Dec. 3, 1940. W. L. CHURCH 2,223,984

OUTSIDE PIPE CUTTER

Filed Nov. 16, 1939

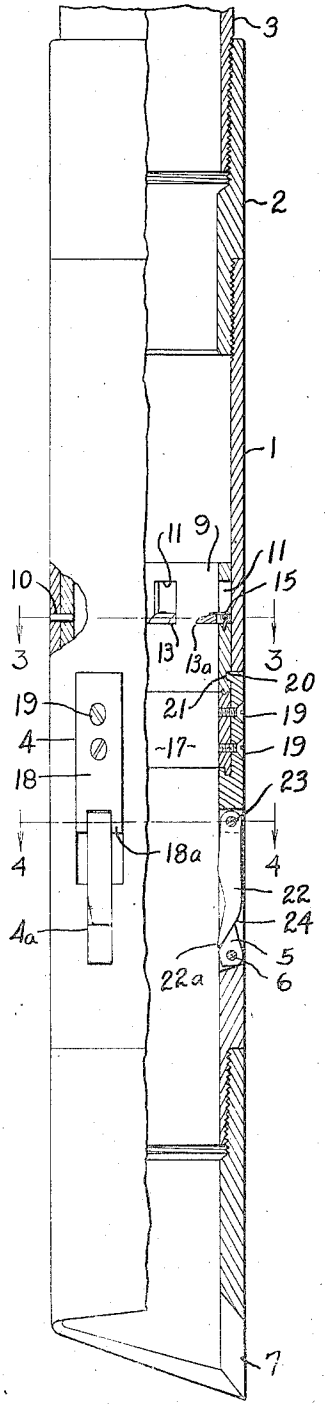


Fig. 1.

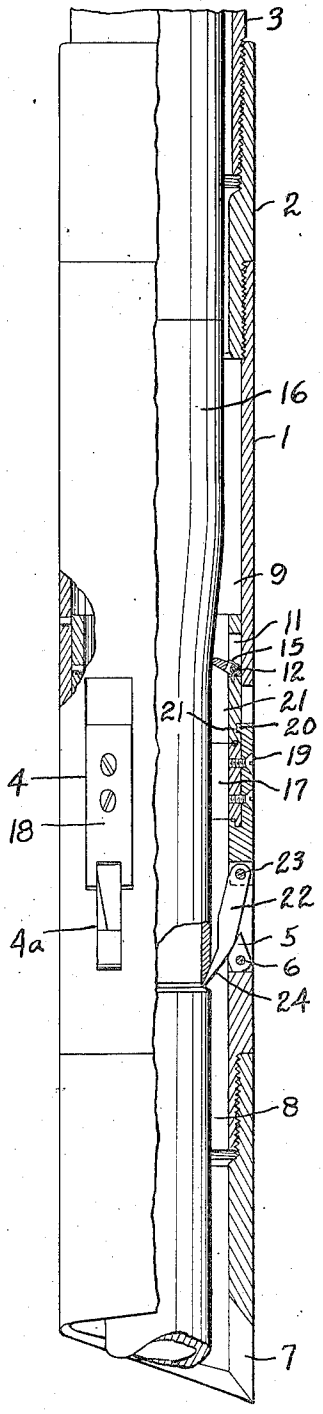


Fig. 2.

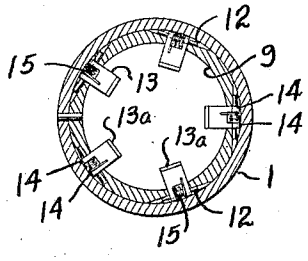


Fig. 3.

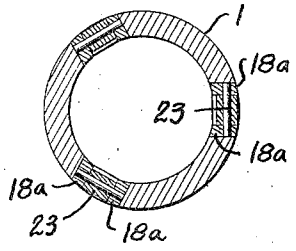


Fig. 4.

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OUTSIDE PIPE CUTTER

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6 Claims. (Cl. 164—0.6)

This invention relates to an outside pipe cutter.

An object of the invention is to provide a cutter adapted to be lowered into a well over a pipe stuck in the well and to cut by rotation whereby the stuck pipe may be cut into sections and withdrawn, a section at a time.

The invention herein described embodies certain improvements over outside pipe cutters disclosed in Patent No. 1,855,338 issued April 26, 1932, and Patent No. 1,944,594 issued January 23, 1934, both of said patents having been issued to applicant by the United States Patent Office.

