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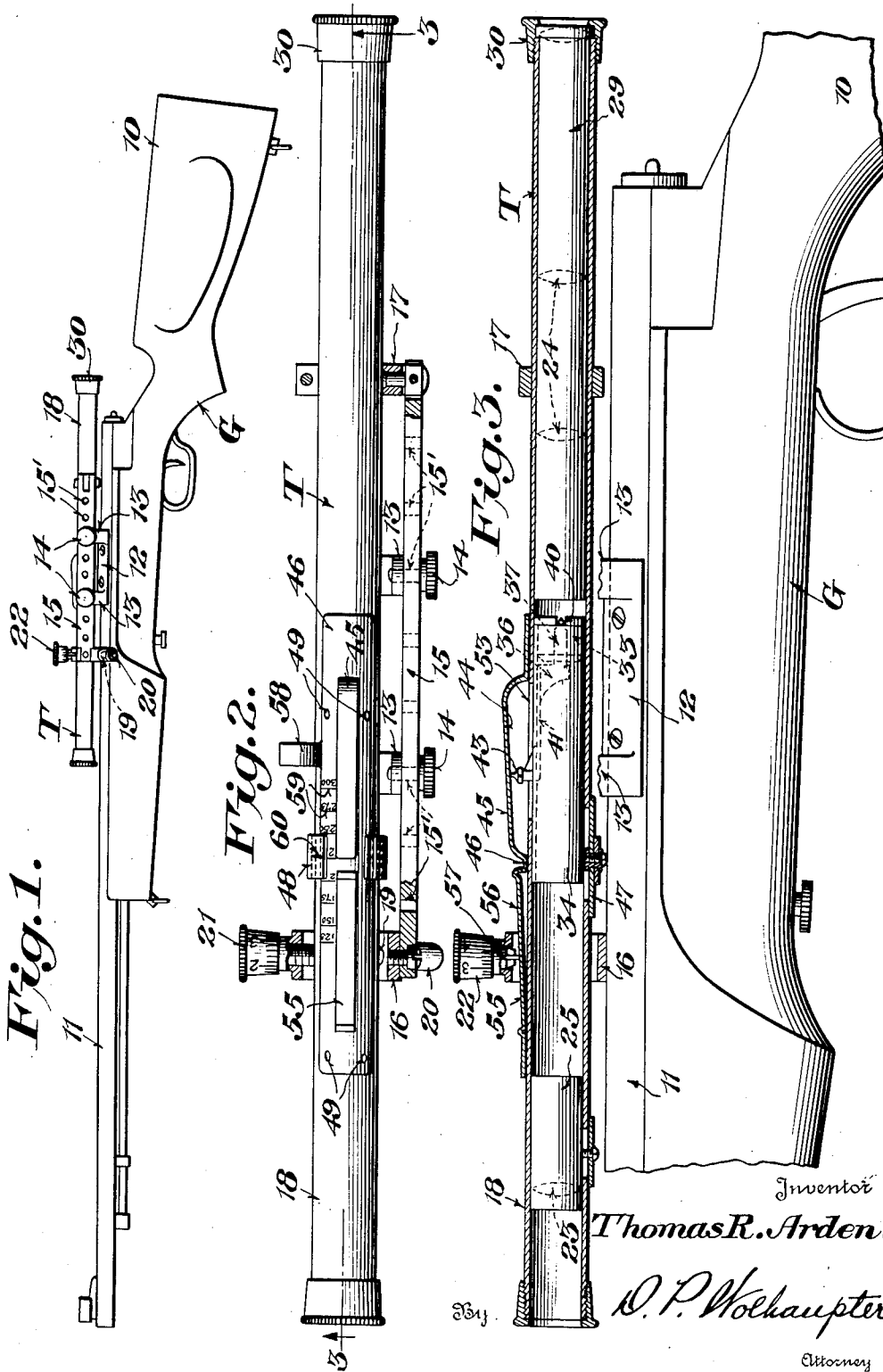
T. R. ARDEN.

