

(No Model.)

3 Sheets—Sheet 1.

V. F. LÄSSOE.
SUBMARINE GUN.

No. 425,574.

Patented Apr. 15, 1890.

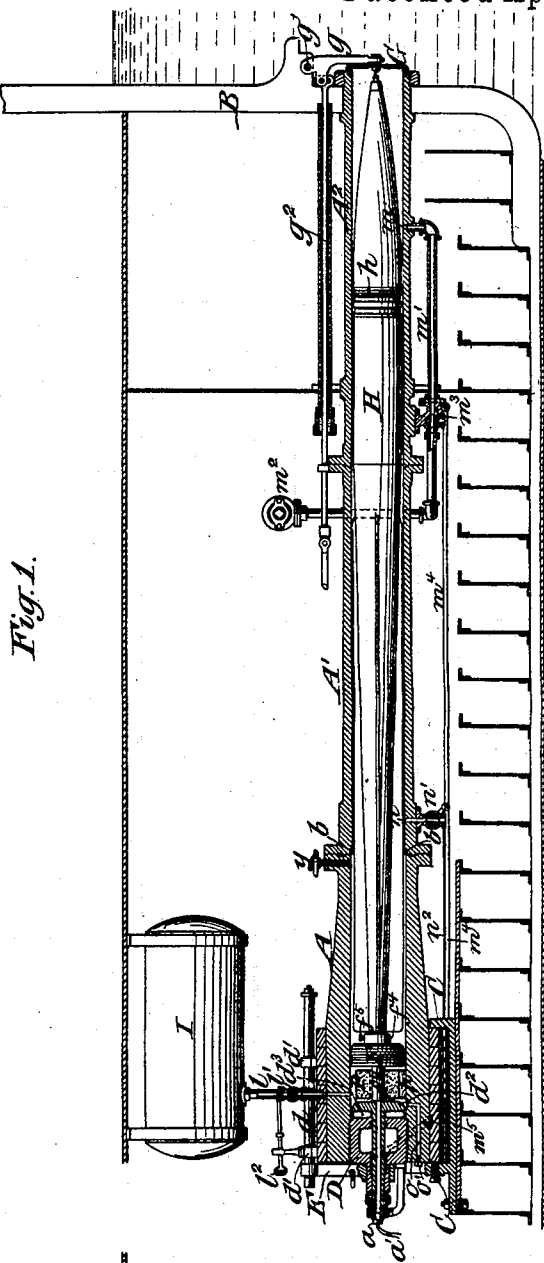


Fig. 1.

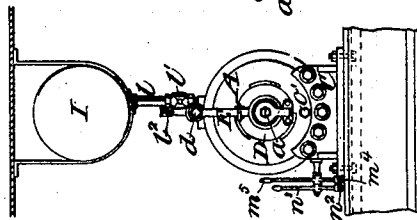


Fig. 2.

Witnesses:

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By attorneys
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(No Model.)

