Oct. 26, 1948. F. W. REINHOLD ET AL 2,452,147

TRAINING MECHANISM FOR FIREARMS

Original Filed May 9, 1945 2 Sheets-Sheet 1

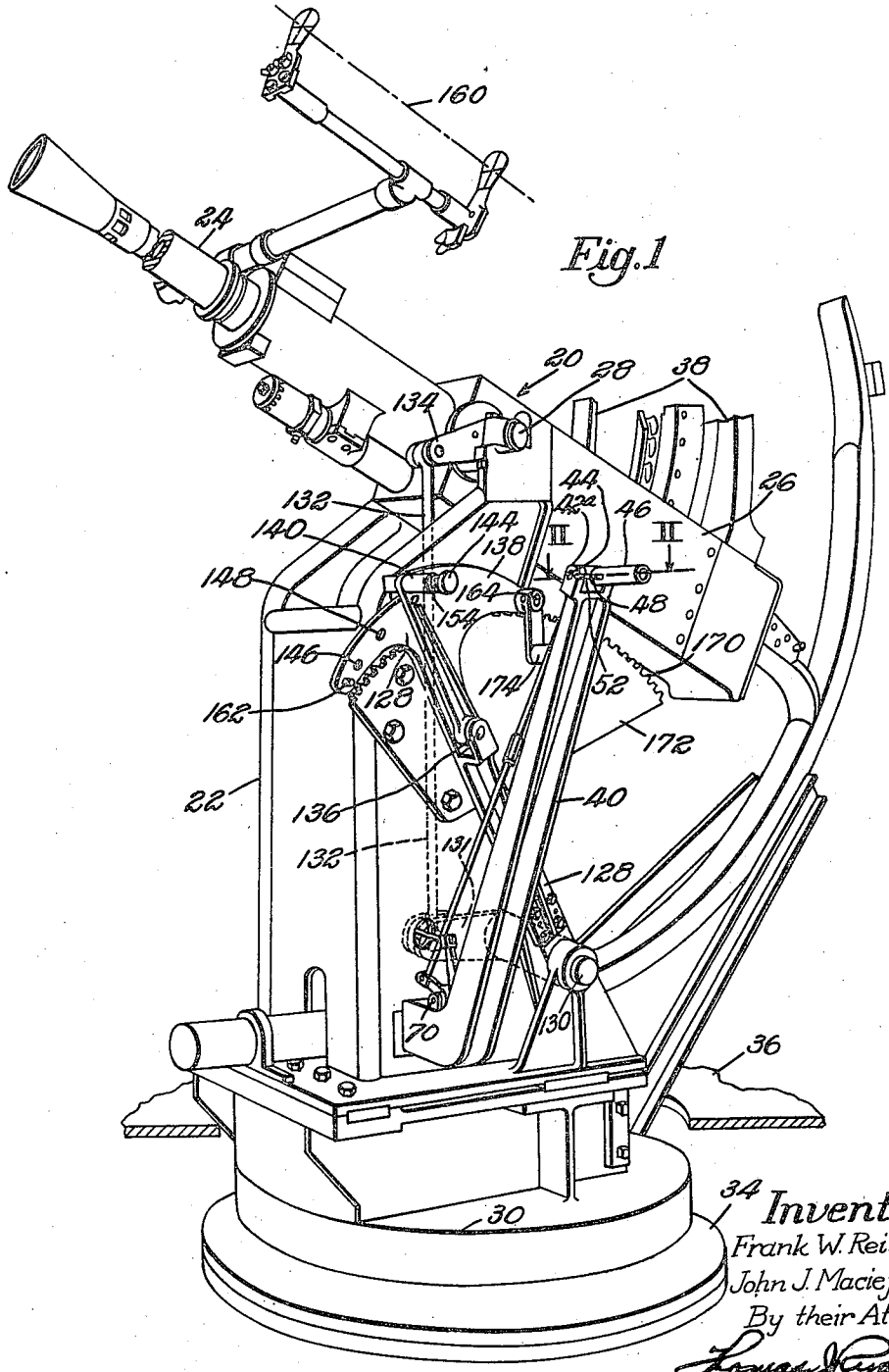


Fig. 1

Inventors
Frank W. Reinhold
John J. Maciejowski
By their Attorney
Lomas J. Ryan.

