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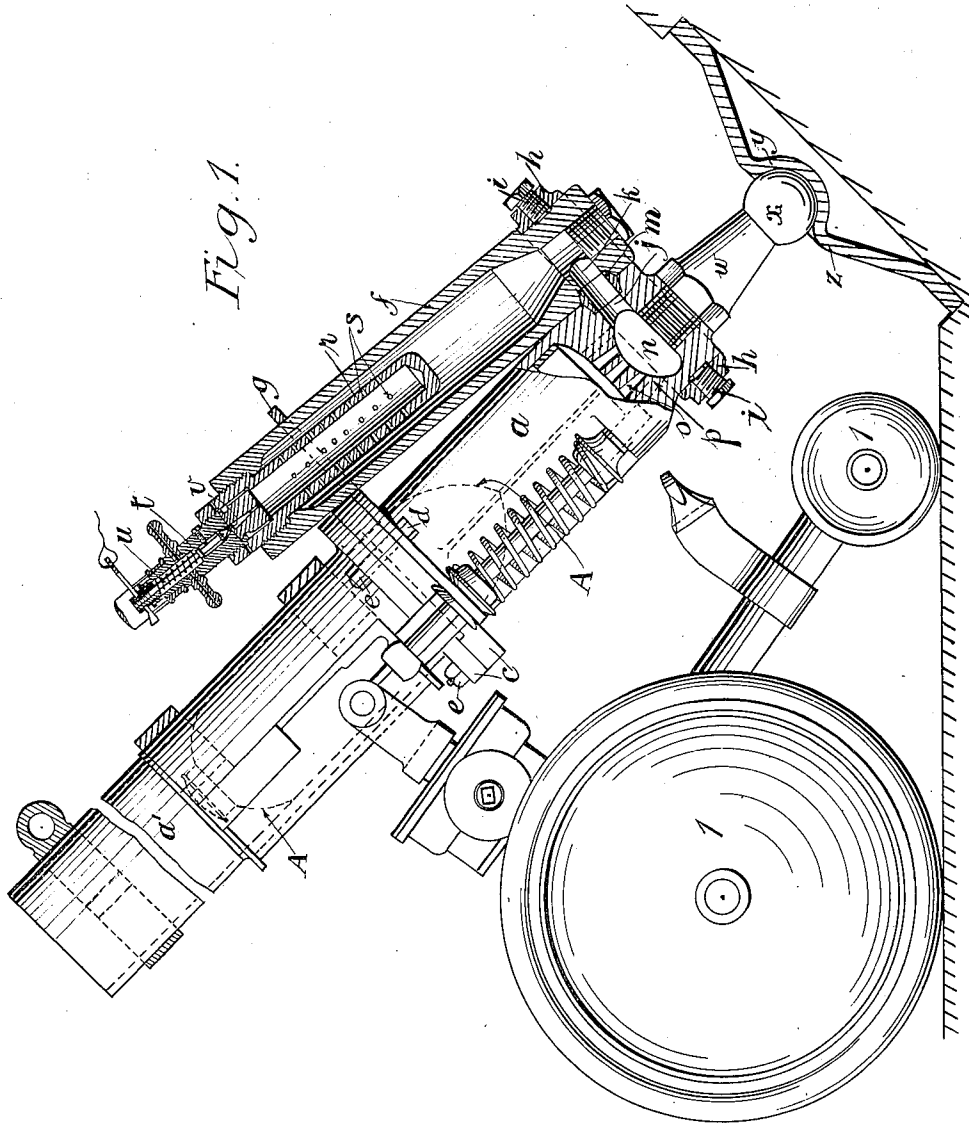
GUN FOR DISCHARGING BOMBS, SHELLS, AND OTHER PROJECTILES.

APPLICATION FILED SEPT. 11, 1919.

1,328,021.

Patented Jan. 13, 1920.