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SIGHTING MEANS FOR GUNS

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2 Sheets-Sheet 1



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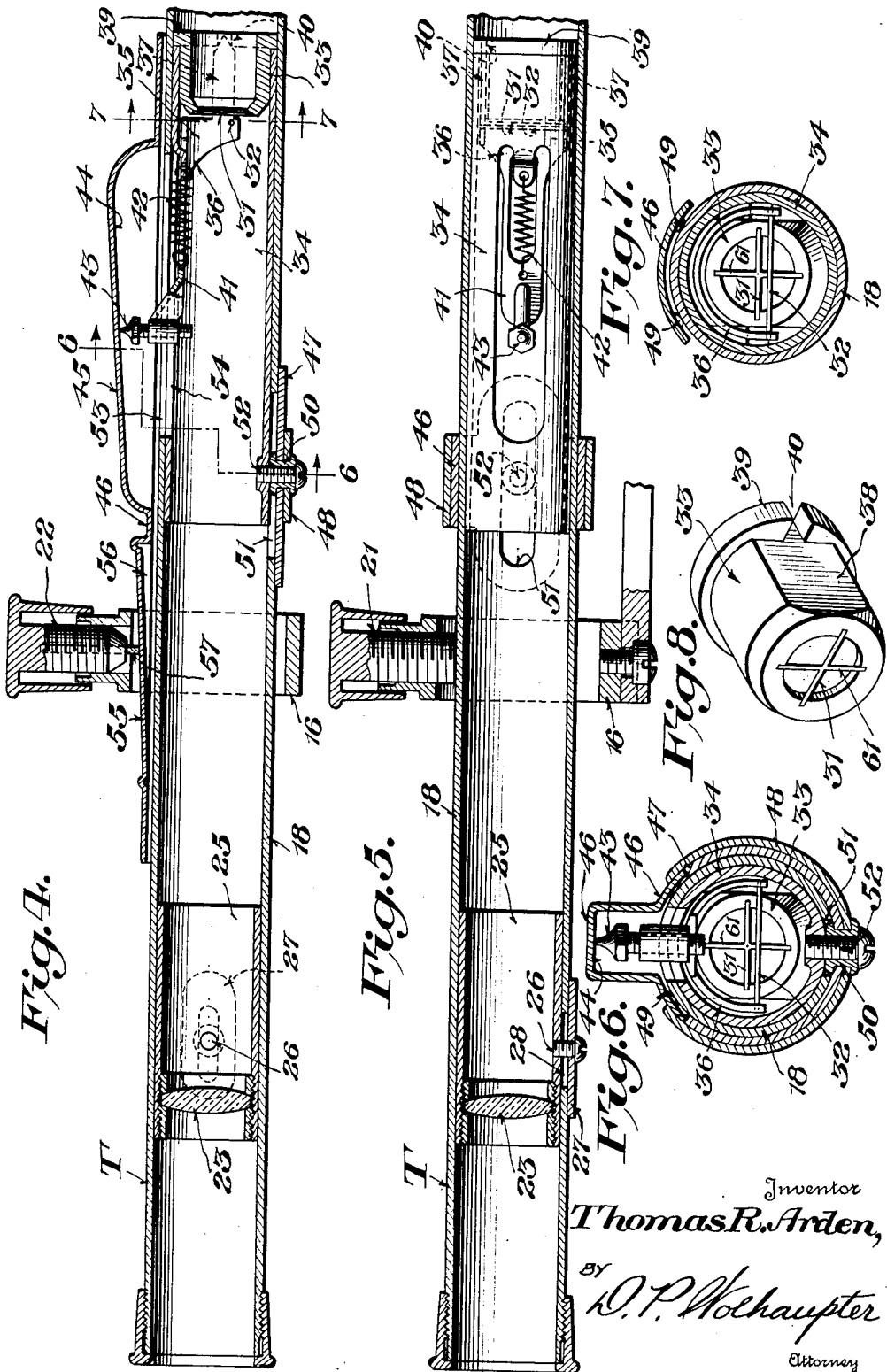
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SIGHTING MEANS FOR GUNS

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This invention relates to a gun sighting means of the type including a range finding means embodying a construction and mode of operation and a cooperative relationship to a gun, such that, by adjustment of the range finding means to ascertain the distance to a target, the angular relationship vertically between the line of sight through the sighting means and the axis of the gun barrel is varied by substantially the exact amount required to assure that, for a given projectile having a given muzzle velocity, the mere act of sighting a target through the sighting means will result in the gun being disposed at the proper elevation to compensate for fall of the projectile in flight and to assure impact of the projectile with the target, either at the same point where the line of sight through the sighting means intersects the target, or at a point definitely related to such a point, for any range within the maximum effective range of the gun, all as fully described and claimed in my prior application, Serial No. 129,951, filed March 9, 1937.

