Oct. 5, 1937. F. E. STOKEY 2,094,623

TELESCOPIC SIGHT

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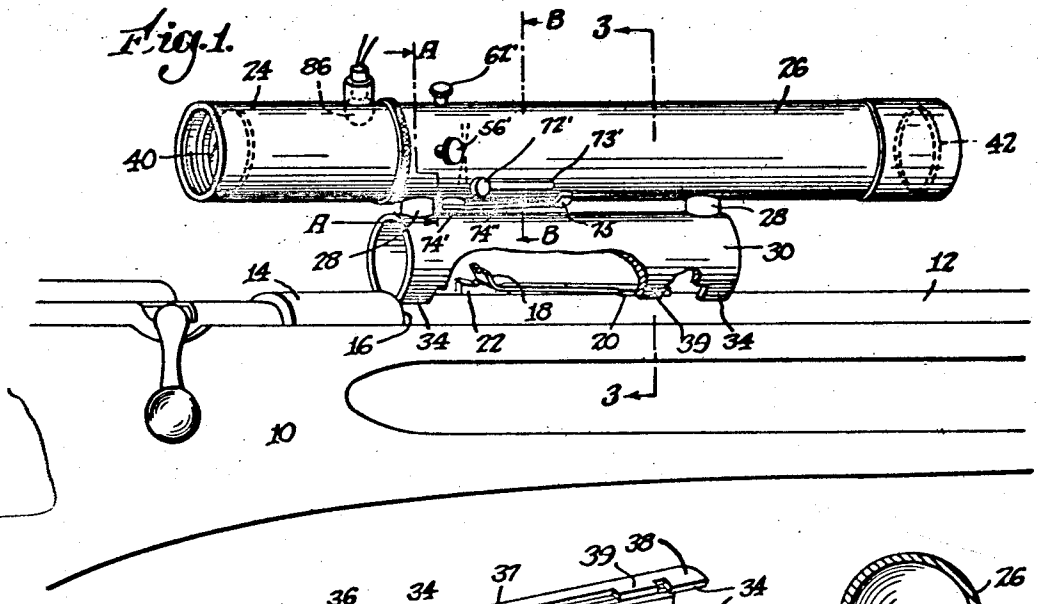
14.38

Fig. 1.



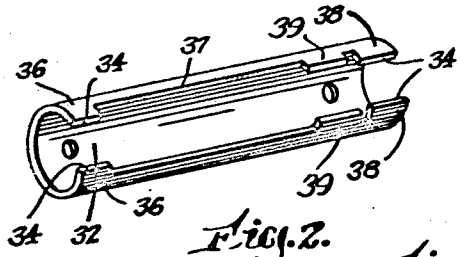


Fig. 2.

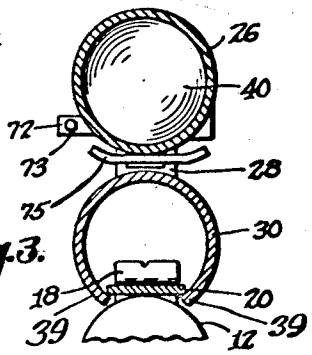


Fig. 3.

Fig. 4.

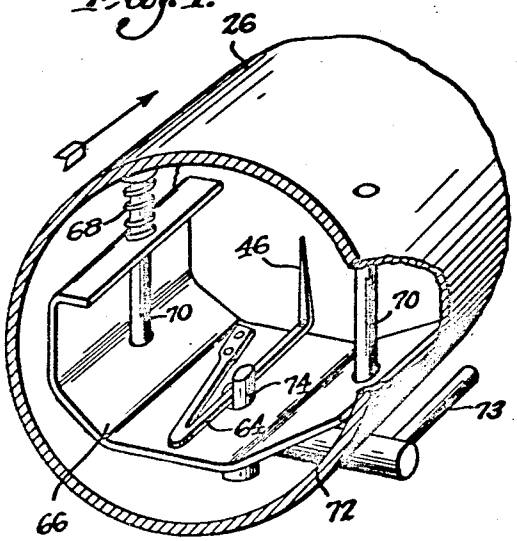
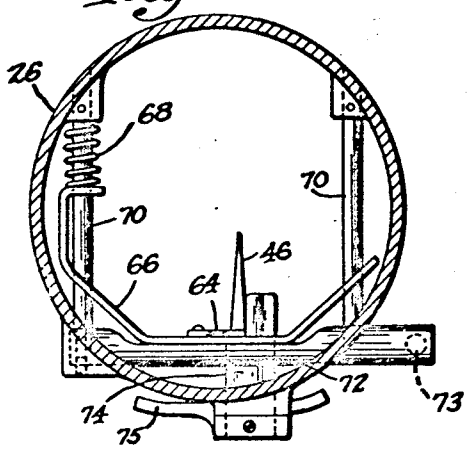


Fig. 5.



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TELESCOPIC SIGHT

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Fig. 6.

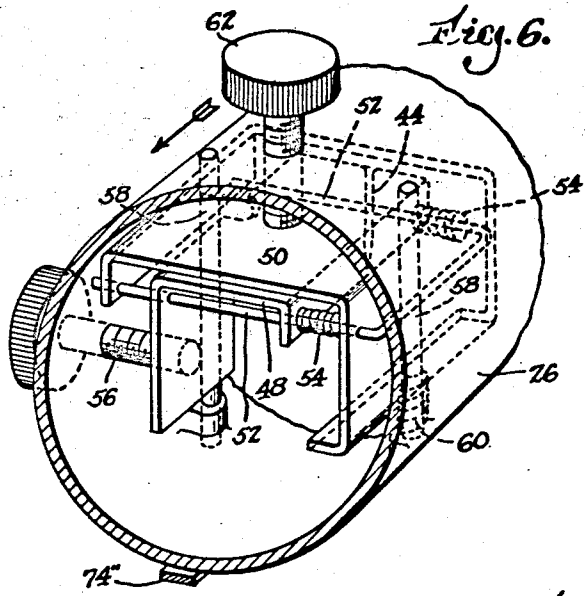

Fig. 7.

