Jan. 28, 1947. H. R. GROSS 2,414,807

SPOT-SIGNAL LAMP

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FIG. 1.

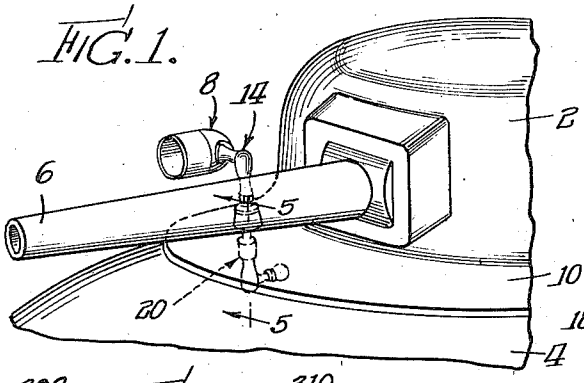


FIG. 3.

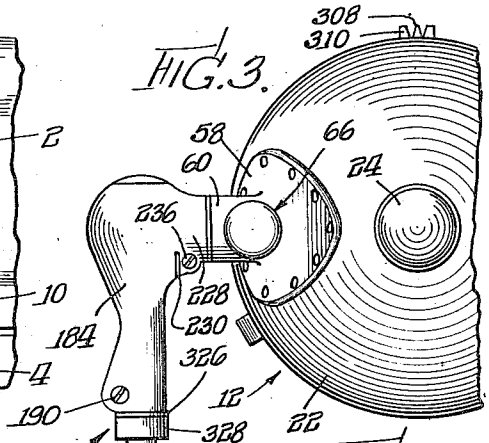


FIG. 2.

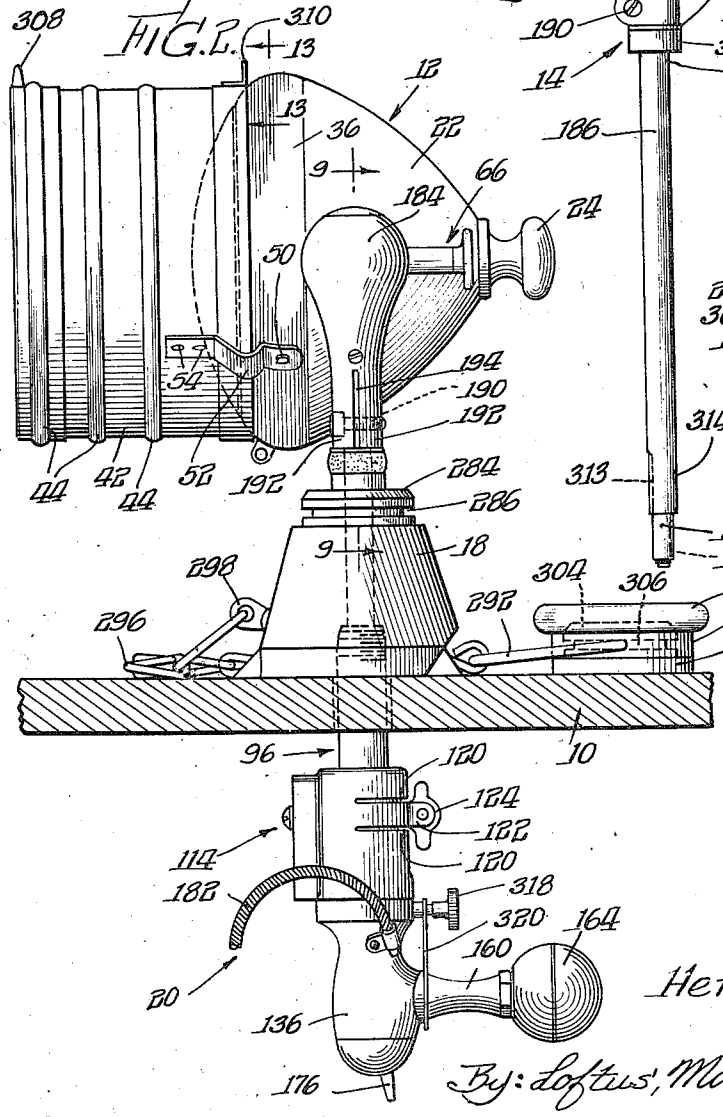
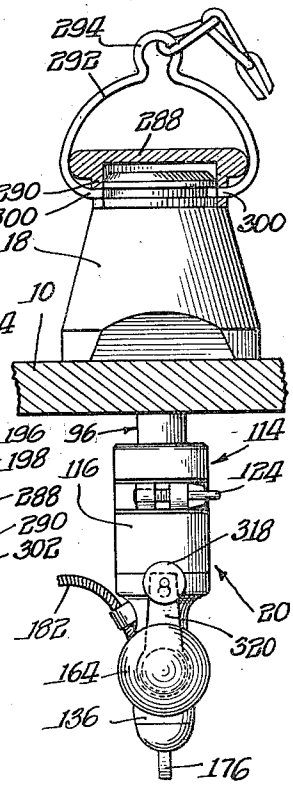


FIG. 4.



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FIG. 5.

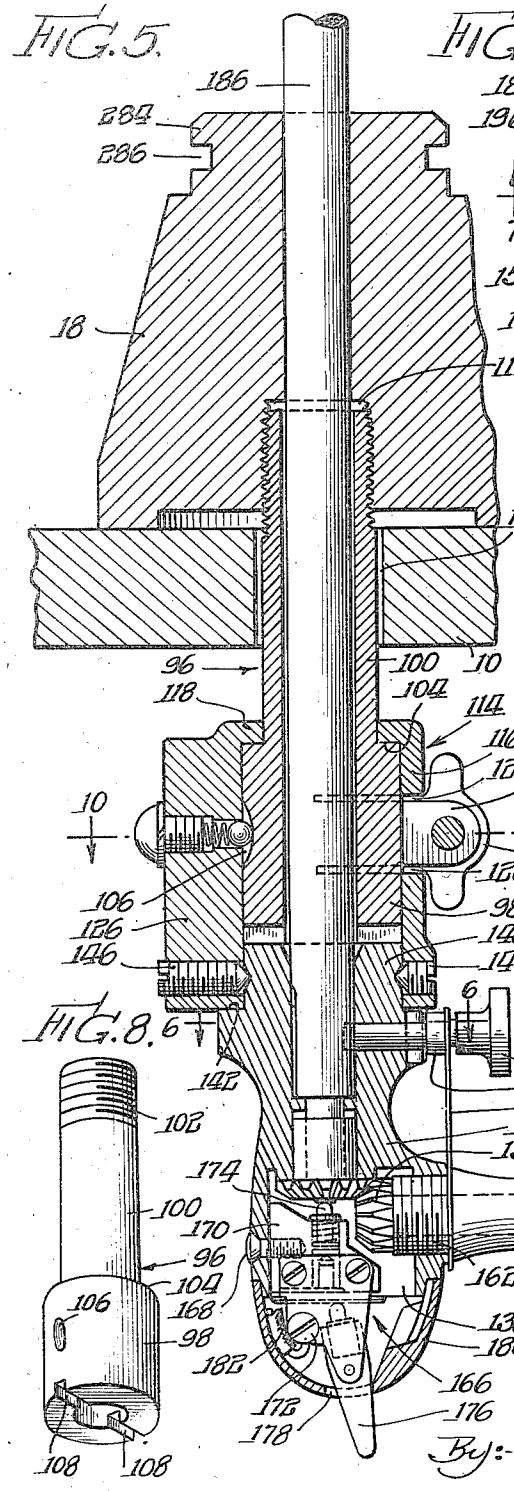


FIG. 6.

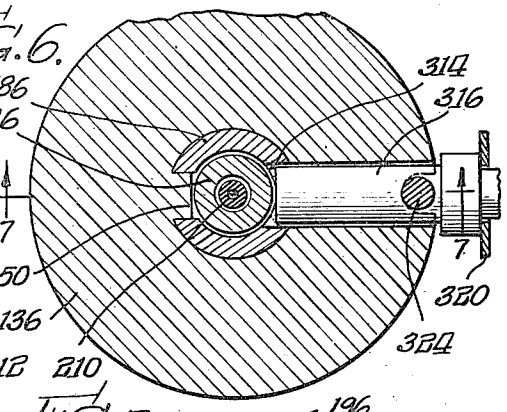


FIG. 7.

