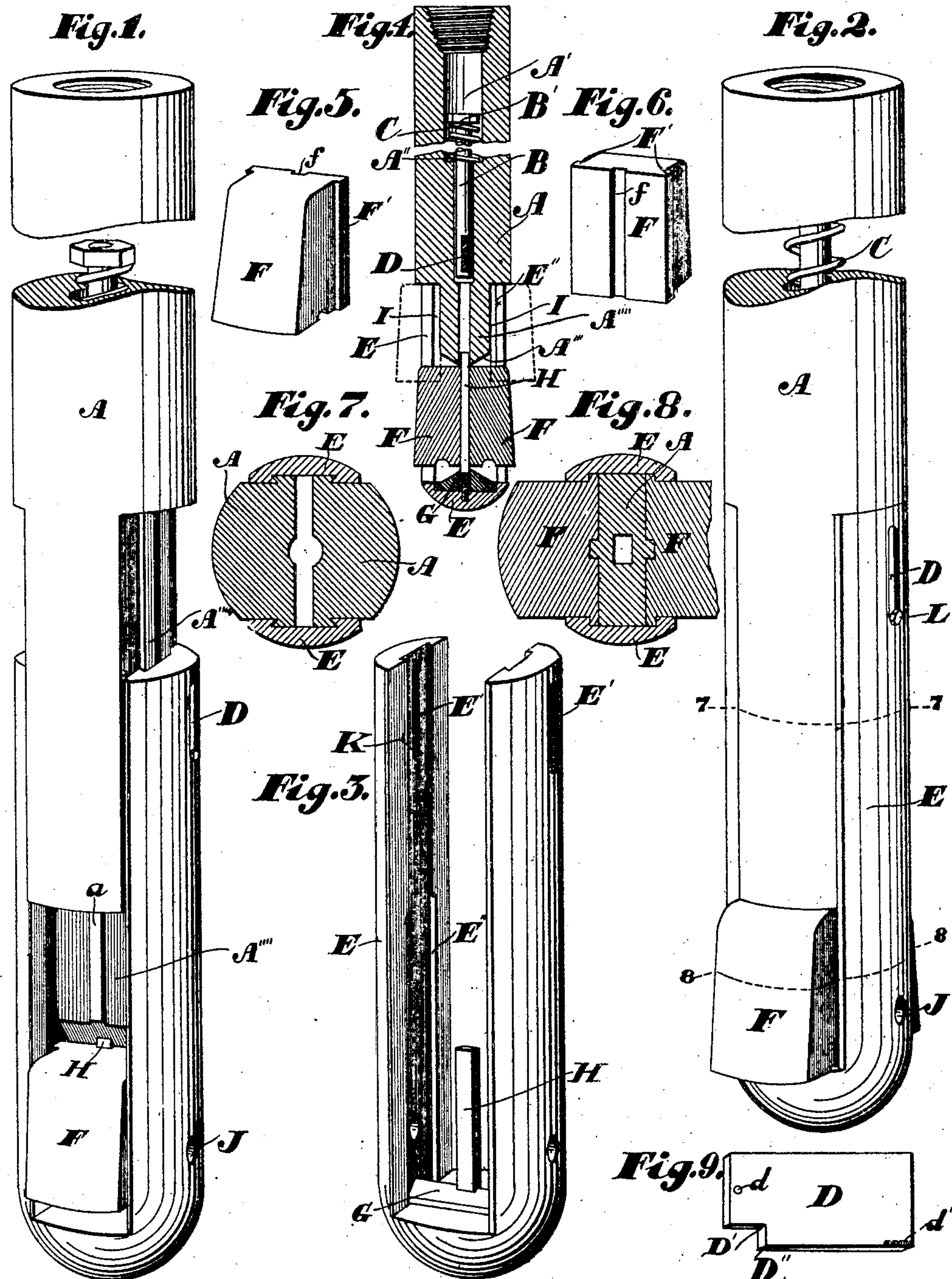


W. J. TRAVERS.  
UNDERREAMER.

APPLICATION FILED MAY 2, 1904.



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# UNITED STATES PATENT OFFICE.

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## UNDERREAMER.

No. 803,642.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that I, WILLIAM J. TRAVERS, 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.

