Dec. 30, 1924. 1,521,091

F. L. GUILLEMET

DEPTH BOMB

Filed July 18, 1918 2 Sheets-Sheet 1

Fig. 1.

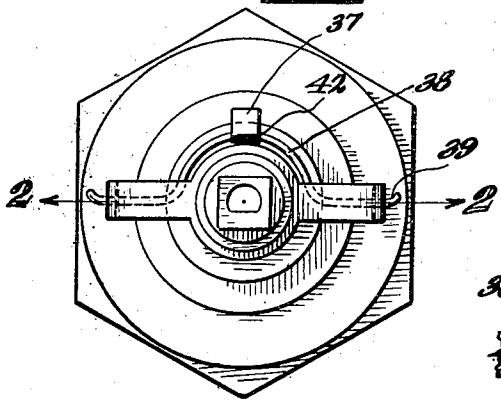


Fig. 2.

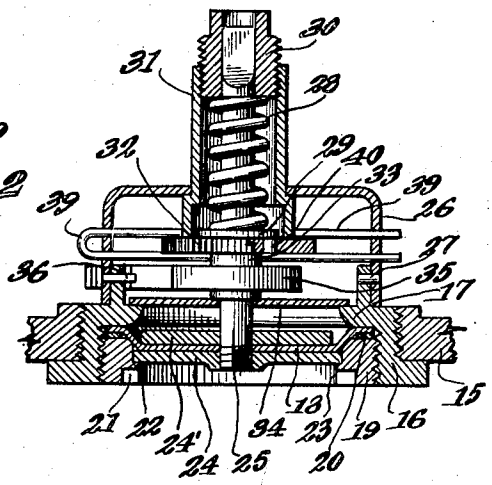


Fig. 4.

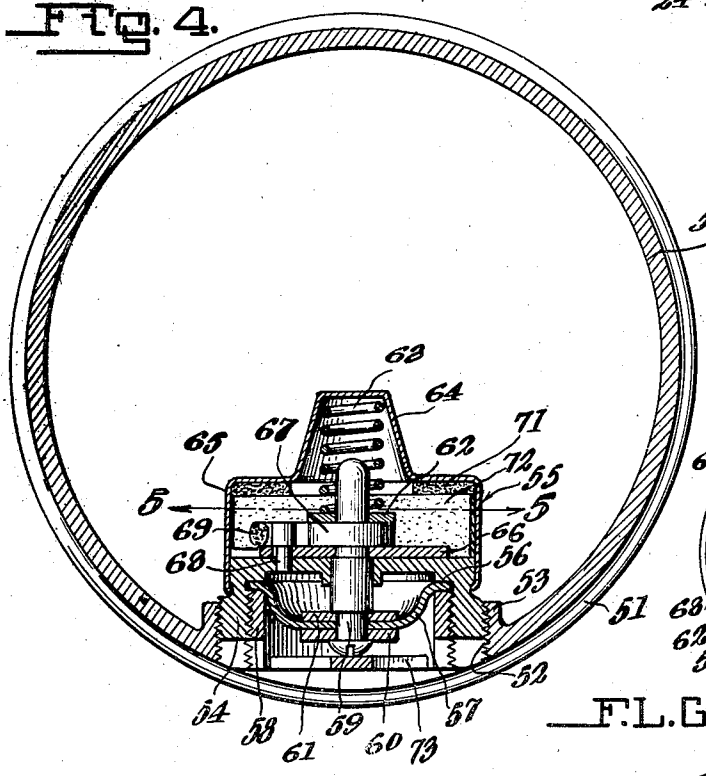
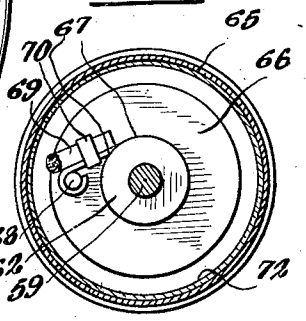


Fig. 5.



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Fig.3.

