P. J. BOOKER.

UNDERREAMER.

APPLICATION FILED JUNE 28, 1920.

1,369,959.

Patented Mar. 1, 1921.

2 SHEETS—SHEET 1.

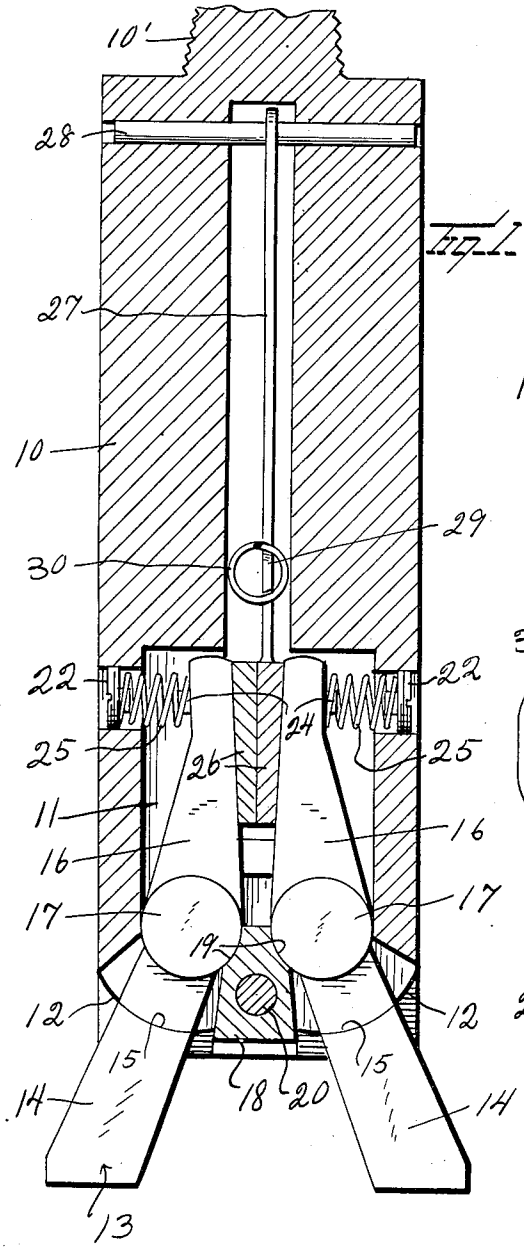


Fig. 1.

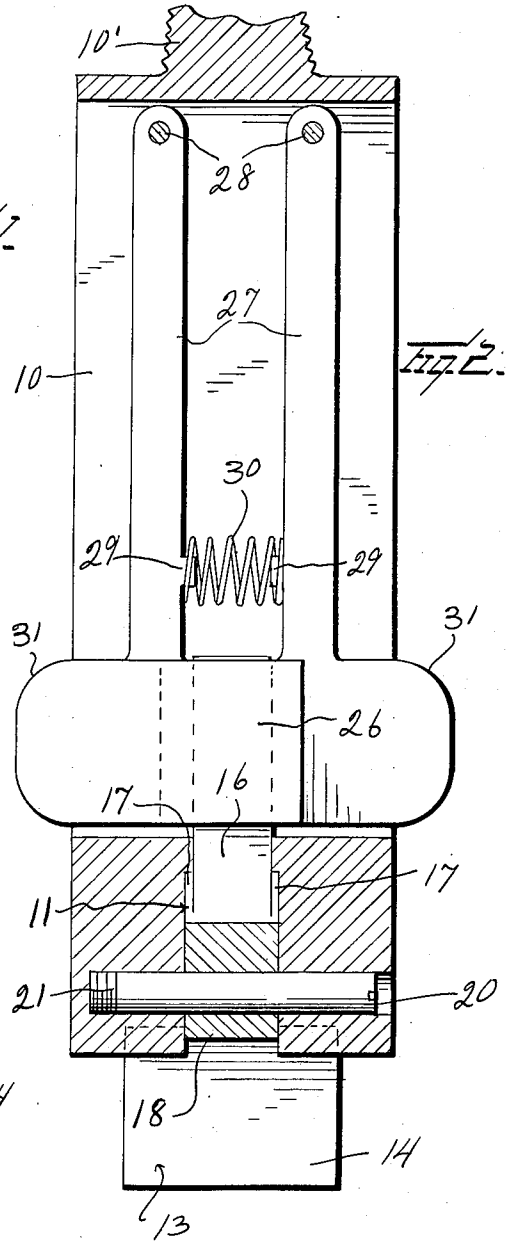


Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 3.

