

Jan. 30, 1940.

E. K. LANE

2,188,409

WIRE LINE PIPE CUTTER

Filed Feb. 18, 1937

2 Sheets-Sheet 1

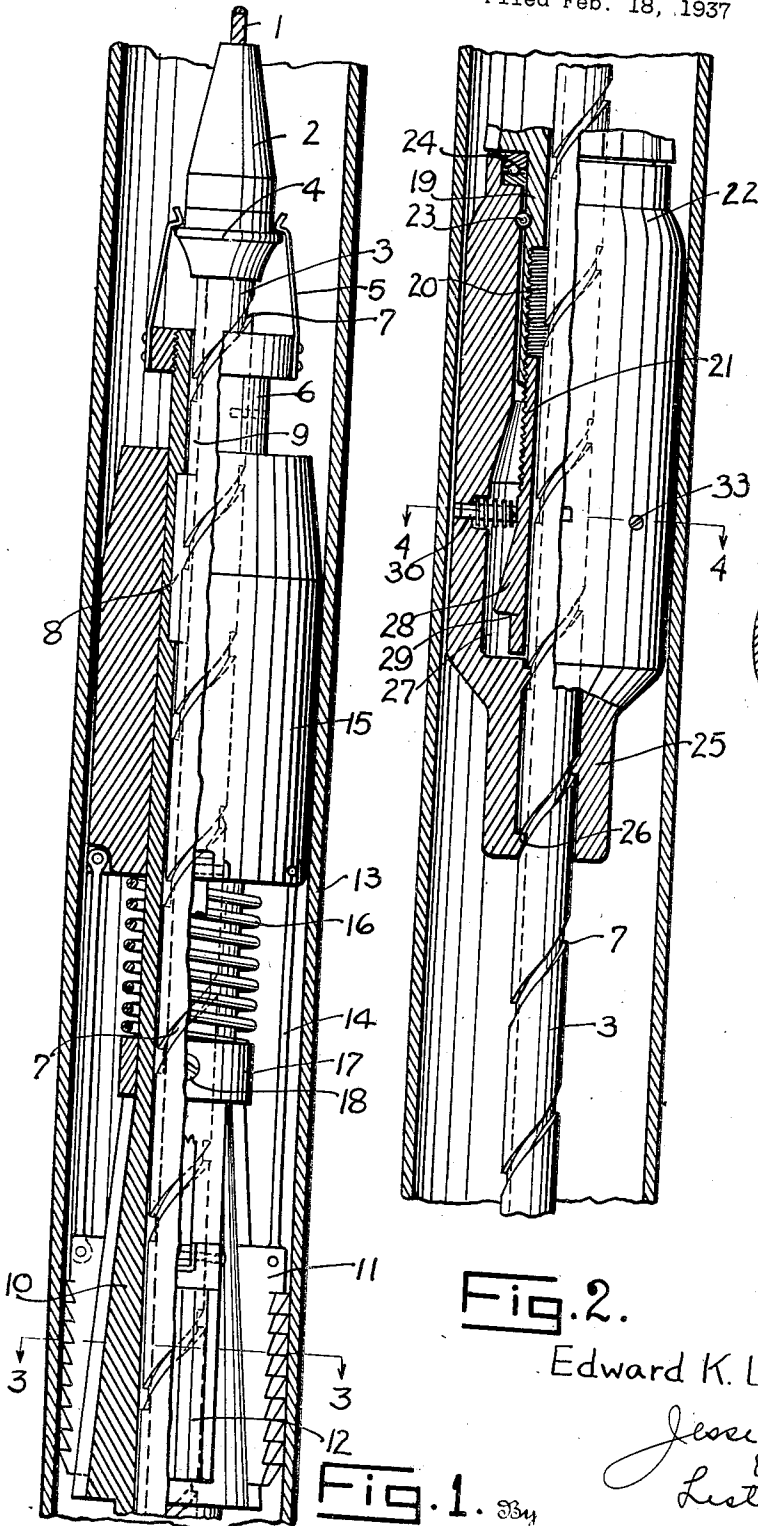


Fig. 2.