3 Sheets—Sheet 2.

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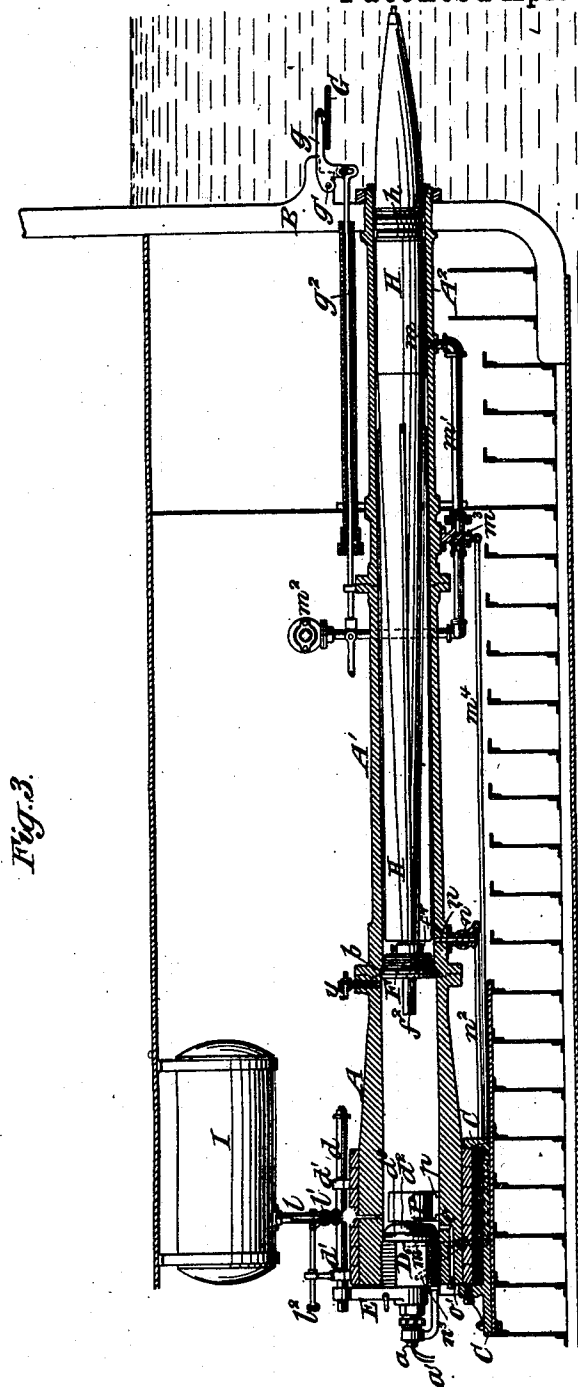


Fig. 3.

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(No Model.)

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Fig. 4.

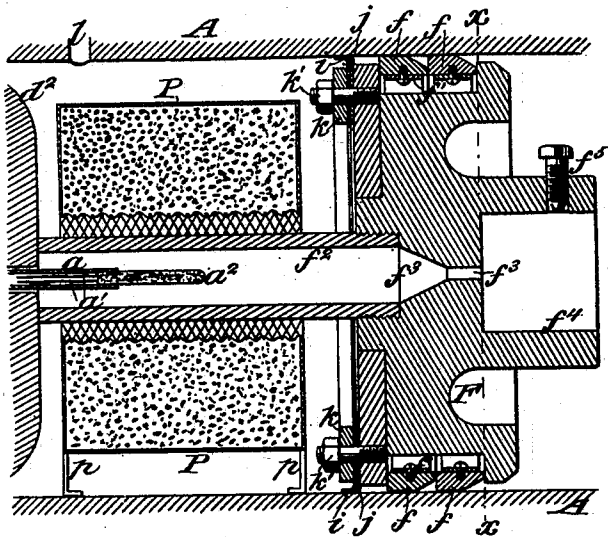


Fig. 5.

