M. CARRAU.

SHIP CONVOY SUBMARINE DEFENSE.

APPLICATION FILED APR. 16, 1918.

1,305,877.

Patented June 3, 1919.

4 SHEETS—SHEET 1.

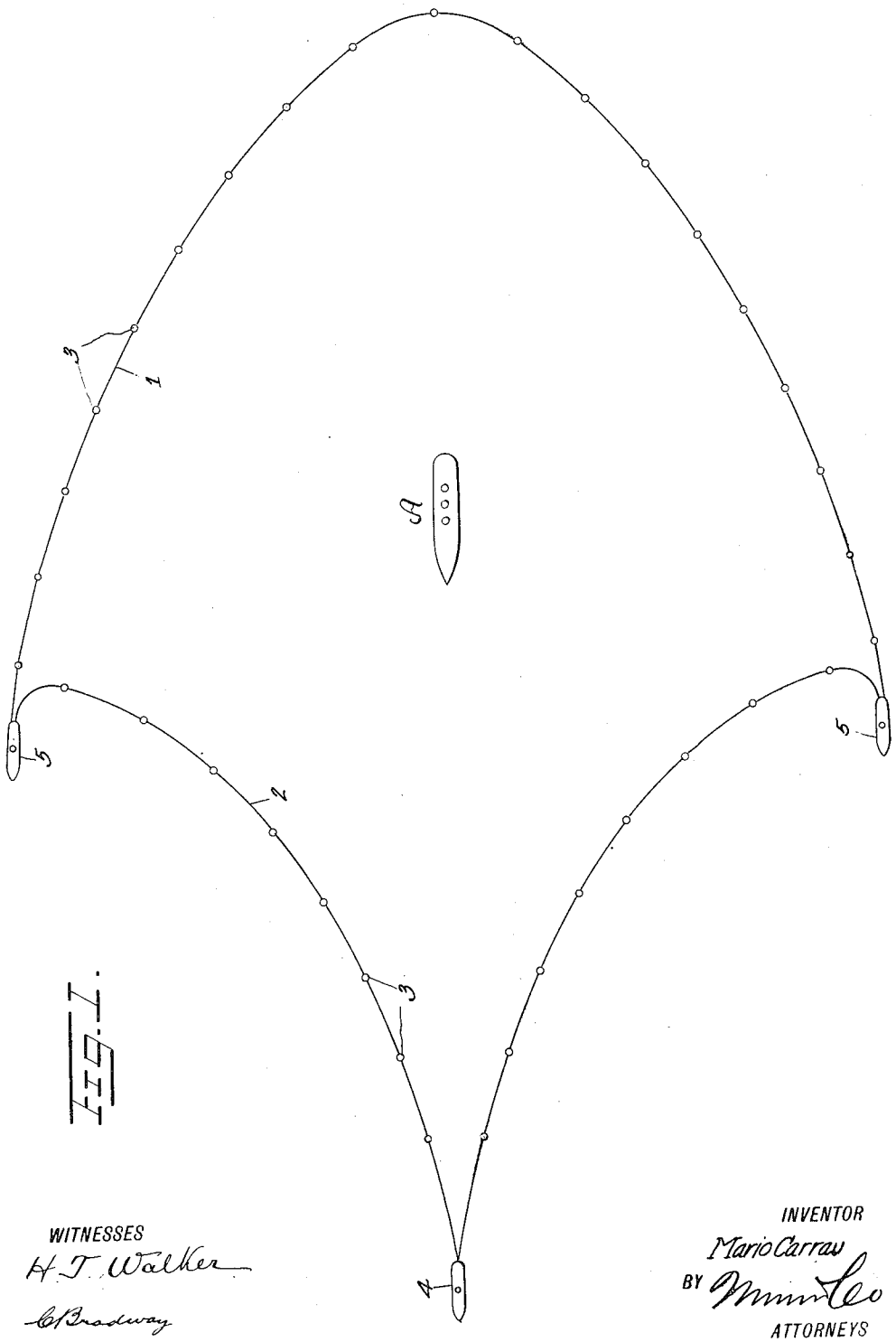


FIG. 1.