My invention relates to devices for reaming out or enlarging well-holes drilled below the casing in a drilled well in order to permit the casing to be lowered farther down in the well-hole; and it is one of the objects of my invention to secure additional strength and durability to the parts employed, to simplify the same, to impart great resistance in such parts to the crushing strains imparted thereto while the underreamer is in operation, to increase the facility by which an underreamer can be passed down through the casing into the well and by which it can be removed therefrom, also to provide an underreamer which will be certain and reliable in its action and not liable to get out of order by reason of excessive wear or undue strain thereon. I accomplish these objects by means of the device described herein and shown in the accompanying drawings, in which—

Figure 1 is a perspective view, partly broken away, showing the cutters in their contracted or inoperative position, which position they assume while passing through the well-casing. Fig. 2 is a like view showing the cutters in their expanded or operative position when below the lower end of the casing. Fig. 3 is a perspective view of the cutter-carrying yoke detached from the underreamer. Fig. 4 is a central longitudinal section of my underreamer, the cutters being shown in their contracted or inoperative position in full lines and in their operative position in dotted lines. Figs. 5 and 6 are back and front views, respectively, in perspective of one of the cutters. Fig. 7 is a transverse section taken on line 7 7 of Fig. 2. Fig. 8 is a transverse section taken on line 8 8 of Fig. 2. Fig. 9 is a perspective view of the yoke-supporting key.

In the drawings, A represents the main body portion or stock of the underreamer screw-threaded in its upper end for engagement with the conventional screw-threaded stem of the underreamer. (Not shown.) Through the center of the stock is a central bore A', having an enlarged portion of the bore to provide housing for the spiral spring C. At the lower end of the enlarged bore is an offset shoulder A'', below which is the con-

tracted portion thereof. The contracted portion of the bore below the shoulder A'' is of a diameter adapted to receive the spring-supported bolt B. This bolt is provided on its upper end with a head B', forming an abutment which rests upon the spiral spring C and is supported thereby, the said spring extending from the head of the bolt down to and resting upon the offset shoulder A'' in stock, and thereby holding the bolt spring-pressed in its elevated position for the purpose of holding the cutters in their elevated, extended, and operative position.

Transversely mounted in the cutter-supporting bolt B is the yoke-supporting key D, (shown in enlarged detail in Fig. 9,) which also extends through the holes E' in the cutter-supporting yoke E. The cutter-supporting yoke has a longitudinal movement on dovetail lugs A''' on the stock A, Fig. 1. Removably mounted in the lower end of the cutter-supporting yoke are the cutters F. These cutters are provided with longitudinal flanges or lugs F', which hold these cutters in a slidable position in the yoke. The longitudinal flanges F' on the cutters are adapted to bear against and be held in place in the yoke by the longitudinal shoulders E'' therein. The inclined cutter-supporting shoulder G in the bottom thereof has an upward inclination toward its center and forms a bearing-surface adapted to engage the cutters F at their bottom ends and crowd them into their outer or operative position. The inclined shoulders A''' on the lower end of the stock are adapted to crowd the upper ends of the cutters also into their outer or operative position when the tension of the spring C contracts the space between the inclined shoulders G on the bottom and the inclined shoulders A''' at the top, which will spread the cutters apart into their operative position. This will occur whenever the cutters pass below the casing (not shown) of the well. In practice a block of wood is inserted between the top of the yoke and shoulder on the stock to relieve friction of cutters against casing when reamer is going down and is crushed out when reamer strikes bottom. Projecting upwardly from the bottom of the yoke into which it is screwed is the square cutter-supporting bar H. This bar is screw-threaded at its lower end and adapted to be screwed into the female thread in the lower end of the yoke. When the bar is screwed tightly therein, the shoulder G, having a square aperture therein to receive



