

Aug. 6, 1946.

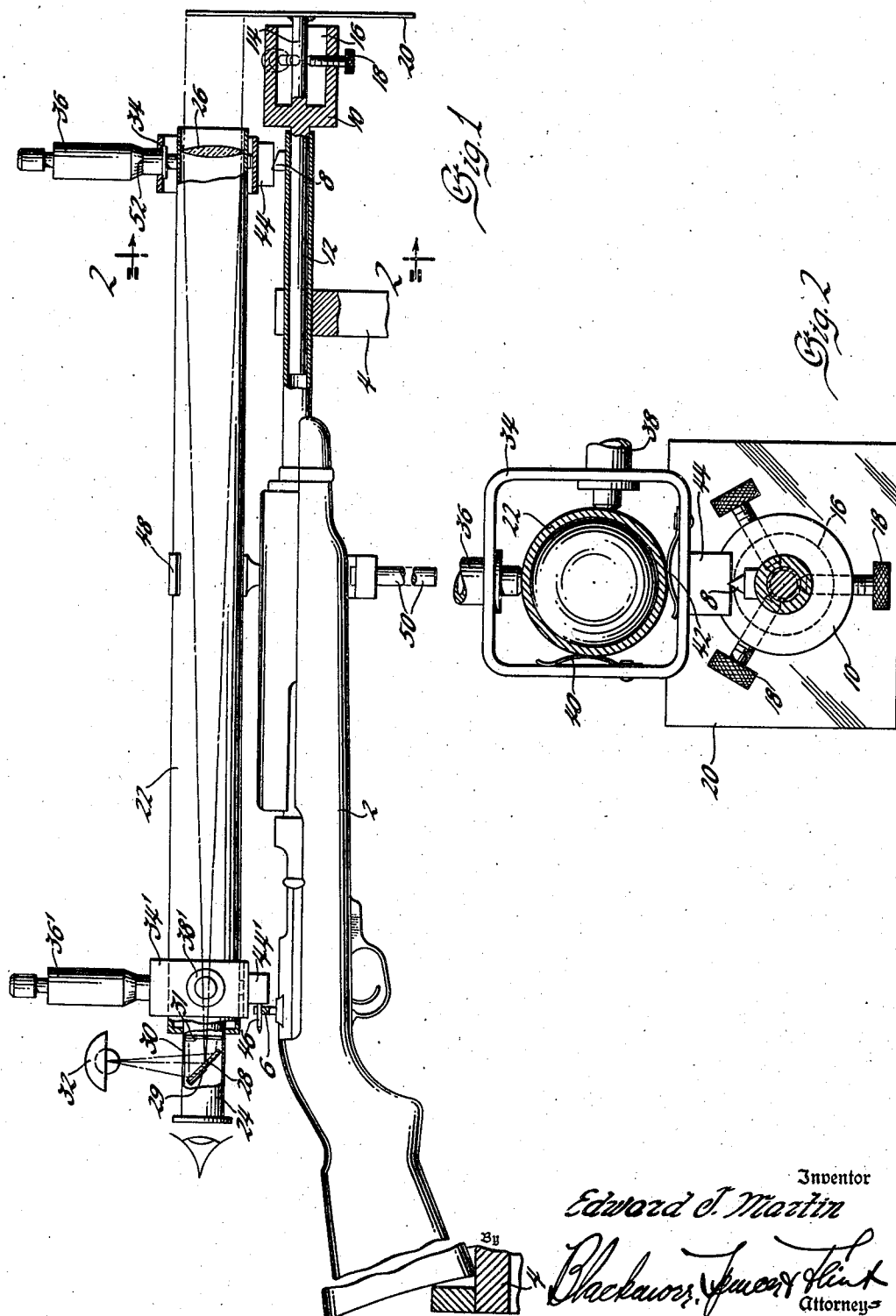
E. J. MARTIN

2,405,441

GUN SIGHTING DEVICE

Filed Dec. 16, 1943

2 Sheets-Sheet 1



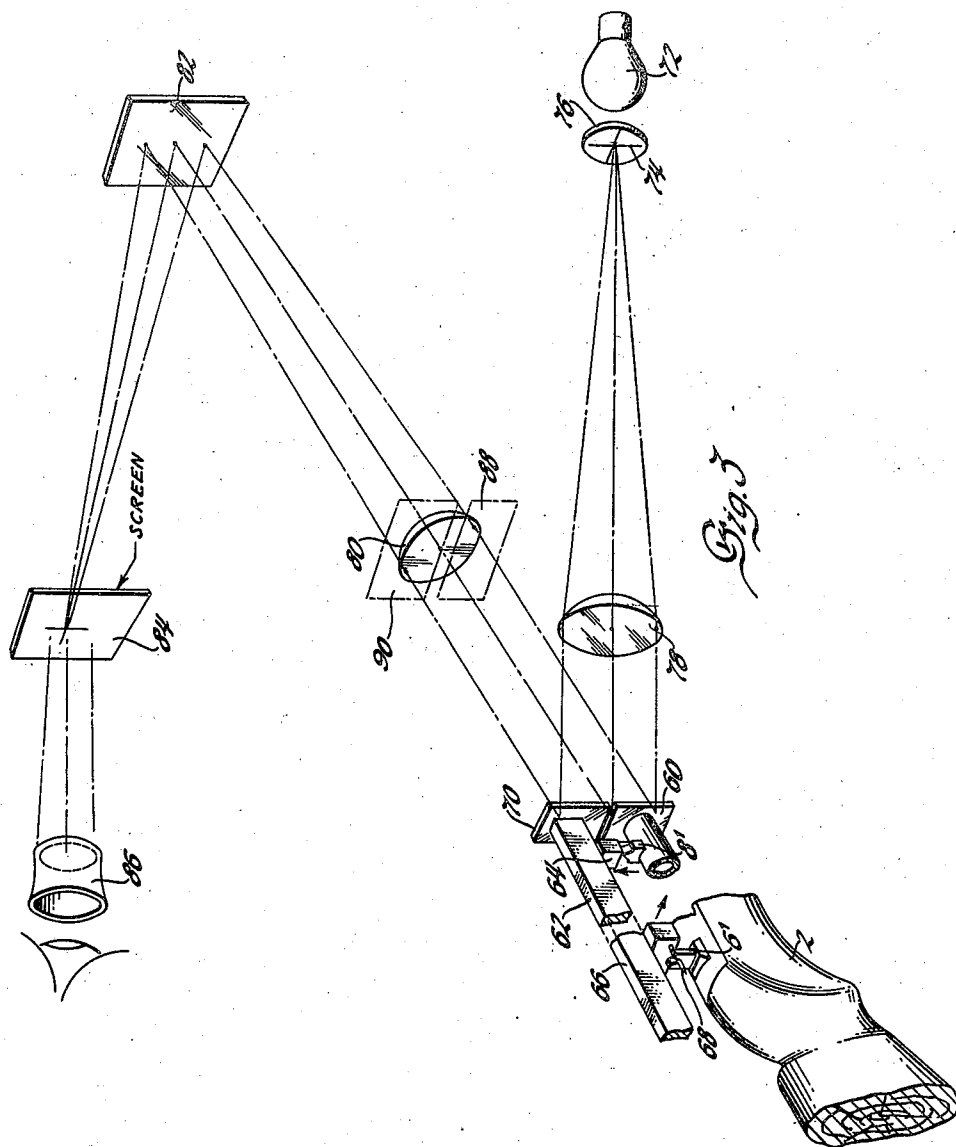
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UNITED STATES PATENT OFFICE

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GUN SIGHTING DEVICE

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4 Claims. (Cl. 88—74)

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This invention relates to adjusting means and more specifically to means for setting or adjusting the sights on rifles. With large scale production of rifles, such as those used for the armed forces, the problem of initially setting or adjusting the sighting means thereon becomes very important. First, from a standpoint of accuracy, secondly, from a standpoint of time consumed in the operation, and, thirdly, from a standpoint of the ammunition expended during such operation. By using live ammunition and actually firing each gun to initially set the sights, the former experience has been that it took approximately thirteen to fifteen rounds of ammunition to bring the sights to their required degree of accuracy. This method also requires the use of a hundred yard rifle range and considerable time. It can readily be seen that by the use of this number of rounds of ammunition per gun, the expenditure of ammunition in this process where any number of guns are built is considerably high. There is of course the further problem of safety concerned in handling these guns.

It is therefore an object of my invention to provide means for initially adjusting the sights of a rifle without the use of rifle ammunition.

It is a further object of my invention to provide means for accurately adjusting the sights on a rifle utilizing light rays.

It is a still further object of my invention to provide means for initially adjusting the sights of a rifle which will occupy only a very limited space and which will permit quick adjustment to the proper degree.