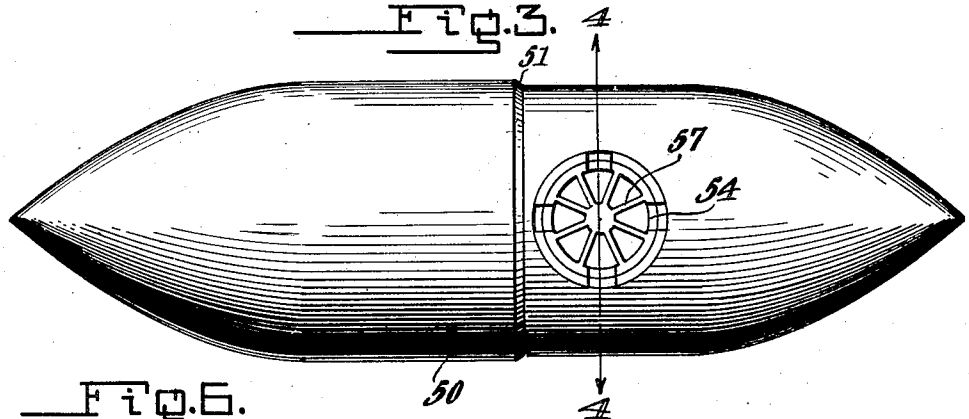


Fig.6.

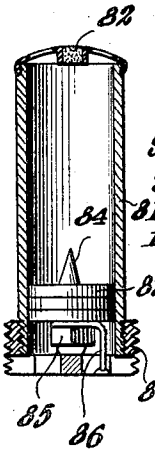


Fig.8.

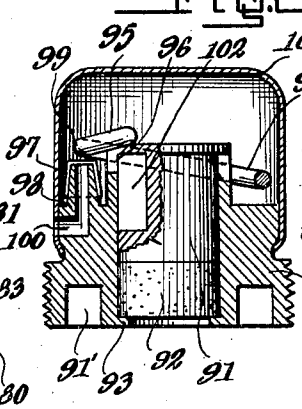


Fig.7.

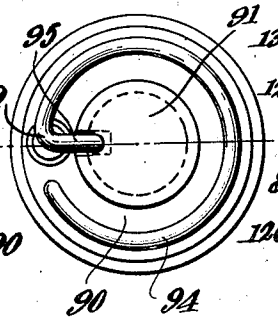


Fig.9.

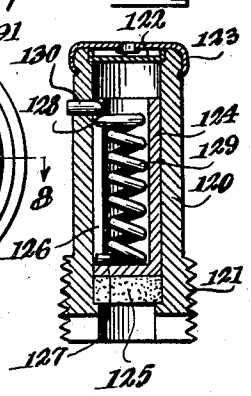
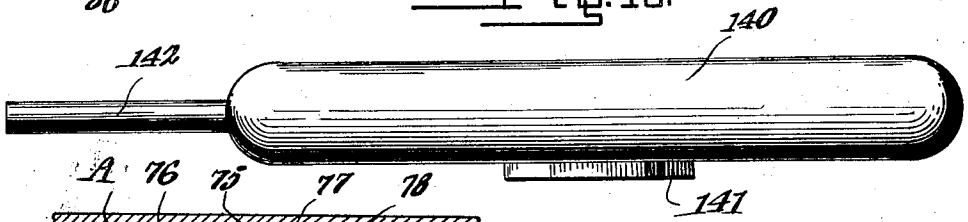


Fig.10.



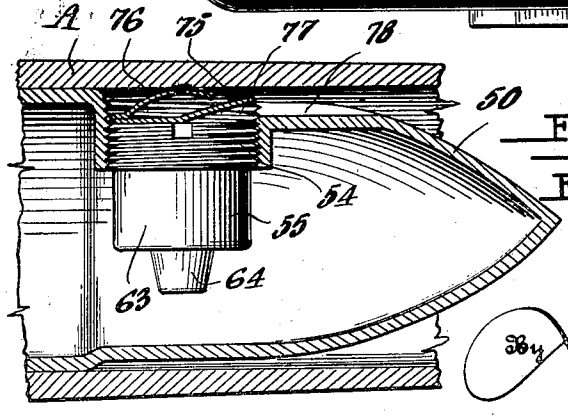


Fig.11.