WITNESSES

H. T. Walker

C. F. Bradway

INVENTOR

Mario Carrau

BY Munn & Co

ATTORNEYS

M. CARRAU.

SHIP CONVOY SUBMARINE DEFENSE.

APPLICATION FILED APR. 16, 1918.

1,305,877.

Patented June 3, 1919.

4 SHEETS—SHEET 2.

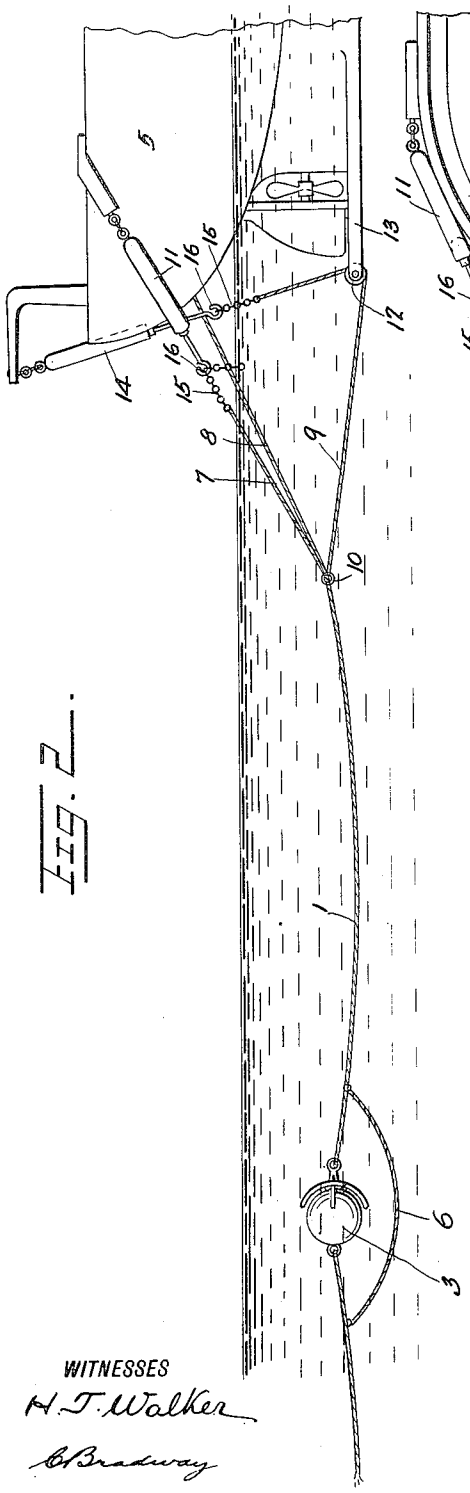


Fig. 2.