the bar H, is permitted to drop into place in the bottom or return bend of the yoke, as shown in Figs. 3 and 4. This bar will hold the cutters apart and in position to be spread  
 5 into their extended operative position when the cutters pass below the well-casing, crushing the block of wood on contact of the yoke with the bottom of well, at which time the spring will contract and draw the yoke up-  
 10 wardly. The cutters being between the upper and lower inclined shoulders will be crowded into their operative position, the cutters having been held by the bar H in position ready to be crowded apart as the upper and lower  
 15 inclined shoulders are drawn together and assume the operative position. (Shown in dotted lines in Fig. 4.) The longitudinal lugs F' on the cutters will pass into and be held in the grooves I, Fig. 4, the said grooves being  
 20 formed by bearing-surfaces on the downwardly extension A''' of the main body portion of stock on one side and the shoulder E'' on the other side. When in this operative position, the cutters being expanded they will  
 25 be firmly held against breakage or movement from their place therein no matter what the jars thereon or wear may be. In the lower end of the yoke I have provided clearance-  
 30 holes J for the passage therethrough of sand or other material that might otherwise lodge between the cutters and prevent the proper closing of same.

To support the yoke carrying the cutters to the main body or stock, I have provided  
 35 the key D, which is wide and strong, but thin in cross-section. It is provided on its lower edge with an offset D', providing a shoulder D'', adapted to engage when in place the body  
 40 portion of the yoke immediately below the aperture E' therein, which point is marked K in Fig. 3. The shoulder on the key will rest firmly against the same. To further prevent the accidental removal of this key, I have provided an aperture d' in the key for  
 45 the passage therethrough of a locking-bolt (not shown) to hold the key in place firmly against the shoulder K. To further secure this key against movement when in place in the yoke, I have provided a screw-threaded  
 50 recess d'' in the corner of the key, and I have also placed in the lower corner of the slot E' in the carrier a corresponding screw-threaded recess adapted when the key is in place to receive and engage the screw-threaded bolt L.  
 55 (Shown in Fig. 2.) The union of these screw-threaded recesses when they register one with the other when the key is in place will form a screw-threaded socket for the reception of the screw-threaded shank on the locking-bolt,  
 60 and when tightly screwed therein will securely hold the key in place.

On the downwardly-projecting extension A''' of the stock I have mounted longitudinal lugs a, Fig. 1, adapted to enter the vertical  
 65 recesses f' on the inner face of the cutters F,

Figs. 5 and 6, the purpose of which is to prevent entrance of sand and gravel when the cutters are assuming their operative position.

Having described my invention, what I claim as new, and desire to secure by Letters 70 Patent, is—

1. An underreamer comprising a stock having a central bore therein, the said bore being provided with a spring-engaging shoulder; a yoke-supporting bolt in said bore having a 75 bearing-head adapted to engage the upper end of a spiral spring surrounding the same and an aperture in the lower end thereof for the reception of a key, the said aperture adapted to register with openings on the yoke 80 for the reception of said key on said bolt, a spiral spring surrounding said bolt and adapted to hold the bolt in an elevated position, the said stock being provided with guideways for the reception and operation of a cutter-sup- 85 porting yoke; a cutter-supporting yoke being provided with longitudinal recesses having dovetail grooves therein for the reception and engagement therewith of the longitudinal lugs on the stock, the said yoke having at the top 90 thereof apertures for the reception of a yoke-supporting key; a yoke-supporting key in said aperture and in said bolt; cutters slidably mounted in bearings in said yoke and in said stock. 95

2. In an underreamer of the character herein described a yoke therefor, longitudinal bearing-faces with dovetail recesses therein and adapted to receive and engage dovetail 100 lugs on the stock and provided at its upper end with apertures for the reception of the yoke-supporting key; a stock having dovetail lugs adapted to enter recesses in the yoke; and a yoke-supporting key in said aperture.

3. In an underreamer of the character here- 105 in described having a stock A with a central bore therein and cutter-engaging lugs a thereon, and a cutter-carrying yoke E slidably mounted on the stock and having grooves E' therein to slidably engage lugs on the stock, 110 cutters F, having longitudinal grooves f' therein for the reception of the lugs a on the stock and provided with longitudinal lugs F' adapted to enter grooves provided therefor in the yoke substantially as herein shown and 115 described.

4. In an underreamer of the character herein described a stock provided with longitudinal depressions on both sides of the lower 120 end, and having on these two sides bearing-faces provided with longitudinal dovetail yoke-engaging lugs extending along said bearing-faces and having a transverse slot there- 125 through for the reception of a yoke-supporting key; a downwardly-projecting extension on the end of the said stock forming a bearing-face for cutters; a cutter-supporting yoke having a central bore for the reception of a yoke-supporting bolt and a spiral spring 130 thereon; a yoke-supporting bolt and spiral



spring therein; the said yoke having a transverse opening therethrough for the reception of a yoke-supporting key, a yoke-supporting key therein.

