J. L. HALL.

PROJECTOR.

APPLICATION FILED JUNE 20, 1917.

1,284,661.

Patented Nov. 12, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

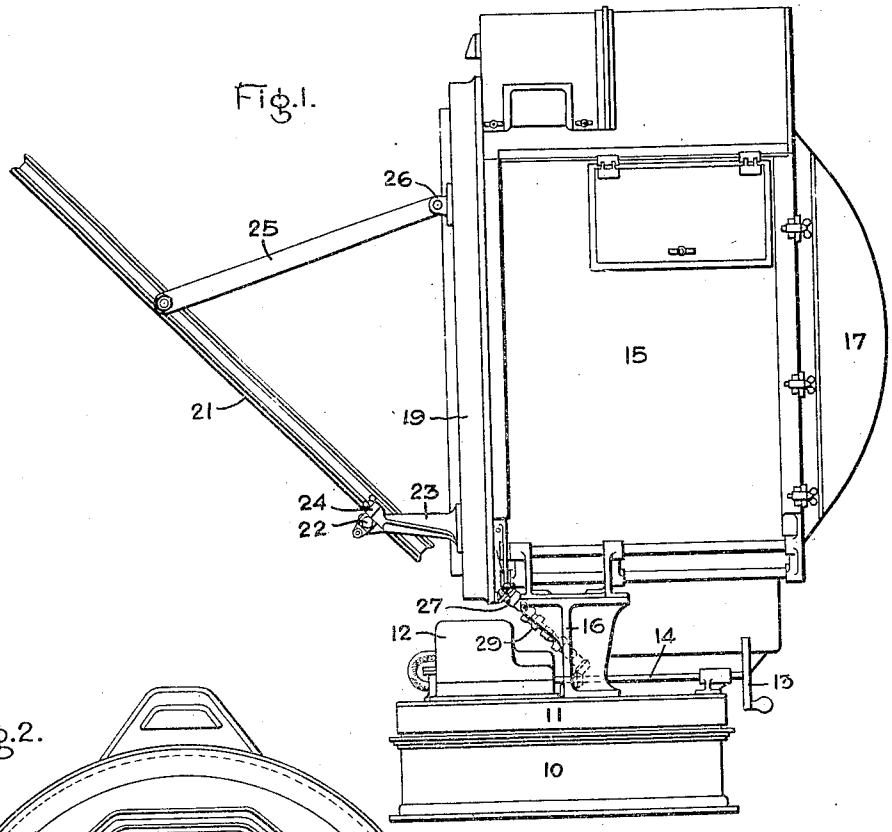
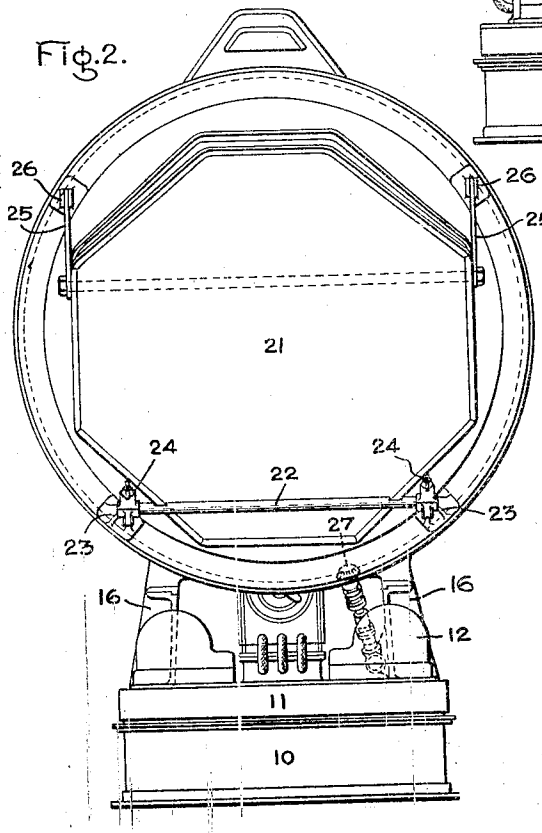


Fig. 2.