2 SHEETS—SHEET 1.

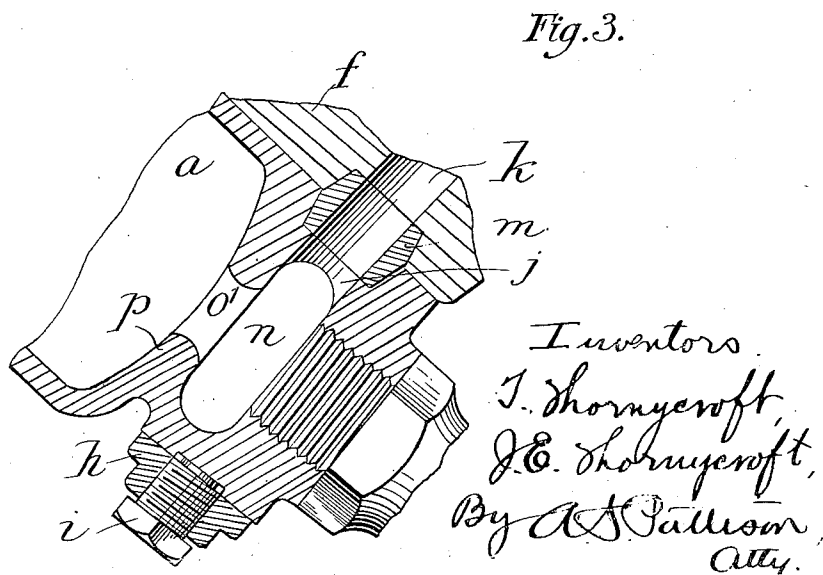
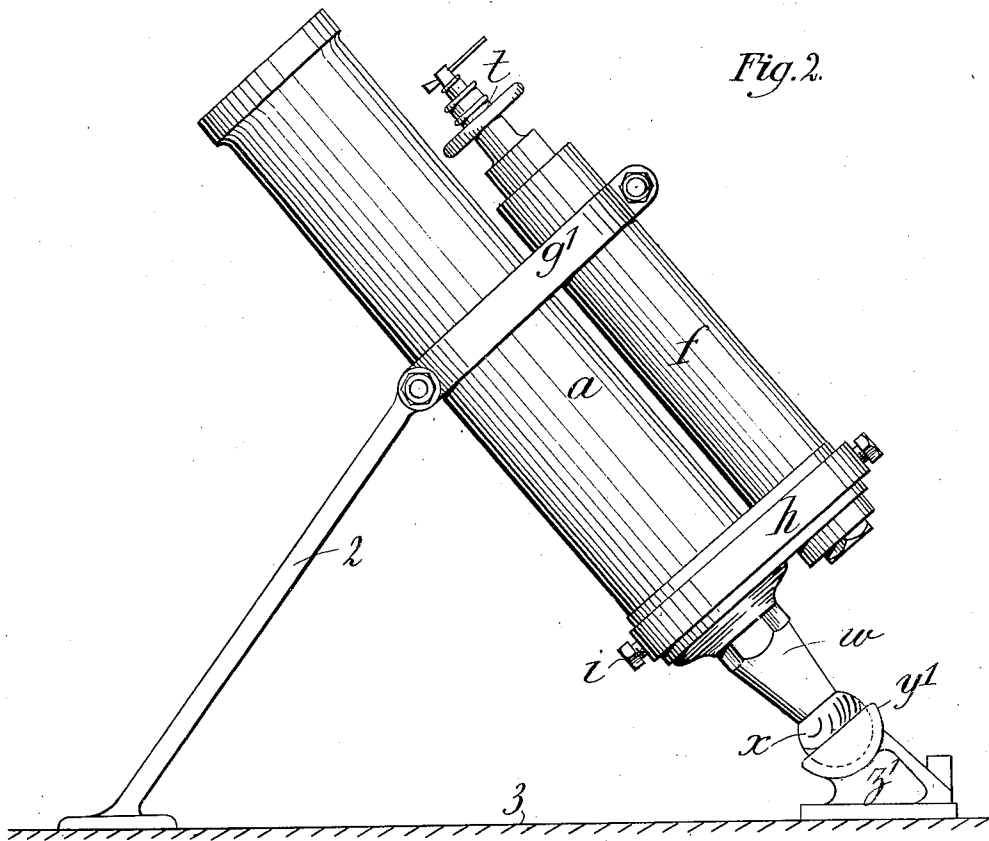


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# UNITED STATES PATENT OFFICE.