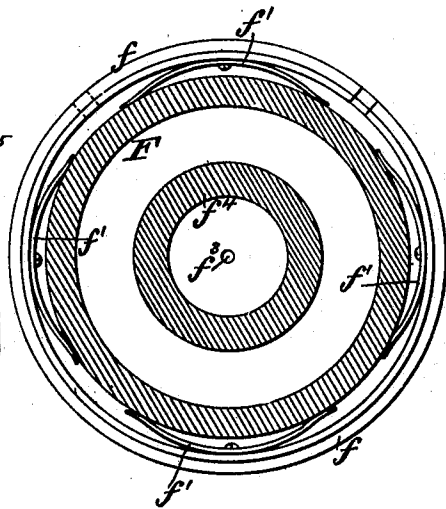
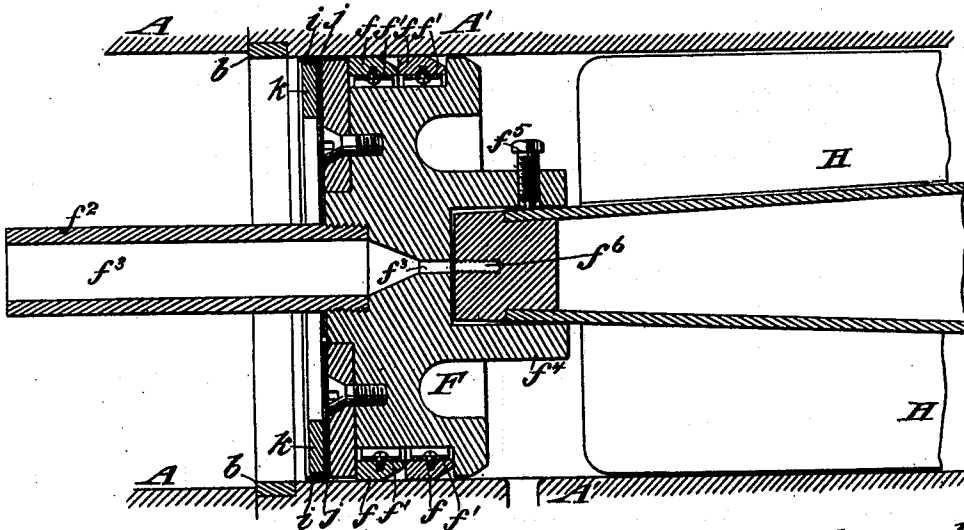


Fig. 6.



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UNITED STATES PATENT OFFICE.

VALDEMAR F. LÄSÖE, OF BROOKLYN, NEW YORK.

SUBMARINE GUN.

SPECIFICATION forming part of Letters Patent No. 425,574, dated April 15, 1890.

Application filed August 27, 1889. Serial No. 322,079. (No model.)

To all whom it may concern:

Be it known that I, VALDEMAR F. LÄSÖE, a citizen of the United States, residing in the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in the Art of Operating Projectiles in Submarine Guns, of which the following is a specification, reference being had to the accompanying drawings.

The firing of explosive projectiles from guns arranged under water has been heretofore attended with considerable danger, owing to the liability of the projectile to be exploded before leaving the gun by the firing-pin which ignites the concussion-fulminates for the explosive employed in the projectiles coming in too violent contact with the water or by its striking a frangible valve which is applied at the muzzle of the gun to exclude the water therefrom until the time of firing. The firing-pin above mentioned is commonly backed by a spiral spring, which is intended to be strong enough to hold the pin forward and prevent it from being driven back until it strikes the object at which the projectile is aimed. If this spring be of sufficient strength no premature explosion can take place either by the pin striking the water or the frangible valve; but the effective range of the projectile is reduced as the strength of the spring is increased. A very strong spring requires a high velocity of the projectile to produce the required movement of the pin for firing. The breaking up of the frangible valve is also an uncertain factor, as experience has proved that such valves never break twice precisely alike, and such valve will sometimes divert the force of the projectile and sometimes re-enter the gun before the outer muzzle-valve, which is commonly used, can be closed.

The principal object of my invention is to entirely remove all such danger of premature explosion. For this purpose I dispense entirely with the inner or frangible valve by providing the projectile with a suitable packing, which, by the pressure of the sea or water outside of the vessel, is forced against the bore of the gun and forms a water-tight joint to exclude the water from the gun after the opening of the muzzle-valve, which is provided to exclude the water from the gun when the latter is not loaded or during loading, and

I push forward the projectile gently in the gun far enough to displace the water from the forward part of the bore thereof and make the projectile project a certain distance from the muzzle of the gun into the water, and I retain the projectile in that position until it is desired to discharge it by firing the gun. I thus obviate any sudden concussion or resistance being offered to the firing-pin in the act of discharging the projectile from the gun.

