(No Model.) 3 Sheets—Sheet 1.

S. H. EMMENS.

GUN AND PROJECTILE FOR THROWING HIGH EXPLOSIVES.

No. 397,052. Patented Jan. 29, 1889.

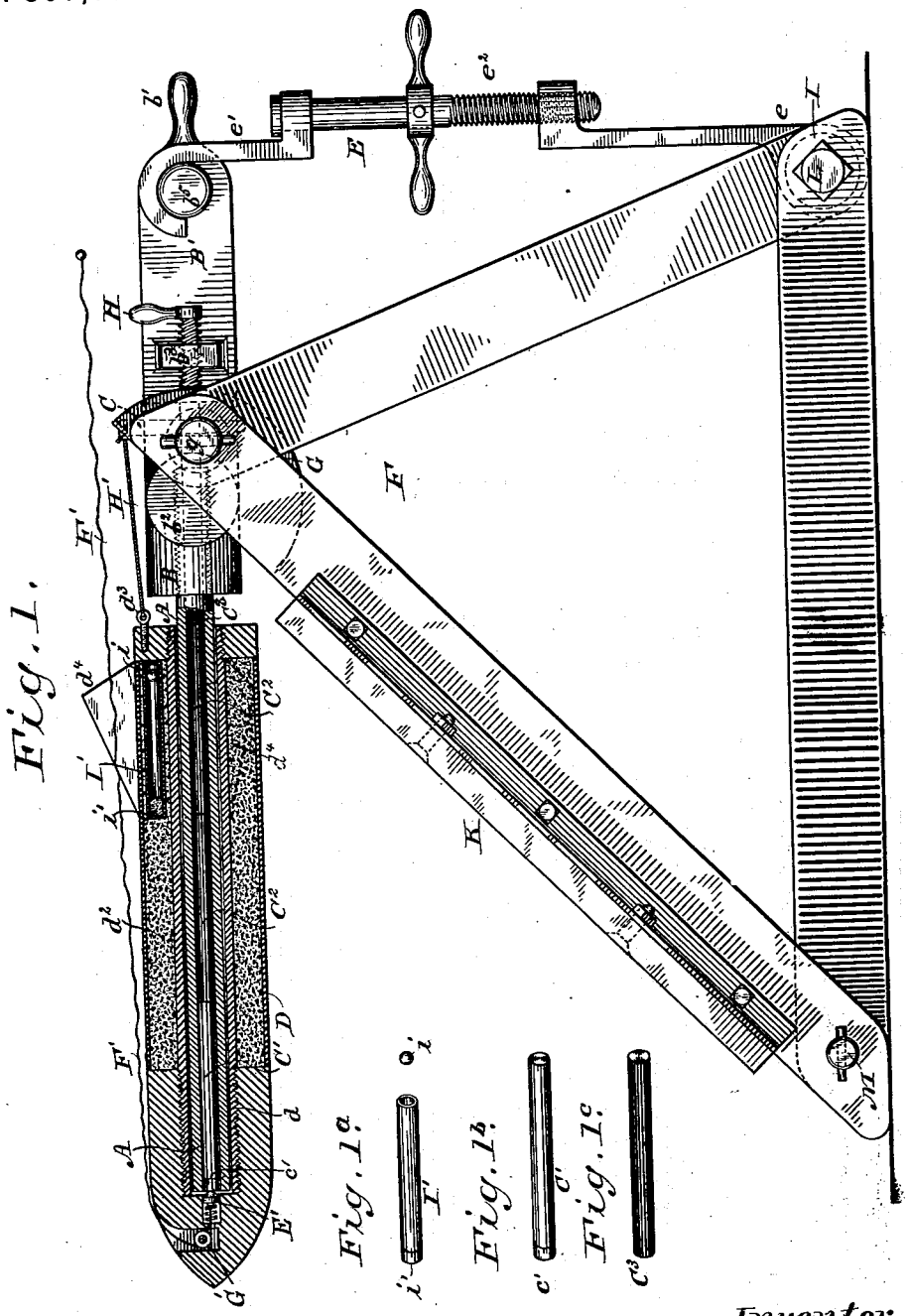


Fig. 1.

