Sept 17, 1957 R. TEMPLE 2,806,442

MINE ANCHOR-LINE CUTTER

Filed Oct. 2, 1943 2 Sheets-Sheet 1

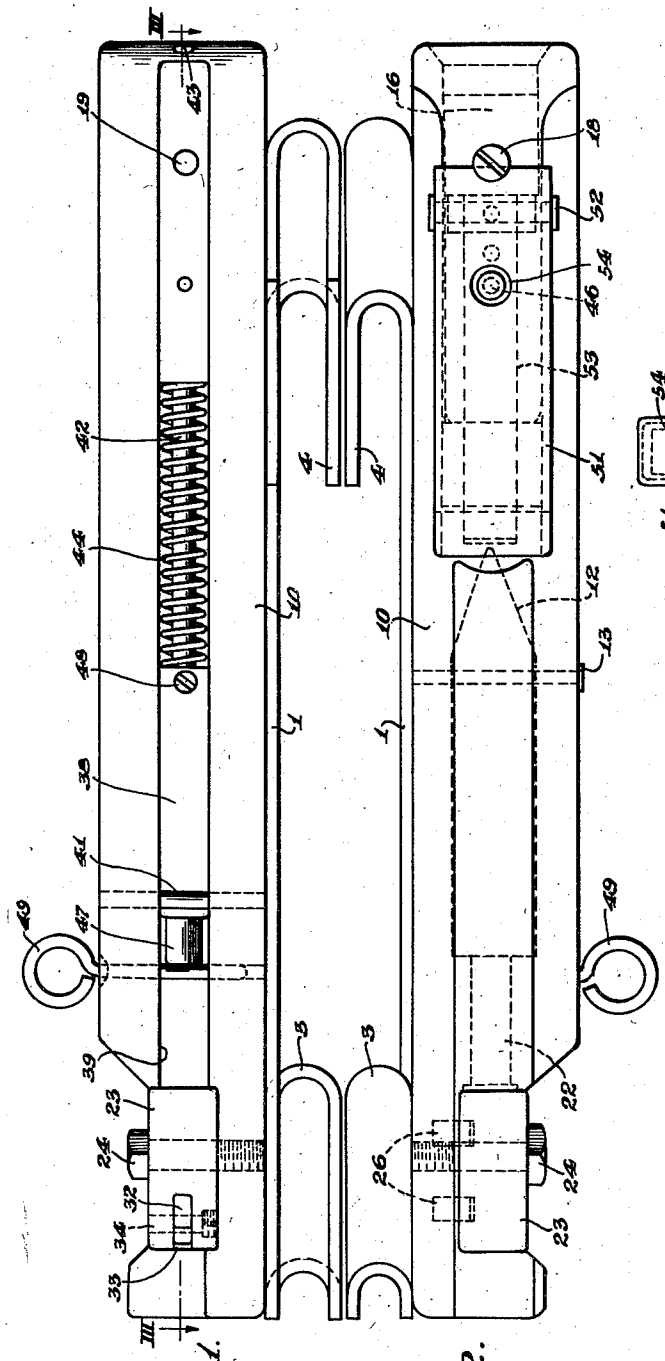


Fig. 1.

Fig. 2.

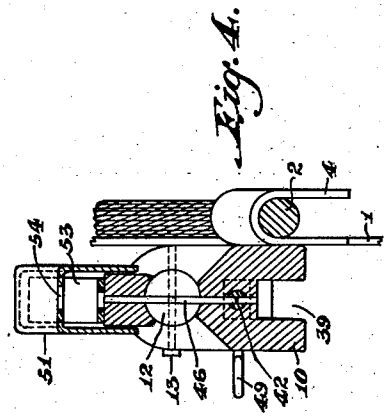


Fig. 4.

