

Dec. 6, 1927.

1,651,699

A. S. HALSEY

GUN FIRING MECHANISM

Filed Sept. 10, 1925

4 Sheets-Sheet 1

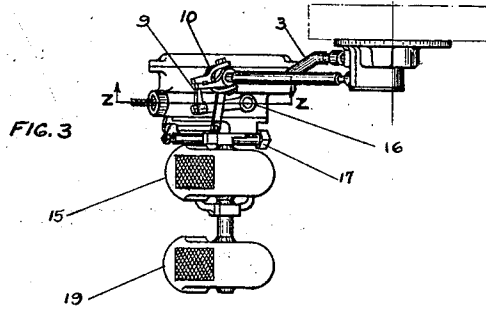


FIG. 1.

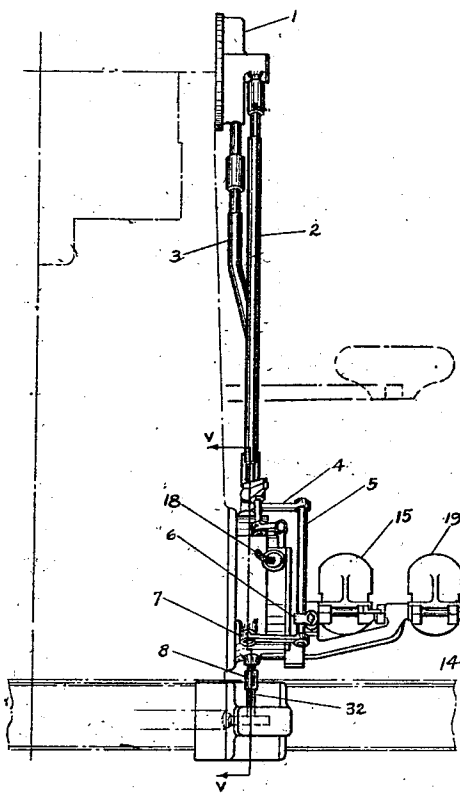
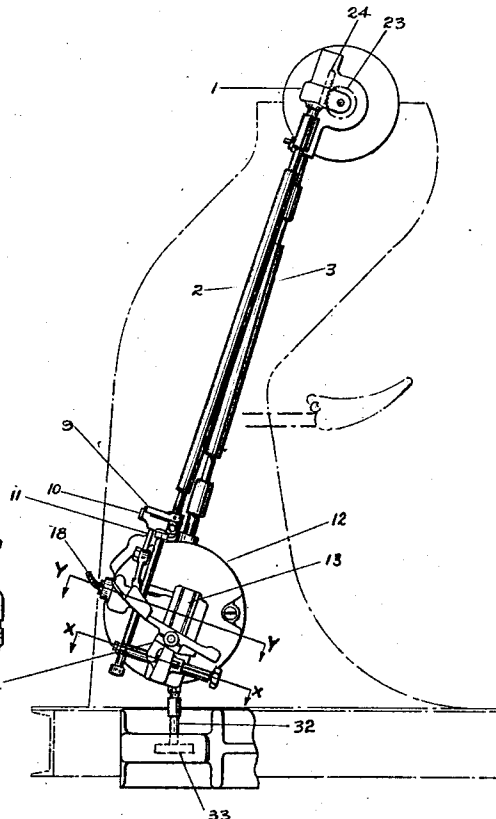


FIG. 2.



