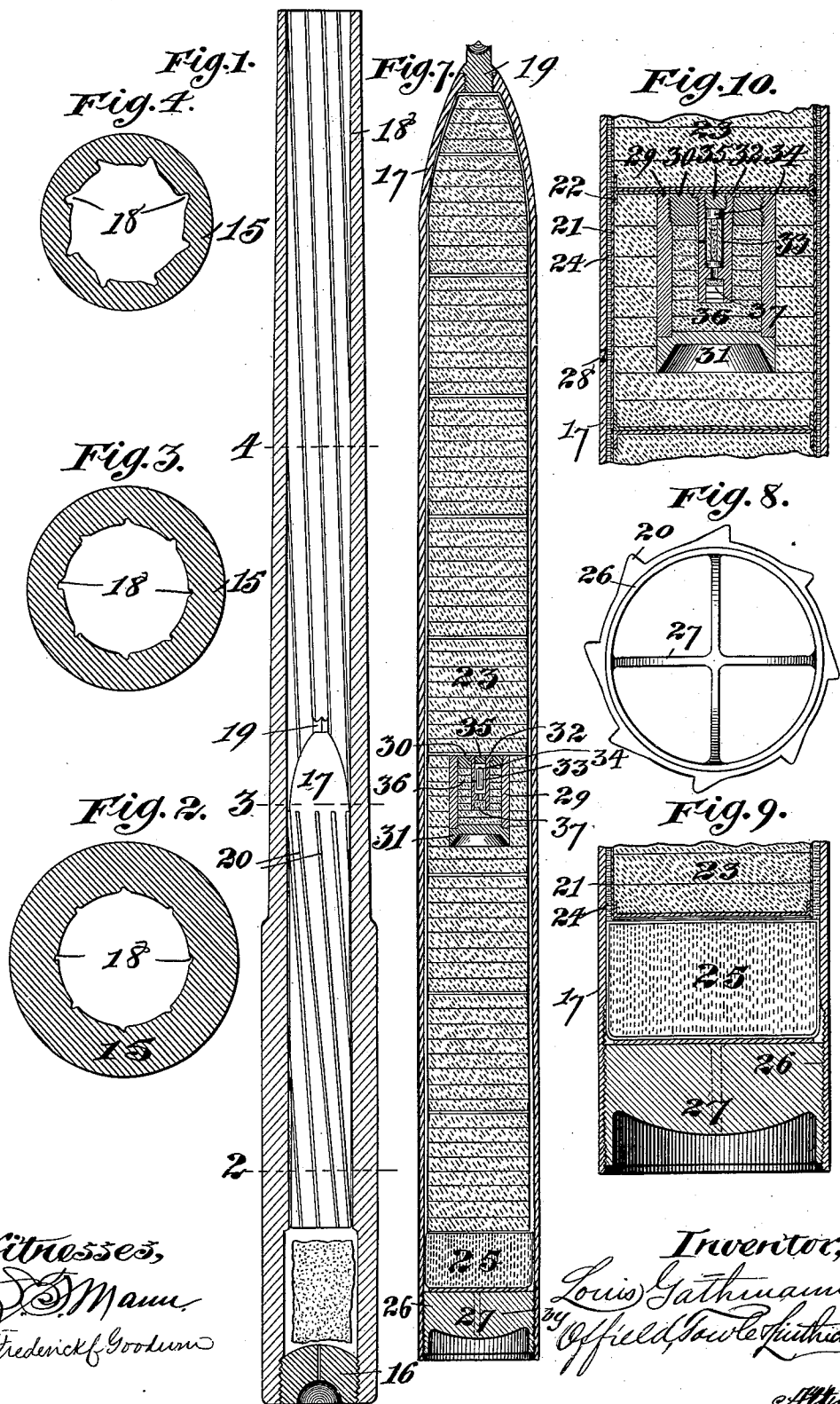


L. GATHMANN.

PROJECTILE AND GUN FOR THROWING SAME.

No. 569,191.

Patented Oct. 13, 1896.



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Fig. 6.

