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KNIFE FOR USE IN WELLS

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By

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This invention relates to a knife for use in oil wells or the like and more particularly to a wire line knife adapted to be used to cut a drilling line in a well.

An object of this invention is to provide a wire line cutter adapted to be lowered into a well with facility and including means for initially compressing the line at the place where it is to be cut prior to the actual cutting operation and thereafter severing the line at this compressed portion.

Another object of the invention resides in the provision of a wire line knife adapted to be lowered in a well and including means whereby it can be frictionally anchored to the well casing in any position to which it is lowered.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawings.

This invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is a fragmentary sectional view partly in elevation taken through a well casing and showing my novel wire cutter, as well as the means for lowering the same in the well.

Figure 2 is an enlarged fragmentary sectional view taken through my novel cutter and illustrating the arrangement of the cutter blades therein.

Figure 3 is a sectional view taken on substantially the line III—III of Figure 2 and showing in detail the frictional means used to hold up the lowermost cutter blade during the lowering of the cutter in the well.

Figure 4 is a horizontal sectional view taken on substantially the line IV—IV of Figure 2 looking downwardly.

Figure 5 is another elevation of my novel cutter when it is in a well casing and illustrates one form of frictional means which may be employed in connection with the cutter to anchor the same to the casing.

Figure 6 is a view of a modification of my invention partly in section illustrating another form of frictional means for anchoring the knife to the well casing wall.

As shown on the drawings:

The knife or cutter of my invention is designated generally in Figure 1 by the reference character 10. It is lowered into a well casing 11 by the means of a sand line 12 connected to the upper end of the knife or cutter by means of a sinker 13 of conventional construction and a jar 14 which may be of the fishing type. Since the sinker 13 and the jars 14 are of conventional construction, it is not believed to be necessary to describe in detail these constructions.

The knife or cutter 10 comprises a body 15 provided with an eccentric portion 16 to which the sand line 12 is connected and a pair of spaced lateral ears 17—17. This knife body is slid downwardly over the wire or drilling line 18 to be cut; the line extending between the two spaced ears 17—17.

Connected to the lower portions of the ears 17—17 are a pair of parallel pins 19 and 20 upon which cutter blades 21 and 22 are pivotally mounted. The upper blade 21 may be referred to as the shorter or wedging blade and the lower blade 22 may be referred to as the longer and cutting blade. That is to say it is the lower blade 22 which actually completes the cutting of the line 18. The upper blade 21 has a beveled edge 28 designed for wedging engagement with the portion of the line at the place the line is to be cut and the lower blade 22 is provided with a chisel-like point or edge 24 for effecting the cutting of the line at the place the line is compressed or wedged by the shorter blade 21.

The upper or shorter blade 21 is at all times urged into cooperation with the lower blade 22 through the means of a spring 25 the lower end of which abuts the upper edge of the blade 21 and the upper end of which encircles a stud 26 secured to a block 27 which is in turn anchored to the ears 17—17 of the knife body 15.

The lower or longer blade 22 is designed to be frictionally engaged by a ball 28 disposed in an opening 29 in one of the ears 17. The outer end of the opening is provided with a closure plug 30. Positioned between
the ball 28 and the closure plug 30 is a spring 31 which at all times functions to urge the ball 28 into frictional engagement with a side of the cutter blade 22. This ball serves to hold up the cutter blades 22 and 21 during the lowering of the knife or cutter in the well casing 11.

The knife body 10 is provided with frictional plates 35—35 for frictionally anchoring the knife to the well casing. Each of these plates 35 has its ends loosely connected to one of the ears 17 of the body by means of bolts 36. In other words, each plate 35 is loosely mounted on the shanks of the bolts 36—36. The plates 35 are each urged outwardly by springs 37—37 positioned between the associated ears 17 of the body and an offset portion 38 of the plate. It will be noted from Figure 4 that the offset portion 38 is curved so as to conform with the inner surface of the well casing 11. Each of the springs 37 is mounted in a recess 39 formed in the associated ear 17.