It is another object of the invention to provide a cutter adapted to be lowered into a well over a pipe stuck in the well with a novel overshot to engage said pipe and which is effective to grip a string of pipe sections connected together by tapered or bottle neck joints, which joints do not present a square abutment and can not be engaged by a conventional grapple.

It is another object of the invention to provide an outside pipe cutter which embodies a novel type of blade guide or shoe which rocks and thereby conforms to the angle assumed by the knife as the same is being fed to the work.

It is another object of the invention to provide an outside pipe cutter wherein the cutter blade anchor and cutter blades are so mounted that they are not moved vertically relative to the pipe to be cut as the cutter body or shell moves vertically during the cutting operation. This is an important feature for the reason that the cutters merely move inwardly about their pivotal mounting which mounting remains stationary relative to the pipe to be cut and consequently the cutters are not required to remove as much material from the pipe being cut, during the cutting operation, as they would be required to do if they were mounted on the vertically movable shell or body as is the case with outside cutters now in common use.

With the above and other objects in view, the invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawing, wherein:

Figure 1 shows a side view of the cutter partly in section.

Figure 2 shows a side view partly in section showing the cutter in operative relation with the pipe to be cut and showing the cutter blades in active position.

Figure 3 shows a cross sectional view taken on the line 3—3 of Figure 1, and

Figure 4 shows a cross sectional view taken along the line 4—4 of Figure 1.

Referring now more particularly to the drawing wherein like numerals of reference designate similar parts in each of the figures, the numeral 1 designates the tubular cutter body or shell whose upper end is connected to the coupling 2 which in turn is connected to an operating string of pipe as 3 which extends to the ground surface. The lower end of the shell is inwardly thickened and is provided with vertical slots 4 whose lower ends have oscillatable shoes 5 mounted therein on cross pins 6, and forming blade guides. Attached to the lower end of the shell is a conventional type of guide 7 whereby the shell may be guided over the upper end of the pipe 8 to be cut as the tool is lowered into the well.

Within the shell 1 is mounted the grapple means which is adapted to engage the pipe 8 which is stuck in the well bore. The cylindrical anchor 9 is pinned in place above the slots 4 by means of a frangible pin 10 of soft metal such as brass, so that it will readily shear as hereinafter explained. The anchor has openings 11 therethrough in which are pivotally mounted on the pins 12, 12, the jaws 13, 13. Each jaw terminates at one end in a sharp pipe engaging edge 13a and is bifurcated at the other end forming arms 14, 14 which have aligned bores therethrough to receive the pin 12. Positioned between the arms and around the pins are coil springs 15, 15 which urge the jaws into radial position as shown in Figure 1. Figure 2 shows that the jaws 13, 13, when in engaging position with the stuck pipe, are almost perpendicular thereto to give the maximum wedging or gripping effect on the pipe. These jaws will grip the smooth cylindrical surface of the pipe and also the tapered or bottle-neck joints 16 thereof. Within the shell 1, beneath the cylindrical anchor 9 there is a collar 17 which abuts the lower end of the anchor 9 and swivels relative thereto. Located within the slots 4 are the cutter blade anchors 18 which are somewhat shorter in length then the lengths of the slots 4 and are suitably secured to the collar 17 as by means of set screws 19. The upper ends of the blade anchors 18 have inwardly turned flanges 20 which ride in the external annular groove 21 of the anchor 9 whereby the cutter blade anchors 18 on the collar 17 may rotate with the shell 1 and swivel about the anchor 9.

The lower ends of the blade anchors 18 are bifurcated forming fingers 18a, and there are cutters 22 whose upper ends are pivoted between these fingers on the pins 23. The outer sides of

the lower ends of these cutters are beveled as at 24 and ride on the correspondingly beveled guide shoes 5 beneath. It is noted that the lower end of each slot 4 is reduced in width as at 4a and the cutter blades fit snugly in these reduced lower ends so as to give said blades lateral support, the lower ends of the blades terminating in sharp cutting edges 22a. As shown in Figures 1 and 2 as the cutter blade 22 is rotated inwardly, the angle of the beveled portions of the blade relative to the shell or body 1 will vary. The shoe 5 is rotated so that a large bearing area between the shoe and the face of the bevel portion is maintained. The large bearing area will reduce the bearing stress on the shoe so that there will be no surface distortion of the shoe whereby the feed of the cutters to the work will be continuous and smooth.

