

No. 793,289

PATENTED JUNE 27, 1905.

R. S. FUTHEY.
UNDERREAMER.

APPLICATION FILED FEB. 9, 1905.

Fig. 1.

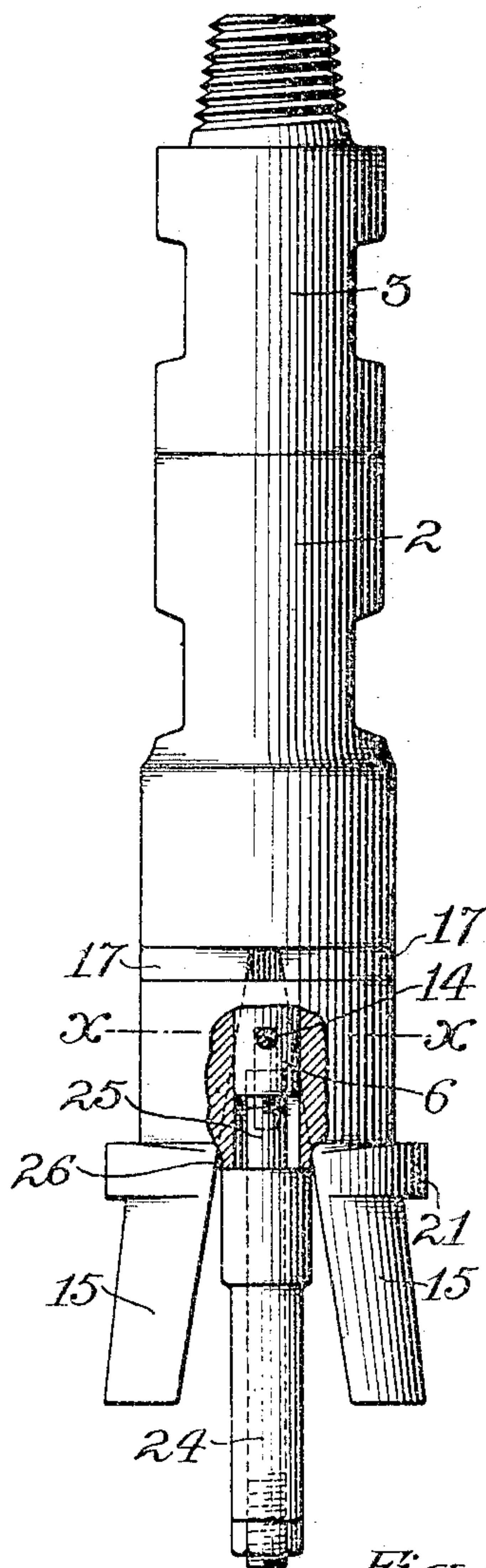


Fig. 2.

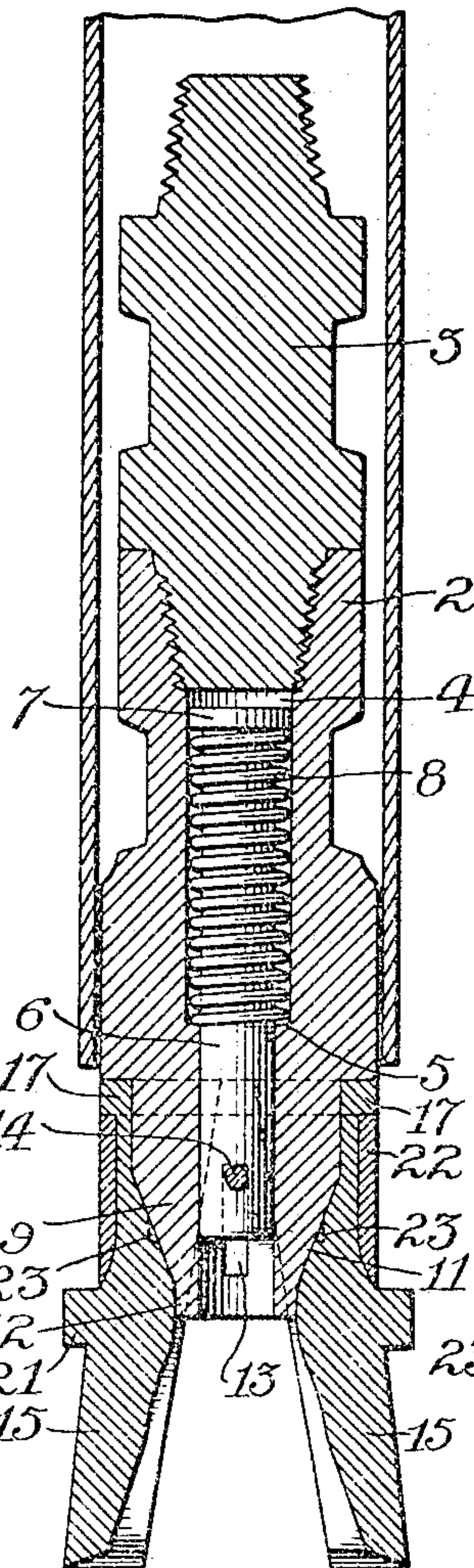


Fig. 3.