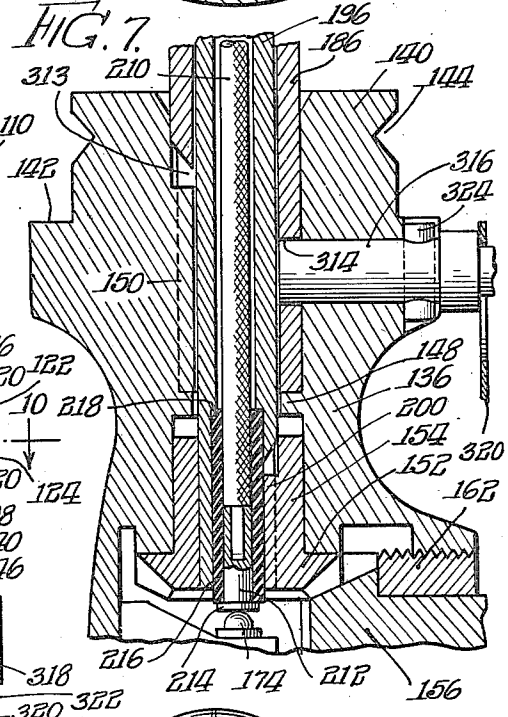


FIG. 8.

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FIG. 9.

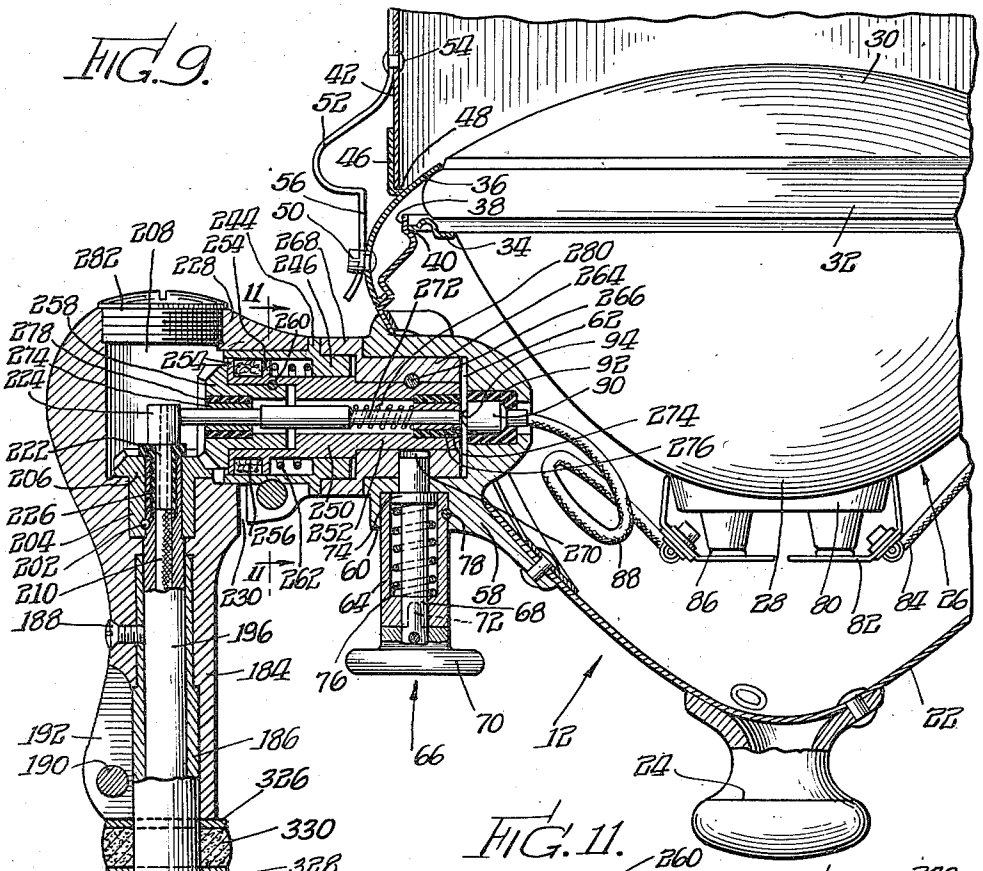


FIG. 11.

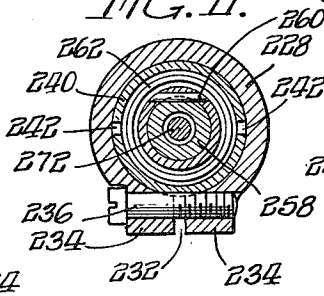


FIG. 12.

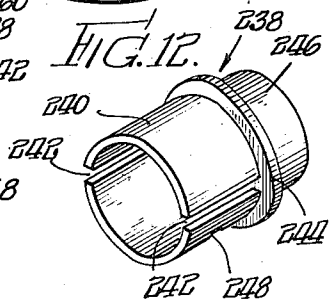


FIG. 10.

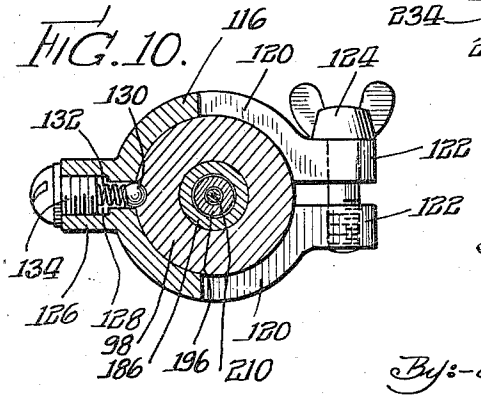
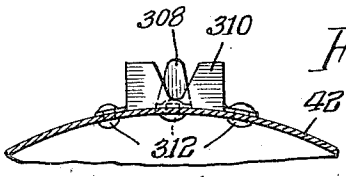


FIG. 13.



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FIG. 14.

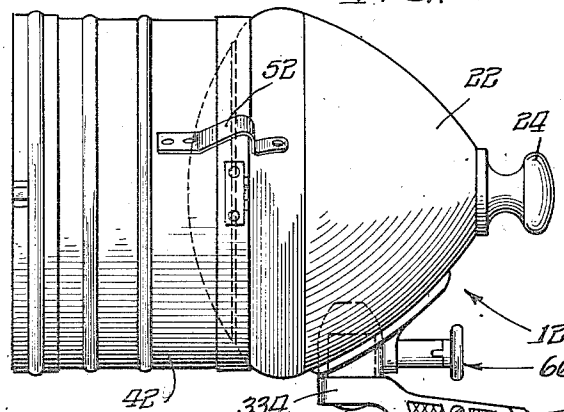


FIG. 15.

