B. A. FISKE.

METHOD OF AND MEANS FOR TARGET PRACTICE.

APPLICATION FILED DEC. 11, 1918.

1,363,861.

Patented Dec. 28, 1920.

2 SHEETS—SHEET 1.

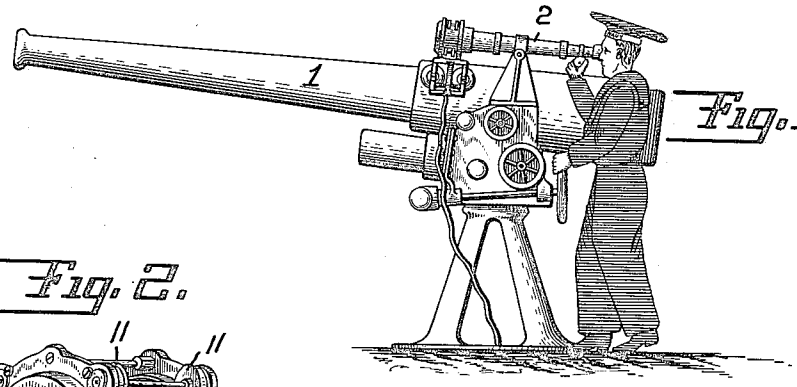


Fig. 1.

Fig. 2.

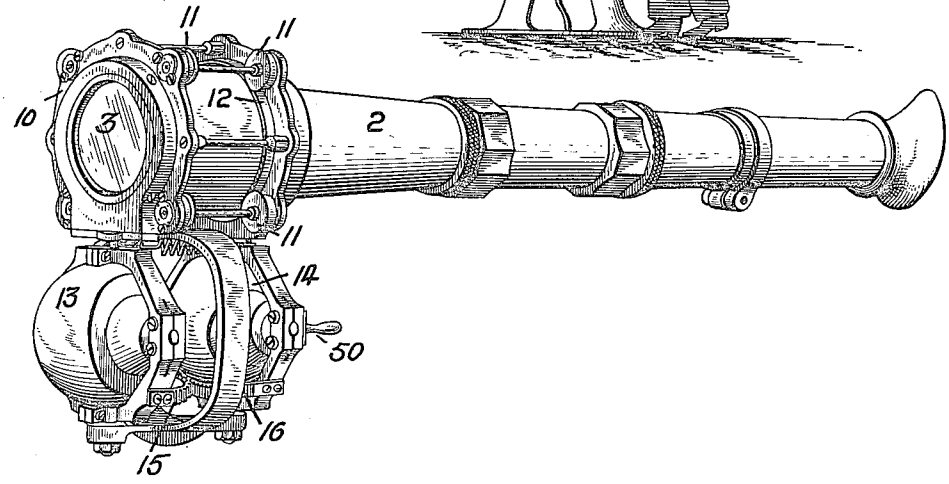
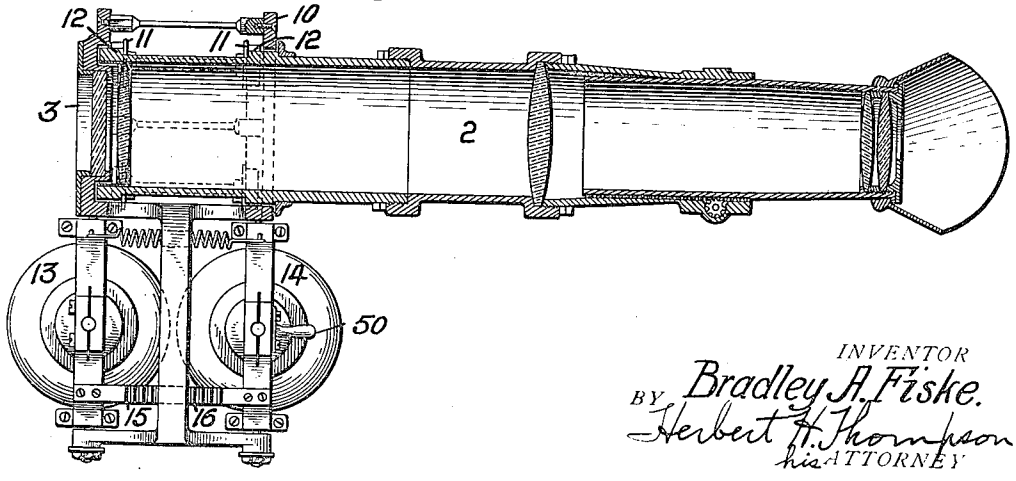