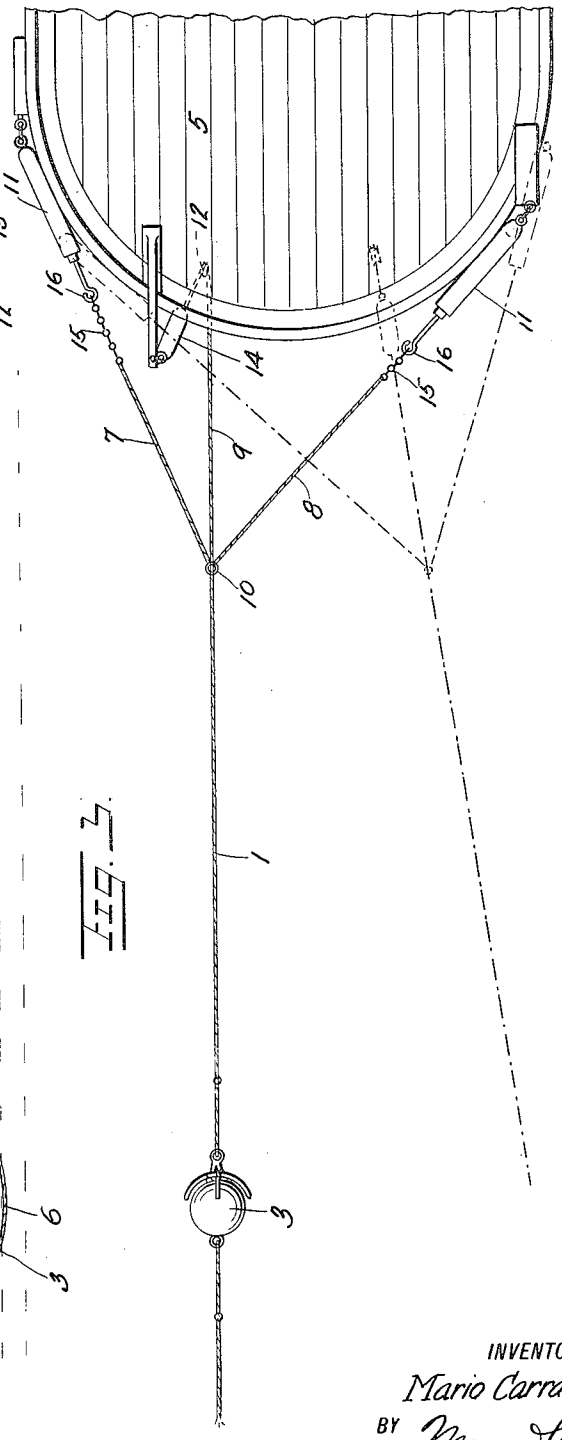


Fig. 4.

WITNESSES

H. T. Walker

C. Bradway

INVENTOR

Mario Carrau

BY Munn & Co

ATTORNEYS

M. CARRAU.

SHIP CONVOY SUBMARINE DEFENSE.

APPLICATION FILED APR. 16, 1918.

1,305,877.

Patented June 3, 1919.

4 SHEETS—SHEET 3.

Fig. 4.

