To all whom it may concern:  
Be it known that I, CLELAND DAVIS, commander, United States Navy, and a citizen of the United States, serving on board the U. S. S. "Mississippi," at present stationed at Hampton Roads, Virginia, have invented certain new and useful Improvements in Apparatus for Firing Projectiles from Aeroplanes; and I do hereby 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. It having been demonstrated that it is practicable to navigate the air under normal atmospheric conditions, and while as yet the practice is too hazardous for ordinary commercial purposes, still air craft have already become a part of the military equipment of most of the civilized nations, and those of the heavier than air type have been found already to be specially useful for both naval and military purposes. They have, however, so far developed little, if any, offensive value, it being practically impossible to strike a comparatively small target, such as the deck of a battleship, the vulnerable point of a fort, or even a large building, by merely dropping explosive charges from a high altitude. This might be possible if the air craft were close to the target, but such proximity would result in the almost certain shooting of the aviator, while objects dropped from a great height would partake of the motion of air craft, and it would be very difficult to land them with any degree of accuracy. Furthermore, the mere dropping of a high explosive on the deck of a ship, or a fort, would occasion very small damage, for the force of the explosive would ordinarily, aboard ship, be confined to the region above the protective deck, and little damage would be done from such explosion. In order to secure the desired velocity to penetrate even thin armor, or a protected position anywhere, the explosive would have to be contained in a projectile, and this projectile would have to be propelled with sufficient velocity to penetrate said armor. It would be impracticable to drop an explosive from a great height as would cause it, under the influence of gravity alone, to obtain said velocity; and moreover, it would be impracticable to aim a projectile dropped from such a height with any reasonable degree of accuracy. For these reasons, therefore, in order to successfully attack a ship with explosive from an air craft, it is necessary that the explosive shall be contained in a projectile with walls thick enough to penetrate the protective deck without breaking up, and that the projectile shall have sufficient velocity to enable it to be directed with accuracy, and to enable it to penetrate when striking. This can only be accomplished by discharging the projectile from a gun. In order for a gun to be effective for such purposes, it must comply with the following conditions:—(1.) It should be of caliber sufficiently large to discharge a projectile carrying a considerable quantity of explosive. (2.) It should be capable of giving a muzzle velocity to the projectile that would enable aimed shots to be fired at distances of 2,000 yards, or more. (3.) It should be so designed that the shock of recoil will bring little or no strain upon the structure of the aeroplane. In order to meet the above conditions, I have devised the apparatus disclosed in the accompanying drawings, to which reference will now be had. Figure 1 is a side elevation, showing a monoplane and its parts diagrammatically. Fig. 2 shows a central axial section through the gun. A represents a monoplane, having the usual so-called "planes" B, and the usual framework with elevating rudder o, and also the steering rudders a' and propeller. I do not make any claim to the special construction of the flying machine proper, as this is not part of my present invention, and this construction is well known in the art. C represents the platform of the monoplane, on which are erected stanchions D, into which the trunnions h of the gun H are journaled. This gun is elevated and depressed through a small angle by means of suitable elevating gear, such as the curved rack e, attached to the tube H, the pinion e' meshing in said rack and the hand wheel e'. F represents the sight, which is attached to the elevating arc in any convenient way. Any suitable sight may be provided for this purpose, preferably the well known telescope sight.

UNITED STATES PATENT OFFICE.

CLELAND DAVIS, OF THE UNITED STATES NAVY, ASSIGNOR TO ORDNANCE DEVELOPMENT COMPANY, A CORPORATION OF DELAWARE.

APPARATUS FOR FIRING PROJECTILES FROM AEROPLANES.

1,108,715.


Application filed November 21, 1911. Serial No. 661,566.

O
The gun II is normally tilted at a considerable angle, since the gun platform would be always at an elevation and generally at a considerable distance above the target. In order to protect the aeroplane from injury from the blast or the recoil of the gun, the lower end of the tube is made to project below the framework of the aeroplane, and the upper end above said framework.