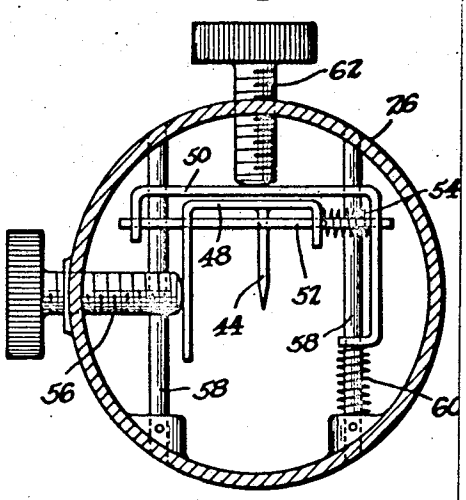

Fig. 8.

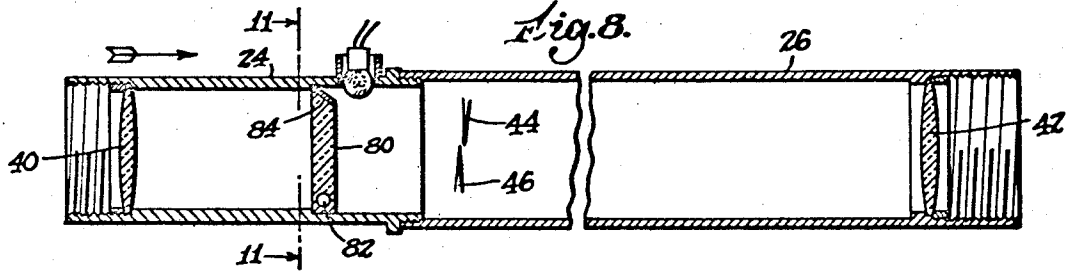

Fig. 11.

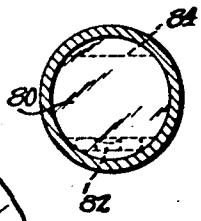

Fig. 10.

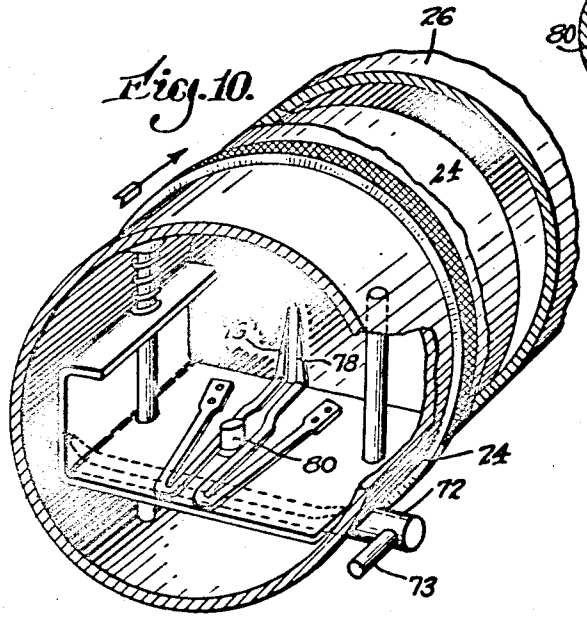

Fig. 9.

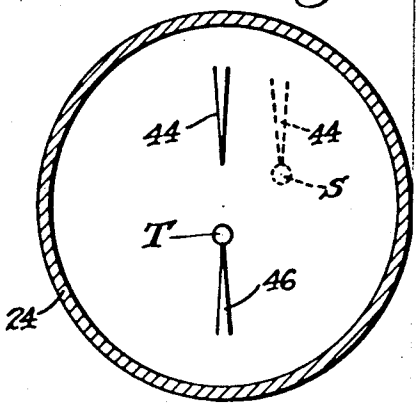

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Fig. 12.

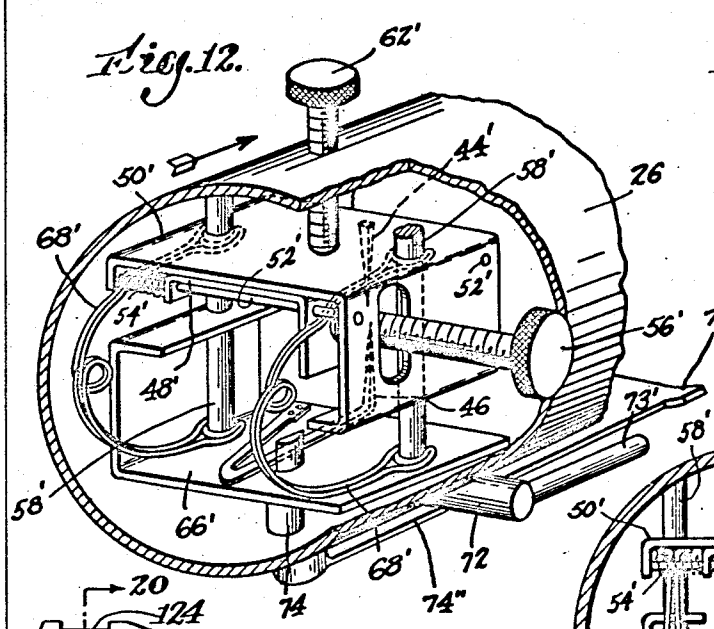


Fig. 21

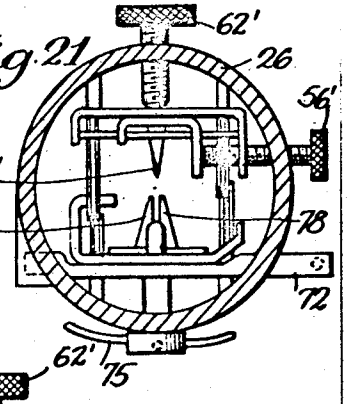
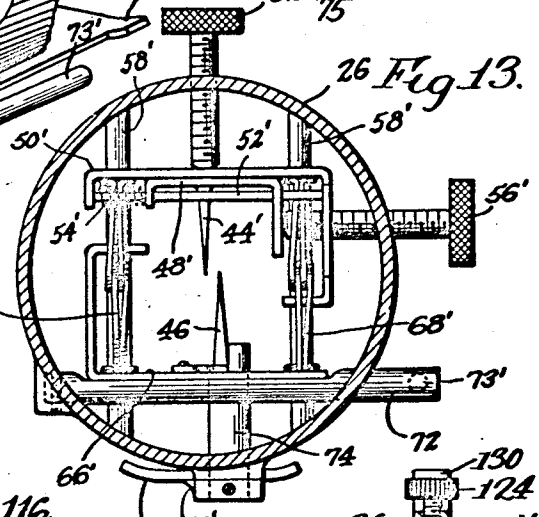


Fig. 13.