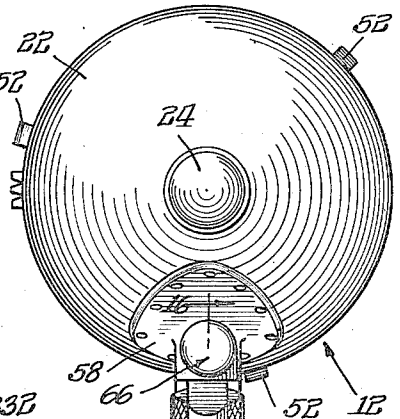
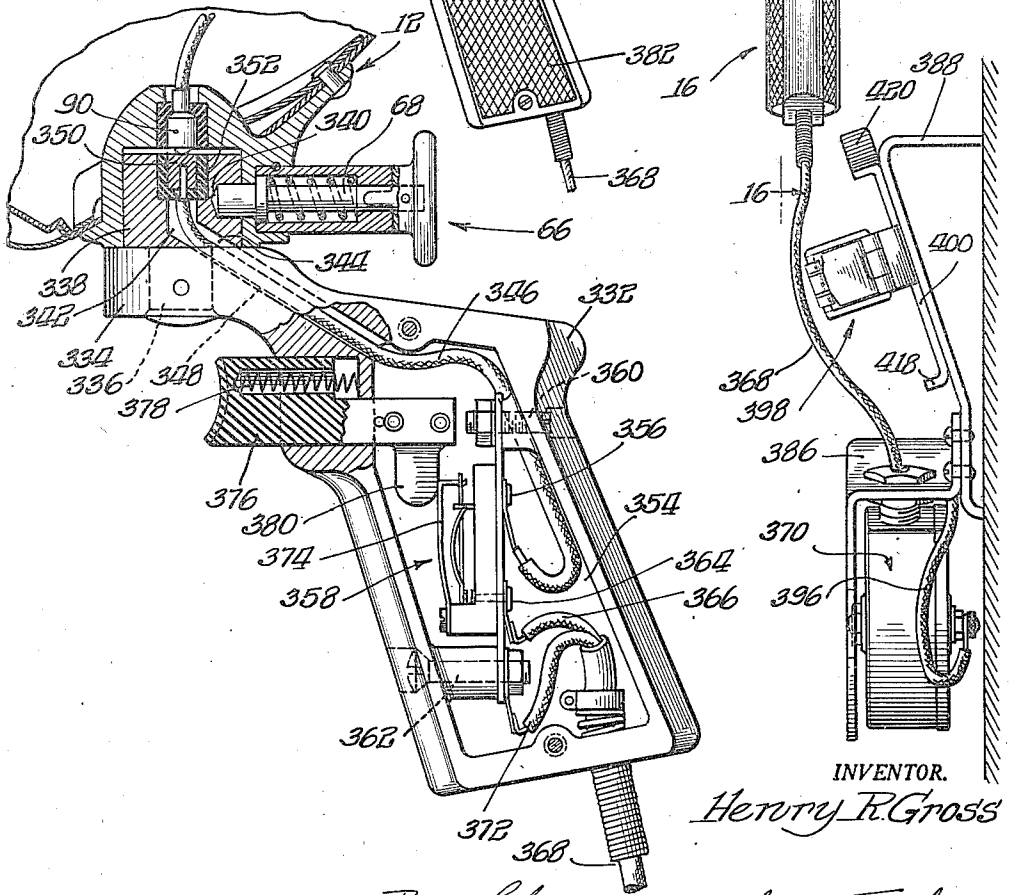


FIG. 16.



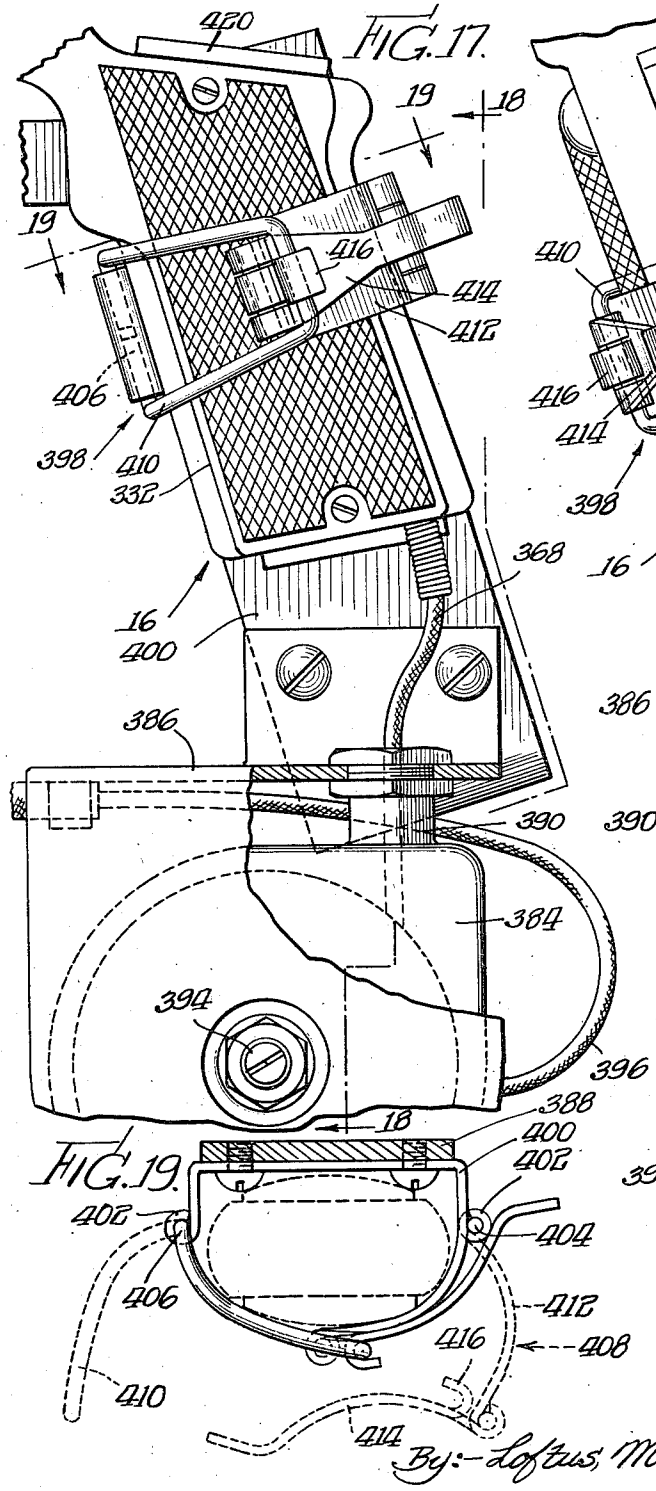
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SPOT-SIGNAL LAMP

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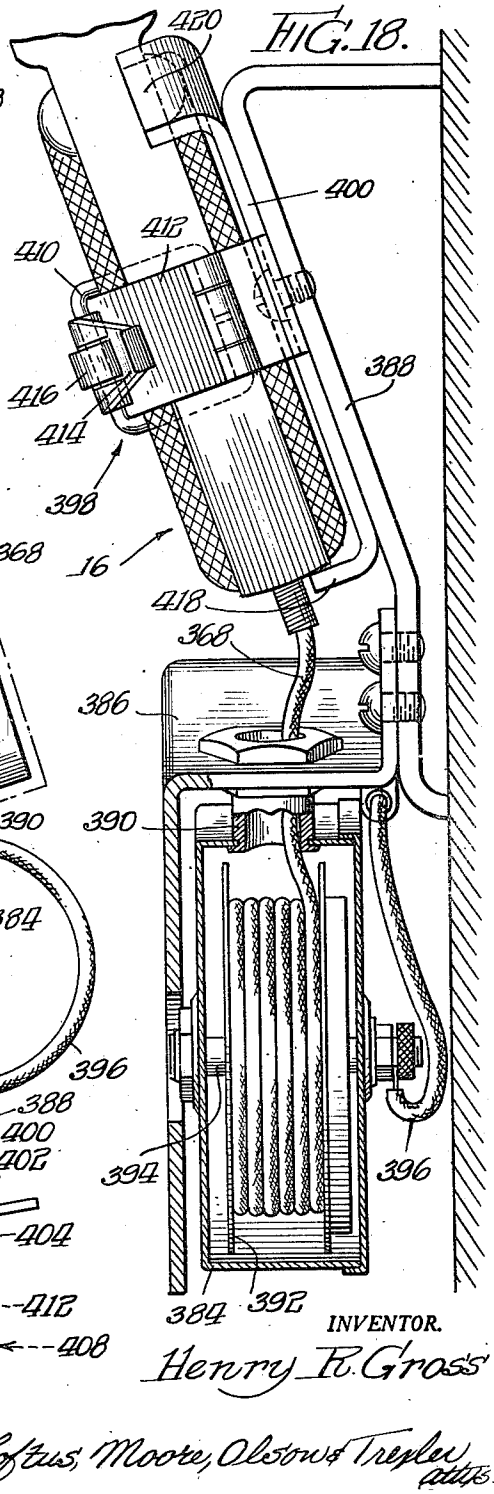


FIG. 19.

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UNITED STATES PATENT OFFICE

2,414,807

SPOT-SIGNAL LAMP

Henry R. Gross, Chicago, Ill.