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Patented Dec. 30, 1924. 1,521,091

UNITED STATES PATENT OFFICE.

FRANÇOIS LEONIDAS GUILLEMET, OF SAN FRANCISCO, CALIFORNIA.

DEPTH BOMB.

Application filed July 18, 1918. Serial No. 245,589.

To all whom it may concern:

Be it known that I, FRANÇOIS LEONIDAS GUILLEMET, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented a new and useful Improvement in Depth Bombs, of which the following is a specification.

This invention relates to depth bombs, and more particularly to a marine projectile which is normally ineffective, being rendered effective in sinking beneath the surface of the water by suitable firing or exploding means controlled by hydrostatic pressure.

More specifically, the invention comprehends the provision of an explosive projectile which is adapted to be discharged in any suitable manner, such as from a suitable gun barrel, tube, or manually, depending upon the size and type of the projectile; which will not explode upon impact against an object; which is particularly designed for use in the destruction of torpedoes, submarines and analogous water craft, being adapted to explode when it reaches a predetermined depth beneath the surface of the water; and one which is ineffective, until the hydrostatic pressure against the firing mechanism reaches a predetermined degree regardless of the distance travelled by the bomb or the lapse of time employed in its trajectory.

A further object of the invention is to provide means for regulating the hydrostat which controls the firing of the projectile, so that this hydrostat may be set to discharge the projectile at various depths.

Another object of this invention is to provide a hydrostatically operated firing mechanism, which comprises a member adapted to be acted upon by hydrostatic pressure when the projectile with which the hydrostat is connected sinks, which member is normally retained against movement by the hydrostatic pressure by suitable springs or analogous retarding means, the retarding action of which is overcome when the hydrostatic pressure reaches or exceeds a substantially predetermined degree, permitting the operation of the firing mechanism of the projectile.

More specifically, the invention comprehends the provision of hydrostatically controlled firing mechanism as specified, which includes a rotary sparker, normally restrained from rotary movement, and which is released, for rotary movement, to create a spark, to ignite the explosive of the projectile upon the disengagement of its restraining pin therefrom, by operation of companion parts of the hydrostatically controlled firing mechanism under hydrostatic pressure.

Other objects of the invention will appear in the following detailed description taken in connection with the accompanying drawings, forming a part of this specification, and in which drawings:

Figure 1 is a plan view of a hydrostatically controlled firing mechanism used in the improved projectile.

Figure 2 is a section through the hydrostatically controlled firing mechanism taken on the line of 2—2 of Figure 1.

Figure 3 is a top plan of a projectile constructed in accordance with this invention having the improved hydrostatically controlled firing mechanism carried thereby.

Figure 4 is a cross section taken on the line 4—4 of Figure 3 illustrating a section through a modified form of the hydrostatically controlled firing mechanism.

Figure 5 is a cross section on the line 5—5 of Figure 4.

Figure 6 is a longitudinal section through a modified form of the hydrostatically controlled firing mechanism.

Figure 7 is a plan view of a modified form of the hydrostatically controlled firing mechanism having a part of the casing thereof removed.

Figure 8 is a vertical longitudinal section through the hydrostatically controlled firing mechanism illustrated in Figure 7 and taken on the line 8—8 of Figure 7.

Figure 9 is a longitudinal section through a further modified form of the hydrostatically controlled firing mechanism.

Figure 10 is a side elevation of a modified form of the projectile, and

Figure 11 is a fragmentary section through the projectile illustrated in Figure 3, showing a protector for the hydrostatically controlled firing mechanism to prevent premature explosion of the projectile when discharging it from a cannon or analogous projector.

