March 26, 1940. J. C. SAVAGE 2,194,836

SEARCHLIGHT

Filed March 24, 1937 5 Sheets-Sheet 1

Fig. 1.

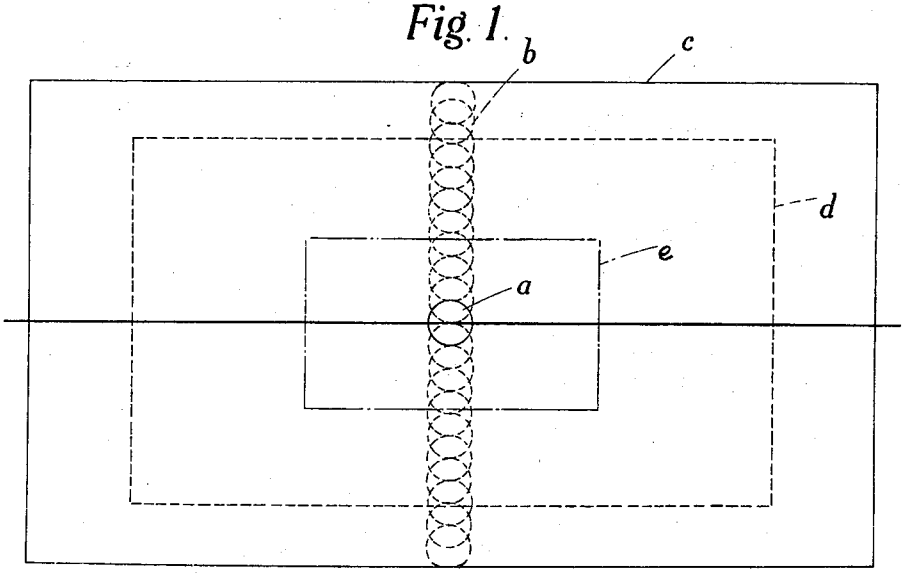
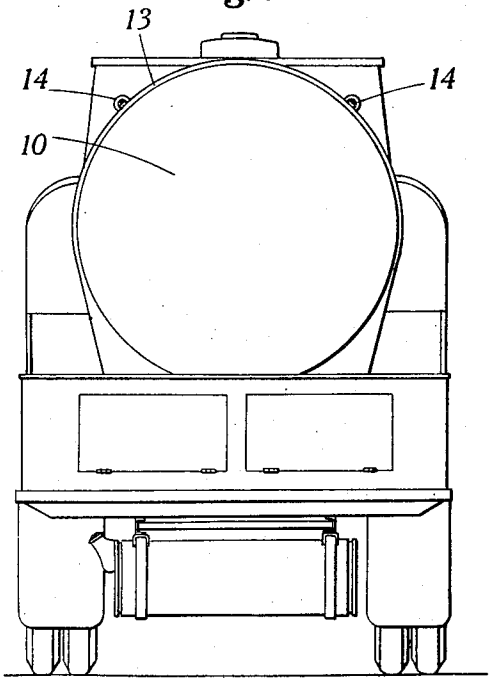


Fig. 3.