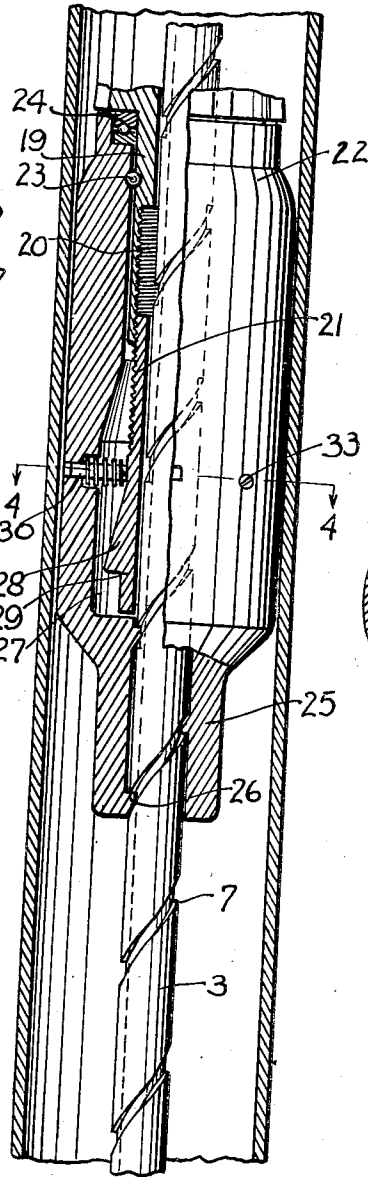
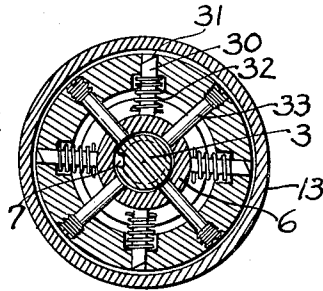
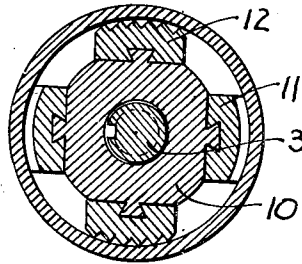


Fig. 4.



