Apr. 3, 1923. 1,450,558

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GUN

Filed Mar. 24, 1921

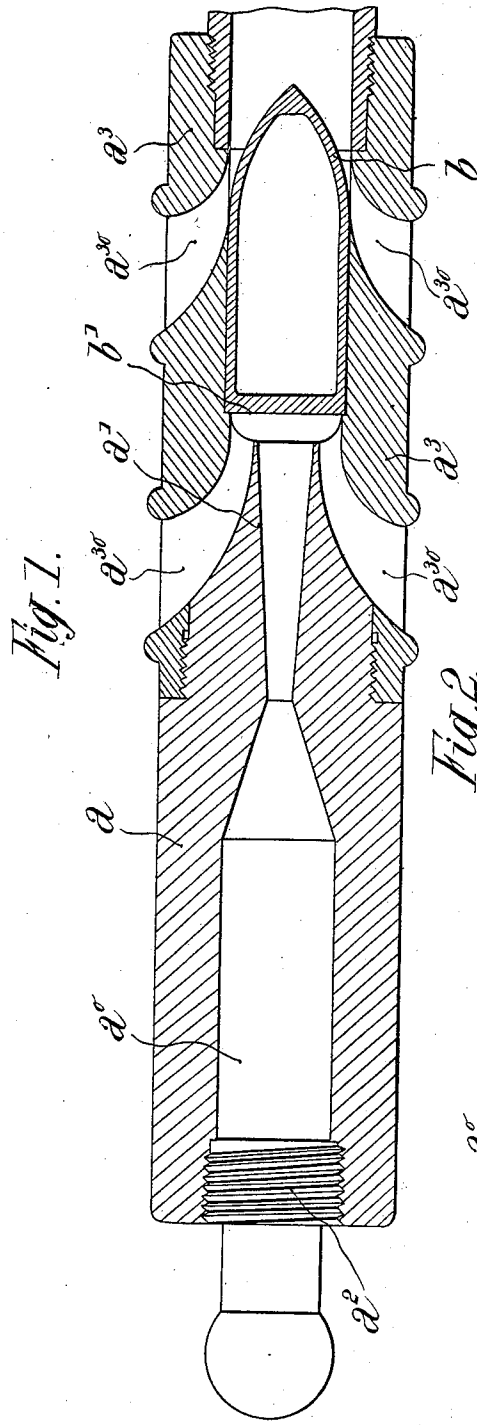


Fig. 1.

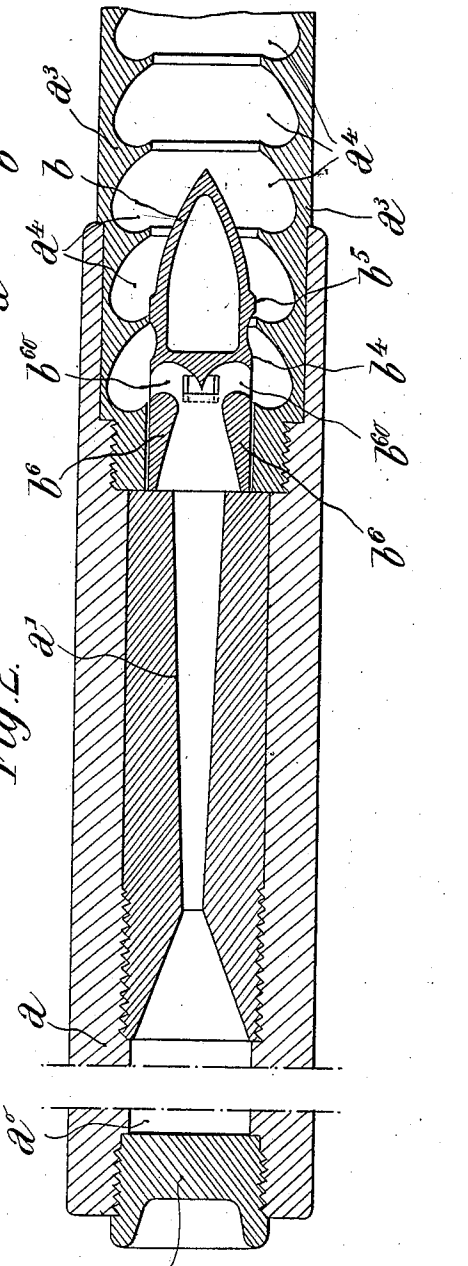


Fig. 2.

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UNITED STATES PATENT OFFICE.

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GUN.

Application filed March 24, 1921. Serial No. 455,169.

