Jan. 8, 1924. 1,479,840

A. J. STONE

SIGHTING MEANS AND METHOD FOR PROJECTILE FIRING

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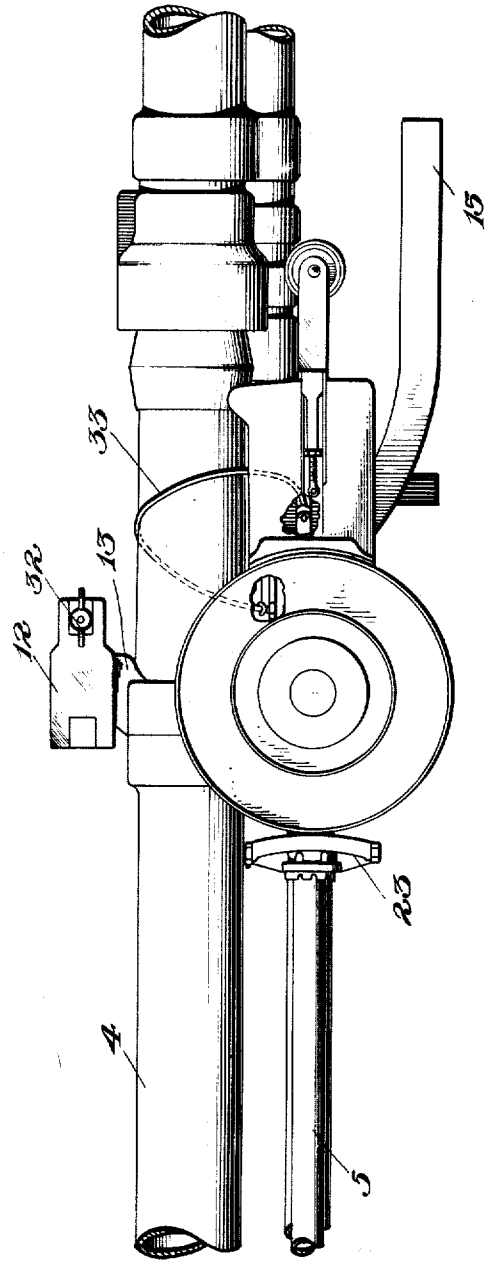


Fig. 1.

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Fig. 2.