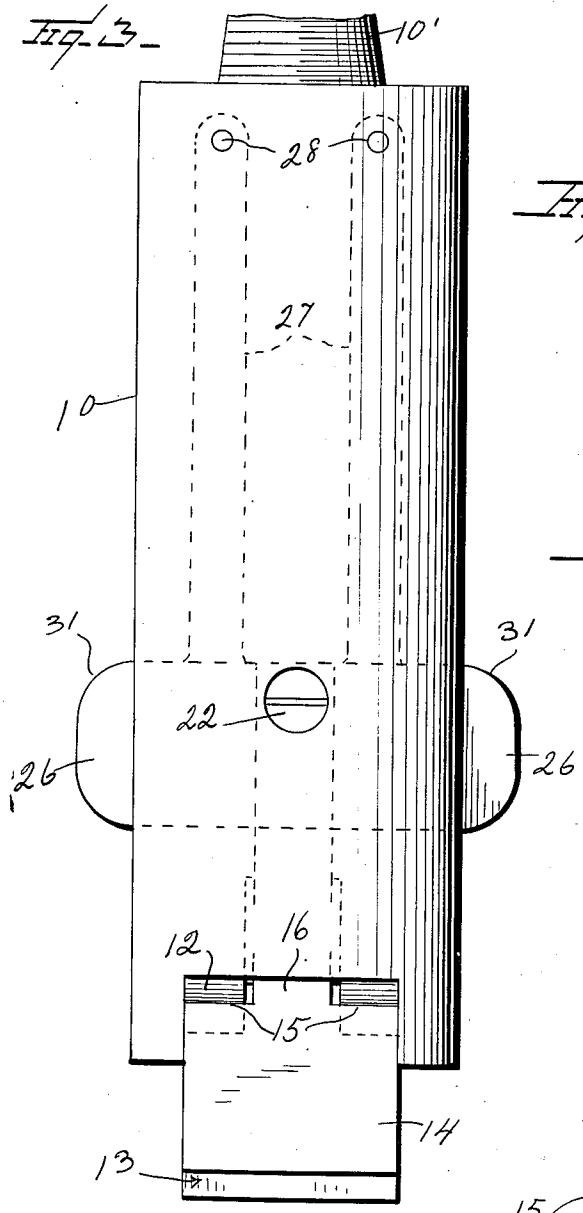


Fig. 4.

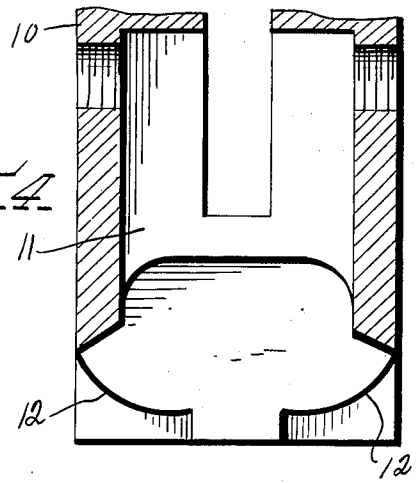


Fig. 5.

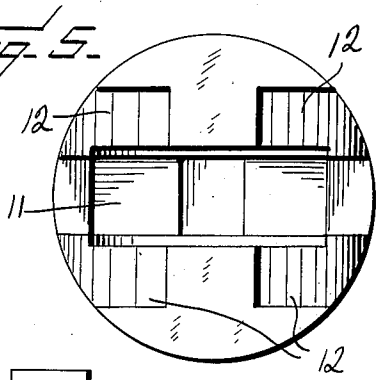


Fig. 6.