TOM THORNYCROFT AND JOHN EDWARD THORNYCROFT, OF WESTMINSTER, ENGLAND.

GUN FOR DISCHARGING BOMBS, SHELLS, AND OTHER PROJECTILES.

1,328,021.

Specification of Letters Patent.

Patented Jan. 13, 1920.

Application filed September 11, 1919. Serial No. 323,214.

*To all whom it may concern:*

Be it known that we, TOM THORNYCROFT and JOHN EDWARD THORNYCROFT, subjects of the King of Great Britain and Ireland, residing at the city of Westminster, England, have invented Improvements in Guns for Discharging Bombs, Shells, and other Projectiles, of which the following is a specification.

This invention has reference to means or apparatus for discharging shells and other projectiles from trench howitzers, mortars and like guns, the said means or apparatus comprising in conjunction with a gun of the kind referred to, a combustion chamber and a gas receiver with restricted connections between them and between such chamber and receiver and between the gas receiver and the gun barrel, the arrangement being such as to admit of an explosive, such for example as cordite, being burnt in a slower, more certain and complete manner than usual to produce gases under high pressure without shock, so that such gases can be utilized to discharge a high explosive or other shell or projectile, practically without shock, but with a comparatively low and steady pressure, and enable it to be thrown with greater accuracy and greater security against premature explosive and inaccurate ranging than has been found practicable with howitzers, mortars and like guns of similar caliber and range as heretofore constructed. The gun barrel with combustion chamber, gas receiver and associated parts are, collectively, hereinafter referred to for brevity as a gun.

To enable the parts of the gun to be rapidly taken apart to facilitate transport and to admit of their being reassembled for use, the gas receiver into which a perforated combustion chamber to hold the explosive charge is fixed, as by screwing, is secured, as by clamping, directly, in a readily detachable manner, to the breech end portion of the barrel of the gun in such a way as to insure a gas-tight joint between the two parts and to dispense with a connecting pipe between them. The gun barrel, when long, may be made in two lengths adapted to be readily connected together.

In the accompanying illustrative drawings, Figure 1 shows partly in side elevation and partly in central longitudinal section, one construction of gun according to the invention. Fig. 2 shows in side elevation, a

slightly modified arrangement. Fig. 3 shows in vertical section, part of a modified construction.

In the example shown in Fig. 1, the gun barrel comprises two longitudinal portions *a*, *a*<sup>1</sup>, conveniently termed its breech end and its muzzle end respectively, these parts being united by convenient means, such as flanges *c* on their adjacent ends and bolts *d* with nuts *e*. *f* is a gas receiver made externally except at its rear end, of cylindrical shape. It is made separately from and arranged above the breech end portion *a* of the gun barrel to which it is secured in a readily detachable manner. The arrangement may be such that, as in the example now being described, the axis of the gas receiver *f* and the axis of the gun barrel *a*, *a*<sup>1</sup> slightly diverge from each other in a forward direction, though the two axes may be arranged parallel to one another as in another construction hereinafter described. The gas receiver *f* is firmly but detachably attached at its front and rear ends to the breech end portion *a* of the barrel. The front attachment may consist, as shown, of a plate *g* bolted to the connecting flanges *c* of the two parts *a*, *a*<sup>1</sup> of the barrel and having formed in it a hole that closely fits around the exterior of the gas receiver *f*. The rear attachment may consist, as shown, of a metal band *h* that embraces the rear end portion *a* of the gun barrel and the rear end portion of the gas receiver *f*, the parts being adapted to be tightened up, as for instance by means of set screws *i*. The rear end portions of the gun barrel *a* and gas receiver *f* are adapted to bear directly one against the other. Formed in these rear end portions of the gun barrel and gas receiver are a pair of laterally extending adjacent ports or passages *j* and *k* respectively that are adapted, when clamped in alinement with each other, to establish a short direct communication between the interiors of the gas receiver and gun barrel. To insure a gas-tight joint between the rear end portions of the gas receiver and gun barrel, there is inserted at the junction of the ports or passages *j* and *k*, means, such as a double tapered nipple *m*, that also serves or assists, upon the firing of the gun, to transmit the thrust of recoil from the gun barrel *a*, *a*<sup>1</sup> to the gas receiver *f*. As will be seen, the construction is such that the gun barrel and gas receiver can be readily taken