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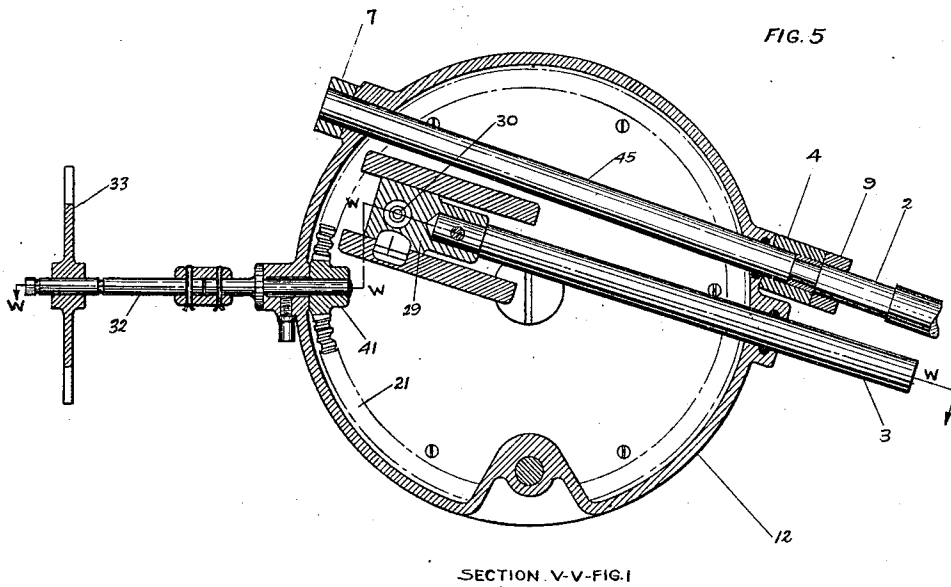
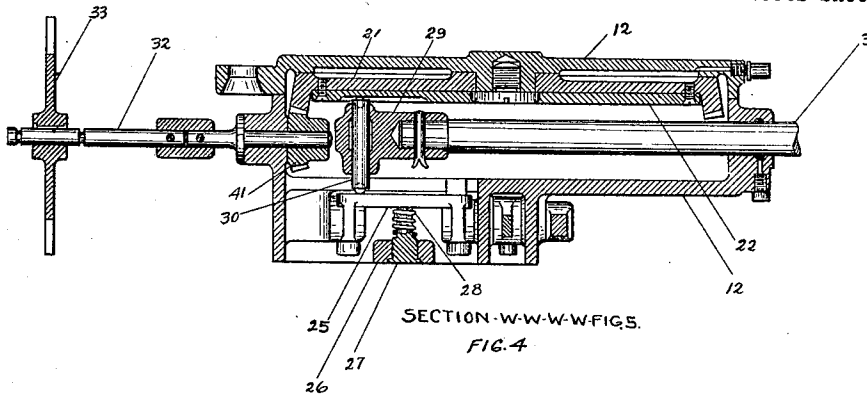
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4 Sheets-Sheet 3

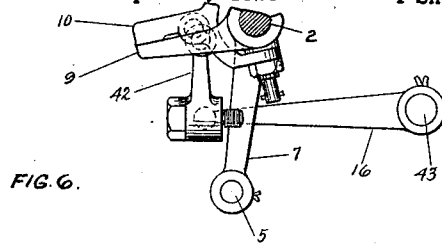


FIG. 6.