Referring more particularly to the drawings, wherein like characters indicate like and corresponding parts throughout the several

views and referring particularly to Figures 1 and 2 of the drawings, the casing or shell 15 of the projectile is provided with a threaded opening extending therethrough into which a plug 16 is threaded. The plug 16 is provided with an axial threaded opening, and with an annular shoulder 17, extending thereinto intermediate the ends of the plug. A diaphragm 18 is positioned within the plug 16 and is forced against the outer surface of the annular shoulder 17, by a plug 19 which is threaded into the threaded portion of the axial bore of the plug 16. If so desired, a suitable gasket 20 may be placed between the plug 19 and the diaphragm 18 which can be constructed of any desired material. The plug 19 is provided with diametrically opposed recesses 21, adapted to receive a key, to facilitate the screwing of this plug into the threaded bore of the plug 16, and it is provided with an annular rib 22 extending into the bore 23 thereof intermediate its ends, against the inner surface of which shoulder or rib, a disc 24 bears. The disc 24 engages the outer face of the diaphragm 18, while a similar disc 24′ engages the inner face of the diaphragm. The disc 24 is threaded upon the end of a stem 25, which extends axially through the plug 16, and through the housing 26, which is attached to the plug 16 in any suitable manner, as indicated at 27. This housing 26 is adapted to contain a highly explosive or volatile gas, liquid or analogous substance, which is ignited by means of the igniting mechanism which will be hereinafter more fully described, upon the inward movement of the diaphragm 18. The diaphragm 18 is normally held against inward movement by a spiral spring 28, which is coiled about the stem 25, and which has one end engaging against the disc 29 formed upon the stem 25, while its other end engages against a plug 30, which is threadably carried by the spring housing 31 so as to permit the tensioning of the spring 28 to regulate the resisting power of the diaphragm 18 and consequently to regulate the depth at which the firing mechanism will be regulated under hydrostatic pressure against the diaphragm 18. The firing mechanism comprises a ratchet 32, which is rotatably mounted upon the stem 25 and has a depending sleeve 33 formed thereon. The lower end of this sleeve engages against a disc 34, which is mounted about the stem 25 and rests upon the upper surface of the annular shoulder 17. A coil spring 35 has one end connected to the sleeve 33 and its opposite end is connected to the plug 16 as shown at 36, so that the uncoiling or unwinding action of the spring 35 will rotate the sleeve 33 and consequently rotate the ratchet 32. The peripheral teeth upon the ratchet 32 are preferably relatively fine, and a flint or analogous sparking substance is held against the periphery of the ratchet 32, by a suitable carrier 37, which is mounted upon the bowed portion 38 of a spring 39 which is substantially U-shaped in side elevation as illustrated in Figure 2 of the drawings and the normal tendency of which is to hold the carrier 37 and the sparking substance carried thereby in engagement with the periphery of the ratchet 32. The ratchet 32 is held against rotary movement and consequently the spring 35 is held coiled or tensioned, by a pin 40, which is carried by the disc 29 and engages in a suitable opening in the ratchet 32.

In operation, when the projectile, which carries the improved hydrostat, sinks, the pressure of the water against the diaphragm 18 will tend to force this diaphragm inwardly. However, the diaphragm will be held against inward movement, by the spring 28, until the hydrostatic pressure or the pressure of the water against the diaphragm is great enough to overcome the action of the spring 28, at which time the force of the water will force the diaphragm 18 and consequently the disc 24 and 24′ carried thereby inwardly, moving the stem 25 therewith. This inward movement of the stem 25 will move the pin 40 out of its seat or the opening in the ratchet 32, releasing this ratchet for rotation, and immediately upon the disengagement of the pin 40 with the ratchet 32 the spring 35 will be released, and the uncoiling thereof will rotate the ratchet 35, moving its roughened periphery over the flint or analogous sparking substance 42, carried by the carrier 37 creating a number of sparks which will ignite the highly inflammable or explosive material within the housing 26 to explode the same and consequently explode the depth bomb or projectile.