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2 Sheets-Sheet 2

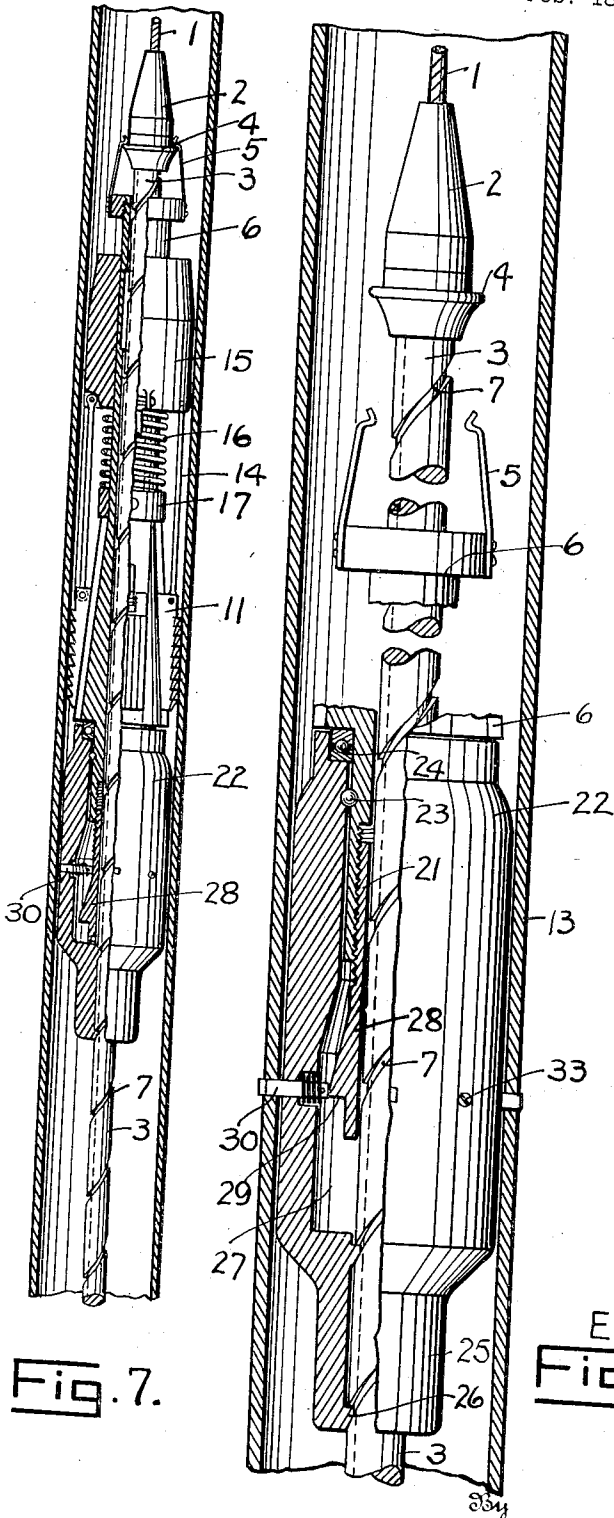


Fig. 7.

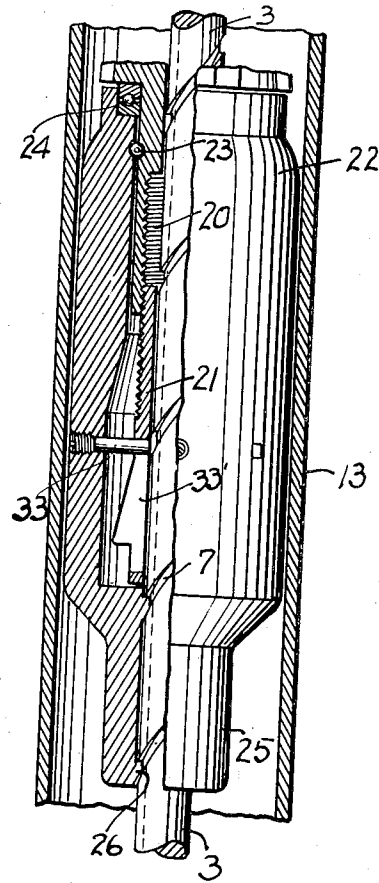


Fig. 6.

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UNITED STATES PATENT OFFICE

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WIRE LINE PIPE CUTTER

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4 Claims. (Cl. 164-0.7)

My invention relates to pipe cutters adapted for cutting pipe in wells. It pertains more particularly to inside pipe cutters wherein the cutter is lowered downwardly within the pipe to be cut off.

Pipe cutters of the general character of that which forms the subject matter of this invention are more or less common but almost without exception they are mounted upon a string of pipe which has to be lowered into and again removed from the well with a large consumption of time in so doing.

It is an object of the invention to provide a pipe cutter which may be lowered into the well on a wire cable and to be then actuated to sever the pipe and withdraw the pipe from the well.

I aim to provide a pipe cutter which is of simple construction and which may be positively operated in the well to engage and cut the pipe at any desired level.

It is also an object of the invention to provide means for holding the device in inoperative position until it reaches the point in the well where it is to be operated.

The invention also resides in the particular construction and arrangement of the parts making up the device and these will be better understood from the description which follows.

In the drawings,

Figs. 1 and 2 are side views, partly in section, and shown within a well casing, Fig. 1 illustrating the upper portion of the device and Fig. 2 representing the lower end thereof.

Fig. 3 is a transverse section on the plane 3-3 of Fig. 1.

Fig. 4 is a similar transverse section on the plane 4-4 of Fig. 2.

Fig. 5 is a broken side view partly in section and partly in elevation showing the cutter head with the cutters advanced.

Fig. 6 is a similar view with the parts in retracted position.

Fig. 7 is an assembly view showing the device in the well and illustrating the structure partly in section and partly in elevation.

With reference particularly to Fig. 7 it will be seen that my device is adapted to be lowered in the well at the end of a cable 1. Said cable is secured at its lower end to a head 2 of an operating shaft 3. The head 2 is cylindrical adjacent its lower end and has a radially extending shoulder 4 over which may be engaged the spring arms 5 of the anchor sleeve 6.

