(No Model.)

G. F. ELLIOTT.

SUBMARINE MINE.

No. 467,793. Patented Jan. 26, 1892.

Fig. 1.

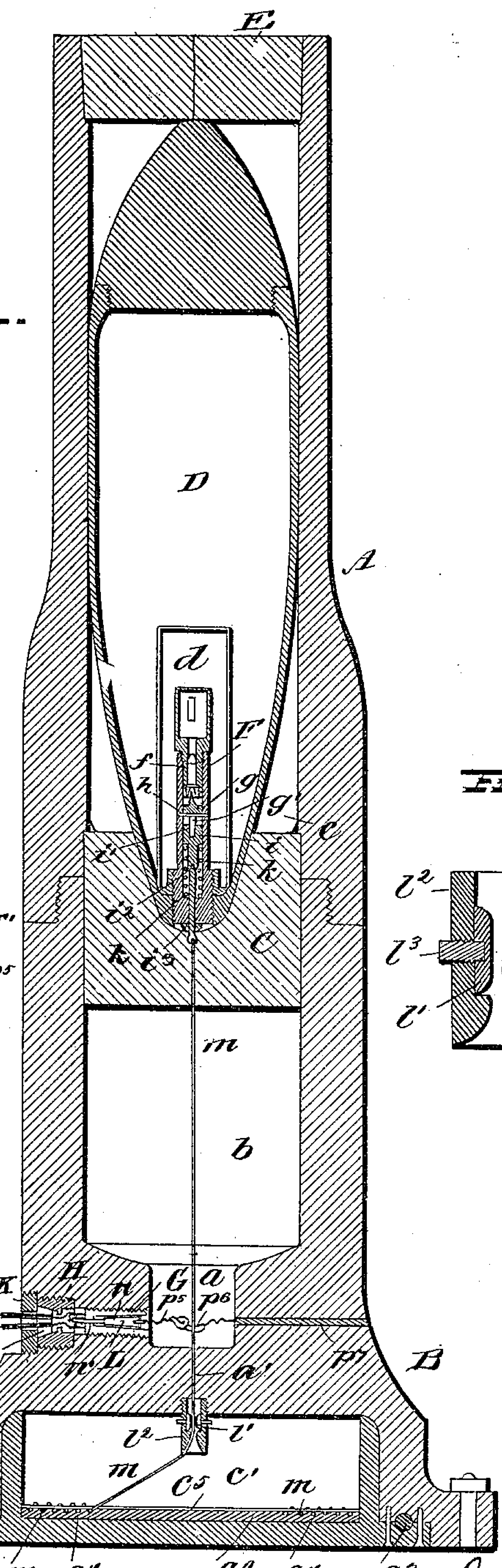


Fig. 2.