Figures 3 and 4 of the drawings illustrate a form of projectile which is adapted to be projected from a cannon, tube or analogous projector, and this projectile 50 is pointed at both ends, to prevent the creating of a vacuum behind the projectile during its travel, and it will be noted that the forward end of the projectile is of smaller diameter than the rear portion thereof, an annular shoulder 51 being provided about the projectile intermediate its ends. This construction will prevent the ricocheting of the projectile, causing it to enter and pass downwardly through water. The non-ricochet feature is produced because of the novel design of the projectile, in that the annular shoulder 51 is provided substantially at the center of the projectile, so that the weight of the projectile on opposite sides thereof is substantially equal. When the projectile is fired, the

annular shoulder coming into contact with the water will act as a fulcrum, so to speak, tilting the projectile so that it will take a downward dip at its forward end, and pass into the water. When the projectile is fired at a high velocity and a low trajectory, the rear enlarged portion of the projectile engages the surface of the water at about the same time as the front pointed end strikes the water. This violent plowing of the enlarged part of the projectile through the water, at the under side thereof, not only prevents the projectile from lifting its nose above the water level, but also tends to make the nose swerve downwardly, causing the projectile to sink abruptly.

The projectile 50 is provided with a threaded opening 52 therein, and an annular inwardly extending flange 53 surrounds a portion of this opening. The threaded opening 52 receives therein the main body 54, of the hydrostatically controlled firing mechanism 55, for connecting the hydrostat to the projectile. The body 54 is provided with an axial recess extending thereinto from its outer surface and terminating in an annular shoulder 56, against which the circumferential edge of the diaphragm 57 is forced by the plug 58, which is threaded into the recess formed in the body 54 of the hydrostat. This diaphragm 57 has a stem 59 extending therethrough upon which stem, discs 60 and 61 are mounted one upon each side of the diaphragm. The stem 59 has a disc 62 mounted thereon, against which a spiral spring 63 presses, for urging the stem and consequently the diaphragm 57 outwardly to prevent inward movement of the diaphragm under hydrostatic pressure less than the pressure exerted by the spring 63. This spring 63 is housed by a substantially frusto-conical extension 64, formed upon a shell 65, which is connected to the body 54 in any suitable manner. A second disc 66 is mounted upon the stem 59 and engages the inner end of the body 54. A coil spring 67 is coiled about the stem 59 between the discs 62 and 66, having one end connected to the stem, while the other end is coiled about a pin 68, which is carried by the body 54. A match 69 is attached to the spring 67 by any suitable type of attaching means 70. A disc 71 of highly explosive material is placed within the shell 65, being securely attached to the under surface of the flat portion of the shell and a strip of any suitable type of abrasive 72 such as sand paper is attached to the inner surface of the shell 65 directly below the disc 71. In operation, when the pressure of the water against the diaphragm 57 overcomes the tension of the spring 63, the diaphragm will be forced inwardly and upon moving inwardly will carry the pin 59 therewith, moving the curved end of the spring 67 off the pin 68, and releasing this end of the spring which will permit the spring to uncoil and in the uncoiling action of the spring the match 69 will be rubbed against the abrasive 72, igniting the match which will in turn ignite the explosive material 71. This material exploding will burst the shell 65, which is relatively thin, and explode the projectile 50.

A spider 73 is placed in the outer end of the body 54 to protect the diaphragm 57.

In Figure 11 of the drawings, a protector or protecting disc 75, is placed over the spider 73 to prevent the premature exploding of the projectile by the operation of the hydrostatically-controlled firing mechanism 55, under the pressure of the exploding charge in the projector A, and this disc is preferably constructed of spring metal, having its forward portion bent upwardly as clearly shown in Figure 11, and having a spring tongue 76 carried thereby which engages the bore of the projector A and maintains the disc 75 in place. However, as soon as the projectile 50 leaves the projector A the pressure against the spring protecting disc 75 through the medium of the tongue 76 will be released and the outwardly bent forward portion thereof will spring beyond the periphery of the projectile forming a pocket, as indicated at 77 for receiving air and also forming an abutment for the air which will cause the spring disc 76 to be forced out of its seat, in the projectile 50, and leave the hydrostatically-controlled firing mechanism free to be operated by hydrostatic pressure. If it is so desired, the projectile 50 may be provided with a way, as shown at 78 to guide air beneath the upstanding or outwardly bent portion of the spring disc 75, and into the pocket 77.

