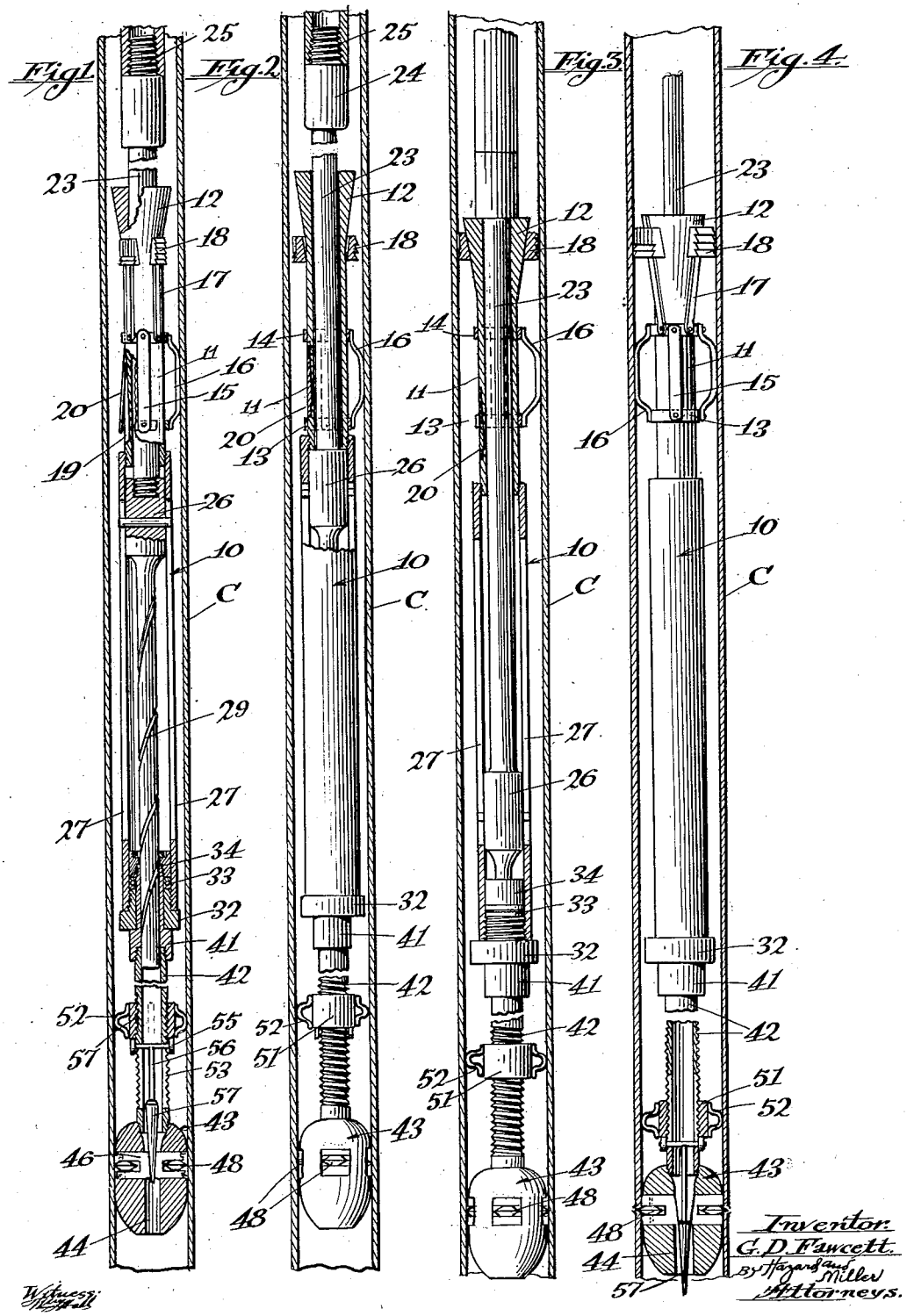
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G. D. FAWCETT

CASING CUTTER

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G. D. FAWCETT

CASING CUTTER

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Fig. 5.

