Jan. 23, 1951

M. LEUPOLD

TELESCOPE SIGHT AND RETICULE AND CAM ADJUSTING MEANS THEREFOR

2,539,256

Filed June 10, 1946

2 Sheets-Sheet 1

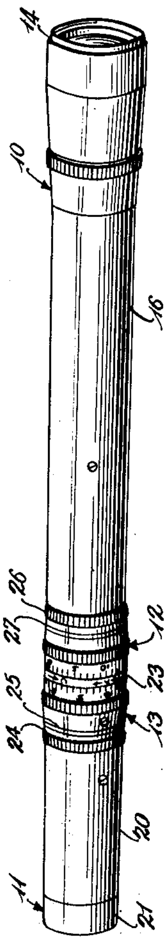

Fig. 1.

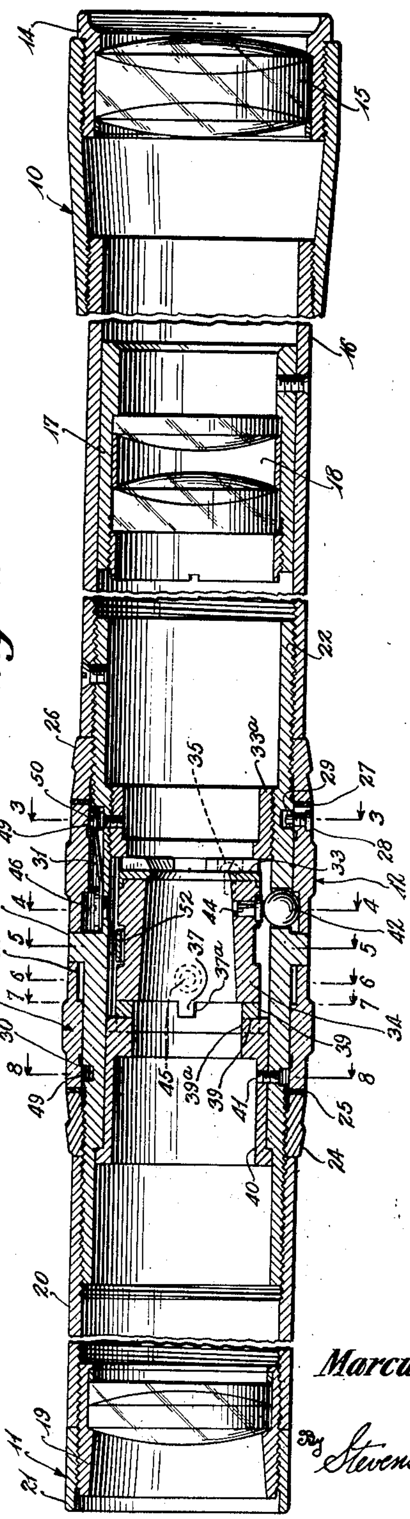

Fig. 2.

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Fig. 3.

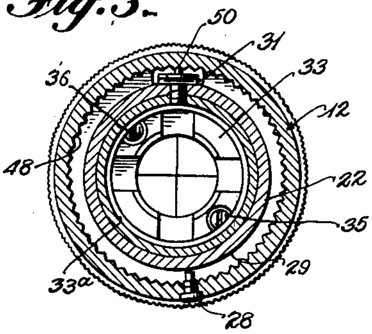


Fig. 4.

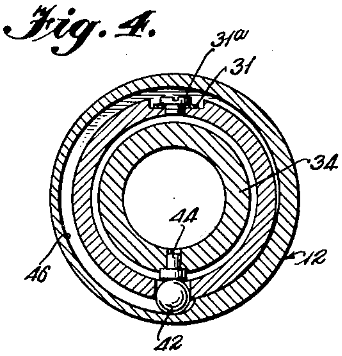


Fig. 5.

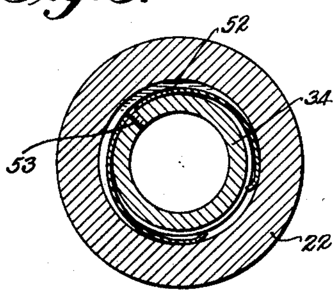


Fig. 6.

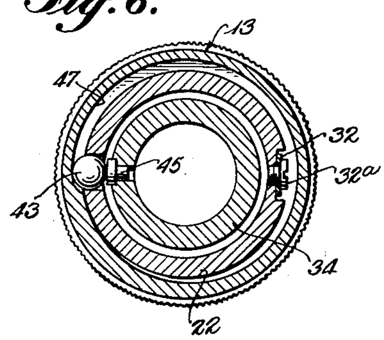


Fig. 7.

