Jan. 8, 1952 L. H. BROWN 2,581,355

OPTICAL AIMING DEVICE FOR INDIRECT ARTILLERY FIRE

Filed Oct. 11, 1949 4 Sheets-Sheet 1

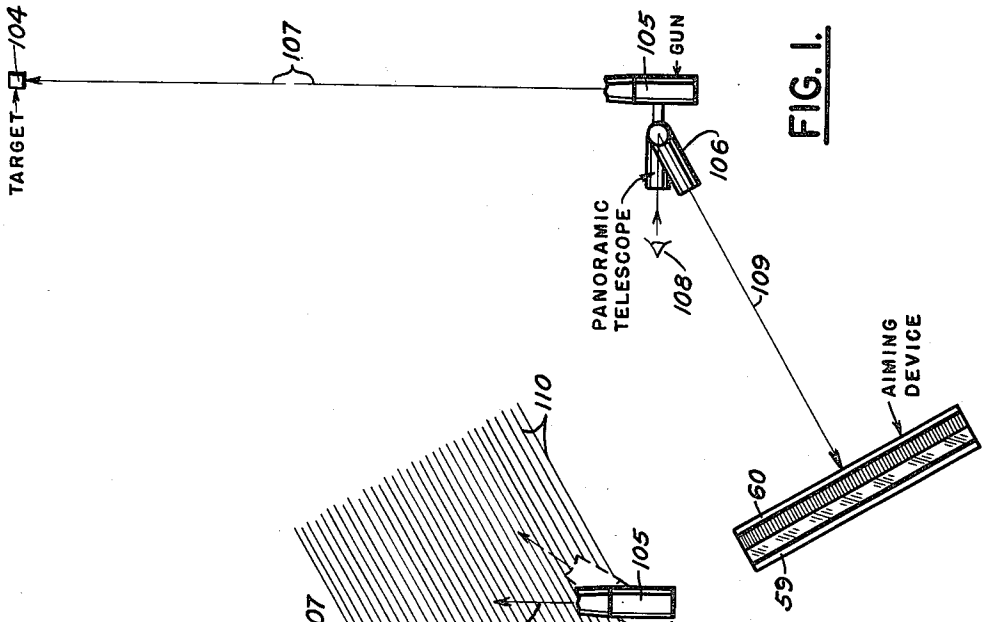


FIG. 1.

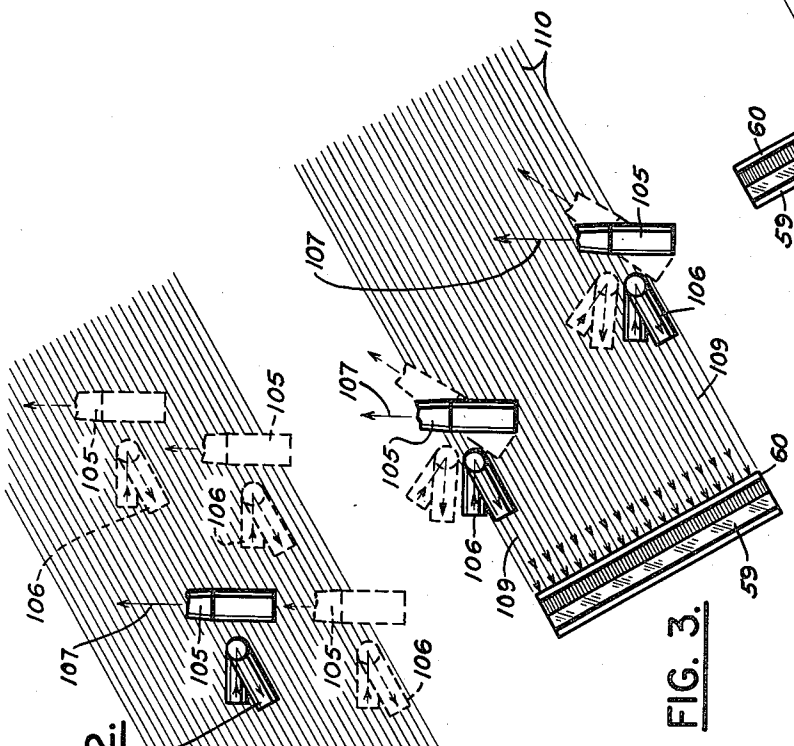


FIG. 3.

FIG. 2.

INVENTOR.
LEO H. BROWN.

