June 17, 1947. R. TEMPLE 2,422,506

MINE ANCHOR-LINE CUTTER

Filed Nov. 6, 1945 3 Sheets-Sheet 1

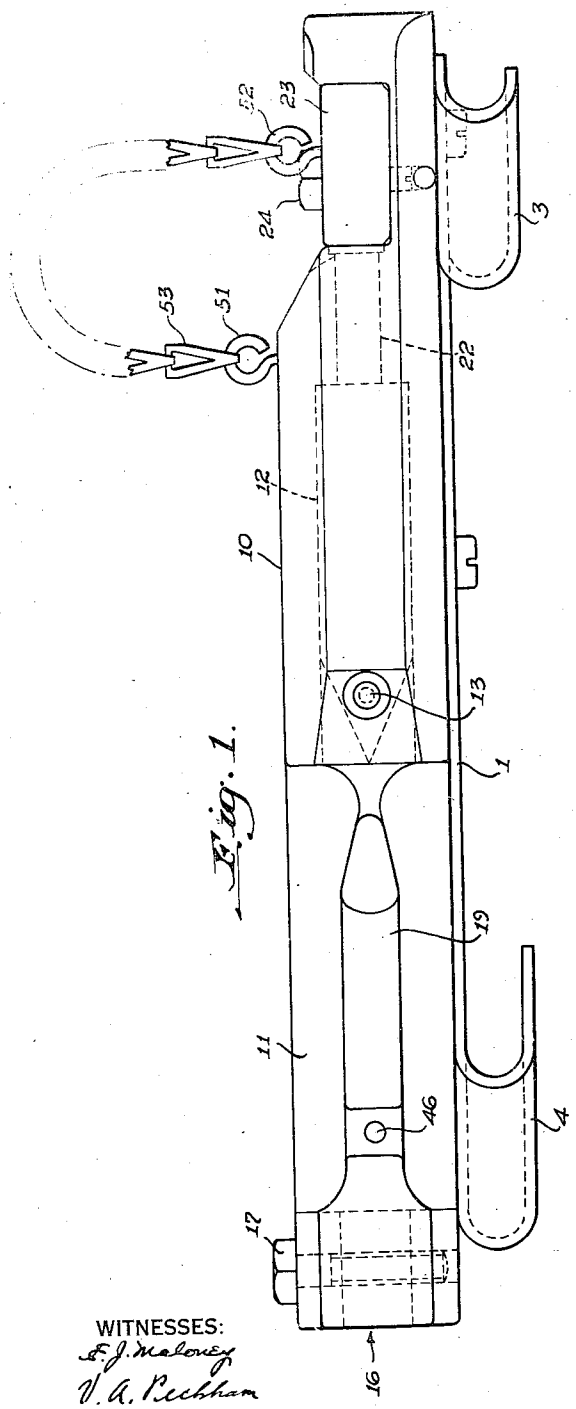


Fig. 1.