It is in the above method of operation that my invention principally consists. In some cases it may be desirable after having pushed the projectile forward in the gun, as hereinabove described, preparatory to firing, to withdraw it into the gun; and my invention further consists in effecting such withdrawal by opening communication between the rear part of the gun and the atmosphere while the forward end of the projectile is exposed to the pressure of the water, which pressure is made to push back the projectile. I generally employ compressed air for the purpose of pushing forward the projectile in the gun, as before described; and in such case, after the projectile has been so pushed forward and retained stationary, a chamber is formed or left between the base of the projectile and the breech of the gun, the chamber being full of compressed air. The charge of powder for the firing of the gun being ignited and exploded in this chamber, a very perfect ignition and complete combustion of the entire charge is assured.

Figure 1 is a longitudinal vertical sectional view of the forward part of a vessel and of a submarine gun therein, showing also an external longitudinal view of the projectile, and showing partly in section the means for pushing forward the projectile within the gun and of withdrawing it thereinto according to my invention, the projectile being shown within the gun and the muzzle-valve being closed. Fig. 2 is a rear view corresponding with Fig. 1. Fig. 3 is a view corresponding with Fig. 1, but showing the muzzle-valve of the gun open and the projectile pushed forward within the gun and into the sea to the position ready for firing. Fig. 4 represents on a larger scale than the above-mentioned figures a longitudinal section of a portion of the barrel of the gun, a portion of the breech-block thereof, an

air-actuated piston, which is employed to push forward the projectile preparatory to its discharge, and of the cartridge which contains the charge of powder for discharging the projectile. Fig. 5 is a transverse sectional view taken in the line xx of Fig. 4. Fig. 6 represents a longitudinal section of a portion of the barrel of the gun and of the piston hereinabove mentioned, showing the latter in a different position in the gun, and showing also a part of the projectile.

Similar letters of reference designate corresponding parts in all the figures.

A A' A² designate the gun, which may be made of cast-iron and of smooth bore, and is represented as made of sections with suitable flanges and bolted together. Its muzzle is shown as passing through an eye forged in the stem B of the vessel, and as being furnished with a collar to abut against the interior of the stem, where it is secured by a screw-thread and nut on the outside. The breech-section of the gun is shown as resting on a wooden support in the cast-iron frame C, which is firmly secured to the floor of the vessel. The muzzle is represented as fitted with an external valve G, by which to close it to exclude the water from the bore of the gun at all times until the gun is to be got ready for firing after the projectile H has been inserted. The said valve G is attached to an elbow-lever g , which is fulcrumed at g' to the stem B of the vessel, and which is operated for opening and closing the valve by means of a rod g^2 , which passes through the stem or bow of the vessel to be worked from on board. The projectile H is represented as furnished with the packing h , which by the pressure of the sea or water outside of the muzzle when the valve G is open may be forced against the bore of the gun to form a water-tight joint to exclude the water therefrom; but as the particular packing which I propose to use for this purpose constitutes an improvement in projectiles, and therefore not a part of the present invention, and any suitable water-tight packing may be used, I shall not here particularly describe the said packing.

The gun is provided with a removable breech-block D for breech-loading. This block may be of any suitable kind, but is represented as fitted to the breech with mutilated screw-threads, in a well-known manner, and as fitted to turn in a carrier E, which is suspended from a shaft d , supported in fixed bearings d' on the top of the breech of the gun, the said shaft being capable of moving longitudinally and turning in the said bearings to permit the insertion and withdrawal of the breech-block into and from the breech and the lateral movement necessary to move it out of the way for loading and to return it to its position in line with the bore preparatory to closing the breech after loading.

The breech-block is shown as fitted with a

wrought-iron nose-plate d^2 , the stem of which passes through the block and is fastened to the carrier E, and between the flange of which and the front of the block is a gas-check d^3 . The said stem is bored throughout centrally to receive the fuse-plug a , through which the wires a' to the fuse a^2 pass.

The construction of the breech-block, its carrier, nose-plate, and gas-check, and the method of applying the fuse, so far as I have described them, constitute no part of my invention, being all well known.