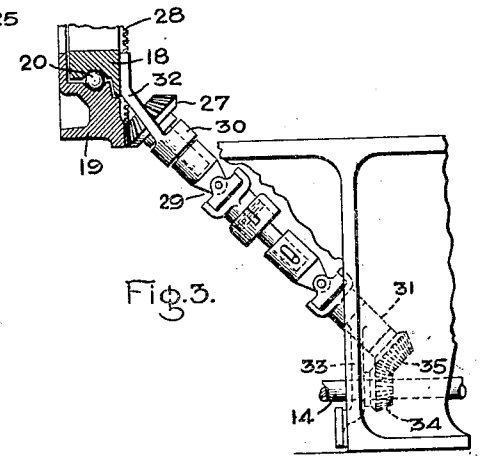


Fig. 3.

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2 SHEETS—SHEET 2.

Fig. 4.

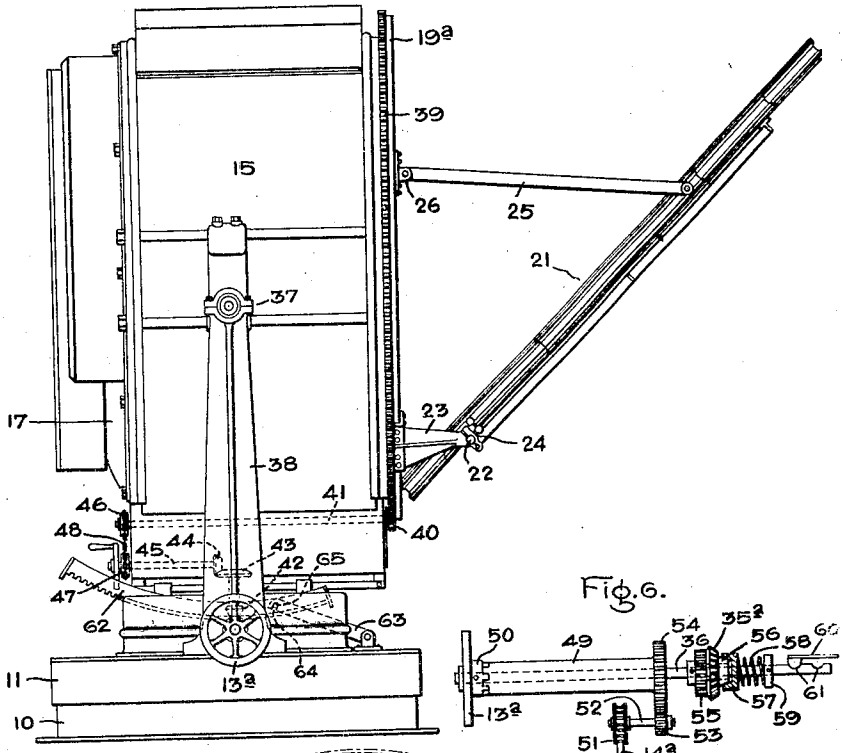
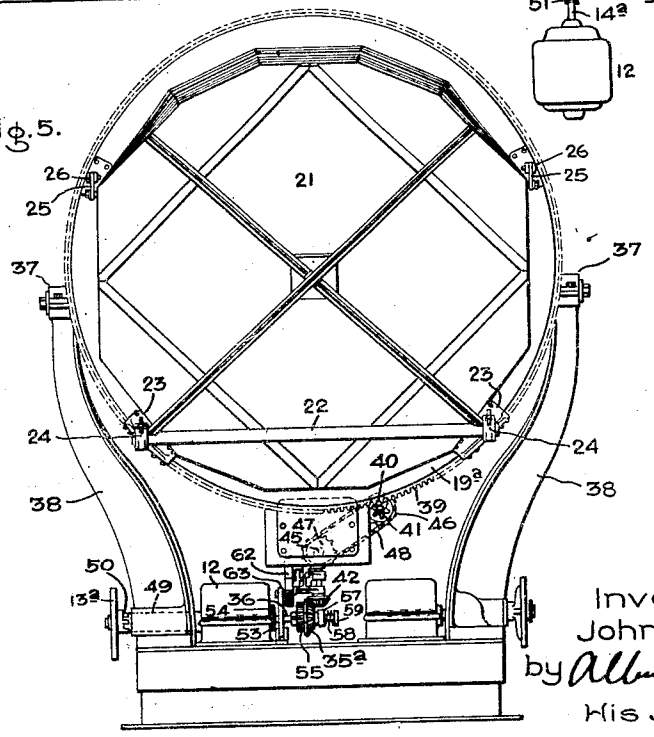


Fig. 6.

Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN L. HALL, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

PROJECTOR.

1,284,661. Specification of Letters Patent. Patented Nov. 12, 1918.

Application filed June 20, 1917. Serial No. 175,701.