From Figure 5 it will be evident that the plates 35—35 are urged in opposite directions by the springs 37 into engagement with the inner surface of the casing 11. These plates function to all times frictionally anchor the knife body to the well casing. In other words, as the knife is raised in the well casing, it is prevented from falling back to its starting position by these frictional elements or plates 35 which anchor the body to the inner surface of the casing.

In Figure 6 I have illustrated an alternative form of frictional means for anchoring the knife body 15' to the well casing 11'. In this modification of my invention the plates 35' do not require springs since they are themselves inherently resilient. Only one end of each of these plates 35' is anchored to an ear 17' of the body 15'. These plates 35' engage the inner surface of the casing 11 in the same manner as the plates 35 and perform the same purpose as these latter plates.

The operation of my novel cutter or knife is briefly as follows. The cutter or knife 10 is mounted on the drilling line 18 to be cut and is thereafter lowered in the well casing 11 to the place in which the line 18 is to be cut. Thereafter the jars 14 are operated by the sand line 12 connected to the knife or cutter 10.

The upward jerk exerted upon the knife or cutter by the jars 14 causes the beveled edge 23 of the upper cutter blade 21 to be wedged into engagement with the portion of the line 18 to be cut, thus compressing said portion. At the same time that this compressing action is taking place, the cutter blade 21 wedges or forces the lower knife blade 22 into cooperation with the line 18 until the chisel edge 24 of this lower blade becomes effective to complete the cutting of the line at the compressed portion. In other words, the upper blade 21 will wedge the lower blade downwardly until it reaches the dotted position shown in Figure 2 at which time the compressed portion of the wire line 18 will have been completely severed by the latter blade.

Attention is directed to the fact that the knife is prevented from falling in the well casing during the upward or return stroke of the jars 14 through the action of the frictional plates 35 engaging the inner surface of the well casing 11. This is a desirable feature for the reason that it enables the blades to be held in the wedge position to which they are forced or jarred until the next jarring action becomes effective to urge them into still tighter engagement with the line 18.

Now I desire it understood that although I have illustrated and described in detail the preferred embodiment of my invention, the invention is not to be thus limited, but only in so far as defined by the scope and spirit of the appended claims.

I claim as my invention:

1. In combination in a wire line cutter a body designed to be lowered in a well and to have the wire line extend therethrough, a cutter blade associated with said body in such a way as to be inactive during the lowering of the cutter in the well, said blade being arranged to be wedged into cutting engagement with a portion of the line at the place the line is to be cut upon the cutter being pulled upwardly in the well and a second cutter blade positioned above said first cutter blade for contemporaneously wedging the line and urging the first blade into cutting engagement with said portion of the line.

2. In combination in a wire line cutter a body designed to be lowered in a well and to have the wire line extend therethrough, a cutter blade pivotally attached to said body in such a way as to be inactive during the lowering of the cutter in the well, said blade being arranged to be wedged into cutting engagement with a portion of the line at the place the line is to be cut upon the cutter being pulled upwardly in the well and a second cutter blade for contemporaneously wedging the line and urging the first blade into cutting engagement with said portion of the line, said second blade being pivotally connected to the body above said first blade.

3. In combination in a wire line cutter a body designed to be lowered in a well and to have the wire line extend therethrough, a cutter blade associated with said body in such a way as to be inactive during the lowering of the cutter in the well, said blade being arranged to be wedged into cutting engagement with a portion of the line at the place the line is to be cut upon the cutter being pulled upwardly in the well, and frictional means arranged to engage said cutter blade for holding up said cutter blade during the
lowering operation and arranged to become ineffective upon the bringing of said cutter blade into cutting engagement with said portion of the line.