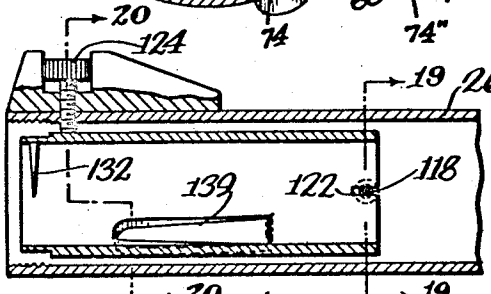


Fig. 18.

Fig. 14.

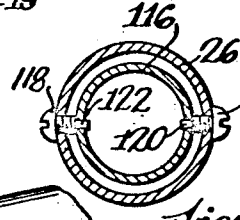


Fig. 20.

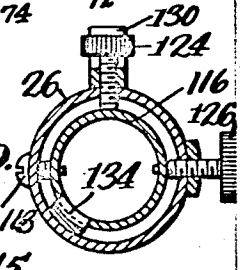
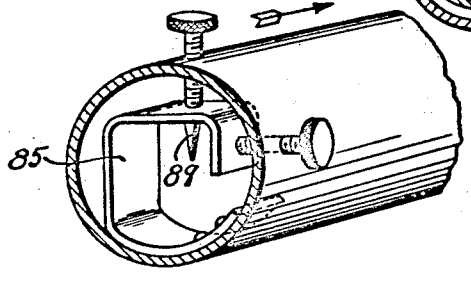


Fig. 19.

Fig. 15.



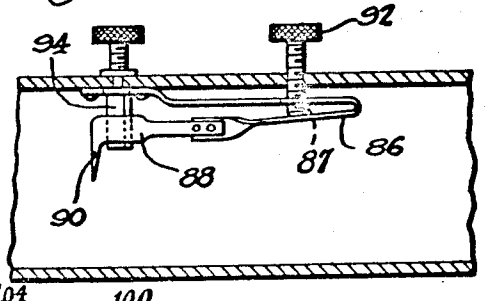
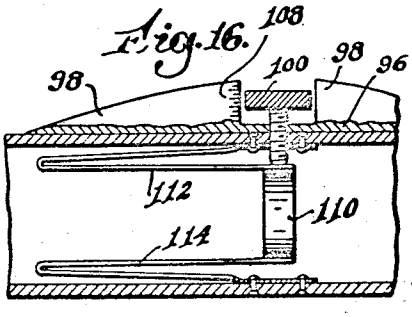


Fig. 16.



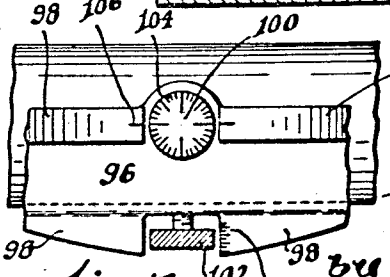


Fig. 17.

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UNITED STATES PATENT OFFICE

2,094,623

TELESCOPIC SIGHT

Fred E. Stokey, Woods Hole, Mass.

Application June 29, 1935, Serial No. 29,109

15 Claims. (Cl. 33—50)

This invention relates to improvements in telescopic sights.

More particularly it provides a sight having reticules capable of a simple, manual adjustment which automatically corrects all errors of range; of external deviating forces such as wind, and of internal deviating influences, such as the gun barrel being not quite true. The device of the invention is adapted to integrate all errors of these sorts, and to make immediate and complete correction.

The invention also provides means to integrate in the aim a corrective allowance for the flight of a body, as an aeroplane, or animal, across the line of fire, elapsed during the flight of bullet.

Also the invention provides improved means for quickly and conveniently mounting or demounting a telescopic sight on a firearm of ordinary standard construction.

The invention is herein described more particularly with reference to ordinary rifles, but this must be understood to be only illustrative, for it is applicable also to other ballistic instruments, from pistols to cannon of any calibre, and indeed to the aiming of discharge tubes of any variety, including torpedo tubes.

As applied to any shooting at a visible target, the invention eliminates the present customary elaborate procedure of observation and report as to where a shot struck, and the ensuing necessary reference to mathematical tables to find a correction, followed by a measuring by micrometer for a shifting of the sight. Also, it permits of the using of a reversing telescope, to which the mathematical tables do not apply, but which if made practicable would have certain advantages over erecting telescopes.

As applied to a rifle carried in hand, it provides means which greatly reduce certain practical objections that hitherto have attended the use of a telescopic sight, in that, for the finding of the object, it affords an easy shift of one's eye into the telescope from a preliminary finding by natural vision along the barrel.

Telescopic sights as heretofore available are among the more expensive of firearm accessories, and their use has mostly been confined to a relatively small class of firearm users. This limitation of use has been due in large part to the relatively heavy initial expense of acquiring such a sight, and of getting it mounted on one's rifle. And, once mounted, the telescopic sight as heretofore known has constituted in effect a fixed part of the firearm, due to the mechanical devices which have made its removal difficult and troublesome. Also the prior telescopic sights have embodied inadequate provision for adjustment and correction of aim; and they have not been suitable for use in the night, or dim light where the density of surrounding woods may shut off necessary light.

It is among the objects of the present invention to make telescopic sights available in a practicable form for general usage. An important feature resides in the provision of improved mounting means, by which the telescopic sight may be attached and detached at will by a simple motion of slipping it into or out of engagement with the sight piece, which is customarily found on rifles.

Another object is to provide a telescope which, as a whole, can be produced at a cost within the means of ordinary users of firearms for hunting and target practice.

A further object is to provide improved reticules within the telescope, and improved mounting and adjusting means therefor, whereby said correction of aim may be attained notwithstanding external deviating forces and mistakes as to range, or rifle defects, which may need to be taken into account in making correct aim.

Still another object is to provide for correcting aim to allow for the travel of a moving target, when the travel has a vertical component.