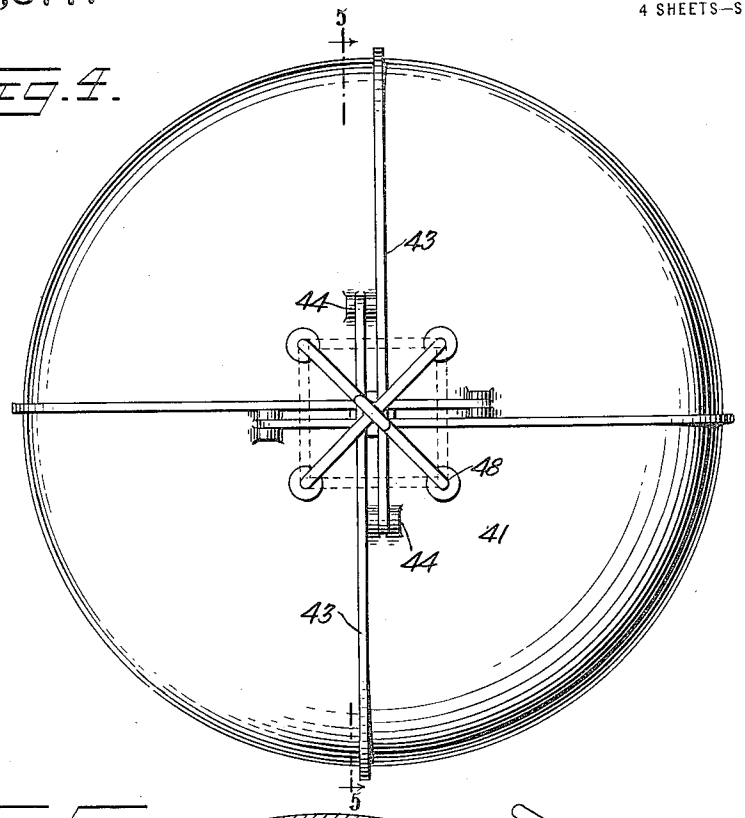
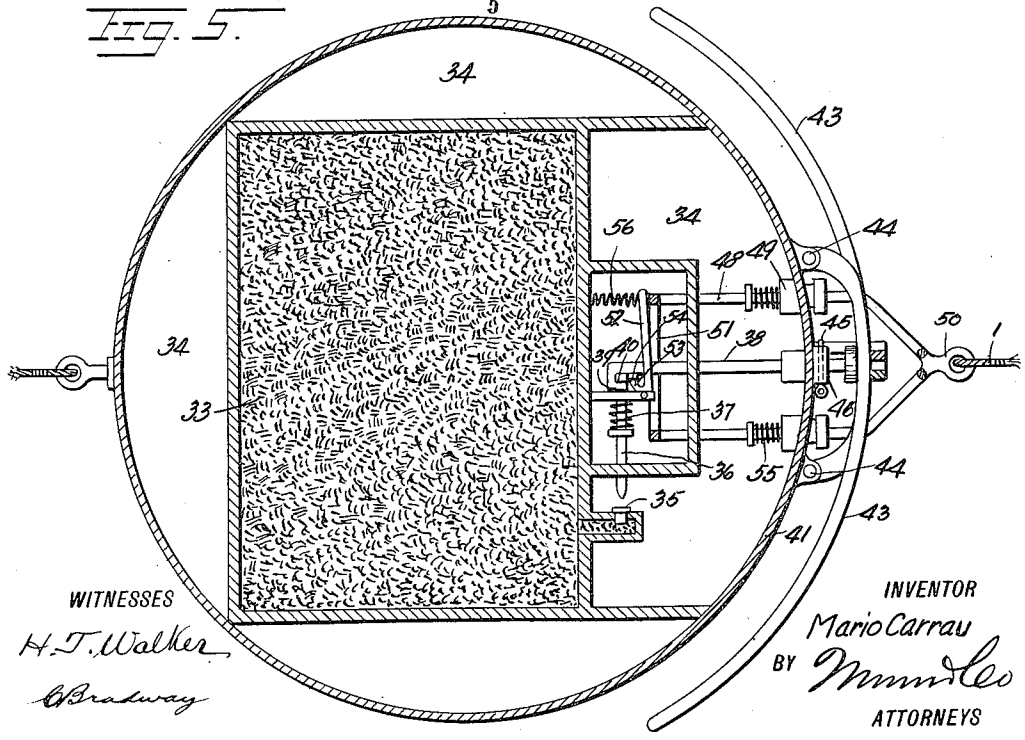


Fig. 5.



WITNESSES

H. T. Walker

C. Bradway

INVENTOR

Mario Carrau

BY Munn & Co

ATTORNEYS

M. CARRAU.

SHIP CONVOY SUBMARINE DEFENSE.

APPLICATION FILED APR. 16, 1918.

1,305,877.

Patented June 3, 1919.

4 SHEETS—SHEET 4.

Fig. 6.