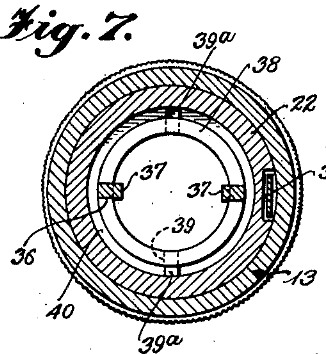


Fig. 8.

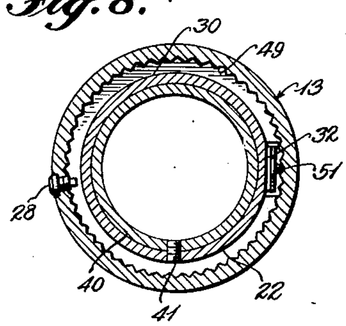
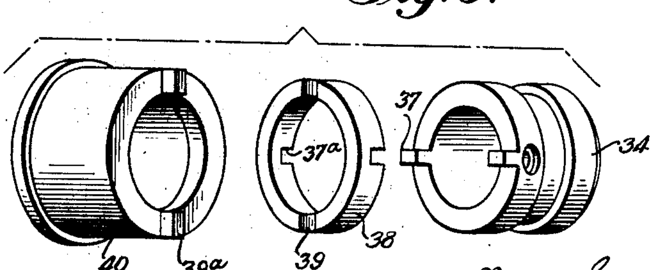


Fig. 9.



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TELESCOPE SIGHT AND RETICULE AND CAM ADJUSTING MEANS THEREFOR

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Application June 10, 1946, Serial No. 675,613

2 Claims. (Cl. 33—50)

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This invention relates to optical instruments and is more particularly concerned with telescopic sights of an improved type for use with fire-arms and the like.

The telescopic sight which is now widely used with both mechanically supported and hand-held fire-arms consists principally of an elongated sighting tube provided with an eye-piece, an objective lens and a reticule disposed therebetween. This instrument, which is usually manufactured separately from the weapon on which it is used, is installed in such a way that the cross-hairs of the reticule lie on the vertical and horizontal axes of the telescope tube. Usually some means is provided for raising the tube and shifting it laterally with respect to its normal position on the barrel of the weapon so that compensations for distance and windage can be effected. Alternatively, the reticule may be so mounted within the tube that it may be shifted vertically and laterally to effect elevational and windage adjustments.

Based on theoretical reasoning alone it would seem that the adjustment of the reticule within the sight tube would be a better way of effecting windage and elevation adjustments than the adjustment of the sight tube as a whole. The reason for this is that an adjustable mounting for the sight-tube is necessarily somewhat fragile and delicate and yet is subject to jars and shocks incident to transportation and use of the weapon. Thus, it is easily possible for the sight tube to get out of alignment with the gun barrel with which it is used. On the other hand, if the sight tube is rigidly mounted on the gun barrel by some sturdy non-adjustable means so that it is resistant to displacement incident to shocks to which the weapon is subjected, it is apparent that the alignment of the tube will be maintained. However, since the reticule, which must be adjustable, is necessarily located within the sight tube of the weapon it is often very difficult to determine the magnitude of adjustments that are made by adjusting means operated from the exterior of the sight tube. Additionally, the operating members for shifting the reticule are often so positioned as to interfere with the normal functioning of the weapon, particularly in the ejection of shells.

Accordingly it is an object of the invention to provide a telescopic sight of the type in which the reticule may be vertically and horizontally shifted in order to effect elevational and windage compensations, characterized by a novel type of adjusting means for shifting the reticule

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whereby the operator is continuously apprised of the magnitude of the adjustment being effected and whereby the adjusting means is so arranged as to totally avoid interference with the normal functioning of the weapon.

It is further an object of this invention to provide an adjusting means for a reticule that is simple in construction and accurate and reliable in operation.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed description of a preferred embodiment thereof in conjunction with the annexed drawings, wherein:

Figure 1 is a perspective view of a telescopic sight constructed in accordance with the present invention;

Figure 2 is a view in longitudinal section of the sight of Figure 1;

Figure 3 is a view in section taken along the line 3—3 of Figure 2;

Figure 4 is a view in section taken along the line 4—4 of Figure 2;

Figure 5 is a view in section taken along the line 5—5 of Figure 2;

Figure 6 is a view in section taken along the line 6—6 of Figure 2;

Figure 7 is a view in section taken along the line 7—7 of Figure 2;

Figure 8 is a view in section taken along the line 8—8 of Figure 2; and

Figure 9 is a perspective view of a group of interfitting parts associated with the reticule of the telescope; the parts being shown in disassembled position for convenience of illustration.