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SEARCHLIGHT

Filed March 24, 1937 5 Sheets-Sheet 2

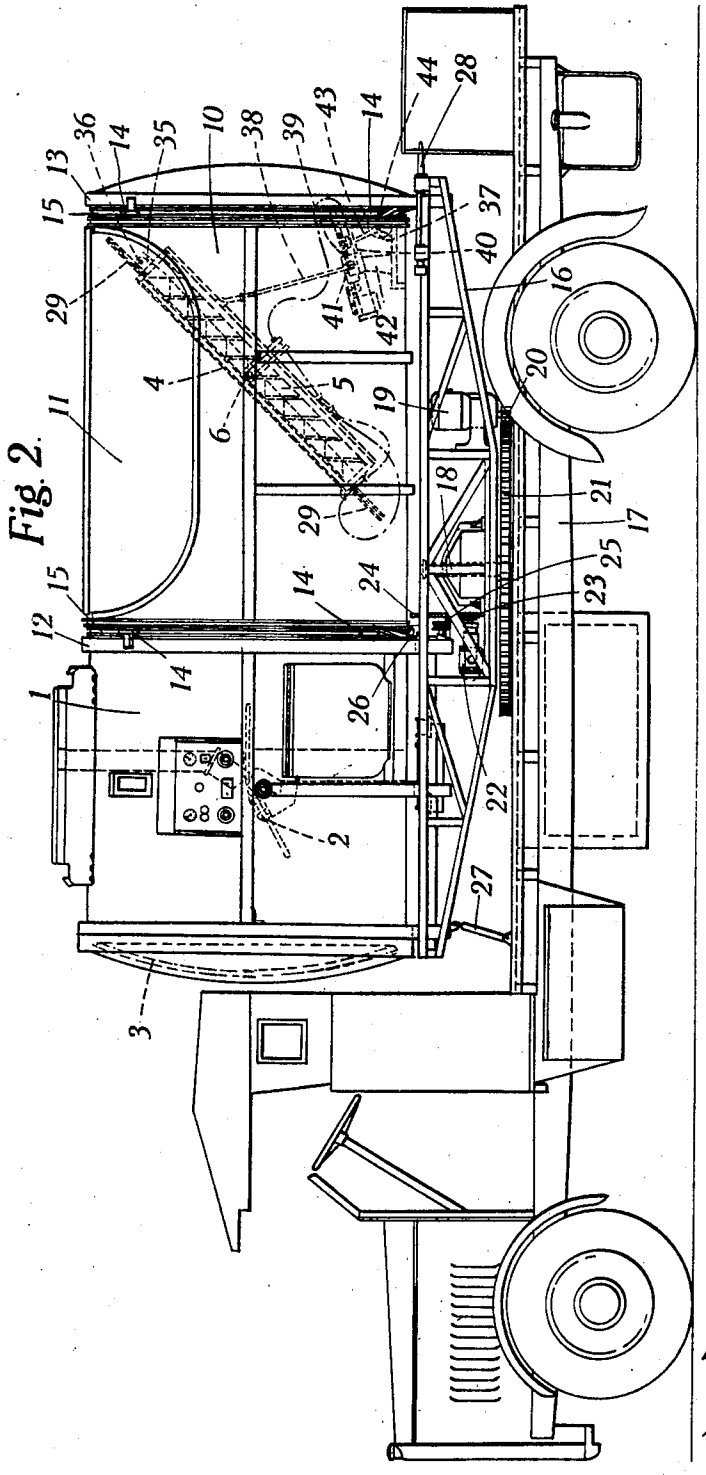


Fig. 2.

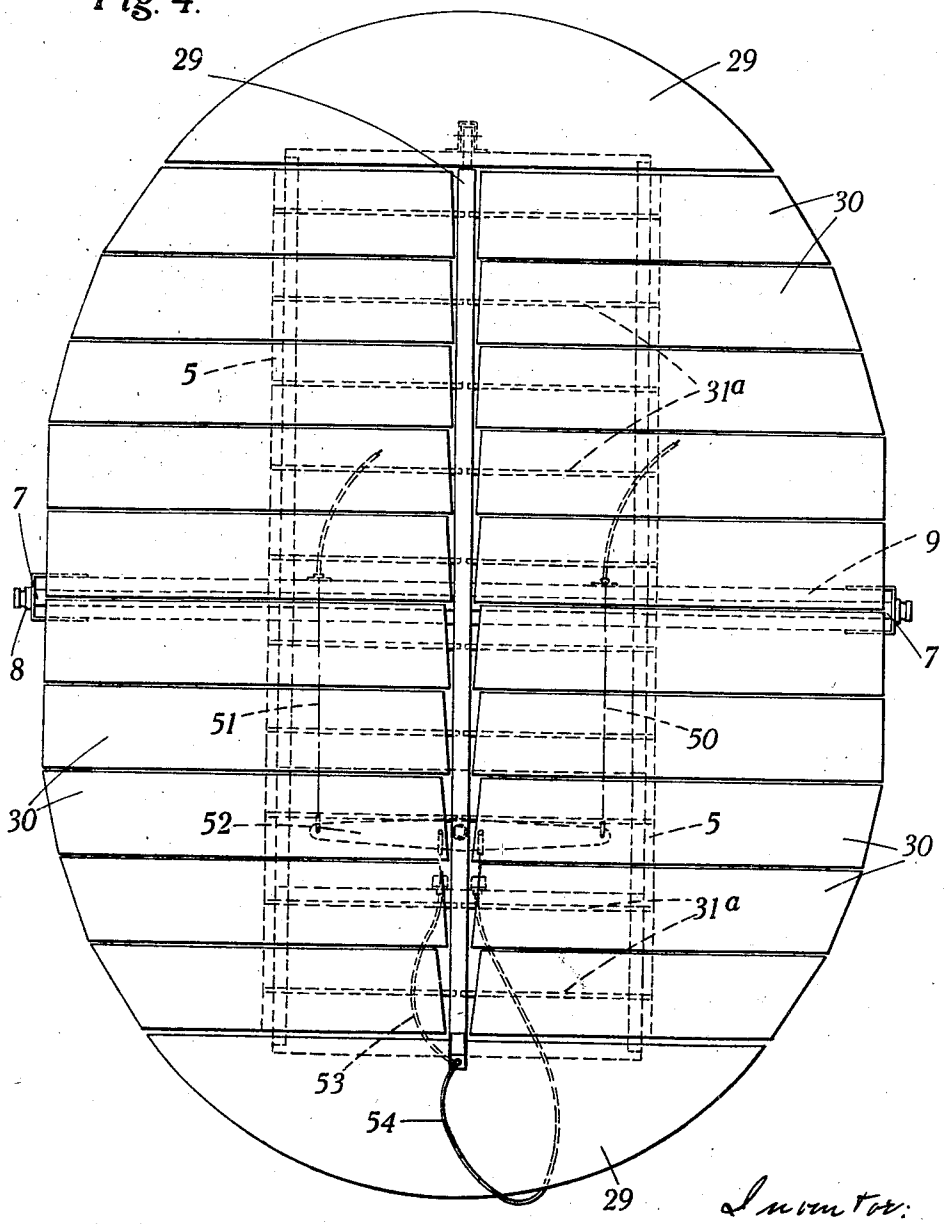
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March 26, 1940. J. C. SAVAGE 2,194,836