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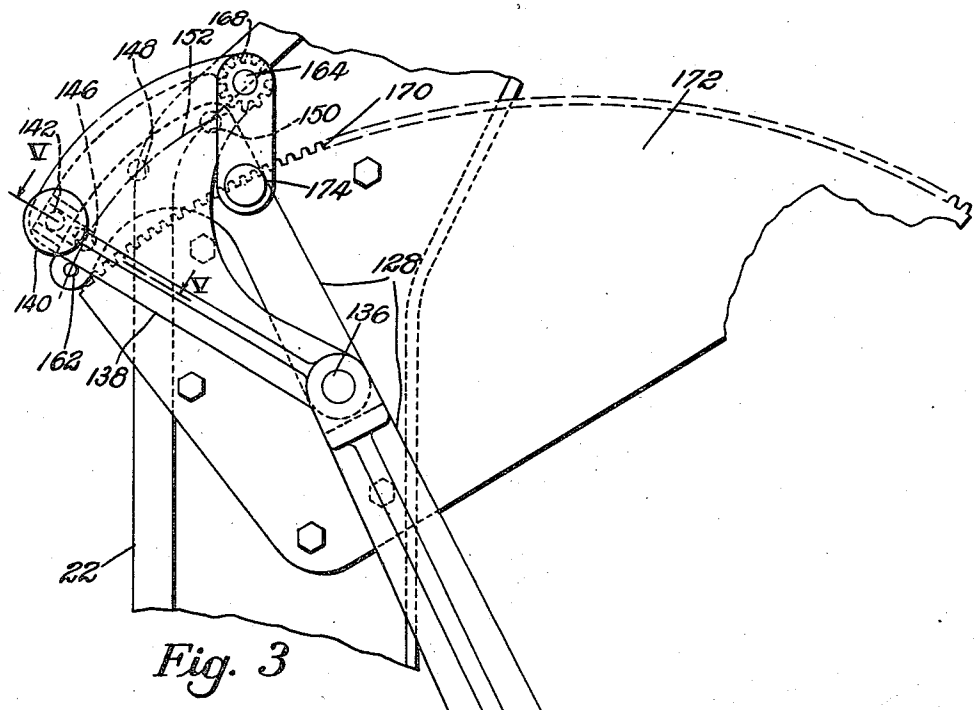


