May 20, 1947. R. TEMPLE, JR 2,420,987

MINE CABLE CUTTER

Filed Dec. 31, 1941 2 Sheets-Sheet 1

Fig. 2.

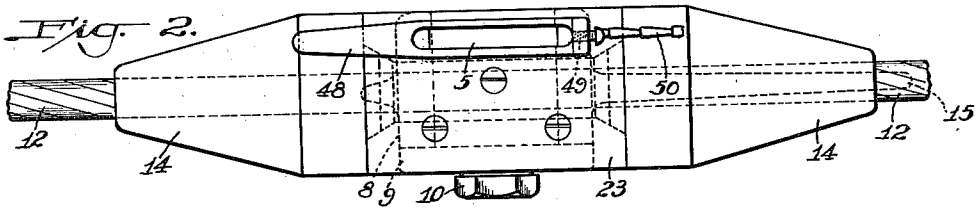


Fig. 1.

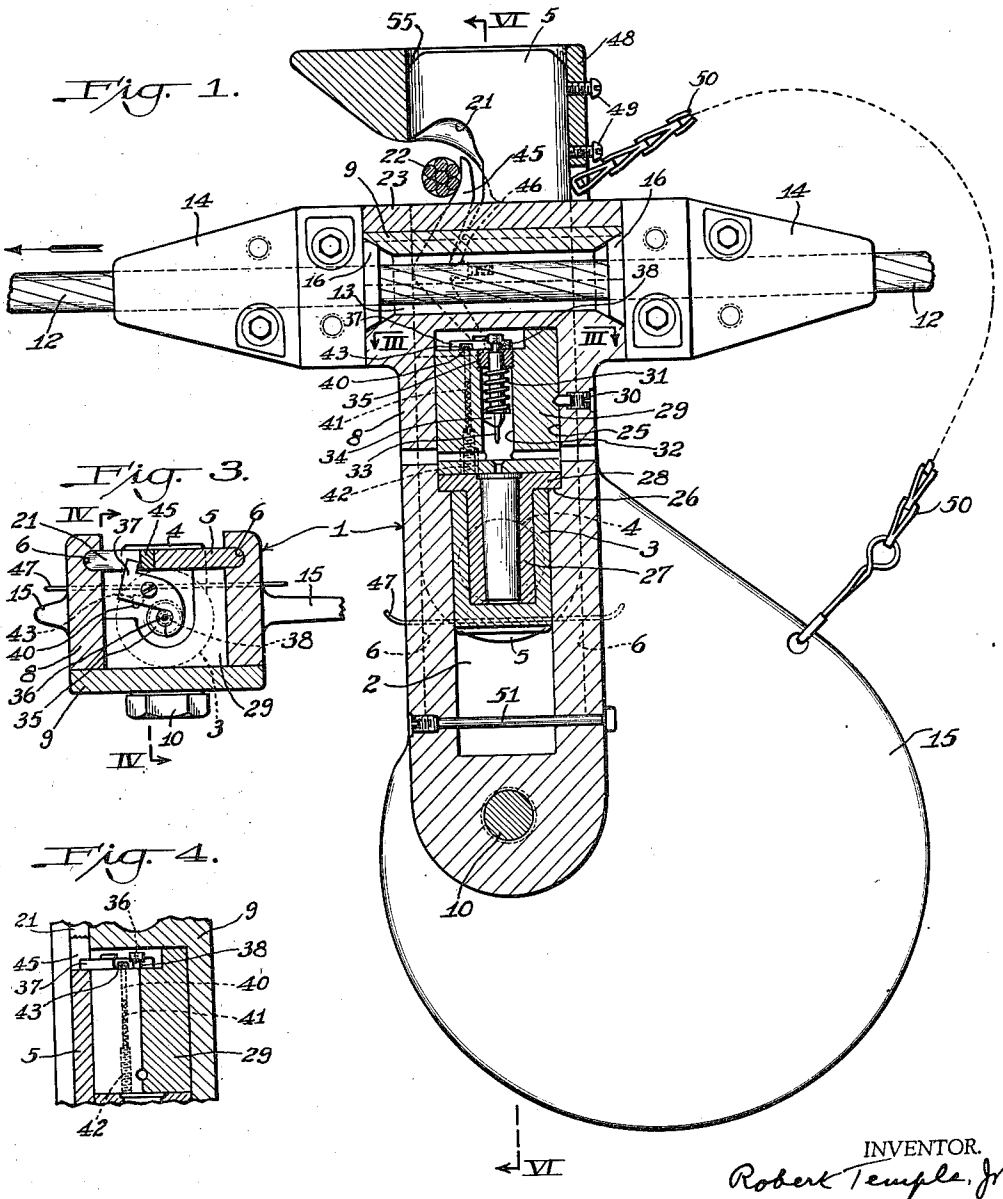


Fig. 3.

Fig. 4.

INVENTOR.
Robert Temple, Jr
BY Brown, Critchlow & Flick
his ATTORNEYS.

May 20, 1947. R. TEMPLE, JR 2,420,987

MINE CABLE CUTTER

Filed Dec. 31, 1941 2 Sheets-Sheet 2

Fig. 5.

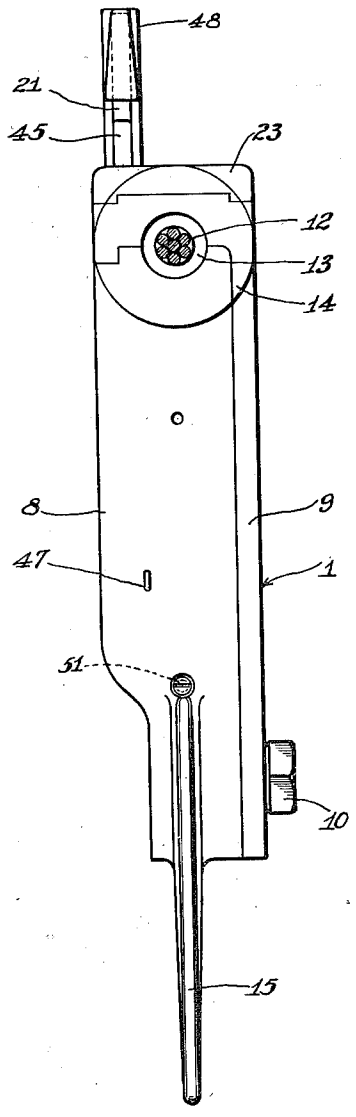
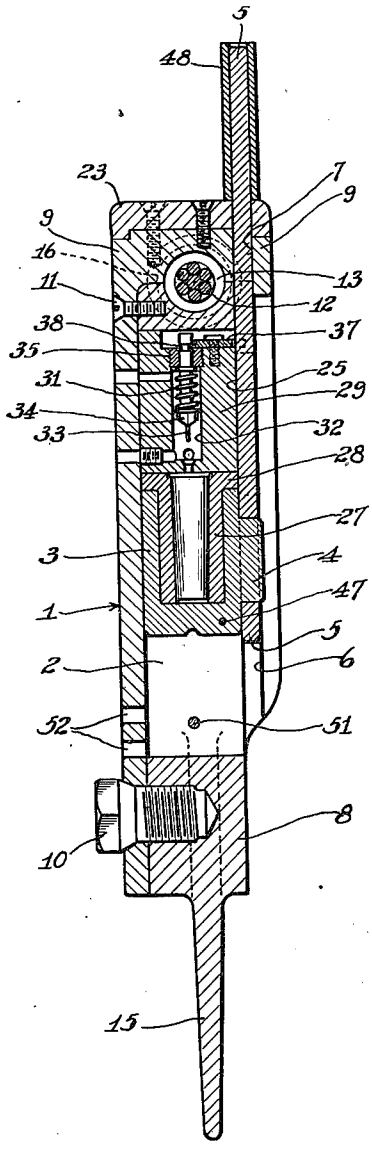


Fig. 6.



INVENTOR.
Robert Temple, Jr.
BY Brown, Critchlow & Flick
his ATTORNEYS.

Patented May 20, 1947 2,420,987

UNITED STATES PATENT OFFICE

2,420,987

MINE CABLE CUTTER

Robert Temple, Jr., Pittsburgh, Pa., assignor, by mesne assignments, to Temple Velocity Equipment, Inc., a corporation of Delaware

Application December 31, 1941, Serial No. 425,027

17 Claims. (Cl. 114—221)

1

This invention relates to cable cutters, and more particularly to devices for cutting the cables by which explosive mines are anchored in oceans and other bodies of water.

