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GUN SIGHTING AND ELEVATING MECHANISM

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Fig. 2.

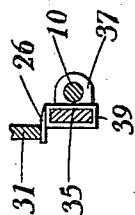


Fig. 1.

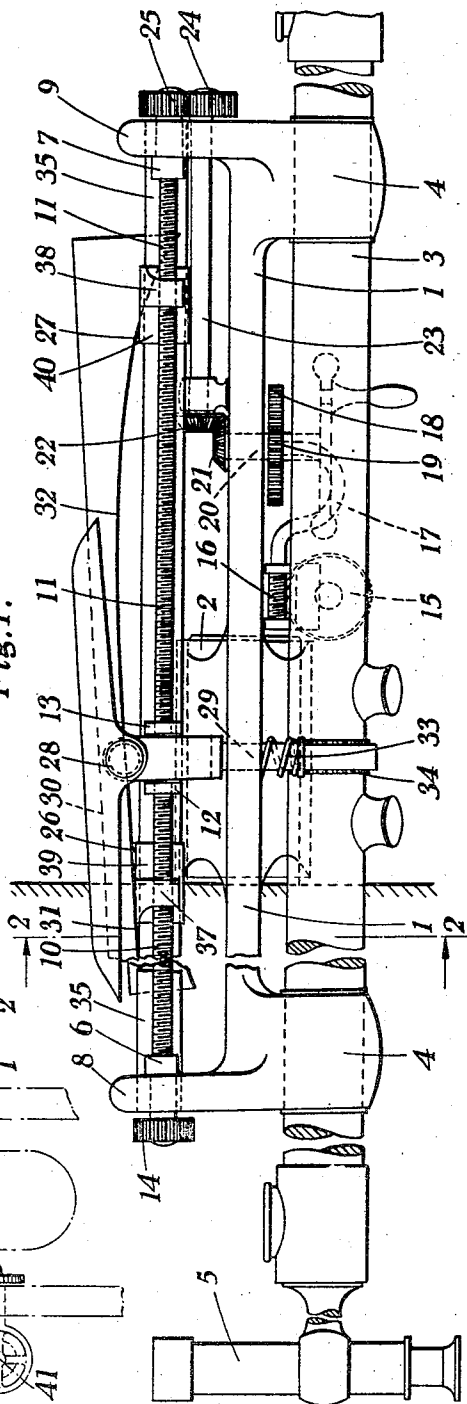
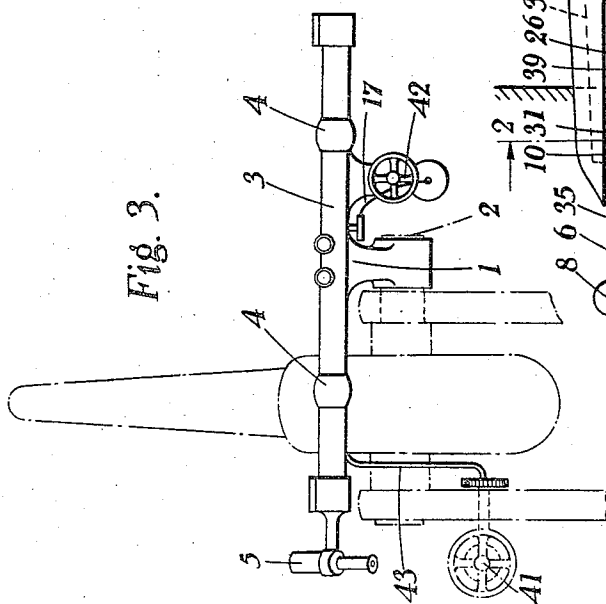


Fig. 3.



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## UNITED STATES PATENT OFFICE

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GUN SIGHTING AND ELEVATING  
MECHANISMRobert William Johnston Fletcher, Westminster,  
London, EnglandApplication November 11, 1931, Serial No. 574,423  
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7 Claims. (Cl. 33—49)

The present invention relates to gun sighting and elevating mechanism, and is more particularly intended for use with anti-aircraft guns.

The object of the invention is to provide a mechanism in which, assuming the sighting telescope remains on the target and the range finder is accurately adjusted, the amount of super elevation of the gun required, owing to the angle of sight and length of the range, will be automatically added to the angle of sight of the target.

A further object of the invention is to provide a mechanism wherein adjustment of a range finder associated with a gun according to range, causes super elevation of the gun by an amount which is a function of the range of the target.

A further object of the invention is to provide a mechanism wherein elevation of the gun to bring it to bear upon the target causes the gun to be super elevated by an amount which is a function of the elevation of the target.