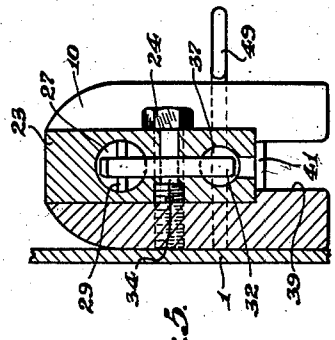


Fig. 5.

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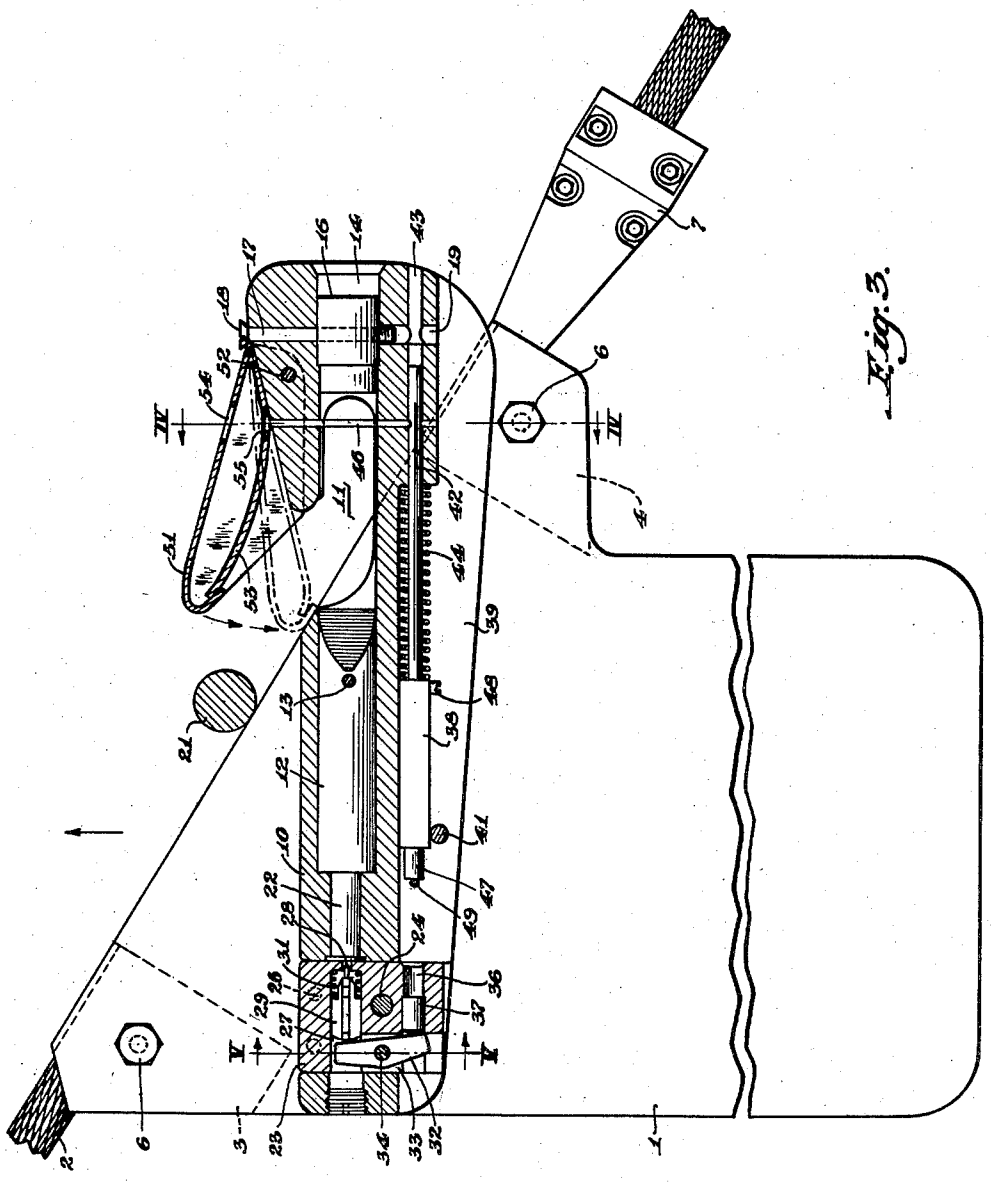


Fig. 3.