As a part of naval warfare light draft ships sail over mined waters in an endeavor to locate and explode the mines that have been planted there by the enemy. After a war is over the same practice may be followed in destroying mines that may have been planted by the same country that is clearing away the field. The ships or mine sweepers engaged in this work generally make use of cables that are towed along behind or between them for pulling the mines from their anchors or for exploding them.

It is among the objects of this invention to provide mine sweeping apparatus which cuts the cables that anchor the mines under water so that they will rise to the surface where they can be exploded by gun fire, which is operated by the mine cables themselves, which is dependable in operation, which can be used over and over, which maintains itself in operating position, which is guarded from accidental operation, and which can be used effectively in groups.

In accordance with this invention a cutter frame is provided with a slidably mounted piston and knife that are connected together. The frame is adapted to be connected to a sweep line towed through the water by a ship, and is so formed and mounted on the line as to maintain the knife substantially horizontal and at right angles to the sweep line. The knife has a recess in its front side for receiving a mine anchoring cable which is cut off against the frame when the knife is actuated. The actuating means comprises an explosive cartridge and a spring pressed firing pin that is released by a trigger which is so connected to the knife that when a mine cable enters the recess in the knife it moves the trigger and thereby fires the explosive charge. The frame is provided with a vane or fin that maintains the frame and knife substantially horizontal while it is being towed through the water by the sweep line. The end of the knife preferably projects from the end of the frame and is protected by a guard member that falls away from the frame when the knife cuts the cable so that the guard will not hook onto the next mine cable or prevent it from reaching an operable cutting device fastened to the same sweep line farther away from the ship. The cartridge is held in a tubular member mounted in stationary position in the frame and projecting into the piston which is hollow. The trigger is held in cocked position by a shear pin which is sheared off when the trigger is struck hard enough, such as by a mine cable.

2

The preferred embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a horizontal section through my cable cutter attached to a sweep line; Fig. 2 is an end view thereof; Fig. 3 is a transverse section taken on the line III—III of Fig. 1; Fig. 4 is a fragmentary longitudinal section taken on the line IV—IV of Fig. 3; Fig. 5 is an elevation of the rear side of the cutter; and Fig. 6 is a longitudinal section taken on the line VI—VI of Fig. 1.

Referring to the drawings a metal frame 1 is provided with a longitudinally extending guideway 2 in which a hollow piston 3 is slidably mounted. The piston has an integral pin 4 projecting from one side into an opening in the inner end of a blade or knife 5 that is slidable along one side of the guideway in parallel grooves 6 formed in the frame. The other end of the knife projects from the end of the frame through a slot 7 therein. The frame is made in two principal parts, a body 8 and a cover plate 9 (Fig. 6) that is held against the side of the guideway opposite to the knife by screws 10 and 11. The cover plate also extends across one end of the frame and contains the slot 7 through which the knife extends.

This cutting device is designed to be towed by a ship through the water in the direction of the arrow in Fig. 1 by means of a sweep line 12 to which it is attached. Although the cutter may be connected to the line in various ways, it is preferred to provide the end of frame 1 adjacent the projecting end of the knife with a passage 13 through which a sweep line can extend. One half of this passage is in the frame body 8 and the other half in the end portion of plate 9 so that when the plate is removed from the body the passage is opened for the reception of the sweep line. The cutter is held in any desired position along such a line by means of removable collars 14 clamped on the line in engagement with opposite sides of the frame. To maintain the device substantially horizontal as it is being drawn through the water the end of the frame farthest from the sweep line is provided with a vane or fin 15 preferably integral with the frame. Passage 13 is somewhat larger than line 12 and is provided at its ends with outwardly flaring side walls engaged by conical thrust bearings 16 that are held in place by collars 14. Consequently, sweep line 12 is free to turn in passage 13 without

rotating the cutter, and the cutter therefore maintains itself in cutting position.