With these and other objects in view which will become apparent as the specification proceeds, the embodiments of my invention will be best understood by reference to the following specification and claims and the illustrations in the accompanying drawings, in which:

Figure 1 is a side view partially in section showing one form of sighting means embodying my invention;

Figure 2 is a sectional view taken on line 2—2 of Figure 1; and

Figure 3 is a schematic perspective view showing a modified system of adjusting the sights of the rifle according to my invention.

Referring now more specifically to Figure 1, there is shown therein a gun or rifle 2 which is supported in any suitable support 4 having openings for the stock and barrel of the rifle so that it may be inserted therein and removed easily. The rifle therefore in this support assumes the position shown and is provided with a rear sight

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6 and a front sight 8. This rear sight may either be a V groove or a peep sight, depending upon the rifle supplied by the manufacturer. In order to properly align these two sights so that the line through them will be parallel to the line through the bore of the barrel, I have provided means which can be easily and quickly applied to the rifle. The first portion which is applied to the rifle is a unitary member having a cylindrical portion 10 which has projecting from its one face an integral rod 12 which extends back into the muzzle of the rifle for an appreciable distance. It might be mentioned at this point that through various investigation it has been discovered that the last four inches in the barrel of the rifle determine the path or trajectory of the bullet and therefore the integral rod 12 is approximately four inches long and its position is determined by the dominating portion of the barrel.

The cylindrical member 10 has a hollow interior into which projects a central rod 14 also integral therewith and which is in alignment with the oppositely extending rod 12. This forwardly projecting rod 14 may be radially adjusted within the cavity 16 of the cylinder 10 by adjusting screws 18 which are threaded into the cylinder 10 from three sides at approximately 120° apart, and so may move the outer end of this rod 14 within the cavity 16 for alignment purposes. To the forward end of this rod 14 is fastened a mirrored plate 20 by any suitable means such as spot welding.

The second portion of the apparatus applied to the rifle is adapted to set in or on the sights 6 or 8 and this consists of an elongated cylinder 22 of a telescope having an eye piece 24 movable in one end thereof which in the example shown will be that end nearest the butt or stock and which has a suitable lens system therein, such as lens 26, to view the mirrored surface of the disc 20. Inserted within eye piece 24 is a small reflector disc 28 which may either be half silvered as at 29 or merely a glass diagonal set in at approximately a 45° angle adjacent an opening 30 in the upper surface of the eye piece and through which opening light rays are projected from a light source 32 which then travel down the full length of the telescope to the mirrored surface and are reflected and the reflected rays can be viewed by the eye.

Mounted just ahead of this angled member 28 and in the eye piece 24 are a pair of right angled cross hairs 31 similar to those used in a great number of optical instruments. At both the front and rear portions of the telescope adjustable

brackets are provided so that both ends may be moved relatively to the sights. In adjusting sights for rifles it might be necessary to move both the front and the rear sights both horizontally and vertically with respect to the barrel. However, it is seldom necessary to move each sight in both directions and in the present instance, while the apparatus could be made to function as above mentioned, it has been found satisfactory to provide only vertical adjustment or height with regard to the front sight and horizontal or transverse adjustment with regard to the rear sight and therefore in both instances the equipment actually used comprises only such adjustment as above mentioned, though the drawings of Figure 1 show adjustments in two planes at right angles to each other.

With regard to the front sight, there is provided a suitable frame such as 34 which carries micrometer adjustment screws 36 and 38 for both horizontal and vertical adjustment. The front end of the telescope is therefore supported by this frame between the movable screw ends of the micrometer mechanisms and two spring biasing ribbons 40 and 42. A block 44 rigidly secured to the lower surface of the frame 34 has an opening therein adapted to fit over the upwardly projecting end of the front sight 8. Thus by moving either of the micrometer screws, the telescope may be moved horizontally or vertically in either direction within the frame 34 to align the telescope with the rifle.

The same type of frame supports the rear end of the telescope as shown at 34' and this also supports two micrometer screw adjustments 36' and 38', the supporting block 44' in this instance however having a rearwardly extending pin 46 which is adapted to lie in the V slot or peep of the rear sight 6. The telescope is provided with a bracket 48 which is connected to the approximate center thereof and which is so formed as to extend around the rifle and support below the same a weight 50 which is adapted to maintain the telescope assembly in the proper position on the sights by gravity. The same may therefore be lifted and placed on the sights, and when the rifle has been properly adjusted, may be removed without any complicated clamping or supporting arrangement.