BY
G. J. Kessenich + J. H. Church
ATTORNEYS

Jan. 8, 1952 L. H. BROWN 2,581,355

OPTICAL AIMING DEVICE FOR INDIRECT ARTILLERY FIRE

Filed Oct. 11, 1949 4 Sheets-Sheet 2

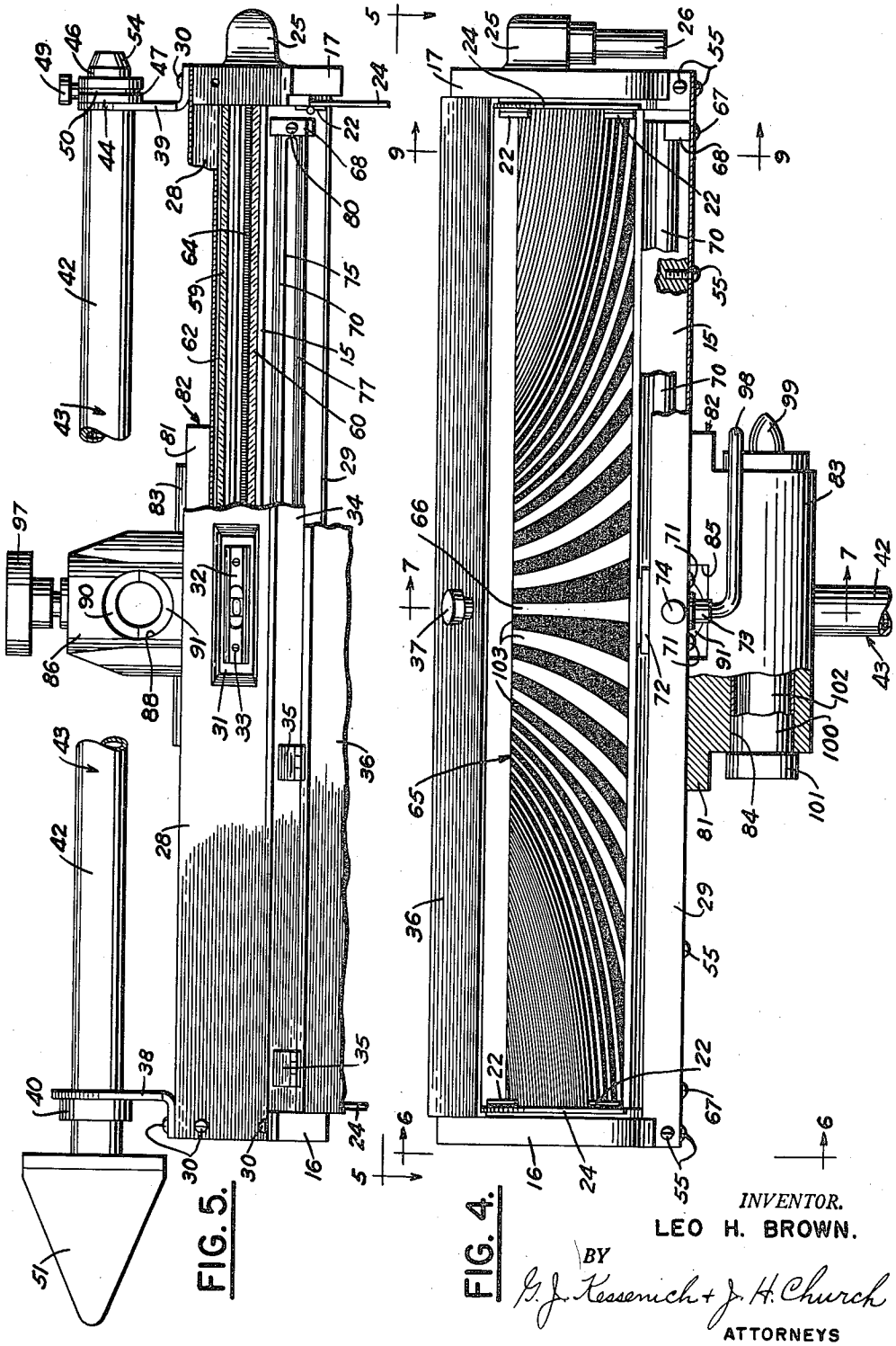


FIG. 5.

FIG. 4.

INVENTOR.
LEO H. BROWN.

BY
G. J. Kessenich + J. H. Church
ATTORNEYS

Jan. 8, 1952 L. H. BROWN 2,581,355

OPTICAL AIMING DEVICE FOR INDIRECT ARTILLERY FIRE

Filed Oct. 11, 1949 4 Sheets-Sheet 3

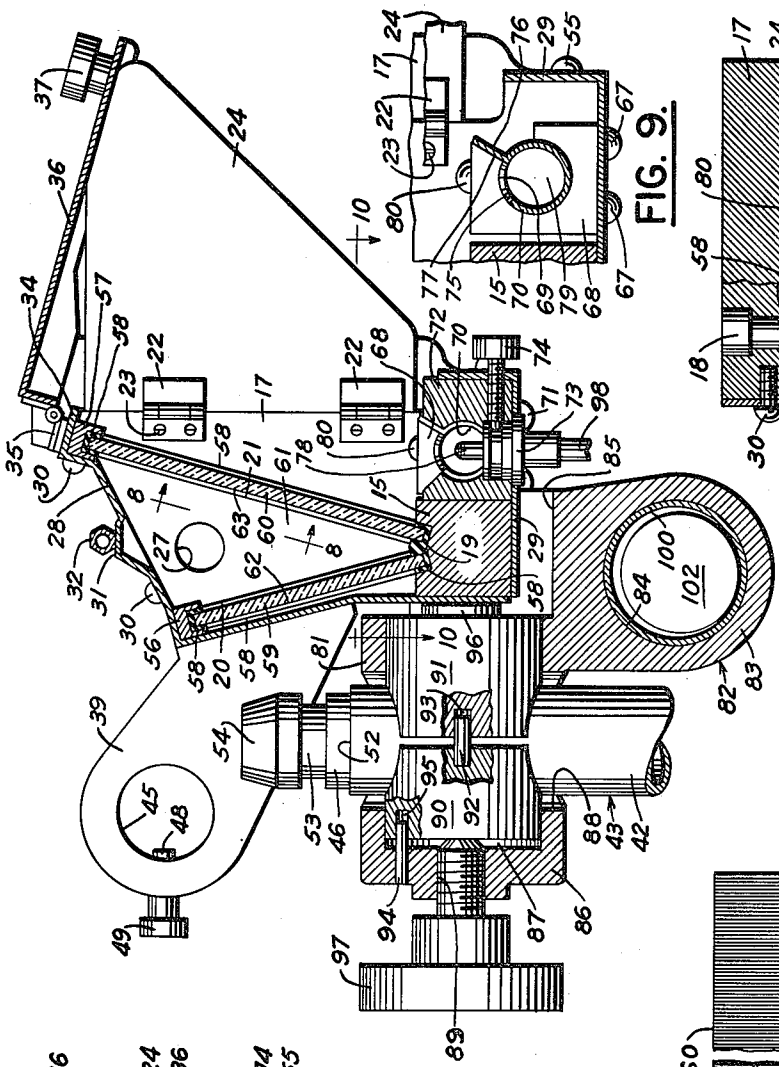


FIG. 7.

FIG. 9.

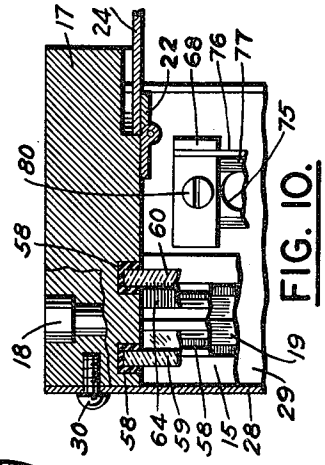


FIG. 10.

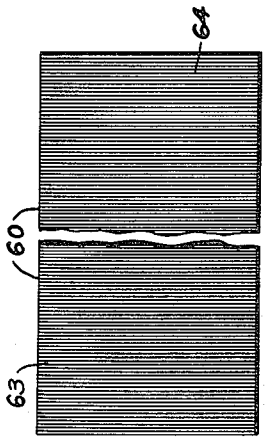


FIG. 8.