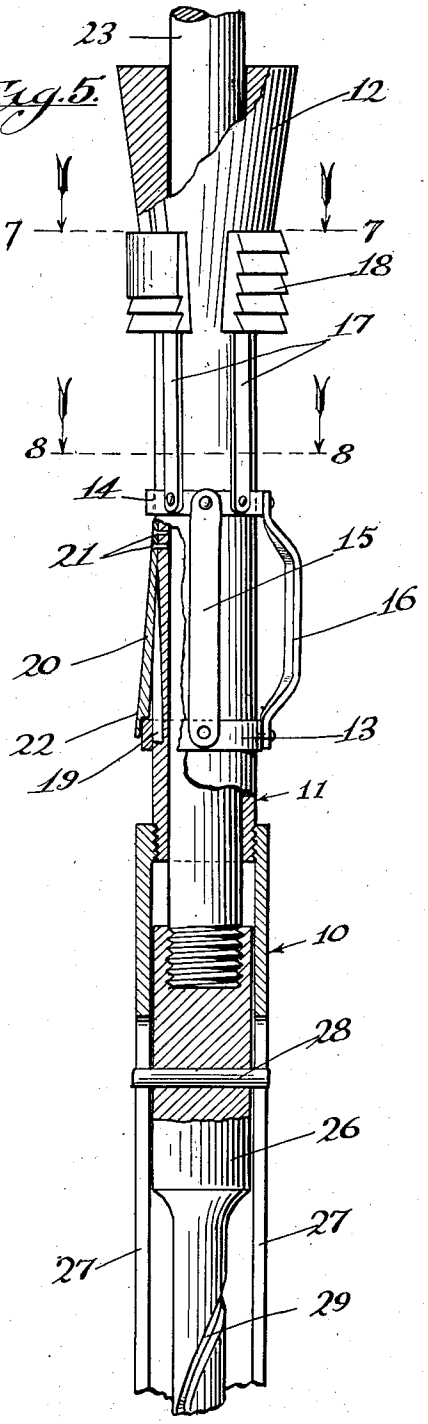


Fig. 7.

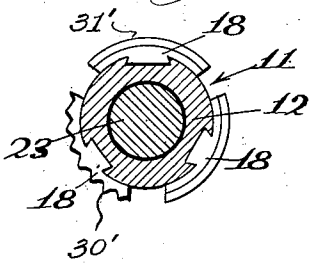


Fig. 8.

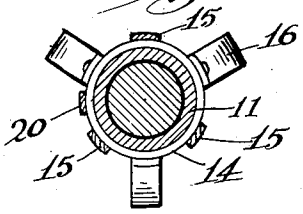
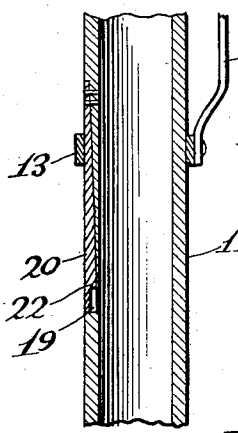


Fig. 9.