The rear or breech section A of the gun is bored somewhat larger than the other sections A' A², which may be of uniform caliber, and a shoulder b is thus presented at the junction of the breech-section A and the next section in front of it. This shoulder is best represented in Fig. 6, which represents the junction of the two sections A and A'. The said shoulder is required to be very abrupt. In order to preserve its abruptness it is composed of a steel ring, which is fitted tightly into a recess provided for it in the end of the section A', and is firmly secured in the said recess by the bolting of the two sections A A' together. Behind the said shoulder b a screw y —the purpose of which will be hereinafter explained—is screwed through a tapped hole in the wall of the gun in such manner that its inner end may be protruded into or withdrawn from the bore of the gun.

F is a piston placed within the gun to receive the force of the projecting charge and transmit it to the projectile H. This piston is fitted with packing-rings f , which may be of cast-iron, and are represented in Fig. 5 as divided in one place only and as having applied within them springs f' for the purpose of pressing them out tightly against the bore of the gun. The head of the piston is of such size that it may pass into the smaller bore of the gun in front of the breech-section A. Its packing-rings are capable of such expansion and contraction that they may pass within either the larger or the smaller bore, and they will so fit the smaller bore as to make a gas-tight joint. The said rings are beveled in front, as shown in Figs. 4 and 6, in such manner that they may pass by the shoulder b when sufficient force is applied behind the piston.

The piston is furnished with a central hollow rod or tube f^2 , which projects from its rear end and is of such length that when it is against the nose-plate of the breech-block, as shown in Figs. 1 and 4, it will keep the head of the piston at such distance from the nose-plate as to leave ample room for the powder-case P, which contains the projecting-charge, and to protect the said powder-case from being crushed when the sea-pressure is permitted to push the projectile inboard, as will be hereinafter explained.

The powder-case P is represented (see Fig. 4) as made of tin-plate, cylindrical in form, with a central hole covered with wire-netting to freely expose the powder to the action of

the fuse, and as being supported loosely, but centrally, in the bore of the gun by being provided with sheet-iron legs p .

A hole f^3 is formed through the center of the piston, the walls of this hole being partly parallel and partly tapering, as shown in Fig. 4. The front portion of the hole forward of the taper is quite small and the rear part behind the taper, which extends through the rod or tube f^2 , is larger. In front of this hole f^3 there is a socket f^4 on the piston to receive the tail or rear end of the projectile, and a set-screw f^5 is provided to secure the tail of the projectile within the said socket. The tail of the projectile is intended to have in it a tapped hole f^6 , (shown in Fig. 6,) which is to be reached by the end of a screw-threaded rod, which is to be inserted through the hole f^3 , for the purpose hereinafter explained, the taper portion of the hole serving to guide the said rod into the said tapped hole.

Besides the packing-rings f' , the piston is provided, as shown in Figs. 4 and 6, at its rear end with a compound packing consisting of a cup-leather i and an annular plate j of copper or other soft metal applied between the said cup-leather and the back of the piston, the said cup-leather and plate being secured to the piston by means of a ring k and screw bolts and nuts k' .

When the plate j is applied it is flat, as shown in Fig. 4, and its external circumference is of a size to pass freely through the larger bore of the section A, but too large to enter the smaller bore of the sections in front of section A of the gun. The purpose of this plate j will be understood when the operations of moving forward the projectile in the gun are hereinafter explained.

I designates a reservoir for compressed air, which is to be admitted to the gun near the breech thereof for the purpose of forcing forward the piston F in the bore of the gun and through it forcing forward the projectile against the pressure of the sea to the position in which its forward part protrudes from the muzzle of the gun into the water, as shown in Fig. 3, in readiness to be discharged. This air-vessel may be charged by hand or from the engine-room until the pressure of say, from fifty to sixty pounds per square inch is obtained. A pipe l forms a communication between this air-vessel and the chamber of the gun. This pipe is furnished with a three-way cock l' , which is to be operated by a handle l'' for admitting compressed air into the chamber behind the piston or forming communication between the chamber and the atmosphere.

