B. B. HOLMES.

FIREARM.

APPLICATION FILED JAN. 18, 1921.

1,416,828. Patented May 23, 1922.

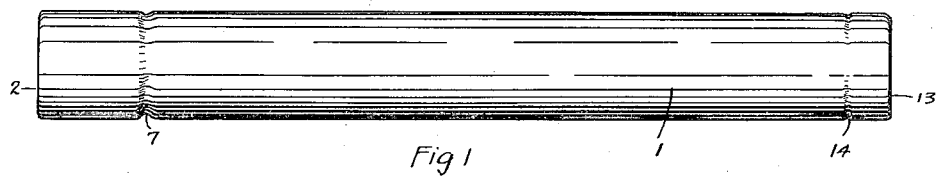


Fig 1

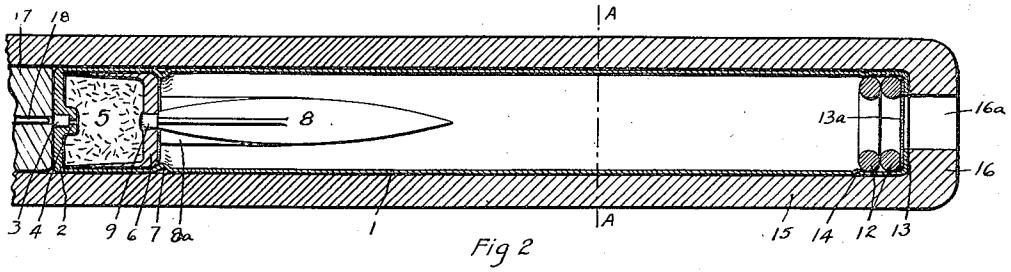


Fig 2

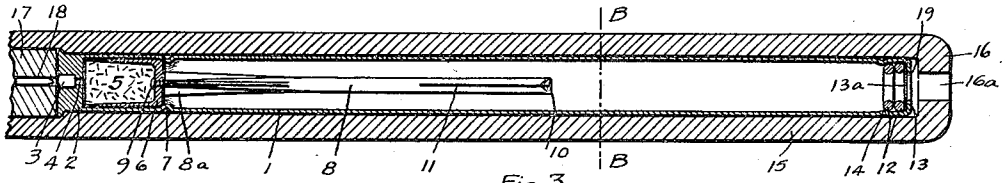


Fig 3

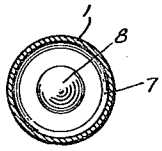


Fig 4

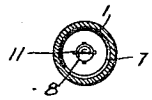


Fig 5

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FIREARM.

1,416,828. Specification of Letters Patent. Patented May 23, 1922.

Application filed January 18, 1921. Serial No. 438,099.

To all whom it may concern:

Be it known that I, BRADFORD B. HOLMES, a citizen of the United States, and a resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Firearms, set forth in the annexed specification; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to fire arms and more particularly to cartridges adapted to be fired in fire arms such as pistols, automatic rifles and machine guns.

In my application for U. S. Patent, Serial Number 436262 filed January 10, 1921, I described and claimed a fire arm, the salient features of which were a vaned projectile set in motion by a cup shaped piston upon the explosion of a powder charge, and an automatic muzzle brake or check to arrest or retard the motion of the piston at the muzzle, but arranged to permit the passage of the projectile; the retention of said piston in the muzzle serving as a plug to prevent the usual blast of gas at the muzzle; a gas escape valve and silencer thus providing silent and controlled escape of the powder gases without noise, flash, disturbing effect on the flight of the projectile and excessive recoil; and finally permitting the escape of said piston after almost all of the powder gas had been released.

In the above method of firing a projectile, appreciable time, probably several seconds, is necessary between shots, which while not detrimental in the case of cannon, would be prohibitive for its use in the form outlined in the above application for very rapid fire arms, such as automatic pistols, rifles and machine guns.

The present invention is the adaption of the above principles to rapid fire arms.

It is a cartridge adapted to be fired in a pistol, rifle, machine gun, small cannon, and, in general, whenever rapid fire is wanted. The cartridge is adapted to fit into a gun barrel or other holder for the purposes of giving it direction, and strength to resist rupture on firing.

Generally stated, the cartridge consists of a case which extends forward of the projectile and acts as a gun barrel. The case is provided with a detonator, a powder charge, a projectile preferably equipped with vanes to keep it head-on in flight, a cup-shaped piston of preferably greater diameter than the projectile attached to the projectile and adapted to impart motion to the projectile upon ignition of the powder charge, and a cushion to stop the piston at the end of its travel, thereby causing the projectile to break loose therefrom and continue on its flight. Means are provided to retain the cup and projectile in position and prevent movement of said parts until the powder gas has developed nearly maximum pressure. Additional means are provided to retain the cushion in position to arrest the motion of the cup, and further means are provided to permit, when desirable, the throttled escape of gas from the case. A diaphragm at the front end seals and waterproofs the case. All the above is combined in a cartridge of unitary form adapted to be fired in a fire arm.