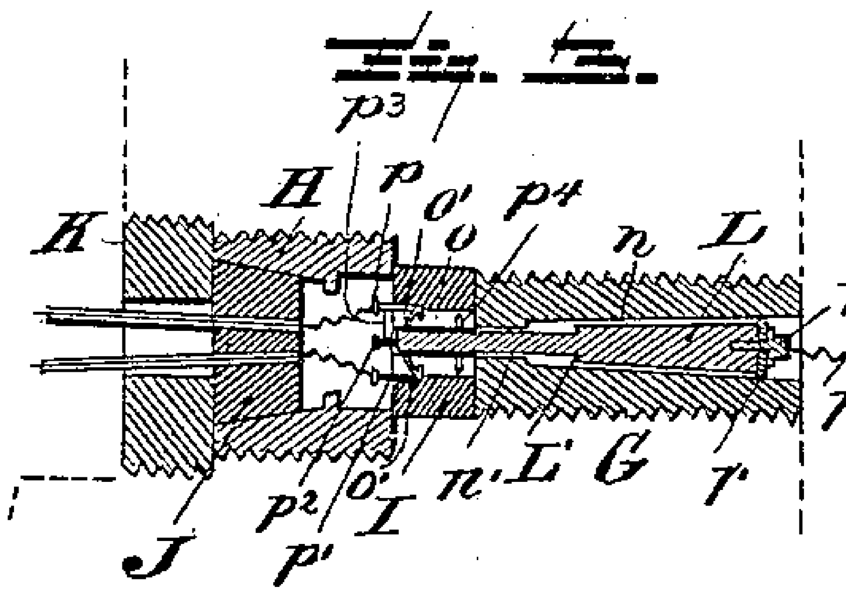
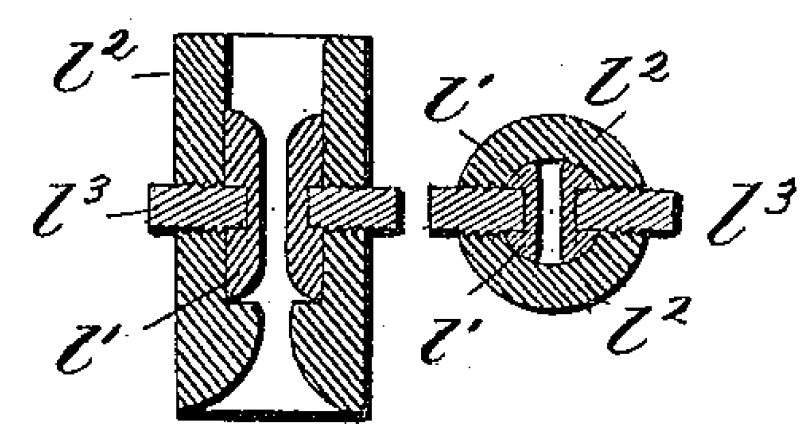


Fig. 3.



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UNITED STATES PATENT OFFICE.

GEORGE FRANK ELLIOTT, OF THE UNITED STATES NAVY.

SUBMARINE MINE.

SPECIFICATION forming part of Letters Patent No. 467,793, dated January 26, 1892.

Application filed February 19, 1891. Serial No. 382,053. (No model.)

To all whom it may concern:

Be it known that I, GEORGE FRANK ELLIOTT, an officer of the United States Marines, at present stationed at the Brooklyn Navy Yard, in the State of New York, have invented a new and useful Submarine Mine, of which the following is a specification.

My invention has relation to fixed submarine mines used for the defense of harbors and other localities. Heretofore the greatest depth of water in which it has been supposed possible to plant such mines so as to obtain efficient action against vessels passing above has been about sixty feet, and even in this case a very large charge of high explosive is required for the mine. The mine which I have devised, while adapted to be planted in any depth of water, has been particularly designed as a deep-water mine, which while containing a comparatively-small charge of explosive, will be effective when planted at a depth very much greater than heretofore has been deemed practicable. It is in effect a fixed mine which when brought into action becomes a movable torpedo—as it is this feature which essentially characterizes my invention.

To this end the mine consists of a gun or case to be planted at the bottom of the stream or other body of water to be protected, which gun is provided with a firing mechanism connected to a distant observation point or shore-station from which it may be operated to effect the discharge of the gun by the observer there stationed, and a shell containing the charge of high explosive, adapted to be contained in and discharged from the gun, which shell may be, and in practice is, provided with means by which it can be exploded at any predetermined point after it leaves the gun. The means for this purpose should be such that the shell will be exploded when it strikes (as it rises) the vessel against which it is directed, or, failing that, when it has reached a predetermined distance—say twelve feet or so—below the surface of the water; or it may be, in some cases, only when it has reached or has risen slightly above the surface of the water.

The nature of my invention and the manner in which the same is or may be carried into effect can best be explained and understood by reference to the accompanying drawings, in which—

Figure 1 is a longitudinal central section of the complete mine. Fig. 2 is a cross-section of the friction clamp or compressor, and Fig. 3 is an enlarged section of the electrical firing mechanism in Fig. 1.

The devices in which my invention are comprised resemble in a general way and in many particulars those described in my application for Letters Patent filed of even date herewith, bearing Serial No. 382,052, and my present invention itself in several of its features is applicable to and comprised in the instrumentality described in said application, although inasmuch as that instrumentality is designed not as a fixed mine, but rather as a protector for such mines whose destructive radius shall be above the surface of the water covering the field in which the mines are planted, its organization is modified to secure that result.