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2,806,442

MINE ANCHOR-LINE CUTTER

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Application October 2, 1943, Serial No. 504,663

29 Claims. (Cl. 114—221)

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.

In mine sweeping operations the mines encountered may be anchored by wire cables, by soft chains, or by hard or case-hardened chains. No satisfactory cutting device known heretofore has been able to sever all three types of anchor lines. This has been due chiefly to the fact that when the cutter is made powerful enough to cut soft chains, the most difficult lines to sever, the device must be very strong and heavy to withstand the tremendous shock to which it is subjected when it cuts only a small cable. As a result, the cutter not only is expensive, but also too heavy for practical use. On the other hand, if a lighter weight cutter is used which is capable of cutting cables and hard chains, it is likely to fail to cut through a soft chain which it may encounter, and merely clamp onto it with all the disadvantages and dangers that arise when a mine thus becomes attached to the sweep line. Other weaknesses of known types of cutters include their too frequent failure to operate when they should, and their occasional tendency to catch on the mine anchor lines and prevent the lines from entering the cutting recesses.

It is among the objects of this invention to provide a mine anchor-line cutter which can cut both hard and soft chains and also cables, which is relatively small and lightweight, which can not be fouled by an anchor line, and with which the chance of not operating is practically negligible.

In accordance with this invention, a frame is provided with a recess for receiving a mine anchor-line, and with a cutting member that is adapted to be driven into the recess for severing the line. The cutting member is driven by an explosive charge that is fired by a combination of mechanical and hydraulic means so that mud and the like will not foul the firing mechanism. Thus, a hydraulically actuated piston actuates a member that transmits the hydraulic pressure to a firing pin which explodes the charge. The hydraulic pressure is obtained by a normally retracted spring-pressed plunger that, when released by a trip member actuated by an anchor line in the cutting recess, forces sea water against the piston. The end of the cutting recess opposite to the cutting member is provided with a removable anvil against which the cutting member operates. This anvil may normally be held in place by a shear pin, but the impact of the cutting member against the anvil causes it to shear off the pin so that both the cutting member and the anvil shoot out of the frame and are lost. This makes it unnecessary to provide a heavy frame to stop the cutting member, and thereby reduces the weight and cost of the cutter.

The frame is rigidly mounted on a stabilizing fin by which it is held substantially horizontally in the water with the entrance to its cutting recess facing forward. The front of the fin is fastened to the sweep line, and the

cutter frame is disposed at an acute angle to the front edge of the fin from which it projects outwardly. The entrance to the cutting recess extends outwardly from the front edge of the fin so that an anchor line sliding along against the front of the fin is guided directly into the recess without exerting any appreciable vertical force on the front of the apparatus. After the apparatus has been fired, a gate closes the entrance to the cutting recess so that the next anchor line encountered will pass over the cutter to the next cutter located further out on the sweep line. This gate may be held open by the shear pin that holds the anvil in place so that when the pin is sheared off, the gate is closed by a spring.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a rear view of my cutting device; Fig. 2 is a front view; Fig. 3 is a horizontal section taken on the line III—III of Fig. 1; and Figs. 4 and 5 are vertical transverse sections taken on the lines IV—IV and V—V, respectively, of Fig. 3.

Referring to 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 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** extend 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 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 is substantially perpendicular to the longitudinal axis of the fin, and the frame is set back from the front corner of the fin so that some of the fin projects ahead of the frame and only a small amount of the frame projects outwardly beyond the 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 cutting recess **11** that extends longitudinally of the frame away from the fin. The entrance to this recess is at its fin-end, and the inner side of the entrance is substantially flush with the front edge of the fin. It will be seen that the general shape of the frame is similar to a hook lying on its side.