Fig. 1a. Fig. 1b. Fig. 1c.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 2*.

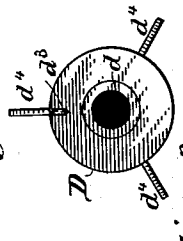


Fig. 3.

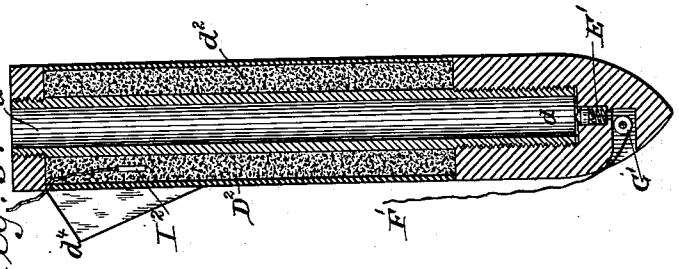
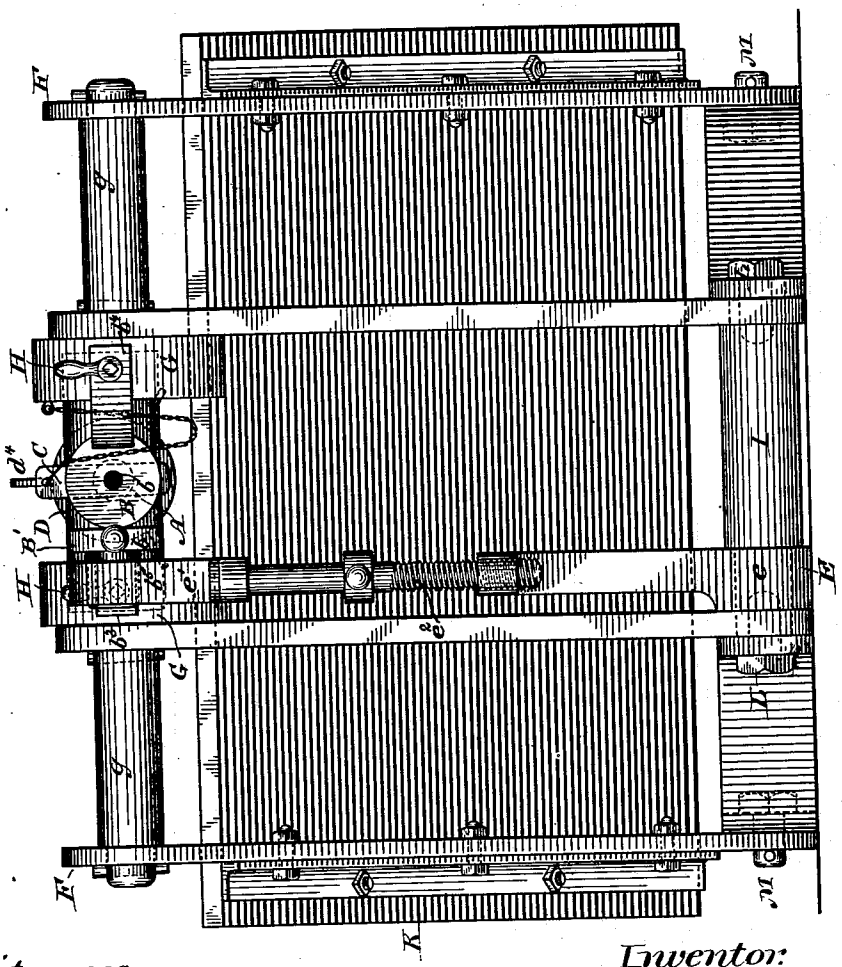


Fig. 2.