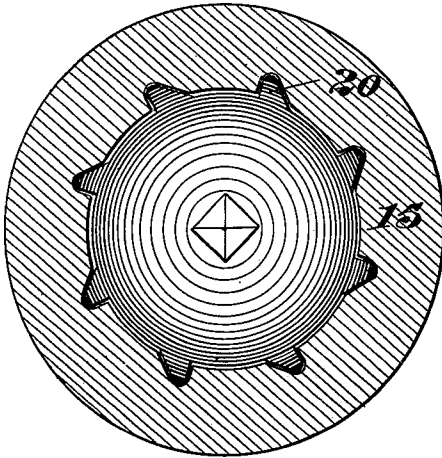


Fig. 5.

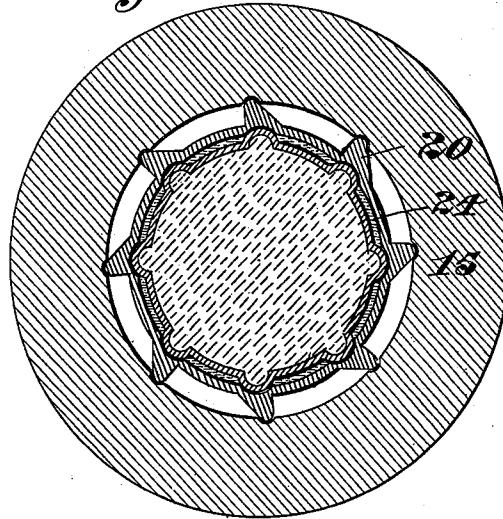


Fig. 11.

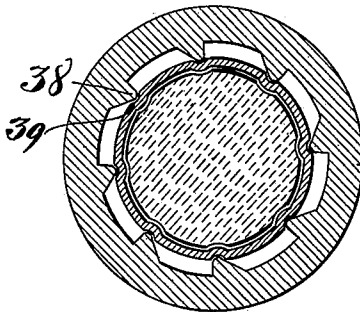


Fig. 12.

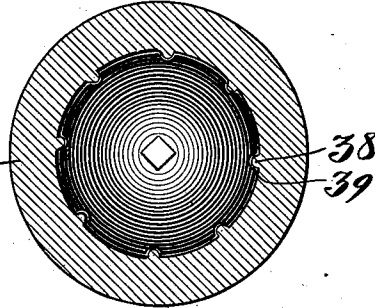


Fig. 14.

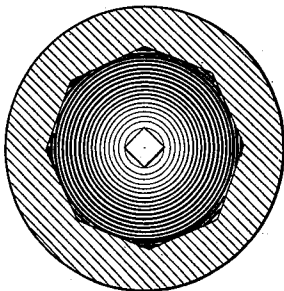
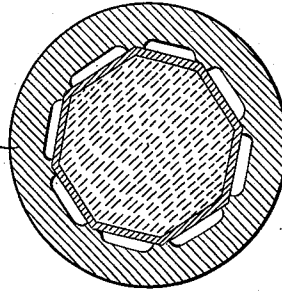


Fig. 13.



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UNITED STATES PATENT OFFICE.

LOUIS GATHMANN, OF CHICAGO, ILLINOIS.

PROJECTILE AND GUN FOR THROWING SAME.

SPECIFICATION forming part of Letters Patent No. 569,191, dated October 13, 1896.

Application filed March 17, 1896. Serial No. 583,538. (No model.)

To all whom it may concern:

Be it known that I, LOUIS GATHMANN, of Chicago, Illinois, have invented certain new and useful Improvements in Projectiles or

5 Aerial Torpedoes and a Gun for Throwing the Same, of which the following is a specification.

This invention relates to a projectile or aerial torpedo of novel construction and to a gun also of novel construction for throwing
10 the same, the object of the invention being to enable a projectile or torpedo having a shell of a minimum weight and containing a maximum of explosive material to be safely
15 thrown accurately a greater distance than has heretofore been possible.

