Feb. 22, 1949. W. W. SMITH 2,462,230

OUTSIDE PIPE CUTTER

Filed Jan. 27, 1947 3 Sheets-Sheet 1

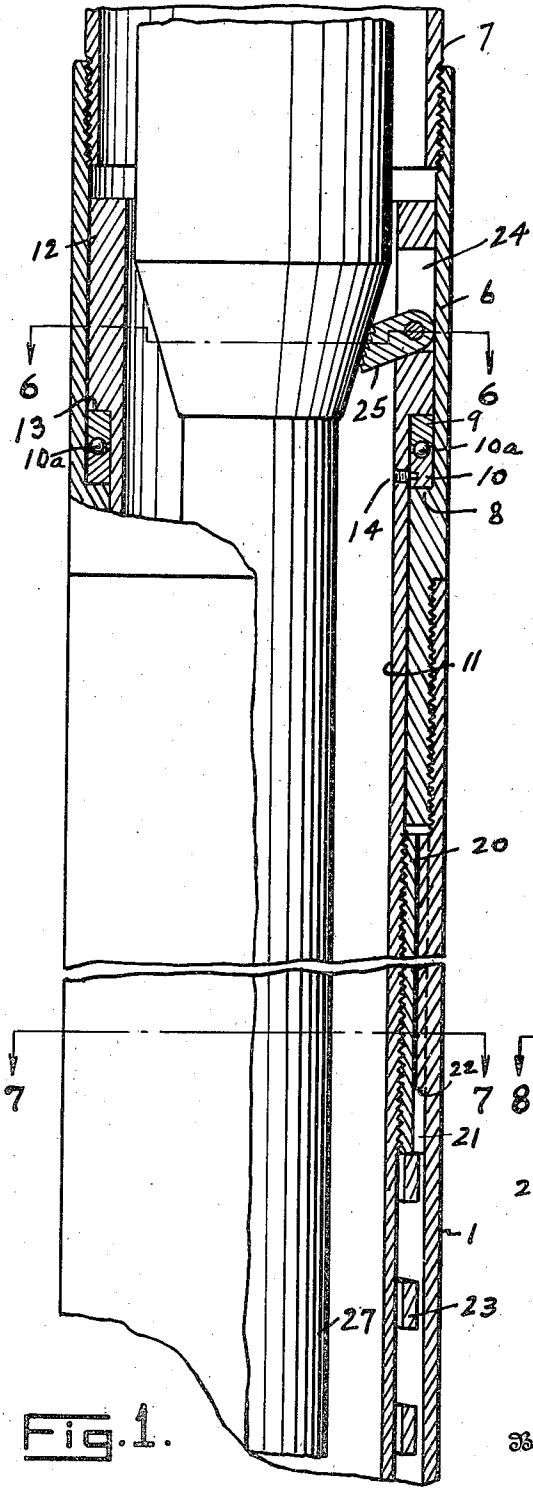

Fig. 1.