apart as, after the set-screws *i* in the band *h* surrounding their rear end portions have been slackened and the band removed, the gas receiver can be canted, to bring its axis parallel to the axis of the barrel and can then easily be disengaged from the plate *g*.

The rear end portion of the gas receiver *f* may, as shown, be of gradually decreasing cross sectional area internally near to its junction with the laterally extending port or passage *k* in such portion.

In the rear end of the breech portion of the gun barrel *a* is a gas chamber *n* that is in free communication with the laterally extending port or passage *j* in such rear end and also with the interior of the breech portion of the gun barrel through a number of small holes *o* that extend through the crown *p* of the gas chamber *n* and open into the interior of the breech end portion of the gun barrel *a*, the holes being preferably of gradually increasing cross sectional area in a forward direction as shown.

*r* is the combustion chamber or charge container (hereinafter called the charge container) projecting into the front or forward end of the gas receiver *f* in which it is fixed, as by screwing. It is closed at its inner end and formed with gas exit apertures *s* through which the gases resulting from the burning of a charge of propellant, such as cordite, can pass into the gas receiver and thence flow through the passages *k* and *j*, chamber *n* and holes *o* into the breech end of the gun barrel *a*. To admit of the cordite being burnt slowly and completely in the charge container *r*, it is burnt at a very high pressure, say of the order of several tons to the square inch and then admitted to the gas receiver *f* at a lower but still high pressure, say of the order of about two tons to the square inch, from which it can be delivered to the gun barrel at a still lower but comparatively high pressure, say of the order of about one quarter to one half of a ton to the square inch. For this purpose the holes *s* in the charge container *r* are made of comparatively small collective cross sectional area and the passage between the gas receiver *f* and the rear end of the gun barrel is also made of restricted cross sectional area as shown. The said cordite container is preferably made, as shown, in the form of a cylinder and is provided with a number of small gas exit apertures *s* arranged along its length and of small collective cross sectional area as set forth. For example, for a charge container for a charge of about thirty ounces of cordite, for throwing bombs, satisfactory results can be obtained by providing the container with 128 holes each  $\frac{1}{16}$  of an inch in diameter, or a total cross sectional area of about  $9\frac{1}{4}$  square inches. The gas exit apertures *s* are preferably arranged to ex-

tend toward the front end of the charge container *r* so that when the charge of cordite is ignited the resulting gases of combustion will first pass out through the apertures nearest to the point where the charge is first ignited and then through succeeding apertures. In this way the cordite can be burnt in a comparatively slow and effective manner. The cordite may be placed loose in the container, or it may be made up as a cartridge that is inserted in the container.

*t* is the firing gear of any known or suitable kind secured in a removable manner in the front or forward end of the charge container *r* and adapted to be operated in any desired manner for firing the cordite charge in the container *r*. Firing gear of a percussion character is shown having a spring actuated striking pin *u*, a perforated seat being provided at *v* to hold a percussion cap or detonator in position to be struck by such pin.

Fig. 2 shows a gun similar to that shown in Fig. 1 but having a gun barrel *a* of less length than that shown in Fig. 1 and made in one piece, and the gas receiver *f* carrying the charge container and firing gear, such as hereinbefore described, is arranged with its axis parallel to that of the gun barrel. The rear end portion of the gun barrel and gas receiver are constructed and clamped together as in the arrangement shown in Fig. 1 and the front or forward end portion of the gas receiver is detachably fixed to the gun barrel by a holder *g*<sup>1</sup>.