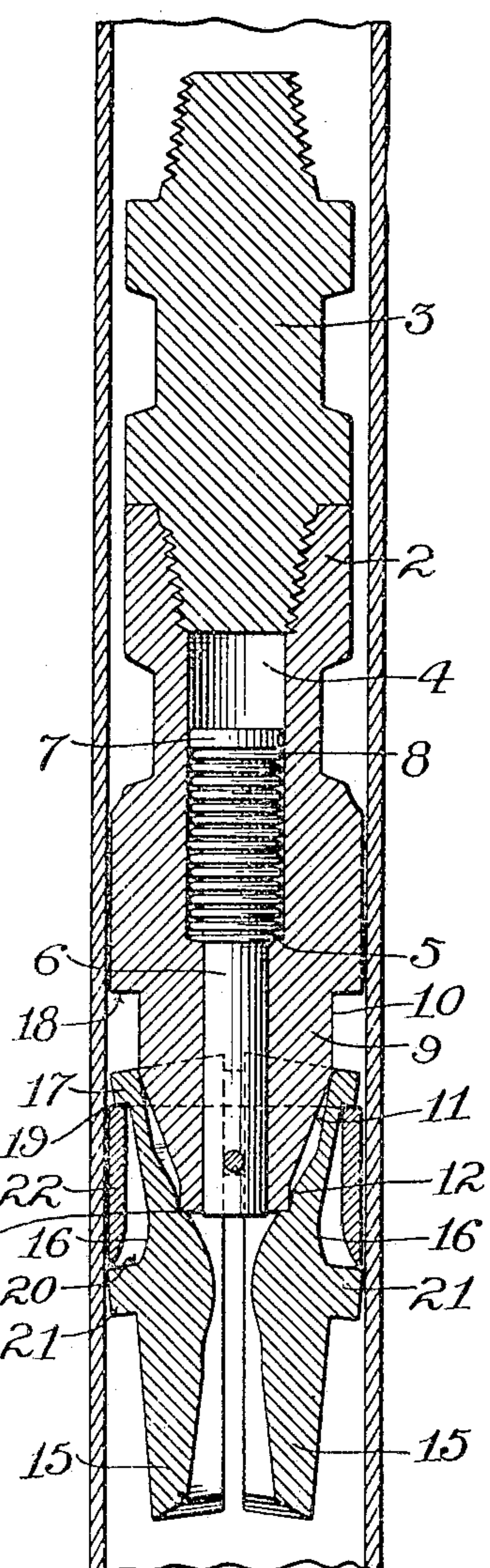


Fig. 4.