The improved sight includes means for guiding the user to a correct levelling of the arm, and also for facilitating use of the telescopic sight and of this levelling means by providing for cooperation of artificial light when natural light is dim within the telescope.

These and other improved results may be attained while mounting the telescope tube on a novel short segmental parallel tube, the edges of whose segment may rest on the gun barrel, and, when moved horizontally backward of the barrel, can abut the shoulder which usually is found at the receiver of the rifle, and can engage under the anchored end of the usual sight piece. This engagement, cooperating with edges of the same tubular segment which rest on right and left top sides of the barrel, forward and rear, can hold the apparatus firmly in place on the barrel, by friction.

The telescopic sighting tube being rigidly fixed on this segmental tube, the whole can be readily mounted or demounted, with what is practically but a single motion.

The telescope has an object lens in whose focal plane are the reticules of the invention, maintained approximately in the focal plane at

all times. The telescope is illustrated as having only one other lens, a conventional eye piece, in which case the object sighted will appear inverted. This measure provides economy in several respects, and absorbs less light; but obviously such additional lens or lenses as may be desired can be embodied for righting the object, or for any other purpose, on principles of optics which are well understood.

I provide a primary reticule and a secondary reticule each adjustable, independently of the other, both in vertical and in lateral directions. And, in one form, I provide a double reticule comprising two needles which, for aiming at a moving object, may be adjusted simultaneously and equally in opposite directions from the optical axis, at any angle of altitude.

Of the primary and secondary reticules, either one may be used for sighting on a trial shot. Then, while holding the gun as initially aimed, with that reticule which was used continuing on the target, the other reticule may be adjusted to sight on the spot where the missile struck. Thereby all of the errors due to range, windage, deviation of barrel, etc., will have been integrated; and if the adjusted reticule be used for sighting another shot while conditions remain the same, they will have been rendered nugatory,—that is, in effect, the aim is corrected.

In using the double reticule, for a target moving across the field of a fixed gun, as anti-aircraft, the points of the double reticule are to be set together, which will be approximately on the optical axis, and may be rotated about the optical axis until the direction in which this reticule splits is that of the apparent line of target flight. During flight of a missile the gun is to be continued stationary; and one point of the double reticule is manually to be moved with the moving target and to be stopped in the position which is occupied by the target at the instant the missile arrives, as known by the burst of the shell. The second point of the double reticule will have been moved simultaneously by the mechanism and will have been stopped at an equal distance in the opposite direction. Then, by using this second point for aiming, thus using the reticule which has moved in direction opposite to the apparent travel of the target, the correction needed for movement of the target will have been made. Without firing a preliminary shot, the same result can better be gained by merely following the target with the double reticule for a period equaling the known time of flight of missile. In this case range and windage may be preliminarily obtained by other means or observers, as at present, and correction made external to the telescope as is now commonly done with telescopic sights.

On a hand rifle the double reticule provides a lead for shooting at a running animal or other object moving horizontally. The corrections needed for range or windage under these circumstances are ordinarily negligible; but if the impact of the missile is observable the correction needed can be estimated by noting the relation of its position to either of the reticule positions,—the single reticule being preferably left set at the zero position of the double reticule.

As a means of assuring proper levelling of the firearm, I provide a spirit level within the telescope, and combine therewith a mirror whereby the level may be seen by the user of the telescope. Also I provide for introducing artificial light to the interior of the telescope to make the reticules visible if the exterior light is dim.

It is intended that the patent shall cover by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawings, in which the "perspectives" are made in isometric style; and in which the large arrow indicates the direction of sight:

Figure 1 is a perspective of part of a rifle having mounted thereon a telescopic sight embodying features of the invention, portions being broken away for clearness of showing;

Figure 2 is a perspective of the supporting and attaching element of the telescope;

Figure 3 is an elevation in section approximately on the line 3—3 of Figure 1;

Figure 4 is a perspective, on an enlarged scale, showing a portion of a telescope having one form of mounting and adjusting means for a lower reticule, the cross-section being comparable to one on A—A of Figure 1;

Figure 5 is an end elevation of the telescope portion of Figure 4, looking toward the muzzle end;

Figure 6 is a view similar to Figure 4 but looking from the muzzle end, and showing a different upper reticule mounting and adjusting means, the cross-section being comparable to one on B—B of Figure 1;

Figure 7 is an end elevation of the telescope portion of Figure 6, looking from the muzzle end;

Figure 8 is an elevation in medial longitudinal section through the telescopic sight proper, a portion of the tube being broken away, and the mounting means for the reticules being omitted;

Figure 9 is an elevation, in section approximately on line A—A of Figure 1, the mounting means for the reticules being omitted, and the reticules being portrayed diagrammatically;

Figure 10 is a perspective similar to Figure 4, but showing a double reticule, its points being in side-by-side relation;

Figure 11 is an elevation in section on 11—11 of Figure 8;

Figure 12 is a perspective showing a modified form of reticule supporting and adjusting means, as on the line A—A of Figure 1;

Figure 13 is an end elevation of Figure 12, looking toward the muzzle end;

Figure 14 is a perspective showing a simplified form of reticule mounting and adjusting means;

Figures 15 and 16 each is an elevation of a fragment of a telescope tube, in medial section, showing still other simple forms of mounting and adjusting means for a reticule;

Figure 17 is a plan of Figure 16;

Figure 18 is an elevation, in medial vertical section, of still another form of reticule mounting and adjusting means;

Figures 19 and 20 are elevations in section respectively on lines 19—19 and 20—20 of Figure 18; and

Figure 21 is a view similar to Figure 13, on a smaller scale, showing a modified form in which the lower reticule has two sighting points comparable to those of Figure 10.

The invention is portrayed as it may be applied to a hand rifle 10;—but, except as to matters which are found only in hand rifles, this illustrates a practicability which extends to firearms in general, and the rifle may be taken as representative of any gun for projecting a mis-

sile at a target, whether the gun be small or large, portable or mounted.

In Figure 1 the rifle 10 has the usual barrel 12 and receiver 14 which latter provides a shoulder at 16 facing forward. A customary type of notched sight 18, having a usual means 22 for vertical adjustment, is shown having a customary anchorage at 20 on the gun barrel 12. The low plinth or block 20 of this anchorage, rigid on the top of the barrel, extends slightly thence to left and to right in a tangential manner.