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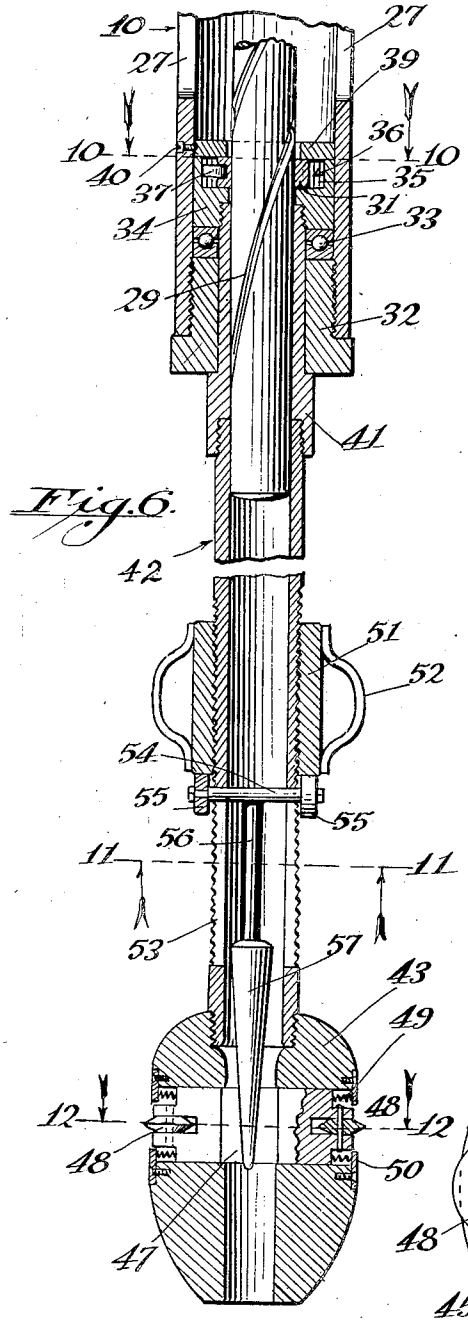
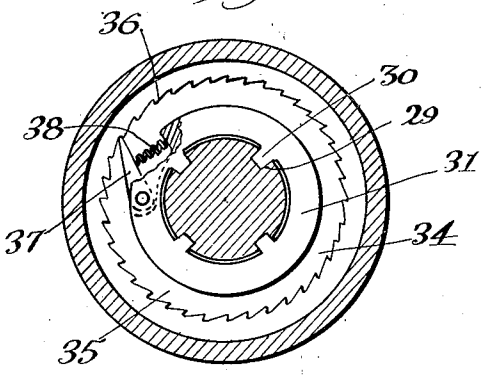


Fig. 6.

Fig. 10.



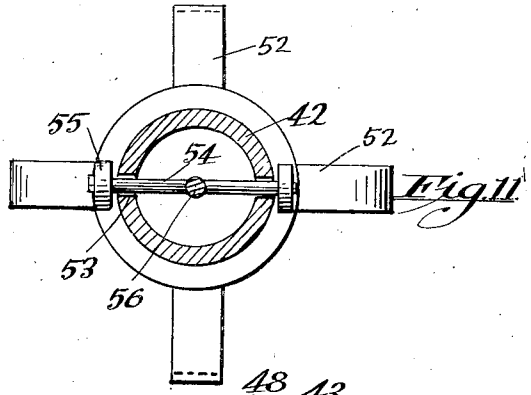


Fig. 11

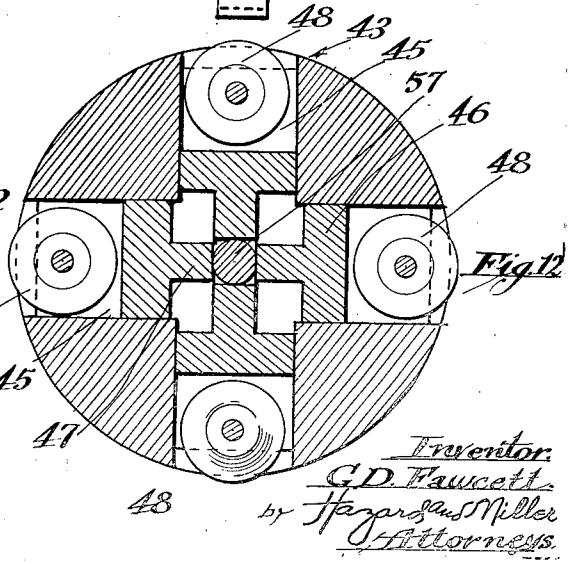


Fig. 12

Witness:

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UNITED STATES PATENT OFFICE.

GERALD D. FAWCETT, OF WHITTIER, CALIFORNIA.

CASING CUTTER.

Application filed October 5, 1925. Serial No. 60,669.

This invention relates to improvements in devices for cutting off well casing and other well pipe which is located in a well.

An object of the invention is to provide an improved casing cutter which may be used and operated by means of a cable, as distinguished from tools which are used and operated by rotary drill pipe.

Another object of the invention is to provide a casing cutter which may be lowered into a well by means of a cable, set in position in the casing or other well pipe by the cable and operated upon reciprocation of the cable to cut off the pipe or casing.