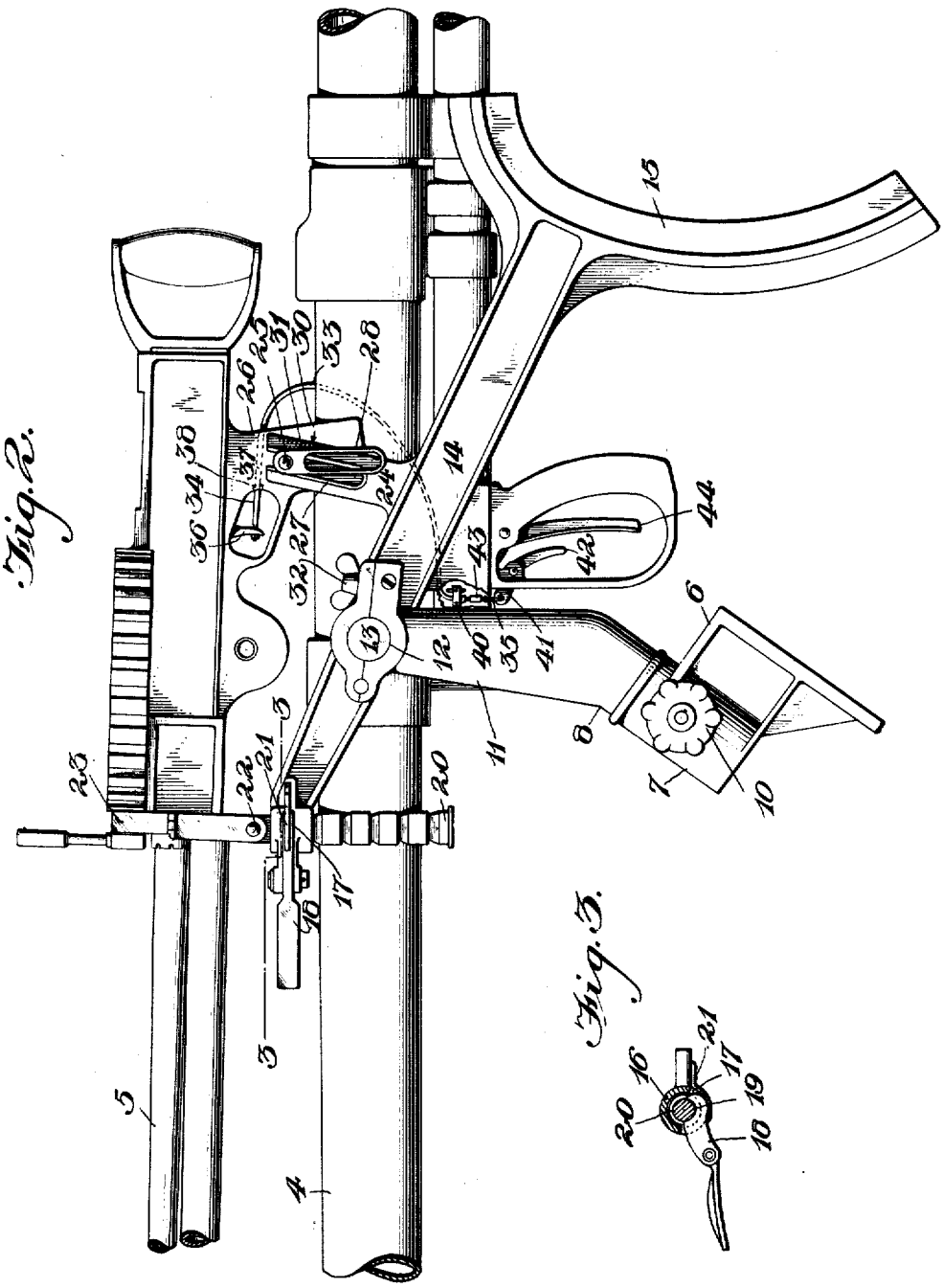


Fig. 3.

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Fig. 4.

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UNITED STATES PATENT OFFICE.

ANDREW J. STONE, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE GOVERNMENT OF THE UNITED STATES.

SIGHTING MEANS AND METHOD FOR PROJECTILE FIRING.

Application filed August 1, 1918. Serial No. 247,774.

To all whom it may concern:

Be it known that I, ANDREW J. STONE, a citizen of the United States, residing at Washington, in the District of Columbia, have invented new and useful Improvements in Sighting Means and Methods for Projectile Firing, of which the following is a specification.

This invention relates to an improved means for sighting ordnance and to the method of using such means. By the term "sighting," I mean to include the adjustment of ordnance both as to "azimuth" and as to "elevation," that is, the adjustment in each of two intersecting planes.

One of the objects of this invention is to provide an improved ordnance sighting means. A further object is to provide a simple and effective sighting means for ordnance which is capable of ready and accurate adjustment. A further object is to provide an improved method of sighting ordnance. Another object consists in an improved method of sighting ordnance carried on aircraft, or other elevated objects, particularly over water. A still further object is to provide a reliable and efficient method of sighting relatively heavy ordnance by noting the effect of shots from relatively light ordnance directly associated therewith.

Other objects will be in part obvious from the annexed drawings, and in part indicated in connection therewith by the following analysis of this invention.

This invention accordingly consists in the features of construction, combination of parts and in the unique relation of the members and in the relative proportioning and dispositioning thereof; as well as in the steps of the method and the interrelation of said steps; all as more completely outlined herein.

In order that the purposes and use of this invention may be more clearly understood, it is recognized that the sighting of relatively large caliber ordnance from a position on an aircraft or other elevated moving body, has, by the methods and means heretofore generally known and applied, been a difficult operation. For example, with ordnance mounted on a hydroplane engaged in hunting submarines or other water target, the requirements of the service make it advisable that such ordnance be of relatively large caliber so that effective results may be obtained from a hit and the submarine be either sunk or disabled. However, as both the target and the hydroplane on which the ordnance is mounted are moving, the variations in the factors entering into the correctness of range are so rapid as to make accurate handling of the heavy ordnance an exceedingly difficult operation.