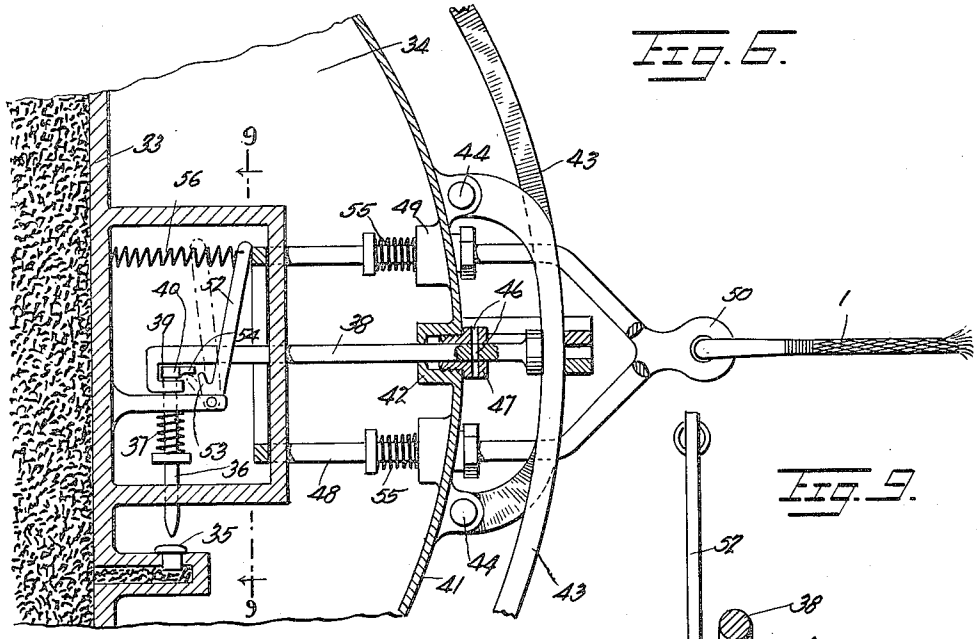


Fig. 9.

Fig. 7

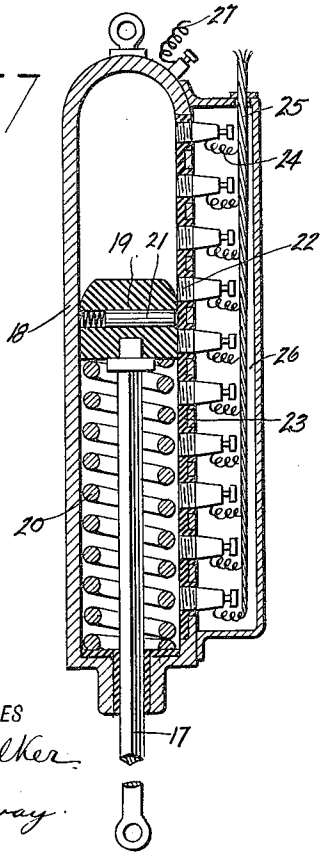
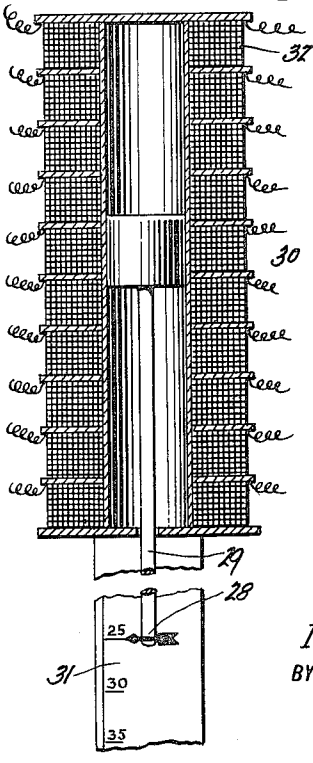


Fig. 8.



WITNESSES

H. T. Walker

C. Bradway.

INVENTOR

Mario Carrau

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

MARIO CARRAU, OF MONTEVIDEO, URUGUAY.

SHIP-CONVOY SUBMARINE DEFENSE.

1,305,877. Specification of Letters Patent. Patented June 3, 1919.

Application filed April 16, 1918. Serial No. 228,897.

To all whom it may concern:

Be it known that I, MARIO CARRAU, a citizen of Uruguay, and a resident of Montevideo, Uruguay, South America, have invented a new and Improved Ship-Convoy Submarine Defense, of which the following is a full, clear, and exact description.

This invention relates to the protection of vessels against the attacks of submarines, and it relates more particularly to a convoy by which one or more vessels are inclosed by submerged bomb-carrying cables looped from and towed by boats forming part of the convoy and maintained at such distances from the vessels being convoyed that a submarine cannot come within torpedo range of the vessels without encountering the cables and setting off a contact bomb or mine whereby the attacking submarine will be destroyed.

