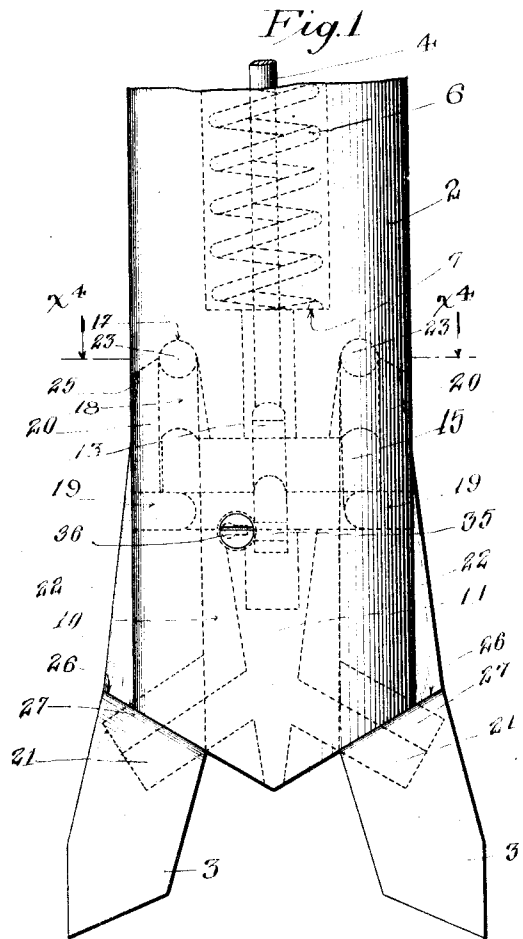


T. J. GRIFFIN.
UNDERREAMER.
APPLICATION FILED APR. 1, 1912.

1,131,928.

Patented Mar. 16, 1915.
2 SHEETS—SHEET 1.



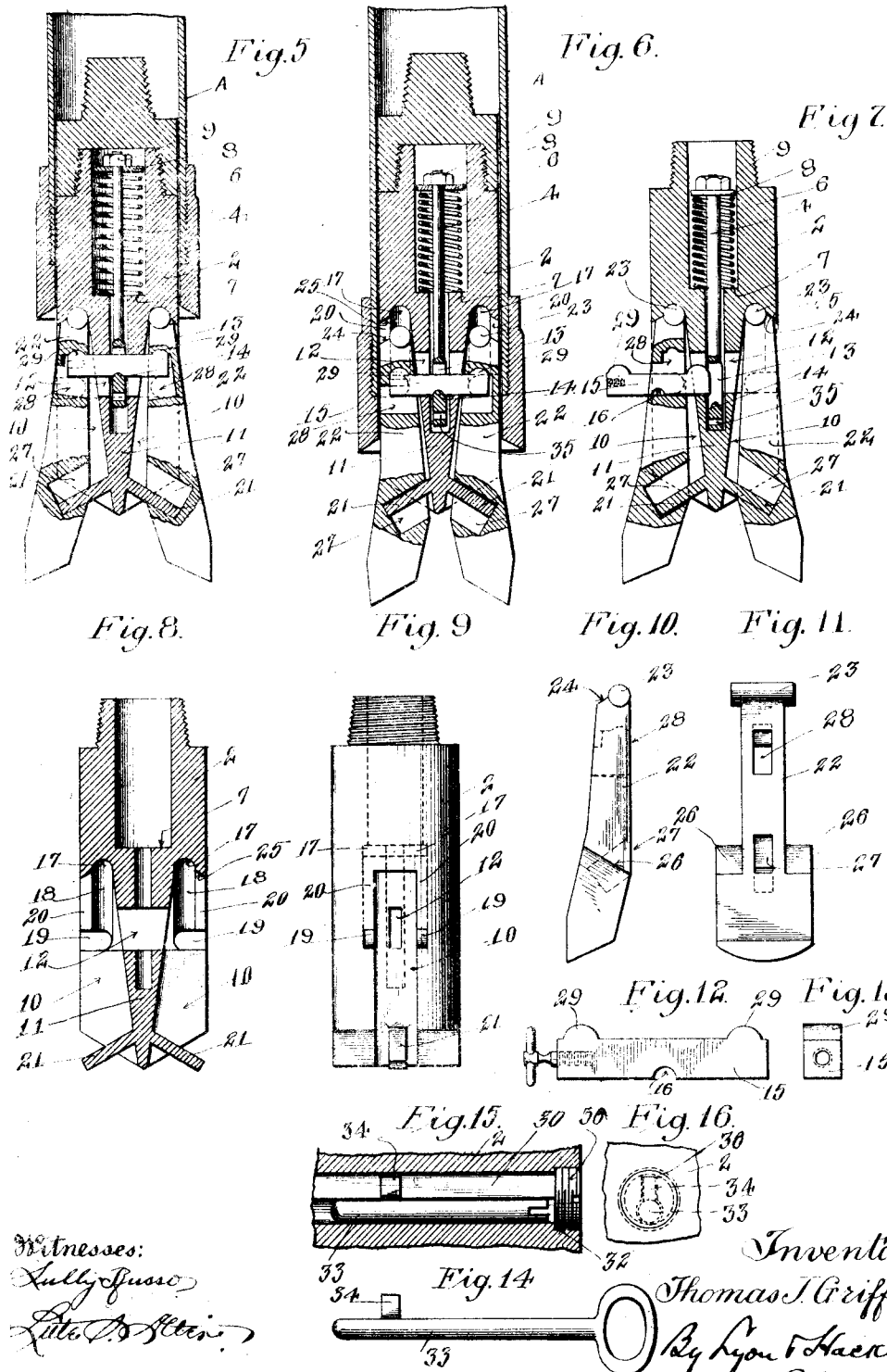
Witnesses:
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UNITED STATES PATENT OFFICE.