SEARCHLIGHT

Filed March 24, 1937 5 Sheets-Sheet 3

Fig. 4.



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March 26, 1940. J. C. SAVAGE 2,194,836

SEARCHLIGHT

Filed March 24, 1937 5 Sheets-Sheet 4

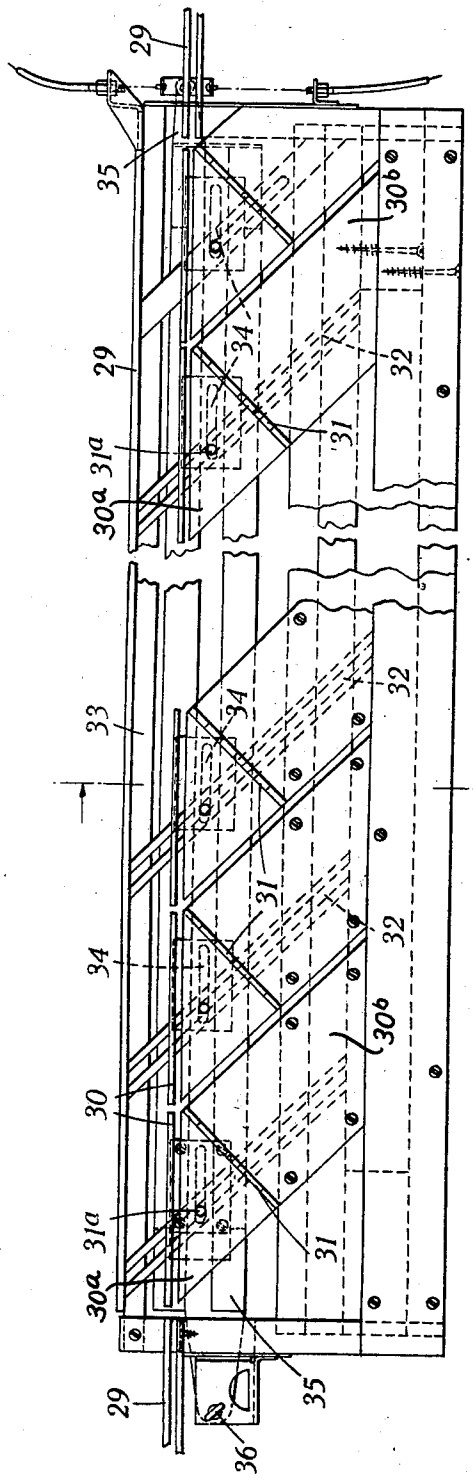


Fig. 5.