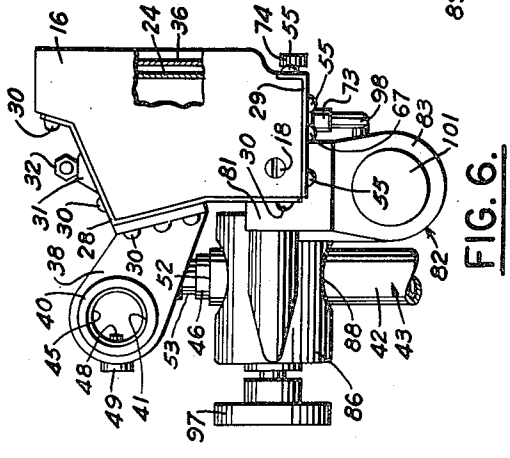


FIG. 6.

INVENTOR.
LEO H. BROWN.

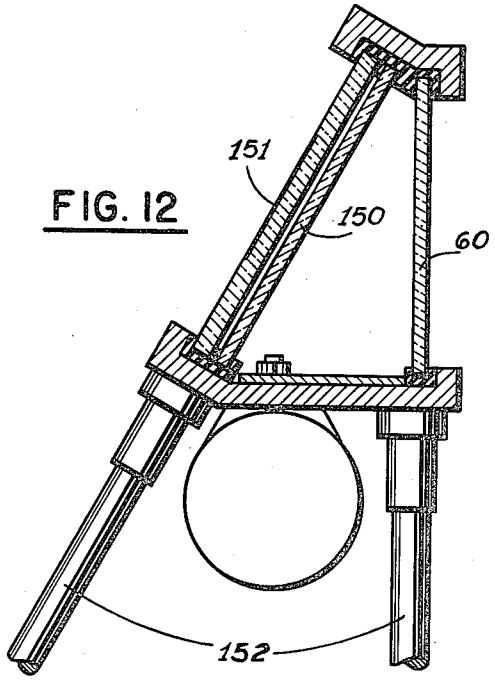
BY
G. J. Kessenich + J. H. Church
ATTORNEYS

Jan. 8, 1952 L. H. BROWN 2,581,355

OPTICAL AIMING DEVICE FOR INDIRECT ARTILLERY FIRE

Filed Oct. 11, 1949 4 Sheets-Sheet 4

FIG. 12



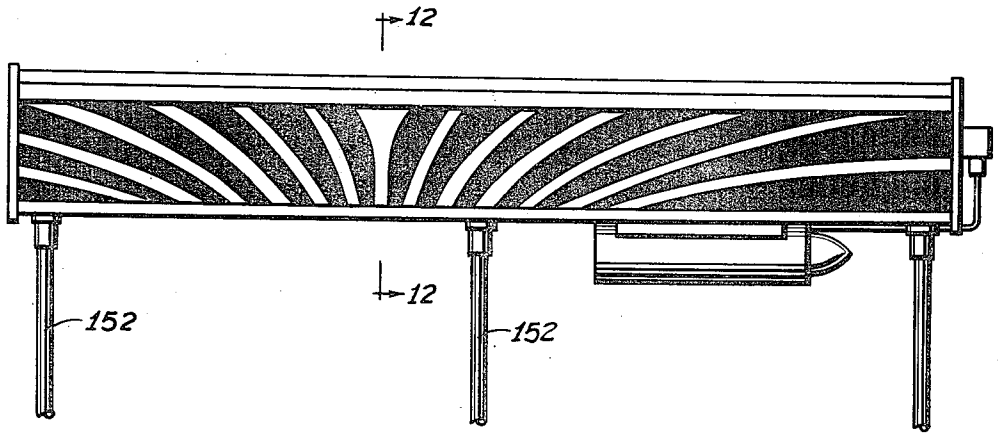


FIG. 11

INVENTOR.
LEO H. BROWN

BY

G. J. Kessenich & J. H. Church
ATTORNEYS:

Patented Jan. 8, 1952

2,581,355

UNITED STATES PATENT OFFICE

2,581,355

OPTICAL AIMING DEVICE FOR INDIRECT ARTILLERY FIRE

Leo H. Brown, Glenville, Conn.

Application October 11, 1949, Serial No. 120,806

11 Claims. (Cl. 88—1)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

My invention relates broadly to the art of indirect artillery fire aiming devices and more especially to the use of an optical device in the aiming of a cannon, artillery piece, or like weapon for indirect firing.

A primary object is to provide an aiming device which will permit a relatively great displacement of the weapon due to recoil or other reason without the necessity of repositioning the aiming device or making time-consuming calculations to compensate for such displacement.

Another object of my invention is to provide an aiming device which can be positioned relatively close to the weapon with which it is used.

Still another object is to provide an aiming device which can be used on uneven terrain.

Yet another object is to provide an aiming device which can be used equally well at any time during the day or night.

One more object is to provide an aiming device which can be used with equal facility during all types of weather conditions such as rain, fog, snow, etc. as well as in a smoke-laden atmosphere.

A further object is to provide an aiming device which will maintain its effectiveness and accuracy within very close limits.

A still further object is to provide an aiming device which is simple in design and construction, durable, light in weight, and easy to manufacture and use.

The foregoing and other objects of my invention will become apparent from an inspection of the following description and the accompanying drawings wherein:

Fig. 1 is a view from above schematically showing a typical operative relationship between my device, the weapon and attached sighting system (as for example a panoramic telescope) with which my device is employed, and a target.

Fig. 2 is a view, also from above, indicating some of the considerable number of possible conditions of weapon displacement in which the conventional need for repositioning the aiming device is eliminated by use of my invention.

Fig. 3 is another view from above depicting some of the large number of possible conditions of weapon displacements and how the weapon can be brought back onto the target without the necessity for repositioning the aiming device or making compensatory calculations.

2

Fig. 4 is a front view, partly in section, of my aiming device in the operating position, and shows the appearance of a distinctive line pattern as seen by a gunner when he looks into the weapon's attached sighting system, provided a certain definite relationship exists between the weapon's sighting system and my aiming device, as will be later described.