To overcome these disadvantages, I propose to combine a rapid fire machine gun using ordinary service ammunition with a second gun or other ordnance of larger caliber whereby the two guns normally move in unison, and to so adjust the position or lay of one gun with relation to that of the other that the trajectories of the projectiles from both guns meet at any desired point. It has been found by experiment that the angle between the bores of the guns, in order that the trajectories meet, is a function of the ground speed of the machine and the angle of the large gun from the vertical. It has also been found that the speed may be varied between certain limits without materially affecting the point of coincidence. So, by flying the machine at a speed within the limits found and selecting a certain angle to the vertical as the desired firing angle of the heavier gun, the rapid fire gun may be employed to fire its rapid succession of bullets at the target, indicating the places of hit by rapidly successive splashes in the water or by tracer bullets if firing on land, thereby getting a readily visible line of splashes or tracer impacts which would indicate the direction of the initial velocity of the larger projectile due to the flight of the aeroplane. Following this line, the position of the guns may be adjusted to rapidly bring the machine gun to bear toward and ultimately upon the target. The machine gun is then kept on the target as the aeroplane continues its flight until the larger gun is finally disposed at that angle with relation to the vertical at which the calculations of adjustment of the two guns have been based. The triggers of both guns are preferably mounted adjacent each other so that they may be operated by the same hand, and at the instant after hits are obtained on the target by bullets from the machine gun that the desired angle has been reached, the trigger of the heavier ordnance is actuated to obtain an effective hit on the target. It has

been found that for the purposes of this invention any slight variation in the angle of fire from that selected would not be of any greater effect than the personal error involved, and so need not be considered.

By this method and the improved means for carrying it out, bullets of small caliber may be sent in a successive stream from the small machine gun at a relatively small expense, whereby the sighting of the larger ordnance on the target is quickly and accurately accomplished, and the necessarily proper approach to the target is effected. Thereupon I bring into operation the heavier gun with its larger and more effective projectiles, and with the range thus known and ascertained quickly obtain the desired effective hit on the target.

To enable others skilled in the art so fully to comprehend the underlying features thereof that they may embody the same in numerous modifications in structure and relation contemplated by this invention, drawings depicting a preferred form have been annexed as a part of this disclosure, and in such drawings, like characters of reference denote corresponding parts throughout all the views, of which:—

Fig. 1 is a plan view of my invention with certain parts broken away; Fig. 2 is a side elevational view; and Fig. 3 is a detailed view showing the locking clamp. Figure 4 illustrates the method of attack obtained by the present invention.

Referring now to the drawings, 4 indicates the heavier ordnance, and 5 the rapid fire machine gun mounted adjacent to said first member and operatively associated therewith. The heavy ordnance 4 may be of any suitable type or design, but I prefer to use that type of member commonly known in the service as a Davis non-recoil gun as it is particularly adaptable for aircraft. This member 4 is mounted at the forward part of the machine, adjacent the observer's cockpit, so that the forward barrel projects over the front of the machine and its rear barrel extends back into the field of vision of the pilot, who is seated to the rear of the observer, whereby the position of the ordnance 4 is visible to the pilot. However, as the particular type of ordnance 4 forms no part of this invention, it need not be further described in detail, it being understood that bomb launching mechanism or other ordnance might be substituted in place of the gun 4, if desired, without departing from the scope of the present invention.

The invention will be hereinafter described with relation to its use in an airplane, although it is equally well adapted for use at any moving elevated point, such as the fighting top of a ship, an observation tower, or the like.

In the forward part of the airplane, preferably in front of the observer's cock pit, is mounted a support 6. This support 6 includes a tubular bushing 7 in which the lower end of a standard or supporting arm 8 is adapted to be secured by means of a locking screw 10. The upper end of this standard 8 is forked to provide two supporting arms 11, furnishing bearings 12 for the trunnions 13 of the heavy ordnance 4. A metal bar 14, secured intermediate its ends to the trunnions 13 of the larger ordnace, is provided at one end with a shoulder rest 15. At its other end, this bar is provided with a tubular bushing 16, slotted at one side at 17 and cooperating with a pivoted locking arm 18, shown more in detail in Fig. 3.

