WOOD & LAY.

Marine Torpedo.

No 47,776. Patented May 16, 1865.

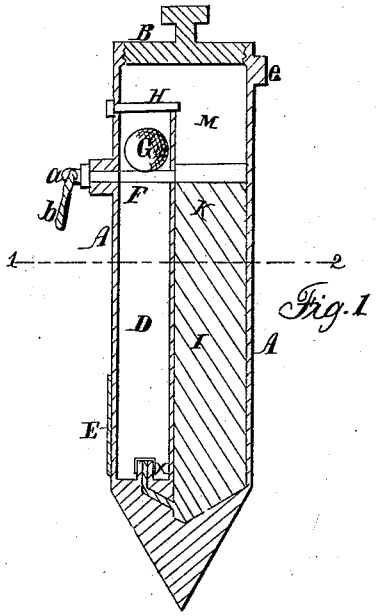

Fig. 1

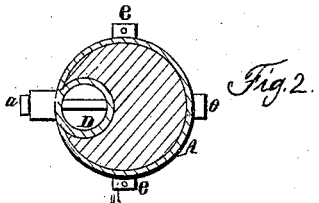

Fig. 2.

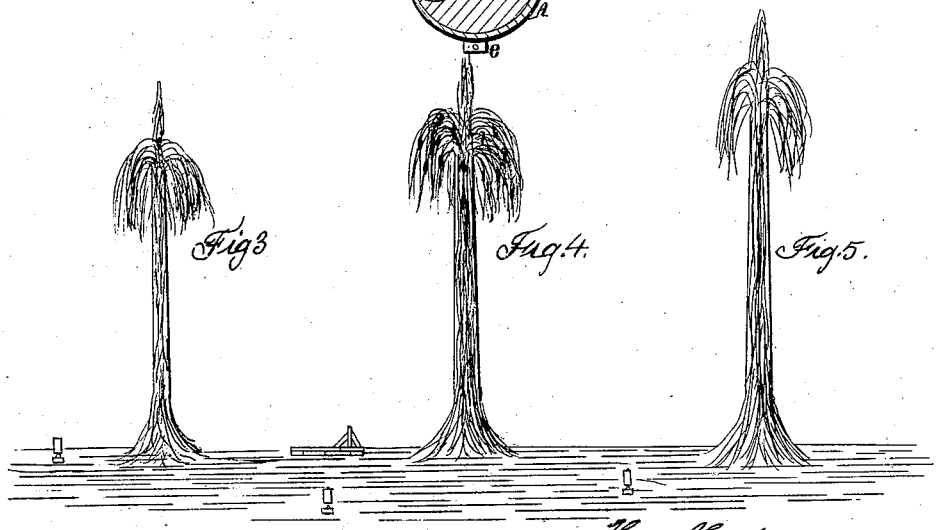

Fig 3 Fig. 4. Fig. 5.

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UNITED STATES PATENT OFFICE.

WM. W. W. WOOD, AND JOHN L. LAY, OF THE UNITED STATES NAVY, ASSIGNORS TO DONALD McKAY, OF EAST BOSTON, MASS.

IMPROVEMENT IN SUBMARINE EXPLOSIVE SHELLS.

Specification forming part of Letters Patent No. 47,776, dated May 16, 1865; antedated February 25, 1865.

To all whom it may concern:

Be it known that we, WILLIAM W. W. WOOD, Chief Engineer, and JOHN L. LAY, First-Assistant Engineer, both of the United States Navy, have invented certain Improvements in Submarine Shells or Torpedoes; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Our invention relates to certain improvements in shells or torpedoes to be submerged or partly submerged, and to be used for the sinking of vessels, the removal of obstructions from rivers or harbors, and the destruction of fortifications.

Our improvements consist, first, of a shell or torpedo composed of a casing, of any desired form and of any suitable material, so charged with gunpowder or other explosive substance as to leave an air-space within the shell; secondly, in the use, within the shell, of a yielding wad or diaphragm for separating the charge of explosive compound from the said air-space; thirdly, in the employment, for igniting the charge, of a weight so arranged within or adjacent to the casing of the shell, and so combined with retaining and releasing devices, that the said weight can be released at pleasure, and be permitted to fall on any substance which can be ignited by percussion, and which communicates with the charge.