Fig. 5 is a top view, partly in section, taken from line 5—5 of Fig. 4, to show additional features of my novel device including a stake which is secured to brackets so as to act as a handle for transporting my device from place to place, but which also can serve as a means for supporting my aiming apparatus upright in the field.

Fig. 6 is an end view, partly in section, taken from line 6—6 of Fig. 4, the front cover having been moved to the closed position.

Fig. 7 is a vertical section taken from line 7—7 of Fig. 4.

Fig. 8 is a view taken from line 8—8 of Fig. 7.

Fig. 9 is a partial vertical section taken on line 9—9 of Fig. 4.

Fig. 10 is a partial section taken on line 10—10 of Fig. 7.

Fig. 11 is a front view of an alternate form of my aiming device.

Fig. 12 is a section taken from line 12—12 of Fig. 11 to show constructional details of the alternate form of my device.

Prior to my invention, practically universal use was made of the well known "barber pole" type of aiming post in the operation of artillery for indirect firing. As is well known, these posts were used in pairs, and after a weapon was brought to bear on a target, these posts were vertically positioned one behind the other at a considerable distance from the gun. The posts were so placed that, when viewed by a gunner through a sighting system attached to the gun, the nearer pole would completely obscure the farther one, thereby indicating that the gun's sight was aligned with both posts.

Unless the two posts were perfectly congruent, the near post would not completely hide the farther one, indicating that the gun had moved out of alignment with the two posts and that some correction for the displacement would have to be made in order to get the gun properly aimed at the target again. Since, for greatest accuracy, the posts had to be positioned at a considerable distance from the weapon with which they were used it was necessary many times for some soldier to expose himself to direct enemy fire in order

to set up the posts. If because of gun displacement, changing of the target, or other reason it was necessary for the alignment of the posts to be re-established, it would again be necessary for some man to risk possibly his life in getting out to the posts to make the change.

These very serious objections, to say nothing of definite impediments due to poor visibility resulting from uneven terrain, darkness, inclement weather, smoke-laden atmosphere, and other intervening obstructions between the gunner and the prior art aiming posts, made indirect firing a very hazardous, and often ineffectual operation because of the indicated numerous shortcomings.

With my new aiming device, however, the many objectionable features of the prior art aiming posts have been overcome. Since my device, without detracting from its accuracy, can be positioned relatively close to the weapon with which it is used, it is no longer necessary for a gun crewman to expose himself in setting up or adjusting the aiming device. Because of its proximity to the weapon and the presence of adequate built-in lighting facilities for use if needed, my device can be clearly seen during darkness, inclement weather, or in a smoke-laden atmosphere. In addition, my device can be used on uneven terrain where the difference in height between the weapon's sighting system and the device may be as much as 25 feet. Probably most important of its features is the fact that my device possesses a very wide range of utility throughout which its accuracy is unchanged. This wide range makes need for repositioning my device a very infrequent occurrence.

I accomplish the foregoing and other objects of my invention by providing an apparatus having in unique relationship a mirror, a glass grating, and a sighting system (as for example a panoramic telescope) attached to a cannon, artillery piece or like weapon.

My unique aiming device essentially consists of a long box-like structure having a substantially triangular cross-section. Its base consists of a strong, grooved bar 15 having end blocks 16 and 17 attached thereto (see Figs. 4 to 7 and 10) by means of screws 18.

From end to end the upper surface of base bar 15 contains a W-like groove 19 whose sides and floors are in a certain angular relationship to each other, for reasons which will be made more clear later (see Figs. 7 and 10).

The inner surfaces of the end blocks 16 and 17 each contain two grooves 20 and 21 which emanate from the W-like groove 19 in base bar 15 and diverge as they progress upward (see Figs. 7 and 10). Each of these same surfaces also has a pair of hinges 22 attached to it by screws 23. Joined to the other leaves of the hinges 22, as by welding, is a gate plate 24 (see Figs. 4, 5, 7, 9, 10).

Gate plates 24 are capable of two stable positions: open and closed. In the open position of Figs. 4, 5, 7, 9 and 10 they are parallel to the end blocks 16 and 17 and permit maximum range of usage of my device. For best results, the gate plates 24 should always be in the open position while the device is being used. In the closed position of Fig. 6 the gate plates 24 are perpendicular to the end blocks 16 and 17. More details about the gate plates will be given later.

End block 17 has projecting from its outer side a hollow lug 25 to which is threadedly attached a desiccator 26. An opening 27 through end block 17 (see Fig. 7) between grooves 20 and 21 makes possible communication between hollow lug 25 and the interior of the box-like principal portion of my device.

Attached to the foundation comprising the base bar 15 and its attached end blocks 16 and 17, there is provided a casing consisting of an upper, larger sheet metal member 28, and a lower, smaller, L-shaped sheet metal member 29 of the same length (see Figs. 4–7, 9 and 10).

The upper, larger sheet metal casing member 28, shaped as shown in Figs. 6 and 7, forms the back and top of the casing and is secured to the end blocks 16 and 17 and to the base bar 15 by means of screws 30 (see Figs. 5, 6, 7, 10). Approximately midway between the end blocks, on casing member 28, is a flat extruded portion 31 upon which is mounted a conventional level vial 32 as by means of screws 33 (see Figs. 5, 6, 7).

The lower sheet metal member 29 forms the bottom and part of the front of the device's casing and is secured to end blocks 16—17 and to base bar 15 by means of screws 55 (see Figs. 4, 6, 7, 9 and 10).

Extending along the top front edge 34 of casing member 28, to which it is secured between end blocks 16 and 17 by means of hinges 35, is a sheet metal cover 36 to which is threadedly attached a knob 37 (see Figs. 4, 7). The cover 36 is generally placed in one of three different positions: fully open (not shown), half open as in Fig. 7, and closed as in Fig. 6.

In the fully open position the cover 36 is swung away from the top front edge 34 of the casing member 28 to the full amount allowed by the hinges 35. When placed in that position, the cover may be prevented from moving by any one of a number of conventional means (not shown). My device is used with the cover 36 in the fully open position (gate plates 24 also open) when a proper amount of natural daylight exists.