In the drawings, A is the barrel, and B is the base of the gun, the latter containing the powder-chamber a for the explosive—such as gun-cotton, rocket composition, gunpowder, or the like—by which the shell is expelled, the air-space b of such dimensions as to provide an air-cushion between the powder-chamber and the shell sufficient to prevent shock, which might cause premature explosion of the shell, and a chamber c' below the powder-chamber closed at the bottom by a coil-plate c^2, having formed in it a helical groove c^4 to receive the drag-wire or lanyard, hereinafter referred to. The coil-plate closes water-tight the bottom of chamber c' in any suitable way. In this instance it is bolted to the body of the base and has between it and that part of the base against which it is drawn a lead or other suitable packing grommet or ring c^3.

The bore of the barrel A is of two diameters, that part in which the sabot C fits being of slightly greater diameter than the part in which the shell D is received, so that when the gun is fired the sabot may act as a gas-check. The muzzle of the barrel is closed water-tight by a plug E, which is tapered and, like the sabot C, is preferably split longitudinally into two or more sections. The shell itself consists of a hollow metallic body, which contains the high explosive and is provided with a solid forged-steel head. The body of the shell is tapered at its base and is provided with feather fins c to assure it in its course. Within the body of the shell and at its bottom or lower end is the copper case d, to contain the detonator for the high explosive, and within this copper case is the firing-tube F, which at its base screws through the bottom of the detonator-case d and the bottom of the shell. Within the upper part of the tube F is fixed a cartridge-tube f to contain a cartridge, such as a pistol-cartridge, and above the cartridge-tube is fixed to the top of the firing-tube the open-bottomed small case, which contains the fulminate by which the detonator is ignited or exploded. The cartridge is exploded by a firing-pin g, capable of reciprocation in tube F and limited in its rearward movement by a cross-head h, through which its shank g' freely passes. The shank g' is of spring metal split lengthwise into two or more tongues normally set so as to stand apart, but which, when brought together, will fit snugly in the end socket i' of a hammer-rod i, which is capable of reciprocating movement in the firing-tube F. The enlarged head of the hammer-rod, containing the socket i', fits snugly in the firing-tube. Back of the head it is smaller in diameter, and its reduced rear end fits snugly in and passes out through the base of the firing-tube, having on its exterior portion a flange i^3 for limiting the forward movement of the hammer-rod. Between the base of the firing-tube and the head of the hammer-rod is confined an impelling spiral spring k. A shoulder i^2 on the hammer-rod limits the extent of its rearward movement. When the hammer-rod is pulled back or brought to what may be called "cocked position," the firing-pin g remains stationary, and consequently the socket i' draws away from and quits the split shank g', and when this takes place the sections of the shank spring apart. If now the hammer-rod be released it will be driven forward by its compressed spring k, and meeting the spread-base of the shank g' will drive the firing-pin g forward with the effect of exploding the cartridge. The ball driven from the cartride will explode the fulminate. This in turn will explode the detonator and the latter will cause the explosion of the high explosive with which the body of the shell is charged.