Fig. 3

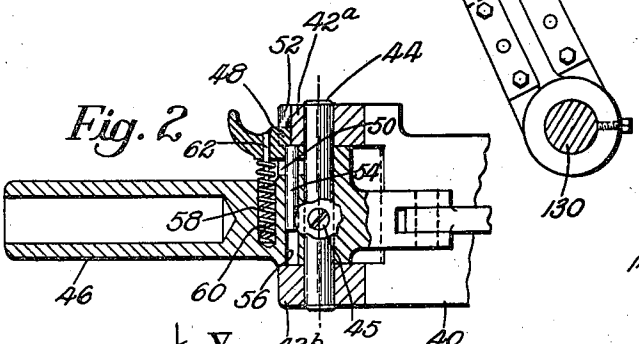


Fig. 2

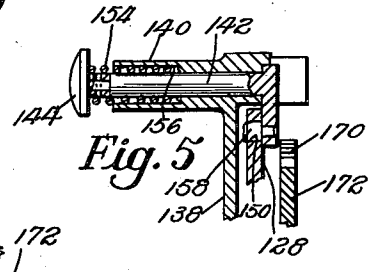


Fig. 5

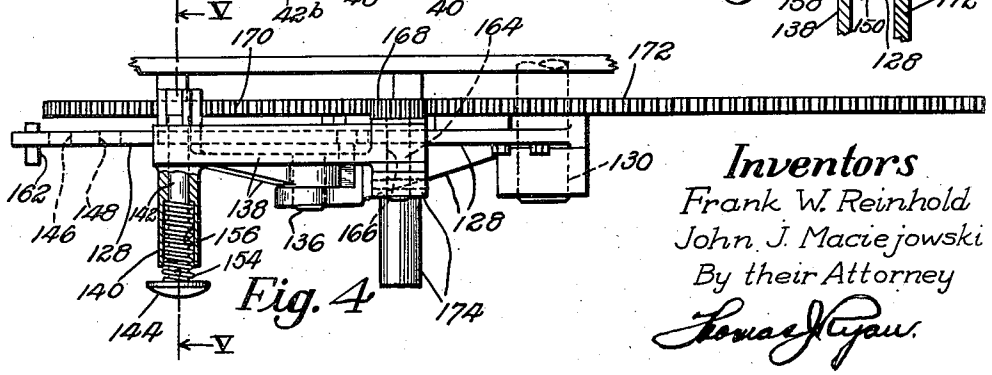


Fig. 4

Inventors
Frank W. Reinhold
John J. Maciejowski
By their Attorney
Thomas J. Ryan

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TRAINING MECHANISM FOR FIREARMS

Frank W. Reinhold, Beverly, and John J. Maciejowski, Ipswich, Mass., assignors to United Shoe Machinery Corporation, Flemington, N. J., a corporation of New Jersey

Original application May 9, 1945, Serial No. 592,864. Divided and this application March 19, 1947, Serial No. 735,772

2 Claims. (Cl. 89—41)

1

This invention relates to ordnance and is illustrated as embodied in an improved firearm of the Bofors 40 mm. type for use against small craft and airplanes.

In order to train a firearm effectively on relatively close, fast-moving airplanes, for example, said firearm must be capable of being swung rapidly in azimuth and elevation. Moreover, when the firearm is mounted on an unstable base of restricted area, such, for example, as the deck of a submarine, it is advantageous for a single gunner standing upon and walking about said deck to be able to train the gun both in azimuth and elevation upon the target.

It is an object of the present invention to provide an improved gun of relatively low caliber, which may be quickly and effectively trained on a target by a single gunner, for use on submarines.

The illustrative firearm comprises a gun freely swiveled for movement in elevation upon a support which is rotatably mounted for movement, together with the gun, in azimuth. There is secured to said support an arm which comprises a handle and is of suitable construction and arrangement to enable a gunner, gripping said handle with his left hand and walking about the deck of the submarine, manually to move the support, together with the gun, in azimuth, a lever manually actuated by the right hand of the gunner being fulcrumed upon the support and operatively connected through driving connections to the gun for swinging the gun in elevation upon said support.

The handle, which is carried by the arm and is normally secured to said arm by a latch, may be swung downward upon the arm by the gunner, after disengaging the latch, into a lowered firing position, thereby operating through firing mechanism disclosed in detail in an application for United States Letters Patent Serial No. 592,864, filed May 9, 1945, in our name of which the present application is a division, a reciprocable firing plunger of the gun and thus causing the gun to be fired.

The illustrative firearm, in accordance with a feature of the present invention, has pivotally mounted upon the lever, in response to movement of which the gun is moved in elevation, a bracket comprising a handle carrying a detent which may be moved interchangeably into interlocking relation with any one of a plurality of holes in said lever, thereby enabling the gunner to secure the bracket in different positions upon the lever and thus insuring that said gunner is never "pulled" out of a natural sighting position in training the gun in elevation on the target.