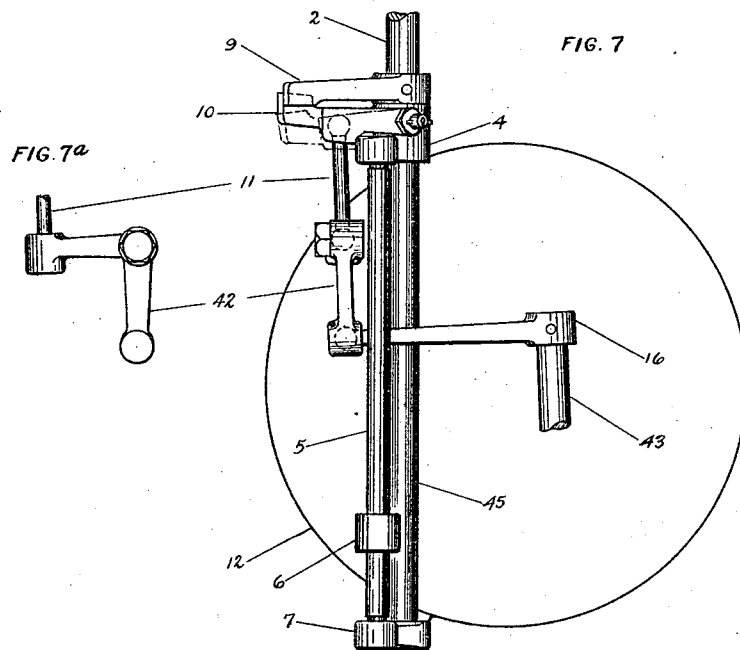


FIG. 7

FIG. 7a

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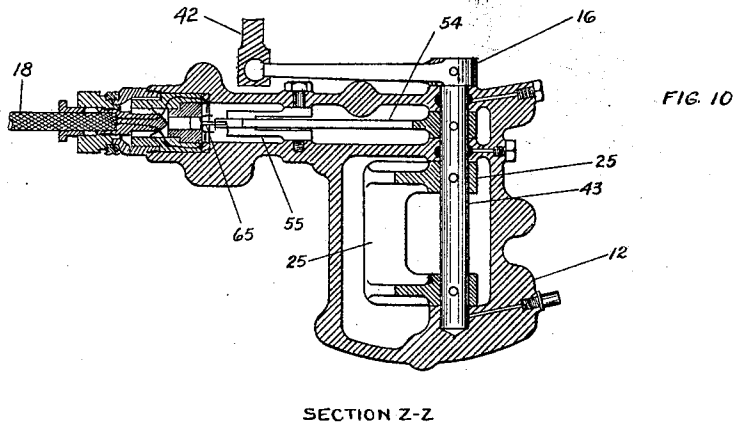
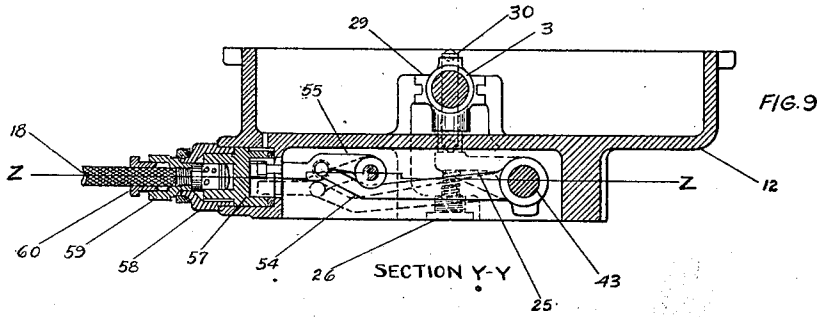
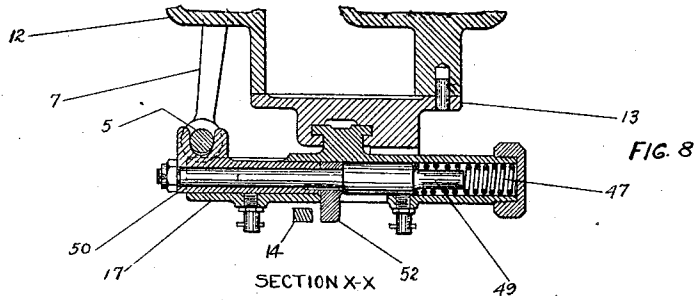
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4 Sheets-Sheet 4



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# UNITED STATES PATENT OFFICE.

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## GUN FIRING MECHANISM.

Application filed September 10, 1925. Serial No. 55,615.

This invention relates to gun firing mechanism and more particularly a control mechanism especially adapted for use on anti-aircraft guns adapted to prevent the firing of the gun when there is danger of the projectile hitting the superstructure or tops of the ships upon which it is carried.

In order that a clearer perception of the objects sought to be obtained by the present invention may be had it is stated that in anti-aircraft defense work especially, it is desirable of keeping the gun trained upon the aircraft (as, for example, when the plane makes a zigzag approach from the rear of the ship or when the ship has a high combined roll and pitch angle) in order that the gun may be fired instantly when the aircraft comes within range and the line of trajectory is clear of the superstructure, funnels, masts, etc.

Heretofore guns have been limited in their train and elevation by certain stops which would prevent damage to the superstructure but when the gun was so limited in its movement the personnel sighting were unable to keep the gun laid on the target.

The present invention therefore contemplates a simple and practical mechanism whereby the gun may be moved in train and elevation so as to keep on the target at all times yet positively prevent the gun from being fired when the projectile might endanger the ship on which the gun is carried.

A further object is to provide a mechanism of the above general character which may be inexpensively manufactured and assembled and applied to gun mounts now in general use without material modification.

A further object is to provide a durable and efficient mechanism having relatively few parts which will be unlikely to get out of order when in use.

Other objects will be in part obvious and in part hereinafter pointed out in connection with the following analysis of this invention and drawings forming part of the disclosure wherein similar parts are designated by like reference characters throughout the several views.

In these drawings,

Figure 1 is a front elevational view of such parts of the mechanism as are necessary to clearly understand the same together with a portion of the gun mount.

Figure 2 is a side elevational view of the parts shown in Figure 1.

Figure 3 is a plan view showing the upper and lower connections to the firing mechanism of the gun with the actuating foot pedal in operative position.

Figure 4 is a detail sectional view taken substantially on the line W/W, Figure 5.

Figure 5 is a detail sectional view of the parts shown in Figure 4 and taken substantially on the line V/V, Figure 1.