To insure the cocking of the hammer-rod when the shell is discharged from the gun and to maintain it in this cocked position until after the shell in its flight has passed up a predetermined distance through the water, various means may be employed. One such means adapted to cause the explosion of the shell only after it shall have passed up through and above the water is illustrated in my companion application hereinbefore referred to of even date herewith; but in order to provide a means which will insure the explosion of the shell after it has left the gun and before it reaches the surface of the water I make use in the present instance of a device consisting, essentially, of a lanyard m, of wire or other suitable material, and a compressor or friction-clamp comprising two compressing-jaws l' l', contained in a tube l^2 and adapted to be set up toward each other by set-screws l^3. The lanyard is made fast to the lower outer end of the hammer-rod. It thence passes down through the air-space b and powder-chamber a through a hole a', formed vertically for it in the bottom of the powder-chamber, thence through the jaws l' l' of the friction clamp or compressor, which is fixed to the under side of the bottom of the chamber, and thence to the coil-plate c^2 in the helical groove c^4 of which it is coiled, its outer end being free and unattached. After the wire is thus laid in the coil-plate the latter is covered by thin sheet-lead or other suitable material c^5, properly stopped down to keep the wire in place. This material c^5 is of little strength, so that while it will hold the wire in place and will insure its accurate delivery without overrunning when the shell is discharged, it will nevertheless yield or tear easily, so as to permit the wire to render readily. The jaws l' l' of the friction-clamp are set up so as to exert a predetermined drag on the wire lanyard—say, for example, from one hundred to six hundred pounds, as the case may be. The result is that when the shell is discharged from the gun the lanyard while being drawn off along with it in its flight will be subjected to a drag sufficient to bring the hammer-rod to cocked position, which position will be maintained until after the free end of the wire passes through and beyond the jaws of the friction-clamp. When this takes place the hammer-rod will be released and the result will be the explosion of the shell. It may here be remarked that the lanyard not only provides for the explosion of the shell at any predetermined distance from the muzzle of the gun, determined by the length of the lanyard, but also serves, so long as it is under control of the friction-clamp, to prevent the "tumbling" of the shell during its flight through the water. The length of the lanyard should generally be such as to insure the explosion of the shell at about twelve feet below the low-water level of the water in which the mine is planted. Should the shell before reaching this point strike the bottom of the vessel for which it is intended, its recoil, due to the concussion, will give to the lanyard already paid out slack sufficient to permit the hammer to act to cause the explosion, the effect of which in this case will be among other things to drive the solid forged head of the shell into the hull of the vessel. It will thus be seen that I have in effect a fixed mine capable of being planted in, say, from one to two hundred feet of water, a depth very much greater than that which will permit efficient action of ordinary fixed mines, and which nevertheless is so organized that when put into action its charge of high explosive will be brought within destructive range of objects on the surface of the water before exploding. I am enabled in this way to reduce the charge required for each individual mine. Indeed the charge of high explosive now required for the effective action of one ordinary deep-water mine will suffice for a number of my mines, which may be planted at considerable intervals apart, and in this way with the same absolute quantity of high explosive I can efficiently cover and protect a much more extensive field than has heretofore been practicable with ordinary fixed deep-water mines. They may be planted in groups, or otherwise, as may be desired; and each may have its own individual independent connection with the distant observation-point or shore-station from which they are fired; or they may be electrically connected in series and in such manner that they can be successively fired by the use of a single circuit making and breaking key or button at said distant station.

A gun-firing mechanism adapted to secure the result last named is illustrated in the drawings, and will now be described, the organization being such that the discharge of one gun will bring into circuit the next gun of the series.

Screwed water tight through the base of the gun into the powder-chamber is a forged steel plug G, which is partially pierced longitudinally with a true tapered hole n, the remaining portion being pierced with a cylindrical hole n' of smaller diameter.

A larger steel plug H screws into the base so as to abut at its inner end against the outer end of the steel plug G. This plug H is cored out longitudinally and at its inner end is recessed to receive a plug I, of hard rubber or other conducting material, which bears against the end of the steel plug G. In the inner end of this plug is formed a cavity o with a concave bottom which is pierced centrally for the passage of the circuit-closing plunger, to be presently described. The bottom of the cavity o is provided with brass contact-strips o' insulated from each other, to each of which is connected an external binding-post lettered, respectively, p and p'. To one of these posts p is connected the wire which leads from the observation-point or shore-station. To the other is connected the wire which leads to the gun which is next in series. This last-named wire will be connected to that binding-post of the second gun which corresponds to the post p of the one under consideration. These two wires pass out through a taper rubber plug J, which is compressed into a correspondingly-tapered portion of the bore of plug H by a compressing-nut K screwing into the base, thus forming a water-tight joint at this point.

