Dec. 4, 1928. 1,693,789

G. F. LE BUS

COMBINATION TOOL FOR WELL DRILLING OPERATIONS

Filed July 17, 1924 2 Sheets-Sheet 1

Fig. 1.

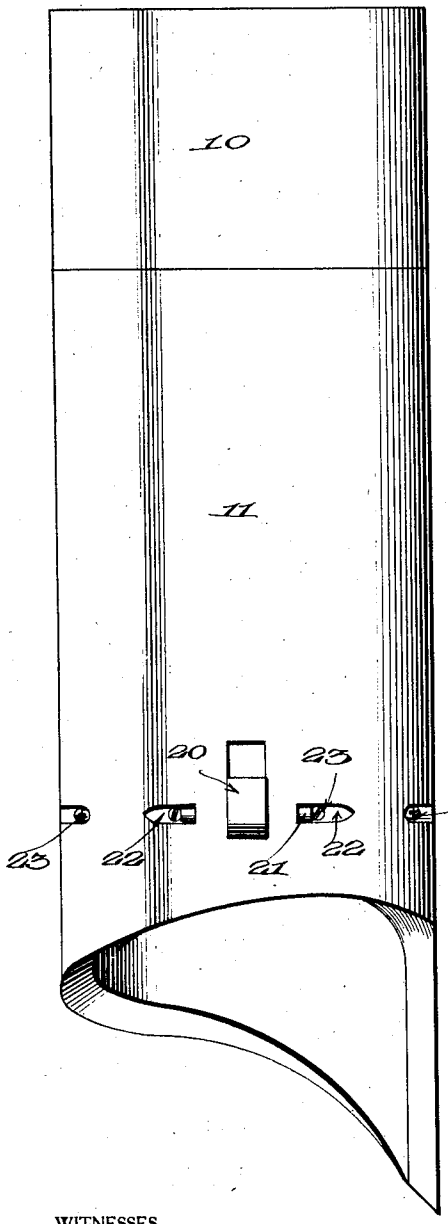
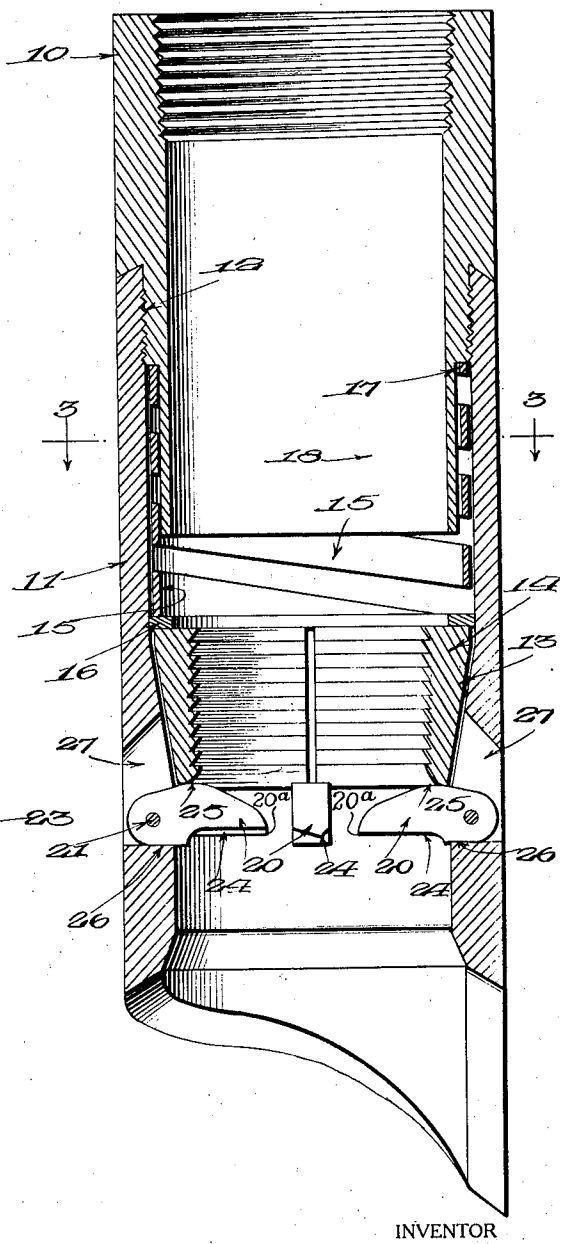


Fig. 2.



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Fig. 3.