This pivoted locking arm 18 is recessed at one end, at 19, and extends through the slot 17 of the bushing 16 where it is normally held in contact with a notched locking bar 20, which passes through said bushing, by means of the leaf spring 21. The notched locking bar 20 cooperates with the arm 18 to provide a forward adjusting means for regulating the lay of the machine gun 5 with relation to that of the larger caliber gun 4. For this purpose the locking bar 20 is pivotally mounted at 22 to a locking band 23, which encircles the barrel of the machine gun 5, and is clamped thereto in any suitable manner. The construction permits the machine gun 5, when released at all other points, to rotate freely about the locking bar 20 as an axis so that it may be used independently of the large caliber gun 4.

On the upper rear portion of the metal bar 14, an upstanding forked plate 24 is secured, which cooperates with means on the rear part of the machine gun, to provide a second point of adjustment. A threaded bolt 25 passes through an opening in a pistol grip 26 on the rear part of the machine gun, and cooperates with a guide slot 27 in the forked plate 24. A locking member 28, comprising a threaded nut with an extension at one side, provides a means for securing the bolt 25 in any desired position in the guide slot 27 in forked member 24, thereby enabling an adjustment of the lay of the machine gun with relation to that of the heavier ordnance.

To further facilitate this operation, an arrow 30 is provided at one point on the pistol grip and cooperates with a suitable scale 31 on one edge of the forked plate 24, whereby the point of coincidence of the trajectories of the two guns may be accurately adjusted. The graduations of the scale 31 are laid out as the result of actual firing tests at different speeds whereby there is definitely determined the various adjustments necessary to be made in the

lay of the two guns to effect the desired point of meeting of the trajectories at the ground speed and angle of fire selected. Wing nuts 32 cooperate with suitable bolts at each of the bearings 12 on the upper arms 11 of the forked standard 8, whereby the loosening of these nuts permits a rotational movement of the heavier gun 4 about the trunnions 13.

In order that the steps of this invention may be more expeditiously carried out, it is necessary that means be provided whereby the trigger members on each gun may be operated from substantially a common point. As one means for accomplishing this purpose, I contemplate connecting operating means with the trigger of one gun and leading such operating means around so that it may be actuated from a point adjacent the other trigger. For this purpose I have utilized a length 33 of Bowden cable, a well known commercial article, comprising an outer casing 34 and an inner wire 35, capable of being moved relative to the casing 34. To this end, one end of the wire 35 is secured to the trigger 36 of the machine gun 5, while the casing 34, surrounding this wire and cooperating therewith, passes through a channel 37 in the pistol grip, and is secured therein in any suitable manner, as, for example, by soldering it at 38. The cable 33 then passes around the barrel of the gun 4, the casing 34 being suitably secured in a support 40 disposed adjacent the trigger guide of the heavier ordnance member. The wire 35 leads from this guide to the upper end 41 of the supplemental trigger member 42. A turn buckle 43 is inserted between the point of attachment to the trigger member 42 and the support 40 thereby enabling the tension on the wire to be adjusted.

This supplemental trigger 42, for operating the main trigger 36 of the machine gun, is by this means placed adjacent a trigger 44 of the heavy ordnance. Preferably the index finger of the hand is used to operate the supplemental trigger 42, while the lower three fingers of the hand are held on the trigger 44 in readiness to operate the same when the time arises to fire the heavy ordnance member.

The machine gun 5 is mounted to one side of the heavy ordnance 4, whereby if desired to use the machine gun independently, the nut 28, forming a means for attaching the machine gun at its rear point to the heavier gun, may be loosened and the gun lifted up, disengaging the bolt 25 from the guide slot 27 of the forked member 24. The machine gun is then free to rotate about the notched locking bar 20 as an axis, and is so disposed with relation to the large caliber gun 4 that it may be brought to bear upon a target in practically any position.

The operation and method of use of the invention is substantially as follows:

Preferably before the hydroplane takes to the air, the lay of the gun 5 with relation to that of the larger caliber gun 4 is adjusted, by means of the locking arm 18, and associated parts whereby the trajectories of the projectiles of the two guns will meet at water level when the plane is travelling within the determined limits of ground speed and the heavier gun is at the proper angle to the vertical, special reference being had to arrow 30 and graduated scale 31 in effecting this adjustment. The hydroplane then takes to the air and flies at any height which is most suitable for observation. When a submarine or other target is sighted, the hydroplane is brought within the predetermined limits of speed and the hydroplane is headed directly for the submarine. The nuts 32 are loosened to permit a movement of the metal bar 14, carrying shoulder rest 15, so that an adjustment in the pointing of the guns is made possible.