Figure 6 of the drawing illustrates a modified form of the hydrostatically-controlled firing mechanism, which includes a plug 80, adapted to be threaded into a casing of a projectile into which is threaded a cylindrical body 81, carrying a percussion cap 82 at its inner end. A hammer or piston 83 is mounted within the cylinder 81 and has a striking point 84 carried thereby, which is adapted to engage the percussion cap 82 to explode the same for exploding a projectile with which this form of the hydrostat is employed. The piston 83 has a head 85 carried thereby which may be a bolt, nut or analogous structure to which a spring is connected. The spring 86 is connected in any suitable manner to the body plug 80. When the hydrostatic pressure against the piston 83 becomes great enough to break the spring 86 the piston will be released from restraint of its inward movement, by the breaking of the spring, and

it will move inwardly in a quick manner, owing to the heavy pressure thereagainst, forcing or driving the point 84 into engagement with the percussion cap 82 and exploding the same.

The modified form illustrated in Figures 7 and 8 of the drawings includes the main body plug 90, provided with suitable recesses 91' to facilitate its threading into a projectile shell. A piston 91 is slidably mounted within the axial bore in the plug 90 and a packing washer 92 of any suitable material abuts the outer end of the piston 91, and rests against the inner surface of an annular flange 93, which is formed upon the plug 90 at the outlet end of the axial bore thereof, forming a constricted outlet for said bore. A spring 94, has one end connected to the body plug 90, and its end 95 turned inwardly, and resting upon the inner end of the piston 91. The piston 91 is provided with a cut away portion 96, at a point where the inturned end 95 of the spring 94 rests. A percussion cap 97, is supported upon a suitable anvil 98, formed upon the body 90, directly beneath the corner or angle formed at the inturning of the end 95 of the spring 94, and a powder train 100 leads from the percussion cap 97 out through the shell 101, which is attached to the body 19, and encloses the mechanism of the hydrostat. A cavity 102, is formed in the piston 91 to allow free movement of the end 95 of the spring 94. The spring 94, engaging against the inner end of the piston 91 will normally hold the piston against inward movement under hydrostatic pressure. However the hydrostatic pressure will gradually force the piston 91 inwardly forcing the spring 94 inwardly and tensioning the same, until the end 95 of the spring is gradually forced outwardly or rides over the inclined face of the cut out portion 96, at which time the spring will be released from engagement with the piston owing to the cut-out portion 96, and it will fly out into its normal position causing the angled portion 99 thereof, to strike the percussion cap 97, and explode the same, the explosion of which will be transmitted to the explosive in the projectile through the powder train 100.

The further modified form illustrated in Figure 9 comprises a cylindrical body plug 120, which has a threaded portion 121 for threadable engagement with a shell of a projectile, and this cylindrical body 120 carries a percussion cap or disc 122 at its inner end, the same being securely attached to the cylindrical body by a suitable metal cap or disc 123. A hollow piston 124 is slidably mounted within the cylindrical body 120 and its outer end engages upon the packing disc 125, of any suitable packing material. The cylinder or piston 120 is provided with a longitudinally extending slot 126, therein, in which the ends 127 and 128 of a spiral spring 129 ride. The end 128 of the spring 129 engages against a pin 130, which extends through the cylindrical body 120, and into the slot 126, normally arresting inward movement of the piston 124. When the hydrostatic pressure against the packing 125 and consequently against the piston 124 reaches a predetermined amount, it will force the end 128 of the spring 129 over the pin 130, releasing the piston 124 and allowing it to be snapped, or quickly forced under the hydrostatic pressure against the percussion cap 122, exploding the same.

In Figure 10 of the drawings, a modified form of projectile is shown, this modified form comprising a substantially cylindrical body 140, which has a hydrostatically-controlled firing mechanism 141 connected to the center thereof. This hydrostatically-controlled firing mechanism 141 may be any one of the types of hydrostatically-controlled firing mechanism heretofore described, for controlling the exploding of the projectile when it reaches a predetermined depth in the water, or when the hydrostatic pressure against the hydrostat 141 becomes great enough to overcome the resisting means in the hydrostatically-controlled firing mechanism. This type of projectile has a handle 142 formed thereon, and is preferably made of such size that it may be manually propelled or projected when in use.