Figure 6 is a detail plan view of a part of the firing latch.

Figure 7 is an elevational view of a part of the firing latch.

Figure 7<sup>a</sup> is a detail view of a part of the linkage mechanism shown in Figure 7.

Figure 8 is a sectional view taken substantially on the line X/X of Figure 2.

Figure 9 is a sectional view taken substantially on the line Y/Y, Figure 2.

Figure 10 is a sectional view taken substantially on the line Z/Z, Figure 9.

While the invention will be hereinafter described more clearly with relation to its application to anti-aircraft guns it is of course to be understood that it is not limited to such application.

Referring now to the drawings in detail and more particularly to Figure 1, 1 denotes the trunnion bearing at the side of the gun mount shown in dotted lines in both Figures 1 and 2.

This trunnion is provided with the usual firing latch for actuating the percussion firing mechanism at the breech of the gun, the parts being of generally well-known construction and requiring no detailed description at this time inasmuch as they form no part of the present invention except in so far as they may enter into certain combinations hereinafter set forth.

This firing latch is connected with a telescope rod 2 extending downwardly towards the base of the gun and is provided with two laterally extending arms 4 and 7 between which is positioned a rod 5 carrying a lug 6 as shown more clearly in Figure 7 which lug is in contact with pedals 15 and 19 adjustably mounted in a guide slot 13 upon a circular casing 12. One of these pedals 19 is fixed and the other may be depressed by the operator when positioned upon the trainer's seat. The movable pedal is pro-

vided with a downwardly extending lug 14 as shown in Figure 2 which is adapted to coact with a stop 52 shown in Figure 8 which stop is carried by a sliding bar or rod 49 in the casing 17 and is normally held in position by means of coiled spring 47 at one end. This casing also carries a member 50 provided with a bifurcated portion at one end in which rests the rod 5 mounted upon the arms 4 and 7 shown in Figure 1. Thus as the pedal 15 is depressed the lug 52 is moved towards the right cam pressing the spring and carrying with it the rod 5, arms 4 and 7 thereby to turn the shaft 2 and actuate the firing gear when the cooperating members 9 and 10 mounted upon this shaft are in the position shown in full lines in Figure 7. A turning of this shaft actuates the percussion firing mechanism in the usual well-known manner.

Mounted near the base of the gun mount is the casing 12 as shown more clearly in Figures 4 and 5 containing two shafts, one being the end of the shaft 2 previously described which is in alignment with the shaft 45 within the casing and forms bearing points for the arms 4 and 7 thereby permitting these arms to move without turning the shaft when the contacting members 9 and 10 shown in Figure 7 are in the dotted line position.

This casing 12 also contains a stop shaft 32 having at its lower end a pinion 33 adapted to mesh with the training rack surrounding the gun mount.

As the shaft 32, Figure 4, is rotated when the gun is moved in train, a pinion 41 at its inner end and within the casing meshes with a rack 21 causing the same to turn proportionally to the turn of the gun. This revoluble rack 21 carries a cam plate 22 which is provided with one or more recesses as indicated at the left thereof adapted to be engaged by the arm 30 at the end of the shaft 3. This arm which is of general T-shaped construction is provided with roller bearings, the upper end of which coacts with the cam plate while the other coacts with the movable plate 25 yieldingly supported upon an adjustable stud 27 screwed into a case 26. A spring 28 normally urges the same into contact with the lower thrust bearing. The cutaway portions on this cam are so positioned with relation to the superstructure tops or funnels of the ship as to break the firing circuit as will be hereinafter explained under certain conditions when the gun is in line with such obstructions.

Referring now to Figure 10 showing a sectional view of Figure 9, on line Z/Z, it will be noted that plate 25 is mounted upon a shaft 43 and is adapted to turn therewith. When the shaft turns the link 16 pinned at its free end actuates the lever 42 shown in

Figures 7 and 7<sup>a</sup> in a manner to pull the connecting member 10 downwardly into the dotted line position out of engagement with its cooperating member 9. When in this position, the shaft 45 is free to turn but will not transmit its movement to the shaft 2 which is connected with the firing latch.

It will also be noted that the shaft 43, Figure 10, is provided with a laterally extending arm 54 pivoted to the central part of switch member 55 thereby to pull this switch member downwardly when the plate 25 is depressed thus breaking the circuit indicated by the lead-in wire 18 which is clamped in a suitable water-tight packing member 60, cooperating gland 59 and base support 58 surrounding the switch member 57.