The invention provides so that these ordinary and usual parts of a rifle can be utilized for mounting and securing a telescopic sight. The telescope, separable into tubular eye piece 24 and barrel piece 26, has the latter rigidly secured as at 28, 28 to a parallel short tubular element 30 which lies on the rifle barrel and constitutes a demountable elastic connector between telescope and rifle, preferably held only by friction. The connector 30 is a segment of a tube whose under side is cut away as at 32, leaving the edges of the segment to provide bearing edges or feet 34, 34, which are adapted to rest on the rifle barrel, having bearing on each side of the top. Preferably the greater part of the length of each edge of this segment is rebated as at 37 leaving, however, two legs 36 for a rear bearing and two 38 for a forward bearing; and leaving depending elastic claw legs 39 which approximate being cylindrical arcs. The curvatures at the forward legs 38, 38, and the spread between their feet are such that, as the connector 30 is moved longitudinally along the barrel 12 toward the receiver 14, its opposed claws 39, 39, (Figure 3) slip under the anchor block 20 of the ordinary rifle sight 18, and become held down thereby. These claw legs are not quite long enough to reach and bear on the barrel, and, being residuary arcs of the original cylindrical tube 30 they have a capacity for being spread slightly, and, with suitable selection of metal, have an elastic tendency opposing the spreading, so that they stand under elastic pressure against and in close contact with the outboard edges of the rigid block on the rifle barrel. This is sufficient to hold them against all unintended dislodgment, yet to permit of their movement along the block by the hand of the user sliding the tube 30 back along the rifle barrel. He may do this until the legs 36 at the rear end are stopped by the shoulder 16 at the receiver 14. The mount is then steady and secure, with the telescopic sight automatically centered on the rifle barrel 12. The parts being properly dimensioned, the tension can be adjusted if necessary to make a fit, or in case of wear, by bending the claws slightly in or out. It will be observed that in this state of security the connector constitutes a sort of compound bridge, under tension in two directions. One is a bridge from two feet at the rear to two feet forward, tied down by the elastic pull of the claws between front and rear, which hold the connector under a stress of bending in its longitudinal vertical plane. The other is a bridge from left to right, the feet 34 firmly pressing on the oppositely inclined sides of the rifle barrel, and held so by the elasticity of the spread claws 39.

Of course the connector may be otherwise fastened if desired; and it is not necessarily on the top; or might be put on the receiver, by providing there a block for the claws to engage. In the case of ordnance it may be mounted adjacent to the gun barrel, provided it is parallel thereto.

This supporting bridge connector allows unobstructed vision directly along the barrel sights, for the user to find his object, and then a slight relaxing of position, a slight raising of the head, shows the target in the telescopic field. It is the difficulty in finding one's target that makes the ordinary telescope impractical for rapid fire.

As the telescope is rigid on the connector, the whole may be detached from the rifle by merely slipping it a little toward the muzzle end, sufficient to disengage the claws 39.

The telescopic sight proper, as illustrated, embodies an eye piece having lens 40, and an object lens 42 at the forward end of barrel 26. With only these two lenses the image is inverted. An erecting lens combination may be added at the eye piece. But the two-lens device has the advantage of greater brightness of image; the inversion is not particularly objectionable; and this construction is a measure of economy.

For practicing the invention it is preferable to use reticules of the needle point type, and to set them extending in opposite directions, preferably one downward and one upward; both being approximately in the focal plane. To distinguish in referring to them either one may be termed the primary reticule, and the upper one 44 being so designated herein; and the secondary or auxiliary reticule is indicated at 46. Both may be mounted in the barrel piece 26; or both in the eye piece 24; or one in each.

For ordinary uses each reticule is mounted so that it can be moved in two dimensions in the focal plane,—each reticule independently of the other, and each dimension independently of the other,—instantly at will, by any convenient manual device, as a screw or a lever.

The drawings illustrate selections among the many mounting and operating arrangements which are available; Figures 4 and 5 show operation by cam and lever; Figures 6 and 7 by screws; Figures 12 and 13 show one reticule operated by cam and the other by screw; Figure 14 shows the two dimensions of a single reticule each controlled by a screw; and in Figure 15, which at present seems to be the form preferred for ordinary usage, has one dimensional movement of a single reticule controlled by screw 92 and one by cam 94. In each of these cases precision of retractile response of the reticule, to a withdrawal of the push of a screw or cam, is attained by some form of spring. The spring itself may carry the reticule, and may be directly mounted on one of the telescope tubes as in Figure 15 and in Figure 14, at the focal plane; or it may be a cantilever spring (not shown) mounted at a distance axially from the focal plane, in a manner already known; or the spring may be applied to a suitably guided carriage which holds the reticule, one type of spring for this being shown at 68 in Figures 4 and 5, and another at 68' in Figures 12 and 13.

As a measure of greatest convenience the springs and other mountings are placed within one of the tubes, preferably the telescope tube, with their operating knobs or levers projecting to convenient locations for the user's fingers to reach and move them.

In the specific form illustrated in Figures 6, 7, the primary reticule 44 is mounted on a horizontally movable carriage 48, which in turn is mounted and is adjustable laterally on a larger and vertically movable carriage 50, there being horizontal guide pins 52, for the carriage 48 to move in one lateral direction against springs 54, one of which is strung on each pin 52, between vertically extending portions of the respective car-

riages, when pushed laterally by a manually accessible adjusting screw 56. The other carriage has guide pins 58 and springs 60 strung thereon with adjusting screws 62. These carriages 48, 50 are merely pieces of bent, thin sheet metal, or fragments of square tubing, punched to receive the wires 52, 58.