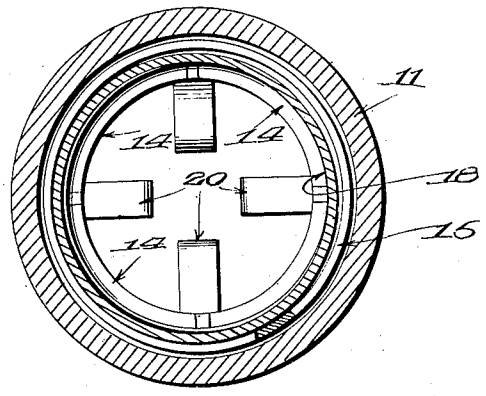
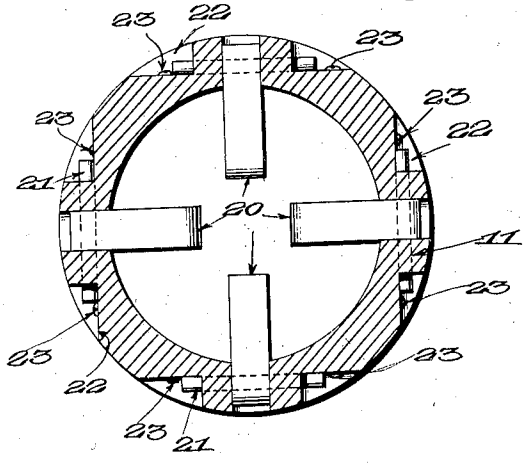


Fig. 4.



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UNITED STATES PATENT OFFICE.

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COMBINATION TOOL FOR WELL-DRILLING OPERATIONS.

Application filed July 17, 1924. Serial No. 726,601.

This invention relates to a combination overshot, rotary shoe and milling and cutting tool.

The object of the invention is to provide a combination tool of this character which may be advantageously utilized for recovering lost tools or other objects from the well as well as for cutting off pipe in the well or for milling down irregular and rough ends of lost tools to facilitate their recovery.

Other objects and advantages of the invention reside in certain novel features of the construction, combination and arrangement of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming part of this specification, and in which:

Figure 1 is a view in elevation, showing one embodiment of the invention;

Figure 2 is a view in diametric vertical section of the embodiment shown in Figure 1;

Figure 3 is a view in horizontal section on line 3—3 of Figure 2;

Figure 4 is a similar view on line 4—4 of Figure 2.

Referring to the drawings, the numeral 10 designates the head of the tool, the head being threaded into the upper end of a main body or bowl 11, as indicated at 12. Both the head and main body are in general of cylindrical form.

Intermediate its ends the main body is formed interiorly with a tapered or frustoconical portion 13 on which slips 14 are slidably mounted. The slips 14 are yieldably urged into position to grip lost tools or objects by means of a coil spring 15 fitted snugly against the inner periphery of the main body 11 of the tool. A ring 16 is interposed between one end of the spring 15 and the slips 14. The other end of the spring abuts a shoulder 17 provided on the head 10. The spring 15 is held against displacement from the shoulder and is guided and protected in its action by means of a sleeve 18 which may be integrally formed with the head 10, the sleeve constituting a reduced extension of the head.

Forwardly or in advance of the slips 14, a plurality of milling or cutting tools 20 are provided. Each cutting tool 20 is pivotally mounted on the main body 11 by means of a pivot pin 21, the body having pivot openings to receive the pivot pin 21 and having recesses 22 facilitating the insertion of the pivot pins 21 in the pivot openings. The retaining screws 23 are threaded into the body and engaged with the ends of the pins 21 to prevent accidental displacement. As shown in the drawings the cutters 20 extend radially and inwardly of the main body and their forward portions are formed with cutting edges 24 adapted for use as millers. The inner ends of the cutters 20 are pointed as at 20^a and adapted to serve to cut off pipe or the like, the pressure of spring 15 holding these edges against the pipe as the cutting tool body is rotated. Cam surfaces 25 are provided on the cutters and engage the lower ends of the slips 14. Shoulders 26 on the cutters limit their forward swinging movement to the position shown in Figure 2.