Referring now to the details of Figure 1, it will be noted that the sight comprises generally a tubular body including an eye-piece 10, an objective 11, and a pair of caibrated reticule adjusting sleeves 12 and 13 for effecting respectively elevational and windage adjustments.

Upon reference to the internal structure of the sight, that is illustrated in Figures 2 to 8 inclusive, it will be noted that the eye-piece 10 includes an internal sleeve 14, containing an externally convex cemented lens 15 with the flint element leading. The eye-piece 10 is internally threaded at the forward end and is attached to a tube 16 that contains an internal sleeve 17 that supports an erecting lens system 18. As can be seen from the drawings the erecting lens system comprises a double convex crown lens followed by a cemented lens with the crown element leading, the cemented lens being externally meniscus with the convex face leading. The objective 11 comprises an internal lens supporting sleeve 19 threaded into a tube 20 and enclosed by a cylindrical cap 21. The lens is cemented and is externally double convex with the crown element leading. The entire lens system is such that magnifications of the objective eye-piece and of the erecting system are equal to the square root of the power of the total system. It is understood that the glass types are so chosen as to correct the system for color, spherical aberration and field curvature.

The tubes 16 and 20 are connected together by an elongate internal sleeve 22 which receives thereover calibrated reticule adjusting sleeves 12 and 13. These sleeves are held apart by an annular flange 23 which is an integral part of internal sleeve 22. An internally threaded collar 24 acting against spring washer 25 holds sleeve 13 with its trailing face in bearing engagement with flange 23 of sleeve 22 and collar 26, acting against spring washer 27, performs a like function with regard to sleeve 13 which, however, is held with its leading rather than trailing end against the flange 23 of sleeve 22. Both of sleeves 12 and 13 are rotatable about elongate sleeve 22, subject to slight loosening of the collars 24 and 26, but are held against axial displacement therealong. The magnitude of the possible angular displacement of sleeves 12 and 13 is controlled by stop screws 28 that are held by the adjusting sleeves but which include projecting shank portions that ride in grooves 29 and 30 of member 22; see Figures 3 and 8. Upon reference to Figures 3, 4, 6 and 8 it will be noted that axially extending springs 31 and 32, anchored to the member 22 by screws 31*a* and 32*a*, lie in the path of the stop screws 28 so that angular displacement of sleeves 12 and 13 is limited to something slightly under 180°.

As has been stated before, the sleeves 12 and 13 serve to adjust the reticule for elevation and windage. To this end the reticule 33 is mounted on a reticule supporting sleeve 34 by longitudinally extending screws 35 and 36. By the use of these screws the reticule 33 and the sleeve 34 are connected together for movement as a unit. The reticule supporting sleeve 34 is provided at its ends, however, with a pair of projecting lugs 37, see Figure 9, said lugs fitting into complementary sockets 37*a* in a shifting ring 38 so that the reticule 33 and holding sleeve 34 may move laterally within the interior of the sleeve 22 as windage adjustments are made. Again upon reference to Figure 9 it will be seen that the shifting ring 38 also includes sockets 39 that are 90° away from sockets 37*a* and are located in the forward face of the ring. These sockets 39 are complementary to lugs 39*a* that project from sleeve 40 which is fixed in sleeve 22 by a screw or screws 41. Thus, the assembly that includes shifting ring 38, reticule holder 34 and reticule 33 may be shifted vertically on lugs 39*a* to effect elevational adjustments. In order to guide the reticule 33 during windage and elevation adjustments a flanged sleeve 33*a* is provided, the flange bearing against the trailing surface of the reticule as can be seen in Figure 2. Flanged sleeve 33a is held in position by threaded engagement with the interior of elongate sleeve 22.

The actual movement of the reticule and its associated parts is effected by balls 42 and 43 which lie in sockets in the sleeve 22 in such position that ball 42 is in tangential contact with an inner surface of the sleeve 12 and ball 43 is in tangential contact with an inner surface

of the sleeve 13. See in this regard Figures 4 and 6 which also disclose the follower pins 44 and 45. These pins project from the reticule supporting sleeve at axially spaced points 90° apart and are in position to contact respectively the balls 42 and 43. The balls 42 and 43 are moved radially by the biasing action of the inner cam surfaces 46 and 47 of adjusting sleeves 12 and 13 respectively. Upon reference to Figure 4 it will be noted that rotation of the adjusting sleeve 12 in a counter-clockwise direction will result in movement of the ball 42 radially inwardly in response to angular displacement of the cam surface 46. This movement is imparted to the pin 44 and in turn to the reticule holder 34, causing an elevational adjustment of the reticule to be made. Similarily, as can be seen upon reference to Figure 6, counter-clockwise rotation of the adjusting sleeve 13 will cause its cam surface 47 to bias ball 43 in a lateral sense, causing it to move the reticule supporting sleeve 34 across the tube to effect windage adjustments.