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

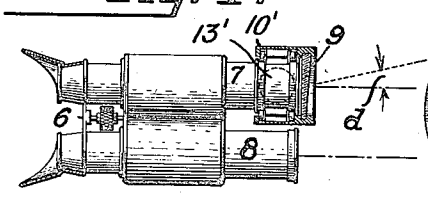


Fig. 5.

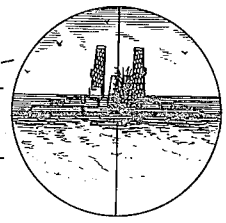


Fig. 6.

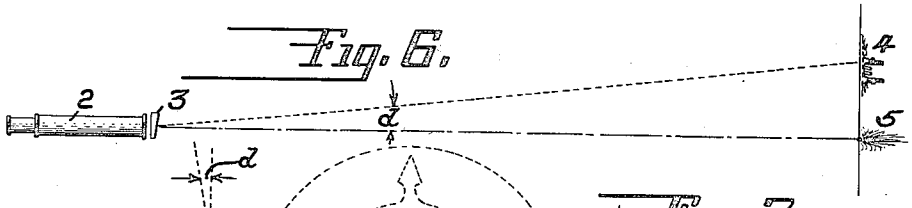


Fig. 7.

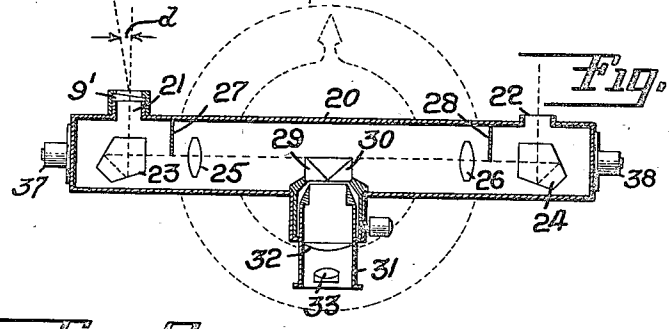


Fig. 8.

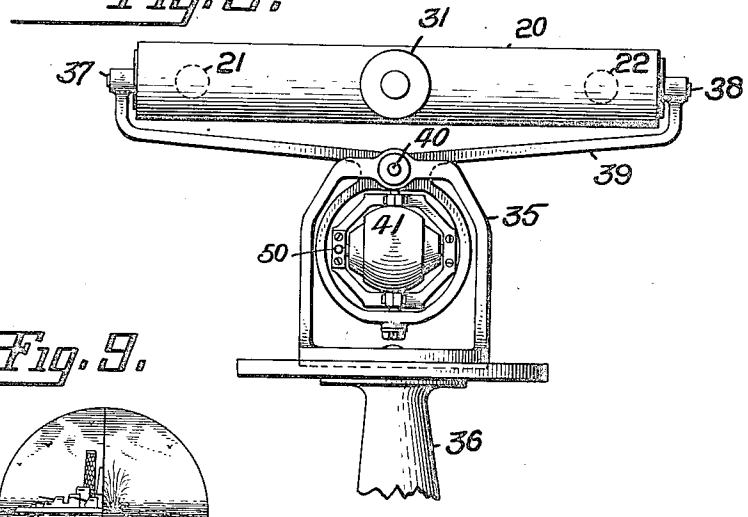
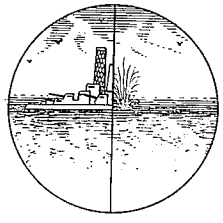


Fig. 9.



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UNITED STATES PATENT OFFICE.

BRADLEY A. FISKE, OF NEW YORK, N. Y., ASSIGNOR TO THE SPERRY GYROSCOPE COMPANY, OF BROOKLYN, NEW YORK, A CORPORATION OF NEW YORK.

METHOD OF AND MEANS FOR TARGET PRACTICE.