With the form of the invention shown in Figures 1, 2, 3 and 4 tools may be moved axially down through the well to recover lost objects, the objects passing in through the forward or lower end of the main body 11 and past the cutters 20 up into the field of action of the slips 14. It is to be noted that lost objects may readily pass the cutters 20 since these cutters, even though they will engage the top edge of a lost tool or pipe joint, for instance, will be forced upwardly by upward pressure of the joint from beneath, the cutters swinging upwardly and inwardly on their pivots until the joint, which must of course, be of less diameter passes through between them and into the area of gripping action of the slips. Of course upward swinging movement of the cutters is accompanied by upward movement of the slips 14, the cam surfaces 25 of the cutters urging the slips 14 upwardly when the cutters swing upwardly. The main body 11 is formed with openings 27 accommodating the cutters 20 when the same swing upwardly. It is also to be noted that the cutters 20 can exert a cutting or milling function in the position shown in Figure 2 or in position above that shown in Figure 2 since these cutters are forced into engagement with the tool or pipe being recovered by the action of the spring 15 exerted through the slips 14.

When the forms of the invention illustrated by Figs. 1 to 4 are to be employed for cutting a piece of pipe, the body member 10 is moved downwardly into the well until the proper depth has been reached for cut-

ting off a section of the pipe. In this instance, however, the body member is moved down until the blades 20 pass over a connection at a joint. The cutting edges 20^a will engage the pipe or tool, with the cutters 20 being located at an acute angle to the horizontal and inclined upwardly. When the cutters are in this position, the slips 14 will have been moved upwardly against the tension of the spring 15 so that they will not be in a position to grip a tool joint or collar. The body member 11 is then rotated and the sharp edges 20 of the blades will sever the pipe. When the body member 11 is raised, the slips 14 will be forced downwardly by the spring 15 and engage the collar or joint, whence the tool will be removed from the well. It may be necessary, at times when moving the member 11 into the well, to rotate said member so that the milling edges 24 of the cutters may be employed for cutting foreign matter which has collected around the tool and formed an obstruction.

When cutting is not necessary to remove a lost pipe from the well the cutters can be taken out of the tool and the tool used as an overshot.

I claim:

1. In a tool of the character described, a rotatable hollow tool body, an annular slip member within said body, a plurality of spaced inwardly extending cutting tools pivotally mounted in said body below the slip member and having non-cutting edges engaging and having a camming action against the lower edge of the slip member effective to raise said slip member relatively to the tool body, pressure means cooperating with the slip member and normally effective to maintain the slip in lowered position with the cutting tools held in operative cutting relation, said tools swinging upwardly and inwardly in response to upward pressure from beneath camming against and raising the slip and permitting tool or pipe joints of less diameter to pass upwardly therebetween and thereafter automatically moved inwardly below said joint and into pipe or tool cutting relation by said pressure means.

2. In a tool of the character described, a rotatable hollow tool body, an annular slip member within said body, a plurality of spaced inwardly extending cutting tools pivotally mounted in said body below the slip member and having non-cutting edges engaging and having a camming action against the lower edge of the slip member effective to raise said slip member relatively to the tool body, pressure means cooperating with the slip member and normally effective to maintain the slip in lowered position with the cutting tools held in operative cutting relation but yielding to upward pressure upon said tools from beneath, said tools being removable from and replaceable in said tool body, and means being provided effective to increase and decrease the internal diameter of the slip as it is moved upwardly and downwardly, respectively, relatively to the tool body.

3. In a tool of the character described, a rotatable hollow tool body, an annular segmental slip member having wedging engagement with said tool body providing diametric contraction and expansion of the slip member responsive to downward and upward movements thereof, respectively, a plurality of cutting tools pivotally and removably mounted in recesses in said hollow tool body with non-cutting edges extending inwardly beneath and having camming action against the lower edges of the slip segments, and effective to raise the said slip relatively to the tool body to increase its internal diameter, a spring housed within said body and acting against the slip segments normally effective to maintain them in their lowered position of minimum diameter with said cutters entended inwardly below the segments, said tools extending inwardly beyond the superposed edge of the segmental slip and, in response to upward pressure from beneath, being effective to raise upwardly and swing inwardly to cam against and lift said slip sections and permitting tool or pipe joints of less diameter to pass upwardly therebetween, said spring being thereafter effective to move said slips downwardly and inwardly toward said joint cutting tools inwardly into engagement with the pipe or tool below said joint.

4. In a tool of the character described, a rotatable hollow tool body, a segmental diametrically expansible and contractible slip mounted and enclosed in said body, a plurality of cutting tools removably seated in recesses formed in said body below the said slip and having non-cutting portions engaging the lower edges of the slip segments, and spring means operating through said segments normally to position and maintain said tools in cutting position.

5. In a tool of the character described, a rotatable hollow tool body, a segmental diametrically expansible and contractible slip mounted within the body, a plurality of cutting tools pivotally mounted on the body member in advance of the slip, means for moving the slip to an operative position and for forcing the cutting tools into operative position.

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