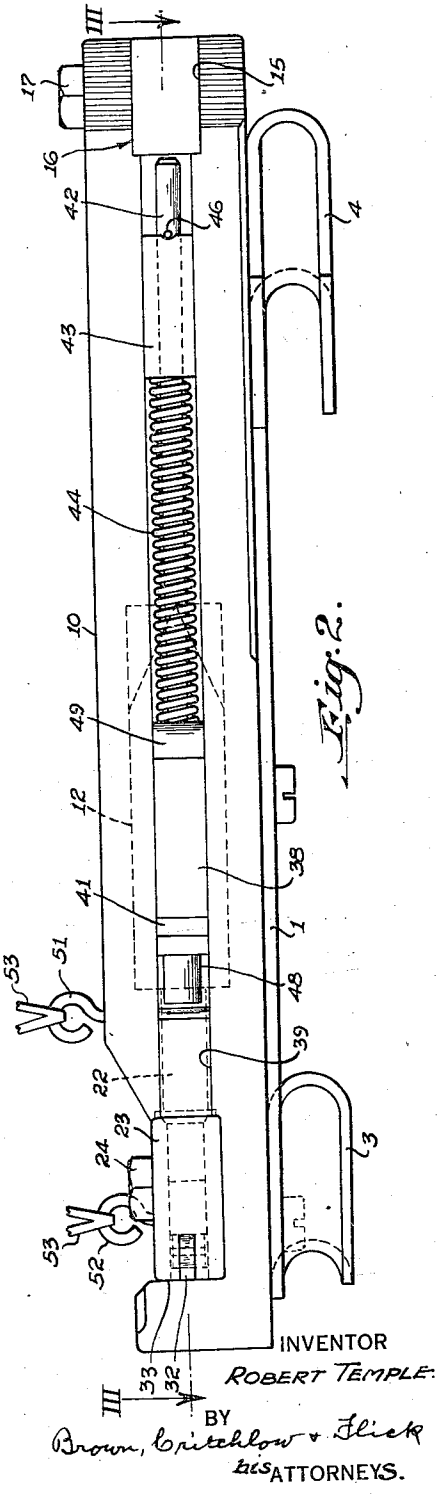


Fig. 2.

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MINE ANCHOR-LINE CUTTER

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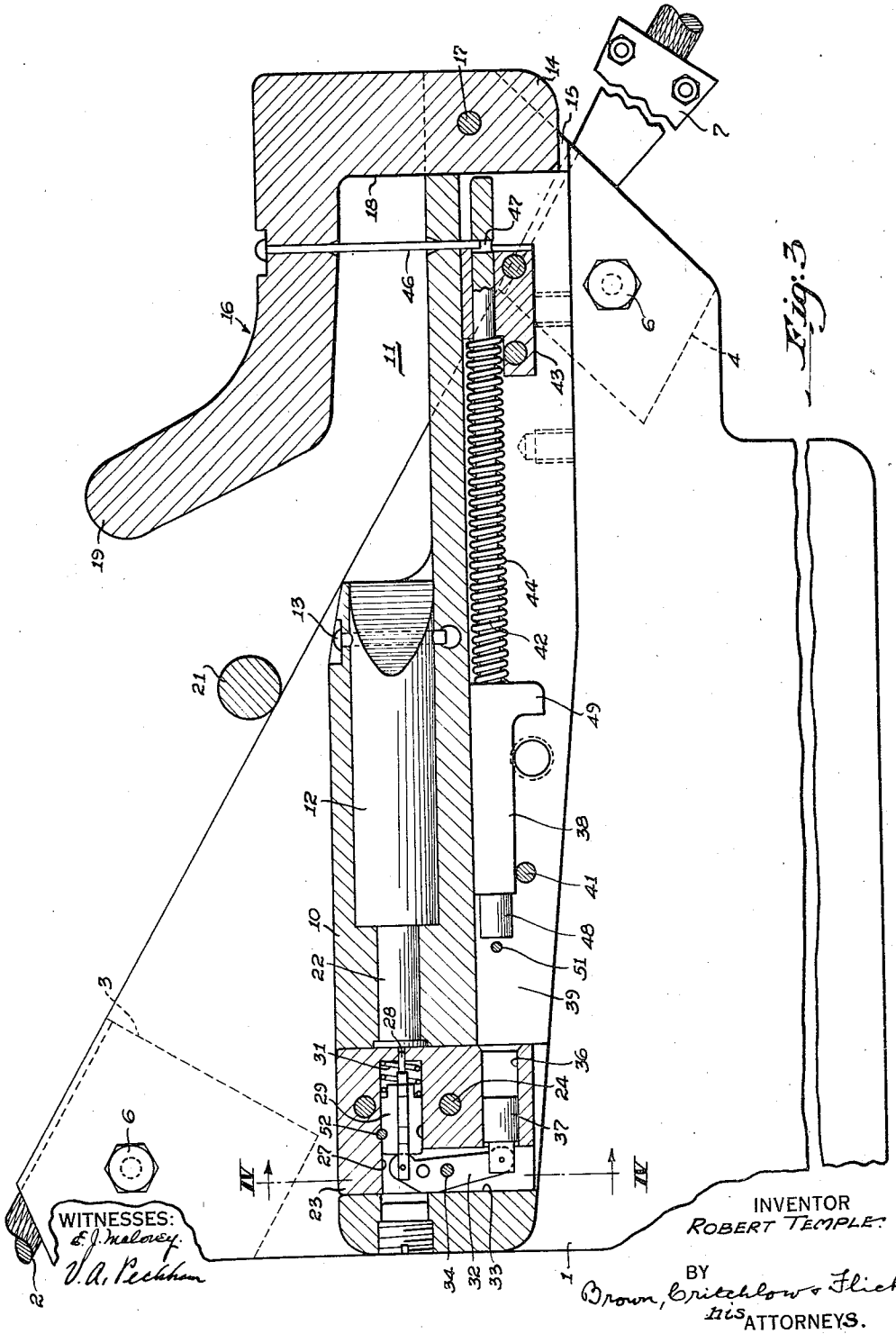