Application September 11, 1943, Serial No. 501,954

9 Claims. (Cl. 240—61.13)

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This invention relates to a combined spot and signal light, and more particularly to such a device in combination with a gun, or the like, for controlling or determining the aiming of a gun, or the like.

It is an object of this invention to provide means for discovering a target and utilizing the position of the target locating means to determine automatically the aiming of a gun upon that target.

It is a further object of the invention to provide a spot-light construction automatically determining the proper positioning or focusing of a gun, or other directable device, upon a target.

The invention contemplates as one of its objects the provision of a gun mounted upon a shiftable base with target locating means shiftable independently of said base to locate a target, and constructed to automatically interlock with the shiftable base to determine automatically the aiming of the gun upon the located target.

A further object of the invention is to provide a combination search and signal light for use upon a tank and constructed for ready manipulation from within the tank to locate an enemy target; to determine automatically the aiming of the tank gun upon the target; to signal; and to facilitate night driving.

Another object of the invention is to provide a spot-light synchronizable with a shiftable gun, or other directable device, to insure accurate aiming or directing of the device upon an object or target in the beam of the light.

The invention further contemplates the provision of a portable search and signal light capable of instantaneous attachment to, or detachment from, a tank, armored car, or other vehicle.

Other and further objects and advantages of the invention will be apparent from the following description when taken in connection with the accompanying drawings, wherein—

Figure 1 is a fragmentary view in perspective of a tank embodying the invention;

Figure 2 is a fragmentary, enlarged view in vertical section through a spot and signal light constructed in accordance with the invention;

Figure 3 is a fragmentary view in elevation of the readily detachable portion of the spot-signal light shown in Figure 2;

Figure 4 is a fragmentary view in vertical section at right angles to Figure 2 and with a detachable portion of the light removed and replaced by a cover;

Figure 5 is a fragmentary, enlarged view in vertical section taken substantially along the line 5—5 of Figure 1;

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Figure 6 is a fragmentary, enlarged view in horizontal section taken substantially along the line 6—6 of Figure 5;

Figure 7 is a fragmentary view in vertical section taken substantially along the line 7—7 of Figure 6;

Figure 8 is a view in perspective of a mounting stud forming a part of the spot-signal light;

Figure 9 is a fragmentary, enlarged view in vertical section taken substantially through the line 9—9 of Figure 2 with the lamp unit directed vertically;

Figure 10 is a view in horizontal section taken substantially along the line 10—10 of Figure 5;

Figure 11 is a view in vertical section taken substantially along the line 11—11 of Figure 9;

Figure 12 is a view in perspective of a mounting sleeve forming part of the spot-signal light;

Figure 13 is a fragmentary view in vertical section taken substantially along the line 13—13 of Figure 2;

Figure 14 is a fragmentary view in side elevation illustrating the lamp unit upon the portable base of the spot-signal light;

Figure 15 is a view in rear elevation of the construction illustrated in Figure 14;

Figure 16 is an enlarged view in vertical section taken substantially along the line 16—16 of Figure 15;

Figure 17 is a fragmentary view in side elevation and partly in section illustrating the portable base of the unit in its releasable support;

Figure 18 is a fragmentary view in rear elevation and partly in section taken substantially along the line 18—18 of Figure 17; and

Figure 19 is a view in generally horizontal section taken substantially along the line 19—19 of Figure 17.

As shown in Figure 1, a rotatably mounted turret 2 of a tank 4 carries a gun or cannon 6 mounted thereon, aimed in horizontal direction by rotation of the turret and adjustable in a vertical plane for vertical aiming to the proper range elevation, all as is conventional. A combined spot and signal light 8 is mounted on the turret 2, preferably on a horizontal flange or skirt 10 of the turret to one side of the gun barrel, i. e., a distance of about a foot, so that the light will be positioned in close juxtaposition to the gun barrel without illuminating the gun or interfering with the raising and lowering of the gun.

The spot-signal light comprises a lamp unit or head 12, a head portion 14 (Figures 1 to 3 and

9) of a tank carried mounting unit, or a portable mounting unit or pistol grip 16 (Figures 14 to 19).

The tank carried mounting unit comprises, in addition to the head portion 14 which extends above the turret flange 10, a base 18 and a control unit or base portion 20 within the tank and dependent from the base 18.

The lamp unit or head 12 preferably comprises a sheet metal shell 22 having a handle or knob 24 fixed to the base or rear of the shell 22. A lamp 26 comprises a high-powered lamp bulb (not shown) mounted in a reflector shell 28 of conventional form, to which at the open side is secured the usual lens 30, the lens 30 being affixed to the reflector shell as by the usual mounting or clamping ring 32. The lamp 26 is supported in the shell 22 by spring clamps 34 and 36 engaging opposite sides of the lens mounting ring 32. The clamp 34 preferably comprises a resilient ring supported in and suitably secured to longitudinal and lateral flanges 38 and 40 formed at the mouth of the shell 22. The clamp 36 preferably comprises a sheet metal, generally parabolic annulus and secured to the shell 22 in any suitable manner, as, for example, by interfitting lugs and slots angularly spaced about the shell and the annulus.

A hood which prevents lateral diversion of rays from the lamp 26 comprises a sheet metal shell 42 having strengthening corrugations 44. A ring 46 welded to the shell 42 has a lateral annular flange 48 snugly embracing the clamping annulus 36. The hood is detachably mounted on the shell 22 through the intermediacy of the clamping annulus 36 and annularly spaced pins 50 carried by this annulus and spring clamps 52 carried by the hood. The spring clamps 52 may comprise metal straps riveted to the hood as at 54 and having spring fingers 56 apertured for the reception of the pins 50. By bending the free ends of the spring fingers 56 outwardly, as shown in Figure 9, means is provided for effective release of the spring clamps from the pins 50 to thereby detach the hood from the rest of the lamp unit.

The shell 22 is riveted or otherwise secured to, or mounted upon, a mounting bracket 58 formed by a casting having a cylindrical boss 60 bored to provide a cylindrical opening 62 (Figure 9) to receive a mounting stud and a second opening transverse to the opening 62 to receive a cylinder 64 of a releasable locking device 66 by which the lamp unit may be non-rotatably secured to the mounting stud.

The locking device 66 comprises, in addition to the cylinder 64, a pin 68, the outer end of which has an operating knob 70, the hub portion of which is provided with lugs 72 receivable in companion notches in the closed, outer end of the cylinder 64. The pin 68 is provided with an intermediate, enlarged part or collar 74 slidably fitting the cylinder 64. A coil spring 76 is interposed between the part 74 and the closed end of the cylinder normally to urge the pin inwardly into interlocking engagement in a radial opening in the mounting stud. The cylinder 64 is held against movement with respect to the boss 60 in any appropriate manner as, for example, by a pin 78. It will be evident that by exertion of a pull upon the knob 70, the pin 68 will be moved outwardly against the action of the spring 76 to release the pin from the mounting stud, so that the lamp unit may be detached by outward movement axially of the mounting stud.

It should be noted that one terminal of the bulb-receiving socket 30 (Figure 9) of the lamp 26 is grounded to the shell 22 as by contact strip 82 and conductor 84. The other terminal of the lamp engages a contact strip 86 connected by conductor 88 to a contact pin 90 mounted in the base of the bracket 58 co-axially with the opening 62 and insulated from the bracket as by sleeve 92. The contact pin 90 preferably comprises a sleeve in which is mounted a pin 94 urged outwardly by a suitable spring (not shown).

The head portion 14 of the tank carried mounting unit is readily attachable to, and detachable from, the control unit or base portion 20. This control unit or base portion 20 comprises a hollow stud 96 (Figures 5 and 8) having enlarged and reduced portions 98 and 100, respectively, the reduced portion 100 having at its free end a thread 102. The enlarged part 98 forms with the reduced part a shoulder 104, and the enlarged part is provided with a longitudinally extending, relatively short slot or groove 106, and diametrically aligned slots or keyways 108 in its lower edge surface. The reduced portion 100 of the hollow stud passes through an opening 110 in the turret flange 10 and is received in a threaded opening in the base 18, the base 18 being suitably secured as by welding or otherwise to the upper surface of the turret flange 10. The threaded opening in the base 18 is provided with a frusto-conical or tapered base portion 112 so as to upset the end convolution or convolutions of the thread 102. Hence, the hollow stud will be jammed in position as the stud is threaded into the base to prevent the hollow stud from vibrating loose from the base.