In order that the operator of this device may be apprised of the magnitude of the angular displacement of the several sleeves, the sleeves 12 and 13 are provided with internally milled portions 48 and 49 viewable respectively in Figures 3 and 8. These milled portions are in contact with projections 50 and 51 respectively, the projections being provided on the free ends of springs 31 and 32 respectively. It can be seen that when either sleeve 12 or 13 is rotated, an audible click will result apprising the operator of the magnitude of the adjustment that he is making. The sleeves 12 and 13 are also externally calibrated to provide a viewable means for apprising the operator of the magnitude of adjustments made. The internally threaded collars 24 and 26, acting against spring washers 25 and 27, serve to lock the adjusting sleeves after the adjusting operation has been completed.

In order that the reticule supporting sleeve 34 may be so held that the pins 44 and 45 always bear against balls 42 and 43 respectively, a spring 52 is provided which is anchored by a screw 53 to the reticule support 34. The leaves of this spring bear against the interior of sleeve 22 as can be seen in Figure 5.

It will be noted that, since the adjusting of the reticule is effected by sleeves that are externally cylindrical and of a diameter only slightly in excess of that of the tube, interference with the firing mechanism of any weapon is wholly avoided. Furthermore, because both audible and viewable indications of adjustment are provided, the sight is well adapted for use under both good and bad conditions of light. It is understood, of course, that variations in the described structure may be undertaken without departure from the spirit of the invention and within the scope of the intended claims.

What is claimed is:

1. A sighting instrument comprising a telescope tube, a substantially cylindrical reticule supporting member mounted in said tube, the external diameter of said member being lesser than the internal diameter of said tube, a cross-hair reticule mounted on said member, means in said tube slidably guiding one end of said member for universal movement in a plane normal to the longitudinal axis of said tube, a first cam movably mounted on said tube, a first cam follower operatively engaging said first cam and said member, said cam follower being movable in a direction radially of said tube for causing shifting movement of said reti-

cule in one direction, first spring means resisting said movement, a second cam movably mounted on said tube, a second cam follower operatively engaging said second cam and said member, said second cam follower being located 90° from said first cam follower and being movable in a direction radially of said tube for causing shifting movement of said reticule in a second direction of movement at 90° to the first movement, second spring means resisting said second movement, a floating ring engaging the opposite end of said member, and an annular flange in said tube engaging the opposite end of said floating ring, said floating ring and said member having cooperating guides thereon parallel to one of the reticule cross-hairs, and said floating ring and said flange having cooperating guides thereon parallel to the other of said reticule cross-hairs, each of said cooperating guides being parallel to a radius passing through one of said cam followers.

2. A sighting instrument comprising a telescope tube, a substantially cylindrical reticule supporting member in said tube, the external diameter of said member being lesser than the internal diameter of said tube, a cross-hair reticule mounted on said member, means in said tube slidably guiding one end of said member for free movement in a plane normal to the longitudinal axis of said tube, a first adjusting ring rotatably mounted on said tube and comprising an annular, internal, cam surface, said tube having a first opening therethrough beneath said cam surface, a first ball retained in said opening and projecting beyond the surfaces of said tube to engage said cam surface and said member whereby radial movement of said ball by said cam surface causes shifting movement of said reticule in one direction, first spring means resisting said movement, a second adjusting ring rotatably mounted on said tube and comprising a second annular, internal, cam surface, said tube having a second opening therethrough be-

neath said second cam at 90° from said first opening, a second ball retained in said second opening and projecting beyond the surfaces of said tube to engage said second cam surface and said member whereby radial movement of said second ball by said second cam surface causes shifting movement of said reticule in a second direction, second spring means resisting said second movement, a floating ring engaging the opposite end of said member, and an annular flange in said tube engaging the opposite end of said floating ring, said floating ring and said member having cooperating guides thereon parallel to one of the reticule cross-hairs, and said floating ring and said flange having cooperating guides thereon parallel to the other of said reticule cross-hairs, each of said cooperating guides being parallel to a radius passing through one of said openings.

MARCUS LEUPOLD.

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