Generally speaking, the object of the present invention is to provide a much simplified and a far lower production-cost structure, as compared with the structure illustrated and described in my prior application, for accomplishing the purposes of the more complicated and more costly structure of said prior application.

Other objects of the present invention are: to provide means whereby the telescope, which comprises part of the sighting and range finding means, may be adjusted to different operative positions longitudinally of the gun for eye relief purposes, that is, to enable the marksman to obtain a clear, full field view of the target through the telescope in the natural position of the head of the marksman when the gun is brought to shoulder; to provide means for the adjustment of the range finding stadia hairs of the telescope to bring said hairs into correct relationship for accurate range finding purposes; and to combine the stadia hair adjusting cam of the mechanism with the cam for varying the angular relationship vertically between the telescope and the gun barrel, in a one-piece, sheet metal stamping which is cheap and easy to produce.

With the foregoing and various other objects in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in the novel features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawings and defined in the appended claims.

In the accompanying drawings, wherein like characters of reference denote corresponding parts in the different views:

Figure 1 is a side elevation of a rifle equipped with a range finding means and a telescopic sighting means combination in accordance with the invention.

Figure 2 is an enlarged top plan view, partly in section, of the mechanism shown in Fig. 1.

Figure 3 is a central, vertical, longitudinal section through the mechanism shown in Figures 1 and 2, some parts being shown in elevation.

Figure 4 is an enlarged view similar to Fig. 3, illustrating in section parts shown in elevation in Fig. 3.

Figure 5 is a sectional view similar to Fig. 4, but taken on a horizontal plane.

Figures 6 and 7 are cross sections on the lines 6—6 and 7—7, respectively, of Fig. 4; and

Figure 8 is a perspective view of an element of the mechanism.

Referring to the drawings in detail, G designates generally, a gun which is illustrated as a sporting rifle, but which, within the purview of the invention may be of any type, large or small, as will hereinafter become apparent.

On the gun G, which includes, as usual, a stock 10 and a barrel 11, is suitably fixed a bracket 12 having a pair of upstanding arms 13 or their equivalent into which are threaded thumb screws 14 which pass loosely through holes 15' in a horizontal bar 15 whereby said bar is removably mounted on said bracket, said bar having a plurality of the holes 15' spaced longitudinally thereof to be selectively engaged by the screws 14 whereby said bar may be mounted on said bracket in different positions of adjustment longitudinally thereof.

Carried by the bar 15 and suitably spaced apart longitudinally thereof, are front and rear rings 16 and 17, respectively, which are disposed vertically and transversely relative to the gun and which serve as supports for a sighting telescope designated generally as T.

The telescope T includes a barrel 18 which extends through the rings 16 and 17 and is suitably clamped in the rear ring 17, which ring is mounted on the bar 15 for swinging movement in a horizontal plane and for rotation about a horizontal axis. On the other hand, said barrel is supported within the front ring 16 for vertical and lateral adjustments relative thereto so that the optical axis of the telescope may be adjusted laterally and vertically relative to the axis of the gun barrel to compensate for windage and to ob-

tain various different angular relationships vertically between the optical axis of the telescope and the axis of the gun barrel.

Yieldable means comprising a spring 19 housed within a cup-like member 20 carried by the ring 16, constantly urges the telescope T upwardly and laterally in one direction in accordance with known practice. Also, in accordance with known practice, the windage adjustment means may comprise a screw member 21 carried by the ring 16 at one side thereof for exerting a lateral shifting force against the telescope counter to the lateral shifting force exerted thereagainst by the spring 19. Similarly, and further in accordance with known practice, the means for vertically adjusting the telescope may comprise a screw member 22 carried by the ring 16 at the top thereof for exerting a downward shifting force on the telescope counter to the upward shifting force exerted thereon by the spring 19. These adjustment means will not further be referred to because the invention is not concerned with windage adjustment means other than that it is provided and may be used if desired, and because, once a proper initial vertical adjustment of the telescope has been made by means of the screw 22 for point blank range, the said vertical adjustment is not disturbed. In other words, for purposes of the present description, it may be assumed at the outset that the optical axis of the telescope lies in a vertical plane including the axis of the gun barrel, and that the angular relationship vertically between the optical axis of the telescope and the axis of the gun barrel is such that said axes intersect at some suitable point blank range.