To all whom it may concern:

Be it known that I, CHARLES ALPHONSE FRANÇOIS MAZE dit DELAMARE MAZE, citizen of the French Republic, residing at Paris, France, have invented certain new and useful Improvements in Guns (for which I have filed an application in France, Aug. 26, 1918), of which the following is a specification.

This invention relates to the construction of guns and has for its principal object so to construct such guns that their utility from a ballistic point of view is greater than has hitherto been the case.

In the specification of a previous application which I filed in U. S. A. under S. N. 261,547 the 7th November 1918, I describe means for the propulsion of projectiles wherein both the impact and velocity of the fluid as well as its pressure are utilized for discharging the projectile.

In my former aforesaid specification, the applications of the novel principle discovered by me were more particularly those concerned with the construction of projectiles, whilst the present invention refers more particularly to guns.

According to my present invention the cannon or gun comprises an explosion or combustion chamber, a nozzle between the said chamber and the bore of the gun and means for enabling the gases of explosion to escape to the outer atmosphere through apertures in the wall of the gun, or around the projectile, to the rear part of the gun, before the said projectile has left its position of rest.

With the foregoing construction, the gases are enabled to expand powerfully before they operate upon the projectile, thus allowing greater velocity and efficiency to be obtained than has hitherto been the case.

I will now proceed to describe, by way of example and with reference to the accompanying drawing, two methods of constructing a cannon or gun according to my present invention.

Fig. 1 is an axial section of the cannon or gun illustrating the construction in which apertures are provided extending to the outside.

Fig. 2 is a modified construction hereinafter referred to.

a is the cannon, formed from metal in any appropriate manner and furnished with a chamber a^0, preferably cylindrical in the interior and having walls of appropriate thickness to suit requirements.

Opening from the chamber a^0 is a nozzle shaped tube a^1, the walls of which first converge and then diverge as will be seen.

Around the wall of the nozzle a^1, I provide, as shown at Fig. 1, an annular chamber a^{30}, which is preferably of nozzle shape, widening towards the rear and commencing in the neighbourhood of the base of the projectile when in the position of rest and communicating with the outside through a number of apertures.

The axis of the tube a^3 of the gun is in the prolongation of the axis of the nozzle, and the projectile when placed in position in the said tube a^3 rests on an inner ledge or the like therein.

The explosive is introduced into the chamber a^0 through a suitable opening which is closed by a block a^2, whilst the projectile b may be introduced through the muzzle, so that it rests in front of the chamber a^{30}.

The gases of combustion which are liberated in the chamber a^0 escape through the nozzle, which they traverse at a determined velocity, which velocity is a function of the temperature of combustion of the power. The gases then expand in the diverging portion of the nozzle, acquiring greater and greater velocity, which is a function of the length of the nozzle and depends upon the relation of the sectional area at the opening of the nozzle and of the throat. The gases then strike against the central portion of the base of the projectile b with very high velocity. Then, turning backwards and still expanding they continue to exert pressure by reaction on the other portions of the base of the projectile—thus exerting their total pressure upon the base; which is preferably of about double the sectional area of the opening of the nozzle, but in certain cases may be equal and even smaller than the opening of the nozzle. Finally, the gases escape freely and expand to atmospheric pressure in a backward direction.

It will thus be understood that the said gases no longer operate upon the base of the projectile merely by direct pressure as is the case with an ordinary cannon, but prin-

cipally through their active power: in other words, the force exerted is a function of the mass and the velocity, in addition to the static pressure.

The advantages as compared with ordinary cannon are very great, as even with the longest which have been constructed, the expansion can never be complete, and only a comparatively small benefit is derived from the expansion from the time of firing until the projectile leaves the muzzle of the gun or cannon.

With a gun constructed as described, the gases operate on the projectile with less pressure but with greater velocity than in the case of an ordinary gun. The effect is less violent but more prolonged, and this enables the walls of the gun and the base of the projectile to be made of less thickness than is the case with a cannon of ordinary construction, the shock or impact at firing being weaker than is usually the case.

It is also to be remembered, that, by reason of the escape of the gases into the air in a backward direction given the same projectile and the same range, the recoil of the cannon is lessened and may be decreased at will by increasing the surface of the mouth of the nozzle until a state of absolute equilibrium is obtained. In this case more powder is necessary than with the ordinary gun but the lessening of the recoil is a consequence of the principle of this gun.

The projectile b may be guided during its translation by the walls of the tube a^3 of the cannon, or by bands provided on the projectile.

In some cases, where it is found that the gases do not escape quickly enough through the single nozzle or series of nozzles and that they accumulate in the cannon in rear of the projectile, the result of which may be to interfere with the discharge, it may in some cases be of advantage to provide a plurality of nozzles a^{30} preferably disposed at equal distances from one another over the length of the tube a^3 of the cannon. In this way, the gases will have sufficient means of exit to enable them to escape and expand and will not be liable to accumulate, and the expansion can take place under normal conditions.