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EDWARD DOUBLE, OF LOS ANGELES, CALIFORNIA.

UNDERREAMER.

1,131,928.

Specification of Letters Patent.

Patented Mar. 16, 1915.

Application filed April 1, 1912. Serial No. 687,883.

To all whom it may concern:

Be it known that I, THOMAS J. GRIFFIN, a citizen of the United States of America, residing at Los Angeles, in the county of Los Angeles, State of California, have invented a certain new and Improved Underreamer, of which the following is a specification.

This invention relates to underreamers for reaming out or enlarging the well hole below the casing in the drilling of oil or Artesian wells.

Among the objects of the invention is the provision of the collapsing bits or cutters in such form and so related to the body portion or mandrel as to positively obviate the possibility of the accidental separation of the bits or cutters from the body of the tool and the consequent loss of either one or both of the cutters or bits in the well hole.

Other objects sought and accomplished by the invention will appear from a consideration of the embodiment of the invention shown in the drawings and hereinafter described in detail.

The invention consists in the combinations of parts hereinafter described and particularly set forth in the claims, and the invention will be more readily understood by reference to the accompanying drawings illustrating the embodiment of the invention and in which:—

Figure 1 is a side elevation of an underreamer embodying my invention, a portion of the upper end of the same being broken away, the cutters or bits being shown in open or distended position, the positions of the internal parts being indicated in this view in dotted lines. Fig. 2 is a front elevation, the bits being shown in open position and internal portions shown in dotted lines. Fig. 3 is an inverted plan view of the underreamer with the bits or cutters in the position of Fig. 1. Fig. 4 is a sectional plan view on the line x^1-x^1 of Fig. 1. Fig. 5 is a longitudinal sectional view of the underreamer, showing the positions the parts occupy when the bits or cutters are in open or expanded position, the underreamer being shown as having just passed out of the lower end of a well casing, A. Fig. 6 is a longitudinal sectional view of an underreamer embodying my invention, the same being shown with the cutters or bits projecting from the lower end of the well cas-

ing A but still in closed or contracted position, and illustrates the position that the parts occupy when the underreamer is in position to be moved through the well casing. Fig. 7 is a longitudinal sectional view illustrating the manner of removing the bits from the mandrel or body. Fig. 8 is a longitudinal sectional view of the mandrel or body portion, the movable parts all being omitted. Fig. 9 is a front view of the body or mandrel portion, the movable parts all being omitted. Fig. 10 is a side view, and Fig. 11, a face view of one of the cutters or bits. Fig. 12 is a side view of the bit or cutter interlocking key. Fig. 13 is an end view thereof. Fig. 14 is a side view of the preferred form of spring retractor which I may employ for removing the tension of the coil spring and torsion rod from the cutters or bits and their retaining key in order to permit the withdrawal of said key and the ready removal of the bits from the body portion or mandrel, and Figs. 15 and 16 respectively are fragmental views showing the channel in which such retractor operates.