The machine gun 5 is then moved through the medium of the metal bar 14, until it is brought to bear approximately on the submarine. As the two guns are connected at the forward and rear parts of the machine gun, such movement of the machine gun 5 effects a corresponding change in the lay of the larger caliber gun 4. When the machine gun approximately sights on the submarine, pressure is then exerted on trigger member 42 to bring the machine gun into action. By observing the fall of the bullets at the point where they strike the water, appropriate corrections of the machine gun are made, following up the splashes of the bullets until hits are finally obtained on the submarine. The machine gun is then kept constantly trained on the target until the instant the desired angle of fire of the larger gun 4 is reached, a stop being provided to define this position, if desired. At this instant pressure is applied to the trigger member 44 to fire a projectile from the large caliber gun 4, and if the guns have been correctly adjusted in accordance with the foregoing description, a hit on the submarine should be obtained which will sink or disable it.

Thus, the succession of splashes made by the shots from the machine gun striking the water will form a line of reference which will clearly show the adjustments necessary in the position of the guns to bring them to bear upon the target, and the proper sighting of the guns may then be readily and quickly accomplished by simple movements transmitted through the shoulder piece 15 and metal bar 14. In the same way, if the object fired at is on land, tracer bullets may be used in the machine gun to produce a line of reference.

This means of sighting ordnance is a distinct improvement over any sighting means hitherto used for this purpose. Instead of having a short sighting tube, such as a telescope, associated with the gun through which the position of the target is observed, this invention has an effective sighting means, equal to the distance from the gun to the fall of the shot. A slight error in the position of a sighting tube with relation to the gun sighted would mean a great error in the fall of a shot from such gun, being multiplied in direct proportion to the remoteness of the target. But a slight error in the sighting of a machine gun, as in this invention, would be dejected by the fall of the shots in the water somewhere adjacent the target, and generally only a slight movement of the machine gun would be necessary to bring the gun to bear on the target.

Thus it may be seen from the foregoing description that by the improved method herein described and by the novel means of combining and coordinating the two guns, I have provided an efficient and satisfactory means for bringing heavier ordnance rapidly to bear upon a target in a short space of time.

Without further analysis, the foregoing will so fully reveal the gist of this invention that others can by applying current knowledge readily adapt it for various applications without omitting certain features that, from the standpoint of the prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and therefore such adaptations should and are intended to be comprehended within the meaning and range of equivalency of the following claims.

I claim as my invention the following:

1. The method of firing a projectile upon a target from an aircraft in motion, which comprises firing from a gun of relatively small caliber carried upon the aircraft a rapid succession of projectiles the impact of which with the medium adjacent the target may be visibly discerned from the aircraft, laying the gun so that the line determined by a plurality of said impacts intersects the target, and when the succession of impacts reaches the target firing a projectile of relatively large caliber from another gun carried by the aircraft and fixed in predetermined relation to said first named gun so that the trajectories of the two guns intersect at the range of target.

2. In combination, a gun of relatively large caliber, a rapid fire gun of relatively small caliber mounted fixedly with relation to said first named gun, and triggers for each of said guns, said triggers being independent but disposed in immediate proximity to each other so that they may be gripped simultaneously by the same hand and selectively operated by the fingers thereof.

3. In combination, an aircraft, ordnance mounted on said aircraft, a rapid fire gun of relatively small caliber mounted adjacent said ordnance, adjustable means connecting said ordnance and said rapid fire gun at a plurality of points along its length whereby they normally move in unison, and means for disconnecting one of said adjustable means whereby said rapid fire gun may move independently about a second adjustment means as a pivot.

4. Means for sighting heavy ordnance, comprising, in combination, a gun of relatively large caliber, a rapid fire gun of smaller caliber mounted adjacent to the first gun, and means for adjusting the disposition of one gun with relation to the other, said means comprising a notched locking bar and a locking clamp associated with said guns at one point and a forked arm and co-operating clamping means associated with said guns at another point.

Signed at Washington, District of Columbia, this 8th day of July, 1918.

ANDREW J. STONE.