The invention has for its general objects to provide a simple, novel and effective submarine defense or barrier especially designed to be towed and having a novel arrangement of protective means for the trolling boats and the convoyed vessels so as to render the bombs or mines innocuous to the latter in case of any derangement or impairment of the system.

A more specific object of the invention is to provide a bomb or mine having a simple and effective firing device controlled by contact therewith of a submarine, and in combination therewith is a safety device to prevent firing of the bomb or mine when the pull on the towing cable should slacken, due to the stopping of the towing boats or the accidental breaking of the cable.

Another object is to so attach the towing cable to the towing boat that by suitable dynamometers and indicators it is possible to determine whether or not the bomb-carrying cable is in proper condition, and furthermore, the effective level of the towing point can be changed at will to bring about the proper level of the cable and bombs which, while being towed, are a suitable distance below the surface best suited for engagement by a submarine.

With such objects in view, and others which will appear as the description proceeds, the invention comprises various novel features of construction and arrangement of parts which will be set forth with particularity in the following description and claims appended hereto.

In the accompanying drawings, which illustrate one embodiment of the invention and wherein similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a plan view showing one of the various forms which the convoy system may take;

Fig. 2 is a side view showing the manner of connecting the bomb-carrying cable to a towing boat and the position the cable assumes while being towed;

Fig. 3 is a plan view of Fig. 2;

Fig. 4 is a view of the leading side of a mine or bomb;

Fig. 5 is a vertical sectional view on the line 5—5, Fig. 4;

Fig. 6 is a detail sectional view of the firing mechanism;

Fig. 7 is a detail sectional view of one of the dynamometers;

Fig. 8 is a detail sectional view of the electrical indicator for showing the pull or drag on the cable registered by the dynamometer; and

Fig. 9 is a detail sectional view on the line 9—9, Fig. 6.

Referring to Fig. 1, A designates a vessel which is inclosed in a submarine defense or barrier composed of a plurality of cables 1 and 2 having at spaced points on each a plurality of mines or bombs 3, the front cables 2 being connected at their front ends with a towing boat 4 and at their rear ends with lateral towing boats 5, and the cable 1 is attached wholly to the last-mentioned towing boats, the said towing boats being maneuvered to keep their proper distances from the convoyed vessel or vessels and traveling at the same speed as the latter. The cables are maintained at such a distance from the convoyed vessels that torpedoes cannot strike the latter, and consequently for submarines to come within range of the convoyed vessels they must encounter the cables and the bombs thereon. Obviously various arrangements of cables may be employed so as to better confuse the enemy.

The bombs 3 are spherical bodies of any suitable construction and material and when

free they are buoyant and will float on the surface, and they also are of such buoyancy that two bombs will support the weight of a section of cable lying between and connecting them. It is to be understood however that the bombs are only of sufficient buoyancy to support the cable connecting them and consequently when a draft is exerted on the bomb-carrying cable the bombs will be submerged to the proper depth for producing an effective defense or barrier against submarines. To reduce the strain on the towing cable the latter decreases in thickness rearwardly from the towing vessel, and consequently there is less liability of the cable breaking. Shunting each mine, as shown in Fig. 2, is a connecting piece of cable 6 which keeps the main cable intact when a mine is set off and destroyed, such connecting element 6 being attached to the cable sections at points in front and rear of a mine or bomb.