As shown in Fig. 1, the projecting end of knife 5 has a recess 21 in its front side for receiving or hooking onto a mine-anchoring cable 22 as the cutter is drawn through the water. By forcefully moving the knife toward the opposite end of the frame as soon as the cable enters recess 21, the cable is sheared off against the adjacent end of the frame. To maintain a satisfactory cutting surface on the frame it is preferred to fasten a slotted hardened steel plate 23 to the end of the frame, as shown in Fig. 6.

Another feature of this invention is that the cutting movement of the knife is produced by means of an explosive charge. For this purpose a cartridge-retaining member is removably mounted in the frame which is provided with a recess 25 at the inner end of guideway 2. This recess is wider than the guideway, whereby shoulders 26 are formed at opposite sides of the frame as shown in Fig. 1. The cartridge-retaining member consists of a tubular portion 27 in which a cartridge is placed and that projects into the hollow piston 3 with which it has a sliding fit, and a flange 28 at its outer end that engages shoulders 26. The flange is held tightly against the shoulders by a breech block 29 snugly fitted in recess 25 between flange 28 and the opposite end of the recess. The breech block is held in place by the frame cover plate 9 and the knife, and also by a lock screw 30 threaded in the frame.

The breech block contains a central bore 32 in which a firing pin 33 is slidably mounted. One end of the bore is reduced in size and it is through this small passage that the tip of the firing pin is projected to discharge a cartridge held in the cartridge member. A coil spring 31 encircles the shank of the firing pin between a head 34 near its inner end and a screw plug 35 threaded in the breech block and in which the outer end of the firing pin is slidably mounted. The outer end of the firing pin is provided with a threaded opening 36 (Fig. 3) for receiving the threaded end of a tool, not shown, by which the pin can be pulled out through the screw plug to compress the coil spring and thus cock the device. The pin is held in cocked position by means of a dog 37 (Fig. 3) pivotally mounted on the end of the breech block and having an arcuate end adapted to be swung manually into an annular groove 38 in the projecting end of the pin. The opposite end of the dog is adapted to project beyond the side of the breech block and into the inner end of knife recess 21 as shown in Figs. 3 and 4.

The chance of accidentally releasing the firing pin is minimized by a shear pin 40 slidably mounted in a small bore in the breech block beside firing pin bore 32. The shear pin is pressed against the bottom of dog 37 by a spring 41 compressed between the pin and a screw plug 42 in the opposite end of the small bore. When the dog is swung into firing pin retaining position, spring 41 forces the shear pin outwardly into a small depression 43 in the bottom of the dog and thereby holds the dog in position until enough force is applied to its projecting end to shear off the shear pin. It will be seen that the shear pin operates automatically to hold the dog whenever it is swung into firing pin retaining position, and that the same shear pin can be used several times before it becomes too short and requires replacement.

To release the dog from the firing pin a trigger 45 is provided which is so connected to the knife that it is actuated by the mine cable 22 that is to be cut. The trigger is in the form of a lever having a laterally projecting boss 46 between its ends that rotatably interlocks with a notch in the inner wall of knife recess 21. This portion of the recess wall projects somewhat so as to form a fulcrum for the trigger. When the device is ready to be fired the laterally projecting end of dog 37 engages the side of the inner end of the trigger which is rocked on its fulcrum so that its outer end is spaced from the back of knife recess 21 across which it projects. Consequently, when the mine cable enters the recess it pushes the outer end of the trigger back against the knife and thus swings the inner end of the trigger forward, thereby causing the dog to cut off shear pin 40 and to rotate far enough to release the firing pin. The firing pin discharges the cartridge and the force of the explosion moves piston 3 along guideway 2 toward the opposite end of the frame. Pressure is allowed to build up in the piston before it starts to move because the piston can not move until the pressure is great enough to cause it to shear off another shear pin 47 extending entirely through the frame and piston in holes provided for that purpose. As the piston is suddenly forced toward the end of the frame it pulls the outer end of the knife toward the frame, whereby the knife cuts off cable 22 against plate 23 attached to the frame.