To all whom it may concern:

Be it known that I, JOHN L. HALL, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Projectors, of which the following is a specification.

My invention relates to a projector and particularly to a projector which is used as a searchlight, and more especially has reference to a searchlight which is used for illuminating objects in the sky, such, for example, as aeroplanes. It has hitherto been proposed to use searchlights of the usual type and which were revoluble about a horizontal axis for directing a beam of light into the sky by simply turning the barrel of the searchlight in the desired direction. When an ordinary searchlight has been thus operated, however, the difficulty has been experienced that molten particles of the copper coating of electrodes and hot particles of carbon and other objectionable material dropped on the mirror which, of course, comes below the arc when the barrel is directed upwardly, with the consequence that the mirror either is pitted or otherwise injured, and sometimes cracks.

In accordance with my invention, the above difficulties are obviated by mounting the searchlight barrel rigidly on a rotatable base so that the beam of light is projected horizontally, and by providing a rotatable substantially plane mirror by which the beam is reflected into the sky in any desired direction.

My invention also has for its object the provision of a searchlight which may be used either in the ordinary manner, that is, it may be rotatable about both a horizontal axis, and about a vertical axis, in the usual manner, or it may be used in the manner above indicated, that is to say, it may be rigidly mounted on a rotatable base and be provided with a mirror for directing the beam of light in the desired direction.

My invention will best be understood by reference to the accompanying drawings, in which: Figure 1 is a side view of a searchlight embodying my invention; Fig. 2 is a front elevation thereof; Fig. 3 is a side view partially in section, illustrating the means for rotating the mirror; Fig. 4 is a side view showing my invention embodied in a modified form of searchlight; Fig. 5 is a front elevation of the modified form shown in Fig. 4; and Fig. 6 is a diagrammatic view showing a mechanism by which the searchlight may be operated in the usual manner or by which the plane mirror may be rotated about the axis of the searchlight barrel.

Referring now to the drawings, and first to Figs. 1, 2 and 3, the base comprises two sections, a lower stationary section 10 and an upper section 11 in the form of a turntable which is rotatable on the lower section in a manner well understood in the art. The section 11 is rotated by a motor 12 or a hand wheel 13, acting on a common shaft 14. The searchlight barrel 15 is preferably mounted on the rotatable base by means of standards 16. A concave reflector 17 of the usual form is mounted in the rear of the casing. The front of the barrel is provided with a frame, preferably in the form of a ring 18 on which is mounted a rotatable frame 19 which is also preferably in the form of a ring surrounding the ring 18, ball bearings 20 being interposed between the two. In front of the barrel is mounted a substantially plane mirror 21, the under side of which is mounted on a bar 22, the bar being secured to brackets 23 mounted on the rotatable frame 19 by means of clamps 24. The upper side of the plane mirror is preferably attached to the frame 19 by means of links 25 which are pivoted to brackets 26 on the rotatable frame, the outer ends of the links being clamped on a bar as shown in Fig. 2, so that the mirror is readily detachable from the searchlight. This is a matter of some importance when the searchlight is to be used on shipboard on which the space particularly during the day, is limited. The plane mirror is preferably disposed at an angle of 45 degrees to the axis of the searchlight barrel, so that the beam of light is reflected at right angles to the axis, though it will of course be understood that it may be disposed at any other suitable angle.

The frame 19 is rotatable by means of a bevel-gear 27 which engages an annular rack 28 on the rear face of the ring 19. The bevel-gear 27 is mounted at one end of a flexible shaft 29 which is provided with one or more universal joints, and is extensible, all as shown in Fig. 3. The shaft is mounted in sleeves 30 and 31, carried by brackets 32 and 33 which are attached to the frame 18

and to the rotatable base respectively. The shaft 29 is rotated from the shaft 14 by means of a bevel-gear 34 secured to the shaft 14 which meshes with a bevel-gear 35 on the lower end of the shaft 29.

It will be apparent that the reflected beam can be directed to any desired elevated point in a plane at right angles to the axis of the searchlight by suitably rotating the plane mirror 21, and by combining with this movement the rotation of the searchlight on the rotatable base about the vertical axis, the projected beam can be directed to any desired point, and this is accomplished with the barrel of the searchlight in a horizontal position where the concave mirror will be kept free from particles falling from the carbons adjacent to the arc. It will also be apparent that the beam can follow a plane through the zenith without material change in azimuth which is necessary where the beam is trained direct in the usual way.