This construction is shown somewhat enlarged in Fig. 1 and it will be seen that the spring arms 5 have their upper ends inclined inwardly and hooked so as to engage over the shoulder 4, thus holding the anchor sleeve 6 in raised position along the shaft. The shaft 3 extends downwardly

in an axial position relative to the assembled device and extends through the entire construction for a suitable distance below the same. It is formed with a coarse spiral groove or thread 7, the purpose of which is to rotate the cutter head when the shaft is moved upwardly.

The anchor sleeve 6 is slidable longitudinally of the shaft but is held from rotation thereon by means of a key 8, which, as shown in Fig. 1, extends inwardly from the sleeve and engages within a longitudinal groove or keyway 9 in the shaft. The sleeve is thus slidable but non-rotatable on the shaft. The lower end of the anchor sleeve has an upwardly tapered expanding head 10 thereon. As will be seen from Fig. 3, this head 10 is provided with opposite flattened surfaces upon which the cutter dogs 11 and 12 may engage. There is a dovetailed connection between the expander head and the jaws 11 and 12 so that the jaws will be held firmly against the side of the head as they are moved longitudinally thereon.

The jaws 11 are formed with teeth thereon which are arranged transversely and, as will be seen in Fig. 1, said teeth are inclined upwardly so as to resist an upward pull on the device when it is anchored. The jaws 12 on the other hand are formed with longitudinal teeth which engage the pipe 13, which is to be cut, and resist rotation of the anchor.

The said jaws are suspended on links or arms 14 which depend from an upper weight block 15. Said block is slidable along the anchor sleeve and tends to push the jaws downwardly into pipe-engaging position. This downward movement of the jaws is resisted by a spiral spring member 16, which is supported at its lower end upon a collar 17 fixed by means of the screw 18 upon the anchor sleeve. This supporting spring 16 is comparatively strong and ordinarily holds the weight block and the dogs upwardly away from expanded position upon the head 10.

The lower end of the anchor sleeve is extended down below the expander head and is reduced in diameter, as shown at 19 in Fig. 2. This downward extension on the sleeve is formed at its extremity with an internal threaded socket 20 within which the cutter expanding mandrel 21 is screwed. This downward extension upon the anchor sleeve provides a swivel attachment with said sleeve of a relatively rotatable cutter head 22. The connection of the cutter head with the anchor sleeve is formed by a row of balls 23 which forms an anti-friction raceway between the head and the sleeve and also prevents relative longitudinal movement of the cutter head upon the sleeve. Between the upper end of the cutter head and the shoulder on the sleeve is an anti-friction bearing 24 which takes up the thrust between the head and the sleeve.

The cutter head has a lower nipple or projection 25 thereon which engages closely against the shaft and has an inwardly extending thread 26 thereon engaging with the groove or thread 7 upon the shaft. It will thus be seen that when the shaft is drawn upwardly relative to the rotatable head 22 the head will be caused to rotate.

The cutter head is formed with an inner chamber 27 within which is housed the mandrel 21 and the upwardly tapered expanding member thereon. Below the expanding member the outer diameter of the mandrel is reduced to form a shoulder 29 below which the mandrel is cylindrical. The upwardly tapered portion of the mandrel forms an expanding means which tends to engage with cutters 30 and move them outwardly as the mandrel is moved relatively upwardly.

The cutters 30 are shown in Figs. 2 and 4 and it will be seen that I have employed four such cutters. Each cutter is approximately rectangular in cross section and its outer end is formed into a cutting point 31. The inner end of the cutter pin engages against the mandrel 28. There is a spring 32 surrounding each cutter and tending to move the cutter inwardly and hold it firmly against the outer surface of the mandrel.

The cutter head is fixed against rotation relative to the mandrel 28 by means of radial connecting pins 33, said pins being screwed through the outer wall of the cutter head and radially into the slot 33' in the mandrel. They serve to connect the two members together so that as the head is rotated the mandrel will be also rotated in a direction to screw the mandrel upwardly within the socket 20 in the anchor sleeve. This movement of the mandrel will obviously advance the cutters until the pipe has been severed and the further movement of the mandrel will allow the spring 32 upon the cutter to force the cutter back below the shoulder 29 on the mandrel.