2

When the gun is elevated below 30° it has a tendency to jump, with the result that the gunner, when using the handle fixed to the bracket, is likely to overcontrol the movement of the gun in elevation. It will be appreciated that when the gun is being fired at low elevations it does not have to be moved in elevation as fast as when it is firing at higher elevations, such, for example, as when it is being trained on overhead planes. Accordingly, when the gun is being trained in elevation at low angles, speed in the training of the gun in elevation may be sacrificed to provide greater steadiness in said training. With the above considerations in view, the bracket, which is pivoted to the lever, has rotatably mounted on it a pinion which, when the detent is in interlocking engagement with one of said holes of the lever, is in meshing engagement with a rack secured to the gun support, the pinion having secured to it a crank, rotation of which by the right hand of the gunner causes the gun to rotate in elevation upon the support.

The above and various other features of the invention will be understood and appreciated from the following detailed description read in connection with the accompanying drawings, in which

Fig. 1 is a perspective view of the illustrative firearm;

Fig. 2 is a section on line II—II of Fig. 1 showing portions of firing mechanism;

Figs. 3 and 4 are side and plan views, respectively, showing portions of mechanism manually operated by a gunner to train the firearm in elevation; and

Fig. 5 is a section on line V—V of Fig. 4.

The illustrative firearm comprises a gun 20 (Fig. 1) and a support or carriage 22 therefor, the gun being of the above-mentioned Bofors 40 mm. type and comprising a recoiling barrel or tube 24 (Fig. 1) and a breech casing or receiver 26 provided with trunnions 28 by which said casing is rotatably mounted for movement in elevation upon the support.

The support 22 is bolted or otherwise secured to a base (Fig. 1) rotatably mounted upon roller bearings (not shown) supported in a housing 34. The housing 34 is secured to a rigid frame (not shown) located just below a deck 36 of a submarine, for example, the arrangement being such that the turret shall interfere as little as possible with the free movement of a gunner, who manually trains the gun 20 both in azimuth and elevation, and an attendant, who places clips (not shown), each containing four cartridges, in ammunition guides 38 of the gun.

Secured to the lower end of the support 22 and extending to the left from said support as viewed from the rear of the gun 20 is an arm 40 (Figs. 1 and 2) which is used by the gunner to swing the support 36 and accordingly the gun 20 in azimuth. The upper end of the arm 40 has bifurcations 42a, 42b (Fig. 2) bored to support rotatably a pin 44 having secured to it by a screw 45 a handle 46 which the gunner grips with his left hand and swings downward to fire the gun through mechanism described in said application Serial No. 592,864. When the gun 20 is idle, the handle 46 is rigidly secured to the arm 40 by a latch 48 which fits in registering slots 50 (Fig. 2), 52 (Figs. 1 and 2) formed in the handle and the bifurcation 42a and which has secured to it a guide pin 54 (Fig. 2) fitting in a recess 56 of the handle. A spring 58, which is housed in a recess 60 of the handle 46 and has extending into it a pin 62 secured to the latch 48, constantly urges the latch into the slot 52, in which position the latch prevents the handle from being swung downward by the gunner. The handle 46 may thus be considered as constituting part of the arm 40 so far as the training of the gun is concerned.

In order to move the gun 20 in elevation, there is provided a lever 128 (Figs. 1, 3, 4 and 5) secured to one end of a horizontal shaft 130 which is rotatably mounted in bosses of the support 22 and has secured to its other end an arm 131 (Fig. 1) operatively connected through a link 132 to an arm 134 secured to the left trunnion 28 of the gun. Pivotally mounted upon a pin 136 (Figs. 1, 3 and 4) fixed to the lever 128 is a bracket 138 comprising a handle 140 bored to receive a detent 142 (Figs. 4 and 5) provided with a head 144. The upper end of the lever 128 has a forwardly extending flange provided with three holes 146 (Figs. 1 and 4), 148 (Figs. 1, 3 and 4), and 150 (Figs. 3 and 5) the line of centers 152 (Fig. 3) of which is centered about the axis of the pin 136. The detent 142 is constantly urged to the left, as viewed in Fig. 5, by a spring 154 (Figs. 1, 4 and 5) arranged in a recess 156 (Figs. 4 and 5) of the handle 140 and having its outer end in engagement with the head 144 of the detent. The bracket 138 may be swung upon the pin 136 into positions in which a stud 158 (Fig. 5) of the detent 142 selectively registers in any one of the holes 146, 148, 150 the detent being retained in said holes by the action of the spring 154.

