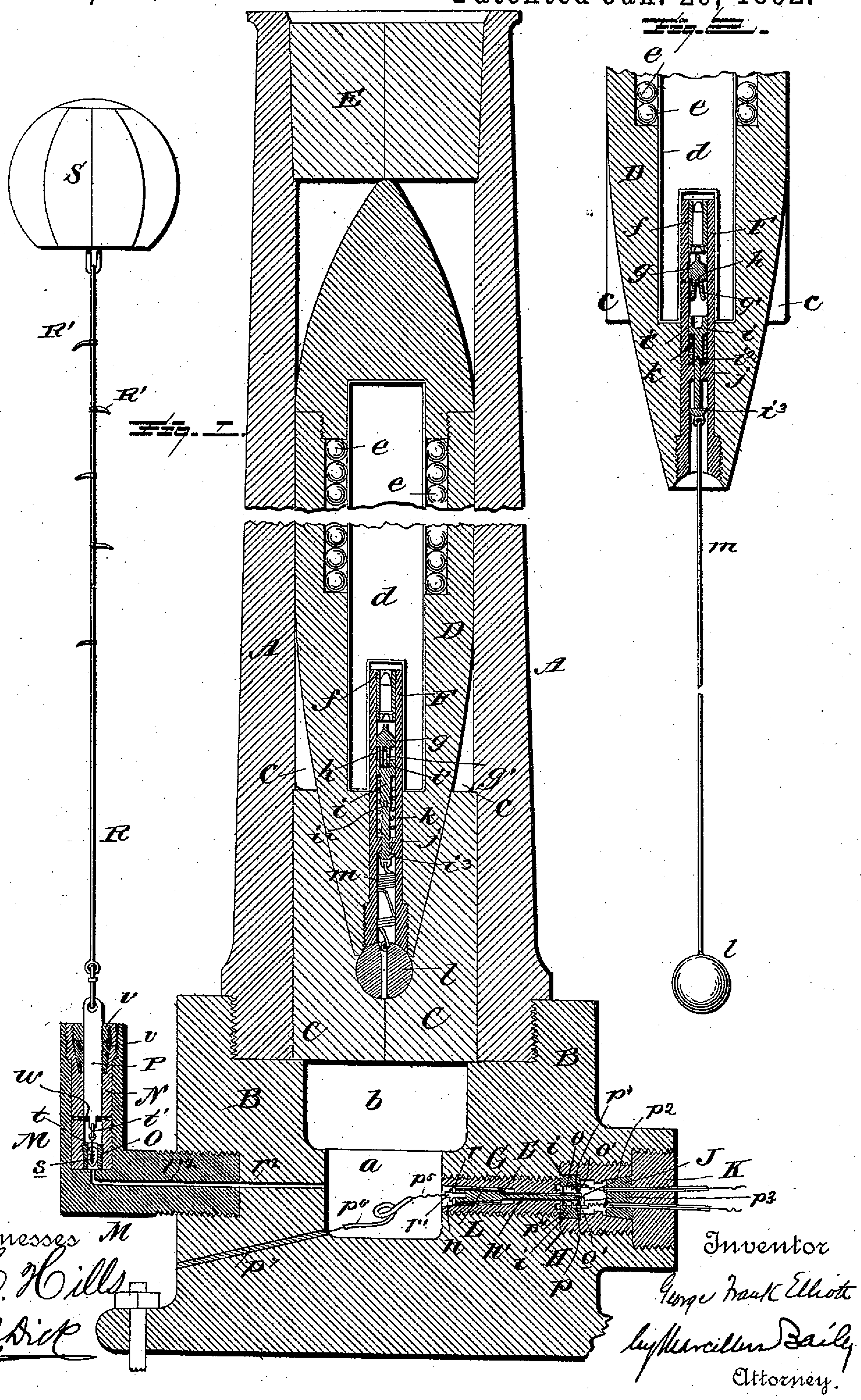
(No Model.)

G. F. ELLIOTT.

SUBMARINE SHELL.

No. 467,792. Patented Jan. 26, 1892.



Witnesses
L. C. Hills
Ewell A. Dick

Inventor
George Frank Elliott
by Marcellus Bailey
Attorney.

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UNITED STATES PATENT OFFICE.

GEORGE FRANK ELLIOTT, OF THE UNITED STATES NAVY.

SUBMARINE SHELL.

SPECIFICATION forming part of Letters Patent No. 467,792, dated January 26, 1892.

Application filed February 19, 1891. Serial No. 382,052. (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 Shell, of which the following is a specification.

The shell in which my invention is comprised is designed to protect submarine torpedo-fields—that is to say, submarine fixed mines or torpedoes employed for harbor defence and the like—against searchers or parties who may attempt to sweep or drag such fields.