As my invention relates solely to the throwing of a projectile which is destructive by reason of the explosion occurring upon impact as distinguished from a projectile which
20 is effective by reason of its power to penetrate and shatter an object into which it is thrown, I do not necessarily employ as great a muzzle velocity as such solid projectile or explosive shell requires. One object of my invention,
25 however, is to enable the throwing of a torpedo or explosive projectile safely or without danger of premature explosion and with a greater muzzle velocity, and consequently to a greater distance, than has heretofore been
30 found practicable and safe. The chief fault of projectiles of the common construction is that they require a very heavy shell and consequently can carry a relatively small amount of explosive material.

35 I attain the objects above stated as follows:

First, I provide a gun whose bore at or near the muzzle is of practically the same diameter as the shell, but of greater and preferably of gradually-increasing diameter from its
40 contracted portion back to the powder-chamber, thus providing an annular space around the shell, into which the pressure generated by the explosion of the expelling charge may pass freely, thus exerting a compressing force
45 upon the shell sufficient to prevent its bulging or jamming under the pressure exerted behind and within it. The gun is preferably rifled throughout, except in the powder-chamber, the rifling being of uniform twist, but
50 necessarily, because of the tapering bore, of varying depth.

Second, I provide a torpedo having rela-

tively a much larger amount of explosive material to its total weight than has heretofore been employed with guns fired by a powder-
55 charge, and such projectile I preferably provide with projections or spiral ribs registering with the rifle-grooves of the gun. I also provide a detonating cartridge located interiorly of the shell of the torpedo and sur-
60 rounded by the explosive material thereof and which is adapted, upon the striking of the torpedo against an object, to be exploded and thereby explode the torpedo. The shell
65 of the torpedo is open at the base and may be made thin, as above stated, because with my improved gun the pressure of the expelling charge within the torpedo is counterbal-
70 anced by the external pressure in the space surrounding such shell, but the detonator is necessarily made with a shell having sufficient strength to withstand the full crushing action of the powder charge.

It is a well-known fact that some highly-explosive materials, notably wet gun-cotton,
75 will not explode by heat, by applied pressure, or by ordinary concussion, and, therefore, I am enabled by my improvements to use large masses of such high explosives without danger
80 of premature explosion and with the utmost certainty of proper delivery from the gun.

In the accompanying drawings I have shown my improvements in the preferred forms and also certain modifications as to
85 features thereof.

In said drawings, Figure 1 is a longitudinal section of the gun, the torpedo being shown therein in elevation and the powder charge indicated. Figs. 2, 3, and 4 are trans-
90 verse sections of the gun on corresponding lines of Fig. 1. Fig. 5 is a transverse section of the gun on a larger scale with the projectile therein shown also in transverse section; and Fig. 6 is a similar view of the gun, the
95 outer end of the projectile showing therein in elevation. The section-lines of Figs. 5 and 6 correspond substantially to the sections shown in Figs. 2 and 4. Fig. 7 is a longitudinal section of the projectile. Fig. 8 is a
100 rear elevation thereof; Fig. 9, an enlarged broken sectional elevation through the rear end of the torpedo; Fig. 10, a sectional elevation through the middle portion of the tor-

pedo; and Figs. 11, 12, 13, and 14 show modifications in the form of the projectile-gun, Figs. 11 and 13 being broken transverse sections through the gun near the breech, and
 5 Figs. 12 and 14 being similar sections near the muzzle, showing the front end of the torpedo in elevation.

In carrying out my invention I propose to construct a gun capable of carrying a torpedo
 10 charged with several hundred pounds of highly-explosive material, say, wet gun-cotton, for a distance of several miles. I prefer to construct the gun of a caliber proportional to the desired range, and the gun may be
 15 made of any of the well-known materials and disposed in well-known ways, but need not be nearly so heavy as guns adapted to fire solid shot or shells which are effective by penetration. In fact it is one of the objects of my
 20 invention to construct a gun which will be much lighter than guns of the character last above named, so as to enable the arming of light cruisers, gun-boats, or torpedo-boats, and to make such lighter vessels as efficient
 25 as a modern iron-clad or battle-ship. The barrel of the gun is marked 15, and its breech may be closed by a breech-block 16, having the usual means for exploding a charge of powder contained within the powder-chamber
 30 adjacent to the breech-block. This powder-chamber is usually smooth and of slightly greater diameter than the bore of the gun at the inner end of the powder-chamber.