The manner of attaching a towing cable to a boat 4—5 is shown in Figs. 2 and 3, the cable having three branches 7, 8 and 9 united to the bomb-carrying cable at the point 10 which can be adjusted to vary the level at which the cable will be towed. The branches 7 and 8 are directly connected by dynamometers 11 with the boat 5, whereas the central branch 9 passes under a pulley 12 on the skeg 13 of the boat, and thence upwardly to connect with the dynamometer 14. Adjustable connections between each branch and its associated dynamometer are provided by means of chains 15 on the branches and hooks 16 on the piston rods 17 of the dynamometers. By adjusting the length of the chains on the branches the towing point 10 can be thrown up or down as well. By means of the dynamometers in connection with an idicator for each it is possible to determine the traction on each cable, and when the pull or traction becomes disturbed for any reason, as, for instance, a break, this fact will be noted by the indicators of the dynamometers.

Each dynamometer is constructed as shown in Fig. 7 and comprises a cylinder 18 in which slides a piston 19 of insulation that is connected with the piston rod 17, and behind the piston 19 is a stiff helical compression spring 20 which tends to oppose the draft or traction on the bomb-carrying cable. On the piston 19 is a spring-pressed contact 21 which is adapted to engage any one of the fixed contacts 22 arranged in a line in an insulating support 23. Each stationary contact is connected by a separate wire 24 of a cable 25 which leads out of the cable box 26 on the cylinder 18. The electric cable 25 leads to a point in the cabin or pilot house of the boat where are arranged indicators such as that shown in Fig. 8. The contact 21 is suitably grounded on the cylinder, which may be connected to a common return wire 27 that leads to the indicator.

The indicator, Fig. 8, comprises a hand 28 carried on a rod 29 of a magnetic core 30, the hand moving over a scale or dial 31 whereby the pull on the bomb-carrying cable can be accurately read. The core 30 is operated on by a solenoid made up of sections 32 which are each connected with a wire on the cable 25 of the dynamometer. When there is no pull on the dynamometer the core will be at its uppermost position, and as a pull is exerted on the dynamometer the sections 32 are successively energized in a downward order so as to pull the core 30 down step by step, whereby the hand 28 is moved along the dial or scale 31. As the pull on the dynamometer is decreased the piston 19 carries the contact 21 upwardly so that the solenoid sections are energized in reverse order to pull the core 30 upwardly.

The bombs and their firing mechanisms are constructed as shown in Figs. 4 to 6 inclusive. In the bomb is a chamber 33 which holds the explosive, and air pockets 34 serve to give the necessary buoyancy to the bomb. A percussion cap 35 serves to ignite the explosive when the firing pin 36, pressed by a spring 37, is released. A trigger member 38 normally holds the firing pin set, such trigger being provided with a hook 39 which engages under the head 40 of the firing pin. The trigger member passes out through the shell 41 of the bomb through a stuffing-box 42, and the outer end is in cooperative relation with a plurality of pairs of crossing antennæ in the form of levers 43 fulcrumed at 44 on the shell 41. These antennæ radiate from a point which is in line with the towing cable 1 or 2 connected with the bomb so that if a submarine encounters the cable it will slide along the same and engage one of the levers 43 and cause the latter to press the trigger 38 inwardly and thereby release the firing pin, which will result in the explosion of the bomb and destruction of the submarine. The trigger can be locked in safety position by inserting a pin or bolt 45, Fig. 5, through registering apertures 46 in the trigger and the gland nut 47 of the packing box 42.

It is desirable to render the firing mechanism inoperative when the cable breaks and the bombs are likely to move into contact with the ship or ships being convoyed, and for this purpose any slack on the cable will cause any firing pin to be locked against its release. The cable is attached to a movable frame having a plurality of rod-like members 48 which pass through stuffing-boxes 49, and their outer ends merge into an eye 50 to which the cable 1 is fastened. The members 48 are connected at their inner ends

by cross bars 51, one of which engages a spring-pressed latch 52 which has a projection 53 that is engageable under a projection 54 on the firing pin, as shown by dotted lines. Fig. 6, when the movable cable-attaching frame moves inwardly, as when there is a slack on the cable, said frame having its members 48 provided with springs 55, which tend to move the frame inwardly, or any equivalent means may serve for this purpose. A spring 56 acts on the latch 52 to hold the same in released position when there is a pull on the cable, and the attaching frame between the cable and bomb is pulled outwardly to the position shown in Fig. 6, but when the frame moves inwardly, as shown in Fig. 5, the latch 52 locks the firing pin against being released, even though the trigger 38 should be moved to releasing position. As soon as a pull is restored to the cable the frame moves from the position shown in Fig. 5 to that shown in Fig. 6, and the firing pin is automatically released from the latch 52 and is ready to be released by the trigger when any lever 43 is moved by contact with a submarine.