In the embodiment of my invention shown in the drawings 2 represents the body or mandrel and 3, 3' the bits or cutters respectively. The bits or cutters are mounted upon a spring-actuated rod 4 being connected to this rod 4 by a key 15. The central portion of the mandrel or body is hollow, the bore being of two different diameters. As viewed from the upper portion of the mandrel the bore is of large diameter for a sufficient distance to properly house and provide for the expansion of a coiled spring 6 surrounding the rod 4. In the lower portion of the body this central bore is only slightly larger in diameter than the diameter of the rod 4 and extends well toward the lower end or bottom of the mandrel or body, thus forming a shoulder 7 against which one end of the coiled spring rests, the rod 4 being provided at its upper end with a suitable washer 8 and retaining nut 9. The washer and nut may be made separate or in one piece and may be keyed in position on the rod if desired. Preferably the rod 4 is threaded at its upper end for sufficient distance to provide for a suitable range of adjustment so as to provide for the desired spring tension of the coiled spring 6 when in position.

The lower portion of the mandrel or body

2 is slotted as shown, there being a slot 10 at each side of the lower portion of the body, thus in effect providing a central bar or portion 11. This central portion 11 is provided with a key way 12 and the rod 4 is also provided near its lower end with a similar key way 13, the lower wall of the key way 13 being rounded to form a convex seat 14. The interlocking key 15 is of less width than the key ways 12 and 13 so that when these key ways are properly registered the key 15 may be readily withdrawn from the rod 4 and through one side of the key way 12. The under side of the key 15 is provided with a central concave recess 16 adapted to engage the convex seat 14 of the rod 4.

As shown best in Fig. 8, the side walls of the lower slotted portion of the body or mandrel is provided at the upper end with two concave seats 17 and with corresponding ways 18, 19 leading respectively downward from said seats and outward from the side of the body at the lower end of the walls 20.

Near the lower end of the central portion 11 and projecting outward through the side slots 10 are two downwardly inclined abutments 21, the lower faces of which are also inclined downward and outward from the central portion 11. It is obvious that these abutments 21 may be formed as an integral part of the central portion or bar 11 or may be downwardly inclined lugs inserted in the slots in the side walls and held therein by pins or any other preferred device.

The upper ends of the shanks 22 of the bits or cutters are provided with rounded portions 23 corresponding in size with the concave seats 17 and adapted to fit therein, the rounded portions 23 of the bits being extended sidewise beyond the shanks 22, thus forming lugs which work in the slots 18, 19 of the body, inclined shoulders 24 being provided at the upper ends of the bits to engage the inclined abutments 25 of the body when the bits are in expanded position, thus providing for the ends of the bits bearing upon the body, and the inclination of the abutments 25 being upward and inward from the surface of the body tends to hold the bits in place, and upon the striking of a blow in drilling the tendency of the bits is to drive inward of the mandrel or body portion, thus taking the shock of the blow upon the strongest portions of the mandrel or body. The lower ends of the bits are wider than the shanks 22, providing the shoulders 26 which are inclined upwardly and inwardly to correspond with the inclination of the lower end of the mandrel or body portion against which the respective shoulders 26 abut when in expanded position. The lower end of the mandrel or body portion from the center is inclined upwardly and

outwardly, as shown for two purposes, first, to co-act with the shoulders 26 to cause the bits to be projected outward when drawn up by the tension of the spring 6, and second, to form an abutment for the shoulders 26, thereby taking a portion of the impact of the blow directly upon the end of the body. Each of the bits is provided with a recess 27 so that the bits may fit over the abutments 21, the recess 27 being of greater width than the abutments so that the bits may move thereon. The lower wall or surface of the recess 27 is inclined to correspond with the under surface of the abutment 21 so as to contact therewith when the bits are in expanded position, thus bracing the bits against any tendency of the impact to rip the bits out sidewise of the body, and the inclination of the abutments being upward and inward from their outer ends tends to further counteract such action.