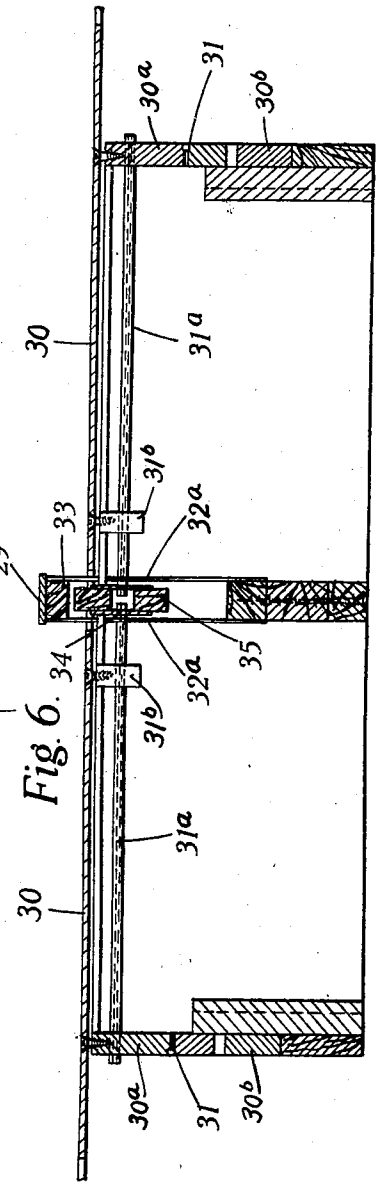


Fig. 6.

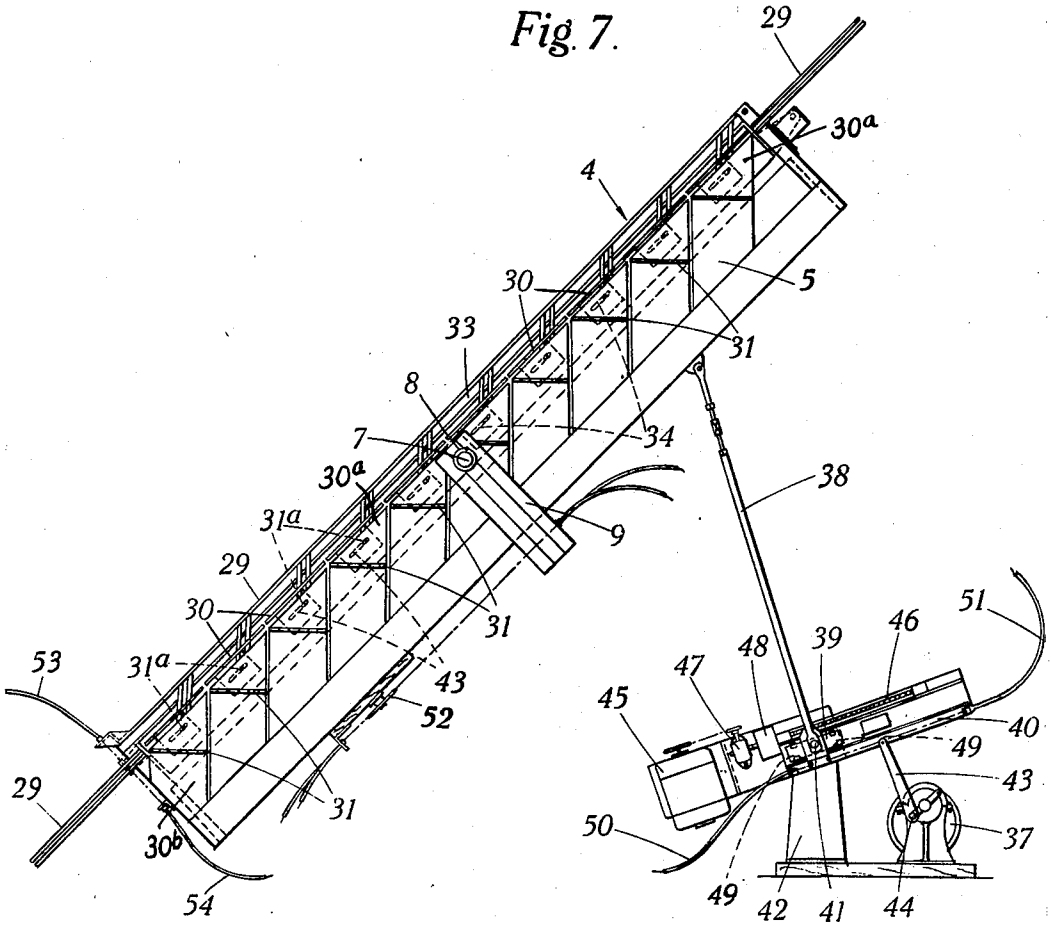
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March 26, 1940. J. C. SAVAGE 2,194,836