Within the telescope barrel 18 is a telescopic lens system of any suitable type including an object lens 23 and any desired plurality of co-operating converging lenses 24. The object lens 23 is disposed near the front end of the barrel 18 and is longitudinally adjustable relative thereto to sharpen the image and to bring it into focus with the eye. In the present instance the object lens is mounted in a tube 25 which fits snugly and slidably within the barrel 18 and which may be secured in different positions of adjustment longitudinally relative to said barrel by means of a screw 26 which extends loosely through a clamp plate 27 disposed against the outside of the barrel, and through a slot 28 in the barrel extending longitudinally thereof, and is threaded into the tube 25.

While the converging lenses 24 may be mounted on the barrel 18 in any suitable manner, they are illustrated in the present instance as being mounted as a unit in a tube 29 which snugly fits said barrel and is retained therein by an eye-piece so threaded on the inner end of the barrel.

Now, in accordance with the present invention, there also is mounted in the barrel 18 a range finding means including a pair of stadia hairs 31 and 32 which are disposed substantially in a plane including the focal point of one of the lenses of the lens system and one of which is mounted for adjustment toward and away from the other. Preferably, said stadia hairs are disposed horizontally substantially in a plane transversely of the telescope including the focal point of the object lens 23, and since said lens is adjustable longitudinally relative to the barrel 18, said stadia hairs also are mounted for adjustment longitudinally relative to said barrel so that they may be disposed substantially in a plane transversely of the telescope including the

focal point of said object lens no matter what the position of adjustment of said object lens may be.

The operation of the present range finding means consisting essentially of the stadia hairs 31, 32 in combination with the telescope lens system, is predicated upon the known approximate height or width of certain well known objects of more or less relatively small height, or width, depending upon whether the stadia hairs are disposed horizontally or vertically, upon maximum range to be determined in any given case, and upon the magnifying power of the lens system. For example, in the case of a firearm of the small caliber, sporting rifle type, the maximum effective range of which is, for example, two hundred yards, and in the case of a lens system having a magnifying power sufficient to render relatively small objects clearly visible at a distance of two hundred yards, operation of the range finder may appropriately be predicated upon objects well known to have some arbitrary small height, or width, such, for example as approximately six inches. On the other hand, in the case of guns having longer effective ranges, and in the case of telescopes having more powerful lens systems, operation of the range finder may be predicated upon objects having well known greater height, or widths.

Assuming that the present telescope T has a sufficient magnifying power to render small objects clearly visible at a distance of two hundred yards and that the gun G is of the small caliber, sporting rifle type having a maximum effective range of two hundred yards, well known objects of approximately six inches in height, or width, or of other arbitrary small height, or width, suitable on which to predicate operation of the range finder are, for example, a man's head, the head of a deer, or in fact, any object which is known to the marksman to have a height, or width, of approximately six inches or any other small height or width, which may arbitrarily be chosen.

By sighting through the telescope T and adjusting the stadia hairs so that they exactly bracket or subtend an object six inches in height or of other arbitrarily chosen small height, located at different known distances from the gun G, and by recording the distance apart of the stadia hairs for each such distance, it is apparent that when, subsequently, the stadia hairs are adjusted to exactly bracket or subtend an object known to be of the same or approximately the same height as the object or objects on which the stadia hair adjustment records were based, but of unknown distance from the gun, such distance may very accurately be determined by the spaced apart relationship of the stadia hairs. In other words, there will be a definite and differently spaced apart relationship of the stadia hairs for an object of a given height at every different distance from the gun, and if the distances represented by different spaced apart relationships of the stadia hairs are known, it is manifest that by sighting through the telescope at an object an unknown distance away, but known to be of approximately the basic small arbitrary height on which operation of the range finder is predicated, and by adjusting the stadia hairs so that they exactly bracket or subtend such object, or bracket or subtend a portion thereof of the small known arbitrary basic height, reference to the record previously made will show that the object is a definite distance away.

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Manifestly, this way of determining unknown distances or ranges is exceedingly accurate due to the small angles involved. Moreover, once a record has been made of the distances or ranges represented by certain spaced apart relationships of the stadia hairs for a telescope of any given magnifying power, the same record applies to all other duplicately constructed telescopes, which, of course, is important from a manufacturing standpoint. Manifestly, the use of a telescope or magnifying lens system is not essential. However, by the use of a magnifying lens system, the range finder is rendered much more accurate than it would be if used without a magnifying lens system. Of course, if height is to constitute the basis of operation of the range finding means, the stadia hairs will be disposed horizontally. If, on the other hand, width is to constitute the basis of operation of the range finder, the stadia hairs will be disposed vertically.