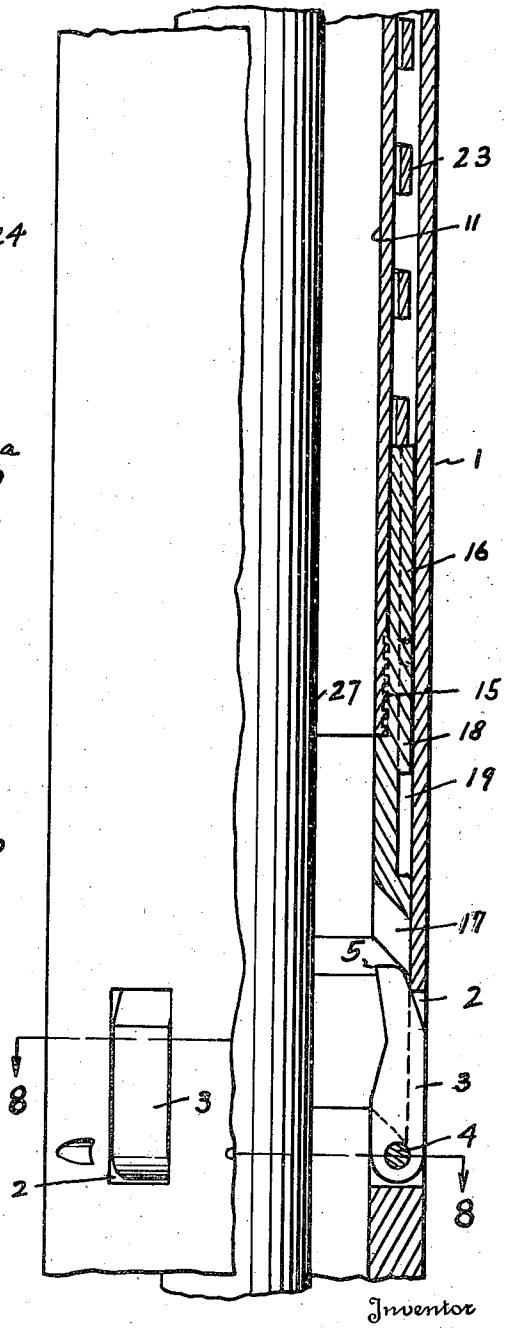

Fig. 2.

Inventor

William W. Smith

By E. V. Hardaway

Attorney

Feb. 22, 1949. W. W. SMITH 2,462,230

OUTSIDE PIPE CUTTER

Filed Jan. 27, 1947 3 Sheets-Sheet 2

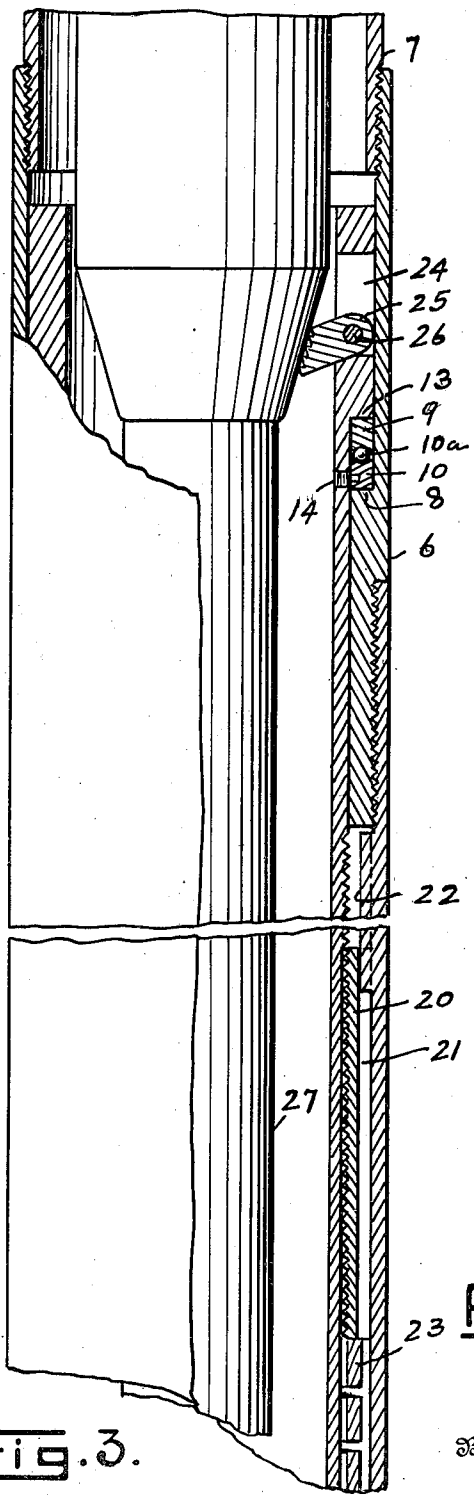

Fig. 3.