SEARCHLIGHT

Filed March 24, 1937 5 Sheets-Sheet 5

Fig. 7.



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Patented Mar. 26, 1940 2,194,836

UNITED STATES PATENT OFFICE

2,194,836

SEARCHLIGHT

John Clifford Savage, Hendon, London, England

Application March 24, 1937, Serial No. 132,837
In Great Britain March 26, 1936

4 Claims. (Cl. 240—61.1)

The present invention relates to searchlights and has for its chief object to provide an improved searchlight so constructed as to enable a large area to be rapidly and thoroughly scanned by the light beam without appreciable reduction in the intensity of the light per unit area.

Another object of the present invention is to provide a searchlight the light beam from which is capable of being spread or diverged linearly in a plane at right angles to the optical axis of the projector and also of being traversed continuously, preferably to variable extents, in a direction parallel to the optical axis of the projector.

A still further object of the present invention is to provide a searchlight whose light beam is capable of being continuously traversed and automatically spread or diverged linearly to an extent depending on the extent of the traversing movement.

Further objects and advantages of the present invention will become apparent from the accompanying detailed description of a preferred embodiment thereof with reference to the accompanying drawings in which:

Fig. 1 is a view illustrative of the purpose of the present invention;

Fig. 2 is a view in side elevation of a motor road vehicle equipped with a searchlight according to the present invention;

Fig. 3 is an end elevation of the motor road vehicle shown in Fig. 2;

Fig. 4 is a plan view of the mirror mosaic or assembly employed in a searchlight according to the present invention;

Fig. 5 is a view in side elevation of the mirror mosaic or assembly;

Fig. 6 is a cross sectional view on the line A—B of Fig. 5;

Fig. 7 is a view in side elevation of means for traversing the mirror mosaic or assembly.

Searchlights as usually constructed project, generally speaking, a parallel or substantially parallel beam of light, the cross sectional area of which at any distance from the projector is approximately circular and of more or less limited dimensions: consequently much time is required to scan a given area with the beam and there is considerable likelihood of the object which it is desired to find and illuminate remaining unilluminated even if it maintains a perfectly straight and level course, and where, as in the case of aircraft, the object is capable not only of considerable speed but also of being manoeuvred in three dimensions to avoid the beam, the chances of finding and illuminating it by means of a searchlight alone are comparatively small.

The use in conjunction with searchlights of sound locating apparatus has increased in some measure the effectiveness of searchlights in finding and illuminating fast moving objects, such as high speed aircraft, but the drawbacks already mentioned of known searchlights remain as formidable obstacles to the certain finding and illumination of an object passing through the area within the range of any given searchlight.

The improved searchlight according to the present invention is constructed in such a manner that the light beam is capable of being spread or diverged linearly, preferably to variable extents and without substantial reduction of light intensity per unit area, in a plane normal to the optical axis of the projector, that is to say, so that it has an elongated rectangular, instead of a substantially circular, form in cross section, and by traversing such a spread or diverged light beam backwards and forwards a large area can be rapidly scanned.

In Fig. 1 the circular area *a* represents an area on a screen, such as a cloud layer, illuminated by a searchlight beam of circular cross sectional form, and the elongated rectangular area *b* represents an area illuminated by the same beam when spread or diverged linearly according to the present invention. It will be apparent that by rocking or traversing the linearly spread or diverged beam an area, such as represented at *c*, can be scanned very much more rapidly than the same area could be scanned by the beam producing the more limited illuminated area *a*.

The extent of the linear spread or divergence of the beam of the searchlight according to the present invention is preferably capable of being varied as desired and *d* and *e* represent areas which could be scanned by the beam when linearly spread or diverged to a lesser extent.

