July 12, 1932. F. J. SPANG 1,867,033

ROPE KNIFE

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Fig. 1.

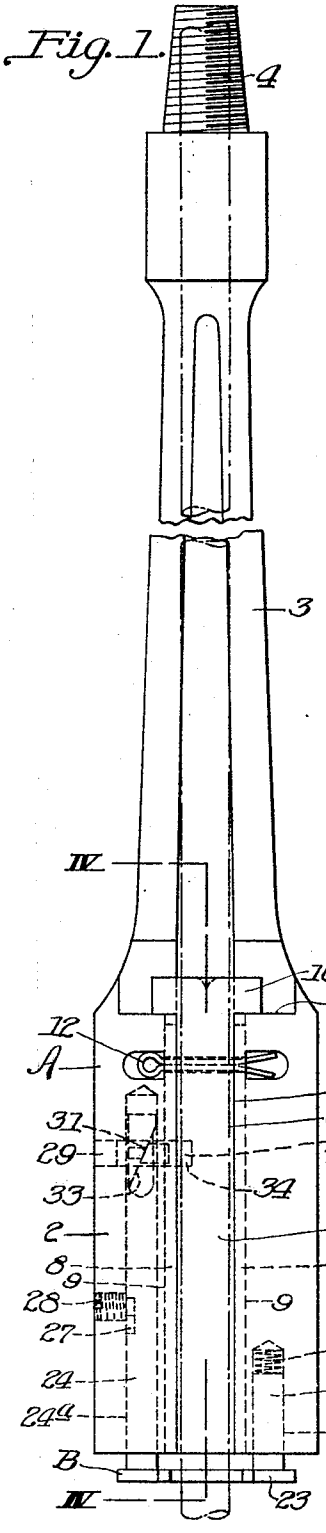


Fig. 2.

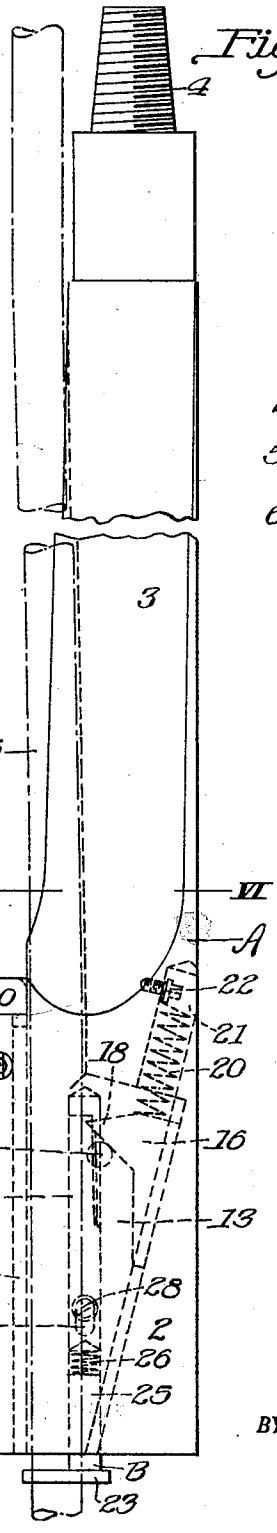
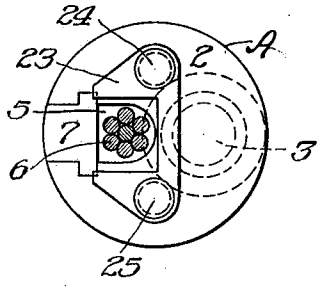


Fig. 3.



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Fig. 4.

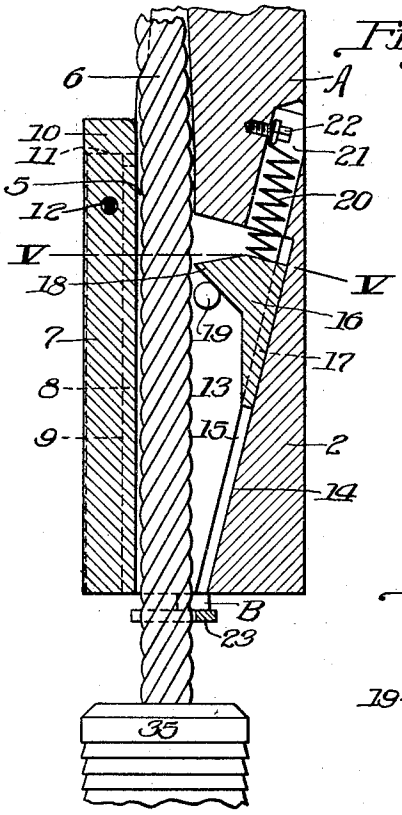


Fig. 6.