The above and other features of the invention will be more fully described and explained in the following specifications and accompanying drawings of a preferred embodiment, in which,

Fig. 1 is an outside side view of a cartridge.

Fig. 2 is a longitudinal axial section of Fig. 1 in firing position in a gun or holder.

Fig. 3 is a modified form of Fig. 2.

Fig. 4 is a cross section of Fig. 2 on line A A omitting the gun.

Fig. 5 is a cross section of Fig. 3 on line B B omitting the gun.

The numeral 1 indicates a cartridge case. The base of the case 2 is provided with a detonator 3 and a hole 4 through which the flame from the detonator passes to ignite the powder charge 5. In the rear of the case is a cup-shaped piston 6 with the open end of the cup towards the base 2.

The piston is normally secured in the position shown by an annular groove 7 rolled into the cylindrical wall of the case 1, which prevents movement of the piston after the ignition of the powder until the gas pressure rises to a point necessary to force the piston forward, flattening out the groove.

A projectile 8 is attached to the piston 6 by a rivet 9 passing through a hole in the forward end of the piston. The projectile is formed with vanes or fins 8^a at the rear to keep it head-on in its flight through the air. The projectile may be made in many shapes, Figs. 2 and 3 showing two examples. In the projectile in Fig. 3, the forward end is

formed with a conical orifice 10 having its base at the forward end of the projectile, which is split at 11 so that on hitting its target the forward end opens out on the split thus giving it the disruptive effect of an expansive bullet and enabling a long thin projectile to execute great damage and shocking power.

Near the forward end of the case 1 are circular cushioning rings 12 which are retained in position at their front end by shaping over the forward end of the case at 13 and at their rear end by a slight annular groove 14 rolled into the case after assembly. A diaphragm 13[a] held between cushion 12 and end 13 serves to seal the cartridge and make it water tight.

The above elements are combined into a complete cartridge of unitary form.

As the case 1 is not made strong enough to resist the gas pressure at the moment of ignition of the powder, it must be supported in a barrel or holder 15, and as the thin wall of the casing end 13 is not sufficient to support the cushion 12 at the moment of impact of the piston 6 upon the cushion, the barrel or holder is provided with an annular shoulder 16 to support the end 13 of the cartridge. Shoulder 16 has a hole 16[a] to permit the passage of the projectile. The barrel 15 will also have a breech block 17 or some similar device to close its rear end and a suitable firing pin 18 and firing mechanism to explode the detonator 3.

It will be noted that when the piston 6 moves forward flattening out the annular groove 7, it will increase the length of the cartridge by flattening the groove. This increase in length of the cartridge must be provided for and may be taken care of in two ways.

A. By fixing the forward end of the cartridge 13 firmly in position as shown in Fig. 2 and permitting the base 2 to push the breech block 17 slightly to the rear. This would provide a source of power for operating the automatic mechanism for ejecting the old cartridge case and feeding in and firing a new cartridge as is customary in automatic pistols, rifles and machine guns.

B. By fixing the base 2 of the cartridge firmly in position and leaving a small space 19 between the front end 13 of the cartridge and the shoulder 16 of the barrel. Upon flattening out the groove 7 of the case 1, the forward end 13 of the case will be pushed tightly against the shoulder 16. (See Fig. 3.)

The cartridge functions as follows: After being inserted in the gun as shown in Figs. 2 and 3 and detonated by pin 18, the powder burns until the pressure is great enough to flatten out the groove 7 whereupon the piston and projectile leap forward acquiring tremendous velocity because of the high powder pressure exerted on the relatively large area of the piston in proportion to the mass of piston and projectile. The piston strikes the cushioning rings 12 held by the front end 13 of the cartridge and supported by the shoulder 16 of the barrel, and is brought to rest by them; its kinetic energy being absorbed by flattening out or deforming the cushions 12. The cushions should be made of softer and more ductile metal than the piston.

Upon arrest of the piston, the projectile breaks away from the piston either by pulling the rivet head through the hole in the forward end of the piston as in Fig. 2 and allowing the throttled escape of the powder gases through the hole thus left in the piston with the result that the noise and flash of discharge are greatly reduced, or the rivet may be small with a large head as in Fig. 3 allowing the projectile to tear loose by breaking the rivet which thus blocks the hole in the piston, seals all gas in the cartridge case and eliminates concussion and flash. In either case the projectile passes through hole 16[a] and is not subject to any muzzle blast tending to deflect it from its true line of flight.