In the half open position the cover 36 rests upon gate plates 24, which are in their open position and which support the cover resting upon them as in Figs. 4, 5, 7. This position of cover 36 and gate plates 24 is used when shading of the face of my device from excessive sunlight or other cause, is necessary, or when it is desired to confine illumination from a built-in lighting unit (later to be described) to the face of the device as would be necessary for operation during the night, inclement weather, or other reason.

The cover 36 may be placed in the closed position only after gate plates 24 have been swung to their closed position, as shown in Fig. 6. The cover and gate plates are put in the closed position for protecting the device's front surface or face as for storing, shipping, and the like.

Stake brackets 38 and 39 are attached to end blocks 16 and 17 by means of some of the same screws 30 which also hold the upper casing member 28 thereto, as illustrated in Fig. 5. Stake bracket 38 has a lug 40 having an opening 41 (see Figs. 5 and 6) which slidably accommodates the hollow, cylindrical shank 42 of a stake 43 (see Figs. 5 to 7) upon which my device is clamped during usage. Stake bracket 39 likewise has a lug 44 having an opening 45 of somewhat lesser diameter than opening 41 for slidably accommodating the cylindrical end plug 46 of stake 43 (see Figs. 5 to 7). Lug 44, in addition, has a circumferential groove 47, and also has an opening (not shown) which slidably receives the shank 48 of a stake retaining pin 49.

Stake retaining pin 49 is transfixed by an arcuate wire spring 50 which fits into the circumferential groove 47 in lug 44 and which exerts

sufficient resilient pressure to cause the shank end 48 of the stake retaining pin to project part way into the opening 45 in lug 44 (see Figs. 5 to 7).

Earlier mention was made of the stake 43 upon which my inventive device was clamped during usage. That stake has attached to one end of its hollow, cylindrical shank 42, as by welding, a spade plate 51 (see Fig. 5). On its opposite extremity there is secured, by any conventional means, an end plug 46 of somewhat smaller diameter than shank 42 (see Fig. 7). The junction of the end plug and stake diameters form a shoulder 52. End plug 46 is provided with a circumferential groove 53 whose size is sufficient slidably to accommodate the smaller or shank end 48 of the stake retaining pin 49 which projects into the end plug's opening 45 in lug 44; and a tapered nose 54 which greatly facilitates engagement between end plug 46 and opening 45. For storing or transporting my device, the stake can serve as a convenient handle by fitting it into brackets 38 and 39, as shown in Fig. 5, and locking it in that position by means of the retaining pin 49. But when my novel apparatus is to be put in use, the stake is removed and the spade plate plunged into the earth (not shown), following which my device is clamped to the other end of the stake as shown in Figs. 4, 6 and 7.

Secured to the upper inner reaches of casing member 28, as by welding or other means, and extending between end blocks 16 and 17 are troughs 56 and 57 (see Fig. 7). These troughs are in alignment with the grooves 20 and 21 in the end blocks, and in conjunction with them and the "W"-like groove 19 in base bar 15 form two continuous, unbroken channels around the inside of the casing.

As shown in Figs. 7 and 10, there is seated in the "W"-like groove in base bar 15, end block grooves 20 and 21 and troughs 56 and 57 a continuous, preferably one-piece, channeled gasket 58 made of molded rubber. Fitted snugly in the front portion of this gasket, namely that which extends from trough 57 to the front half of the W-like groove 19 and in groove 21, is a rectangular glass grating 60. Similarly fitted in the rear portion of the gasket, namely that which extends from trough 56 to the rear half of the W-like groove 19 and in groove 20, is a somewhat smaller rectangular mirror 59.

The purpose of the channeled gasket is to cushion mirror 59 and glass grating 60 and to seal off the confined space 61 contained within those two members and end blocks 16 and 17 in order to prevent dust, dirt, or other like contamination from entering thereinto. In order to prevent fogging in that confined space 61, the previously mentioned desiccator 26, which is connected therewith through the opening 27 in end block 17, serves to remove any moisture which may be present therein.

Mirror 59 is preferably of good quality optical glass having its reflecting surface 62 facing the front of my device (toward the reader in Fig. 4 or to the reader's right in Figs. 7 and 10).

The glass grating 60 likewise should also preferably be good quality transparent optical glass upon whose inner surface 63 are etched, ruled, printed, or otherwise produced a multiplicity of equally spaced, preferably fine, parallel lines 64. When grating 60 is assembled into my device these lines extend up and down and, when viewed from without, extend in a substantially true vertical direction (as in Fig. 8) when the level vial 32 atop casing member 28 is properly trued.

Concerning the inner, lineated surface 63 of grating 60, the object is to produce lines which will "stand-out" or be very conspicuous, to anyone using my device. If these lines be produced by printing or some like process, any desirable, satisfactorily colored opaque pigment can be used. If the lines be made by etching, ruling, or other similar process, it is desirable to apply some properly colored opaque material into the lines thus produced in order that sharp contrast will be obtained. The exact number of grating lines per inch is not critical, but a greater number per inch will give a more pronounced line pattern 65 of the type shown in Fig. 4.

As best shown in Fig. 7, it can be seen that the mirror 59, having reflecting surface 62 facing the front (at the reader's right), and the glass grating 60 having its inner, lineated surface 63 (see Fig. 8) facing the rear (at the reader's left) are positioned at an included angle of preferably about 30° to each other, converging at their lower ends. Other acute angles are suitable, of course, short of a right angle. However, this angle, like the number of grating lines per inch, is not critical since changing it would only change the shape of the line pattern 65 (later to be discussed) on each side of a single, substantially straight vertical reference line 66 (see Fig. 4) contained in the pattern.

A self-contained source of illumination for the line pattern is supplied in the form of a two-piece light reflecting trough 70 housing an electric light bulb 78. This trough 70 may be of sheet metal, or other like material, which has been shaped as shown in Figs. 4, 5, 7, 9 and 10 to contain an elongated opening 75 and an apron 76. The inner surface of the trough, as well as the apron surface 77 nearest glass grating 60, have been treated in a conventional manner to reflect light rays issuing from light bulb 78.