With the foregoing and other objects in view which will be made manifest in the following detained description and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Figure 1 is a vertical section through a casing and through the improved casing cutter therein, illustrating the position of the tool upon being lowered into the well,

Fig. 2 is a view similar to Fig. 1 illustrating the position which the tool assumes preparatory to becoming set,

Fig. 3 is a view similar to Fig. 1 illustrating the tool in set position,

Fig. 4 is a view similar to Fig. 1 illustrating the position of the tool after the cutters have been completely expanded and the casing cut,

Fig. 5 is a detail view illustrating the upper portion of the tool,

Fig. 6 is a detail view showing the lower portion of the tool,

Fig. 7 is a horizontal section taken substantially on the line 7—7 of Fig. 5,

Fig. 8 is a horizontal section taken substantially on the line 8—8 of Fig. 5,

Fig. 9 is an enlarged vertical section illustrating the latch in its retracted position,

Fig. 10 is a horizontal section taken on the line 10—10 of Fig. 6,

Fig. 11 is a horizontal section taken on the line 11—11 on Fig. 6 in the direction indicated, and

Fig. 12 is a horizontal section taken on the line 12—12 of Fig. 6.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, the improved casing cutter consists of a barrel preferably formed of two sections of pipe, seamless tubing or the like, one of which is indicated at 10 and the other being indicated at 11. The upper section 11 is smaller in diameter than the lower section 10 and is threaded into its upper end. The upper end of the upper section 11 is enlarged, as at 12, and presents a conical or tapered exterior surface. About the upper section 11 there are slidable two rings or bands 13 and 14 which are connected by means of strips 15 and friction springs 16. These friction springs are so arranged as to engage upon the interior surface of the well casing C which is to be cut. Extending upwardly from the upper ring or band 14 are links 17 which are connected to slips 18 fitting about the enlarged portion 12. These slips are provided with horizontal and vertical teeth 30′ and 31′ respectively and when expanded are adapted to engage upon the interior of the well casing C. A groove 19 is formed upon the exterior surface of the upper section 11 and a leaf spring 20 has its upper end rigidly secured within this groove, as indicated by the rivets 21. This leaf spring is so arranged that it normally occupies a position within the groove 19, as indicated in Fig. 9, but it may be sprung outwardly from the groove, as shown in Fig. 5, and has a shoulder 22 formed near its lower end which is engageable upon the lower ring or band 13, so as to prevent upward sliding of the bands 13 and 14 while the tool is being lowered into the well.

A reciprocating member 23 is reciprocable within the barrel and has its upper end enlarged, providing a head 24 and a pin 25, to which one or more sections of drill stems may be connected to provide sufficient weight to operate the cutter and to which sections the operating cable may be connected. Below the lower end of the upper section 11 of the barrel the reciprocating member 23 is enlarged providing a head 26 which fits rather closely within the lower section 10. Slots 27 are formed in the opposite sides of the lower section 10 and receive the ends of a pin 28 passing through the head 26, thus preventing rotation of the reciprocating member 23 within the barrel. Below the head 26 on the reciprocating member there are formed one or more helical grooves 29 which receive keys 30 upon a ring 31 arranged about the reciprocating member (see Fig. 10).

The lower end of the lower section 10 has threaded into it a sub 32 on which rests a

bearing 33 shown as consisting of two races between which balls are arranged. On the upper race of the bearing 33 there is positioned a collar 34 which has an annular recess formed in its upper end as indicated at 35. The sides of the recess 35 are toothed with vertical teeth, as indicated at 36, and the ring 31 is disposed within this recess. A pawl 37 is pivoted to the ring and is urged into that position in which it engages upon the teeth 36 by a coil spring 38, thus providing a ratchet connection between the ring 31 and the collar 34. The ring 31 is maintained within the recess 35 in any suitable manner, such as by a disc 39 held in place within the lower section 10 of the barrel as by one or more screws 40.