In the forward part of the gun, not far from the muzzle, there is provided an orifice m , communicating with one end of a pipe m' . The other end of the said pipe communicates through the side of the vessel with the sea, and is furnished with a valve m^2 , which may be termed the "sea-valve." This pipe m' is fitted with a three-way cock m^3 , to be operated

through a rod m^4 by a hand-lever m^5 , arranged near the breech of the gun. The orifice m is at such distance from the muzzle of the gun and the packing-ring h of the projectile at the end thereof that when the projectile is entirely within the gun, as shown in Fig. 1, the packing-ring will be behind the said orifice, but that when the projectile is pushed forward out of the gun to the position shown in Fig. 3, in readiness for firing, the packing-ring will be in front of the said orifice, but still within the bore of the gun. This orifice m and the valve m^2 and cock m^3 provide for admitting water from the sea to the gun between the muzzle-valve and the front of the projectile to establish an equilibrium of pressure on both sides of the muzzle-valve before opening the latter. The gun has also another orifice n in the smaller portion of its bore a short distance in front of the shoulder b , and this orifice is fitted with an ordinary stop-cock n' , which constitutes a test-cock, as hereinafter described. The test-cock is operated through a rod n^2 by a hand-lever n^3 , arranged near the breech of the gun. There is also in the rear portion of the gun a drain-passage from the bore to the outside to drain out water from the breech part of the gun. This passage must be provided with some means of opening and closing it—as, for instance, a screw-plug o' , as shown in Figs. 1 and 2.

The operations of the gun and projectile are controlled and performed as follows: The air-vessel having been charged, the muzzle-valve G and the cocks l' n' m^3 being all closed, and the sea-valve m^2 being open, the breech-block is unlocked and swung clear of the bore. The projectile, having meanwhile been placed centrally on rollers attached to the floor, is now run into the bore and pushed forward until its rear end is within a few inches of the breech end of the gun, when the piston F is to be attached to it by passing the socket f^4 of the latter over its tail end and screwing up the set-screw f^5 just tight enough to keep the piston from turning on the projectile, but leaving it so free that on entering the water the resistance on the front of the piston will cause it to part from the projectile. The piston and projectile are then pushed forward to their proper position, (shown in Fig. 1,) which is ascertained by a gage-rod from the rear of the gun. The powder-case P is next placed in position and the breech-block closed.

To ascertain whether the packing of the projectile at h is tight the three-way cock m^3 is opened, as shown in Fig. 1, to make communication through the pipe m' , and water under sea-pressure thus admitted in front of the packing when, by opening the test-cock n' , any imperfection in the packing will show itself by water running out through the orifice n . Should the leak be serious the projectile must be withdrawn and the packing readjusted. The withdrawal may be effected after opening the breech by the pressure of

the sea-water admitted to the bore through the orifice *m*; but should that be insufficient to overcome the friction of the packing *h* and the piston-packing the withdrawal may, after opening the breech, be effected or assisted by means of a rod having a screw-thread at its front end and an eye at its rear end, the said rod being screwed into the tapped hole *f*⁶, hereinbefore mentioned, in the rear of the projectile and a tackle being applied to the eye in the rear end of the said rod. The packing being all right, the cocks *n'* and *m*³ are left in the position last mentioned until just before firing.

It having been decided to bring the projectile to the firing position, as shown in Fig. 3, the fuse-plug is screwed in the stem of the nose-plate and the muzzle-valve *G* is opened either by air, steam, or hand power, as may be arranged in the vessel; the sea-pressure at the time being on the inside as well as on the outside of the valve, the resistance to its opening will be only such as is due to the speed of the vessel. The muzzle-valve having been brought to the horizontal position shown in Fig. 3, the air-valve *l'* is opened to admit compressed air behind the piston and force it outward until the copper plate *j* comes against the shoulder *b* between the larger and smaller bores, when the piston is stopped by the said shoulder until it is desired to discharge the projectile. Should it be found desirable to keep the projectile in the firing position for any length of time, the screw *y* may be screwed down for security to prevent the piston from being moved back by the pressure of the water, owing to any possible diminution of air-pressure behind it, the said screw constituting a positive stop to prevent the return of the piston, but being adjustable from the outside of the gun.