1,363,861. Specification of Letters Patent. Patented Dec. 28, 1920.

Application filed December 11, 1918. Serial No. 266,224.

To all whom it may concern:

Be it known that I, BRADLEY A. FISKE, a citizen of the United States of America and rear admiral (Rtd.) U. S. Navy, residing at 128 West 59th street, in the county of New York and State of New York, have invented certain new and useful Improvements in Method of and Means for Target Practice, of which the following is a specification.

This invention relates to a method and means of target practice especially adapted to be employed at sea.

At present it is the practice to employ targets which consist of large screens mounted on correspondingly long rafts which are towed into position and back to port when the practice is over. This method has numerous disadvantages. Due to the fact that the targets are unwieldly and not very seaworthy the target practice must be carried on near the coast and in good weather. The difficulty of handling the targets is so great, and the necessity of having them near a place of shelter and repair is so absolute, that bases must be established and the fleet is compelled to go to a certain place and at certain seasons for its target practice. Furthermore, it will be obvious that a great deal of time and labor is wasted not only getting the fleet to the target practice base but in handling the rafts after the base has been reached.

The present invention has for its principal object to provide a system in which any vessel may be employed as a target in any locality at sea thus obviating the above mentioned disadvantages together with numerous others. Other objects and advantages will appear as the description proceeds.

Referring to the drawings in which are illustrated what I now consider the preferred physical embodiments of my invention:

Figure 1 is an elevation of a gun with one portion of my system applied thereto.

Fig. 2 is a detail perspective of the sighting instrument shown in Fig. 1.

Fig. 3 is a longitudinal section of the instrument shown in Fig. 2.

Fig. 4 is a plan view of one form of spotting instrument.

Fig. 5 depicts the image formed by the instrument of Fig. 4 when an apparent hit is scored on the target.

Fig. 6 is a diagrammatic view employed in explaining my invention.

Figs. 7 and 8 are respectively a horizontal section and an elevation of a modified form of spotting instrument.

Fig. 9 depicts an image formed by the instrument shown in Figs. 7 and 8.

In my system any vessel may be selected as a target. The gunner sights on this target but means are provided whereby the projectile will hit a predetermined angular distance to the right or left of the target. A spotting instrument is employed which forms two images, one of the target or a portion thereof and the other of that portion of the field of vision which is at the same predetermined angular distance to the right or left of the target as that above mentioned. These two images are so positioned in the spotting instrument, as by being superimposed or juxtaposed, that the projectile appears to hit the target if the gun has been so aimed that a hit would have been scored were it no for the above mentioned predetermined deviation or deflection.

While the method or system may be carried out by spacing the longitudinal axis of the gun from the sighting axis of the gun telescope by a predetermined azimuth angle I prefer to leave this relationship undisturbed and to cause a predetermined azimuth deflection or deviation of the line of sight of the gun sighting instrument. Thus in Fig. 1 I have shown a gun 1 having the usual positioning controls and a common type of sighting instrument shown in the form of a telescope 2. The latter is provided with sight deflecting means shown in the form of a prism 3 so associated with the instrument 2 as to deflect the line of sight thereof to the right or left a predetermined angular amount *d*.

Calling attention to Fig. 6, assume that the battleship 4 is selected as the target. When the telescope 2 is on the target it will occupy a position in which its sighting axis lies along the line 5—3 where the angle 4, 3, 5 is the angle *d* above mentioned. This means that when the gunner has his cross-hairs on the target he is aiming his gun along a line at an angle *d* to the line 3—4 connecting the gun and target. If the gun is fired when the cross-hairs are in such position and the proper corrections for drift, etc., have been made the projectile will land

at 5 scoring an apparent hit but leaving the target unharmed. By "apparent hit" I mean what would have been a real or actual hit if the prism 3 were omitted.

Various forms of instruments may be employed to enable the spotter to determine whether or not an apparent hit has been made *i. e.* whether or not the fire of the gunner is accurate. One form of such an instrument is illustrated in Fig. 4 and comprises a binocular telescope 6 having sighting elements 7, 8. One of the latter has associated therewith a prism 9 preferably identical to the prism 3 for the purpose of deflecting the line of sight of said element through the same azimuth angle *d* referred to in connection with Fig. 6. If the spotter sights the target 5 by means of element 7 he will obtain not only an image of the target but, superimposed thereon, an image of the field wherein the shell should land if the aim is correct. In short if the aim of the gun is such that were it not for the prism 3 an actual hit would be scored, the spotter will obtain an image such as that shown in Fig. 5 which depicts an apparent hit, horizontally in the middle of the target.