According to the present invention the stadia hair 31 has a fixed operative position and the stadia hair 32 is adjustable, the means for adjusting the stadia hair 32 preferably being calibrated to indicate different ranges for differently spaced apart relationships of said stadia hairs. However, the provision of such calibrations is not essential for reasons which will subsequently appear.

The stadia hair 31 is mounted across the forward, open end of a thimble 33, and said thimble is fixedly mounted in any suitable manner in the rear end of a sleeve 34 which fits snugly within the barrel 18 and is longitudinally adjustable relative thereto to bring said stadia hair into the focal plane of the object lens 23. The other stadia hair 32 is carried by the substantially inverted U-shaped body portion 35 of a yoke element 36 and extends horizontally across the space between the opposite sides of said yoke body portion. From the opposite sides of said yoke body portion 35 a pair of arms 37, 37 extend rearwardly and are accommodated in spaces between the sleeve 34 and the thimble 33 provided by cutting away the sides of said thimble as indicated at 38 (Fig. 8). At its rear end the thimble 33 has an outwardly extending flange 39 which, at opposite sides of the thimble, is notched as indicated at 40, the free or rear ends of the arms 37, 37 being pointed and being engaged in said notches, whereby the yoke is pivotally engaged with the thimble for swinging movement in a vertical plane to vary the transverse separation of stadia hair 32 and stadia hair 31.

Extending forwardly from the body portion 35 of the yoke element 36 is an arm 41, and connecting said arm with the sleeve 34 is a contractile coil spring 42 which exerts a constant rearward and upward influence on said yoke element, whereby the pointed ends of the arms 37, 37 thereof are maintained engaged in the notches 40 and whereby the stadia hair 32 is urged constantly toward the stadia hair 31.

Carried by the arm 41 is a cam follower 43 which cooperates with a cam 44 slidably mounted on the barrel 18, said cam follower preferably, but not necessarily, being in the form of a screw member or its equivalent adjustable with respect to the arm 41 to obtain a correct relationship between the cam 44 and the stadia hairs 31, 32.

The cam 44 is comprised by the under face of an upwardly pressed portion 45 of a cam plate 46, which plate generally speaking, is of segmental shape in cross section and is seated on top

of the barrel 18 and is guided for sliding movement longitudinally of said barrel, but is held against rotation relative thereto, by a segmental member 47 which embraces the barrel 18 and has its free edges cooperating with the free or side edges of said cam plate 46, (Fig. 6). In other words, the free edges of the segmental member 47 comprise stops against which the free or side edges of the cam plate 46 abut, whereby said cam plate is held against rotation relative to the barrel 18 and is guided for sliding movement along said barrel.

For retaining the cam plate 46 on the barrel 18 there is provided a second segmental member, designated as 48, which embraces the segmental member 47 and has its free edge portions overlapping the free or side edge portions of the cam plate 46. Moreover, in order to provide for free sliding movement of the cam plate 46, the same does not have surface contact with the barrel 18, but only point contact therewith afforded by any desired plurality of protuberances 49 pressed either downwardly from the cam plate or upwardly from the barrel.

At their bottoms the segmental members 47 and 48 are connected together by an eyelet 50, the inner end portion of which is disposed in and fits neatly between the side edges of a slot 51 in the bottom of the barrel 18, whereby said segmental members are held against rotation relative to said barrel.

Extending through the eyelet 50 into threaded engagement with the sleeve 34, is a screw 52 which, in cooperation with said eyelet, holds said sleeve against rotation relative to the barrel 18. As shown, the slot 51 is elongated longitudinally of the barrel 18. Accordingly, by loosening the screw 52, the sleeve 34 may be adjusted longitudinally of the barrel 18 to bring the stadia hairs 31, 32 into the focal plane of the object lens 23, and by then tightening said screw the sleeve may be secured in its adjusted position.

In the tops of the barrel 18 and the sleeve 34 are aligned slots 53, 54, respectively, through which the cam follower 43 extends into engagement with the cam 44.