The circuit-closing plunger above mentioned is represented at L. It is capable of endwise movement and extends through the passages n n', back into the recess o', and out through the bottom of that recess. That portion of it which is in the passage n' is of a taper exactly corresponding to that of the passage and of a size to exactly and tightly fit the hole or passage n, when it is forced back until its shoulder L' brings up against the shoulder at the rear of the passage n. At its inner end it is provided with a rubber disk r, which is pressed and expanded laterally by a cap r', so that when the plunger is in the inward position shown in the drawings, which is its normal position, the edges of the rubber will form a guide-flange by which the body of the plunger in the taper-passage n will be held out of contact with the walls of the passage. The air-space thus formed will afford the resistance needed to insulate this part of the plunger from the walls of the passage with the feeble electrical currents that are in practice used; but for greater protection the plunger or the walls of the passage can, if desired, be coated with insulating material of any suitable kind. The same is true of that part of the plunger which plays in the cylindrical passage n'. This portion of the plunger is sufficiently smaller in diameter than the passage n' to leave an air-space between the plungers and the walls of the passage; but either or both may be coated with insulating material, if desired. That portion of the stem of the plunger which extends out beyond the passage n into the cavity in the hard-rubber plug and out through the bottom of the same is coated with insulating material, and said portion fits snugly in the hole in the bottom of the hard-rubber plug. On its outer end is a binding-screw p^2, which is electrically connected to the body of the plunger, and this binding-screw p^2 is electrically connected to the binding-post p by a frail conducting strip or wire p^3. Upon the insulated portion of the stem of the plunger is fixed a disk p^4 of brass or other conducting material, this disk being so located that when the plunger is moved outwardly far enough to bring its shoulder L' against the bottom of the taper-passage n, the disk will rest upon and form an electrical bridge between the two contacts o' o'. To the inner end of the plunger is connected the wire p^5, which enters the powder-chamber of the gun, has the fuse p^6 attached to it at that point, and thence extends to the other side of the chamber, where it is attached and electrically connected to a platinum plug p^7, which, owing to its non-corrosive nature I prefer to use, in order to form the needed earth connection.

Assuming the gun to be loaded and fixed to its foundation or support beneath the water and in readiness for firing, then the circuit will be from the distant station through post p, wire p^3, post p', plunger L, wire p^5, plug p^7, to ground. The moment the circuit is closed by momentarily depressing the closing key or button at the distant station the fuse p^6 is ignited, thus igniting the powder-charge in the powder-chamber, and the gun is discharged. The force of the explosion breaks the wire p^5, forces back the plunger L as far as it will go, thus breaking the frail connecting strip p^3 and bringing the disk p^4 as a bridge down upon the contact o' o'. The circuit now will be from the distant station to post p, contact o' of that post, bridge p^4, contact o' of post p', and from the latter post to post p of the gun next in series, through which the circuit is completed to the ground of that gun in the manner first above described. The operator, therefore, by again depressing the circuit-closing key at the distant station can discharge the second gun. This brings into circuit the third gun, and so on throughout the series.

I have described what I deem to be on the whole the best construction and arrangement of parts for effectuating my invention. I do not, however, restrict myself to the particular details hereinbefore described and illustrated, since manifestly the same can vary considerably without departure from the principle of the invention; but

What I claim herein as new and of my own invention, and desire to secure by Letters Patent, is as follows:

1. A submarine mine comprising a gun which is fixed to the bed or bottom of the stream or other body of water to be protected by the mine and is provided with a firing mechanism connected to and operated from a distant observation-point or shore-station, a high explosive shell contained in and adapted to be discharged from the gun, and provided, also, with a firing mechanism, and a drag connected to said firing mechanism and arranged and adapted to co-operate therewith to insure the explosion of the shell when the latter after its discharge from the gun has traveled a predetermined distance, substantially as and for the purposes hereinbefore set forth.

2. The combination, with the gun and the drag-wire chamber, of the high-explosive shell and its firing mechanism, the drag-wire or lanyard connected to said mechanism, and the compressor or friction-clamp, under the arrangement and for joint operation, substantially as hereinbefore set forth.

3. A deep-water mine for river and harbor defense, comprising a gun or case fixed to the bed or bottom of the body of water to be protected and provided with an electrically-controlled firing mechanism connected to and operated from a distant observation-point or shore-station, and a shell which contains the charge of high explosive and is received in and adapted to be discharged from said gun or case, substantially as and for the purposes hereinbefore set forth.

4. The combination and arrangement in connection with a series of guns of the circuit-closing plunger and other appliances forming the electrical firing mechanism for igniting the powder-charges in the guns, the circuit connections being such that the act of firing one gun shall effect the closing of the circuit to the wire leading from that gun to the next in series, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE FRANK ELLIOTT.

Witnesses:

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