The first step in the use of my equipment is to adjust the bore plug mirror so that its reflecting surface is perpendicular to the axis of the bore plug itself. This may be done by mounting the bore plug in a lathe or fitting it to a muzzle of a rifle. It is then turned slightly and adjusted by means of the adjusting screws 18 until a spot of light reflected by the mirror remains stationary. Of course, once this bore plug has been adjusted, it is not necessary to thereafter further adjust the same, but only check it occasionally. When this has been so adjusted, the bore plug and mirror are inserted into the bore of a master rifle which has previously had its sights adjusted and is known to be correct. The autocollimating telescope is then mounted in the position as shown in Figure 1 and the horizontal and vertical adjusting micrometers are set so that the image of the cross hairs reflected by the muzzle mirror 20 coincide with the hairs themselves as seen through the eye piece. The axis of the telescope will now lie parallel with the bore of the rifle, and since the supporting blocks 44 and 44', which either themselves or through their associated parts, contact the sights, determine the

adjusted axis of the telescope, the aligning mechanism may be now considered properly set.

The bore plug and telescope assembly are then removed from the master rifle and a rifle to be adjusted is then placed in the supporting block 4. The bore plug 10 is inserted into the rifle muzzle and the telescope assembly placed upon the sights as shown in Figure 1. If in viewing through the telescope the cross hairs do not coincide with the image thereof, the operator then knows that the sights are not correct. He then turns, for example, the vertical micrometer screw 36 to raise the forward end of the telescope, or lower as the case may be, until the horizontal cross hair positions correspond. When that has been accomplished, the operator then turns the horizontal adjusting micrometer screw 38 in the rear assembly until the vertical cross hairs and their image coincide. The reading on each of these two micrometer screws from the scales such as 52 which are found thereon, gives an index as to the amount that the sights must be moved or ground to be correct.

In this respect, the front sight is always provided too high so that it may be ground off to the proper height and the rear sight is in a horizontal slot so that it can be moved back and forth as the need demands. The telescope is then of course removed and the parts adjusted as indicated and the telescope then replaced to see if the adjustment is now correct. This is repeated until the micrometer screws can be placed in their normal zero position and the cross hairs coincide with their image as reflected.

In this system it is of course necessary for an operator to continuously view through the eye piece the mirrored surface and make small adjustments which may be fatiguing. I have therefore provided a modified optical arrangement for adjusting sights in which the image of cross hairs or its equivalent may be thrown upon a screen so that it will not be necessary for an operator to continuously squint through a telescope. In this instance, as before, the rifle is supported in a suitable block (not shown in Fig. 3) and in this case the muzzle plug is supported in the end of the muzzle as before, which is shown diagrammatically in Fig. 3 at 60. However, in this instance the forward face of the mirror 20 is polished to form a reflecting surface rather than the surface facing the rifle.

The telescope assembly is replaced in this instance by an ordinary straight bar 62 having a supporting block 64 mounted on the front sight and a second supporting block 66 having a pin 68 which projects into the opening in the rear sight. This bar 62 therefore lies over the barrel of the gun, and at its center section, which in this instance happens to be broken away, has a pendulum rod on the broken away portion (not shown) similar to 48 and 50 of Figure 1 to maintain it in position on top of the sights. Applied to the forward surface of the bar 62 and at right angles to the axis thereof is a second mirror 70 whose surface is adapted to lie substantially parallel to the mirror 60, depending upon the alignment of the bar 62 with the bore of the rifle barrel.

A source of light 72 is provided to one side, the rays from which are adapted to flow through the vertical and horizontal slots 74 of a small disc 76, thus forming a cross in the nature of the cross hairs in the modification of Figures 1 and 2. These rays which project through the slots in the opaque disc 76 proceed through a lens 78 and fall on both mirrored surfaces 60 and 70 and are then reflected through a second lens system 80

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after which they proceed to a mirror 82 which is merely a reversed mirror to bring them back to a screen 84. This screen may be viewed either directly or through an enlarging lens, such as 86, for micrometer adjustment. A series of colored filters such as 88 and 90 shown in dotted lines adjacent to the lens 80 may be applied if desired. These filters may if more easily applied be located adjacent the mirrors 60 and 70 if desired.