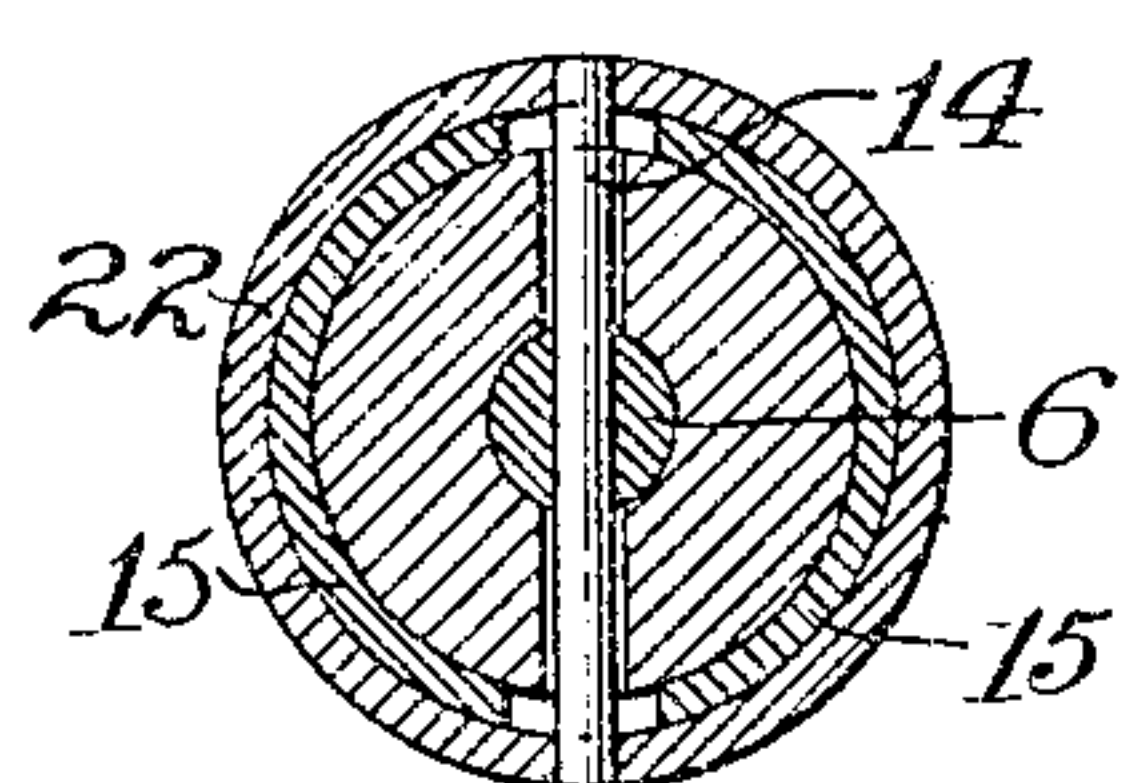
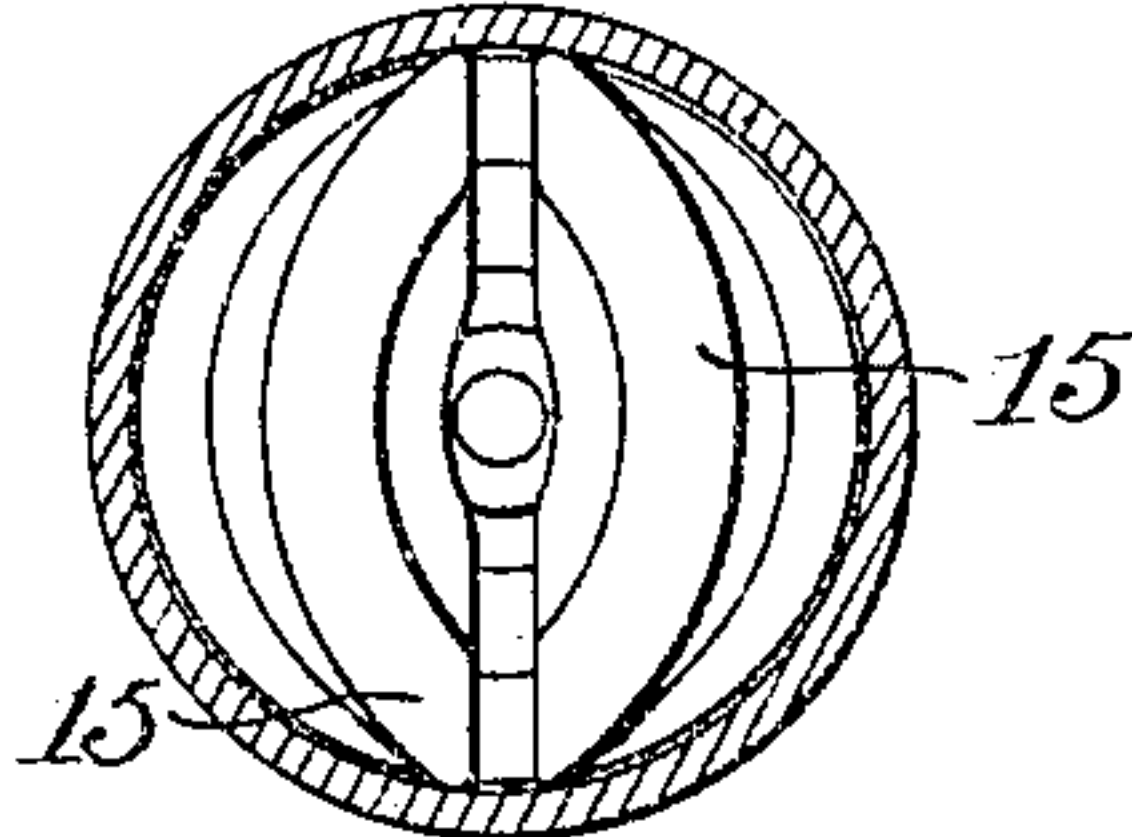


Fig. 5.