The above explanation of the *modus operandi* is predicated upon the assumption that the prisms 3 and 9 refract the rays of light horizontally at all times. If such is not the case the refracted image will be thrown above or below its true position in elevation. If the invention is employed on a ship, as it is especially adapted to be, it is obvious that some means must be provided to stabilize the prisms 3, 9 about at least one axis, *i. e.* about the sighting axis of the corresponding instrument with which each prism is associated or an axis parallel thereto, so that the prism will remain horizontal. While this means may assume various forms such as stabilizing means for the entire ship or for the gun platform I prefer to employ the means shown in Figs. 1, 2, 3, 4.

The prism 3 is secured in a frame 10 rotatably mounted on the telescope 2 by means of oppositely flanged rollers 11 rotatably mounted on said frame 10 and riding on tracks 12 provided on said telescope. A pair of gyroscopic rotors 13, 14 are mounted on the lower portion of said frame for precession about axes parallel to each other and perpendicular to the axis of telescope 2 and for rotation about axes at right angles to said first mentioned axes. The gyros are coupled for equal and opposite precession by means of gear sectors 15, 16 and the frame 10 together with the mechanism it supports is pendulous about the axis of the telescope 2. It will be obvious to those skilled in the art that the structure above described will maintain the prisms in a given position, say the horizontal, with respect to the axis of the telescope 2, even though the latter is turning, because of the pitching and rolling of the ship. Since the stabilizing means aforesaid will not ordinarily prevent the gradual departure of the prism from the horizontal it becomes important to provide simple and efficient means for quickly accomplishing the readjustment of the position of the prism. It will be seen that if pressure be applied to the frame 10 to turn said frame about the axis of the telescope, the gyros 13 and 14 will precess, resisting such pressure and disarranging the stabilizing system. In order to prevent such resistance and disarrangement and to thereby permit the frame 10 to be turned quickly, and without disturbance of the gyroscopes, about the axis of the telescope, to reset the prism 3, I have provided a handle 50, secured to the frame of one of the gyroscopes, which handle may be grasped to prevent precession of the gyroscopes when pressure is applied to frame 10. In this manner if the prism departs from the horizontal, the observer at the telescope can note it, by reference to the horizon, and speedily readjust the position of the prism by simultaneously pressing on the lower portion of frame 10 and grasping handle 50. An alternative way of resetting the prism is to apply pressure in the correct direction to handle 50. As is well understood, such pressure or torque will cause the gyroscopes and frame 10 to turn about the axis of the telescope, which axis is at right angles to the axis about which the torque is applied.

Similar means may be provided for the prism 9 to stabilize the latter about the axis of the optical elements 7. Thus I have shown, in Fig. 4, a pendulous frame 10′ in all respects similar to the frame 10 except that a simple weight 13′, shown in dotted lines, is substituted for the gyros 13, 14. This weight 13′ which is secured to the frame 10′ forms a simple pendulum and as the optical element 7 is held in substantially horizontal position when in use the prism 9 will be stabilized about the sighting axis of said element 7.

The operation of my invention, as thus far described, should be clear in view of the preceding disclosure. It will be noted that a great saving in time and expense is effected as compared to the system now in vogue. Furthermore, target practice in which my invention is employed has the added advantage of arousing intense interest on the part of the crew. The gunner aims at a real ship and to the spotter the projectile appears to strike the ship if the aim is correct. Various instrumentalities other than those above mentioned may be employed. Thus the spotting instrument illustrated in Figs. 7 and 8 may be employed instead of that shown in Fig. 4.

This instrument is of the type generally

known as a coincidence meter and comprises means for bringing portions of the fields 4 and 5 (Fig. 6) into juxtaposition. A tube 20 is provided with openings 21, 22 and prisms 23, 24 adapted to reflect rays of light, entering said holes, along the axis of said tube. The latter is provided also with objective lenses 25, 26 opaque, non-reflecting screens 27, 28, prisms 29, 30 and an eyepiece 33. A prism 9′, in all respects the same as prism 9, is provided in the opening 21 for the purpose of deflecting the line of sight, through said opening, the same angular amount d as is the case in Fig. 4.