From the above it will be seen that there are two safety members for positively preventing the firing of the gun. One, a mechanical disconnection of the firing latch at the points 9—10 when the pedal is depressed should the trajectory of the projectile endanger any part of the ship upon which the gun is mounted. The other is an electrical disconnection of the lead-in wire 18 which is a portion of the firing circuit.

While it is believed that the operation of the device above described will be perfectly clear it may be stated that a depression of the movable pedal 15 will through the lug 14 cooperating with the lug 52, Figure 8, cause a movement of the link 7 (or 4) to rotate the shaft 45, which when the parts 9 and 10 are in engagement, will cause a corresponding rotation of the shaft 2 and an actuation of the firing latch at the trunnion 1. If, however, the gun is not so trained or elevated as to permit firing without danger, the cam plate 22, Figure 4, will have been automatically turned to bring a raised portion into engagement with the thrust bearing 30 causing a depression of the plate 25 shown in Figures 9 and 10 thereby to break the electrical circuit by reason of a switch 65 and mechanically separate the contacts 9 and 10 shown in Figure 7 by reason of the linkage 42—11—16 connected with the rod 43.

It will be noted by reference to Figure 2 that the trunnion is provided with a small gear 23 meshing with the rack 24 carried at one end of the telescopic rod 3 which will cause the thrust member 29 to slide in its guides according to the elevation to which the gun is moved thereby bringing the thrust member into engagement with a raised portion of the cams 22 which, as above explained, mechanically and electrically prevents the firing of the gun.

It will thus be seen that the present invention contemplates a simple and practical mechanism which may be easily and quickly

applied to gun mounts now in use and which will reliably and efficiently prevent the firing of a gun when there is danger of injury to the ship upon which the gun is fired by the projectile issuing therefrom.

What I claim is:—

1. In combination with a gun mount having percussion firing mechanism, a pointer's foot pedal and means associated with the firing mechanism adapted to prevent firing when the pedal is depressed and the gun is in danger of injuring the ship upon which it is mounted.

2. In combination with a gun mount having percussion firing mechanism, a pointer's foot pedal, means associated with the firing mechanism adapted to prevent firing when the pedal is depressed and the gun is in danger of injuring the ship upon which it is mounted, said means including an electrical circuit breaker.

3. In combination with a gun mount having percussion firing mechanism, a pointer's foot pedal, means associated with the firing mechanism adapted to prevent firing when the pedal is depressed and the gun is in danger of injuring the ship upon which it is mounted, said means including mechanical connection between the pedal and the firing mechanism adapted to be thrown out under predetermined conditions.

4. In combination with a gun mount having percussion firing mechanism, a pointer's foot pedal and means associated with the firing mechanism adapted to prevent firing when the pedal is depressed and the gun is in danger of injuring the ship upon which it is mounted, said means including both electrical and mechanical breakers.

5. In combination with percussion firing mechanism of a gun, means for preventing the firing of the gun at predetermined positions of train or elevation including a pointer's foot-pedal and means including a cam-

plate, movable proportionally to the movement of the gun in train for rendering the foot pedal inoperative.

6. In combination with percussion firing mechanism, means for preventing the firing of the gun at predetermined positions of train and elevation including a pointer's foot pedal, means including a cam plate movable proportionately to the movement of a gun in train for rendering the foot pedal inoperative, and means movable by difference in elevation of the gun for electrically disconnecting the firing circuits.

7. In combination with a percussion firing mechanism, a manually actuated member for firing the gun, means for rendering the manually actuated member inoperative at certain positions of the gun, electrical means between the percussion firing mechanism and the manually actuated member for preventing firing of the gun at those positions of train and elevation at which the manually operated member is inoperative.

8. In combination with percussion firing mechanism, means whereby continuous aim of the gun is obtained for all angles of elevation and train possible for the gun to move and mechanical and electrical means adapted to prevent firing of the gun except when the gun is pointed in a safe firing zone.

9. In combination with percussion firing mechanism, means whereby continuous aim of the gun is obtained for all angles of elevation and train possible for the gun to move, means automatically actuated adapted to prevent firing of the gun except when gun is pointed in safe firing zone, said means including a cam and cooperating member movable proportionally to movement of train and elevation adapted to mechanically and electrically interrupt the firing mechanism.

Signed at Washington, District of Columbia, this 22nd day of July, 1925.

ARTHUR SHERMAN HALSEY.