Witnesses:
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UNITED STATES PATENT OFFICE.

ROBERT S. FUTHEY, OF LOS ANGELES, CALIFORNIA.

UNDERREAMER.

SPECIFICATION forming part of Letters Patent No. 793,289, dated June 27, 1905.

Application filed February 9, 1905. Serial No 244,838.

To all whom it may concern:

Be it known that I, ROBERT S. FUTHEY, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented certain new and useful Improvements in Underreamers, of which the following is a specification.

This invention relates to underreamers for underreaming undercasing in oil and Artesian wells, and has for its object the provision of a device which shall be simple, extremely cheap to manufacture, durable, and at the same time positive and efficient in operation.

The invention consists in constructions and combinations of parts hereinafter described, and particularly pointed out in the claims, which will be more readily understood by reference to the accompanying drawings, in which—

Figure 1 is a front elevation of an underreamer embodying my invention, a portion thereof being shown in section and illustrating means which I provide and employ for holding the spring-actuated rod in position to permit of disengagement of the bits and the removal thereof from the mandrel. Fig. 2 is a longitudinal sectional view of an underreamer in operative position, the underreamer being shown protruding from the bottom of the well-casing. Fig. 3 is a similar view showing the underreamer within the well-casing and the bits in their contracted or collapsed position. Fig. 4 is a cross-sectional view on the line X X of Fig. 1, showing means for attaching the bit-retaining ring or sleeve to the spring-operating rod. Fig. 5 is a bottom view from Fig. 3, showing the contacting of the bits with the well-casing.

As shown in the drawings, 2 represents the mandrel proper, and 3 the "sub," adapted to engage therewith. The mandrel 2 is provided with a central bore 4, preferably having two diameters providing a shoulder 5 toward the lower end of the bore 4.

6 represents a rod slidable in the bore 4 and provided with a suitable head 7. About the upper end or shank of the rod 6 is a coiled spring 8, the upper end of which bears or is shouldered against the head 7 and the lower

end resting on the shoulder 5. It is thus seen that the rod 6 is normally held in its upper or raised position.

The mandrel 2 is provided with a lower extension 9, having a straight cylindrical face 10 and a conical surface 11, downwardly tapered. At the extreme end of the conical or tapered surface 11 the surface of the extension 9 is extended in the cylindrical form, as shown at 12. The central bore 4 extends through this extension 9, and the extension 9 is provided at opposite sides with elongated slots 13, through which a pin or key 14, extending through the lower portion of the rod 6, operates.

15 represent the bits or slips, preferably having a cross-sectional form, as shown, and provided with cut-away portions 16, providing portions 17, adapted to abut against the shoulders 18, formed at the top of the extension 9 of the mandrel, and with shoulders 19 at the upper end of the cut-away portion 16 and with shoulders 20 at the lower end of said cut-away portions 16, the shoulders 20 being extended outwardly to form projections or flanges 21, adapted to abut against the inner surface of the well-casing when the underreamer is drawn up in the said well-casing to hold the bits in their contracted or collapsed position. The lower ends of the bits 15 are semicircular in cross-section.

22 represents the bit-retaining ring or sleeve, which fits between the shoulders 19 and 20 and in the cut-away portions 16 of the bits. The pin or key 14 is fixed in the opposite sides of this ring or sleeve 22 in the usual or any preferred manner. It is thus seen that the pivoting of the bits on the rod 6 is by means of the pin 14 and the retaining ring or sleeve 22, the bits being, in effect, tiltingly mounted on the rod 6.

The inner faces of the bits 15 correspond to the outer surfaces of the cylindrical portion 10 and tapering portion 11 of the extension 9 of the mandrel, the inner surface of the bits being preferably provided with notches into which the end of the cylindrical portion of the extension 9 of the mandrel is adapted to fit when the bits are in collapsed position,

Fig. 3. By thus providing the bits 15 with the notches or sockets 23 the strain or tension of the spring 8 is substantially removed from the frictional contact between the flanges or projections 21 of the bits and the inner surfaces of the well-casing, thus minimizing the friction therebetween.