Under some circumstances it is found desirable to embody my invention in searchlights of the usual type, that is to say, searchlights which may be rotated in altitude about a horizontal axis, and in Figs. 4, 5 and 6 I have illustrated a construction by which this may be accomplished, and in which the searchlight may also be rigidly mounted on a rotatable base and used in the manner described in connection with Figs. 1, 2 and 3. In the construction shown in Figs. 4, 5, 6, the searchlight barrel is mounted on trunnions 37 carried by the standards 38 in the usual manner. The plane mirror in front of the barrel is mounted in the same manner as in Figs. 1, 2 and 3, and is rotatable about the axis of the barrel, but in this case is preferably provided with a gear 39 formed on the ring 19^a which is engaged by a pinion 40, mounted on a shaft 41 (shown in dotted lines in Fig. 4) which is rotated from a bevel-gear 42, the latter engaging the bevel-gear 35^a on the operating shaft 36. Motion is transmitted from the bevel-gear 42 to the shaft 41 through bevel-gears 43 and 44, shaft 45 and sprockets 46 and 47, mounted on the shafts 41 and 45 respectively, and a sprocket chain 48.

The shaft 36 is rotated by the motor 12 through a hollow shaft 49, surrounding the shaft 36, the two shafts being coupled together by means of a clutch 50 to which is secured the hand wheel 13^a. The motor shaft 14^a carries a worm (not shown) which engages the worm wheel 51 mounted on shaft 52. A pinion 53 mounted on this shaft 52 engages a gear 54 secured on the end of the shaft 49. A gear 55 is secured to the bevel-gear 35^a, both of which are slidably mounted on the shaft 36. A bevel-hub 56 is secured to the bevel-gear 35^a and is engaged by a friction clutch 57, which is held in engagement with the hub 56 by means of a spring 58 the outer end of the latter engaging a collar 59 secured on the shaft 36. The shaft 36 together with the gears mounted thereon, is thus shiftable longitudinally and is held in either position by a latch 60 which engages grooves 61, formed in the shaft. The searchlight may be rotated in a vertical plane by means of a rack 62 secured thereto, which is engaged by the pinion 55 when the shaft in which the pinion is mounted is shifted to the left as viewed in Figs. 5 and 6. When the rotatable plane mirror is to be used in conjunction with the searchlight, the barrel of the searchlight may be made rigid with the rotatable base by means of a strut 63 which is pivoted to the base 11 and is provided at its end with a slot 64 engaging a pin 65 on the rack.

With the parts occupying the positions shown in Fig. 6 the bevel-gear 35^a engages the bevel 42 and the plane mirror is rotated by the motor 12. When the searchlight is thus operated, the barrel is made rigid with the base by means of the strut 63 so that there are but two sources of control, viz: the control for the rotation of the base and that for the rotation of the plane mirror for the operator to manipulate.

Now, if it is desired to use the searchlight in the ordinary manner by rotating it through a vertical plane combined with the horizontal rotation on the base, the plane mirror 21 which is readily detachable from the searchlight, will first be removed and the hand wheel 13^a and the shaft 36 attached thereto will be shifted to the left, as viewed in Fig. 6, thus bringing the gear 55 into engagement with the rack 62 and the movement of the same operating member which has previously effected the rotation of the plane mirror about the axis of the searchlight, now causes the rotation of the searchlight in a vertical plane.

It will be apparent from the above description that the searchlight is in all cases rigidly mounted on a rotatable base near the plane mirror in front of the barrel of the searchlight, and that in every case there are but two controls for the operator to manipulate.

While I have described my invention as embodying a concrete structure and as operating in a specific manner in accordance with the provisions of the patent statutes, it should be understood that I do not limit my invention thereto, since various modifications thereof will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the annexed claims.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In a projector, a rotatable base, a projector casing mounted on said base and rotatable in azimuth, means for making said

casing rigid on the base at will, a mirror arranged in front of the casing and angularly disposed to the projected beam of light and a common operating member for rotating said casing in altitude or for rotating said mirror about the axis of the casing.

2. In a projector, a rotatable base, a projector casing mounted on said base and rotatable in azimuth, means for making said casing rigid on the base, a mirror arranged in front of the casing and angularly disposed to the projected beam of light, and means comprising a single shiftable operating member for rotating the casing in altitude or for rotating the mirror about the axis of the searchlight.

In witness whereof, I have hereunto set my hand this 18th day of June, 1917.

JOHN L. HALL.