Since the arm 37 of the yoke element 36 is urged constantly upward by the spring 42, the cam follower 43 is maintained in engagement with the cam 44. Accordingly, movement of the cam 44 longitudinally of the barrel 18 will result in rocking movement of the yoke element 36, with consequent movement of the stadia hair 32 toward or away from the stadia hair 31, depending upon the direction of movement of the cam and its contour. In any given longitudinally adjusted position of the cam the stadia hairs 31, 32 will, of course, be disposed a definite distance apart, and in this connection said cam is plotted with reference to the bracketing or subtending by the stadia hairs of an object of known height located at different distances from the mechanism, so that each different longitudinally adjusted position of the cam corresponds to a different and definite range.

The cam plate 46 is provided with a second cam 55 which generally speaking, slopes forwardly and downwardly and is comprised by the upper face of a second upwardly pressed portion 56 of said cam plate 46 and cooperates either directly with the inner end of the adjusting screw 22, or with a narrow cam follower element 57 which is adjustable with said screw and affords line or edge contact with said cam across the same. In either case, since the screw

22 or the element 57, as the case may be, has a fixed operative relationship to the gun G, and since the cam 55 slopes forwardly and downwardly, it is apparent that shifting of said cam forwardly will result in downward and forward tilting of the telescope T relative to the gun G, and that shifting of said cam rearwardly will result in forward and upward tilting of the telescope relative to the gun.

10 For a given gun using given ammunition, the necessary elevation of the gun to compensate for fall of the projectile in flight for different ranges either is known or may very readily be ascertained. The cam 44 has a definite position for each different range. Also, the gun G must have a definite angular position relative to the telescope for each different range to assure impact of the projectile with the target either at the point where the line of sight through the telescope intersects the target or at some point in definite relationship to the point where the line of sight intersects the target. Therefore, all that is required to obtain proper angular adjustment between the telescope and the gun by adjustment of the range finding means is so to shape the cam 55 that, for any given longitudinally adjusted position of said cam in harmony with the cam 44, the angular relationship vertically between the axis of the gun barrel and the optical axis of the telescope is such that, for a given ammunition, the gun will be disposed at the proper elevation relative to the line of sight through the telescope as to assure impact of the projectile with the target either coincidentally with the point at which the line of sight through the telescope intersects the target, or at a point in definite relationship to said first mentioned point. The cam 55 has such a shape. It follows, therefore, that responsive to adjustment of the present range finding means there occurs a relative angular adjustment between the axis of the gun barrel and the optical axis of the telescope such that, for a given projectile having a given muzzle velocity, sighting of the target through the telescope will result in proper elevation of the gun to assure striking of the target by the projectile either at the point where the line of sight intersects the target or at some other point in definite relationship to said first mentioned point. Of course, it is most practical in this respect to provide for impact of the projectile with the target coincidentally with intersection of the line of sight therewith, but so long as the point of impact has a definite relationship to the point of intersection of the line of sight with the target, the point of impact obviously may be spaced from the point of intersection of the line of sight with the target and the marksman merely is required to make allowance for such spacing in aiming the gun. Preferably the line of sight is the optical axis of the telescope, but this is not essential.

In adapting the mechanism for use by any given marksman, the object lens 23 first is adjusted to sharpen the image and to bring it into focus with the eye. By adjustment of the sleeve 34 the stadia hairs 31, 32 then are brought into the focal plane of the object lens. The cam plate 46 then is shifted until the portion of the cam 44 corresponding to point blank range cooperates with the cam follower 43. By adjustment of the cam follower 43 the stadia hair 32 then is adjusted relative to the stadia hair 31 to correspond to point blank range. The telescope then is adjusted longitudinally in the supporting rings 16

and 17 to obtain a point blank range relationship between the cam 55 and the cam follower 57. Finally the bar 15 carrying the rings 16 and 17 and the telescope is adjusted longitudinally of the gun so that when the gun is brought to shoulder the telescope is disposed to afford eye relief; i. e., a clear full field view of any target which may be sighted through the telescope while the gun is at shoulder and the marksman's head and eye are in the natural positions they occupy in aiming and firing the gun. If, now, the cam plate 46 is slid to adjust the stadia hair 32 relative to the stadia hair 31 to bracket or subtend a target, or a portion of a target, of the arbitrarily small height on which operation of the range finding means is predicated, the cam 55 will coact with the cam follower 57 to adjust the angular relationship vertically between the line of sight and the axis of the gun barrel so that, by the mere act of sighting the target, the gun will be disposed at the proper elevation to cause the projectile to strike the target either at the point where the line of sight intersects the target, or at a point in definite relationship to such point, depending, as aforesaid, upon whether the arrangement is or is not such that the point of impact of the projectile and the point of intersection of the line of sight with the target are the same.