The gun is provided with a primer I, preferably an electric primer operated by a suitable source of electricity P, such as a dry cell, the connections being completed by any suitable conductors p and q, and the circuit may be closed by any suitable switch Q. The powder K in the gun propels the projectile M, which has its chamber filled with high explosive N, and any suitable kind of fuse T may be used.

The breech block T is held in the gun by a yielding connection, such as the set screw t, and the shell should be held in the gun by some yielding or friable connection, such as m; the idea being that the shell will be discharged in the direction of the target, and the powder gases in the gun will blow the breech block T up through the top of the tube and in rear of the aeroplane, the breech block being expended along with the projectile at each shot. By this arrangement of having the breech block and the projectile fly in opposite directions, comparatively small shock will be thrown on the framework of the aeroplane, and the tube may be used for several shots.

The tube is pointed downward and forward, which gives the advantage of being ready to fire when first approaching the target, and before those on the target have much chance of observing, much less injuring, the aviator; and since gravity will add to the velocity of the projectile, a comparatively small propelling charge, and consequently a comparatively light gun, may be used. At the same time, a large enough projectile may be employed to carry a sufficiently large bursting charge, and also to have sufficient strength to penetrate the armor.

It will be obvious that the herein described apparatus may be installed on the rear portion of a dirigible balloon, the sleeve projecting rearward and clear of the gas bag, or other parts of the ship.

In the structure shown, the gun does not recoil; but the breech block is so held in the gun that it flies to the rear with corresponding force to that required to propel the projectile forward, the result being that there is very little strain on the gun in either the forward or backward direction. This may be accomplished in various ways, as by holding the breech block T in the gun by a friable connection t, or it may be accomplished in various other ways well known in the ordnance art.

The object of the invention being to reduce the thrust on the gun, it will be obvious that the weight of the recoil projectile may be increased and the length of its travel correspondingly reduced. This will also operate to proportionately increase the velocity of the projectile proper, though the pressure will also be increased. But it is desirable to have the rear portion of the gun of such length that the blast will not interfere with the operator. The following considerations, then, will govern the design of the apparatus: Weight of gun and projectile; velocity of projectile pressure in gun; blast from both ends.

To make the gun as light as possible, it should preferably be tapered toward the breech and muzzle, as shown in Fig. 2.

It will be evident that the stanchions D may be omitted and the sleeve or gun truncated direct to the framework of the machine.

It will also be evident that the sleeve or gun may be fixed in the framework of the machine, and the pointing accomplished by steering the machine.

It will also be obvious that various other changes might be made in the herein described apparatus and in the combination and arrangement of parts which could be used without departing from the spirit of my invention.

I claim as my invention—

1. An apparatus for propelling projectiles adapted for use in air, comprising a gun barrel open at both ends to the atmosphere, a projectile, a propelling charge for said projectile, and a recoil weight in rear of said propelling charge, and adapted to be expelled from the gun into the air when the propelling charge is fired, for neutralizing the backward thrust incident to the expulsion of the projectile, substantially as described.

2. The combination of a flying machine, a gun carried thereby, and a projectile and breech block for said gun, said breech block and said projectile being adapted to fly in opposite directions when the gun is fired, substantially as described.

3. In a flying machine, the combination with a gun support carried by said machine, of a gun tube open at both ends and carried by said support, and projecting clear of the framework of the machine, a projectile and a breech block both mounted in said gun tube, a propelling charge interposed between said projectile and said breech block, and means for exploding said propelling charge, substantially as described.

4. In a flying machine, the combination with a gun support carried by said machine,
of a gun tube open at both ends and carried by said support, and projecting clear of the framework of the machine, a projectile and a breech block both mounted in said gun tube, a propelling charge interposed between said projectile and said breech block, means for y eldingly holding said projectile and said breech block in said gun tube, and means for exploding said propelling charge, substantially as described.

5. The combination of a flying machine, a gun open at both ends and carried thereby, and a projectile and breech block in said gun, with a propelling charge interposed between said projectile and said breech block, said projectile and said breech block being of approximately the same weight, and adapted to fly in opposite directions when the gun is fired, substantially as described.

In testimony whereof, I affix my signature, in presence of two witnesses.

CLELAND DAVIS.

Witnesses:
E. R. McClung,
R. W. Kessler.