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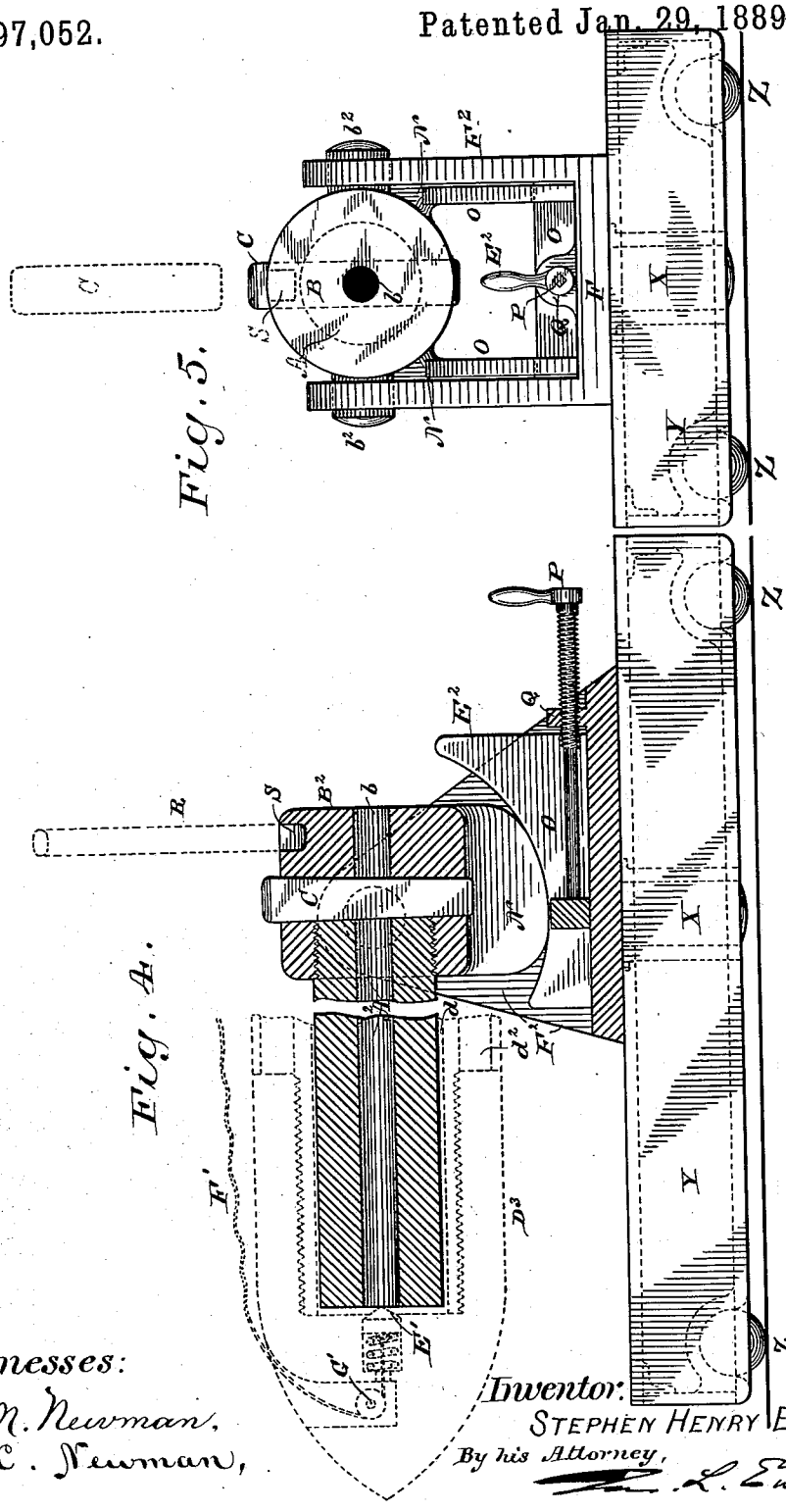


Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE.

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GUN AND PROJECTILE FOR THROWING HIGH EXPLOSIVES.