For sliding the cam plate 46 the same is formed with or has suitably attached thereto a finger piece 58, while for determining range by sliding adjustments of said cam plate, said plate is calibrated as indicated at 59 for cooperation with a suitable relatively fixed index 60. Moreover, the mechanism includes a reticle in the form of a vertical hair 61 carried by the thimble 33 and disposed substantially in the same plane transversely of the telescope as the stadia hairs 31 and 32.

Regarding the fixed stadia hair 31, it will be observed that the same is disposed in a horizontal plane including the optical axis of the telescope, which also is the present sighting axis. Therefore, according to the present invention, the point of intersection of the reticle hair with the stadia hair 31 is used for sighting purposes following adjustment of the stadia hair 32 relative to the stadia hair 31 for range ascertaining purposes.

From the foregoing description, considered in connection with the accompanying drawings and in connection with the disclosure of my prior application, Serial No. 129,951, it is believed that the construction, operation and advantages of the present mechanism will be clearly understood. It is desired to point out, however, that while only a single structural embodiment of the invention has been illustrated and described, the same obviously is capable of embodiment in various other specifically different mechanical structures within its spirit and scope as defined in the appended claims.

I claim:

1. In a telescopic sight for a gun having a barrel, a telescope mounted on the gun for tilting movement in a vertical plane relative thereto and having a pair of stadia hairs one of which is movable toward and away from the other transversely of the telescope, means including a cam slidably mounted on the telescope for moving said movable stadia hair, said cam having a contour such that for different definite positions of the same the stadia hairs are spaced apart different definite distances such that subtending by the same of a known dimension of a target

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corresponds to a definite range of the target, and a second cam and a cooperating cam follower, the latter on the gun and the former slidable as a unit with said first mentioned cam and
5 cooperable responsive to adjustment of said first mentioned cam to effect a vertical angular adjustment of the telescope relative to the gun such that for a given projectile having a given muzzle velocity and a definite range adjustment of said
10 first mentioned cam, sighting of the target through the telescope will result in the gun being disposed at the proper elevation to cause the projectile to strike the target in definite relationship to the point of intersection of the line
15 of sight with the target, said first and second mentioned cams being pressed from a single cam plate.

2. In a telescopic sight as set forth in claim 1, means for mounting the telescope on the gun for
20 longitudinal adjustment relative thereto without disturbing the cooperative relationship between the second mentioned cam and its cam follower.

3. In a telescopic sight as set forth in claim 1, a lens in the telescope, means mounting the
25 stadia hairs for adjustment longitudinally of the telescope into the focal plane of said lens; a cam follower included in the means for adjusting the movable stadia hair, said cam follower cooperating with the first mentioned cam and being
30 adjustable to bring the movable stadia hair into correct position relative to the other stadia hair for accurate range indication for any position of adjustment of said first mentioned cam.

4. In a telescopic sight as set forth in claim 1,
35 the first mentioned cam being comprised by the inner surface of a formation pressed outwardly from the cam plate.

5. In a telescopic sight as set forth in claim 1, a sleeve slidably mounted in the telescope barrel; a thimble carried by said sleeve; one of the stadia hairs having a fixed operative position and being carried by said thimble; a yoke element
5 pivotally engaged with said thimble and carrying the movable stadia hair, and a cam follower carried by said yoke element for cooperation with the first mentioned cam whereby the yoke is swung and the movable stadia hair is adjusted
10 relative to the fixed stadia hair responsive to adjustment of the first mentioned cam.

6. In a telescopic sight as set forth in claim 1, the cam plate being of arcuate cross section and being slidably mounted on the exterior of the
15 telescope; a member embracing the telescope barrel and guiding said cam plate for sliding movement longitudinally of the telescope and holding said cam plate against rotation relative to the telescope; and a second member embracing the
20 telescope and overlying edge portions of the cam plate to retain the same in assembly with the telescope.

7. In mechanism of the class described, a telescope barrel, a fixed stadia hair therein, a yoke
25 element rockably mounted in said telescope barrel, a stadia hair carried by said yoke element for movement toward and away from said fixed stadia hair responsive to rocking of said yoke element, a cam slidable on the telescope barrel,
30 a cooperating cam follower on said yoke element, and spring means tending constantly to rock said yoke in a direction to urge said cam follower into contact with said cam.

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