The means providing for movement of these reticules, laterally and vertically, may be of any suitable sort. For illustrating different types, Figures 4, 5, represent the auxiliary reticule 46 carried at the end of a compound spring arm 64, which may be merely a suitably shaped piece of spring wire or sheet metal, in the nature of one end half of a fully elliptical spring. This, anchored at one end, which is the middle of one side of such a supposed ellipse extends thence to the tip of the ellipse where it makes a V-reversal and comes back to the middle of the supposed ellipse, where its free end is turned upward vertically to constitute the reticule point 46. This spring is mounted on a carriage 66, which may be similar to the larger carriage 50 heretofore explained, adjustable on a vertical guide pin 70, against a spring 68 engaging between the carriage 66 and the tube wall. The possibility of having varieties of adjustment control is here illustrated by showing shaft 72, which extends crosswise of the tube, shaped as a cam adapted to engage and elevate the carriage against the spring. A suitable lever arm 73 on the cam facilitates quick vertical microscopic adjustment of this carriage and auxiliary reticule. For lateral adjustment of this reticule I also show a cam 74 extending vertically into the tube in position to bear against the spring arm 64 which carries the reticule point 46.

What I at present consider to be a preferred form of reticule mounting and adjusting is illustrated in Figure 15, wherein only the upper reticule is shown, it being obvious that a lower reticule might be similarly mounted and adjusted. In this case a flat spring 86 approximates the shape of one-half of an elliptical spring. One end of this spring 86 is anchored preferably at the focal plane, whence the spring extends for a distance along the tube and thence back toward the focal plane. But before reaching the focal plane it has attached to it a lighter and more flexible strip of spring metal 88, which terminates in the needle reticule 90, standing in the focal plane. Vertical adjustment of the reticule may be accomplished by adjusting screw 92; and lateral adjustment may be accomplished by cam 94 which extends vertically into the tube and operates laterally against the resilience of the spring 88 which tends to return the reticule whenever the cam permits.

It is a feature of the device of Figure 15 that adjustment of the reticule vertically can be made without displacing to any appreciable degree the reticule from the focal plane. The adjusting screw 92 extends through a slot 87 in the long arm of the spring 86 and engages the shorter arm thereof. As a result, adjustment of screw 92 tends to spread apart the arms of the spring, and also moves the spring as a whole in the direction of adjustment, flexure for which occurs adjacent to the anchored end of the spring. This compound flexure produces a resultant movement at the reticule which is approximately vertical in the focal plane, without appreciable swinging of the reticule out of that plane.

In Figure 14 a simple mounting and adjusting means is represented wherein the spring 85 which carries the reticule 89 extends in direction around the tube, in, or in the region of, the focal plane. Here again the lower reticule may be similarly mounted, with the spring reversed, one reticule to be on the edge of its spring which is toward the muzzle end of the barrel, and the other reticule to be on the edge of its spring which is toward the eye piece, so that both reticules may stand in the focal plane of the object lens. Both springs can be thin and narrow.

The somewhat more involved mounting and adjusting means portrayed in Figures 12, 13 may be desirable in some cases. Here the vertical adjustment of both primary and auxiliary reticules is guided by the vertical guide pins 58', 58'. The primary reticule 44', in this form, is carried on a carriage 48' which is adjustable laterally on the larger carriage 50', along the transverse guide pins 52', 52'. And in this form, as in the form of Figures 6, 7, there are springs 54', 54', one on each pin 52', which engage between portions of carriages 48' and 50', yieldingly urging the smaller carriage 48' against an adjusting screw 56'.

Both the carriage 50' and the lower carriage 66' are mounted slidably on the vertical pins 58', 58'. And springs 68', 68', one of which is associated with each of the pins 58' yieldingly urge the carriages 50' and 66' apart. For vertical adjustment of primary reticule 44', the adjusting screw 62', engaging the upper side of the carriage, may serve. And cam elements 72 and 74 may serve as in Figures 4 and 5, respectively for vertical and lateral adjustment of auxiliary reticule 46.

In the assembly showing of Figure 1, the mounting and adjusting means for the reticule may be considered to be those of either Figure 12 or 14. But, in Figure 1, and also in the details of Figures 3–5, I have represented the operating arm 74' of the vertical cam 74 as extending forward between barrel 26 and connector 30, and as having a transverse finger piece 75 extending a little to each side, so that the arm 74' may be pushed to one side by pressure of one finger. Preferably the finger piece 75 will frictionally engage the underside of barrel 26 in order to be held by friction in adjusted position.

In use, my improved telescopic sight may be mounted as heretofore explained on a rifle, or may be suitably secured with reference to any tube for projecting a missile. Assuming that one is to shoot at a target the range of which is undetermined, and as to which the windage and other deflecting forces are unknown quantities, one may preliminarily set the auxiliary reticule preferably in the region of the center of the field of vision, but at an elevation estimated proper for the range; may aim so that in the telescopic sight the auxiliary reticule is on the target, and may make a trial shot. Then, holding the gun with the auxiliary reticule fixed on the target, indicated at T in Figure 9, one adjusts the primary reticule to the spot S (Figure 9) which is seen to have been struck by the bullet on that trial shot. The primary reticule can then be used for sighting on subsequent shots, as, so long as conditions remain the same, this setting of that reticule will have made correction for all errors in the trial shot due to range, windage and other deflecting causes.

For a target, as an aeroplane, moving across the field of vision I may employ the double reticule, comprising the pair of needles 76, 78 shown in Figure 10, to aim at a proper lead in the direction

in which the object in flight is traversing the field. The two needles of this pair will first be set together, the slight space if any between their points constituting the sighting reticule for a preliminary observation or shot. With the gun held unmoved during the known or observed time of flight of the missile from the gun to the object, one of these needles, for example, 76, is made to follow the image of the moving object in the telescopic field. This is easily done by a turning of the lever and cam 73, 80 and a turning of the reticules on the axis of the telescope. To facilitate this latter the double reticule will have been suitably mounted, as for example by setting it in an eye piece which fits rotatably into the telescope tube, as that shown in Figure 10 may be supposed to do, or that mounted on screw threads in Figure 8, with the imaginary line between the split tips 76, 78 always passing through the optical axis. When the missile has attained the distance of the object, the movement of this needle is to be stopped at the then location of the image of the spot struck, or supposed to be struck. The other needle of the pair, for example needle 78, will have moved simultaneously an equal distance in the opposite direction, and is stopped in a position which will effect the needed correction for the lateral flight of object, at whatever angle of altitude, during flight of missile. When used in this way the corrections for windage and for range, if any, are to be estimated or obtained by other means. The two needles 76, 78, may each be the tip of a compound spring arm similar to that in Figure 4, or may be made in any of numerous other styles. Their points when set together should be at the optical axis; and if desired they may be set on a vertically adjustable carriage 66. A single symmetrical cam 80 on a shaft extending vertically between the two spring arms provides for spreading the arms laterally and uniformly.