Trough 70 is supported at each end by a support block 68. These blocks are secured by screws 67 to the inside of the bottom surface of lower casing member 29, adjacent base bar 15 and near each end block 16 and 17, as shown in Figs. 4, 5, 9 and 10. Each block contains a central opening 69 into which fits the outer end of trough 70. Likewise secured to the inside of the bottom surface of lower casing member 29 by screws 71, adjacent the base bar 15 and approximately midway between the end blocks 16 and 17, is a central trough support block 72 shaped as shown in Figs. 4 and 7. This central block 72 serves to support the inner ends of the two-piece light-reflecting trough as well as to house a bulb socket 73 which is retained therein by a thumb screw 74.

In the ends of trough 70 resting in support blocks 68 are end plugs 79 which prevent the undesirable escape of light from the bulb 78 and into which trough retaining screws 80 are threaded.

The purpose of the light-reflecting trough 70 and lighting source contained therein is, of course, to make possible the ready use of my invention during darkness as well as during daylight hours. To supply the energy for the electric light bulb 78 there is provided a lighting unit consisting of bulb socket 73, insulated wire 98 and a dry cell 102, the last named being contained in a cell case 100 covered by a cap 101 (see Figs. 4, 6, 7).

All that need be said concerning these parts is that the cell case 100 is accommodated in the

cylindrical recess 84 in a lug 83 where it is keyed (not shown) in well-known fashion to prevent rotation of the cell case during rotation of a knob 99. Cell 102 is housed in cell case 100 and is held thereby the case cap 101 which is joined to the case by any convenient, well known means. When the case cap is properly joined to the cell case, removal of the case from lug 83 is impossible. At the end of cell case 100 on the reader's right is knob 99 which can, by means of a turning movement applied thereto, serve the dual function of operating a switch (not shown) and also a rheostat, potentiometer, or like element (not shown) for controlling the degree of illumination given by bulb 78. As shown in Fig. 7, bulb socket 73 is mounted in central block 72 where it is fastened in place by thumb screw 74. Insulated wire carries electrical energy from cell 102 to the bulb 78.

Midway between the two end blocks 16 and 17 the box-like portion of my inventive aiming device is mounted on a right-angled seat portion 81 of a saddle block 82 by means of conveniently located screws (not shown) which pass through the sheet metal casing members 28 and 29 and thread into the base bar 15 (see Figs. 4 to 7).

Projecting downward from the bottom of the right-angled seat portion 81 of saddle block 82 is cylindrical lug 83 (see Figs. 4 to 7) which contains an axial dry cell case recess 84 to which access is gained through a cleft 85; and projecting outward from the rear of the right-angled seat portion 81 is another somewhat cylindrical lug 86. This lug 86 has an axial clamp recess 87, and in addition a vertical stake opening 88 and a threaded clamp opening 89, both of which communicate with the main axial opening 87, as shown in Figs. 5 to 7.

Slidably accommodated in axial recess 87 of lug 86 is a split clamp composed of the two halves 90 and 91 (see Figs. 5 and 7). The adjacent faces of each half of the clamp are cylindrically recessed to a size slightly less than the radius of shank 42 of stake 43; and the two halves of the clamp are kept in proper alignment with each other by means of the pin 92 which is driven into clamp member 90, and which is slidably accommodated in a recess 93 in clamp member 91. In turn, as Fig. 7 shows, the opening in clamp members 90 and 91 is kept in proper relationship with the larger stake opening 88 in lug 86 by means of the pin 94 which is driven into lug 86 and which projects into a recess 95 in clamp member 90. Recess 95 is so made as to permit a certain amount of axial rotation of the two-piece clamp member so that the stake shank recess therein can, before clamping, "float" between the limits of the larger stake opening 88 to facilitate setting-up my device.

Clamping pressure is applied and released by use of the clamp screw 97 which is threadedly attached to lug 86. This pressure urges clamping member 90 forwardly against the stake which is forced against clamp member 91 and there held rigidly because one end 96 of member 91 is backed up by sheet metal casing member 29 reenforced by the strong base bar 15.

Before describing the operation of my invention, it would be well now to discuss one of the most important features of my aiming device, that is the line pattern 65 shown in Fig. 4.

The two elements responsible for this pattern are the mirror 59 and the glass grating 60 ably assisted by either natural or artificial light. As was pointed out earlier the reflecting surface 62 of the mirror and the lineated surface 63 of the glass grating 60 are mounted facing but at an angle to each other (see Fig. 7).

As a result of this relationship between mirror 59 and glass grating 60, a distinctive line pattern 65 is seen by a gunner when he views the front face of my device through the weapon's sighting system if his line of sight is perpendicular to the horizontal line of intersection of the plane of mirror 59 and the plane of glass grating 60. The line pattern 65 depicted in Fig. 4 is seen to consist of the single substantially straight reference line 66 flanked on either side by lines 103 which gradually curve away with successively increasing curvatures, and tend to become almost perpendicular to the single substantially straight reference line 66.

In the Fig. 4 showing of the line pattern the gunner's line of sight is represented as being directed approximately midway between the extremities of mirror 59 and glass grating 60, hence the similarity between both sides of the line pattern on each side of the central reference line 66. However, if the gunner's line of sight, still remaining perpendicular to the line of intersection of the two planes, were to be moved either to the right or left, the substantially straight reference line 66 would move accordingly with a corresponding change in the line pattern. That is, the curvilinear portions on one side of line 66 would be fewer and shorter than on the other side. Such movement of the reference line will alter slightly the position of the gun aimed thereby, but the amount of such variation will be negligible and of no consequence in affecting the gun's accuracy, as will later become evident. In short, the gun can undergo horizontal translation in any direction, without affecting the accuracy of aim, so long as the line of sight to the device falls between the ends of the sight pattern formed by the mirror and grating.

It will be readily appreciated from the foregoing that my device makes possible accurate aiming of the gun from a number of different positions caused by its displacement upon firing. Movement of the gun in a linear direction perpendicularly away from the front face of my device is not a limiting factor so long as the gun's sighting mechanism is powerful enough to pick up the line pattern 65. The only limitation is that when the gun moves laterally (with respect to my device) from its original emplacement, my device is effective only if the gun's sighting mechanism can be trained on a perpendicular to the intersection of the plane of the mirror and the plane of the grating, as aforesaid. Thus, if the distance between end blocks 16 and 17 is conveniently made to be two feet, the effective lateral range through which the gun can be moved, and yet permit accurate aiming without the need for compensatory calculations, is two feet.

In discussing the use of my invention, recourse will be had to Figs. 1 to 3.