As will be appreciated the maximum permissible linear spread or divergence of the beam should be such that sufficient intensity of illumination is always available.

A further feature of the present invention resides in continuously rocking or traversing the beam when linearly spread or diverged. Preferably the degree of linear spread or divergence is automatically adjusted to correspond with the extent of the rocking or traversing movement, that is to say, as the linear spread or divergence increases the extent of the traversing movement is automatically increased and vice versa.

Referring to Figs. 2–7 inclusive of the accom-

panying drawings, 1 is a projector comprising a source of light 2, shown as an electric arc light, located at or near the focus of a curved—for example a parabolic—reflector 3, arranged to project a substantially parallel light beam in a horizontal direction on to a mirror mosaic or assembly 4 supported on a frame 5 which occupies an inclined cross sectional area of the beam and is mounted for pivotal or rocking movement about an axis 6 lying in a plane passing through the principal axis of the projector 1 by means of trunnions 7 which cooperate with bearings 8 on supports 9 carried at opposite sides of the cylindrical casing 10. The cylindrical casing 10 has an aperture 11 through which the beam reflected from the mirror mosaic 4 emerges. The casing 10 is supported for rotation about its longitudinal axis upon end members 12 and 13 having rollers 14 which engage in suitable runways 15 on the casing 10.

The projector 1, casing 10 and appurtenant parts are carried upon a platform 16 which is mounted upon vehicle 17 for rotation about a vertical axis 18. For this purpose an electric motor 19 carried by the platform 16 drives a gear 20 which is in engagement with a gear 21 rigidly secured to the vehicle 17.

The platform 16 also carries an electric motor 22 which drives through the gearing 23, 24 and other gearing not shown a pulley 25 adapted to rotate the casing 10 about its longitudinal axis through suitable belt type gearing 26. Locking devices 27, 28 adapted for engagement with fixed parts of the vehicle are provided at each end of the platform 16 for normally holding the platform 16 with its longitudinal axis in line with the longitudinal axis of the vehicle.

The mirror mosaic 4 comprises an assembly of separate reflectors—some of which, as 29, are fixed upon the frame 5 and others of which, as 30, are mounted upon the frame 5 so as to be capable of individual rocking or tilting movement for the purpose of spreading or diverging the reflected beam in the manner hereinbefore referred to. As shown the rockable or tiltable reflectors 30 are rectangular in form and are disposed on opposite sides of a plane passing through the principal axis of the projector 1 and normal to the rocking axis 6 of the frame 5. The reflectors 30 are further disposed with their longitudinal axes parallel to the rocking axis 6 of the frame 5 and to permit individual rocking or tilting movement they are secured, as by screws or the like, to elements, 30*a* hinged or otherwise rotatably connected to members 30*b* forming part of the frame 5, the hinging or rocking axes 31 being so arranged that they are parallel to the principal axis of the projector when the frame 5 is arranged at 45° to the principal axis of the projector.

For effecting rocking or tilting movement of the reflectors 30 each reflector is provided with a rod 31*a* which extends parallel to the longitudinal axis thereof, and bears in the respective element 30*a* and also in a block or the like 31*b* secured to the reflector as by screws or the like. The inner end of each rod 31*a* engages in an inclined slot 32 in a guide member 32*a* attached to beam 33 forming part of the frame 5 and also in a cooperating slot 34 extending longitudinally of a control bar 35 which is pivoted at one end to the frame 5 at 36. With this construction movement of the control bar 35 about its pivot 36 effects tilting of the reflectors 30 about their axes 31, the amount of the tilting movement of the respective reflectors depending upon their distance from the pivot 36 of the control bar 35.

In the embodiment of the invention shown the frame 5 is adapted to be rocked continuously about its axis 6 for the purpose of continuously traversing the beam by an electric motor 37 through mechanism designed to permit of adjustment for the purpose of enabling the extent of the rocking movement, and consequently the traverse of the beam, to be varied as desired. This mechanism may conveniently comprise a link 38 pivotally connected at one end to the frame 5 at a distance from its rocking axis 6 and pivotally connected at its other end to a slide or trolley 39 longitudinally movable with respect to a frame member 40 pivoted at 41 on a support 42 and which can be rocked about its pivot by a link 43, one end of which is connected to a crank 44 on the shaft of the motor 37. The slide 39 is adapted to be moved along the pivoted frame member 40 by means of an electric motor 45 which drives a shaft 46 engaging the trolley 39 through suitable reduction gearing 47 and a slipping clutch 48. The slide or trolley 39 conveniently has rollers 49 which engage the frame member 40 to facilitate its movement. The extent of the rocking or traversing movement imparted to the frame 5 depends upon the position the slide or trolley 39 occupies along the frame member. When the axis of the pivotal connection of the link 38 to the trolley 39 is coincident with the axis of the pivot 41 no rocking movement is imparted to the frame 5. On the other hand, as the distance between these two pivotal axes increases the extent of the rocking movement of the frame 5 increases.