It may be found desirable in some cases to provide scale graduations on the adjusting screws or cams in Figures 1–15 to facilitate the making of any particular desired advance setting of the reticules, as for estimated range or to cancel a known lateral skew. Such graduations (not shown) may be embodied in a manner well known, as in Figures 16, 17.

With aid of such graduations and a pointer made for the adjusting cam of Figure 10, the divided reticule of that figure may be used as a range finder. These divided reticules 76, 78 can be set to the apparent width of a particular object (for instance a standard size of target, or a helmet) when seen at a known distance, say one thousand yards away, and again at other selected known distances, and then, a scale having been made and marked accordingly, showing the particular distances corresponding to successive particular degrees of turning of the cam, the user of the rifle may at any future time ascertain the distance of an object known to have the same width as that which was initially used for gauging the range, or can estimate the distance of any object as to which the ratio is known or estimated of its width to the width of the standard used in making the scale.

In Figures 16 and 17 I portray a device 96 fitting exteriorly on a sighting tube, providing the ramp-ribs 98 in position to protect the adjusting screws 100, 102. The face of the head of each screw 100, 102 may be marked with radial graduations 104, for registering with a mark or pointer 106 on the adjacent outward face of a rib 98. And the side face of the rib, adjacent to a screw 100, 102, conveniently may be graduated as at 108. By this means definite and predetermined adjustments of the screws may be made with corresponding adjustment of interior elements.

Figures 16 and 17 portray also a spring-held ring mount for a reticule. The ring is shown at 110, supported by the two springs 112, 114. Each spring is mounted on the tube at the plane of ring 110, having a portion extending along the tube in direction away from the ring and then turning and extending back to the ring which is secured to the free end of each. The screws 100, 102 are arranged to engage the ring at right angles to each other, for shifting its position. And one or both springs tend to keep the ring against both screws. Also it is important that movements of ring 110 can be in a single plane due to the particular spring suspension which produces a compound spring action when flexing occurs.

The form of the invention shown in Figures 18–20 employs a pivotally mounted tube for carrying a reticule. A relatively short length of tube 116 is somewhat less in diameter than the barrel piece of the telescope in which it is mounted. The tube 116 is pivotally supported at one end by a pair of pivot pins or screws 118, 118 which pierce the barrel piece from opposite sides. One of these pivots engages loosely in a hole 120 in tube 116, and the other engages in an elongated notch or slot 122 which permits slight swings of tube 116 around the pivot at 120, which at the remote end where the reticule is amounts practically to movements of the reticule from side to side, and also permits up and down movements of the reticule and around the axis of the two pivots, and composite movements in intermediate directions. Two adjusting thumb screws 124, 126 may pierce the barrel piece, one at the top and the other at one side, for engaging the tube 116 at the end remote from the pivots, suitable graduations being provided on the screw heads and on ramp-ribs 130, for facilitating setting of the reticule 132. And a portion of the wall of tube 116 may be slit and pressed outward for serving as a spring 134, for urging the tube against both of the adjusting screws 124, 126.

If desirable or necessary, levelling means may be provided within the telescope, without obstructing view or otherwise interfering with its regular uses. In Figures 8 and 11 there is portrayed such means comprising a disk of thick clear glass 80 set across the telescope tube. The disk has thickness sufficient to permit of its being drilled, as shown in Figs. 8, 11, for receiving a liquid whose bubble 82 acts as in a well known type of level. This being at a location interiorly of the tube, out of the easy line of vision, the upper surface of this disk is provided with a bevel of about 45°, as at 84, whose surface, silvered if desired, is a mirror for reflecting the image of the bubble 82 to the eye of the user of the telescope. Preferably the disk 80 will be located a little in rear of the focal plane, to avoid interfering both with the reticule mounts and with needed clear vision of the reticules. The disk 80 might be one of the telescope lenses.

The essential parts of the invention are inexpensive. They can be made and assembled at low cost, as compared with telescopic sights heretofore available. While perfection of lenses is desirable for some uses, I have found that two very inexpensive lenses of fair grade will suffice for giving excellent results to the ordinary users of firearms for target shooting and hunting, the inversion of the image

of the sighted object being something to which one soon becomes accustomed. But, if an upright image is required, the simple addition of other lenses, preferably in the eye piece, in a manner well understood in the art of optics, will accomplish it. The internal threads illustrated in the eye piece 24, provide means by which a second eye piece carrying an erecting combination may be added to the device herein illustrated.

It will be understood that the accompanying drawings are more or less diagrammatic; also that the illustrated specific construction of connector 30, and the manner of its association with the sighting tubular body, may be varied, as by making the tubular body and connector 30 as an integral piece, die cast or otherwise formed.

The telescope tube is useful for keeping the lenses clear and for excluding light, but should not be regarded as essential inasmuch as the optical axis and the relation of the lenses are the controlling factors in the attaining of my improved results with reticules as described, in the focal plane. Other lens and reticule supporting means may be provided. Several optical methods of arrangement of lenses and reticules are known, and many variations thereof, and my invention is applicable to these, with or without a sighting tube, as well as in connection with the various known types of lenses and reticules.

I claim as my invention:

1. A telescopic sight comprising a telescope having an object lens, combined with two reticules at its focal plane; and individual mounting means for these two reticules, for holding them simultaneously in diverse aiming positions; one of the said mounting means being a movable support, whereby the reticule thereof can be moved universally in a transverse plane into a position which is aim-corrective relative to a simultaneous aim-position of the other reticule, these two aim-positions being available for use simultaneously.

2. A telescopic sight comprising a telescope having an object lens, combined with two reticules at its focal plane; and individual mounting means for these two reticules, for holding them simultaneously in diverse aiming positions; each of these mounting means being movable in a transverse direction independently of the other reticule, and the diverse aiming positions being available for use simultaneously.

3. A telescopic sight comprising a telescope having an object lens combined with two needle reticules at its focal plane, simultaneously standing in position for use, pointing in opposite directions transversely of the telescope; one of said reticules having a support which is freely movable in a transverse direction, by which its reticule is movable in said focal plane independently of that other reticule; whereby it can be set in aim-corrective position relative to a simultaneous aim-position of the other reticule, these two aim-positions being available for use simultaneously.