A friction clamp 114 (Figures 5 and 10) comprises a sleeve 116 having an inturned annular flange 118 seating upon the shoulder 104 of the hollow stud 96. The sleeve 116 is formed with longitudinally spaced, arcuately extending slots 120, between which the sleeve is formed with outwardly extending, apertured lugs or ears 122 (Fig. 10), one of which is threaded for the reception of a wing bolt 124, by means of which the sleeve may be caused to frictionally clamp the enlarged portion 92 of the hollow stud.

The sleeve 116 is also formed with a longitudinally extending boss 126 in diametrically opposed relation to the ears 122. A radial opening or aperture 128 through the boss 126 receives a clutch ball 130 urged inwardly by a spring 132 interposed between the ball and the cap screw 134 threaded into the aperture 128 to retain the spring and ball and to adjustably determine the tension of the spring 132.

A handle mounting and control housing 136 (Figs. 2, 4, 5 & 7) is centrally bored to receive the lower end of the head portion 14 and is formed with an enlarged chamber 138 (Fig. 5). The housing 136 is also formed with a reduced cylindrical portion 140 snugly fitting within the lower end of the sleeve 116 and forming an annular positioning shoulder or abutment 142 adapted to abut the lower edge of the sleeve. The reduced cylindrical portion 140 is provided with an annular slot or groove 144 (Figure 7) of generally V shape in radial section to receive diametrically opposed positioning, and clamping set screws 146 threaded in suitable apertures in the sleeve 116 adjacent its lower edge. As shown best in Figure 7, the central bore in the housing 136 is formed to provide an intermediate annular shoulder 148 and a longitudinal key 150 extending into the bore above the shoulder 148.

A ring gear 152 in the chamber 138 is formed with a hollow hub portion 154 journaled in the

lower portion of the central bore of the housing 136 below the shoulder 148. The ring gear 152 is supported in position by the companion ring gear 156 secured to a shaft 158 journaled in the sleeve 160. The sleeve 160 is formed with a reduced end portion 162 threaded for reception in a radial, threaded bore at the lower portion of the handle housing. The shaft 158 projects beyond the sleeve 160 and has secured to its outer end an operating knob or the like 164.

A manually operable switch 166 is mounted in the chamber 138 as by means of a screw 168 carried by the housing 136 and threaded into the mounting bracket 170 of the switch 166. The switch 166 may be of any suitable construction, of which one contact is connected to a terminal 172 and the other contact is connected to an upwardly urged or resilient or spring-pressed pin 174 disposed co-axially with the central bore in the handle housing 136. The switch is so mounted that the operating lever 176 depends from the handle housing and projects through an enlarged opening or slot 178 in an end closing cap 180 secured in any convenient manner to the bottom of the handle housing to close the chamber 138. The terminal 172 of the switch is connected to a wire or lead-in 182, which extends upwardly of the handle housing through a suitable longitudinal hole (not shown), and from which the wire projects for connection to one side of a battery or other source of electric energy that is, according to the customary practice, grounded at its other side to the metal parts or frame of the tank.

The head portion of the tank carried lamp mounting unit comprises a housing casting 184 (Figures 2, 3 and 9) having a vertical central bore receiving the upper end of a tube or sleeve 186. The sleeve 186 is positioned angularly with respect to the head housing 184 by a pin or set screw 188 carried by the housing and received in a radial opening in the upper end of the sleeve 186. The housing is also frictionally clamped to the sleeve by means of a screw 190 threaded in one of two ears 192 (Figure 2) formed by a longitudinal slot 194. A second sleeve 196 is journaled in the sleeve 186 and is formed at its lower end with a longitudinal slot or keyway 198 receiving a key 200 (Figure 7) formed in the hub 154 of the ring gear 152.

At its upper end the sleeve 196 is keyed or pinned as by pin 202 (Figure 9) to the hub 204 of a ring gear 206. The gear 206 is mounted in a chamber 208 formed in the upper end of the housing 184 and is journaled in the housing by the extension of its hub portion into the upper, enlarged end of the central vertical bore through the housing.

An insulated wire, cable, or conduit 210 extends through the sleeve 196 from one end to the other. At its lower end the wire is bared and the bare wire is soldered or otherwise fixed to a pin 212 (Figure 7), having a cap portion 214 abutting the lower edge of an insulating sleeve 216 surrounding the lower end of the wire 210 and the pin 212 and snugly fitted into the lower, enlarged portion of the bore in the sleeve 196, the sleeve 216 abutting at its upper edge an annular shoulder 218 formed in the bore of the sleeve 196. The cap portion 214 of the pin provides means for detachably engaging and establishing electrical contact with the upwardly urged terminal pin 174 of the switch 166.

At its upper end the wire 210 is bared and the bare wire received in the central opening of a contact pin 222 having an enlarged head portion 224 by which the pin is supported upon the upper surface of an insulating sleeve 226 having a depending reduced portion encompassing the upper end of the wire 210 and the pin 222 and snugly fitting within the enlarged portion of the bore in the hub of the ring gear 206.

The housing 184 is formed with a lateral arm or extension 228 having a vertical slot 230 in its lower surface and with a horizontal slot 232 (Figure 11) intersecting the slot 230 and forming spaced ears 234 receiving a clamping bolt 236. The extension 228 is provided with a central bore communicating with the end chamber 208 of the housing 184, and in this bore is mounted a sleeve 238 (Figures 9, 11, and 12).

The sleeve 238 is formed with a relatively thin, inner cylindrical portion 240 subdivided into semi-cylindrical parts by diametrically opposed, longitudinally extending slots 242. The slots 242 extend inwardly from the free edge of the cylindrical portion 240 to an annular flange or collar portion 244, on the other side of which extends a thicker cylindrical portion 246. The annular flange 244 of the sleeve 238 abuts the outer edge of the lateral extension 228 of the housing 184 and the cylindrical portion 240 is formed with a cross slot 248, through which the shank of the clamping bolt 236 extends.

A sleeve 250 is journaled in the sleeve 238 and is formed with a reduced end portion 252 extending beyond the sleeve 238. The sleeve 250 is provided with spaced annular flanges 254 forming a channel receiving a lubricant packing ring 256. A ring gear 258 which meshes with the ring gear 206 is provided with a hollow hub portion received in the cylindrical portion 240 of the sleeve 238 and keyed thereto as by cross pin 260. A coil spring 262 interposed between the inner annular flange 254 and the internal shoulder formed by the cylinder portion 246 of the sleeve 238 urges the sleeve 250 inwardly and the gear 258 into meshing engagement with the gear 206.

A sleeve 264 is mounted on the reduced extension 252 of the sleeve 250 and cooperates with the latter to form a mounting stud for the lamp unit 12. The sleeve 264 is keyed to the sleeve 250 as by cross pin 266, and is formed with an offset annular end portion 268, by which it is journaled on the sleeve 238 with the inner edge of the sleeve 264 abutting the annular flange 244. The sleeve 264 is also provided with a radial opening 270 for receiving the inner end of the releasable locking pin 68, by means of which the lamp unit is latched to the mounting stud.

Electrical connection is established between the contact pin 90 of the lamp unit 12 and the pin 222 in the chamber 208 by a pin 272 slidably mounted in spaced bushings 274 supported by insulating bushings 276 and 278 mounted co-axially in the sleeve 250 and the gear 258. A coil spring 280 between the outer bushing 274 and an enlarged portion of the pin 272 urges the pin inwardly into electrical contacting engagement with the head portion 224 of the contact pin 222. The outer end of the pin 272 is exposed for electrical contact with the spring-pressed pin 94.

It will be evident that by adjustment of the clamping bolt 236, the split tubular portion 240 of the sleeve 238 will exert a frictional clamping force on the sleeve 250—the adjustment being such as to hold the sleeve 250 and the lamp unit 12 against inadvertent rotation while permitting their intentional rotation upon manipulation of the knob 164 or manual swinging of the lamp unit through manipulation of the knob 24.