5 5. In an underreamer of the character herein described having a stock and a cutter-supporting yoke provided with a transverse opening for a supporting-key, the lower wall of said opening being provided with a bolt-  
10 engaging thread adapted to register with a like thread in the yoke-supporting key; a yoke-supporting key D to removably secure the yoke to the stock, the said key being provided with a screw-threaded recess for the  
15 reception of a locking-bolt L; a locking-bolt L in the screw-threaded opening between the key and the yoke.

6. In an underreamer of the character herein described having a cutter-supporting yoke  
20 with a return-bend at its lower end, inclined shoulders G on the return-bend their inclined surfaces forming bearing-faces for the engagement with bearing-faces on the cutters and adapted to spread the lower end of the  
25 cutters apart in combination with reaming-cutters substantially as herein shown and described.

7. In a reamer, such as herein described comprising the stock A having a central bore;  
30 a yoke E slidably mounted therein, cutters workably secured in said yoke, and provided with means to secure said cutters in workable engagement with said yoke, the said yoke being provided on its bottom return end with  
35 inclined cutter-bearing shoulders adapted when the yoke is in its upward position to spread the cutters apart; a yoke-supporting bolt in the bore of said stock and provided with resilient means to hold said bolt in its  
40 elevated position; and means to secure said bolt to said yoke.

8. In an underreamer of the character herein described; a stock provided with a central bore therein; a yoke-supporting bolt in said  
45 bore; a spiral spring surrounding said bolt the lower end resting on an offset shoulder in said bore, the upper end engaging a head on said bolt, the said stock being provided with longitudinal yoke-bearing faces and having dove-  
50 tail lugs extending along said bearing-faces adapted to enter recesses in the yoke; a yoke adapted to pass up on either side of the stock and having stock-bearing faces adapted to slid-  
55 ingly engage the said faces on the stock; longitudinal dovetail recesses adapted to receive and slidingly engage the dovetail lugs on the bearing-faces of the stock; a yoke-supporting

key extending through transverse apertures in the upper projecting end of the yoke and through an aperture in said bolt. 60

9. In an underreamer provided with a body portion or stock having a central bore therein; a yoke slidably mounted thereon over a portion of the length of the stock, cutters workably mounted in the yoke and adapted to  
65 be thrown into their extended operative position when the yoke is moved upward on the stock; a spiral spring in said central bore for engagement with a yoke-carrying bolt and adapted to hold the same in an elevated posi-  
70 tion; a yoke-carrying bolt in said spring workably connected with the yoke substantially as herein shown and described.

10. In an underreamer of the character herein described provided with cutters of the character herein shown; means to spread the cutters apart into their operative position when removed from the casing comprising a spring-operated bolt in the bore of the stock; a key connecting said bolt with a yoke; a stock hav-  
80 ing on its lower extension inclined cutter-bearing shoulders; a yoke workably mounted on said stock and having upturned inclined shoulders.

11. In an underreamer of the character herein described the combination of the stock A;  
85 a yoke E slidably mounted thereon; means to hold said yoke in its elevated position on said stock, comprising a yoke-supporting bolt B, a spiral spring C surrounding said bolt and  
90 adapted to hold the same in its elevated position; a key D transversely mounted in said stock and having a longitudinal movement therein, the said key passing through the said bolt, the projecting ends extending through  
95 apertures E' in the upper end of the yoke; cutters F loosely mounted in the return-bend of said yoke and provided with longitudinal lugs F' to hold the same in said yoke; means  
100 to spread the cutters into their extended position when the yoke assumes its elevated position, comprising inclined shoulders A''' on the downward extension A'''' of said stock; an inclined bearing-shoulder G in the return-bend  
105 of said yoke, substantially as herein shown and described.

In witness that I claim the foregoing I have hereunto subscribed my name this 25th day of April, 1904.

WILLIAM J. TRAVERS.

Witnesses:

P. A. SCHUMACHER,  
BEN FLONICH.