SPECIFICATION forming part of Letters Patent No. 397,052, dated January 29, 1889.

Application filed January 27, 1888. Serial No. 262,172. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN HENRY EMMENS, a subject of the Queen of Great Britain and Ireland, and a resident of London, in England, temporarily at New York, in the State of New York, have invented a new and useful Improvement in Apparatus for Utilizing High Explosives in Warfare, of which the following is a specification.

The object of this invention is to enable large quantities of high explosives to be safely and accurately hurled to considerable distances and there exploded.

The present invention relates, jointly, to ordnance and projectiles therefor, or, more particularly, to "torpedo-guns" and "torpedoes;" and it consists in certain novel combinations of parts: first, in the combination of a gun having a powder-tube which contains the propelling-charge, and an externally-applied thimble-shaped projectile having an annular charge-space for high explosives, an axial guide-bore fitted to said tube, and a head which masks both the guide-bore and the charge-space in front, whereby the possible diameter of the projectile is rendered independent of that of the powder-tube, which may consequently be a long tube of small diameter, and thus light and strong, while the projectile may carry a relatively large charge of high-explosive, the latter being protected, at the explosion of the propelling-charge, by the thickness of the powder-tube and the superadded tube, which contains the guide-bore, and the forward movement of the projectile opens up immediately a gas-space of much greater area than that of the powder-tube, which renders it safe to use high explosives for the propelling-charge, and so reduce weight, size, and expense; secondly, in the combination of a gun having a powder-tube which contains the propelling-charge, and an externally-applied thimble-shaped projectile having an annular charge-space for high explosives extending rearwardly behind its head, and a guide-bore fitted to said tube, extending forward into said head, whereby the virtually solid head of the projectile is made to receive the first shock of the explosion of the propelling-charge, and the charge of high explosive is protected against such shock; thirdly, in the combination, with such a gun, of an externally-applied thimble-shaped projectile, having a guide-bore extending forward into its head, and provided with a firing device within its head at the front end of said guide-bore, whereby provision is made for firing the propelling-charge at its front end, which insures its complete combustion and affords opportunity for using a column of cartridges charged with explosives of increasing degrees of quickness; fourthly, in the combination, with such a gun, of an externally-applied thimble-shaped projectile having an axial guide-bore, an annular charge-space for high explosives, and external directing wings or vanes of effective size projecting from its outermost surface, their projection to any required extent being unlimited.

Three sheets of drawings bearing nine figures accompany this specification as part thereof.

Figure 1 of the drawings is a side view, partly in section and partly in elevation, of a light torpedo-gun with its torpedo, designed for use in the field or wherever portability is a requisite. Figs. 1^a, 1^b, and 1^c are perspective views, respectively, of a "percussion-fuse," a detonator-cartridge, and a "dummy" cartridge, represented in Fig. 1. Fig. 2 is a rear end view of said light torpedo-gun and torpedo. Fig. $2^\times$ is an end view of the torpedo detached. Fig. 3 is a longitudinal section of the torpedo as provided with a time-fuse; and Figs. 4 and 5 are respectively a side view, partly in section, and a rear end view, of a heavier weapon or apparatus, suitable for use on shipboard or in a fort, embodying the main features of the same invention, a section of its projectile being represented in dotted outline in Fig. 4.

Like letters refer to like parts in the several figures.

Each of said torpedo-guns comprises a cylindrical "powder-tube," A, a breech-piece, B, into which the tube A is screwed fast, and a breech-plug, C, fitted to a cross-bore of said breech-piece B, and shown in position, except in dotted lines in Fig. 5, the breech-piece having a loading-bore, *b*, corresponding with the

bore of the tube A, and closed by the insertion of said plug C before firing the charge. The gun in each case is loaded to the muzzle of the tube A, as represented in Fig. 1, its charge consisting of an outer cartridge, C', having a detonating-primer, c', at its front end, and usually one or more additional powder-cartridges, C^2, with or without primers, according to the nature of the explosive. To diminish the charge when desired, one or more dummy cartridges, C^3, of wood or other suitable material, are inserted between the rear of the charge and the breech-plug C. By making all the cartridges for each gun, including such dummies C^3, of uniform length, and so that a certain number—as four—shall exactly fill the bore in front of the breech-plug, any required adjustment of the charge may be readily effected. Otherwise the charge of the tube A may be composed of ordinary gunpowder, gun-cotton, emmensite, or any other suitable explosive, in one or more cartridges of any approved kind.