The shanks 22 of the bits or cutters are provided with recesses 28 of sufficient width to permit the insertion and withdrawal of the interlocking key 15 and are preferably provided with concave seats in which the convex lugs 29 on the key 15 engage. Preferably one of the cutters or bits only has the recess 28 opening entirely through from side to side, the recess in the other being closed by an imperforate outer wall, it only being necessary for one of the recesses 28 to be open through the outer side of one bit to effectuate the insertion and withdrawal of the interlocking key.

I may, if desired, provide means for holding the spring-actuated rod 4 downward against the action of the spring 6 to permit the ready removal or adjustment of the bits or cutters and also hold the spring-actuated rod against the action of the spring while the underreamer is inserted into the well casing. This means preferably consists in providing a way or recess 30 in the body 2, this way 30 preferably being formed of two portions having respectively straight walls and concave walls adapted to receive respectively the rounded shank 33 and rectangular lug 34 of the spring retractor. When the retractor is slipped through the recess 30 into the body 2 the lug 34 will register with the slot 35 in the rod 4 and upon turning the retractor, the lug forces the rod 4 downward against the tension of the spring 6 by engaging the lower wall of the slot 35. Upon turning the lug 34 to its limit of throw downward the rod 4 is thereby locked against the tension of the spring 6 so that bits may be removed or closed in to permit the tool being inserted into the well casing, in which latter case as soon as the tool has been inserted into the well casing a sufficient distance for the end of the casing, or the shoe thereon, to extend over the upper ends of the shanks of the bits the

retractor is turned to unlock the rod 4 and is withdrawn from the body 2.

In Fig. 15 I have shown the end of the shank 33 slotted for the insertion of an operating key and a bushing 36 for closing the recess 32. It is obvious that the shank 33 may be provided with an operating head as shown in Fig. 14, or slotted as shown in Fig. 15, to be operated by a key or may be squared for operation by a wrench as desired. It is obvious that as an equivalent for the shank 33 and lug 34 I may use a tapered key which may be driven through the body 2 into the recess 35 bearing against the lower wall thereof and thereby forcing the rod 4 down against the spring until the rod has registered its lower limit. In case such tapered key is used a suitable head would be provided on the tapering key for pulling it out of the tool when desired.

I claim:—

1. The combination of a body or mandrel, a spring-actuated rod therein, the body having slotted sides, a key way in said rod, a key therein, bits tiltingly mounted on said key, the lower end of said mandrel being inclined downwardly and inwardly toward the center, said bits provided with shoulders adapted to bear thereon and provided with recesses opening inwardly near the bottom of said mandrel, abutments projecting outwardly from the slotted sides and near the bottom of the mandrel and extending into the recesses in said bits, the under surfaces of said abutments being downwardly and outwardly inclined and the lower surfaces or walls of said recesses being correspondingly inclined to abut thereagainst when the bits are in expanded position.

2. The combination of a body or mandrel having slotted sides, a spring actuated rod therein having a key way near its lower end, a key therein, bits tiltingly mounted on said key and provided with lateral shoulders, the end of the mandrel being inclined to coact

with said shoulders and cause the bits to expand, the body of the mandrel provided with a way and the rod with a slot registering therewith and means insertible through said way and into said slot to lock said rod down against the tension of its spring.

3. The combination of a body or mandrel, a spring-actuated rod therein, the body having slotted sides, bits or cutters tiltingly mounted on said spring-actuated rod, the upper walls of the slotted sides being provided with abutments or surfaces, the lower end of the mandrel being downwardly and inwardly inclined, downwardly and outwardly inclined abutments at the lower end of the slotted portion of said body, said bits provided at their upper ends with inclined portions adapted to coact with said inclined abutments and with recesses fitting over the inclined abutments at the lower end of said slotted portion and having the lower walls of such recesses correspondingly inclined and provided with shoulders adapted to bear against the inclined ends of the mandrel.

4. The combination of a body or mandrel, a spring-actuated rod therein, tilt cutters or bits thereon, the body or mandrel at its lower end being inclined downwardly and inwardly, said cutters or bits provided with shoulders adapted to bear thereagainst, downwardly and outwardly inclined abutments on said mandrel, the bits having recesses receiving and adapted to embrace said abutments and provided with surfaces adapted to bear against said abutments when in expanded position.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 15th day of March, 1912.

THOMAS J. GRIFFIN.

In presence of—

FREDERICK S. LYON,
ELIZABETH BLASDEL.