The shell is intened to be an offensive protector, and to have its destructive radius on and above the surface of the water in which it is planted. To this end it comprises a fixed gun or case, which is below water and may be fired mechanically or electro-mechanically, and either by observation or by being engaged by a sweep or drag passing over the torpedo-field which the shell is intended to protect, and a shell proper which is contained in and discharged from the gun, but which is so organized that it bursts or explodes only after it has passed up above the surface of the water. It is in this combination of instrumentalities that my invention, essentially, is comprised.

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

Figure 1 is a longitudinal central section of the complete submarine shell. Fig. 2 is a like section of the lower part of the shell proper, with the trigger mechanism in the position it assumes after the shell has been fired from the gun and while it is passing up through the water.

The case or gun consists of two sections—the tube or barrel A and the base-piece B—which are united together by a screw-joint or by other suitable means. The base, which is adapted to be bolted or otherwise suitably secured to any proper submarine foundation or support, contains the chamber a for holding the explosive—such as gunpowder, rocket composition, or other suitable agent—by which the shell is expelled, and an air-space b between the powder-chamber and the sabot of the shell to provide an air-cushion, which will prevent shock which might cause premature explosion of the shell. The bore of the barrel A is of two diameters, that part of it in which the sabot C fits being of slightly greater diameter than the part in which the shell D is contained, so that when the gun is fired the sabot may act as a gas-check. The barrel above the shell is closed by a water-tight plug E, which is tapered and preferably is made in two or more sections.

The shell itself consists of a solid head screwed onto the hollow body of the shell, which body is tapered toward the base to give it a clear run through the water, and at this point is provided with fins c to assure it in its course. Within the body of the shell is the chamber to receive the bursting charge, (which may be gun-cotton or other suitable explosive,) this chamber being formed by a copper or other suitable metal case d. Between this case and the outer walls of the shell are contained the metallic balls e, and the case is so formed that it will constitute, also, a sheath for the firing-tube F, which, with its contained mechanism, will now be described.

The firing-tube F is screwed into the base of the shell and extends thence up into the chamber which contains the bursting charge, where it is sheathed by a portion of the case d, as above explained. In the top of this firing-tube is fixed what may be called a "cartridge-tube" f, which contains a cartridge, such a pistol-cartridge. When this is fired, the ball is driven up through the sheath d into the bursting charge of the shell, which thereby is exploded. The cartridge is exploded by a firing pin or plunger g, which has a slight reciprocating movement in the firing-tube F and brings up at the rear against a cross head or pin h, through which its shank g' freely passes. The shank g' is split lengthwise into two or more sections, which are of spring metal normally set so as to spread apart, but which are of such size that when compressed together they will snugly fit in a socket i' in the front end of a rod i, which serves as a hammer, and to this end is capable of longitudinal reciprocation in the firing-tube. The enlarged head of the hammer-rod in which the socket i' is formed fits snugly the bore of the firing-tube. Back of the head it is reduced in diameter, and its reduced rear end passes through a suitable guide j, formed for it in the tube. Between this guide and the head of the hammer-rod is confined the spiral spring k, which impels the rod forward, the extent of this forward movement being limited by a flange i^3 on the rear end of the rod which brings up against the guide j. A shoulder i^2 on the rod limits the extent of its rearward movement, and consequently the degree of compression of the spring k. When the hammer-rod is pulled back, the firing-pin g is incapable of following this movement, and consequently the socket i' draws away from and quits the split stem or shank g'. When this takes place, the sections of the shank spring apart, as indicated in Fig. 2. If now the hammer-rod be released, the spring k by its recoil will drive the head of the rod against the spread base of the shank g', and the firing-pin will thereby be driven forcibly forward. Its point will be driven through the hole in the base of the cartridge-tube against the head of the cartridge therein and the cartridge will be exploded. Various means may be employed for assuring that this result shall take place only after the shell passes up above the surface of the water. One simple means for this purpose is illustrated in the drawings, consisting of a spherical or other suitably-shaped drag l, connected to the rear end of the hammer-rod by a metallic lanyard m. When the shell is in the gun, the lanyard lies coiled in the rear open end of the firing-tube F, and the drag is received in a suitable space formed for it in the abutting parts of the shell and sabot. The drag is made of wood or other suitable material.

When the gun is fired and the shell and sabot pass the muzzle, the sabot, which breaks in two or more pieces, quits the shell, thus leaving exposed the drag. The latter, inasmuch as it loses its momentum much sooner than the shell and is more readily held back by the resistance of the water, separates from the shell, and by its dragging action exerts through the lanyard a pull upon the hammer-rod sufficient to retract it, separating it from the firing-plunger and holding it in what may be called its "cocked" position, as illustrated in Fig. 2. The parts are maintained in this position until the shell has passed above the surface of the water and the drag is thrown into the air. When this point is reached, the spring k is free to act, and by its recoil causes through the intermediary of the hammer-rod and the firing-plunger the explosion of the cartridge, which in turn brings about the explosion of the shell, whose contents thus are scattered with destructive effect over and above the surface of the water.