A torpedo, D or D^2 or D^3, peculiar to such torpedo-guns, consists of a thimble-shaped projectile having an axial guide-bore, d, fitted to said tube A, and an annular space, d^2, concentric with such bore, which space is filled with emmensite, dynamite, explosive gelatine, or any other high explosive, as the charge of the torpedo. Said charge-space d^2 extends rearward behind the metallic head of the torpedo, while said guide-bore d extends forward into said head, as shown in Figs. 1 and 3.

To facilitate applying the torpedo, and for varying the elevation of the powder-tube A in aiming the same, said breech-block B of each gun is constructed with horizontal trunnions b^2, whereby said breech-piece, and therewith the powder-tube, is pivoted so as to rotate in a vertical plane. It is so mounted, together with elevation-gear E or E^2, in a suitable frame, F or F^2, which is in turn movable in a horizontal plane to provide for training the piece horizontally in customary manner.

In that species of the apparatus represented by Figs. 1, 1^a, 1^b, 2, and $2^\times$ the breech-block B is provided with a rearwardly-projecting lever-extension, B', terminating in a handle, b', by which to manipulate the gun, and said trunnions b^2 rest in sockets in the flat faces of semicircular bearings G, from which arms g project laterally to the respective sides of the frame F, passing through the upper ends of two pairs of slanting bars, which, together with a pair of base-bars, constitute the main members of said frame F. (Compare Figs. 1 and 2.) Said trunnions b^2 are held in their sockets by a pair of hand-screws, H, engaging with the peripheral backs of said bearings G and working in nut projections b^3 b^4, which are respectively formed on or attached to said lever-extension B' and the breech-piece B itself. A tie-piece or strut, I, between the lower ends of the rear bars of the frame, forms a convenient connection between the frame and said elevation-gear E, which comprises an eye, e, embracing a cylindrical portion of said strut I, a central turn-buckle, e^2, and a hook, e', at its upper end. The latter engages a stud, b^5, on one side of said lever-extension B' of the breech-piece B, and through these media said elevation-gear elevates or depresses the powder-tube A, so as to direct the torpedo for its flight.

The propelling-charge within the powder-tube A is fired at its front end by means of a firing device, E', located within the head of the torpedo. The particular device designed to fire said cartridge C', having a detonating-primer, c', at its front end, consists of a sliding hammer and a spiral spring arranged within an axial chamber in the head of the torpedo, as shown in Figs. 1 and 3. The spring is put in tension by a firing-string, F', attached to an eye on the hammer and drawn backward around a sheave, G', in the head of the torpedo. The string is pulled until it breaks, when the recoil of the spring causes the hammer to explode the primer.

The premature escape of the torpedo, when the muzzle of the gun is depressed, may be prevented by a cord, H', stretched between an eye, d^3, on the rear end of the torpedo and the perforated upper end of the breech-plug C, as shown in Fig. 1. This cord breaks as soon as the primer c' is fired.

The flight of the torpedo is directed, apart from the powder-tube A, by wings or vanes d^4, which may project to any required extent. Three are shown on each torpedo, projecting radially equidistant from each other around the rear end of the torpedo.