Fig. 3

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MINE ANCHOR-LINE CUTTER

Filed Nov. 6, 1945 3 Sheets-Sheet 3

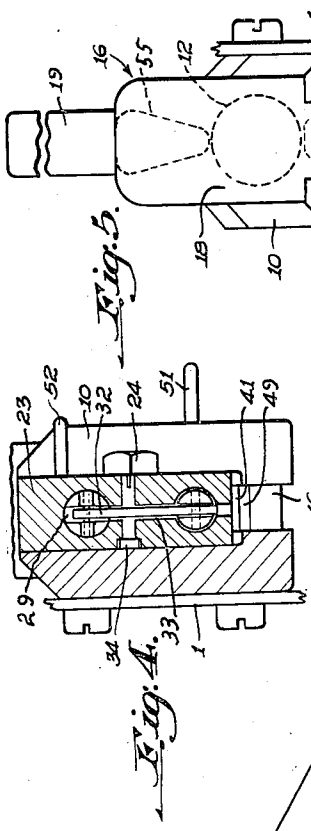


Fig. 5.

Fig. 4.

Fig. 6.

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UNITED STATES PATENT OFFICE

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MINE ANCHOR-LINE CUTTER

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Application November 6, 1945, Serial No. 626,969

9 Claims. (Cl. 114—221)

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This invention relates to devices for cutting the lines by which explosive mines are anchored below the surface of oceans and other bodies of water, and more particularly to such devices in which the cutting member is actuated by an explosive charge.

It is among the objects of this invention to provide a mine anchor-line cutter which can not catch onto a mine line after the cutter has been operated, which is practically certain to operate in all cases, which can cut both hard and soft chains and also cables, and which is relatively small and light in weight.

In accordance with this invention a frame, adapted to be connected to a sweep line, carries a cutting member that has a cutting end. A guide member, connected to the frame by breakable means such as a shear pin, has an anvil portion disposed in the path of the cutting member. The guide is shaped to direct a mine anchor-line into a position between the cutting end of the cutter and the anvil portion of the guide. Explosive means is carried by the frame for driving the cutter through the mine line and then against the anvil portion of the guide with sufficient force to cause the shear pin to break and release the guide member from the frame. After the guide member has left the frame, nothing remains to hook the frame onto another mine line.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a front view of my cutting device; Fig. 2 is a rear view; Fig. 3 is a horizontal section taken on the line III—III of Fig. 2 and showing the cutter attached to the sweep line; Fig. 4 is a vertical transverse section taken on the line IV—IV of Fig. 3; Fig. 5 is an end view of the cutting notch end of the device; and Fig. 6 is a plan view, partly in section, showing the device after it has cut a mine anchor-line.