From the powder-chamber to the muzzle
 35 the gun has in the preferred construction a bore of uniformly-decreasing diameter and of greater diameter than the shell of the torpedo, except at or near the muzzle, whereat the bore is of practically the same size as the
 40 external diameter of the shell. By this means an annular space is provided around the shell of the torpedo, said space gradually decreasing from the powder-chamber to the muzzle.

The gun is preferably rifled from the front
 45 end of the powder-chamber to the muzzle, the rifling being indicated at 18, and such rifling is of uniform twist, and the lateral distance from the bottom of one groove to the bottom of a groove directly opposite is equal throughout the gun, the grooves being shallow at or
 50 near the powder-chamber and of increasing depth toward the muzzle, as clearly shown in the sectional views 2, 3, and 4, and in a slightly-exaggerated scale in Figs. 5 and 6.

The torpedo has a cylindric shell 17, thin
 55 at its rear end and slightly increasing in thickness toward its front end, the additional thickness being, of course, added upon the interior of the shell, the exterior diameter being uniform. The front end of the shell is tapered and has the usual opening closed by
 60 the plug 19. The shell of the torpedo is provided, as shown in Figs. 1, 5, 6, and 8, with spiral ribs 20, and adapted to the rifle-grooves for imparting an axially-rotating movement
 65 to the torpedo. The explosive material is packed in separate metallic shells or car-

tridges having the cylindrical bodies 21 and the caps 22, which are tightly closed or hermetically sealed. The explosive material (in-
 70 dicated at 23) is prepared by pressing it into disks or any other preferred forms. The cartridges inclosing the explosive material are of a less external diameter than the internal
 75 diameter of the torpedo-shell, so as to fit loosely therein and provide a space 24, which is preferably filled with a liquid. Near the rear end of the torpedo an asbestos plunger
 25 is fitted into the shell of the torpedo and preferably sealed with paraffin. The shell is
 80 threaded at its rear end and a metal spider, having a threaded web 26 connecting its arms 27, is screwed into the rear end of the shell, thus affording means for pressing the plun-
 85 ger and the several cartridges tightly into the chamber of the shell previous to sealing. The rear end of the shell is thus left open, except that it is crossed by the arms of the spider, and hence the force of the expelling charge
 90 acts upon the plunger to break the seal and then upon the contents of the shell, transmitting the pressure through the fluid body outwardly upon the shell and equally through-
 out its length.

A detonator is inclosed in one of the car-
 95 tridges and surrounded by the explosive material. Said detonator is clearly shown in Figs. 7 and 10, and consists of a strong shell 29, having its forward end provided with a screw-plug 30 and its rear end closed by a cap
 100 31. A metal tube or barrel 32 has a threaded engagement with the plug 30 and contains a sliding plunger 33, which acts upon a percussion-cap 34, confined by a threaded plug 35, closing the end of the barrel 32. The interior
 105 of the outer shell 29 is filled with dry gun-cotton, (represented at 36,) and fulminate of mercury is inclosed in the outer end of the barrel 32, as indicated at 37. This detonator is of the usual construction, but in my inven-
 110 tion I apply it in a novel way, the same being inclosed in one of the cartridges containing the wet gun-cotton, whereby the detonator is protected from the heat generated by the exploded powder charge, from the liquid inclos-
 115 ing the torpedo-shell, and from accidental or premature explosion by the packing of wet gun-cotton about it.

It will be observed that the shell of the torpedo is open at its rear end or base, thus al-
 120 lowing the force of the expelling charge to exert itself upon the plunger and through it upon the mass of wet gun-cotton. At the same time the pressure caused by the explosion of the expelling charge passes into the
 125 space around the shell, thus counterbalancing the interior pressure and preventing the bulging of the shell and its jamming within the gun. The shell of the detonator is of ample strength to withstand the full pressure
 130 of the expelling charge without fracture, but will be exploded by the concussion caused by the sudden stoppage of the shell upon encountering an object.