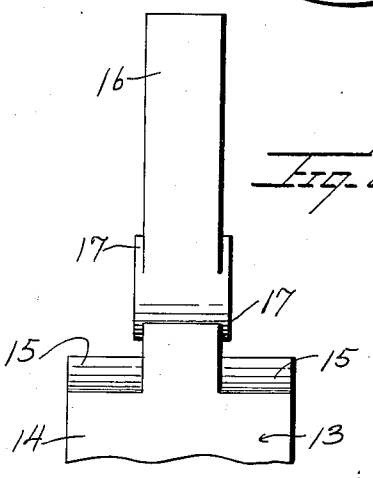
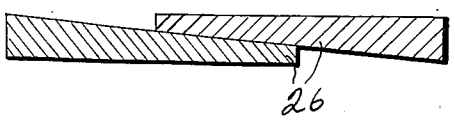


Fig. 7.



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UNITED STATES PATENT OFFICE.

PAUL JOHN BOOKER, OF PARKERTON, WYOMING.

UNDERREAMER.

1,369,959. Specification of Letters Patent. Patented Mar. 1, 1921.

Application filed June 28, 1920. Serial No. 392,275.

To all whom it may concern:

Be it known that I, PAUL JOHN BOOKER, a citizen of the United States, residing at Parkerton, in the county of Converse and State of Wyoming, have invented certain new and useful Improvements in Underreamers, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to improvements in well boring apparatus and more particularly to the construction of underreamers.

An important object of the invention is to provide a device of this character wherein the cutting jaws, or reamer cutters, are readily removable for re-grinding.

A further object of the invention is to provide a device of this character wherein the reamer cutters are projected for engagement with the wall of the cut when they are passed through the casing and are held with the underreamer body while being inserted into the casing and withdrawn therefrom.

Other objects and advantages of my improved underreamer will appear throughout the course of the following description.

In the accompanying drawings wherein for the purpose of illustration is shown a preferred embodiment of my invention and wherein like reference characters designate like parts throughout:

Figure 1 is a longitudinal sectional view taken through an underreamer constructed in accordance with my invention.

Fig. 2 is a similar section taken at right angles to that shown in Fig. 1.

Fig. 3 is a side elevation of my reamer.

Fig. 4 is a detail sectional view illustrating the form of recess provided in the lower end of the reamer body.

Fig. 5 is a bottom plan view of the reamer body with the reamer cutters removed.

Fig. 6 is a fragmentary side elevation of a reamer cutter similar to that employed in my underreamer, and

Fig. 7 is a detail sectional view illustrating the shape of the camming members utilized for shifting the underreamer cutters.

Referring now more particularly to the drawings, the numeral 10 indicates an underreamer body portion provided upon its upper end with a threaded reduced extension 10′ by means of which it may be connected with the usual operating means. The underreamer body is provided in its lower end with a recess or slot 11 extending through the bottom of the body, the shoulders of metal upon each side of the recess being arcuately curved, as at 12, for a purpose presently to appear.

Reamer cutters 13 are provided, preferably two in number, each comprising a cutter body 14 which is reduced upon its upper end to form shoulders 15 which are concaved upon the same radius as the curved shoulders upon the sides of the slot or recess 11. The reduced portion or extension 16 of the reamer cutter 13 is provided at a point spaced above the shoulders 15 with enlargements 17 circular in form and curved from the same center as the curvature of concavity of the shoulders 15. The slot 11 is of such size as to permit insertion of these enlargements or shoulders therewithin, the upper ends of the extensions extending upwardly into the recesses 11 and the concaved shoulder 15 and gage the curved shoulders of the underreamer body.

A retaining member 18 is provided having upon its upper faces seats 19 having a curvature conforming to the curvature of the enlargements or lugs 17 formed on the extensions 16 of the cutters 13. This member is adapted to be inserted within the slot 11, subsequent to the insertion of the extensions 16 of the reamer cutters therein and held in position by means of a pin 20 extending through openings formed in the reamer body and through a similar opening formed in the retainer member 18, the entering end of the pin 20 having threaded engagement with the reamer body as at 21.

The reamer body is provided at points approximately alining with the upper ends of the extensions 16 with threaded apertures receiving adjustable spring seats 22. Each extension 16 is provided upon the face thereof adjacent such apertures with a lug 24 and springs 25 engage the spring seats 22 and against the extensions 16 about the lugs 24 normally forcing the extensions 16 inwardly

and thereby tending to throw the cutters 14 outwardly for engagement with the walls of the cut.