In the use of my device the parts are assembled in the position shown in Figs. 1, 2 and 7, and are lowered downwardly to the desired level where the pipe is to be cut. To set the anchor and fix the anchor sleeve firmly in position an upward jerk on the cable will tend to move the anchor sleeve upwardly and advance the anchor jaws 11 and 12 so as to firmly engage the casing. An upward tension on the cable thereafter will hold the device firmly fixed in position. The upward jerk on the cable also releases the spring arms 5 at the upper end of the anchor sleeve so that the shaft may be moved upwardly relative to the anchor.

The upward movement of the shaft through the anchor device will impart a rotative movement to the cutter head. This rotative movement carries the cutters around in contact with the inner surface of the pipe to cut the same. The rotation of the cutter head also screws the mandrel 28 upwardly into the threaded socket 20 and the engagement of the tapered surface of the mandrel with the inner ends of the cutter pins will force the cutters gradually outward until the pipe has been severed. The lower extension upon the operating shaft will be regulated to impart to the cutter head the desired number of rotations to assure that the pipe is severed before the shaft is moved upwardly through the device beyond a certain point. An enlargement upon the lower end of the shaft may be formed to limit the upward movement of the shaft in

the cutter block and furnish a support therefor so that after the pipe has been severed it may be withdrawn upwardly with the device from the well.

The advantage of my construction lies in the speed with which the cuts may be made and the sections of pipe withdrawn from the well. It will be obvious that the cutter assembly may be lowered in a very short time to the level where the cut is to be made and the device may be then quickly operated to cut the pipe and by continued upward pull on the cable the pipe may be removed.

It is therefore expeditious in its operation and simple in construction.

What is claimed as new is:

1. A cutter for pipe in wells, including a shaft adapted to be supported by a cable, an anchor sleeve slidable but nonrotatable on said shaft, means responsive to an upward jerk on said shaft to anchor said sleeve in the pipe to be cut, a cutter head rotatably supported on said anchor sleeve, a coarse spiral groove in said shaft, means on said head interfitting in said groove to impart rotative movement to said head as said shaft is moved longitudinally relative to said head, cutters movable outwardly in said head, an upwardly tapered mandrel in said head engaging said cutters to move them, and means operable by the rotation of said head to move said mandrel upwardly.

2. A cutter for pipe in wells, including a shaft adapted to be supported by a cable, an anchor sleeve slidable but nonrotatable on said shaft, means responsive to an upward jerk on said shaft to anchor said sleeve in the pipe to be cut, a cutter head rotatably supported by said anchor sleeve, a coarse spiral groove in said shaft, means on said head interfitting in said groove to impart rotative movement to said head as said shaft is moved longitudinally relative to said head, cutters movable outwardly in said head, an upwardly tapered mandrel in said head engaging said cutters to move them, a threaded connection of said mandrel with said sleeve, and means on said head connecting with said mandrel to screw it upwardly in said sleeve as said head is rotated and thus advance said cutters.

3. A wire line pipe cutter for wells, including a cable, a threaded shaft thereon, an anchor sleeve mounted slidably but nonrotatably on said shaft, means actuated by a jerk on said cable and said sleeve to fix said sleeve against upward movement in the pipe to be cut, a downward extension on said sleeve, a cutter head, a swivel connection for said head on said sleeve, said head being screwed upon said shaft, cutters housed in said head, and means in said head engaging said sleeve to move said cutters outwardly to cut said pipe as said shaft is moved upwardly in said head to rotate the same.

4. A wire line pipe cutter for wells, including a cable, a threaded shaft thereon, an anchor sleeve mounted slidably but nonrotatably on said shaft, means actuated by a jerk on said cable and said sleeve to fix said sleeve against upward movement in the pipe to be cut, a cutter head rotatably supported on said sleeve, said head being screwed upon said shaft, cutters housed in said head, a tapered mandrel threaded to said sleeve and engaging said cutters and means to move said mandrel upwardly to advance said cutters.

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