Referring to Fig. 3 of the drawings, a stabilizing fin 1 has its longitudinal axis extending in the direction in which the device is pulled through the water by a sweep line 2 extending backwardly and laterally from a mine sweeper in a well known manner. The front edge of the fin is inclined to its longitudinal axis to the same degree as the sweep line. This front edge is provided at opposite ends with integral ears 3 and 4 that hook over the sweep line and extend rearwardly parallel to the fin. Bolts 6 extending through the fin and these ears hold the fin on the sweep line, while a tapered collar 7 (Fig. 3) clamped on the line at the far side of the fin keeps it from sliding outwardly along the line and yet

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permits it to rotate thereon so that it can stay horizontal.

Rigidly mounted on the front portion of the fin is the metal frame 10 of the cutting device. The longitudinal axis of this frame extends across the fin, and the frame is set back from the front corner of the fin so that only a small amount of the frame extends across the inclined front edge of the fin. As shown in Fig. 3, the front side of this outwardly projecting portion of the frame is provided with a recess 11 that extends longitudinally of the frame away from the fin to the adjacent end of the frame. The frame also is provided with a longitudinal bore extending inwardly from the inner end of recess 11, and this bore normally contains a cutting punch 12 that is held retracted in proper position by a shear pin 13 extending through it and the surrounding frame.

The end of the frame beside the recess is provided with a slot 15 for receiving a tongue 14 on one end of a guide member 16. The tongue and frame 10 are provided with transverse passages through which a shear pin 17 extends. This pin is only in the tongue 14, so that when the pin is sheared off its ends will fall out of the frame passages. The guide member 16 extends across the end of recess 11 to form an anvil portion 18, and then the guide turns and extends along the front side of the recess toward the punch. At a point spaced from the punch the guide is inclined forward away from the frame to form a finger 19 that will intercept a mine anchor-line and direct it into the cutting notch formed by recess 11 between the guide and frame.

When a mine anchor-line 21, across which the sweep line and fin have been dragged, is caught in the cutting notch it is cut by the punch which is driven against it by the force of an explosion from a cartridge 22 removably mounted in a small bore in the frame at the inner end of the punch. During cutting, the mine line is backed up by the front and back walls of the cutting notch, and by the anvil in the path of the punch. To explode the cartridge, a firing mechanism is mounted in the inner end of the frame. This mechanism includes a breech block 23 which is removably mounted in a slot in the top of the frame by means of a screw 24. This block is provided with a passage 27 in axial alignment with the cartridge, the cartridge end of the passage being of materially reduced diameter. Slidably mounted in this passage is a firing pin 28 the inner end of which is provided with four laterally projecting wings 29 that engage the wall of the passage

and guide the pin therein. The pin is urged inwardly by an encircling coil spring 31 compressed between the wings and the reduced end of the passage. The opposite ends of the wings engage the side of the front end of a lever 32 mounted in a transverse slot 33 in the inner end of the breech block. The central portion of this lever is pivotally mounted on a vertical pin 34 so that it can swing toward and away from the cartridge. The rear portion of the block is provided with a passage 36 parallel to the firing pin passage and containing a piston 37 that engages the same side of the lever as the firing pin 28, but at the opposite end thereof. The piston extends only about half way through passage 36. It will be seen that when the piston suddenly is moved toward the lever it will rock the lever on its pivot and thereby force the firing pin against the cartridge which will thereby be discharged to drive the cutting punch into the cutting notch.