A rotating sub 41 fits between the lower end of the reciprocating member 23 and the sub 32, and has its upper end threadedly connected to the collar 34. The lower end of the rotating sub 41 has a hollow stem 42 threaded to it, which stem carries on its lower end the cutter body 43. A bore 44 extends longitudinally or vertically through the cutter body and radial passages 45 communicate with it. In the passages 45 there are arranged cutter blocks 46 carrying inwardly extending fingers or ribs 47 and rotary disc cutters 48. The cutter blocks 46 are slidable in the passages and may be moved outwardly therethrough, thus expanding the cutters. They are urged into their innermost or retracted positions by means of springs 49, which are compressed between the outer faces of the blocks and lugs 50. The hollow stem 42 is externally threaded to receive a collar 51 carrying friction springs 52 engageable upon the interior surface of the well casing C. In the opposite sides of the stem there are formed slots 53 through which extend the ends of a crossbar 54 carrying rollers 55 which engage upon the bottom surface of the collar 51. A rod 56 connects the center of the crossbar 54 to the top of a tapered mandrel 57 movable within the hollow stem 42 and within the bore 44 in the cutter body 43. The tapered mandrel 57 engages the fingers or ribs 47 on the cutter blocks 46, and when the mandrel moves downwardly within the cutter body, it will force the cutter blocks 46 outwardly through the passages 45 against the action of the springs 49 and thus expand the cutters.

The operation of the casing cutter is as follows: The tool is lowered into the well within the casing C in a position as shown in Fig. 1, in which the slips 18 are at the bottom of the enlarged portion 12 on the upper sections 11 and the lower band 13 is held against upward sliding by the leaf spring or latch 20 having its shoulder 22 resting thereon. On lowering the device into the well casing both sets of friction springs 16 and 52 engage the inside of the casing while moving downwardly. The weight of the drill stems secured to the pin 25 is sufficient to cause the complete tool to slide downwardly within the casing, and when it has reached the proper location, the downward movement is arrested by the cable. In such position, after the tool has been brought to rest, the cable is lifted, causing the reciprocating member 23 to slide upwardly within the barrel until the head 26 engages the bottom of the upper section 11. By continuing the upward movement of the reciprocating member 23, the barrel will be caused to slide upwardly a short distance within the bands 13 and 14 which are frictionally held stationary. This movement allows the end of the leaf spring or latch 20 to disengage from the band 13, and the spring will snap into the groove 19 and occupy its retracted position, as shown in Fig. 9. In this manner the latch is disengaged from the band 13 and the barrel is capable of upright sliding downwardly within both of the bands. The cable is then let down, lowering the reciprocating member 23 and the barrel until the slips 18 are expanded by the enlarged portion 12, causing the slips to engage upon the inside of the casing. Because of the vertical as well as horizontal teeth upon the slips, it will be readily appreciated that the barrel will not be able to move downwardly or to be rotated within the casing after the slips have become set, and in this manner the barrel is held stationary within the casing preparatory to the cutting. After the barrel has become set, the reciprocating member 23 is vertically reciprocated within it by means of the cable, and the cutting operations are started. The reciprocation of the reciprocating member 23 produces rotation of the ring 31 because of the helical grooves 29 and the keys 30.

It will be readily understood that the ring 31 rotates in one direction upon the down stroke of the reciprocating member and in the other direction upon its up stroke. During the up stroke the ring 31 is rotated in that direction in which the pawl 37 merely slips over the teeth 36. During the down stroke, however, the ring 31 rotates in the opposite direction and the pawl 37 engages one of the teeth, causing the collar 34, the rotating sub 41 and the stem 42 together with the cutter body 43 to rotate with it. The rotation of the collar 51, however, is prevented by means of the friction springs 52, so that while the stem 42 is being rotated, the collar 51 is gradually screwed down upon the stem. The downward movement of the collar 51 against the roller 55 causes the tapered mandrel 57 to move downwardly between the cutter blocks 46, thus gradually expanding the cutters while the cutter body 43 is being rotated. Because of the con-

struction of the subs 32 and 41 and the collar 34, it will be readily appreciated that vertical movement of the stem 42 relatively to the barrel is prevented, and as the barrel is held stationary within the casing by the slips, the discs 48 will always be cutting in the same groove. The reciprocation of the reciprocating member 23 is continued until the cutter blocks 46 have been completely expanded and the casing cut. When the blocks have been completely expanded, the fingers or ribs 47 pass over the top of the tapered mandrel 57 and are returned to their retracted position about the rod 56 by the coil springs 49, as shown in Fig. 4. The tool can then be withdrawn from the casing by pulling upwardly upon the cable, causing the head 26 to strike the lower end of the section 11 and unseat the slips 18. In this manner the head 26 and the upper section 11 provide a type of jar for loosening the slips from the casing. In originally setting the tool after the slips have engaged the casing, the reciprocating member may be lowered several times causing the head 24 to engage the top of the barrel and act as a hammer in firmly seating the slips upon the casing.