The chamber 208 in the upper end of the housing 184 may be closed by a cap screw 282.

The base 18 may comprise a generally frusto-conical casting secured at its base in any convenient manner to the turret flange 10, and provided with a central bore extending upwardly from the threaded opening in the lower portion of the casting to receive the sleeve 186. This casting may be provided with an upper cylindrical portion 284 (Figures 2, 4, 5 and 9) having an annular recess or groove 286. When the head portion 14 of the lamp mounting unit is removed from the base 18, the central bore in the base may be closed by a cylindrical cap or cover 288 having an annular flange 290 fitting about the cylindrical portion 284 of the base, and this cover may be provided with a spring clip 292 having an eyelet 294 for receiving one end of a chain 296 affixed at its base at its opposite end to the eyelet 298 threaded into the base 18.

The clip 292 is preferably formed with latching fingers 300 received in diametrically opposed openings in the flange 290 of the cover, the clip being preferably of round stock and the spring fingers normally spaced apart a distance less than the diameter of the head of the cover 288, with the spring fingers projecting inwardly of the cap into the annular notch 286, so that the cover is latched to the cylindrical part 284 of the base, but, when the clip is swung to the position above the cap as shown in Figure 4, the head of the cap forces the spring fingers apart and withdraws them from the groove 286 so that the cap may be removed from the base.

A casting 302 having a cylindrical portion 304, similar to the portion 284, and an annular recess or groove 306, is secured to the turret flange 10 to one side of the base 18 to receive the cover when the head portion of the lamp mounting unit is inserted in the base, as shown in Figure 2.

The sheet metal hood 42 of the lamp unit 12 is preferably provided with aligned front and rear sights 308 and 310 (Figure 13) secured as by rivets 312 to the hood shell 42 and positioned, as shown in Figure 2, at the forward and rear edges of the hood.

In assembling a lamp mounting unit on the tank, the hollow stud 96 (Figure 5) is threaded into the base 18 from within the tank until the end of the stud reaches the tapered bottom portion of the threaded opening in the base. Thereafter a tool having key projections fitting into the keyways 198 in the bottom of the hollow stud, and a cross handle or other part which may be used as a positioning indicator, is employed to turn the hollow stud and to forcibly jam the upper end portion of the threaded hole in the base, which thereby upsets the last thread convolution or convolutions of the thread of the hollow stud so as to positively lock the hollow stud against loosening under vibration of the tank, and this turning is continued until the tool handle or other positioning indicator reveals that the slot or longitudinal groove 196 in the surface of the hollow stud faces in the same direction as the muzzle of the gun. The sleeve 116 having been mounted on the hollow stud 96 before it is threaded into the base is then rotated until the clutch ball 139 is seated in the groove 196 and the friction clamp is then adjusted by the wing bolt 124 to clamp the sleeve 114 to the hollow stud.

The handle housing 136 is then inserted in the bottom of the sleeve 116 and the set screws 146 adjusted until they seat in the annular groove 144 of the housing. The handle, operating gears and the switch may be mounted in the handle housing either before or after assembly of the handle housing with the sleeve 116, as may be most convenient. These mechanisms being secured to the handle housing, the lower portion of the lamp mounting unit is now ready for the insertion of the head portion 14 of the unit. This head portion is inserted from a position externally of the tank by pushing the sleeve 186 through the central bore of the base 18 and rotating the head portion until the keys 150 and 200 (Figure 7) are received in the companion key slots 313 and 198 in the outer sleeve 186 and the inner sleeve 196, and the sleeve 186 is seated upon the annular shoulder 148 in the central bore of the handle housing. When the sleeve 186 is thus positioned, a radial opening 314 (Figures 3 and 5 to 7) is aligned with a pin 316 having an operating head or knob 318, the pin being normally urged into the opening 314 by a spring strip 320. The spring strip 320 is apertured at its upper end to receive the pin and bears against an annular collar or flange 322 secured to, or formed upon, the pin. This spring strip is also provided with an aperture in its lower portion to receive the reduced threaded shank 162 of the handle sleeve 160, by means of which the strip is secured to the handle housing. The pin 316 may be released from the opening 314 in the sleeve 186 by a pull exerted on the knob 318, and it may be held in this position by a cross pin 324 normally received in a slot in the handle housing, but which upon rotation of the pin engages the outer, adjacent edge of the housing, and thus prevents inward movement of the pin under the action of the spring strip 320. The pin 316 serves as means for releasably latching the head portion 14 of the lamp mounting unit to the base portion of that unit.

The lamp unit 12 may then be mounted on the head portion 14 by placing the boss 60 of the bracket 58 over the sleeve 264, and then turning the knob 76 until the lugs 72 are aligned with the complementary notches in the cylinder 68, whereupon the spring 76 forces the pin 68 outwardly when the pin is aligned with the opening 270 in the sleeve. It is then necessary to precisely align the lamp unit with the gun, the approximate alignment having been originally attained by causing the slot 196 in the hollow stud 96 to face in the same direction as the muzzle of the gun. This precise alignment is effected by rotating the handle housing 136 relative to the sleeve 116, the partially tight set screws 146 serving as a support for the handle housing. It will be evident, of course, that as the handle housing is turned, the sleeve 186 and consequently the head portion 14 are simultaneously rotated to swing the lamp unit 12 in a horizontal plane. When the proper precise alignment has been attained, as determined by sighting the lamp and the gun upon a common target within a point-blank range or an average range, as may be desired, the set screws 146 are fully tightened to maintain the handle housing in such fixed angular relation to the sleeve 116 of the friction clamp 114. The lamp is now synchronized with the gun in a horizontal plane and any shell fired by the gun at point-blank range, or ranges approximating the average range, will hit whatever target may be in the light beam.

In locating the target at night, the friction clamp 114 is released to permit horizontal swinging of the lamp independently of the hollow mounting stud 96, and hence independently of the

turret and gun. The horizontal swinging of the lamp is accomplished by swinging the knob 164 in a horizontal plane to rotate the handle housing and the friction clamp about the axis of the hollow stud. This rotation of the handle housing is transmitted through the key 150 (Figure 7) to the sleeve 186, and through the sleeve to the housing 164 of the head portion 14 to effect swinging of the lamp about the vertical axis of the sleeve. The target having been located, rotation of the turret is initiated. During this rotation of the turret, the knob 164 is swung to compensate for the turret rotation and to maintain the target illuminated by the lamp. When the gun, due to the rotation of the turret, becomes aimed at the target illuminated by the lamp, the clutch ball 130 snaps into the groove 106 of the hollow stud 96, for the groove 106 always faces in the same direction as the muzzle of the gun. The snapping of the ball into the groove may be felt, and observed by the operator or gunner for, as the ball falls into the groove, immediately the rotating turret will begin to swing the handle which is gripped by the operator or gunner. At the same time the lamp will begin to move with the turret and across the target. The turret is immediately stopped; the friction clamp tightened to hold the lamp and gun upon the track; the lamp then extinguished by opening the switch 166; and the gun is then fired.

When the target is a moving one, the rotation of the turret may be continued to move the gun and lamp in synchronism after the clutch ball has dropped into the groove 106, the lamp remaining energized for a short period to assure the proper synchronization of the movement of the gun with the target. This having been attained, the switch 166 is then operated to extinguish the lamp and the gun fired.

Once the ball 130 has dropped into the groove 106 and the friction clamp tightened to hold that relation, the gun will necessarily be accurately directed upon any target illuminated by the lamp. The synchronized position of the gun and lamp may be adjusted in the field by loosening the opposed set screws 146 and swinging the handle housing relative to the friction clamp until the precise synchronization of the lamp and gun is again attained.