In another application, filed of even date herewith and bearing Serial No. 382,053, I have illustrated another device which can be used for this purpose. In this device the drag l is dispensed with and the effect of that drag is obtained by causing the wire lanyard (which is coiled in a chamber in the base below the powder-chamber) to pull through a friction-clamp fixed to the base, whereby sufficient pull is exerted upon the lanyard during the upward flight of the shell to hold the firing-plunger retracted until the free end of the lanyard passes through and beyond the clamp. The lanyard may be of such length as to cause the discharge of the shell only after it rises above the water and in this event it should of course be of a length at least equal to the depth at low water of the water in which the gun is planted. It is on this account that for the purposes of a submarine shell which shall explode only after it rises above the surface of the water that I prefer the means first above described, because it is apparent that however much the depth of water may vary the drag l will cause the shell to explode at the same point, with reference to the surface of the water in all cases.

It remains now to describe the means by which the gun may be fired. This may be done in various ways, as hereinbefore indicated, electrically or electro-mechanically from a distant-shore station, or mechanically by engagement of the firing mechanism with a sweep or drag in the immediate vicinity. I have shown both means conjoined in the drawings.

I shall first describe the mechanism by which the gun may be fired at will by an observer located at a distant station; and I may here observe that this mechanism is one which is designed to operate a number of submarine shell located at suitable points throughout the torpedo-field which it is desired to protect, and connected electrically in series, the arrangement being such that one shell or gun only is in circuit at a time with the station, but that the act of firing the gun thus in circuit will have the effect of automatically closing the circuit between the station and the gun next in series. This is a nicety, rather than a necessity, for manifestly each gun may have its own independent connections. I prefer, however, the arrangement which I am about to describe on the score of economy and for other reasons.

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 plunger 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^2, 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 contacts 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.

To provide for the firing of the gun mechanically, I employ a metallic elbow M, the horizontal member of which screws into the base of the gun and communicates with the powder-chamber therein by a vent r^2, and the vertical member of which is cored out to provide a chamber which at its bottom communicates with the vent. Into this chamber is fitted a steel cylinder N, held therein by a screw-joint at the top, and in the lower end of this cylinder is inserted and held by a screw-joint the brass open-bottomed case O, which contains the fulminate. In the fulminate is a barbed stem s, by the retraction of which it is fired, which stem extends through a glass head t, hermetically closing the fulminate-case, and is connected by a link t' to the lower end of a longitudinally-movable rod P, which fits in the cylinder N and extends out from the upper end of the same. At the point where it passes out from the cylinder it is packed by a rubber-tapered cylindrical plug u and a compressing-nut v. To the top of the rod is fastened a wire or other cord R, at the upper end of which is a float S. The wire R is of such length that when the shell is set in position on its submarine support or foundation the float will be a certain distance—say, twelve, fifteen, or more feet—below the surface of the water in position to be grappled or engaged by any drag or sweep used to rake the torpedo-field, which is to be protected. To further insure such engagement, the wire R is provided with arms or hooks R′, upon which will catch anything used for dragging or sweeping. A pull upon the wire or float will retract the rod P, and consequently the stem *s*, thus exploding the fulminate, which, through the communicating vent r^2, will in turn ignite the powder-charge in the powder-chamber of the gun.

In order to assure the rod P against accidental movement, it is held at its lower end by a cross-pin *w*, of brass or other comparatively-yielding metal, which passes through it into the walls of the cylinder N on each side, and is of such strength that when an upward pull of, say, one hundred pounds is exerted upon the wire R it will buckle and give way, and thus permit the upward movement of the rod P. Such a pull would be readily exerted under ordinary conditions by a sweep or drag passing over the field and would scarcely be perceptible by those operating the sweep.

Having now described my improvements and the best way now known to me of carrying the same into effect, I state in conclusion that I do not restrict myself to the precise details of construction and arrangement hereinbefore described and illustrated, for manifestly the same can be varied considerably and in many particulars without departure from the principle of my invention; but

What I claim herein as new and of my own invention is as follows:

1. An apparatus for protecting submarine torpedo-fields, comprising a gun fixed to the bed or bottom of the body of water to be protected, a shell adapted to be contained in and discharged from the gun, firing mechanism attached to and carried by the shell for exploding the charge therein, and a drag connected to and adapted to operate the said firing mechanism to effect the explosion of the bursting charge of the shell only after the latter rises above the surface of the water, substantially as and for the purposes hereinbefore set forth.

2. An apparatus for protecting submarine torpedo-fields, consisting of a gun fixed to the bed or bottom of the body of water to be protected, a shell adapted to be contained in and discharged from said gun, and means carried by the shell for exploding the bursting charge of the shell, comprising a spring-impelled hammer-rod or plunger and a drag, which, by the action of the water through which the shell passes, is caused to retract the hammer-rod or plunger against the pressure of its spring, substantially as and for the purpose hereinbefore set forth.

3. A submarine gun provided with a firing mechanism, combined with a float connected to said mechanism by a wire or other cord, 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:
R. W. HUNTINGTON,
A. C. KELTON.