It is a further object to effect the tilting of a gun sight and range finder associated therewith through a movable beam carrying a cam, this cam being held in engagement with two followers, one of which is positioned by the range finder adjustment and the other by the gun-elevating gear.

With these and other objects in view, the invention consists in the improved combinations and arrangements of parts hereinafter described and illustrated by way of example in the accompanying drawing, the novel features being set forth in the appended claims.

In the drawing,

Fig. 1 represents a broken plan view of apparatus in accordance with the invention,

Fig. 2 represents a detailed view taken on the line 2—2 of Fig. 1, of a cam with its follower and carriage,

Fig. 3 represents diagrammatically the interrelation of a gun and apparatus provided in accordance with the invention.

Referring to this drawing, a frame 1 is mounted on the trunnion 2 of a gun, and a range finder tube 3 is rotatably carried in bearings 4, 4 on this frame 1.

A sighting telescope 5 is integral with one end of the range finder. Bearings 6 and 7 in lugs 8 and 9 of the frame 1 each bear one end of traversing screws 10 and 11 respectively, the other ends of these screws being respectively borne in bearings 12 and 13 on the frame 1. The screw 10 is driven from the elevating gear of the gun through a pinion 14, and the screw 11 is driven from the operating mechanism of the movable

prism of the range finder, through a pinion 15, worm 16, flexible shaft 17, pinions 18 and 19, shaft 20, bevel wheels 21 and 22, shaft 23, and pinions 24 and 25. Carriages 39 and 40 ride on a rail 35 and female threads in lugs 37 and 38 carried by these carriages engage the screws 10 and 11 respectively. Carried by the carriages 39 and 40 respectively are cam followers 26 and 27. Mounted on a pivot 28 carried by a plunger 29 is a beam 30. The arms of the beam carry cams 31 and 32 in the form of predetermined curves, and a spring 33 tends to press the plunger 29 in such a direction as to maintain the faces of the cams 31 and 32 in contact with the cam followers 26 and 27 respectively. The end of the plunger 29 remote from the pivot 28 is formed as a rack which meshes with peripheral teeth 34 on the range finder tube 3.

Figure 3 illustrates diagrammatically the interrelation of a gun and apparatus provided in accordance with the invention. In this figure the elevating gear and prism moving mechanism are illustrated at 41 and 42 respectively, and a flexible drive from the elevating gear 41 for the cam follower 26 is illustrated at 43.

The two cams 31 and 32 are mounted on the beam 30 so that they form a practically continuous curve, and they are so arranged that the point where they meet shall lie on the center line of the pivot 28.

Each of the two cam followers 26 and 27 is so arranged that its point of contact with its cam surface can coincide as nearly as possible with the centre of the pivot of the beam.

If either of the cam followers (or both) is moved to the centre of the beam pivot there will be no movement from zero position of the plunger or rack, whatever the position of the other cam follower may be.

If neither of the cam followers is at the centre of the beam pivot the plunger will have moved from zero position; such movement being a resultant of the two factors; (1) the amount of the movement of the gun through the vertical quadrant; (2) the amount of the movement of the angle-measuring device in the range finder.

The gear ratio between the elevating gear of the gun and the cam follower 26 is such that the follower 26 travels the length of the surface of the cam 31 during elevation of the gun through 90°. The gear ratio between the operating mechanism of the movable prism of the range finder and the cam follower 27 is such that the follower travels the length of the surface of the cam 32

during the limits of movement of the range finding prism.

The arrangement is such that both cam followers are close together adjacent the pivot of the lever when no super elevation is required, i. e. with an overhead target at close range, although normally the cam followers will rest adjacent the outer ends of the lever corresponding to a horizontal target at long range.

Assuming, however, the cam followers are together, as the sighting telescope 5 is rocked downwardly by depression of the gun muzzle, the cam follower 26 moves along the face 31 of the lever and rocks it about its pivot, the other cam follower offering no obstruction to this rocking movement. When, however, the range setting prism is also moved in a direction from short range to long range, the cam follower 27 moves outwards and tends to rock the lever in the opposite sense so that under the action of the two cam followers the pivot of the lever is positively displaced in a direction at right angles to the paths of the cam followers.

This displacement of the pivot moves the rack, which rotates the tube 3 of the range-finder in such a direction that the telescope 5 is depressed at a greater speed than the gun muzzle, with the result that when the telescope is on the target, the axis of the gun has a certain angular elevation above that of the axis of the telescope. The angle between the telescope and the gun will be a function of the quadrant elevation of the gun.