To prevent piston 37 from being moved accidentally, and thereby causing the cartridge to be discharged, the firing mechanism is so formed that it can not be operated unless the piston passage behind the piston is full of water. This occurs only when the cutter is in the ocean or other body of water in which it is being used. To force the water against the piston so that it will be actuated, a plunger is mounted in the frame in axial alignment with the piston. This plunger has a rectangular portion 38 that is slidable in a guiding slot 39 extending lengthwise of the back side of the frame. A retaining pin 41 extends across the slot substantially in engagement with the rear side of this rectangular portion to help hold the plunger in the slot. The plunger is also held in place by a rod 42 connected to its rear end and slidably mounted in a bore through a block 43 rigidly mounted in slot 39 behind the cutting notch. The plunger is urged toward the breech block by a coil spring 44 encircling the rod and compressed between the plunger's rectangular portion and block 43. The plunger normally is held in retracted position, with the spring compressed, by means of a trip pin 46 of small diameter extending through the guide member, across the cutting notch, through the frame and into a transverse opening 47 in the plunger rod. The front end of the plunger has a cylindrical head 48 which enters the rear end of piston passage 36 when the plunger is released, and thereby forces the water in the passage against the piston to move it ahead against lever 32.

If the plunger is accidentally released when the apparatus is out of the water, the plunger will not actuate the piston because a lateral projection 49 on the plunger will strike pin 41 before the head can strike the piston or the plunger can strike the breech block. To retract or cock the plunger it is pushed backwardly by any suitable tool (not shown) forced against projection 49. When in cocked position, a safety pin 51 is inserted in a hole through the frame with a portion of the pin directly in front of the plunger. Another safety pin 52 extends into a hole in the breech block and through a notch in one of the wings of the firing pin. These two safety pins are connected by a chain 53 by which they can be pulled out of the frame and breech block. They are not removed until trip pin 46 has been inserted in the plunger rod and the apparatus is about to be lowered into the water.

When a mine anchor-line 21 enters the cutting notch it engages trip pin 46, the front end of which is held in fixed position by engagement

of its head with guide member 16. As the front end of the pin therefore can not move when the mine line bends the pin toward anvil 18, the rear end of the pin is pulled out of plunger rod opening 47, thus releasing the plunger. The released plunger forces the water in passage 36 against piston 37 and thereby actuates the firing mechanism. The force of the explosion of cartridge 22 builds up until sufficient to cause the cutting punch to shear off pin 13. The punch then shoots forward, and in cutting the mine line it also shears off the portion of the trip pin 46 in the cutting notch. Shear pin 17, which connects guide member 16 to the frame, is strong enough to hold the anvil 18 in place until the punch has severed the mine line. The impact of the punch against the anvil then causes the tongue 14 of the guide member 16 to shear off pin 17 and slide out of frame slot 15. Of course, this means that the guide member, as well as the punch, leaves the frame and is lost. However, as illustrated in Fig. 6, the loss of these relatively inexpensive parts is justified by the fact that separation of the guide member from the frame eliminates the cutting notch so that there is no longer any such notch in which another mine anchor-line might catch. It is obvious that if this apparatus, after it had been discharged, were to hook onto another mine line, the latter would not be cut but would be dragged along behind the mine sweeper. This would necessitate cutting the sweep line in order to free the ship from the dangerous mine. The present invention eliminates this difficulty by ridding the cutting device of its hooked end as soon as the cartridge is discharged.

Although the mine anchor-line is shown as being a cable 21, it is understood that it may be either a hard or soft chain either of which will be cut by my cutting device as easily as a cable. In the case of a hard chain the cutting action is more in the nature of a breaking because the impact of the punch against a chain link causes the link to snap apart like a piece of glass. To prevent chain links from becoming locked in the entering portion of the cutting notch, in which case the chain would not slide back in the notch far enough to bend trip pin 46, the portion of the guide member in front of its anvil portion is made quite narrow and is tapered toward the cutting notch, as shown at 55 in Fig. 5. Therefore, there is no opportunity for the chain to bind in the notch before it reaches the trip pin. The shear pin 17 is made strong enough for the particular type of line expected to be cut, and if desired, a strong enough pin can be used to hold the anvil in place against the impact of the cutter.

According to the provisions of the patent statutes, I have explained the principle and construction of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame and having a cutting end, a guide member having an anvil portion disposed in the path of the cutting member, said guide being shaped to direct a mine line into a position between the cutting end of the cutter and said anvil portion of the guide, breakable means connecting said guide member to the frame, and explosive means car-

ried by the frame for driving the cutter through said line and then against said anvil portion with sufficient force to cause said breakable means to break and release the guide member from the frame.

2. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame and having a cutting end, a guide member having an anvil portion disposed in the path of the cutting member, said guide being shaped to direct a mine line into a position between the cutting end of the cutter and said anvil portion of the guide, a shear pin connecting said guide member to the frame, and explosive means carried by the frame for driving the cutter through said line and then against said anvil portion with sufficient force to sever said pin, whereby the guide member is released from the frame.

3. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame and having a cutting end, a guide member having an anvil portion disposed in the path of the cutting member, said guide being shaped to direct a mine line into a position between the cutting end of the cutter and said anvil portion of the guide, a shear pin connecting one end of said guide member to the frame at one side of said path of the cutting member, and explosive means carried by the frame for driving the cutter through said line and then against said anvil portion with sufficient force to sever said pin, whereby the guide member is released from the frame.

4. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame and having a cutting end, a guide member having an anvil portion disposed in the path of the cutting member, said guide being shaped to direct a mine line into a position between the cutting end of the cutter and said anvil portion of the guide, the end of the frame adjacent said guide member being bifurcated to receive one end of the guide member, a shear pin extending through said bifurcated end and adjoining portion of the guide member, and explosive means carried by the frame for driving the cutter through said line and then against said anvil portion with sufficient force to sever said pin, whereby the guide member is released from the frame.

5. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame and having a cutting end, a guide member having an anvil portion disposed in the path of the cutting member, said guide being shaped to direct a mine line into a position between the cutting end of the cutter and said anvil portion of the guide, breakable means connecting said guide member to the frame, and explosive means carried by the frame for driving the cutter through said line and then against said anvil portion with sufficient force to cause said connecting means to break and release the guide member from the frame, said breakable means being strong enough to maintain the guide and frame connected until after the line has been severed.

6. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame and having a cutting end, a guide member having an anvil portion disposed in the path of the cutting member, said guide being shaped to direct a mine line into a position between the cutting end of the cutter and said anvil portion of the guide, means normally connecting the guide member to the frame, and explosive means carried by the frame for driving the cutter through

said line and against said anvil portion, said guide member connecting means releasing the guide from the frame when said anvil portion is struck by the cutting member.

7. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame and having a cutting end, said frame having an open end recess in front of said cutting end, a guide member having an anvil portion extending across the open end of said recess, said guide having a front portion extending from said anvil portion toward the cutter and then forward away from the frame to provide a notch for receiving a mine line, breakable means connecting said guide member to the frame, and explosive means carried by the frame for driving the cutter through said line and then against said anvil portion with sufficient force to cause said connecting means to break and release the guide member from the frame.

8. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame and having a cutting end, said frame having an open end recess in front of said cutting end, a guide member having an anvil portion extending across the open end of said recess, said guide having a front portion extending from said anvil portion toward the cutter and then forward away from the frame to provide a notch for receiving a mine line, breakable means connecting said guide member to the frame, explosive means carried by the frame for driving the cutter through said line and then against said anvil portion with sufficient force to cause said connecting means to break and release the guide member from the frame, firing mechanism for discharging said explosive means, and a trip pin connected to said front portion of the guide member and extending across said notch for holding said firing mechanism cocked, said trip pin being adapted to be engaged and bent by said line when it enters the notch, whereby the pin releases the firing mechanism.

9. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame and having a cutting end, said frame having an open end recess in front of said cutting end, a guide member having an anvil portion extending across the open end of said recess, said guide having a front portion extending from said anvil portion toward the cutter and then forward away from the frame to provide a notch for receiving a mine line, the opposite side walls of said notch being tapered transversely toward each other, breakable means connecting said guide member to the frame, and explosive means carried by the frame for driving the cutter through said line and then against said anvil portion with sufficient force to cause said connecting means to break and release the guide member from the frame.

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