When ready to discharge the projectile the cocks *l'*, *m'*, and *n*³ should all be closed and the stop-screw *y* screwed back, and on the fuse-wires being attached to the firing-battery the gun may be fired.

It may be observed that when the piston and the projectile have been pushed forward, as above described, by the compressed air a chamber full of compressed air is left between the breech of the gun and the base of the projectile.

The shoulder *b* is made strong enough to resist for an infinitesimal time the explosive force of the charge of powder; but this is long enough to assure the complete ignition of the whole charge, and consequently the perfect subsequent explosion. When the full force of the explosion is developed it will of course exert upon the piston a pressure far beyond what the copper plate *j* is capable of resisting, and will so press the said plate against the shoulder *b* as to turn its edges back, as shown in Fig. 6, and the said ring will, along with the cup *i*, form a part of a gas-tight packing to the piston while the latter with the pro-

jectile before it is projected from the gun. The piston, being only lightly attached to the projectile by the screw *f*³, is left behind by the projectile immediately after their exit from the gun. After firing, the muzzle-valve *G* should be closed and the three-way cock *n'* turned to give free communication between the bore of the gun and the gun-room or interior of the vessel. If no water be discharged through the cock *n'* the muzzle-valve is tight; but if any water should appear the muzzle-valve must be resealed again by opening and closing it. The breech-block can then be removed and the water in the gun emptied in the bilge. Should it, however, for some cause be deemed advisable not to fire after having brought the projectile to the firing position, (shown in Fig. 3,) but to withdraw the projectile from that position and let it fully re-enter the gun, the screw *y* must be unscrewed and the cock *l'* turned to such a position that the air behind the piston can escape into the gun-room or interior of the vessel. The sea-pressure then forces the projectile back to its place, or, if that should fail to do so, it may be drawn back without opening the breech; but after removing the fuse-plug by means of the rod hereinbefore mentioned inserted through the breech-block and screwed into the tapped hole *f*⁶ in the rear of the projectile the muzzle-valve *G* should then be closed and the valve-cock *m*³ so turned that the water which has entered the bore in front of the packing of the projectile will empty itself into the bilge.

When the gun is not used the bore should be kept drained through the drain-passage *o* by removing the screw-plug *o'* from the rear orifice of the said passage or otherwise opening the said passage. By pushing forward the projectile within the bore of the gun and so gently protruding it into the water before discharging it I obviate all percussive action of the firing-pin upon the water as to arrest or cause it to be driven back upon the fulminate which is employed for giving the explosive charge of the projectile.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The improvement in the art of operating projectiles in a gun under water, consisting in first pushing the projectile forward in the gun against the pressure of the water to a definite position in which it displaces the water in the bore of the gun and is retained stationary, partly projecting from the gun into the water and afterward discharging the projectile from the gun, substantially as herein set forth.

2. The improvement in the art of operating projectiles in a gun under water, consisting in effecting the withdrawal of the projectile into the gun, after it has been pushed forward therein and partly projected therefrom, by opening communication between the rear part of the gun and the atmosphere while the

forward end of the projectile is exposed to the pressure of the water, substantially as herein set forth.

5 3. The improvement in the art of operating projectiles in submarine guns, consisting in first forcing the projectile forward by means of compressed air to a given position, in which it is so temporarily retained by the air-pressure as to form a chamber behind it, and

afterward igniting and exploding a charge of powder in the so-formed chamber filled with compressed air for the discharge of the projectile, substantially as and for the purpose herein set forth.

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Witnesses:

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