The reamer body 10 has a slot formed therethrough which communicates with the upper end of the slot 11. Wedges 26 are mounted within this slot having their thin or entering edges disposed intermediate the extensions 16 and slidably engaging one another. Each wedge 26 is provided with an upwardly extending arm 27 pivotally connected with the reamer body by a pin 28 which extends through the upper end of the arm and through the reamer body. The arms 27 are provided upon their adjoining faces with alined inwardly extending lugs 29 which receive a compression spring 30 normally tending to force the arms apart. The outer ends of the wedges 26 under action of the spring 30 normally project beyond the sides of the underreamer body and are cam faced as indicated at 31 for a purpose presently to appear.

In the use of my improved underreamer, when the device is inserted within the casing the cam faces 31 of the wedges 26 engaging the walls of the casing force the wedges inwardly and consequently force the extensions 16 apart, thereby moving the cutting portions 14 of the cutters inwardly into alinement with the body of the underreamer to prevent their engagement with the casing. When the underreamer body arrives at the lower end of the casing, the cam faces 31 being freed, the spring 30 forces the wedges apart reducing the thickness interposed between the members 16 to permit the springs 25 to move the cutting portions 14 outwardly for engagement with the walls of the cut. When it is desired to remove the cutters 13 to regrind the cutting edges thereof, it is merely necessary that the pin 20 be removed.

It will be obvious that the retaining member 18 while preventing removal of the cutters, permits of free radial movement thereof, and at the same time prevents the downward displacement of the cutter members effectually thereby eliminating the loss of the bits with the consequent necessity for fishing therefor.

It will also be obvious that the underreamer body and the underreamer cutters are so constructed that the working contact therebetween is maintained at, or near the base or lower end of the underreamer body and upon the shoulders or heaviest and broadest part of the underreamer cutters.

It will be obvious that many minor changes in the shape, size and arrangement of the various parts herein shown may be resorted to, and I accordingly do not limit myself to the specific structure hereinbefore set forth, but may make any such changes without departing from the spirit of the invention, or the scope of the subjoined claims.

Having now described my invention, what I claim is:

1. In an underreamer for enlarging a bore to permit a further insertion thereinto of a casing, a body portion, cutter members pivotally connected thereto and adapted to be moved to engaged and disengaged positions, means normally projecting said cutter members for engagement and means carried by said body portion and engaging said cutter members for withdrawing said cutter members from engagement, said means being actuated by engagement with the casing wall.

2. In an underreamer for enlarging a bore to permit of further insertion thereinto of a casing, a body portion, cutter members pivotally connected therewith to be moved to engaged and disengaged positions, means normally moving said cutter members into engaged position, a shiftable wedge adapted to engage said cutter members and provided with a cam face adapted to engage the casing wall, whereby said wedge member is shifted to move said cutter members to disengaged position when the body portion is within the casing.

3. In an underreamer, a body portion provided in the lower end thereof with a slot forming shoulders, said shoulders being arcuately curved, reamer cutters provided with reduced extensions forming shoulders, said shoulders being arcuately curved to coact with the shoulders of said body portion, said extensions being adapted to engage in the slot of said body portion, enlargements formed on said extensions and having their under surfaces curved from the same center of curvature as the concavity of the shoulders of said cutter members, a member adapted for insertion within said slot provided upon its upper surface with seats adapted to receive said enlargements, and means for retaining said member in position within said slot, said cutter members being unremovable while said member is in position.

4. In an underreamer, a body portion provided in the lower end thereof with a slot forming shoulders, reamer cutters provided with reduced extensions forming shoulders, said shoulders being adapted to coact with the shoulders of said body portion, said extensions being adapted to engage in the slot of said body portion, enlargements formed on said extensions and having their under surfaces curved, a member adapted for insertion within said slot provided upon its upper surface with seats adapted to receive said enlargements, and means for retaining said member in position within said slot.

5. In an underreamer, a body portion having pivotally connected thereto cutter members adapted to be moved to engaged and

disengaged positions, said cutter members embodying upwardly extending portions, springs engaging said upwardly extending portions, and normally forcing said cutter members outwardly to the engaged position, a pair of wedge shaped members pivotally mounted within said body portion and having their entering edges extending intermediate the extensions of said cutter members, the ends of said wedge shaped members projecting beyond the wall of said portion and being cam faced.

In testimony whereof I hereunto affix my signature.

PAUL JOHN BOOKER.