From the foregoing description taken in connection with the accompanying drawings, the advantages of the construction and method of operation will be readily understood by those skilled in the art to which the invention appertains, and while I have described the principle of operation, together with the apparatus which I now consider to be the best embodiment thereof, I desire to have it understood that the apparatus shown is merely illustrative and that such changes may be made when desired as fall within the scope of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A submarine defense system of the class described, comprising a towing ship, a cable made up of sections, contact explosive devices between the sections, and flexible connecting elements connecting the sections at the said devices to prevent disruption of the cable when a device is exploded.

2. A submarine defense system of the class described comprising a towing boat, a bomb-carrying cable having a plurality of branches, and a dynamometer connecting each branch with the boat.

3. A submarine defense system of the class described comprising a towing boat, a bomb-carrying cable having a plurality of branches, and a dynamometer connecting each branch with the boat, each branch having means for lengthening or shortening the same to vary the towing point between the cable and its connection with the branches.

4. A submarine defense system of the class described including a towing boat, a bomb-carrying cable towed by the boat in a submerged condition, a plurality of branches on the cable, certain of the branches extending upwardly and adjustably connected with the boat and another branch extending downwardly from the cable and thence upwardly to adjustably connect with the boat, and a guide on the boat for the last-mentioned branch and arranged below the point where such branch connects with the cable.

5. In a submarine defense system, a tow boat, three dynamometers on the boat, one at each side and one approximately at the center, and a bomb carrying cable having three branches secured to the dynamometers, the branch secured to the centrally arranged dynamometers extending downwardly therefrom over a guide on the lower part of the boat.

6. A submarine defense system of the class described including a towing boat, a bomb-carrying cable towed by the boat and having a plurality of connections with the boat at different points, each connection including a dynamometer, each dynamometer including a movable contact movable successively over stationary contacts, and an indicator having a plurality of magnet sections energized successively by the movement of the movable contact over the fixed contacts, and an indicator element operated by the magnet sections.

7. A submarine defense system of the class described comprising a towing cable, bombs, means connecting the bombs with the cable, a firing mechanism on each bomb including a plurality of contact levers radiating from the point of attachment of the bomb on the cable, and means controlled by the bomb connecting means for preventing the operation of the firing mechanism when the pull is removed from the cable.

8. In a submarine defense system of the class described, the combination of a towing cable, a bomb, a movable frame attaching the bomb to the cable, a firing mechanism including a plurality of movable contact members, and means for preventing the operation of the mechanism by the movement of the frame when the pull is removed from the cable.

9. A submarine defense system of the class described including a cable, a bomb, a movable frame extending into the bomb and forming attaching means between the latter and the cable, a firing pin in the bomb, a trigger releasably engaging the pin, members on the outside of the bomb and normally engaging the trigger, whereby movement of any member will release the trigger from the firing pin, and a latch movable by the member when the pull on the cable is removed to engage the firing pin and prevent operation thereof.

10. In a submarine defense system, a bomb, a movable frame in the bomb, two spring pressed rods secured to the frame and having their ends projecting through the bomb and secured together and to which a cable is adapted to be secured, a spring pressed firing pin in the bomb, a sliding trigger for holding the firing pin set, said trigger projecting through the bomb, levers fulcrumed on the bomb for operating the trigger and a spring pressed latch engaging the frame and adapted to engage the firing pin.

MARIO CARRAU.

Witnessed by:
GEORGE R. OTALY,
WILLIAM SAMOR.