Fig. 1 shows one desired relationship between a target 104, a gun 105, its attached sighting system including a panoramic telescope 106, and a schematic representation of my unique aiming device whose principal elements 59 and 60 are shown. Line 107 is the "ideal" line of fire (neglecting pertinent variables) between the gun 105 and the target 104. When the gunner's eye 108 sights through the panoramic telescope, his line of vision 109 which looks into my device is perpendicular to the line of intersection between the plane of mirror 59 and the plane of glass grating

60, and he sees the line pattern as shown in Fig. 4.

Fig. 2 contains the elements of Fig. 1 except for the target 104 and the gunner's eye 108; the same gun-to-aiming device relationship exists and is indicated by a solid line drawing of the respective parts. The gun and sighting system drawings shown in dashed lines represent only a few of the great number of possible gun displacements due to recoil or other causes in which the gunner's line of sight 109 into my device is still perpendicular to the line of intersection of the plane of mirror 59 and the plane of grating 60. Thus in each of these many cases, the gunner (not shown) is able to sight the substantially straight reference line 66 flanked on either side by the curved lines 103.

Lines 110 represent a large number of imaginary lines of vision, each parallel to the original line of vision 109 and therefore perpendicular to the line of intersection between the plane of mirror 59 and the plane of grating 60. Therefore, as long as a gunner, in looking into the sighting system 106, sees along any one of the lines 110 it will be possible for him to see the substantially straight reference line 66 flanked on either side by a greater or lesser number of curved lines 103. That will be proof to him that any new line of fire is parallel to the original line of fire 107 and that the gun, for all practical purposes, is still "on target."

Fig. 3 deals with displacement of the gun 105, due to recoil or other cause, in which the gunner can no longer see reference line 66 when he looks into the gun's sighting system. This is because the line of sight 109 is no longer perpendicular to the line of intersection between the plane of mirror 59 and the plane of glass grating 60. Only two of a considerable number of possible conditions of this nature are indicated.

In Fig. 3 the solid line drawing of the gun 105 and its attached sighting system 106 indicates the gun firing on the target (not shown), because in each case the gunner is able to see the correct line pattern on my device. The dashed line drawings indicate that, after firing, the gun 105 has been displaced because of recoil or other cause and that as a result the gunner can no longer see the line pattern when he looks into the sighting system 106. Immediately, he knows the gun 105 is "off target" in azimuth.

By traversing the gun and sight as a unit until the sight pattern as seen by the gunner in looking through his sight, is symmetrical, the gun can be brought back "on target" quickly and effectively. As abovesaid, the only limitation to the use of my device would occur when the gun is displaced parallel with the line of intersection of the mirror and grating such a distance that the line of sight from the gun falls without the confines of the device.

For example, in using the prior art plain aiming posts, the post nearer the gunner would be seen by him, through the gun's sighting system, to coincide with the farther post only if his line of sight fell in the imaginary vertical plane determined by the two aiming posts, thus limiting its best action to a mere single plane. In my device, however, the substantially straight reference line 66 can be seen by the gunner, through his sighting system, from any point in a certain imaginary, three-dimensional space. From this comparison, it is clearly evident that with the prior art aiming posts frequent repositioning of the aiming posts or the extra step of making compensatory calculations therefor would be necessary, whereas no such maneuvering is required in using my device.

In beginning to explain the use of my invention, it may be assumed that the aiming device is in the closed, inoperable position; that is, the gate plates 24 and cover 36 are facing the glass grating 60 (see Fig. 6), and the stake 43 is secured between the brackets 38 and 39 (see Fig. 5). Although my device could be employed for indirect firing at a moving target, in the present illustration it may further be assumed that it will be employed for indirect firing at a stationary target.

By using one of the conventional techniques described in existing Armed Forces manuals, as for example F. M. 6—81, the weapon 105 with which my device is to be used is brought to bear on the target.

After releasing the stake 43 by pulling the stake retaining pin 49 sufficiently outward, the stake 43 is removed from the brackets 38 and 39, then thrust, spade end first, into the ground (not shown) in a substantially vertical position. Stake 43 is located in the ground on the same side of the weapon as its sighting system 106 (for example, a panoramic telescope), and may be located at any convenient place within a radius of, say, from five to one hundred feet from the weapon's sighting system. One preferred relationship between target 104, weapon 105, its attached sighting system 106, and the principal elements 59 and 60 of my aiming device is shown in Fig. 1.

The cover 36 is next raised and the gate plates 24 are swung outward as far as they will go. If daylight conditions are not excessive, and the face of my device does not require shading, the cover 36 is raised upward as far as it will go to the fully opened position. If bright sunlight, reflections, or other causes require the face of my device to be shaded, or if the instrument's built-in lighting unit is to be used, the cover 36 is allowed to rest upon the gate plates 24 (see Figs. 4, 5, 7).

My device is then placed in a convenient location along the shank 42 of the stake 43 (see Fig. 7) facing in the general direction of the weapon's sighting system 106. It is preferable to have the box-like portion of my device horizontally level, and this can be done when mounting it on the stake with the aid of level vial 32. The gunner, represented in Fig. 1 by the eye 108, endeavors by looking into the sighting system 106 visually to "pick-up" the line pattern 65 on the face of the aiming device. By coordination between the gunner and a second person (not shown) handling my aiming device, adjustments are made until the gunner sees the line pattern having its central straight reference line 66 approximately midway between gate plates 24.

It is not imperative that the reference line 66 be located approximately midway between the gate plates 24, since it can actually be located anywhere along that distance between the gate plates. The mid position is, however, preferable.

Since the gun has been placed "on target," by means earlier referred to, when the gunner sees the substantially straight reference line 66 in my aiming device he thereby establishes a fixed datum point for keeping the gun "on target." Although my device could be used for the initial laying of the gun on the target, its best use

accrues from enabling the gunner to keep the gun "on target" after an initial correct setting. This is so because my device is effective in dealing only with the azimuth component of the aiming process.

It must be understood that the disclosure here made is for illustrative purposes only, and that many diverse variations of my invention are possible without departing from the spirit and scope of my inventive concept. For that reason I do not wish to be limited to the narrow confines of this single practical application.