For simultaneously and automatically controlling the spread or divergence of the beam and its traversing movement, the slide or trolley 39 is connected with the control bar 35 and in the embodiment shown the slide or trolley 39 is connected by means of Bowden cables 50, 51 to the opposite ends of a differential lever 52 pivoted beneath the frame 5, other Bowden cables 53, 54 being connected between the lever 52 and the control bar 35 as shown. By this arrangement any movement of the slide or trolley 39 produces a corresponding movement of the control bar 35 and consequently of the tiltable reflectors 30 and thereby enables both the traversing movement and the linear spread or divergence of the beam to be varied by operation of a single control.

Any suitable form of reflector, such as a mirrored glass or highly polished metal, may be used, and it will be understood that the particular mode of producing the tilting movement may be varied in any desired manner providing it is such as to enable the beam to be linear spread or diverged in a plane normal to the optical axis of the projector. For example instead of the slots 32 and 34 suitable surfaces may be provided with which the ends of rods 31*a* are maintained in engagement by means of helical springs each secured at one end to a corresponding rod and at the other end to the frame 5. Such an arrangement as last described enables the central fixed reflector 29 to be dispensed with.

Although the searchlight has been shown and described herein as mounted upon a motor road vehicle it may obviously be mounted upon any other form of vehicle or in a fixed position. When mounted upon a vehicle the propelling engine may be employed when the searchlight is being used to drive a dynamo for supplying the

current required for the various purposes described.

What I claim is:

1. A searchlight comprising a projector adapted to project a substantially parallel beam of light, a frame mounted to occupy an inclined cross sectional area of said beam, a pivotal mounting for said frame lying in a plane passing through the principal axis of the projector, a plurality of mirrors each mounted upon said frame for angular adjustment about an axis parallel to the principal axis of the projector when the frame is at 45° to said principal axis, means for rocking said frame about its pivotal axis, and means coordinating the extent of said rocking movement with the angular adjustment of said mirrors.

2. A searchlight comprising a projector adapted to project a substantially parallel beam of light, a frame mounted to occupy an inclined cross sectional area of said beam and pivoted about an axis lying in a plane passing through the principal axis of the projector, a plurality of mirrors each mounted on said frame for angular adjustment about an axis parallel to the principal axis of the projector when the frame is at 45° to said principal axis, means for simultaneously angularly adjusting said mirrors to different extents about their pivotal axes, means for continuously rocking said frame, means for varying the extent of said rocking movement, and means co-ordinating the extent of the rocking movement of the frame with the degree of spread of the beam.

3. A searchlight comprising a projector adapted to project a substantially parallel beam of light, an assemblage of mirrors mounted to occupy an inclined cross sectional area of said beam and each angularly adjustable to permit spreading of the beam linearly, means for continuously rocking said assemblage to and fro, means for varying the extent of said rocking movement, means for simultaneously adjusting the angularity of said mirrors, and means interconnecting said mirror adjusting means and said assemblage rocking movement varying means whereby said beam is spread linearly proportionately to the extent of its traversing movement.

4. A searchlight comprising a projector adapted to project a substantially parallel beam of light, an assemblage of mirrors mounted as a whole to occupy an inclined cross sectional area of said beam and angularly adjustable with respect to one another for the purpose of spreading said beam linearly, a pivotal mounting for said assemblage, a control bar for simultaneously angularly adjusting said mirrors, a member rockable about a fixed pivot, a trolley slidable lengthwise of said member, a link connected to said assemblage at a distance from its pivotal axis and also to said trolley, and means connecting said trolley and said control bar whereby movement of said trolley causes a proportional movement of said control bar.

JOHN CLIFFORD SAVAGE.