From the above it will be appreciated that an improved casing cutter is provided, which can be lowered into a well by means of a cable, set in position and operated by the cable and then withdrawn from the well by the cable. It will be readily appreciated that the stem 42 can be rotated in any one of a number of various manners, either employing a reciprocating cable, or, if desired, this stem can be rotated by means of a rotary drill pipe, if the tool is used upon such an outfit. Consequently, the stem 42 and parts associated with it constitute a subcombination of the complete tool which can be associated either with the rotating mechanism as shown or with various other types of rotating mechanisms.

It will be understood that various changes may be made in the detail of construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A casing cutter comprising a hollow stem, a cutter body secured thereto, cutters radially slidable upon said body, a mandrel movable within said body for moving the cutters outwardly therethrough, a collar threaded onto the stem, means carried by the collar engageable upon the interior of the casing for preventing its rotation, means for rotating said stem, and means forming a connection between the mandrel and said collar whereby upon rotation of said stem the collar will move relatively thereto, moving the mandrel and thus expanding the cutters during their rotation.

2. A casing cutter comprising a hollow stem, a cutter body secured thereto, cutter blocks slidable within said cutter body, disc cutters mounted on said cutter blocks, a tapered mandrel movable within said body engageable upon said cutter blocks for expanding them, a collar threaded onto the stem, friction springs engageable upon the interior of the casing carried by said collar for preventing rotation of the collar, means for rotating said stem so as to cause said collar to move relatively thereto, and means forming a connection between the mandrel and said collar whereby the mandrel may be caused to expand the cutters causing the cutters to be simultaneously rotated and expanded upon rotation of the stem.

3. A casing cutter comprising a hollow stem, a cutter body secured thereto, cutters movable outwardly from said cutter body, a tapered mandrel disposed within the body for forcing the cutters outwardly, said mandrel carrying arms which slidably extend through slots in the stem, a collar threaded onto the stem, means carried by the collar engageable upon the casing for holding the collar against rotation, and means for rotating the stem causing the collar to engage said arms and thus cause the mandrel to force the cutters outwardly while the cutter body is rotating with the stem.

4. A casing cutter comprising a hollow stem, a cutter body secured thereto, cutter blocks slidable in the body, cutters rotatable upon the cutter blocks, a tapered mandrel disposed within the cutter body, arms carried by the mandrel extending through slots in the stem, a collar threaded onto the stem, friction springs carried by the collar engageable upon the interior of the casing for holding the collar against rotation, rollers carried by said arms bearing against the collar, and means for rotating the stem whereby the cutter body may be rotated and the collar may be moved relatively to the stem, causing the mandrel to force the cutter blocks outwardly.

5. A casing cutter comprising a barrel having a tapered upped end, slips slidable upon the barrel adapted to be expanded by the tapered upper end, friction springs slidable upon the barrel and connected to the slips, a spring latch for holding the friction springs against upward movement on lowering the device into a well hole, a reciprocating member having a head adapted to lift the barrel and cause the latch to release the springs, said reciprocating member being held against rotation in the barrel, there being helical grooves formed upon said reciprocating member, a hollow stem rotatably mounted upon the barrel at the bottom thereof and extending downwardly therefrom, a ring disposed within the barrel adapted to be rotated by the reciprocating

member upon its reciprocation, means providing a ratchet and pawl connection between the ring and said stem, a cutter body rigidly secured to said stem, cutters movably mounted thereon, a wedge for expanding the cutters, a collar threaded onto the stem, means connecting the collar to said wedge, said collar being engageable upon the casing to hold it against rotation, and means for reciprocating said reciprocating member, whereby rotation of said stem may be produced, thus causing rotation of the cutter body and causing the collar to move relatively thereto to cause the wedge to force the cutters outwardly.

In testimony whereof I have signed my name to this specification.

GERALD D. FAWCETT.