The main objects of our invention may be enumerated and expressed as follows: First, the concentration of the full force of the explosion and the direction of that force in the desired course; second, the laying of the torpedoes without danger to the operators or to the vessels from which the operation is conducted; third, sufficient buoyancy to enable the torpedoes to rise after they have been submerged; fourth, the maintenance of the submerged shell in the proper position for producing the best effect; fifth, a certainty of the entire charge being consumed and the full force therefrom obtained before the water can reach and injure the explosive compound; sixth, a much more destructive effect than can be caused by the explosion of the torpedoes as hitherto constructed.

In order to enable others to make and use our invention, we will now proceed to describe its construction, operation, and effect.

On reference to the accompanying drawings, which form a part of this specification, Figure 1 is a vertical section of our improved submarine shell or torpedo; Fig. 2, a sectional plan on the line 1 2, Fig. 1, and Figs. 3, 4, and 5 views illustrative of experiments made with our improved shells.

In the present instance, the casing A of the shell is constructed of sheet-iron in the form of a hollow cylinder, A, closed at the lower end and furnished at the upper end with a detachable cover, B, the lower closed end being cone-shaped, if desired, and being made stronger and heavier than other portions of the casing by making the metal thicker or by securing a mass of cast-iron at this point.

At the side and in the interior of the casing, and extending nearly from the bottom of the same to within a short distance from the detachable cover B, is formed a tubular chamber, D, and at the lower end of the latter is a nipple, *x*, a hole in which communicates through a suitable channel with the interior of the casing, an opening being formed near this nipple in the said casing, and the said opening being closed by a door, E, so constructed that it can be readily removed when access has to be had to the nipple. A pin, F, passes through the casing and through the tubular chamber D at a point a short distance below the top of the said chamber, this pin serving to support a spherical weight, G, and having an eye, *a*, to which a cord or wire, *b*, may be secured. A pin, H, also passes through and is screwed into the casing, and serves to prevent the weight G from escaping upward from the tubular chamber. Gunpowder I, or gun-cotton, or other highly explosive composition is packed into the casing, but not allowed to gain access to the tubular chamber D. The interior of the casing is not entirely filled with powder; but the latter is limited by a wad or diaphragm, K, to a predetermined space, so that between the diaphragm and the cover B there shall be an air-space, M.

Although the diaphragm, which may be of any suitable material, is packed sufficiently tight to maintain the explosive compound within the desired limits, it is not so tightly se-

cured to the interior of the casing as to prevent it from yielding and passing into the air-space the instant the explosion takes place and before the disruption of the shell ensues.

The air-space M may be of sufficient extent to render the shell buoyant, and the exterior of the casing may be provided with any suitable lugs or projections, *e*, or other appliances to serve as a means of handling and laying the shell.

When the shell has to be discharged, the cord *b* is pulled, the pin F thereby withdrawn from the casing, and the spherical weight G permitted to fall on a suitable cap charged with detonate and placed on the nipple *x* at the bottom of the tubular chamber D, the ignition of the detonate insuring the instant discharge of the explosive compound.

In order that the advantages of our improved submarine shell or torpedo may be thoroughly understood, it may be well here to give the following brief account of certain experiments made at Schenectady, New York, in obedience to orders from Rear Admiral F. H. Gregory, United States Navy, the account, as well as the diagrams Figs. 3, 4, and 5, being taken from the official report of Captain Charles S. Boggs, United States Navy, and Chief Engineer Wood, United States Navy, to Admiral Gregory:

"The dimensions of the experimental shells were as follows: three feet in height, one foot in extreme diameter, cylindrical in form, and constructed of iron one-sixteenth of an inch thick, with a diaphragm inside dividing the interior into two compartments, the lower compartment containing the powder, the upper portion acting as an air-vessel to direct the course of the explosion. The shells, when exploded, were in a vertical position.

"*Experiment No.* 1.—In this trial the shell contained forty pounds of powder, and was retained at the bottom of the river at a depth of ten feet by a weight of one hundred and twenty pounds. The weight being detached, the shell rose to the surface in two seconds, and then exploded, raising a column of water, as nearly as could be determined, one hundred and seventy-five feet high, some of the fragments of the shell being projected upward to the height of probably four hundred feet. The diameter of the water raised was about eight feet, and caused but little disturbance immediately under the vortex of the explosion.