The liquid body inclosed between the interior of the shell of the torpedo and the exterior of the cartridges containing the explosive material prevents heating of the cartridge-shell and also serves as a medium for equalizing the pressure from within and counterbalancing the pressure from without. The shell is made of increased thickness toward its outer end, because there is at no time any external pressure effective upon the tapering portion of the shell and hence the internal pressure upon such portion of the shell is not compensated, except by this increased thickness, and as the shell issues from the gun increasing portions of it are subjected to the internal pressure in the absence of counter-pressure from without.

Of course there will be slight waste of the force of the expelling charge, which waste is due to the fact that there is an escape around the torpedo until the front end of the latter reaches the muzzle, when the full force is confined within the gun.

Modifications of the above-described construction may be made. I have shown some of said modifications in Figs. 11 to 14, inclusive. In Fig. 11 the gun is provided with interior spiral ribs 38, which engage grooves 39 in the shell of the torpedo, the spaces between the ribs serving to admit the pressure of the charge around the shell of the torpedo. Fig. 12 shows the same construction, the section being taken near the muzzle of the gun and looking into the muzzle upon the front end of the torpedo. In Fig. 13 the bore of the gun and the cross-sectional form of the torpedo are polygonal, an elevation of the front end of the torpedo being shown in Fig. 14. The view is taken near the muzzle of the gun and the torpedo is of the same caliber as the bore. In this construction the provision of mating ribs and grooves is not present, but the twisting movement of the projectile is secured by its form coöperated with the similar form given to the bore of the gun.

Further modifications may be made both in the gun and torpedo. For example, the rifling need not extend the entire length of the gun and the bore need not be of uniform taper. It is essential to my invention, however, that there be provided a space around the torpedo except at or near the muzzle, and by a "space" I mean such a contraction at the muzzle as would prevent unnecessary waste of the powder charge.

In my application, Serial No. 480,100, filed July 10, 1893, I have described and broadly claimed the method of firing explosive shells by exploding the powder charge at the base of the shell and simultaneously transmitting a portion of the expelling force to the interior and exterior of such shell, and also the combination, with a gun having a contracted muz-

zle and enlarged powder-chamber, of a projectile having an open base. Such matter is shown and described herein, but this application is subordinate to said prior application and is intended to be restricted to the particular improvements herein shown, described, and claimed.

I claim—

1. The herein-described improvement in ordnance comprising in combination a gun and a projectile or torpedo, said gun having a bore of greater diameter than the projectile and rifled throughout its length except at the powder-chamber, said projectile having a shell open at the base and containing high explosives packed therein with means arranged in the open base of the shell to confine the explosives therein, and said open base permitting the gases of the expelling charge to enter the base of the shell, while the enlarged bore permits said gases to envelop the shell, substantially as and for the purpose set forth.

2. A projectile or torpedo having a shell with high explosives packed therein, a detonator enveloped by the explosive, said shell having its base open to the expelling-gases of the powder charge, substantially as described.

3. The herein-described improvement in projectiles comprising in combination a metallic shell, and a sealed shell or shells containing high explosives and arranged within the interior of the principal shell, a liquid body filling the interstices between the shells, a liquid seal at the base of the outer shell and an open frame or spider confining the explosives within the shell and permitting the gases of the expelling charge to pass to the interior thereof, substantially as and for the purpose described.

4. An explosive projectile or torpedo having an open base and filled with a material such as wet gun-cotton, a detonator having a strong shell inclosed with said explosive material and a gun for throwing said torpedo, said gun having a bore of larger diameter than the torpedo, except at its muzzle, whereby to provide an annular space about the torpedo when in place in the bore of the gun, the gun and torpedo having contacting surfaces of such form as to cause an axial rotation of the torpedo when discharged and the interspace permitting the pressure of the expelling charge to be exerted equally on the exterior and the interior of the torpedo, in such manner that a torpedo having a maximum charge of the explosive material may be used.

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C. C. LINTHICUM.