When the stud 158 of the detent 142 registers in either of the holes 146, 148, the gunner, grasping the handle 140 with his right hand and sighting along line 160 (Fig. 1), trains the gun in elevation on the target by moving the handle, and accordingly the lever 128, about the axis of the shaft 130. In order that the gunner shall not have to move out of a comfortable or natural position when he is training the gun on the target by the use of the handle 140, the bracket 138 is movable about the pin 136 to move the stud 158 of the detent 142 into register in either of the holes 146, 148. Such change in the position of the bracket 138 upon the lever 128 may be readily effected by pressing the head 144 of the detent 142 inward against the action of the spring 154 to withdraw the stud 158 from the hole in which it is held in interlocking relation and then swinging the bracket on the pin 136 until the stud moves into interlocking relation with the other hole. The lever 128 is provided with a stop 162 (Figs. 1, 3 and 4) to limit forward movement of the bracket 138 on the lever.

The gun 20 when elevated less than 30° has a tendency during firing to jump about the axis of the trunnions 28, with the result that the gunner when using the handle 140 unconsciously tries to counteract such movement and thus tends to overcontrol the gun in elevation. With a view to steadying the training of the gun on the target when said gun is swung through angles of 30° or less, there is secured to the inner end of a shaft 164 (Figs. 1, 3 and 4), rotatably mounted in a bore 166 (Fig. 4) of the bracket 138, a pinion 168 (Figs. 3 and 4) which, when the stud 158 (Fig. 5) of the detent 142 registers in the hole 150, is in meshing engagement with teeth 170 (Figs. 1, 3, 4 and 5) of an arcuate rack 172 which is bolted to the support 22, the teeth of the rack having a pitch line centered at the axis of the shaft 130. To the outer end of the shaft 164 is pinned a crank 174 having a handle which the gunner rotates with his right hand to move the gun in elevation. By providing the above-mentioned rack 172 and pinion 168, when swinging the gun 20 in elevation through low angles there is less strain on the gunner than when the gunner actuates the gun directly through the bracket handle 140. It will be appreciated that there is little tendency for the gun 20 to jump during firing when it is elevated above 30°, at which time it is usually firing at fast-moving targets, such as airplanes, and is then more rapidly trained in elevation on the target by the use of the bracket handle 140.

Having described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. In a firearm, a support freely rotatable in azimuth, a gun freely rotatable in elevation upon the support, and means constructed and arranged to enable a gunner to move the gun manually in elevation with relation to the support, said means comprising a lever, a bracket which is carried by the lever and is securable in at least two different operative positions upon said lever, a rack secured to said support, and a pinion and a crank therefor both rotatably mounted in the bracket, said pinion when the bracket is in one of its operative positions upon the lever being in meshing engagement with the rack and when the bracket is in another operative position upon the lever being held in an inoperative position away from said rack.

2. In a firearm, a support freely rotatable in azimuth, a gun which is rotatable in azimuth, together with the support, and in elevation with relation to said support, a lever having two or more openings, mechanism for moving the gun in elevation in response to movement of said lever, a bracket which is pivotally mounted upon said lever and comprises a handle, a detent which is associated with the handle and is constructed and arranged to be moved interchangeably into interlocking engagement with any one of said openings to secure the bracket in different operative positions upon said lever, a rack secured to said support, and a pinion and a crank therefor rotatably mounted in the bracket, said pinion when the detent is in interlocking engagement in one of said openings being in meshing engagement with said rack, rotation of the crank with the detent thus positioned causing movement of the lever relatively to the support and accordingly movement of the gun in elevation.

FRANK W. REINHOLD.
JOHN J. MACIEJOWSKI.

No references cited.