If, in employing the last described instrument, the spotter so directs the instrument that an image of the fore part of the target is obtained the image of the aft part of the latter will be cut off by the screen 27 and he will simultaneously obtain an image of the right hand half of the field at 5 which will appear adjacent the image of the fore part of the ship. The combined image is depicted in Fig. 9 which shows that the projectile was properly aimed in the case assumed as it appears to hit the target, near the middle. The observer at the spotting glass will, of course, point his instrument so that the vertical line will be in line with the splashes of the projectiles.

Figs. 7 and 8 illustrate also a somewhat different form of stabilizing means for the prism 9′. The tube 20 is shown universally mounted on a yoke 35 in turn supported for rotation about a normally vertical axis on a pedestal 36. This universal mounting is effected by pivoting the tube 20 for oscillation about its axis 37—38 in a frame 39. The latter is pivoted at 40 on the yoke 35 for oscillation about a normally horizontal axis at right angles to the axis 37—38. It is clear that if the instrument 20 is stabilized about the axis 40, the prism 9′ can be maintained horizontally in the same way as has just been explained with reference to Figs. 2 and 3.

In order so to stabilize the instrument a gyroscopic unit 41 in all respects similar to the unit comprising gyroscopes 13 and 14 may be provided on the frame 39.

In accordance with the provisions of the patent statutes, I have herein described the principle of operation of my invention, together with the apparatus, which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means. Also, while it is designed to use the various features and elements in the combination and relations described, some of these may be altered and others omitted and some of the features of each modification may be embodied in the others without interfering with the more general results outlined, and the invention extends to such use.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. The method of target practice which comprises aiming a gun at a predetermined angle to the line connecting the gun and target, producing an image of a field at an angular distance from said line equal to said predetermined angle and producing an image of the target at a predetermined position with relation to the first named image.

2. The method of target practice which comprises aiming a gun at a predetermined angle to the line connecting the gun and target, producing an image of a field at an angular distance from said line substantially equal to said predetermined angle, producing an image of the target and superimposing said images.

3. The method of target practice which comprises aiming a gun at a predetermined angle to the line connecting the gun and target, producing an image of a field at an angular distance from said line substantially equal to said predetermined angle, producing an image of the target and juxtaposing said images.

4. In combination a sighting instrument, sight deflecting means therefor and means for stabilizing said first named means about an axis with respect to said instrument.

5. In combination, a spotting instrument having two lines of sight, means for deflecting one of said lines of sight and means for stabilizing said first mentioned means about an axis and with respect to said spotting instrument.

6. In combination, a spotting instrument having two lines of sight, a prism in one of said lines of sight and means for stabilizing said prism about an axis and with respect to said spotting instrument.

7. The method of target practice which comprises aiming a gun at a predetermined angle to the line connecting the gun and target, producing an image of a field at an angular distance from said line equal to said predetermined angle, maintaining the horizontality of said angle, and producing an image of the target at a predetermined position with relation to the first named image.

8. Apparatus for use in target practice, comprising means for producing an image of an object at a predetermined angle with relation to the true position of said object and means for maintaining said angle in a given position with relation to the horizontal.

9. In combination, a sighting instrument, sight deflecting means therefor, a frame rotatably supported by said instrument and carrying said sight deflecting means, and stabilizing means attached to said frame.

10. In combination, a sighting instrument, a frame pivotally supported thereby, a prism carried by said frame in the line of sight of said instrument, and stabilizing means depending from said frame.

11. In combination, a sighting instrument, sight deflecting means therefor, a frame rotatably supported by said instrument and carrying said sight deflecting means, and a pair of inter-connected oppositely rotating gyroscopes depending from said frame.

12. In combination, a sighting instrument, a frame provided with rollers and rotatably mounted upon the outer surface of said instrument, sight deflecting means for said instrument carried by said frame, and gyroscopic stabilizing means suspended from said frame.

In testimony whereof I have affixed my signature.

BRADLEY A. FISKE.