The tool is assembled as shown in Figure 1 with the anchor 9 pinned in place by the pin 10 and with the cutter blades 22 in upper, or inactive, position. As so assembled the tool is let down into the well bore and is guided over the inside pipe 8 to be cut, the inwardly inclined jaws 13, 13 readily passing over the outside couplings 16 of the pipe 8. When the cutting tool is lowered to a point at which it is desired to make the cut, an upward pull is exerted on the operating string 18, causing the sharp edges 13a of the jaws 13 to engage the pipe 8. A further upward pull will cause the pin 10 to shear but the jaws 13 will hold the anchor 9, the collar 17 and the cutter blade anchors 12 as well as the cutter blades 22 against upward movement; in other words, the cutter blades 22 will be held against longitudinal movement relative to the pipe 8, while the outer shell or body 1 is moved upwardly. At the same time the body or shell 1 is being moved upwardly, the tool will also be rotated. The shoes 5 contacting with the inwardly beveled lower ends 24 of the cutter blades will gradually force said blades inwardly while the tool is being rotated and the cutter edges 22a will be gradually forced into and sever the pipe 8.

It will be noted that very little of the material of the pipe being cut will be removed while making the cut owing to the fact that the cutter blades 22 move inwardly only and do not also move longitudinally of the pipe being cut as is the case in cutters of this type now in common use.

When the pipe has been severed the cut off section may be pulled out with the tool as it is removed from the bore, the jaws 13 being of sufficient strength for this purpose.

The drawing and description disclose what is now believed to be a preferred form of the invention only while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. An outside pipe cutter adapted to cut by rotation and comprising an outer shell adapted to work over the pipe to be cut, a cutter blade anchor mounted in the shell, a blade pivoted to the anchor, means in the shell engageable with the pipe to be cut and arranged to hold said anchor against longitudinal movement relative to the pipe being cut during the cutting operation, said shell being movable longitudinally relative to said pipe and anchor during the cutting operation, said cutter blade and shell having coacting parts which include a shoe mounted in the shell and having a substantially flat face which bears against the outer face of the cutter blade and effective to move the cutter blade inwardly into cutting relation with the pipe upon longitudinal movement of the shell, said shoe being pivotally mounted whereby the shoe will pivot as the angle of the cutter blade is varied.

2. An outside pipe cutter shaped to be lowered into a well over a pipe to be cut and adapted to be cut by rotation and comprising a shell, a cutter blade anchor in the shell, a cutter blade pivoted to the anchor, grappling means including a pivotally mounted jaw adapted to grip the outer smooth surface of a pipe and yieldable means urging the jaw in contact with said pipe to hold said anchor against longitudinal movement relative to the pipe being cut during the cutting operation, said shell being movable longitudinally relative to said pipe and anchor during the cutting operation, said cutter blade and shell having coacting parts which are effective to move the cutter blade inwardly into cutting relation with the pipe upon longitudinal movement of the shell.

3. An outside pipe cutter shaped to be lowered into a well over a pipe to be cut and adapted to be cut by rotation and comprising a shell, a cutter blade anchor in the shell, a cutter blade pivoted to the anchor, grappling means including a pivotally mounted jaw and yieldable means urging the jaw into contact with said pipe to hold said anchor against longitudinal movement relative to the pipe being cut during the cutting operation, said shell being movable longitudinally relative to said pipe and anchor during the cutting operation, said cutter blade and shell having coacting parts which include a shoe mounted in the shell and having a substantially plane bearing face adapted to bear against the outer face of the cutter blade and effective to move the cutter blade inwardly into cutting relation with the pipe upon longitudinal movement of the shell, said shoe being pivotally mounted whereby the shoe will rotate as the angle of the cutter blade is varied.

4. In an outside pipe cutter, a tubular shell having a slot, a cutter anchor mounted for longitudinal movement relative to the shell, a cutter in the slot and mounted to rotate on the anchor a cutter guide in the slot having a substantially flat face in contact with the outer side of the cutter and mounted to pivot to maintain said contact approximately throughout the cutter movement.

5. In an outside pipe cutter, a tubular shell having a slot, a cutter anchor mounted for longitudinal movement relative to the shell, a cutter in the slot and mounted to rotate on the anchor, a cutter guide in the slot whose surface conforms in shape to and is in contact with the outer side of the cutter and mounted to pivot to maintain said contact approximately throughout the cutter movement.

6. In an outside pipe cutter, a tubular shell, a cutter mounted in the shell, a cutter anchor mounted for longitudinal movement relative to the shell and effective upon said movement to actuate the cutter into cutting position, grappling means in the shell engageable with a pipe to be cut and arranged to hold said anchor against longitudinal movement relative to the pipe being cut during cutting operation including a pivotally mounted jaw whose free end is formed to grip the smooth surface of a pipe and yieldable means urging the jaw in contact with said pipe.

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