The high-explosive charge of the torpedo may be exploded either by percussion or at the end of a given time-period. In said species of the apparatus represented by Figs. 1, 1^a, 1^b, 1^c, 2, and $2^\times$, a "percussion-fuse," I', Figs. 1, 1^a, is inclosed within the charge-space d^2 of the torpedo. This fuse consists of a tube having a detonating-charge, i', of fulminate of mercury or other fulminate at its front end, and provided with a ball, i, of some hard and heavy material—as lead—which is free to roll or move back and forth in the tube, and will therefore occupy the rear end of the fuse-tube, owing to inertia, during the flight of the torpedo, and will fly forward and strike and explode the detonating-charge when the torpedo strikes any object by which its motion is suddenly checked. The shock so produced directly within the main charge of high explosive, explodes the latter with certainty and in the most effective manner.

A bullet-proof shield or mantlet, K, attached to the slanting front bars of the frame F, protects the men engaged in handling the light torpedo-gun, and together with a pair of screw-bolts, L, at the end of said strut I, and a pair of pin-bolts, M, at the front lower corners of the frame F, complete the latter. Said shield thoroughly braces the front of the frame, and when the parts are united, as shown in Figs. 1 and 2, the frame is rigid and adapted to re-

sist the strains to which it is subjected by the firing of the piece. By removing either pair of said bolts, L or M, the frame may be quickly lowered flat upon the ground, said arms *g*, strut I, and bolts M forming pivots at the respective angles of the frame, as indicated in Fig. 1; or the frame may be readily folded up or taken apart to facilitate transportation, owing to its construction, as aforesaid.

The modified torpedo D^2 (represented by Fig. 3) is provided with an ordinary detonating time-fuse, I^2, and is or may be otherwise identical with said torpedo D.

The topedo D^3 (represented in Fig. 4) may be identical with said torpedo D or with said torpedo D^2, as preferred, save as to immaterial details of size and proportions, in regard to which it is fitted to the powder-tube of the larger topedo-gun.

The elevation-gear E^2 and frame F^2 (represented in Figs. 4 and 5) are designed with reference to their heavier work as compared with those previously described. Said elevation-gear E^2 is composed of a pair of rocker-shaped projections, N, fast on the breech-piece B^2, a sliding "chock," O, having a concave double wedge in contact with each of said projections, and a screw, P, to advance and lock said chock with a relatively-fixed nut, Q, for said screw, formed on or attached to the base of said frame F^2, upon which the chock slides. An ordinary hand-spike, R, accommodated by a socket, S, in the top of the breech-block B^2, supplements said elevating-gear E^2. The frame F^2 is composed of its said base and a pair of simple bearings for the trunnions b^2 of the breech-piece B^2. Its said base is further provided with a vertical pivot, X, which occupies a central socket in a bed-frame, Y, mounted in turn upon ball-casters Z. The details of said elevation-gear E^2 and frame F^2 form no part of the present invention.

Details of the respective parts and devices which have not been specified may be of any approved description, and other like modifications will suggest themselves to those skilled in the art. I do not therefore limit my claims, hereinafter stated, to any such details except as therein specifically set forth.

Having thus described my said improvement in apparatus for utilizing high explosives in warfare, I claim as my invention, and desire to patent under this specification—

1. The combination of a gun having a powder-tube which contains the propelling-charge, and an externally-applied thimble-shaped projectile having an annular charge-space for high explosives, an axial guide-bore fitted to said tube, and a head which masks both the guide-bore and the charge-space in front, substantially as hereinbefore specified.

2. In combination with a gun having a powder-tube which contains the propelling-charge, an externally-applied thimble-shaped projectile having an annular charge-space for high explosives extending rearwardly behind its head, and a guide-bore fitted to said tube extending forward into said head, substantially as hereinbefore set forth.

3. In combination with a gun having a powder-tube which contains the propelling-charge, an externally-applied thimble-shaped projectile having a guide-bore extending forward into its head and provided with a firing device within its head at the front end of said guide-bore for firing the propelling-charge at its front end, substantially as hereinbefore set forth.

4. In combination with a gun having a powder-tube which contains the propelling-charge, an externally-applied thimble-shaped projectile having an axial guide-bore fitted to said tube, an annular charge-space for high explosives, and directing wings or vanes which project from its outermost surface, substantially as hereinbefore specified.

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