The lamp unit may be swung to locate a target in a vertical plane by rotation of the knob about a horizontal axis, thus rotating the shaft 158 and the ring gear 156, this rotation of the ring gear 156 being transmitted to the lamp unit through the ring gear 152, sleeve 196, the ring gear 206, the ring gear 258, the sleeve 250, the sleeve 264, the pin 68, and the bracket 58 to effect vertical movement of the lamp unit. The positioning of the lamp in a vertical plane when illuminating a target will not always directly indicate the angle to which the gun is to be elevated before firing upon the target since a shell or missile has a curved trajectory. However, it may be desirable to aid in determining the proper angle or elevation of the gun and for other purposes to provide the operator or gunner with an indication of the angle of inclination of the lamp unit relative to the normal horizontal plane of the operating handle. The rotatable knob 164 and the adjacent sleeve 160, may, therefore, be provided with appropriate scales or indicia for indicating the angle through which the knob has been rotated in terms of the angle of inclination of the lamp unit.

During daylight or whenever the lamp is not required, the lamp unit and also the head portion 14 of the lamp mounting unit may be readily removed and stored within the tank. The lamp unit can be instantly removed by pulling out the pin 68 to withdraw it from the opening 270 in the sleeve 264, and then pulling the lamp unit off the end of that sleeve. The head portion 14 may be removed, with or without the lamp unit, by first merely pulling the pin 316 out of the opening 314 in the sleeve 186, and then pulling upwardly on the head housing 134, and thus the sleeve 186, the sleeve 196, and cable 210 are simultaneously withdrawn from the aligned central bores of the handle housing 136, the hollow stud 96, and the base 18. The head portion 14 of the lamp mounting unit and the lamp unit 12 are instantaneously replaceable for immediate action by merely inserting the head portion into the base and pushing downwardly thereon until the sleeve 186 is bottomed by abutment on the annular shoulder 148 in the central bore of the handle housing, after which the pin 316 is released for inward movement by the spring 320 into the opening 314 in the sleeve 186.

To seal the central opening in the base and compensate for manufacturing tolerances, the sleeve 186 is provided with metal washers 326 and 328 (Figure 9), between which is interposed a soft, flexible washer 330 preferably of rubber. The washer 328 may be snugly fitted on the sleeve to prevent the washers from dropping off the sleeve. The washer 330 is preferably of such normal thickness that, when the sleeve 186 is bottomed upon the annular shoulder 148, the washer will be compressed so that the base opening is sealed, vibrations absorbed, and compensation offered for dimensional differences due to manufacturing tolerances.

The lamp unit 12 is preferably stored within the tank upon the portable mounting unit or pistol grip 16 (Figures 14 and 19). This portable mounting unit comprises a hollow casting 332 in the form of a pistol grip having an integral lamp supporting arm 334 apertured to receive a stud 336, the stud having an enlarged portion 338 above the supporting arm 334. The portion 338 is formed with a radial opening 340, an axial opening 342, and an opening 344 angularly intersecting the opening 342 and extending to the surface of the supporting arm 334. The radial opening 340 is adapted to receive the pin 68 of the releaseable locking device 66, by means of which the lamp unit 12 may be detachably secured to the stud 336. The openings 342 and 344 provide a passage for the insulated wire cable or conduit 346 which extends through an opening 348 in the arm 334.

A contact pin 350 which is mounted in an insulating bushing 352 set into the upper end of the axial opening 342, is soldered to the bare wire of the insulated wire 346 and serves to establish electrical connection between the wire and the contact pin 90 of the lamp unit. The wire 346 extends into the chamber 354 of the casting 332 and is connected to one terminal 356 of a switch 358 mounted in the chamber in any suitable manner as by bolts 360 and 362. The other terminal 364 of the switch is connected to a wire 366 of a two-wire cable 368 extending from the bottom of the casting 332 to a spring return cable reel 370 (Figures 15, 17 and 18). The wire 372 of the cable 368 is a grounding wire and is connected to the bolt 362 to establish a ground connection through the pistol grip to the lamp unit. The switch 358 may comprise a spring

blade 374 normally holding the switch contacts in open position but movable under the action of a trigger 376 to close the switch contacts.

The trigger may comprise a slide block preferably of insulating material slidably mounted in the pistol grip and projecting therefrom beneath the arm 334 in position for ready grasping and manipulation by an operator's finger. The slide block or trigger is urged outwardly to permit the switch to be opened by its spring blade 374 by a coil spring 378 bearing upon the trigger and against the housing casting. The trigger is provided with a depending lug 380 for manipulating the switch operating blade 374. One or both sides of the pistol grip may be opened, as most conveniently manufactured, and the open side or sides may be closed by a cover or covers 382 fastened by screws to the housing casting 332.

The reel 370 may comprise a housing 384 mounted on the bracket 386, in turn bolted to a bracket 388 mounted in any suitable place within the tank in a fixed position. The wire 368 passes through the shelf of the bracket 386 and the reel housing through a bushing 390 and is coiled about a spring returned drum 392 mounted for rotation on an axle 394. The grounding wire 372 may be directly connected to the drum and grounded thereby through the reel and bracket to the tank frame while the wire 366 is connected in the conventional manner through a wiper (not shown) to the lead (not shown) extending through the axle and connected to a wire 396, connected to the ungrounded side of the battery or other source of electric energy carried by the tank.

The portable unit 16 may be detachably mounted on the bracket 388 by the clamp 398 comprising a U-shaped base part 400 bolted at its base to the bracket 388, and provided at its free edges with ears 402 receiving pivot pins 404 and 406. A latch 408 may be pivoted by the pin 404 to one ear 402 while the keeper 410 is pivoted to the other ear by the pin 406. The keeper may comprise a rod or heavy wire bent in the form of a U, having the ends of its arms inturned to form the pivot pin 406.

The latch 408 may comprise a strap 412 pivoted by the pin 404 to one ear 402 and a strap 414 hinged to the strap 412 and formed adjacent the hinge with a reversely bent latching lug 416. The portable unit 16 being inserted in the base part 400, the clamp 398 being open is then secured by moving the straps 412 and 414 inwardly from the position shown in dash lines in Figure 19 to a position in which the strap 412 is shown in full lines in this figure, and the open side of the latching lug 416 faces outwardly to receive the cross bar of the rod keeper 410. The strap 414 is then moved rearwardly to the full line position in Figure 19 to cause the latching lug to encompass the received cross bar of the keeper. The base part 400 is extended vertically along the bracket 388 and provided at its upper and lower ends with lateral flanges 418 and 420 to receive and support the portable unit 16, as shown in Figures 17 and 18.

It will be evident that the portable unit or pistol grip 16 provides ready mounting means for storing the lamp unit 12 within the tank and a full portable control mount for the lamp unit, by which it may be used as a portable searchlight or signalling device when the supply cable is withdrawn from the reel.

It will be evident that applicant has provided a combined spot and signal light for controlling

the aiming of a gun or the like upon a target; means for discovering a target and utilizing that means for the proper aiming of the gun or other directable device upon that target; a gun mounted on a shiftable base with target locating means automatically synchronizable with the gun, a combination search and signal light mounted on a tank for ready manipulation to locate an enemy target and determine automatically the aiming of the tank gun; to signal; and to facilitate night driving; and also a portable search and signal light capable of instantaneous attachment to, or detachment from, a tank, armored car, or other vehicle for immediate use for any of said purposes.

It is thought that the invention and numerous of its attendant advantages will be understood from the foregoing illustrative description, and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention or sacrificing any of its attendant advantages, the form herein described being a preferred embodiment for the purpose of illustrating the invention.

What I claim is:

1. A spot-light mounting unit for a tank having a gun turret, a hollow stud rigidly fixed to a wall of the gun turret and extending into the tank, a sleeve rotatable on said stud, a rod extending through said hollow stud and the wall of the gun turret to support the spot-light, control means with which said rod is detachably associated at its inner end for rotating said rod, means for synchronizing the spot-light with the gun, said last mentioned means comprising means for automatically connecting the sleeve to the stud to indicate that the gun and lamp are in certain relative positions, and means adjustably connecting the sleeve to the control means for rotation synchronously with said rod and to adjustably predetermine said relative positions of the gun and lamp.