4. In combination in a wire line cutter a body designed to be lowered in a well and to have the wire line extend therethrough, a cutter bladepivotally attached to said body in such a way as to be inactive during the lowering of the cutter in the well, said blade being arranged to be wedged into cutting engagement with a portion of the line at the place the line is to be cut upon the cutter being pulled upwardly in the well and frictional means for holding up said cutter blade during the lowering operation and arranged to become ineffective upon the bringing of said cutter blade into cutting engagement with said line, said frictional means comprising an element mounted in the body and resiliently urged outwardly into engagement with the cutter blade.

5. In combination in a wire line cutter a body designed to be lowered in a well and to have the wire line extend therethrough, a cutter blade pivotally attached to said body in such a way as to be inactive during the lowering of the cutter in the well, said blade being arranged to be wedged into cutting engagement with a portion of the line at the place the line is to be cut upon the cutter being pulled upwardly in the well, a second cutter blade contacting with said first blade for contemporaneously wedging the line and urging the first blade into cutting engagement with said portion of the line, and means resiliently urging said second blade in engagement with said first blade.

6. In combination in a wire line cutter adapted to be lowered in a well casing, a body formed to have the line to be cut extend therethrough, a cutter blade connected to said body and means pivotally mounted above and engaging with said blade for compressing a portion of the line at the place the line is to be cut and for wedging said cutter blade into cutting engagement with said compressed portion.

7. In combination in a wire line cutter adapted to be lowered in a well casing, a body formed to have the line to be cut extend therethrough, a cutter blade connected to said body and means pivotally mounted above said blade for engagement with said blade for compressing a portion of the line at the place the line is to be cut and for wedging said cutter blade into cutting engagement with said compressed portion, said means comprising an element pivotally connected to the body above said blade and resiliently urged into engagement with the blade.

8. In combination in a wire line cutter adapted to be lowered in a well casing, means for initially compressing a portion of the line to be cut and a knife for thereafter cutting said line at said compressed portion, said means being positioned above said knife and being arranged to engage said knife and line upon an upward pull being exerted on the cutter.

9. In combination, in a cable cutter adapted to be lowered in a well casing, a blade for compressing a portion of the cable to be cut, and a second blade for cutting the cable at the compressed portion, said first blade being mounted above said second blade and arranged to be pressed into frictional engagement with said second blade for causing the latter blade to cut the cable.

10. In combination, in a cable cutter adapted to be lowered in a well casing, a body formed to have a cable to be cut extend therethrough, and a plurality of blades connected to said body, one of said blades being mounted above said other blade and arranged to compress a portion of the cable, said first blade also engaging said latter blade to wedge said latter blade against the cable to cut the latter at the compressed portion thereof.

11. In combination, in a cable cutter adapted to be lowered in a well casing, a body formed to have a cable to be cut extend therethrough, a cutter blade connected to said body, and a second blade engaging with said cutter blade for contemporaneously compressing a portion of the cable to be cut and for wedging said cutter blade into cutting engagement with said compressed portion.

12. In combination, in a cable cutter adapted to be lowered in a well casing, a body formed to have the cable to be cut extend therethrough, means connected to said body for compressing and cutting said cable, said means comprising a plurality of blades pivotally mounted one above the other in said body, said blades being arranged for engagement with each other to cut the cable, and means on said body outwardly movable for frictionally engaging the well casing at the place where the cable is to be cut.

13. In combination, in a cable cutter adapted to be lowered in a well casing, a body formed to have the cable to be cut extend therethrough, a cutting blade connected to said body for cutting said cable, and a second blade pivotally mounted above and frictionally engaging with said first cutting blade and arranged in such a manner as to contemporaneously compress a portion of said cable and to wedge said first cutting blade against the compressed portion of the cable to cut the same.

14. In combination, in a line cutter adapted to be lowered into a well casing, a body formed to have a line to be cut extending therethrough, a plurality of blades pivotally connected to said body and positioned on one side of the line, said blades being mounted one above the other so that the upper of said
blades will engage a portion of one side of
the line for compressing the same and for
contemporaneously contacting with the lower
blade for aiding said lower blade to cut the
line.

In testimony whereof I have hereunto sub-
scribed my name at Tulsa, Tulsa County,
Oklahoma.

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