In the modification shown in Fig. 3, the crown *p* of the gas chamber *n*, instead of being formed with a number of small apertures *o*, as shown in Fig. 1, is provided with a single central perforation *o*<sup>1</sup> of sufficiently small cross sectional area to reduce the pressure of the gas passing through it into the gun barrel to the desired degree.

The gun barrel *a* may be furnished at its rear end (see Fig. 1) with an axial extension *w* having a ball shaped end *x* adapted, when the gun is in position to be fired, to fit in a socket *y* formed in a kick-plate or like thrust or abutment device *z* adapted to bear against the rear wall of a trench or other support. A gun of the kind described is carried by a mounting that can be variously constructed to admit of the gun being brought into and supported in the desired inclined position for use. In Fig. 1, the gun is supported in an inclined position partly upon a wheeled vehicle 1, and in Fig. 2 by a strut or plate 2, and by a socket *y*<sup>1</sup> carried by an abutment device *z*<sup>1</sup> adapted to be fixed to a suitable base or support 3 upon which the strut or plate 2 also bears.

The operation of a gun constructed as hereinbefore described is as follows:—

A cordite charge or cartridge being placed in the perforated charge container *r* the fir-

ing gear  $z$  is placed in position ready to be actuated. When it is desired to discharge a bomb or shell A (Fig. 1) from the gun  $a$   $a^1$  or  $a$ , the firing gear is operated in the usual way, as through a lanyard or other device, and the cordite charge or cartridge ignited, and as the resulting gases are restricted in volume owing to the special construction of the charge container  $r$  used, the cordite burns completely under high pressure. The resulting gases pass into and are collected in the receiver  $f$  and thence pass through passages  $k$  and  $j$ , chamber  $n$  and holes  $o$  (Fig. 1) or hole  $o^1$  (Fig. 3) into the breech end of the gun barrel  $a$ . As the cordite is burnt under pressure and comparatively slowly, there will be very little shock due to its combustion and the resulting gases will pass from the gas receiver into the gun barrel through the restricted pressure reducing passage shown, in a steady and continuous manner, without violent shock, and with a comparatively low and steady pressure, so that they will act in an advantageous manner upon a bomb or shell A within the gun barrel and throw it in a definite and effective manner.

What we claim is:—

1. A gun for throwing bombs, shells and the like, comprising a gun barrel, a separate gas receiver normally in direct and free communication with the rear end of the gun barrel through a short passage of less cross sectional area than that of the receiver or gun barrel, means for connecting said gas receiver to said gun barrel, a charge container carried by the gas receiver and the wall of which has a gas outlet of restricted cross sectional area in communication with the gas receiver, as and for the purpose set forth, firing means for igniting a charge of propellant within said gas container and means for supporting said gun in position for use.

2. A gun for throwing bombs, shells and the like, comprising a gun barrel, a separate gas receiver mounted longitudinally above and carried by said gun barrel and having its rear end in direct and free communication with the rear end of the gun barrel through a short passage of less cross sectional area than that of the gas receiver or gun barrel, means for connecting said gas receiver to said gun barrel in a detachable manner, a charge container carried by and extending into said gas receiver and in free communication with the interior of said gas receiver through an outlet of restricted cross sectional area, as and for the purpose set forth, firing means for igniting a charge of propellant within said gas container and means for supporting said gun in an inclined position for use.

3. A gun for throwing bombs, shells and the like, comprising a gun barrel, a separate

longitudinally arranged gas receiver having its rear end in direct and free communication with the rear end of the gun barrel through a short passage of restricted cross sectional area, means for securing said gas receiver to said gun barrel in a readily detachable manner a perforated tubular charge container extending into and carried by the gas receiver, the perforations in said charge container forming a gas outlet of restricted cross sectional area, substantially as described for the purpose set forth, between said charge container and gas receiver firing means for igniting a charge of propellant within said charge container, and means for supporting said gun in position for use.