To prevent the projecting end of the knife from being knocked against something, such as the side of the boat when the cutter is being lowered into the water, and thereby shearing off the piston shear pin 47, the end of the knife is protected by a surrounding guard member 48 held thereon by the frictional engagement of screws 49 threaded in the guard. The guard may be shaped to help guide a cable into the knife recess, as shown in Fig. 1. When the cartridge is exploded and the knife drawn inwardly of the frame and out of the guard, the released guard falls away from the frame so that it will not hook onto the next mine cable and prevent it from reaching another cutter farther back along the sweep line. The knife guard is connected by a chain 50 to the fin 15 so that it will not be lost when released from the knife. The knife itself is drawn far enough into the frame to prevent its outer end catching on an uncut cable. The knife also may be provided with a beveled edge 55 to assure the cable sliding across the front end of the knife.

A strong enough explosive charge is contained in each cartridge to cause the cutting of the largest mine cable that the cutter will accommodate. In such cases most of the energy in the charge is utilized in cutting the cable so that the piston does not strike the end wall of the guideway with undue force. However, sometimes smaller cables are encountered and there is therefore danger that the piston will strike the end wall of the guideway so forcefully as to cause damage. To avoid this a rather heavy shear pin 51 is disposed in the frame near the outer end of the guideway across which it extends. The piston is slowed down considerably in shearing off this pin and therefore does not strike the frame too hard. Furthermore, it is preferred to make this pin of a soft material, such as copper, which crushes and acts as a cushion when forced against the frame by the piston. Bleed holes 52 (Fig. 6) are formed in

the cover plate to facilitate escape of water from behind the piston when the cartridge is fired.

To load and cock this cutter the cover plate 9 must first be removed from the frame body 8 so that piston 3, the cartridge-retaining member and breech block 29 can likewise be withdrawn from the frame. A cartridge is inserted in tubular member 27 which is then inserted in the hollow piston and the assembly is returned to the frame. A pin 4 on the piston must project into the opening provided for it in the knife which is projecting from the end of the frame, as shown in Fig. 1. The firing pin 33 is then pulled back and held by dog 37 and the block replaced in the frame with the projecting end of the dog against the front side of the inner end of trigger 45 ready to be released when the outer end of the trigger is struck by a mine cable. The cover plate is then screwed back onto the frame body to hold the piston in place.

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 cable cutter comprising a frame provided with a longitudinally extending guideway, a piston slidably mounted therein, a knife slidably mounted in said frame and connected to the piston, one end of said knife projecting from an end of the frame and being provided in its side with a recess for receiving a cable to cut it against the frame, means for holding a cartridge adjacent the piston, a spring pressed firing pin for the cartridge, means operable by a cable entering said recess for releasing the firing pin, and a guard provided with an opening for the projecting end of the knife, the wall of said opening in said guard frictionally engaging the knife whereby when the knife cuts a cable the knife is withdrawn from said opening and the guard falls away from the frame.

2. A mine cable cutter comprising a frame provided with a guideway, a hollow piston slidably mounted therein, a knife slidably mounted in said frame and connected to the piston, said knife being provided with a cable-receiving and cutting recess, a tubular cartridge-retaining member mounted in fixed position in said frame and projecting into said piston, a spring pressed firing pin for the cartridge, and means operable by a cable entering said recess for releasing the firing pin.

3. A mine cable cutter comprising a frame provided with a guideway, a hollow piston slidably mounted therein, a knife slidably mounted in said frame and connected to the piston, said knife being provided with a cable-receiving and cutting recess, a tubular cartridge-retaining member extending into said piston and provided at its outer end with a flange, said frame being provided at one end of the guideway with a recess in which said flange is disposed, said frame recess being wider than the guideway and forming therewith shoulders against which said flange bears, a breech block mounted in said frame recess in engagement with the outer side of said flange, said block having a passage therethrough, a spring pressed firing pin slidably mounted in said passage for discharging a cartridge in said tubular member, and means operable by a cable entering said knife recess for releasing the firing pin.

4. A mine cable cutter comprising a frame provided with a guideway, a piston slidably mounted therein, a knife slidably mounted in said frame and connected to the piston, said knife being provided with a cable-receiving and cutting recess, means for holding a cartridge adjacent the piston, a spring pressed firing pin for the cartridge, a pivoted dog for holding the firing pin in cocked position, a shear pin for holding the dog in cocking position, and a trigger operable by a cable entering said recess for causing said dog to shear off the shear pin and thereby release the firing pin.