The frame is provided with a longitudinal bore extending inwardly from the inner end of the cutting recess, 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. At the other end of the recess there is another bore **14** in axial alignment with the punch and extending out through the end of the frame. This bore is at least as large as the punch-receiving bore and normally contains an anvil **16** in the form of a metal plug which is held in place by a shear pin **17** that extends through it from front to back. The pin also extends forward through the front of the frame and is provided with a slotted head **18**. The inner or rear end of the pin is threaded into the anvil and projects therefrom into an enlarged bore **19** in the rear portion of the frame.

When a mine anchor line **21**, across which the sweep line and fin have been dragged, is caught in the cutting recess 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 frame above and below the cutting

recess, and by anvil **16** 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** and a couple of dowel pins **26**. 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 pin, but at the opposite end thereof. The piston extends only about half way through passage **36**, the rest of which is reduced in diameter slightly so that the piston can not escape from the passage. It will be seen that when the piston 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 exploded to drive the cutting punch into the cutting recess.

To prevent the piston 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 **43** in the frame behind the anvil. 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 the portion of the frame encircling the rod. The plunger normally is held in retracted position, with the spring compressed, by means of a trip pin **46** of small diameter extending through a central passage from the front of the frame and across the cutting recess and into a transverse opening in the plunger rod. The front end of the plunger has a cylindrical head **47** 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 its head **47** is shorter than the empty part of the piston passage, so the rectangular portion **38** of the plunger will strike the breech block before the head can strike the plunger. To retract or cock the plunger it is pushed backwardly by any suitable tool (not shown) forced against a stud **48** projecting from the back of the plunger. When in cocked position, a safety pin **49** is inserted in a hole through the frame with a portion of the pin directly in front of the plunger. This pin is 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 enters the cutting recess it engages the trip pin, the front end of which is held in fixed position in a manner about to be described. As the front end of the pin therefore can not move when the mine line bends the pin back against anvil **16**, the rear end of the pin is pulled out of the plunger rod opening, thus releasing the plunger. The released plunger actuates the firing mechanism, and the force of the explosion 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 in the cutting recess and thus permits the opposite ends of the pin to be removed from the frame when the apparatus is prepared for cutting again. The impact of the punch against the anvil generally will be great enough to shear off pin **17** so that both punch and anvil will shoot out of the outer end of the frame, and, of course, be lost. This is a small price to pay, however, for a universal cutter of small size and light weight.

At it is necessary to prevent the cutter from catching on another mine anchor-line after the cutter has been fired, means is provided for closing the entrance to the cutting recess after a line has been cut therein. The next anchor-line will therefore pass over the projecting end of the cutter frame and slide along the sweep line until it reaches the next unfired cutter mounted on the sweep line. For this purpose a gate **51** is provided which is pivoted to the frame so that it can open and close the entrance to the cutting recess. The gate preferably is in the form of a bifurcated member the outer end of which straddles the front end of the frame to which it is pivoted by a vertical pin **52**. The gate is urged toward closed position by a leaf spring **53** that has its outer end fastened to the front of the frame inside the gate and that has its inner end pressing rearwardly against the inner end of the gate. The gate normally is held open by the head **18** of the anvil shear pin which projects over the outer end of the gate and holds it against the frame. When this pin is sheared off, its head releases the gate which is snapped shut by the leaf spring. While the gate is open it helps guide a mine anchor-line into the cutting recess. Being bifurcated and wider than the cutting punch, it can close and straddle the punch if for some reason the punch fails to leave the frame. The headed front end of trip pin **46** bears against the front surface of the frame by which it is held in fixed position until the trip pin has been cut by the punch. To permit the trip pin to be put in place and removed therefrom, the gate and spring **53** are provided with enlarged openings **54** and **55**, respectively, adjacent the head of the pin.