Owing to resistance applied by groove 7 to the piston, most of the powder will be burned before the piston moves. The work done on the piston is thus principally by expansion of gas and when the piston is brought to rest against the cushion 12, the gas pressure will be relatively low. If the cartridge is large in diameter and if the wall thin as in Fig. 2, this gas pressure may be great enough to cause bursting of the cartridge when unsupported by the barrel 15, but if the diameter of the cartridge is small with relatively thick walls as in Fig. 3, the case may be able to resist such bursting. In the former case (Fig. 2) the hole in the piston is opened allowing rapid drop in gas pressure so that bursting will not occur upon the taking away of the barrel support 15, but in the latter case (Fig. 3) the cartridge may be removed from the barrel while still subject to the pressure of the gases confined within it.

As the powder gases and piston are arrested, it is apparent that the only final recoil will be that given by the projectile.

From the foregoing it will be apparent that when inserted in a gun or holder adapted for it, this cartridge permits:

1. The attainment of very high velocity of projectile with
2. The utilization of a relatively small powder charge and
3. A very slight recoil with
4. A short barrel length.
5. Also that it permits the firing of a projectile designed to maintain a head-on flight due to its conformation and air resistance

without any disturbing influence acting on it at the moment of discharge which would tend to deflect it from its true line of flight.

6. That such a projectile may be very long and tapered at both ends to give minimum air resistance and consequently long range for a given mass and velocity.

7. That rifling and bore or barrel erosion are eliminated, and

8. Due to the retention or throttled escape of gases from the bore, no or little flash, and

9. No or little noise accompany the discharge.

10. It is also apparent that the use of this cartridge permits rapid fire such as is necessary in automatic fire arms, and that

11. By withdrawing the cartridge case and gas content after each shot, most of the heat will be withdrawn and little heat imparted to the gun or holder itself.

There are other ways in which this invention may be realized, and I contemplate its use in other relations, so I do not restrict myself to the form of the preferred embodiment herein illustrated, except as defined in the claims.

I claim—

1. In a device of the class described, in combination, an explosive charge; a detonator to ignite said charge; a projectile; a piston adapted to impart motion to said projectile upon the ignition of the explosive charge; cushioning means arranged to permit the passage of said projectile but to arrest the motion of said piston, and a cartridge case containing the said parts and forming with them a single unitary structure.

2. In a device of the class described, in combination, an explosive charge; a detonator to ignite said charge; a vaned projectile; a cup shaped piston secured to said projectile and arranged to impart motion to said projectile upon ignition of the explosive charge; cushioning means adapted to permit the unobstructed passage of said projectile but to arrest the motion of said piston; and a cartridge case containing the said elements and forming with them a single unitary structure.

3. In the combination of claim 1, the added feature of means preventing the movement of said piston and projectile until the generation of high explosive pressures in said cartridge case.

4. In the combination of claim 1, the additional feature of an annular depression in said cartridge case engaging the outer periphery of said piston and preventing movement of said piston and projectile under the gases generated by the ignition of said explosive charge until said gas pressure is great enough to cause the piston to flatten out said annular depression in said cartridge case.

5. In the combination of claim 1, the additional feature of a diaphragm sealing the front end of said cartridge case.

6. In the combination of claim 4, the additional features of a second annular depression in said cartridge case and shoulder at the forward end of said cartridge case for the purpose of securing said cushioning means in position.

7. In a device of the class described, in combination; a projectile; a powder charge; a piston adapted to impart motion to said projectile upon ignition of said powder charge and provided at its forward end with a hole; attaching means normally rigidly securing said projectile to said piston and closing said piston hole but arranged to permit the detachment of said projectile from said piston upon retarding the motion of said piston relative to said projectile; and a cartridge case enclosing said parts.

8. In the combination of claim 7, the additional feature of causing the detachment of said projectile to open said hole in said piston to permit the throttled escape of gases from said cartridge case.

9. In a device of the class described, a powder charge; a projectile; a piston adapted to impart motion to said projectile upon the ignition of said powder charge; and a cartridge case enclosing said parts and projecting forward beyond the forward end of said projectile and acting as a guiding means for said piston while said piston is in motion.

10. In the combination of claim 9, the additional feature of a diaphragm sealing the forward end of said cartridge case.

11. In the combination of claim 9, the added feature of a holder surrounding said cartridge case to prevent it from bursting upon the ignition of said powder charge.

12. In a device of the class described, a powder charge; a projectile; a piston adapted to impart motion to said powder charge; a cartridge case enclosing said parts and projecting forward beyond the forward end of said projectile and acting as a guiding means for said piston while in motion; and a cushioning device secured in the forward end of said case to retard and arrest the motion of said piston but arranged to permit the passage of said projectile.

13. In the combination of claim 12, the additional feature of a holder surrounding and supporting said case and provided with a restricted opening in its forward end to permit the passage of said projectile but forming a support for the forward end of said case and cushioning device upon impact of said piston upon said cushioning means.

Signed at New York city, in the county of New York and State of New York, this 15th day of January A. D. 1921.

BRADFORD B. HOLMES.