"*Experiment No.* 2.—In this case the shell contained sixty pounds of powder, and was moored to the bed of the river. A heavy raft of timber, sixteen feet by sixteen feet square and ten inches in thickness, solid, well bolted and secured, was placed over the shell, three and one-half feet of water intervening between the raft and the top of the shell. When the shell was exploded, the raft was blown to atoms, some of the pieces being raised to a vertical height of from one hundred and seventy-five feet to two hundred feet. The column of water was in this case concentrated and solid, reaching, apparently, a height of two hundred to two hundred and fifty feet, the fragments of the raft falling at no great distance from the point of explosion.

"*Experiment No.* 3.—The shell in this case contained fifty pounds of powder, and floated in the water so that the upper extremity of the shell was about one foot beneath the surface. The column of water was projected about two hundred and fifty feet vertically, and was six feet in its concentrated diameter.

"The shells were exploded by a line of about one hundred and twenty-five feet in length, at which distance the operators stood without any inconvenience, and could have been in a boat ten feet from the point of explosion without being in any danger, excepting from falling timber, broken up by the explosion."

The cause of these most extraordinary results may be best explained by the following extract from the report:

"In torpedoes and submarine mines, as heretofore constructed, the explosions have been nearly equal in all directions. It is well known that powder exploded *in vacuo* loses much of its effect, and in torpedo-cases filled entirely with explosive compound, rupture takes place instantly, when, in consequence of the water coming in contact with the powder, much of it remains unburned, and its effect diminished in the ratio of the quantity unburned. The center of gravity of the improved shell is so fixed that its vertical position at the time of contact and explosion is secured, and a diaphragm of slight resistance placed in the shell forms an air-space, which directs the force of the explosive material in the shell, while it secures the means of causing it to rise rapidly when liberated, and of maintaining its vertical position in contact with the bottom of the vessel when exploded. The experiments prove very conclusively the correctness of this theory. The method of firing was by liberating a ball inclosed in a tube two inches in diameter extending the length of the shell."

From the foregoing, it will be seen that the concentration of the force of the explosion is caused by the air-chamber. The moment the ignition of the charge is effected, the first part to yield will be the diaphragm K, and the disruption of the torpedo and the force of the explosion will be in the direction in which the diaphragm moved in the first instance.

It will be evident that the shell may be varied in form and construction without departing from the main features of the invention, and that the exterior casing may be made of other material as well as sheet-iron. A strong casing of wood for instance, properly hooped or otherwise strengthened, may be converted into a most efficient and destructive torpedo by charging it in the manner described.

Although we prefer to ignite the charge by means of a weight released so as to fall and strike a cap charged with detonate, in the manner described, when such means are available, other methods of discharging the load

may be adopted. Electricity, for instance, may be brought into play for accomplishing this end, as in discharging heavy blasts in mines and excavations; or a time-fuse may be employed; or such apparatus may be applied to the shell that the explosion may be effected by the impact of the rising shell (previously submerged) against the bottom of a vessel or the side of a fortification.

It should be understood that the pin F is so secured to the casing that it cannot be withdrawn therefrom too readily, and without the application of considerable force to the cord *b;* otherwise there would be danger in handling the shell.

We may remark here that although our improved torpedo can be used in a variety of ways for destructive purposes, we prefer to use it in connection with apparatus which we have designed for the purpose of submerging the torpedoes and releasing them after being submerged, which apparatus forms subjects for separate applications for patents.

We claim as our invention and desire to secure by Letters Patent—

1. A submarine shell or torpedo composed of a casing of any desired form and of any suitable material so charged with explosive compound as to leave an air-space within the shell, for the purpose specified.

2. The use within the shell of a yielding wad or diaphragm for separating the charge of the explosive compound from the air-chamber, substantially as and for the purpose described.

3. The employment, for igniting the charge, of a weight so arranged within or adjacent to the said casing, and so combined with the retaining and releasing device herein described, or any equivalent to the same, that the said weight can be released at pleasure and be permitted to fall on any substance ignitable by percussion.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

WM. W. W. WOOD.
JOHN L. LAY.

Witnesses:
HENRY HOWSON,
CHARLES HOWSON.