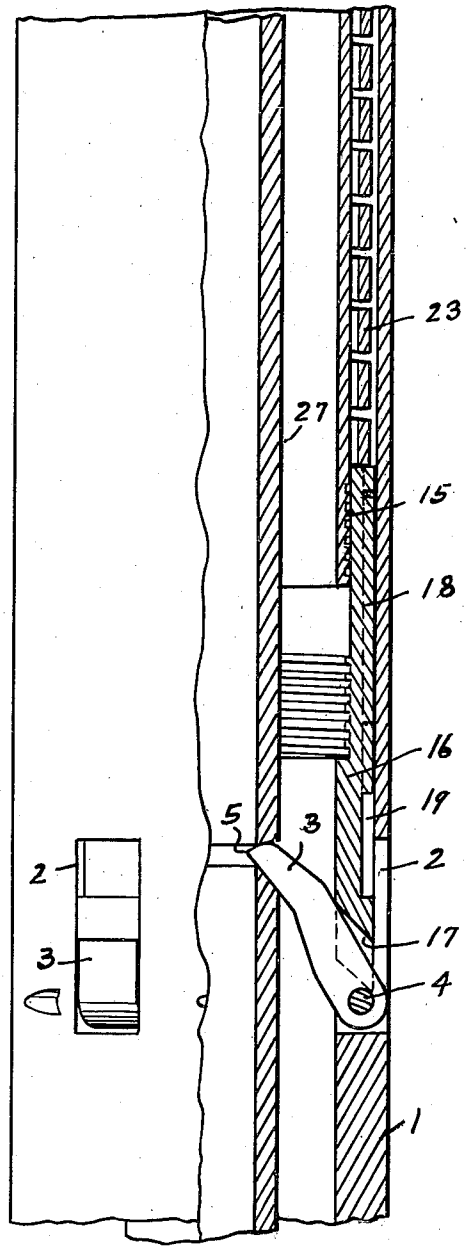

Fig. 4.

Inventor
William W. Smith

By E. V. Hardway.
Attorney

Feb. 22, 1949. W. W. SMITH 2,462,230

OUTSIDE PIPE CUTTER

Filed Jan. 27, 1947 3 Sheets-Sheet 3

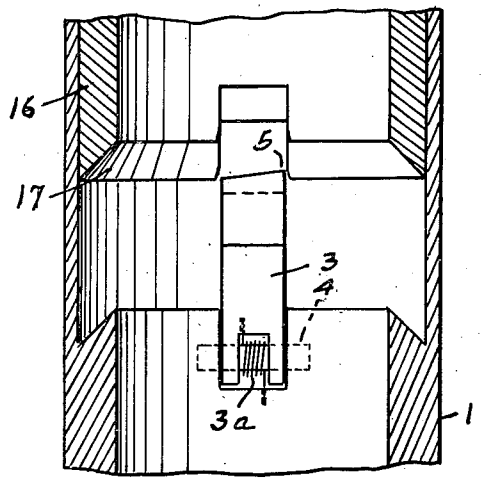

Fig. 5.

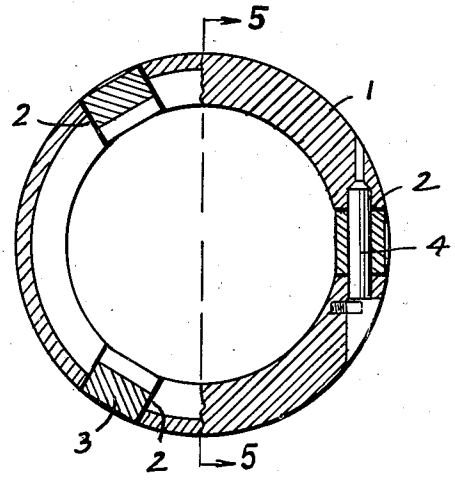

Fig. 8.

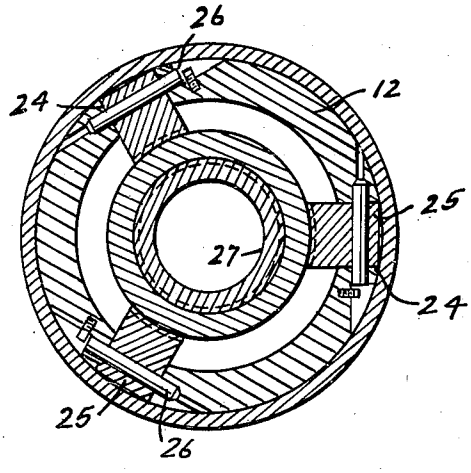

Fig. 6.

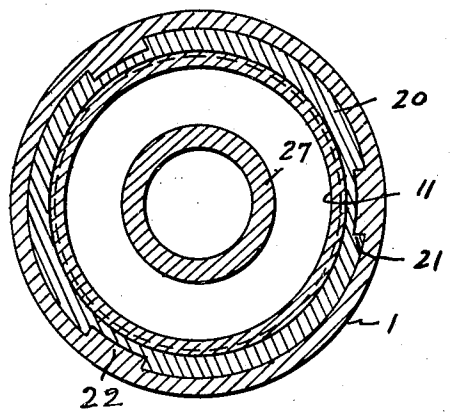

Fig. 7.

Inventor
William W. Smith

By E. V. Hardaway
Attorney

Patented Feb. 22, 1949

2,462,230

UNITED STATES PATENT OFFICE

2,462,230

OUTSIDE PIPE CUTTER

William W. Smith, Houston, Tex.

Application January 27, 1947, Serial No. 724,548

4 Claims. (Cl. 164—0.6)

1

This invention relates to an outside pipe cutter.

An object of the invention is to provide a cutter of the character described which is shaped to be lowered over a pipe stuck in a well bore and having cutters, or bits, adapted to be actuated into cutting relation with the stuck pipe to sever the same upon rotation of the tool.