5. A mine cable cutter comprising a frame provided with a guideway, a piston slidably mounted therein, a knife slidably mounted in said frame and connected to the piston, said knife being provided with a cable-receiving and cutting recess, means for holding a cartridge adjacent the piston, a spring pressed firing pin for the cartridge, a pivoted dog for holding the firing pin in cocked position, a shear pin, a spring pressing the shear pin toward one face of the dog, said face being provided with a recess for receiving the end of the shear pin when the dog is in cocking position, and a trigger operable by a cable entering said cable-receiving recess for causing said dog to shear off the shear pin and thereby release the firing pin.

6. A mine cable cutter comprising a frame provided with a guideway, a piston slidably mounted therein, a knife slidably mounted in said frame and connected to the piston, said knife being provided with a cable-receiving and cutting recess, means for holding a cartridge adjacent the piston, a spring pressed firing pin for the cartridge, a dog for holding the firing pin in cocked position and provided with a lateral projection, and a trigger pivotally connected between its ends to said knife, one end of the trigger being adapted to be engaged by a mine cable and swung backwardly so as to swing its opposite end forward, and said opposite end being positioned to actuate said dog and thereby release the firing pin.

7. A mine cable cutter comprising a frame provided with a longitudinally extending guideway, a piston slidably mounted therein, a knife slidably mounted in said frame at one side of the guideway and projecting from the end of the frame, means connecting the knife to the side of the piston, the projecting end of the knife having a recess in its side for receiving a cable to cut it against the end of the frame, explosive-firing means adjacent said piston for driving the piston, and means in said knife recess actuatable by a cable entering the recess for operating said explosive-firing means.

8. A mine cable cutter comprising a frame provided with a guideway, a piston slidably mounted therein, a knife slidably mounted in said frame and connected to the piston, said knife being provided with a cable-receiving and cutting recess, means for holding a cartridge adjacent the piston, a spring pressed firing pin for the cartridge, means operable by a cable entering said recess for releasing the firing pin, and a shear pin extending across said guideway for cushioning the impact of the piston against the end wall of the guideway when the cartridge explodes.

9. A mine cable cutter comprising a frame provided with a guideway, a piston slidably mounted

therein, a knife slidably mounted in said frame and connected to the piston, said knife being provided with a cable-receiving and cutting recess, means for holding a cartridge adjacent the piston, a spring pressed firing pin for the cartridge, means operable by a cable entering said recess for releasing the firing pin, one end of the frame being provided with a passage for loosely receiving a sweep line, bearings rigidly disposed on said line and projecting into the ends of said passage and engaging the wall thereof, and a fin at the other end of the frame for holding it substantially horizontal while being towed through water by the sweep line regardless of twisting of the line.

10. A mine cable cutter comprising a frame provided with a guideway, a piston slidably mounted therein, a knife slidably mounted in said frame and connected to the piston, said knife being provided with a cable-receiving and cutting recess, means for holding a cartridge adjacent the piston, a spring pressed firing pin for the cartridge, means operable by a cable entering said recess for releasing the firing pin, and a shear pin of soft metal extending across said guideway for cushioning the impact of the piston against the end wall of the guideway when the cartridge explodes.

11. A mine cable cutter comprising a substantially horizontal frame formed at its front end for attachment to a sweep line extending transversely thereof, said frame being provided with a guideway extending longitudinally thereof, a piston slidably mounted in the guideway, a knife slidably mounted in said frame beside the piston and connected thereto, the front end of said knife projecting beyond the front end of the frame and being provided in its side with a recess for receiving a mine cable to cut it against said end of the frame, means for holding a cartridge adjacent the piston, a spring-pressed firing pin for the cartridge, and means operable by a cable entering said knife recess for releasing the firing pin.

12. A mine cable cutter comprising a frame provided with a longitudinally extending guideway, a piston slidably mounted therein and having a laterally projecting boss, a knife slidably mounted in said frame at one side of the guideway and projecting from the end of the frame, the inner end of the knife having an opening receiving said boss, the projecting end of the knife having a recess in its side for receiving a cable to cut it against the end of the frame, explosive-firing means adjacent said piston for driving the piston, and means in said knife recess actuatable by a cable entering the recess for operating said explosive-firing means.