Although a mine anchor-line is shown as being a cable **21**, it will be understood that it may be either a hard or a 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 link causes the link to snap apart like a piece of glass. Due to the construction of the firing mechanism it is not necessary for the firing pin to fit passage **27** like a piston, so there is little danger of the pin becoming stuck by mud and the like in the passage. The alignment of the front of the fin with the sweep line, and the position of the cutting recess relative to the front of the fin permit mine lines to enter the recess without becoming caught on the fin or cutter frame.

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 movable cutting member therein, said frame being provided with a recess adjacent the cutting end of said member for receiving a mine line, means adapted to receive an explosive charge adjacent the opposite end of the cut-

ting member, a firing pin for exploding the charge to actuate the cutting member, a piston, spring-actuated means for forcing water against the piston to move it, a movable member actuated by said piston for actuating the firing pin, a trip pin extending across said recess for holding said spring-actuated means in cocked position, a gate pivotally connected to the frame beside said recess, means normally holding said gate open, one end of said trip pin being held in fixed position by the portion of the frame adjacent said gate, said gate-holding means being adapted to be released by said cutting member when the latter cuts the line, and means for swinging the released gate across the entrance to said recess.

2. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a firing pin for exploding the charge to actuate the cutting member, hydraulic pressure actuated means, and a pivoted lever for transferring the force of said hydraulic pressure actuated means to the firing pin for actuating the pin.

3. A mine anchor-like cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a firing pin for exploding the charge to actuate the cutting member, a pivoted lever having one end for actuating the firing pin, and hydraulic pressure actuated means for operating against the opposite end of the lever.

4. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a firing pin for exploding the charge to actuate the cutting member, a piston, spring-actuated means for forcing water against the piston to move it, a movable member actuated by said piston for actuating the firing pin, and means operable by said mine line for releasing said spring-actuated means.

5. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a firing pin for exploding the charge to actuate the cutting member, a pivoted lever having one end for actuating the firing pin, a piston at the other end of the lever, spring-actuated means for forcing water against the piston to move it, and means operable by said mine line for releasing said spring-actuated means.

6. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a firing pin for exploding the charge to actuate the cutting member, a passage communicating at one end with the firing pin and open at the other end, a lever pivoted in said passage with one end adjacent the firing pin for actuating it, a piston adjacent the side of the other end of the lever, spring-actuated means for forcing water against the piston to cause it to swing the lever, and means operable by said mine line for releasing said spring-actuated means.

7. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a passage communicating with one end of said charge-receiving means, a firing pin in said passage for exploding the charge to actuate the cutting member, laterally projecting guide members connected to said pin and centering it in said passage, hydraulic pressure actuated means, and a movable member for transferring the force of said hydraulic pressure actuated means to the firing pin for actuating the pin.

8. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a reciprocable firing pin for exploding the charge to actuate the cutting member, a piston mounted for movement in a direction substantially parallel to the direction of movement of said pin, a lever having the opposite ends of one of its sides substantially engaging said pin and piston, means pivoting the lever between the pin and piston, and means for forcing water against the piston to move it toward the lever.

9. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a reciprocable firing pin for exploding the charge to actuate the cutting member, a piston mounted for movement in a direction substantially parallel to the direction of movement of said pin, a lever having the opposite ends of one of its sides substantially engaging said pin and piston, a normally retracted spring-pressed plunger mounted substantially parallel to the direction of movement of the cutting member and adapted to force water against the piston to move it toward the lever, and means operable by said mine line for releasing said plunger.

10. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a firing pin for exploding the charge to actuate the cutting member, a piston, spring-actuated means for forcing water against the piston to move it, a movable member actuated by said piston for actuating the firing pin, means operable by said mine line for releasing said spring-actuated means, and means stopping said spring-actuated means before it can strike the piston.

11. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a breech block removably mounted adjacent said charge-receiving means, said block being provided with a plurality of passages containing a firing pin and a piston and a movable member for transferring motion from the piston to the pin to actuate the pin, and means for forcing water against said piston to actuate it.

12. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a breech block removably mounted adjacent said charge-receiving means, said block being provided with a pair of substantially parallel passages connected at one end by a cross passage, a firing pin mounted in one of the parallel passages for exploding said charge to actuate the cutting member, a piston disposed in the other parallel passage, a lever pivotally mounted in the cross passage with its opposite ends adjacent one end of the piston and firing pin, and means for forcing water against the other end of the piston to move it toward said lever.

13. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive

charge adjacent the opposite end of the cutting member, a breech block removably mounted adjacent said charge-receiving means, said block being provided with a pair of substantially parallel passages connected at one end by a cross passage, a firing pin mounted in one of the parallel passages for exploding said charge to actuate the cutting member, a piston disposed in the other parallel passage, a lever pivotally mounted in the cross passage with its opposite ends adjacent one end of the piston and firing pin, a normally retracted spring-pressed plunger spaced from the opposite end of the piston in axial alignment with the piston-receiving passage, and means operable by said mine line for releasing said plunger whereby it forces water against the adjacent end of the piston to move it, said plunger being provided with an enlargement that strikes the breech block and stops the plunger before it can strike the piston.

14. A mine anchor-line cutter comprising a movable cutting member, means adjacent the cutting end of said member for catching a mine line and holding it in position for cutting, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, a firing pin for exploding the charge to actuate the cutting member, a piston, spring-actuated means for forcing water against the piston to move it, a movable member actuated by said piston for actuating the firing pin, said spring-actuated means being provided with an opening, a trip pin projecting into said opening for holding the spring-actuated means in cocked position, and means for holding the other end of the trip pin in fixed position, said trip pin being adapted to be engaged and bent by said mine line whereby it is withdrawn from said opening to release said spring-actuated means.

15. A mine anchor-line cutter comprising a frame, a free cutting member slidably mounted in the frame, an anvil spaced from the cutting end of said member, means normally holding the anvil in operative position in the frame, means adapted to receive an explosive charge adjacent the opposite end of the cutting member, means for guiding a mine line into the space between the cutting member and anvil, and means for exploding said charge to drive the cutting member through said line and against the anvil, said anvil-holding means releasing the anvil when it is struck by the cutting member, whereby the cutting member and anvil leave said frame.

16. A mine anchor-line cutter comprising a frame, a free cutting member slidably mounted in the frame, an anvil spaced from the cutting end of said member, shearable means normally holding the anvil in operative position in the frame, means for guiding a mine line into the space between the cutting member and anvil, and explosive means for driving the cutting member through said line and against the anvil, the impact against the anvil causing it to shear off said shearable means and to be ejected from said frame by the cutting member.

17. A mine anchor-line cutter comprising, a frame, a free cutting member slidably mounted in the frame, an anvil spaced from the cutting end of said member, a shear pin extending transversely through the anvil and into the frame for holding the anvil in operative position, means for guiding a mine line into the space between the cutting member and anvil, and explosive means for driving the cutting member through said line and against the anvil, whereby said pin is sheared off and the anvil and cutting member shoot out of the frame.

18. A mine anchor-line cutter comprising a frame, a free cutting member slidably mounted in the frame, an anvil spaced from the cutting end of said member, a shear pin extending transversely through the anvil and into the frame for holding the anvil in operative position, means for guiding a mine line into the space between the cutting member and anvil, explosive means for driving the cutting member through said line and against the anvil, whereby said pin is sheared off and the anvil and cutting member leave the frame, and means for closing the entrance to said space after the line has been cut.