In a modified construction, I may suppress the nozzle opening to the outside through the walls of the cannon, which have been recently described, and provide in their place annular stages or ranges of chambers a^4, as shown at Fig. 2. These are formed in the thickness of the tube a^3, and are provided to any suitable number. They open to the interior of the tube and are shaped in a manner analogous to the vanes of a turbine, so that the gases driven backwards from the base of the projectile pass into the chambers and are turned back and sent forward. The projectile is of the ordinary shape, but the body thereof is of smaller diameter than the inner diameter of the tube a^3, so that the gases can pass around the same towards the muzzle. The base has an exterior diameter substantially equal to the diameter of the tube a^3.

In two parallel planes, parallel to one another by preference, I provide integral with the periphery of the projectile projecting shoulders b^4 and b^5, extending circumferentially around the same. One of these shoulders b^4 is in the neighbourhood of the base, and the other b^5 at a distance from the first equal to about the opening of one of the chambers a^4 measured in the longitudinal direction. The first projecting shoulder b^4 is preferably constituted by a thickened portion of the base projecting beyond the projectile.

In addition, I furnish the projectile with a tubular tail b^6 of the same exterior diameter as the base, and of relatively short length. This tube is so constructed that it narrows internally towards the front, so that the gases strike against the centre of the base; and I provide, below the base b^1, and in the wall of the tube b^6, openings b^{60} adapted to direct the gases towards the rear walls of the chambers a^4.

With this construction again, the gases act on the base of the projectile, which latter is guided by its shoulders and its tail coming into contact with the walls separating the chambers a^4. The gases enter the chambers in the first stage and then pass around the shoulders b^4 of the projectile. They then enter the chamber of the second stage, and so on, finally escaping into the barrel of the cannon. The arrangement is moreover such that the gases which have impinged against the base and have passed around the surface, continue to flow through the chambers and between the shoulders and the projectile without shock and without any throttling action. With the construction just described, the gases escape into the atmosphere without any danger of them accumulating in the body of the cannon, and they become rapidly expanded, since during their circulation around the projectile, they have a greater velocity than this latter. A greater proportion of the power generated and stored up during expansion is utilized, the amount depending upon the length and thickness of the tube a^3. With this construction a projectile may be thrown to a very considerable distance.

The cannon just described is not usually provided with riflings, although in the construction shown at Fig. 1, the bore may be rifled.

It is to be understood that the invention is not limited to the particular constructions which have been described, but that modifi-

cations may be introduced, within the scope of the claims without departing from the principles of the said invention.

In place of using an explosive to throw the projectile, I may use the ballistic power of any suitable fluid of an elastic nature under pressure, such as gas, vapour, or liquid, and that these may be used separately or in combination.

I am aware that it has been already proposed to provide a chamber in the body of a gun, behind the projectile, into which the gases of explosion enter in some cases through a nozzle or perforated diaphragm but with these constructions there has been no provision for the escape of the said gases to the atmosphere through the wall of the cannon, or around the projectile, whilst this latter is still at rest, the result being that upon explosion the chamber behind the projectile is instantaneously filled with gases under pressure and that such gases only operate in the ordinary well known manner and not in the manner essential for obtaining the results contemplated by my present invention.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A cannon having an explosion chamber and a main bore, a nozzle between the said chamber and the main bore, a chamber located behind the rear portion of the projectile when at rest into which the said nozzle opens and an aperture between the said last mentioned chamber and the outside of the gun for the purposes set forth.

2. A cannon having an explosion chamber and a main bore, a nozzle which converges and then diverges between the said chamber and the main bore, a space located behind the rear portion of the projectile when at rest, into which the said nozzle opens, and an aperture between the outside of the gun and the said space, for the purposes set forth.

3. A cannon having an explosion chamber, a main bore and a passage which converges and then diverges between the explosion chamber and main bore, a plurality of openings in said main bore to the outside arranged to be progressively reached by the propulsion gases and which are adapted to discharge the gases outwardly and rearwardly into the atmosphere.

4. A cannon having an explosion chamber, a main bore and a passageway between said chamber and main bore which first contracts and then expands, and passageways leading rearwardly and outwardly from the main bore from points in the vicinity of the juncture of said first named passageway with said main bore.

In testimony whereof I have hereunto set my hand in presence of one subscribing witness.

CHARLES ALPHONSE FRANÇOIS MAZE
dit DELAMARE MAZE.

Witness:
VICTOR MARENDOWSKI.