With this equipment, assuming of course that the muzzle plug 60 has been adjusted so that the mirror is perpendicular to the barrel or rod 12 which projects back into the barrel as before described, this plug is then inserted into the end of the gun barrel, and by using a master rifle to initially set the equipment, the bar 62 is laid upon the front and rear sights 8' and 6'. The light 72 is then energized and a cross beam of rays is projected upon the mirrors 60 and 70. If the two mirrors are exactly parallel, a single image of the crossed beams projecting through slots 74 will fall upon the mirror 82 and therefore upon the screen 84. This will indicate that the axis of the bar 62 is parallel with the bore of the rifle barrel.

If, however, two images of the cross appear on the screen 84, then the mirrors 60 and 70 are not parallel, and since we are assuming that a master rifle is being used, we must adjust the axis of the bar 62 so that it will lie parallel to the axis of the rifle barrel. Thus through micrometric adjustment means similar to that shown in Figure 1 and illustrated diagrammatically only as supporting blocks 64, 66 and 68, these axes may be aligned. As before mentioned, for all practical purposes if the adjustment on the front sight is vertical and that on the rear horizontal, most sighting means can be properly aligned. I have indicated such adjustment by arrows in Figure 3.

The master rifle is then removed and these two parts are placed in a rifle to be tested. If there appears two images of the slots in the disc 76 not in coincidence on the screen 84, the micrometers at the front and rear plugs are moved until the same are coincident. This adjustment as read on the micrometer screws then gives an indication as to how far these parts must be moved or ground away to bring them into alignment and such correction is then made following which a second check is made by the equipment shown in Figure 3. This is repeated until a single image of the cross slots appears.

In order to facilitate the alignment, if a color filter 88 is inserted either as shown in dotted lines or adjacent the mirror 60, and a second color filter of complementary color such as 90 is applied to intercept the rays from the second mirror, it will be easier for the operator to superimpose these two images. By using such complementary colors, such, for example, as red and green, two different images of the slots will appear on the screen, one red and one green, if the equipment is not in alignment. However, upon bringing these two images into coincidence, a yellow cross will appear which will be a very accurate indication to the operator that the two crosses are coincident and therefore assist in the adjustment.

It will be obvious that with this equipment only a relatively small area or test location is required;

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that it is highly accurate and not subject to errors usually occasioned by short sighting means, but that it accurately provides indications as to when a line through the sights and that through the axis of the barrel are parallel and that the system as a whole is simple, rugged and easily operated.

I claim:

1. In aligning means for guns having visible sights thereon, light reflecting means mounted on the barrel of the gun whose position is determined by the bore thereof, a second light reflecting means mounted upon the sights and whose position is determined by the alignment thereof, means for projecting a beam having definite configuration onto the two reflecting surfaces simultaneously, and means operatively positioned with respect to the light reflecting means to project said rays onto an image plane in such a way that the coincidence of these rays may be observed.

2. In aligning means for guns having visible sights thereon, light reflecting means mounted on the barrel of the gun whose position is determined by the bore thereof, a second light reflecting means mounted upon the sights and whose position is determined by the alignment thereof, means for projecting a beam having a definite configuration onto the two reflecting surfaces simultaneously, means operatively positioned with respect to the light reflecting means to project said rays onto an image plane in such a way that the coincidence of these rays may be observed, and means to adjust the position of the second light reflecting means with respect to the sights to bring the rays into coincidence.

3. In aligning means for guns having visible sights thereon, light reflecting means mounted on the barrel of the gun whose position is determined by the bore thereof, a second light reflecting means mounted upon the sights and whose position is determined by the alignment thereof, means for projecting a beam having definite configuration onto the two reflecting surfaces simultaneously, means operatively positioned with respect to the light reflecting means to project said rays onto an image plane in such a way that the coincidence of these rays may be observed, and color filter means interposed in the paths of the two rays to give each a different identifying color.

4. In aligning means for guns having sighting means thereon, a pair of reflecting surfaces, means extending into the bore of the gun for mounting one of the surfaces, means engaging the sights for supporting the second surface adjustably with respect to said sights, light means for projecting a predetermined pattern on both surfaces, means for receiving the reflected rays, said reflecting surfaces being so positioned and associated with respect to one another and to the receiving means that the reflected rays are directed to said receiving means, means to adjust the means supporting the second surface to bring the two images on said receiving means into coincidence, and indicating means on the adjustable means to provide information as to corrective movement of the sights.

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