4. A gun for throwing bombs, shells and the like, comprising a gun barrel, a separate tubular longitudinally arranged gas receiver having its rear end in direct and free communication with the rear end of the gun barrel through a short passage of restricted cross sectional area, means for securing said gas receiver to said gun barrel in a readily detachable manner, a tubular charge container extending into and carried by said gas receiver and having along its length a number of small gas outlet apertures, firing means for igniting a charge of cordite within said charge container and means for supporting said gun in position for use.

5. A gun for throwing bombs, shells and the like, comprising a gun barrel, a separate tubular longitudinally arranged gas receiver carried by said gun barrel, the rear ends of said gun barrel and gas receiver having short alined lateral passages forming between the said rear ends, a short direct passage of considerably less cross sectional area than the cross sectional area of said gun barrel or of said gas receiver, means for securing in a detachable manner, said gas receiver to said gun tube with their rear end passages in direct alinement, a perforated charge container extending into and carried by said gas receiver, firing means carried by said charge container for firing a charge of propellant within said charge container and means for supporting said gun barrel with gas receiver and associated parts in position for use.

6. A gun according to claim 5, wherein means are arranged between the adjacent ends of the said alined passages for insuring a gas tight joint between them.

7. A gun according to claim 5, wherein a double conical nipple is arranged between the adjacent ends of the said alined passages for insuring a gas tight joint between them.

8. A gun for throwing bombs, shells and the like, comprising a gun barrel, a separate tubular longitudinally arranged gas receiver carried by said gun barrel, the rear ends of said gun barrel and gas receiver having

short alined lateral passages forming between the said rear ends a short direct passage of considerably less cross sectional area than the cross sectional area of said gun barrel or of said gas receiver, means for holding the forward end of the gas receiver to the gun barrel in a detachable manner and clamping means for securing the rear end of the gas receiver to the rear end of the gun barrel with the lateral passages in their rear ends in direct communication with each other, a charge container carried by and extending into said gas receiver and having its interior in communication with the interior of the gas receiver through a gas outlet in its wall of restricted area, as and for the purpose set forth, firing means carried by said charge container and adapted to ignite the forward end of a combustible charge in said container and means for supporting said gun barrel and associated parts in position for use.

9. A gun according to claim 8, wherein the clamping means for securing the rear ends of the gun barrel and gas receiver together comprises a separate metal band surrounding the said rear end portions of the gun barrel and gas receiver and set screws extending through said band and engaging the said rear end portions of the gun barrel and gas receiver for securing said band in place in a readily detachable manner.

10. A gun for throwing bombs, shells and the like, comprising a gun barrel, a separate gas receiver arranged longitudinally upon and carried by said gun barrel, a per-

forated tubular charge container extending into and carried by said gas receiver, firing means carried by said charge container, said gun barrel having at its rear end a gas chamber separated from the rear end of the gun barrel by a perforated partition and a short lateral passage extending from said gas chamber, and said gas receiver having at its rear end a lateral passage in alinement with the lateral passage at the rear end of the gun tube and means for connecting the gas receiver to the gun barrel in a detachable manner.

11. A gun for throwing bombs, shells and the like, comprising a gun barrel, a separate gas receiver arranged longitudinally upon and carried by said gun barrel, a perforated tubular charge container extending into and carried by said gas receiver, firing means carried by said charge container, said gun barrel having at its rear end, a gas chamber separated from the rear end of the gun barrel by a perforated partition and a short lateral passage extending from said gas chamber, and said gas receiver having at its rear end a lateral passage in alinement with the lateral passage at the rear end of the gun tube, means for connecting the forward end of the gas receiver to the gun barrel in a detachable manner and means for clamping the rear end of the gas receiver to the rear end of the gun tube in a detachable manner.

Signed at London, England, this twenty-first day of August, 1919.

TOM THORNYCROFT.

JOHN EDWARD THORNYCROFT.