2. A spot-light for a tank having a gun turret, a hollow stud fixed to a wall of the turret in juxtaposition to the gun, clutch means having one part carried by the stud in fixed position relative to the gun, a member rotatable on said stud and carrying the other clutch part, said clutch parts being automatically engageable and disengageable to prevent and permit relative rotation of said stud and member, releasable means for locking said stud and member against relative movement upon engagement of said clutch part to lock the member in predetermined position relative to the gun, relatively rotatable sleeves passing through said stud and the wall of the turret, a lamp unit connected to said sleeves externally of the turret for rotation and revolution by said sleeves, operating means within the turret, connections between said operating means and one of said sleeves for revolving said lamp unit, an adjustable connection between said operating means and said member for effecting rotation of said member about said stud synchronously with said one sleeve, said adjustable connection being adjusted to synchronize the lamp unit with the gun when the clutch parts are engaged, whereby the engagement of said clutch parts after an object has been located by said lamp unit determines the direction of the gun upon the object, and said operating means including means for rotating the other sleeve to rotate the lamp unit.

3. A spot-light for a tank having a gun turret, a hollow stud fixed to a wall of the turret in

juxtaposition to the gun, clutch means having one part carried by the stud in fixed position relative to the gun, a member rotatable on said stud and carrying the other clutch part, said clutch parts being automatically engageable and disengageable to prevent and permit relative rotation of said stud and member, releasable means for locking said stud and member against relative movement upon engagement of said clutch parts to lock the member in predetermined position relative to the gun, relatively rotatable sleeves passing through said stud and the wall of the turret, a lamp unit connected to said sleeves externally of the turret for rotation and revolution by said sleeves, operating means within the turret, connections between said operating means and one of said sleeves for revolving said lamp unit, an adjustable connection between said operating means and said member for effecting rotation of said member about said stud synchronously with said one sleeve, said adjustable connection being adjusted to synchronize the lamp unit with the gun when the clutch parts are engaged, whereby the engagement of said clutch parts after an object has been located by said lamp unit determines the direction of the gun upon the object, said operating means including means for rotating the other sleeves to rotate the lamp unit, and electrical supply means including electrical conductor means extending through said sleeves for connection to said lamp unit, and a control switch carried by said operating means.

4. In a device of the character described, a lamp unit, a head housing comprising means for rotatably supporting said lamp unit and a pair of interfitting sleeves, the first of which is connected to said lamp unit for rotating said lamp unit on rotation of the sleeve and the second of which is connected to said head housing for rotating said head housing to revolve the lamp unit on rotation of the sleeve, a hollow member adapted for fixed attachment to a shiftable support, said sleeves projecting through said hollow member, a member rotatably mounted on said hollow member, a clutch having automatically engageable and disengageable parts for connecting said members in one position to determine the position of the rotary member relative to the hollow members, operating means for said sleeves, said operating means including an operator constructed for automatic connection to the second sleeve in fixed angular relation and disconnection at will, manually operable means for locking said second sleeve and said operator against disconnection, means for adjustably connecting said operator to said rotary member to align the lamp unit in fixed relation to the shiftable support when the clutch parts are engaged, and releasable means for locking said rotary member, said operator, said second sleeve, and said lamp unit against movement relative to said hollow member, said operating means including a second operator for rotating the first sleeve to effect rotation of the lamp.

5. A spot-light comprising a lamp unit, a supporting unit comprising a head housing, said head housing having intersecting bores, a rotary sleeve mounted in one bore, means for mounting said lamp unit on said sleeve, releasable means for locking said lamp unit against rotation relative to said sleeve, a rod mounted in and insulated from said hollow sleeve and exposed for electrical contact with the lamp unit, an electrical conductor in the other bore of the head housing, a tube surrounding said conductor, intermeshing gears mounted in the bores and secured to said sleeve and said tube, respectively, a contact member secured to a free end of the conductor within the head housing for engagement by said rod, and control means spaced from said head housing, said tube and said conductor extending to said control means, a second tube surrounding the first tube and secured to said head housing, said second tube extending to said control means, said control means including means for rotating the first mentioned tube to effect rotation of the lamp unit, means for rotating the second tube to rotate the head housing and revolve the lamp unit, and means for controlling a supply of electrical energy to said conductor to control the energization of said lamp unit.

6. In a vehicle spot-light, control means adapted to be mounted in the vehicle, said control means comprising a handle housing having a chamber, a control switch in said chamber, said housing having a first bore therein communicating with said chamber, said switch having a resiliently mounted terminal aligned with the axis of the bore, said housing having an abutment extending into said bore, a key projecting into said bore above said abutment, a hollow gear rotatably mounted in said housing co-axially with said bore, said housing having a second bore communicating with said chamber and extending at an angle to the first bore, a handle comprising a sleeve, an operating shaft journaled in said sleeve, said sleeve being secured to said housing with said shaft extending into said chamber, a second gear carried by said shaft intermeshing with and supporting the first gear, said first gear having a key extending into its central bore, a lamp unit, means for supporting said lamp unit, said supporting means comprising a head housing, means for rotatably mounting said lamp unit on said head housing for rotation relative thereto and for revolution therewith, said mounting unit comprising an outer sleeve secured to said head housing and projecting therefrom for insertion into the first bore of said handle housing, said outer sleeve having an open keyway receiving the first mentioned key in the handle housing upon insertion of the sleeve thereinto to connect the sleeve to the handle housing for rotation therewith, an inner sleeve passing through the first sleeve and projecting therefrom for insertion into the central bore of the first gear, said second sleeve being rotatably supported in said head housing and having an open keyway for the reception of the key in the bore of the first gear to connect the sleeve to the gear for rotation therewith, an electric conductor in the second sleeve insulated therefrom and projecting beyond the opposite ends of the second sleeve, a contact button secured to the free end of the conductor for engaging the resiliently mounted switch terminal in the chamber of the handle housing, means in the head housing for operatively connecting the inner sleeve to the lamp unit and causing rotation of the lamp unit with the sleeve, and means for locking the outer sleeve to the handle housing, said locking means being releasable to permit withdrawal of the outer sleeve, the inner sleeve and the conductor from the handle housing by movement axially of the first bore in the handle housing.

7. A spot light comprising a hollow mounting stud, clutch means having one part carried by the

stud in fixed position relative to the stud, a member rotatably mounted on said stud and carrying the other clutch part, said clutch parts being automatically engageable and disengageable to prevent and permit relative rotation of said stud and member, manually releasable means for locking said stud and member against relative rotation on engagement of said clutch parts to lock the member in predetermined position relative to the stud, relatively rotatable sleeves passing through said stud, a lamp unit connected to one end of said sleeves for rotation and revolution by said sleeves, operating means at the other end of said sleeves, and connected to one of said sleeves for revolving said lamp unit, an adjustable connection between said operating means and the member which is rotatable on the stud for effecting rotation of said member about said stud synchronously with said one sleeve, said adjustable connection being adjusted to predetermine the angle of direction of the lamp when the clutch parts are engaged, and said operating means including means for rotating the other sleeve to rotate the lamp unit.

8. In combination with a supporting wall having an aperture therethrough, a supporting column supported in said aperture, a lamp supported on said column at said side of said wall, a housing carried by said column at the other side of said wall, said column being separable from said housing, a drive gear in said housing, a shaft in said column and removably splined in said gear, a latch for attaching said column to said housing, wiring extending through said column to said lamp and having a bare end in said housing, and a spring-pressed contact in said housing and engaging said bare end.

9. A spot-light comprising a hollow member adapted to be mounted on a support, a lamp unit, a second hollow member extending through the first hollow member from one end thereof and on which said lamp unit is rotatably secured, a control housing rotatably mounted on the first hollow member on the other end thereof, the second hollow member and said control housing being constructed for attachment by insertion of the second hollow member axially into the first hollow member from said one end of the latter, releasable means for locking the second hollow member and the control housing against relative movement, operating means in the control housing and including an operating member projecting from said housing, said operating means including a drive member mounted in said housing for rotation relative thereto, a tubular member mounted in said second hollow member and rotatable relative thereto and constructed for attachment to said drive member by insertion of the second hollow member axially into the first hollow member from said one end of the latter, drive means connecting the tubular member to the lamp unit for rotating the latter relative to the second hollow member, electric control means carried by said control housing, and electric conductor means carried by and extending within the tubular member and connected to said lamp unit and constructed for electrical attachment to the electric control means upon insertion of the second hollow member axially into the first hollow member from the said one end of the latter.

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