When it is desired to remove the bits 15—as, for instance, for sharpening the same—I provide a sleeve 24, having a rod 25 threaded at its inner end and adapted to screw in a threaded socket in the end of the rod 6. This sleeve 24 is provided with a shoulder 26 at the inner end of the rod 25, the shoulder 26 being adapted to bear against the end of the cylindrical portion 12 of the extension 9 of the mandrel. By screwing the shank 25 in the socket of the rod 6, the rod 6 is held in position to permit the withdrawal of the key or pin 14 from the retaining ring or sleeve 22 and permitting the withdrawal of the sleeve and bits from the extension 9 of the mandrel.

When the underreamer is to be used, the member 24 is of course removed. In the collapsed position of the bits the projections or flanges 21 of the bits contact with the inner surface of the well-casing, drawing the bits and retaining ring or sleeve 22 down, thereby carrying the rod 6 therewith, and when the bits reach the position of Fig. 3 the end of the extension 9 is permitted to engage in the notches or sockets 23 of the bits, thereby tending to sustain the tension of the spring 8 on the bits and relieving excessive friction from the inner surface of the casing.

As shown in the drawings, the collapsing or tilting of the reaming-bits 15 is doubly insured, the projections or shoulders 21 being adapted to contact with the interior of the casing to cause the reaming-bits to tilt when the reamer is drawn in the casing, and, as shown, the outer ends or edges of the bits, Fig. 5, are of such shape and length that they will contact with the interior of the casing. It is obvious that either one of these features may be relied upon for causing the tilting of the bits, and if the shoulders 21 are provided on the bits the edges of the bits may be cut away, so as not to contact with the inner surface of the casing.

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

1. An underreamer comprising in combination a hollow mandrel, a spring-actuated rod slidably mounted therein, said mandrel provided with a tapering end portion, reaming-bits adapted to slide on said tapering portion and a ring or sleeve operatively connected with said rod and supporting said bits.

2. An underreamer comprising in combination a hollow mandrel, a spring-actuated rod therein, said mandrel provided with a tapering lower end, bits or slips, the inner faces

of each corresponding to the tapering ends of said mandrel, and a retaining sleeve or ring about said bits, said ring or sleeve operatively connected with said spring-actuated rod.

3. An underreamer comprising in combination, a hollow mandrel provided with a tapering, slotted lower end, a spring-actuated rod slidably in said mandrel, a retaining sleeve or ring, a key or pin connecting said sleeve or ring with said spring-actuated rod, said key or pin operating in the slots of said slotted portion of the mandrel, and reaming-bits removably connected with said mandrel by said retaining ring or sleeve.

4. An underreamer comprising in combination a hollow mandrel provided with a hollow extension having a cylindrical portion of less diameter than the body of the mandrel, a tapering portion, reaming-bits having inner faces corresponding to the shape of said extension, said bits provided on their outer faces with cut-away portions, a spring-actuated rod slidably mounted in said mandrel, a retaining ring or sleeve mounted in said cut-away portion, and means connecting said sleeve with said spring-actuated rod.

5. An underreamer comprising in combination a hollow mandrel provided with a hollow, slotted extension having a cylindrical portion of less diameter than the diameter of the body of the mandrel proper and having a tapering hollow slotted end, reaming-bits having inner faces corresponding to the outer surfaces of said extension and having cut-away portions in their outer surfaces, a spring-actuated rod slidably mounted in said mandrel, a retaining ring or sleeve mounted in said cut-away portion and a pin or key connecting said sleeve with said spring-actuated rod and operating in the slots of said extension.

6. An underreamer comprising in combination a hollow mandrel having an extension having a cylindrical portion of less diameter than the diameter of the mandrel and having a tapering portion and having a cylindrical portion forming an extension on the tapering portion, a spring-actuated rod slidably mounted in said mandrel, reaming-bits having inner faces corresponding to the surfaces of said extension and provided with sockets into which the end of said extension is adapted to project when the bits are collapsed, said bits also provided with cut-away portions and with shoulders adapted to contact with the interior of the casing and to tilt said bits, a retaining ring or sleeve mounted in said cut-away portion, and a pin or key operatively connecting said sleeve with said slidable rod through the slots of said extension.

7. An underreamer comprising in combination a hollow mandrel having a hollow tapering extension, a spring-actuated rod slidably mounted in said mandrel, reaming-bits having inner faces corresponding to the surfaces

of said extension, a retaining ring or sleeve
about said bits, and means operatively con-
necting said sleeve with said spring-actuated
rod, said bits provided with shoulders for con-
5 tacting with the interior of the well-casing
causing said bits to collapse.

In testimony whereof I have hereunto set

my hand, at Los Angeles, California, this 31st
day of January, 1905.

ROBERT S. FUTHEY.

In presence of—

FREDERICK S. LYON,

JULIA TOWNSEND.