Changes in details may be made without departing from the spirit of this invention, but;

I claim:

1. A hydrostatically-controlled firing mechanism for firing depth bombs when the same reach a predetermined depth comprising a diaphragm, a stem connected to said diaphragm, a sparking rachet rotatably mounted upon said stem, a sparking member, spring means yieldably maintaining said sparking member in peripheral engagement with said sparking ratchet, means for rotating said sparking ratchet, a disc carried by said stem, a pin upon said disc and engaging said ratchet to prevent rotation thereof, said pin adapted to be moved out of engagement with the ratchet upon inward movement of the diaphragm to permit rotation of the ratchet means.

2. A hydrostatically-controlled firing mechanism for exploding depth bombs at a predetermined pressure comprising a diaphragm, a stem connected to said diaphragm, a sparking ratchet rotatably mounted upon said stem, a sparking member, spring means yieldably maintaining said sparking member in peripheral engagement with said sparking ratchet, means for rotating said sparking ratchet, a disc

carried by said stem, a pin upon said disc and engaging said ratchet to prevent rotation thereof, said pin adapted to be moved out of engagement with the ratchet upon inward movement of the diaphragm to permit rotation of the sparking ratchet, and a spring wound spirally about said stem and normally preventing inward movement of said diaphragm.

3. A hydrostatically-controlled firing mechanism for exploding depth bombs at a predetermined pressure comprising a diaphragm, a stem connected to said diaphragm a sparking ratchet rotatably mounted upon said stem, a sparking member, spring means yieldably maintaining said sparking member in peripheral engagement with said sparking ratchet, means for rotating said sparking ratchet, a disc carried by said stem, a pin upon said disc and engaging said ratchet to prevent rotation thereof, said pin adapted to be moved out of engagement with the ratchet upon inward movement of the diaphragm to permit rotation of the sparking ratchet, spring means wound spirally about said stem and normally preventing inward movement of said diaphragm, and means for tensioning said spring.

4. A hydrostatically-controlled firing mechanism for exploding depth bombs at a predetermined pressure comprising a diaphragm, a stem carried by said diaphragm, a coil spring, means engaging said coil spring to prevent uncoiling action thereof, said spring adapted to release upon inward movement of the diaphragm and stem from engagement with the means normally restraining uncoiling action of the spring, and a sparker actuated by said spring and adapted to explode the depth bomb charge.

5. The combination with a marine projectile comprising a body having a socket therein and a groove communicating with the socket extending from the forward end of the projectile, a hydrostatically-controlled firing mechanism for exploding the projectile when the same reaches a predetermined depth comprising a body detachably fitted in the socket having means sensitive to fluid pressure, and a guard for said hydrostatically-controlled firing mechanism fitted within the socket and normally covering said means, and a resilient tongue formed on the guard and disposed in line with said groove, said tongue forming means for holding the guard in position in relation to the hydrostatically-controlled firing mechanism when the projectile is in the barrel of a gun and for forming air resisting means when the projectile is in flight so that the guard will be lifted during flight off of the projectile.

6. A firing mechanism for projectiles comprising a supporting plug, a pressure operated diaphragm mechanism including adjustable means normally resisting pressure upon the diaphragm to a predetermined degree, and sparking means including an abrasive member, normally inoperative spring means for rotating said abrasive member adapted to be released by movement of said diaphragm mechanism upon operation of the latter at predetermined pressure, and a pyrophoric material yieldably held in engagement with said abrasive member and adapted to produce sparks upon movement of the latter thereover.

7. A marine depth bomb having an annular shoulder provided thereon rearwardly of its nose in non-projecting relation forwardly of the bomb and in such relation to the ballistic characteristics of the bomb that when striking a water surface the shoulder will engage the water to deflect the bomb into the water and prevent ricochet thereof.

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Witnesses:
ROSE A. GUILLEMET,
VIRGINIA FLORENCE GUILLEMET.