It is another object of the present invention to provide an outside pipe cutter equipped with jaws engageable with the pipe to be cut and which is also equipped with means for applying a constantly increasing pressure to the cutters as the cutting process progresses.

The invention also includes means for withdrawing the severed section from the well.

Other objects and advantages will be apparent from the following specification which is illustrated by the accompanying drawings, wherein—

Figure 1 is a side elevation of the upper end of the cutter shown partly in section and in inactive position.

Figure 2 is a side view, partly in section, of the lower end of the cutter showing the parts in inactive position.

Figure 3 is a side elevation, partly in section, of the upper end of the tool shown in cutting position.

Figure 4 is a side view, partly in section, of the lower end of the tool shown in cutting position.

Figure 5 is a fragmentary, vertical, sectional view taken on the line 5—5 of Figure 8.

Figure 6 is a cross-sectional view taken on the line 6—6 of Figure 1.

Figure 7 is a cross-sectional view taken on the line 7—7 of Figure 1; and

Figure 8 is a cross-sectional view taken on the line 8—8 of Figure 2.

Referring now more particularly to the drawings wherein like numerals of reference designate the same parts in each of the figures, the numeral 1 designates a tubular cutter body whose lower end may be inwardly thickened, as shown in Figures 2, 5 and 8, and above said inwardly thickened portion is provided with the vertically elongated slots 2 in which are located the cutters 3. These cutters are pivoted, at their lower ends, on the cross pins 4 whose ends are suitably anchored in the body. The upper ends of the cutters terminate in the cutting bits 5.

It will be noted from an inspection of Figure 2 that the cutters are slightly longer than the corresponding slots 2 and their upper ends are limited in their outward movement by engagement

2

with the body 1 above said slots. These cutters 3 stand vertically when in inactive position, as indicated in Figure 2, being maintained in that position by the springs 3*a*.

In the present illustration three of said cutters are shown although a greater or less number may be employed.

The upper end of the cutter body is connected to a coupling 6 and the upper end of this coupling 6 is, in turn, connected to an operating string 7 which extends to the ground surface and by means of which the tool is operated.

A mid portion of the coupling 6 is inwardly thickened forming an inside upwardly facing shoulder 8 and supported on this shoulder is a bearing assembly comprising the upper and lower raceway rings 9 and 10 with a series of ball bearings 10*a*, between them.

Within the body there is a tubular stem 11 whose upper end is formed with an elongated outwardly thickened head 12 having an inside downwardly facing shoulder 13 which is supported on said bearing assembly and said stem is secured to the lower raceway ring 10 by means of one or more pins 14 so as to hold said stem against rotation. The lower raceway ring 10 is suitably secured within the coupling 6 so that said raceway ring 10 will not rotate.

The lower end of the stem 11 is provided with external coarse right hand threads 15 and screwed onto said coarse threads 15 there is a tubular, cutter actuator 16 whose upper end is extended above said threads and fits closely around the lower end of the stem and whose lower end has the downwardly and outwardly flared face 17 which is located above the cutters when the tool is in inactive position.

The cutter actuator has one or more external longitudinal splines, or keys, 18 which are located in relatively short inside keyways 19 in the cutter body whereby the cutter actuator will rotate with the body but may be moved longitudinally relative to it.

Threaded onto the stem 11, by right hand threads, there is a sleeve 20 which is provided with external longitudinal grooves 21 to receive the corresponding internal longitudinal splines 22 in the body 1 whereby the sleeve 20 will be caused to rotate with the body. Beneath the external threads connecting the sleeve to the stem, the stem is externally reduced in diameter.

Surrounding said stem and interposed between the lower end of the sleeve 20 and the upper end of the cutter actuator 16 there is a strong coil compression spring 23 which surrounds said stem

and is located between it and the body, as shown in Figures 1 and 2.

When the cutting tool is in inactive position, with the cutters 3 expanded, the spring 23 is also expanded, that is it is not under compression.

The head 12 is provided with longitudinally elongated radial slots 24, three of said slots being shown, and mounted in these slots are the pipe engaging jaws 25. These jaws are pivoted on the cross pins 26 which extend through their lower ends and the ends of these cross pins are anchored in the head 12.