13. A mine cable cutter comprising a frame provided with a longitudinally extending guideway, a piston slidably mounted therein, a knife slidably mounted in said frame at one side of the guideway and projecting from the end of the frame, means connecting the knife to the side of the piston, the projecting end of the knife having a recess in its side for receiving a cable to cut it against the end of the frame, explosive-firing means adjacent said piston for driving the piston, the inner wall of said knife recess having a notch therein, an elongated trigger in the recess having a boss between its ends projecting into and interlocking with said notch to make the trigger tiltable longitudinally, one end of the trigger being adapted to be engaged by a mine cable and swung backwardly so as to swing its opposite end forward, and said opposite end being adapted when swung forward to operate said explosive-firing means.

14. A tether-cutting device, comprising a body, a severing element longitudinally slidable in said body, said element having an arcuate cutting portion that projects outside and faces toward said body when said device is set and is retracted into said body when said device is tripped to cooperate shear-wise with said body, a breech in said body, a spring-actuated firing pin in said breech, a sear engageable with said firing pin to hold said pin in cocked position, a trigger rockably mounted in said element adjacent said cutting portion whereby an object contacting said trigger will lie in the path of said cutting portion as said element is retracted into said body, said trigger being engageable with said sear to release said firing pin when said trigger is so contacted, and a piston slidable in said body and connected to said severing element, said piston having in it an explosive-charge chamber closed at one end and disposed with its other end abutting said breech when said severing element is projected, to position a charge in said chamber to be fired by said firing pin when said pin is released, whereby firing of said charge drives said piston away from said breech, which retracts said severing element into said body and severs an object that contacts said trigger.

15. A tether-cutting device comprising a body, a severing element reciprocally extending into said body, said element having a cutting portion that projects outside and faces toward said body when said element is set and is reciprocated into said body when said element is tripped to cooperate shear-wise with said body, trigger means trippable by a tether between said cutting portion and said body, an explosion operated means responsive to tripping of said trigger means to retract said cutting portion of said element into said body, and a tether guide detachably securable to said element while said element is in projecting position.

16. A tether-cutting device comprising a body, a severing element reciprocally extending into said body, said element having a cutting portion that projects outside and faces toward said body when said element is set and is reciprocated into said body when said element is tripped to cooperate shear-wise with said body, trigger means trippable by a tether between said cutting portion and said body, an explosion operated means responsive to tripping of said trigger means to retract said cutting portion of said element into said body, a tether guide detachably securable to said element while said element is in projecting position, and loss-preventing means securing said tether guide to said body when said guide is detached from said element by reciprocation thereof.

17. A tether cutting device comprising a body, a cable, means for rotatably mounting said body on said cable, means preventing said body from moving longitudinally of said cable, a severing element reciprocally extending into said body, said element having a cutting portion that projects outside and faces toward said body when said element is set and is reciprocated into said body when said element is tripped to cooperate shear-wise with said body, fin means on said body causing said body to rotate as said body mounting cable is drawn through water to direct the cutting portion forward of said body and said body mounting cable, trigger means trippable by

a tether between said cutting portion and said body, an explosion operated means responsive to tripping of said trigger means to retract said cutting portion of said element into said body, a beveled edge on said severing element extending forwardly of said body when said severing element is in retracted position, said longitudinal motion preventing means being sloped from said cable to the forward end of said body, whereby a first tether contacting said cable may ride over said longitudinal motion preventing means to the forward end of said body beneath said cutting portion and against said trigger, and a second tether contacted by said cable may ride over the beveled edge of said now retracted severing element to a further tether cutting device on said cable.

ROBERT TEMPLE, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,304,549	Dupont	May 27, 1919
1,397,911	Tossizza	Nov. 22, 1921
2,140,338	Temple	Dec. 13, 1938
2,017,329	Temple	Oct. 15, 1935

FOREIGN PATENTS

Number	Country	Date
134,069	Great Britain	Oct. 30, 1919
127,640	Great Britain	June 12, 1919
174,922	Germany	Sept. 21, 1906
308,571	Germany	Dec. 24, 1919
13,921	Great Britain	1914