4. An aiming device for a firearm comprising a tube adapted to be mounted thereon parallel to the barrel; two reticules mounted in the tube, comprising mutually independent rear sights; means mounting these two reticules individually in diverse simultaneous positions for aiming; the second of these reticules having two sighting points and supports therefor which are movable independently of the first reticule; means coordinating the movements of the two said sighting points of the second reticule so that their movements are equal in length and mutually opposite in direction, transversely of the tube, whereby, when one sighting point of the second reticule is moved into a position for correction of the aim made by use of the first reticule, the said coordinating means moves oppositely the other sighting point of the second reticule into position for the aim; and manipulating means outside of the tube for manually controlling the movements and positions of the second reticule.

5. A sighting device for firearms comprising a tubular body mounted on the firearm; aligning means, for aiming the firearm, in which the line of aiming vision passes through the tube; said aligning means including two reticules within the tube; mounting means for each said reticule mutually independent to the extent that both may simultaneously be in aiming position and that one of them is free from the other for aim-correcting movement transversely of the tube; each said reticule having a sighting needle which extends transversely of the tube in direction opposite to the sighting needle of the other reticule.

6. A telescopic sight for firearms, comprising a tubular body; an object lens at one end of the tube; a reticule at the focal plane of said lens; and a spring mounted on the tube in the region of said focal plane, and carrying said reticule; said spring having a portion approximating the form of an end-half of an elliptical leaf spring which is adapted to flex in one direction, and having as a continuation a more flexible portion on which said reticule is directly carried; said more flexible portion being arranged to flex on said leaf portion in a plane normal to the plane of flexure of said flexible portion.

7. A sighting device for firearms comprising a tubular body mounted on the firearm; aligning means, for aiming the firearm, in which the line of aiming vision passes through the tube; and means removably associating said tubular body in sighting relation to the barrel of the firearm, comprising a connector secured to said tubular body, having firearm-engaging supports, fore and aft, for resting on the firearm, and having a pair of claws between said fore and aft supports for longitudinal slip-engagement under a fixed piece on the firearm.

8. A sighting device for firearms comprising a tubular body mounted on the firearm; aligning means, for aiming the firearm, in which the line of aiming vision passes through the tube; and means removably associating said tubular body in sighting relation with the barrel of the firearm, comprising a tubular connector secured to said tubular body, having a pair of forward supports and a pair of aft supports, each pair being spread laterally for resting on the firearm, and having, at a location between said fore and aft supports, a pair of stiff spring claws for engagement by longitudinal slip under the sides of a fixed piece on the firearm.

9. An aiming device for a firearm comprising a tube adapted to be mounted thereon parallel to the barrel; two reticules mounted in the tube, comprising mutually independent rear sights, the second of which reticules has two sighting points; means mounting these two reticules individually in diverse simultaneous positions for aiming; there being a portion of said tube which is rotatable relative to the remainder of the tube, and which includes supports, for mounting the second of these reticules, which supports are movable independently of the first reticule; and means coordinating the movements of the two said sighting points of the second reticule so that their movements are equal in length and mutu-

ally opposite in direction, transversely of the tube, and manipulating means outside of the tube for manually controlling the movements and positions of the second reticule.

10. A telescopic sight for firearms, comprising a tubular body having a lens mounted therein; a shorter tube of smaller diameter pivotally mounted within the tubular body at a distance from the focal plane, and carrying a reticule approximately in the focal plane; means for adjusting said shorter tube about its pivots for setting the reticule; and resilient means urging said shorter tube against said adjusting means.

11. A telescopic sight for firearms comprising a tubular body having a lens mounted therein; a shorter tube of smaller diameter, having diametrically opposite mounting pivots within the tubular body at a distance from the focal plane, and carrying a reticule approximately in the focal plane; means for adjusting said shorter tube about its pivots for setting the reticule; and resilient means urging said shorter tube against said adjusting means; one said pivotal support comprising a pin threaded in said body and fitting in a longitudinal slot in the shorter tube, whereby the reticule-carrying portion of the shorter tube is adjustable in all directions from the focal axis.

12. In a firearm, an aiming device therefor which includes a group of three sights mounted on the barrel of the firearm; means for adjusting said sights to positions where they severally cooperate for the aiming; of the firearm; the second of these sights being movable transversely of the direction of aim, to a location for registering with an observed error resulting from an aim made through the location in which the first of said sights is set; and connections for moving the third sight to an aim-corrective location which, as related to the line of said aim through the first sight, has its direction opposite and its distance equal respectively to the direction and distance therefrom of the said error-registering location of the second sight; all of the three said sights being simultaneously available for the making of an aim.

13. In a sight for firearms having a tube with adjustable reticule therein, the combination therewith of a spring mount for the reticule wherein the attachment of the spring to the tube is at the plane of the reticule transversely of the tube and the body of the spring extends away from said attachment and said plane, then back to said plane by means of a reverse bend, said reticule being mounted on the spring at its free end whereby the reticule remains in said plane in all positions of transverse adjustment; said portion of spring which extends from its said attachment to the bend being operatively movable freely; and means beyond the bend for engaging the portion of spring which holds the reticule, for adjusting the position of the reticule within the tube.

14. A sight for firearms, comprising a tubular body having a reticule adjustably mounted therein; said mounting comprising a reticule carrier extending from said reticule a substantial distance within the tube to a location where it is pivotally mounted; said carrier having, at said pivotal location, two portions respectively adjacent to opposite sides of the tube, and combined with a pin at each side of the tube projecting from the tube toward the axis and pivotally mounting said carrier; there being a longitudinal groove in one of said portions of carrier, in which one of said pins engages whereby said carrier can swing longitudinally of the tube slightly about the other said pin, whereby the end of carrier holding the reticule is free to move universally, at the focal plane, in directions approximately parallel to that plane.

15. A sight for firearms, comprising a tubular body; a reticule therein; a spring having a free portion carrying the reticule; and means for adjusting the position of the reticule both vertically and laterally, with flexure of the free portion of spring; the said free portion of spring beginning at and being supported at the plane of the reticule, and having a length, from that support to the reticule which it carries, exceeding the length of straight distance therebetween.

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