The tool may be assembled as shown in Figures 1 and 2 and lowered into the well over the stuck pipe which is indicated by the numeral 27. While being lowered the jaws 25, in passing a coupling, may swing outwardly into the corresponding slots 24. When a point is reached where it is desired to make the cut an upward pull may be taken on the operating string 7 and the jaws 25 will engage with the coupling above of the pipe 27. With a tension on the operating string it is then turned to the right and the cutter body will also be turned with it and the jaws 25, in engagement with the coupling of the pipe 27, will hold the stem 11 against turning. The cutter actuator 16 will be rotated with the body 1 and will be screwed off of the lower end of the stem 11, in practice it usually requiring about four rotations to disengage the actuator from said stem. The actuator 16 will then move downwardly, the flared face 17 causing it to engage behind the cutters 3 and said cutters will be forced inwardly against the pipe 27. A continuous rotation of the operating string and body in the same direction will cause the sleeve 20 to move downwardly operating against the upper end of the spring 23 and gradually applying compression to said spring which will be transmitted to the actuator and to the cutters 3 with gradually increasing intensity thus forcing the bits 5 yieldingly against the inside pipe 27 and causing them to penetrate into said pipe until it is severed, as indicated in Figure 4.

When a section of the stuck pipe has been thus severed the operating string 7 may be pulled upwardly elevating the tool and the tool and severed section may then be withdrawn, together with the severed sections from the well.

The drawings and description are illustrative merely while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. An outside pipe cutter comprising, a rotatable body shaped to telescope over a pipe stuck in a well bore, a cutter mounted in the body to rotate on a horizontal axis, a tubular stem mounted in the body, pipe engaging means on the stem engageable with the stuck pipe to hold the stem against rotation as the body rotates, a cutter actuator having a splined connection with the body and a threaded connection with the stem and releasable from the stem upon rotation of the body, said actuator being arranged to engage the cutter and rotate it inwardly into engagement with said pipe upon release and downward movement of the actuator, a sleeve threaded onto the stem and having a splined connection with the body, a compression spring between the sleeve and actuator effective to apply yielding pressure to the actuator and cutter as the sleeve is screwed downwardly on the stem.

2. An outside pipe cutter comprising, a tubular shaped body adapted to telescope over a pipe in a well bore, cutters mounted in the body to rotate on horizontal axes, a tubular stem mounted in the body and rotatable with respect to the body, a plurality of pipe engaging jaws in the stem engageable with the stuck pipe to hold the stem against rotation, a cutter actuator in the body and having a threaded connection with the stem, operative connection between the body and actuator whereby the actuator is rotated with the body to unscrew the actuator from the stem, said actuator being arranged to engage the cutters and rotate them inwardly into engagement with the pipe upon release and downward movement of the actuator, a sleeve threaded onto the stem, operative connections between the body and a sleeve whereby the sleeve is screwed downwardly on the stem upon rotation of the body, and a yieldable member between the sleeve and actuator arranged to be placed under compression by the sleeve as the sleeve moves downwardly to apply pressure to the actuator and cutters to hold the cutters in yielding contact with the pipe.

3. An outside pipe cutter comprising, a tubular body adapted to telescope over a pipe in a well bore, a cutter mounted in the body to rotate on a horizontal axis, a tubular stem mounted in the body, pipe engaging means on the stem engageable with the stuck pipe to hold the stem against rotation as the body is rotated, a cutter actuator releasably connected to the stem, operative connections between the body and actuator effective to release the actuator from the stem upon rotation of the body relative to the stem, a yieldable member in the body operable against the actuator to force the actuator downwardly, upon release of the actuator, said actuator being shaped to engage the cutter, upon downward movement of the actuator, to force the cutter inwardly into cutting relation with said pipe, means operatively connected with the stem and with the body and movable downwardly on the stem as the body is rotated and operable against the yieldable member to place the same under compression to apply pressure to the actuator and the cutter to hold the cutter in cutting relation with the pipe under gradually increasing pressure.

4. An outside pipe cutter comprising, a body adapted to telescope a pipe in a well bore, a tubular stem in the body and rotatably mounted relative thereto, pipe engaging jaws carried by the stem and engageable with the pipe to hold the stem against rotation, upon rotation of the body, a pipe cutter mounted in the body, an actuator connected to the stem and adapted to be released therefrom upon rotation of the actuator, operative connections between the actuator and body whereby the actuator will be rotated, and released, upon rotation of the body, the lower end of the actuator being shaped to engage the cutter and force it inwardly into cutting relation with the pipe, upon downward movement of the actuator, a yieldable element arranged to operate against the upper end of the actuator and means operatively connected with the stem and body and arranged to apply a compressive force to said element upon rotation of the body relative to the stem.

WILLIAM W. SMITH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,418,278	Reed	Apr. 1, 1947