NOTES ON TORPEDO FUZES

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BY

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TORPEDO FUZES.

DEFINITION.—The term Fuze is generally applied to any contrivance used to ignite, at a desired time, a distant charge of explosive material.

CLASSIFICATION.—Torpedo fuzes may be classified according to their mode of operation, as *Percussion, Friction, Chemical, and Electric Fuzes.*

PERCUSSION FUZES

COMPRISE WHAT?—Percussion fuzes comprise all fuzes in which the flame is produced by a blow on some fulminating compound.

The fulminate is generally used in the form of the ordinary percussion cap, percussion cannon-primer, or in a similar form.

The blow may be produced in various ways:

(1.) By releasing a compressed spring which acts on a hammer.
(2.) By the dropping of a weight.
(3.) By the impact of a moving body.

(1.)

SINGER'S SYSTEM.—Plate I, Fig. 1, shows a single percussion apparatus. A is the trigger, B the hammer, C a spiral spring, D an iron firing rod having a percussion cap on the end, E a thumb-screw holding the firing rod in position, F a composition rod having lugs G G for the hammer and firing rod to work through, and H a face plate to serve as a fulcrum for the trigger.

Fig. 2 shows the method of multiplying the number of points of ignition.

Fig. 3 represents the apparatus in position, and shows the manner of working it; K is a cast-iron cap placed on top of the torpedo,

and retained in position by a projecting ring *r r*. The cap is attached by means of a wire to the triggers.

When the torpedo is struck by a passing vessel, the cap K is knocked off, and in falling pulls out the trigger. The hammer being released, is forced up by the spring and strikes the end of the firing rod, thus exploding the cap. The entire lock should be covered to protect it from rust, and to prevent the accumulation of marine grass and shell-fish.

Application.—Apparatus of this form can only be used with buoyant torpedoes. It was used extensively by the Confederates, and with greater effect than any other variety of torpedo. It possesses the merit of simplicity, and would not be likely to get out of order. But it is best to avoid as far as possible the use of springs in torpedoes which are to remain in position any length of time.

CLOCK-WORK SYSTEM.—Plate I, Fig. 4, shows the general features of this form of apparatus.

It consists of a train of clock-work carrying on the axis to which the main-spring is attached a small wheel graduated as represented, and having a recess cut in its circumference.

Fig. 5 shows the details of the exploding mechanism, N is a cylinder containing the hammer B and the spring C; D is the cone-seat, and E the cone of a musket, on which is placed the percussion cap F. G is a lever, the toe of which catches under the collar H on the hammer; I is a small stud in the lever which rests on the circumference of the wheel K, and thus keeps the hammer up. As the wheel K revolves, the recess L is brought under the stud I, which drops into it; thus allowing the arm of the lever G to descend, and releasing the hammer which is forced down on the cap by the spring G.

The wheel K can be set at will like an alarm clock, thus securing the action of the hammer at any desired time.

Application.—This form of fuze, which is in reality a time-fuze, is used in torpedoes which are intended to be exploded after a given interval of time, *e. g.*, "current or drifting torpedoes." Torpedoes of this class are placed in a river or tide-way, and left to drift towards the object to be attached; and the fuze must be so con-

structed as to explode when they have reached that object, that is, after a given length of time, depending on the strength of the current and the distance. In torpedoes designed to blow up bridges and obstructions in rivers, this form of fuze can be used to advantage.

McEvoy's System.—Plate I, Fig. 5. A represents an arm pivoted in the center, and having at one end a many bladed screw-propeller of sheet-tin; B C is a worm attached to the propeller, and turning with it. D is a hammer retained at full cock by the lever E, which is secured to the sleeve F. This sleeve travels freely on the arm A. The outer end of the lever has a curved arm which works in the thread of the worm. G is a percussion primer. A few turns of propeller withdraws the lever E, and permits the hammer to fall on the primer.

Application.—The apparatus is designed to be used with "current or drifting torpedoes." As long as the torpedo is free to move with the current or tide, the propeller will not turn; but as soon as its motion is arrested, the propeller commences to revolve, and soon releases the hammer and causes the explosion.

This form has an advantage over the clock-work system, as it is not likely to be exploded except when in actual contact with an obstacle; and as the explosion occurs immediately upon arresting its progress, there is no opportunity for an enemy to remove it before the explosion takes place.

(2.)

The Weight System.—Plate I, Fig. 6. A is a tube about 2½ inches in diameter running longitudinally through the torpedo case. B is a metallic plug secured in the end of the tube, and serving as a seat to an ordinary musket-nipple C. D is a tube used as a hand-hole in adjusting the cap. E is an iron ball about 2 inches in diameter held in position by the pin F. This pin passes through a stuffing box at G, and has a laniard H attached to it.

The air-chamber in the end of the torpedo causes it to take an upright position. A slight jerk on the laniard H withdraws the pin F and permits the ball to fall on the cap.

Application.—Fuzes constructed on this principle have been used

successfully with spar torpedoes; for instance, in the destruction of the "Albemarle."

A modification of the form was also used on the powder-boat "Louisiana."

Although successful in the case named above, this form of fuze is not considered as well adapted to offensive torpedoes. It would probably only be employed in cases where it was necessary to improvise a fuze from such material as could be easily obtained.

(3.)

THE CONTACT SYSTEM.—This system requires a fulminating compound more sensitive than that used in either the percussion cap or cannon-primer. A very good compound has been prepared by Mr. Hill, chemist to the torpedo station. It is made by finely powdering and mixing together, under alcohol, the following ingredients:

Potassic Chlorate	($K Cl O_3$) . . .	60.50 per cent.
Antimonius Sulphide	($S b_2 S_3$) . . .	33.50 per cent.
Red Phosphorous	(P) . . .	6.00 per cent.

Plate I, Fig. 8, shows the form of the primer usually employed. A is a small paper tube, one end of which is stopped with a wad of tissue-paper and dipped in wax. The other end is glued into the hole in a small disc of wood, B. The tube is then filled with fine rifle powder, and a piece of tissue-paper is glued over the disc to confine the powder. The cone C is made by taking a piece of thick paper, cut as shown in Fig. 9, and gluing the two edges E E together. This cone is turned base up and filled about one-third with ground quartz. The remaining space is filled with the composition described above, which has previously been dried and pulverized. The upper surface of the disc having received a little glue, is now placed on the base of the cone and held there until the glue sets. The primer is then coated with shellac.

Plate I, Fig. 10, is the stock used with the primer; all the parts being made of gun composition, or of some similar metal not easily affected by sea water. A A is the stock, B a plunger, C the primer seat, and D a spiral spring which keeps the plunger from coming in contact with the primer head until force is applied; E is a thin cap of soft well-annealed copper called the water-cap. F is a safety