One example of an alternate form of my invention (see Figs. 11–12) is the use of a second line grating 150 instead of mirror 59, backed up by frosted glass 151 or other translucent member, if desired, instead of a mirror. (In Fig. 12, the glass plate 151 is shown only partially frosted, the remaining portions being unfrosted to admit more light; however, this is optional, as the whole plate may be frosted, if preferred.) Another modification consists in inverting the box-like structure so that the included angle between mirror 59 and grating 60 is at the top (see Fig. 11) rather than at the bottom (as in Fig. 7), whereupon the line pattern of Fig. 4 likewise will appear inverted, taking the form shown in Fig. 11. Other obvious design modifications are shown in Figs. 11–12, such as the use of three support legs 152 instead of a stake 43, etc.

From the foregoing, it will be evident to those skilled in the art that I have provided an aiming device which will permit a relatively great displacement of the weapon without the necessity for repositioning the device or making time-consuming compensatory calculations; that I have provided an aiming device which can be positioned relatively close to the weapon with which it is used; that I have provided an aiming device which can be used on uneven terrain; that I have provided an aiming device which can be used equally well at any time during the day or night; that I have provided an aiming device which can be used with equal facility during all types of weather and atmospheric conditions; that I have provided an aiming device which will maintain its effectiveness and accuracy within very close limits; and that I have provided an aiming device which is simple in design and construction, light in weight, and easy to manufacture and use.

I claim:

1. For use in the indirect aiming of a gun mounted for elevation about a normally horizontal axis upon a part trainable about a normally vertical axis, the combination with said gun of a sighting device mounted upon said part for movement therewith and angular movement relatively thereto, about normally vertical and horizontal axes, an aiming target comprising a transparent member having a multiplicity of parallel grating lines thereon and an opaque member having a reflecting surface, the planes of said opaque and said transparent members intersecting each other at an acute angle along the longitudinal axis of said aiming target and with the said reflecting surface facing the said grating lines, and means mounting said aiming target adjacent to and independently of said gun remote from the plane of fire, with its longitudinal axis horizontal and its reflecting surface visible through said sighting device.

2. In a device for indirect aiming of a gun having an aiming sight mounted thereon, a transparent member having a muliplicity of parallel grating lines, a plane reflector member, and means uniting and supporting said members with the reflecting surface of said reflector member making an acute angle with said grating lines, said grating lines being reflected from the reflecting surface of said reflecting member toward the sight, to thereby produce a sight pattern indicating the proper aim of the sight with respect to the device.

3. In an aiming device for indirect aiming of a gun having an aiming sight mounted thereon, a substantially box-like housing, a mirror, a grating, said mirror and grating being so mounted in said housing that their planes intersect at an acute angle, the lines of said grating being reflected from the reflecting surface of said mirror toward the sight, to thereby produce a sight pattern indicating the proper aim of the sight with respect to the device.

4. A device as recited in claim 3, said acute angle being about 30°.

5. In an aiming device for indirect aiming of a gun having an aiming sight thereon, a substantially box-like housing, a mirror, a grating, means mounting said mirror and grating fixedly in said housing with their flanges intersecting at an acute angle, a light-reflecting trough in said housing and illuminating means secured within said trough to illuminate said mirror and grating, the lines of said grating being reflected by said mirror toward the gun to produce in the field of view of the sight thereof, a distinctive pattern of lines which is symmetrical only when the sight is properly aimed with respect to the device.

6. In a device for the indirect aiming of a gun having an aiming sight mounted thereon and pivotally adjustable about a normally vertical axis relatively thereto, a housing, a grating, a mirror, means mounting said grating and mirror within said housing with their planes intersecting at an acute angle and their line of intersection substantially horizontal, a pair of end plates hingedly attached to said housing to extend from the respective ends of said grating, and a cover for said housing, said cover being hinged to the top front of said housing above said grating, said cover when in open position resting upon and being supported by said end plates extended, to thereby constitute a shade for said grating.

7. In a device for the indirect aiming of a gun having an aiming sight mounted thereon for training movement as a unit therewith about a normally vertical axis, and for pivotal adjustment relatively thereto about an axis parallel to said normally vertical axis, a housing, a mirror, a grating, means mounting said mirror and grating in said housing with their planes making an acute angle and with said grating forwardly of said mirror, the lines of said grating being at right angles to the line of intersection of said planes, and means for mounting said housing independently of the gun with said line of intersection horizontal, said grating lines being reflected from said mirror to form in the field of view of said sight a distinctive pattern of lines symmetrical only when the line of sight from gun to device is perpendicular to said line of intersection.

8. In a device for the indirect aiming of a gun having an aiming sight mounted thereon for training as a unit with the gun and for adjustment in azimuth relatively thereto, a transparent pane member having a multiplicity of parallel

grating lines, a plane reflector member, and means uniting and supporting said members independently of the gun with their planes intersecting at an acute angle, the grating lines of said transparent member being at right angles to the line of intersection of said members, said reflector member reflecting a distinctive symmetrical pattern of grating lines into the field of view of the aiming sight only when the line of sight is at right angles to said line of intersection.

9. In a device for the indirect aiming of a gun having an aiming sight mounted thereon, a substantially box-like housing, first and second gratings mounted within said housing so that their planes intersect at an acute angle, a translucent member covering the surface of said second grating outside of said included angle, and illuminating means secured to said housing to illuminate said gratings, said gratings when facing toward the gun, coacting to form a sight pattern in the field of view of said sight indicating the proper aim of the sight with respect to the device.

10. In a device for the indirect aiming of a gun having an aiming sight thereon, a substantially box-like housing, first and second gratings

mounted within said housing so that their planes intersect at an acute angle, a reflecting member covering the surface of said second grating outside of said included angle, and illuminating means secured to said housing so as to cast light upon said gratings, said gratings when facing toward the gun forming a distinctive symmetrical image pattern in the field of view of the sight thereof which pattern is symmetrical only when the line of sight of the sight is normal to the line of intersection of said gratings.

11. An aiming device as recited in claim 10, said acute angle being about 30°.

LEO H. BROWN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,546,687	Stutzer	July 21, 1925
1,590,532	Lenouvel	June 29, 1926
2,150,992	Scott	Mar. 21, 1939
2,399,971	Wolfe	May 7, 1946
2,491,476	Brown	Dec. 20, 1949