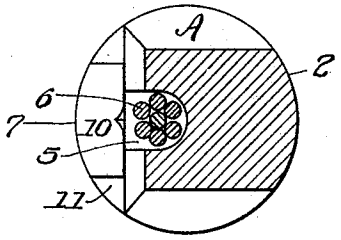


Fig. 8.

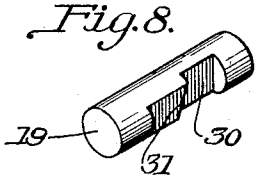
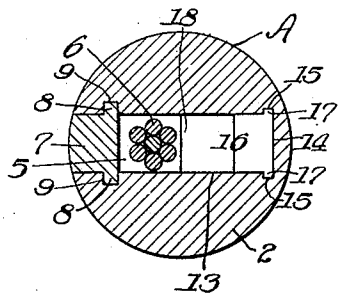


Fig. 7.

Fig. 5.



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UNITED STATES PATENT OFFICE

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ROPE KNIFE

Application filed February 3, 1931. Serial No. 513,139.

My invention relates to rope knives of the character employed in connection with well drilling apparatus, as for example, when severing the cable or rope from a string of tools stuck in an oil or gas well prior to withdrawal thereof by means of a fishing tool.

The present improvement is particularly directed to an up-cutting rope knife wherein the cutting motion is provided by repeated upward strokes or jars of the knife, whereby the cutter is forced through the rope to be cut, although it is to be understood that my invention is not limited thereto.

An object of this invention is to provide a knife body having a cutter operably disposed therein, a rope-receiving slot or opening in the body, and a removable key or closure member therefor, said key or closure member constituting an anvil for the cutter.

A further object is to provide means for normally retaining the cutter out of engagement with the rope and guided trip means for releasing said cutter for engagement with the rope.

Additional objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a front elevation of a rope knife embodying my invention;

Fig. 2, a side elevation thereof;

Fig. 3, a bottom plan view;

Fig. 4, a longitudinal sectional view taken on the line IV—IV of Fig. 1;

Fig. 5, a cross section on the line V—V of Fig. 4;

Fig. 6, a cross section on the line VI—VI of Fig. 2;

Fig. 7, an enlarged perspective view of the trip and its guide; and

Fig. 8, a perspective view of the trip pin.

Referring to the drawings, A designates generally the knife body, preferably formed of bit steel and having an especially hardened lower portion or cylindrical body 2. As illustrated and as preferred, the body A, in addition to the cylindrical portion 2, includes an upwardly extending tapered shank or stem 3 and a taper-threaded portion 4 adapted to be coupled with means for lowering the knife into the well.

The cylindrical body 2 is formed with a longitudinally extending rope-receiving opening or slot 5, adapted to receive the rope or cable 6, said rope being retained therein by means of a slidably mounted removable key or closure member and/or cable anvil 7. Member 7 is provided with longitudinally extending tongues 8, adapted to be entered and slidable in corresponding grooves 9 formed in the walls of the slot or opening 5; and is also formed with a T-shaped head portion 10 for engagement with an upper face or shoulder 11 of the body 2. A transverse cotter pin or bolt 12 is passed through an opening in member 7 and through the walls of the body 2 to retain member 7 in place. Member 7 is made of hardened steel, and cooperates with the cutting blade in the operation of severing the rope, as more fully hereinafter referred to.

Disposed rearwardly of the opening or slot 5, and in alinement therewith, is an irregularly shaped chamber or T-shaped recess 13 designed to receive the cutter and parts of coacting mechanism. This chamber has a rear wall 14 inclined downwardly and forwardly, and has longitudinal grooves 15 formed adjacent said rear wall 14. A rope cutter or knife blade 16 is positioned on and movable with respect to the said inclined wall 14 and is retained thereon by means of longitudinal tongues 17 at the rear edges of the cutter, entered into said grooves. The cutter 16 is provided with a forwardly extending sharpened cutting edge portion 18, normally maintained out of engagement with the rope 6 by means of a transverse trip pin 19, and against the action of a spring 20, said spring being secured in a suitable recess 21 above the chamber 13 by means of a screw 22.

Thus, it will be seen that when the knife is assembled in this manner about the rope or cable 6, upon effecting a release of the cutter 16, repeated upward strokes or jars of the knife body A will force the said cutter through the rope, due to the action of the inclined wall 14 thereon. It is to be noted that this cutting action takes place against

the closure member 7, and that said member functions as an anvil for the cutter, and provides a solid cutting surface for the latter. Since the member 7 is removable, it may be readily renewed when it becomes damaged through use.