19. A mine anchor-line cutter comprising a frame, a free cutting member slidably mounted in the frame, an anvil spaced from the cutting end of said member, a shear pin extending transversely through the anvil and into the frame for holding the anvil in operative position, means for guiding a mine line into the space between the cutting member and anvil, explosive means for driving the cutting member through said line and against the anvil, whereby said pin is sheared off and the anvil and cutting member leave the frame, and means normally held retracted by said pin for closing the entrance to said space after the pin has been sheared off.

20. A mine anchor-line cutter comprising a frame, a free cutting member slidably mounted in the frame, an anvil spaced from the cutting end of said member, a shear pin extending transversely through the anvil and into the frame for holding the anvil in operative position, means for guiding a mine line into the space between the cutting member and anvil, said pin having a head, means for closing the entrance to said space normally held in open position by said head, and explosive means for driving the cutting member through said line and against the anvil, whereby said pin is sheared off and its head releases said space-closing means.

21. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame, said frame being provided with a recess adjacent the cutting end of said member for receiving a mine line, explosive means for driving the cutting member through said line, and means for closing the entrance to said recess after the line has been cut.

22. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame, said frame being provided with a recess adjacent the cutting end of said member, a guide member movably attached to the frame for guiding a mine line into said recess, explosive means for driving the cutting member through said line, and means for moving said guide member across the entrance to said recess after the line has been cut.

23. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame, said frame being provided with a recess adjacent the cutting end of said member, a normally open gate pivotally connected to the frame beside said recess, explosive means for driving the cutting member through said line, and means for swinging said gate across the entrance to said recess after the line has been cut.

24. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame, said frame being provided with a recess adjacent the cutting end of said member, a gate pivotally connected to the frame beside said recess, means normally holding the gate open, explosive means for driving the cutting member through said line, the moving cutting member releasing said gate-holding means, and means for swinging the released gate across the entrance to said recess.

25. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame, said frame being provided with a recess adjacent the cutting end of said member, a normally open gate pivotally connected to the frame beside said recess, explosive means for driving the cutting member through said line, and means for swinging said gate across the entrance to said recess after the line has been cut, said gate being shaped to straddle the cutting member in said recess.

26. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame, said frame being provided with a recess adjacent the cutting end of said member, a gate pivotally connected to the frame beside said recess, a shear pin extending across the path of travel of the cutting member and normally holding the gate open, explosive means for driving the cutting member through said line, the moving cutting member caus-

ing the shear pin to be sheared off to release said gate, and means for swinging the released gate across the entrance to said recess.

27. A mine anchor-line cutter comprising a frame, a cutting member carried by the frame, said frame being provided with a line-receiving recess adjacent the cutting end of said member, a removable anvil in the end of the recess opposite to the cutting member, a gate pivotally connected to the frame beside said recess, a shear pin connecting the anvil to the frame and projecting from the frame, the projecting portion of the pin being formed to normally hold the gate open, explosive means for driving the cutting member through said line and against the anvil, the impact against the anvil causing it to shear off said pin whereby the anvil and cutting member can leave the frame and the gate is released, and means for swinging the released gate across the entrance to said recess.

28. A mine anchor-line cutter comprising a frame provided in its front side with a recess for receiving a mine line, a cutting member carried by the frame, explosive means for driving the cutting member across said recess to sever said line, and a fin on the forward portion of which said frame is mounted for holding the frame substantially horizontal while being towed through the water by a sweep line, the fin projecting forward beyond the front of the frame with its front edge substantially parallel to the sweep line and inclined back to the entrance of said recess for guiding mine lines to the recess.

29. A mine anchor-line cutter comprising a stabilizing fin adapted to be connected along its front edge to a sweep line, a frame mounted on said fin at an acute angle to said front edge and with the frame projecting beyond said edge, the front of the frame being provided with a recess for receiving a mine line, said recess having its entrance extending forward from said front edge of the fin, a cutting member carried by the frame, and explosive means for driving the cutting member across said recess to sever a mine line therein.

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