Contrariwise, if the gun is normally horizontal and is lifted to sight on a target, the pivot of the lever will be allowed to move back towards its zero position from the maximum displacement (1) as the gun is lifted and (2) as the range is adjusted from long range to shorter.

It will be realized, however, that if either cam follower is in its innermost position, movement of the other cam follower will merely rock the lever idly without displacing the pivot.

Alternatively, the cams might be arranged so that the followers move inwardly towards each other to give super elevation, but I prefer the arrangement described so as to reduce friction, the followers displacing the pivot through maximum leverage at maximum displacement.

A further sight will be necessary to determine the horizontal direction of the target. This may be an ordinary telescopic sight free to move in the vertical plane parallel to the axis of the gun barrel and fixed to any convenient part of the gun mounting which revolves in the horizontal plane.

The operation of laying the gun on a target rapidly moving in both horizontal and vertical planes would require, with this apparatus, three operators; one to follow the horizontal direction of target, one to follow the vertical direction; and one to follow variations of range.

With such an arrangement it will be realized that the correction for super elevation by reason of (1) the angle of sight, and (2) the range, are automatically introduced into the laying of the gun.

It is to be understood that the invention is not restricted to the exact details shown and described but embraces such modifications as come within the accompanying claims.

I claim:—

1. In combination with a gun, a range finder carried by said gun, an independent sighting means carried by said range finder, mechanism for adjusting said range finder according to range, a traversing screw driven by said adjusting

mechanism, elevating gear for said gun, a traversing screw driven by said elevating gear, peripheral teeth on said range finder, a plunger, a rack carried by said plunger and meshing with said peripheral teeth, a beam pivotally connected to said plunger, cams carried by the arms of said beam, cam followers driven by said traversing screws respectively and means for maintaining said cams in contact with said followers.

2. Tilting mechanism for gun sighting means associated with a range finder, comprising a beam, a movable pivot for said beam, means for translating the movement of said pivot into angular movement of said sighting means and said range finder, a cam carried by said beam, and a pair of cam followers, said cam being held in contact with said cam followers, and one of said cam followers being positioned by the elevation of said gun and the other being positioned by the adjustment of said range finder according to range.

3. Tilting mechanism for gun sighting means associated with a range finder, comprising a beam, a movable pivot for said beam, means for translating the movement of said pivot into angular movement of said sighting means and said range finder, a cam carried by said beam and a pair of cam followers, said cam being held in contact with said cam followers, and one of said cam followers being positioned by the elevation of said gun so that its point of contact with the cam surface coincides as nearly as possible with the center of the pivot when the gun barrel is vertical and the other being positioned by the adjustment of said range finder according to range, so that its point of contact with the cam surface coincides as nearly as possible with the center of the pivot when the range is short.

4. In combination with a gun provided with elevating gear, a range-finder carried on said gun, a sighting telescope carried by said range-finder, a beam, a movable member, means to automatically move said movable member by the focusing of said range finder by an amount which is a function of the range, a second movable member, means to move said second movable member by an amount which is a function of the elevation of the gun, differential movement of said movable members causing movement of said beam, and means for converting movement of said beam into movement of said sighting telescope to cause the axis of said gun and the axis of said sighting telescope to have a desired angle between them when the said sighting telescope is on the target.

5. In combination with a gun, a range-finder carried on said gun, a sighting telescope carried by said range-finder, means for elevating the gun, a movable beam, two movable members adapted to move said beam, gearing connecting one of said movable members to mechanism for adjusting said range finder, and gearing connecting the other of said movable members to said gun elevating mechanism, movement of said beam causing movement of said sighting telescope relatively to the gun.

6. In combination with a gun, a range-finder carried on said gun, a sighting telescope carried by said range-finder, a movable beam, two cams fixedly connected to said beam, the faces of said cams forming a substantially continuous curve, two movable members adapted to cooperate with said cams to move said beam, a movable pivot supporting said beam, means connected to said pivot for causing said sighting telescope to move

relatively to the axis of the gun, the axis of said pivot being so placed relatively to said cams that it cuts said curve formed by said cam faces.

7. In combination with a gun, a range-finder  
5 carried on said gun, a sighting telescope carried by said range-finder, a movable beam, two movable members adapted to move said beam, mechanism for adjusting said range-finder, mechanism for elevating said gun, gearing connecting  
10 one of said movable members to said range-finder adjusting mechanism, and gearing con-

necting the other of said movable members to said gun elevating mechanism, said gearing comprising a pair of traversing screws, threaded holes in said movable members adapted to engage said traversing screws, rails to guide said movable members, and means for driving said traversing screws from said gun elevating mechanism and said range-finder adjusting mechanism respectively.

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