For the purpose of releasing the cutter 16, I provide trip-means, generally designated B. These means are associated with and cooperate with the trip pin 19. The trip mechanism as shown comprises a bifurcated trip or contact plate 23 disposed below the body 2 and normally spaced therefrom.

Secured to the plate 23 in any suitable manner, and extending upwardly therefrom in spaced relationship, are a combined trip and guide rod 24 and a guide rod 25, said rods being respectively slidable in openings 24*a* and 25*a* formed in the body 2. A spring 26 disposed in the guide rod opening 25*a* contacts with the said rod to normally maintain the trip plate 23 spaced from the body. The movement of the trip mechanism is limited by means of a vertical slot 27 in the trip rod 24 and a pin or bolt 28 in the body 2, having an end thereof entered in the slot. The bolt 28 also functions to prevent the trip dropping free of the knife.

The trip pin 19 is disposed in a transverse opening 29, formed in the body 2, and extends at right angles to and intersects with the trip rod opening 24*a*. Said trip pin is cut away at 30, and is formed with an inclined shoulder or abutment 31. The upper end of the trip rod 24 is also cut away, as at 32, to form a similarly inclined shoulder or wedge portion 33, the latter being adapted to be entered into the cut-away portion 30 of the trip pin 19, in the manner shown in Fig. 1. When the trip plate 23 is in the lowered position as shown, only the point of the wedge portion 33 will be entered into the trip pin portion 30, thereby permitting the pin to project inwardly, as at 34, to engage the cutter 16 and retain it in its retracted position.

However, when the knife is lowered on the rope 6, the trip plate 23 will engage the rope socket or upper portion 35 of the string of tools to which said rope is attached, and a continued downward motion of the knife will cause the wedge portion 33 of rod 24 to be moved upwardly in contact with the inclined abutment 31 on the trip pin to retract the same into its opening 29, thereby permitting the cutter 16 to fall into engagement with the rope and, upon repeated upward strokes of the knife, be forced through said rope.

It will be noted that the trip mechanism is inserted in the body parallel to the axis of the tool and is of substantial size, and that a guide, in addition to the trip rod, may be employed, thus providing considerable support for the tripping face. The direction of movement is such that no binding occurs and the spring 26 functions to insure the positioning of the tripping rod to receive the knife lock 19 without preparation of the operator.

I claim:

1. In a rope knife, a single circular body having a rope-receiving slot therein, a cutter movable in the body, a slidably removable closure member for the rope-receiving slot, said closure member constituting an anvil for the cutter, trip means for the cutter, said means including a transversely movable trip pin normally engaging the cutter, a trip rod disposed and movable parallel to the axis of the body for retracting the trip pin, a trip plate, and a guide rod for the trip plate movable parallel to the axis of the body.

2. In a rope knife, a body having rope-receiving and retaining means therein, a cutter movable in the body, a transversely movable trip pin normally engaging the cutter, a trip rod disposed and movable parallel to the axis of the body for retracting the trip pin, a trip plate, and a guide rod for the trip plate movable parallel to the axis of the body.

3. In a rope knife, a body having rope-receiving and retaining means thereon, a cutter movable in the body, a transversely movable trip pin normally engaging the cutter, a trip plate having a guide rod, a trip rod disposed and movable parallel to the axis of the body, an inclined abutment on the trip pin, and a wedge portion on the trip rod engaging the said abutment for retracting the trip pin.

4. In a rope knife, a cylindrical slotted body having longitudinally extending grooves therein, a cutter movable in the body, a closure member removably positioned in the body and having projecting portions thereon for engaging said grooves, a head portion on said member for engaging a shoulder on the body, means for locking the closure member in the body, means for retaining the cutter in retracted position, and trip means for releasing the cutter including a trip rod disposed and movable parallel to the axis of the body, a trip plate, and a spring-pressed guide rod movable parallel to the axis of the body.

5. In a rope knife, a cylindrical body having a vertically extending rope-receiving slot therein, a closure member for the slot, a cutter movable in the body, a trip pin normally engaging the cutter, a vertically movable trip rod disposed and movable parallel to the axis of the body for retracting the trip pin, a trip plate, a vertically movable guide rod for the trip plate, and a spring for the guide rod movable parallel to the axis of the body.

In testimony whereof I affix my signature.

FERDINAND J. SPANG.