W. G. WOOD.
HEADLIGHT.
APPLICATION FILED FEB. 5, 1920.

1,419,482.

Patented June 13, 1922.

3 SHEETS—SHEET 1.

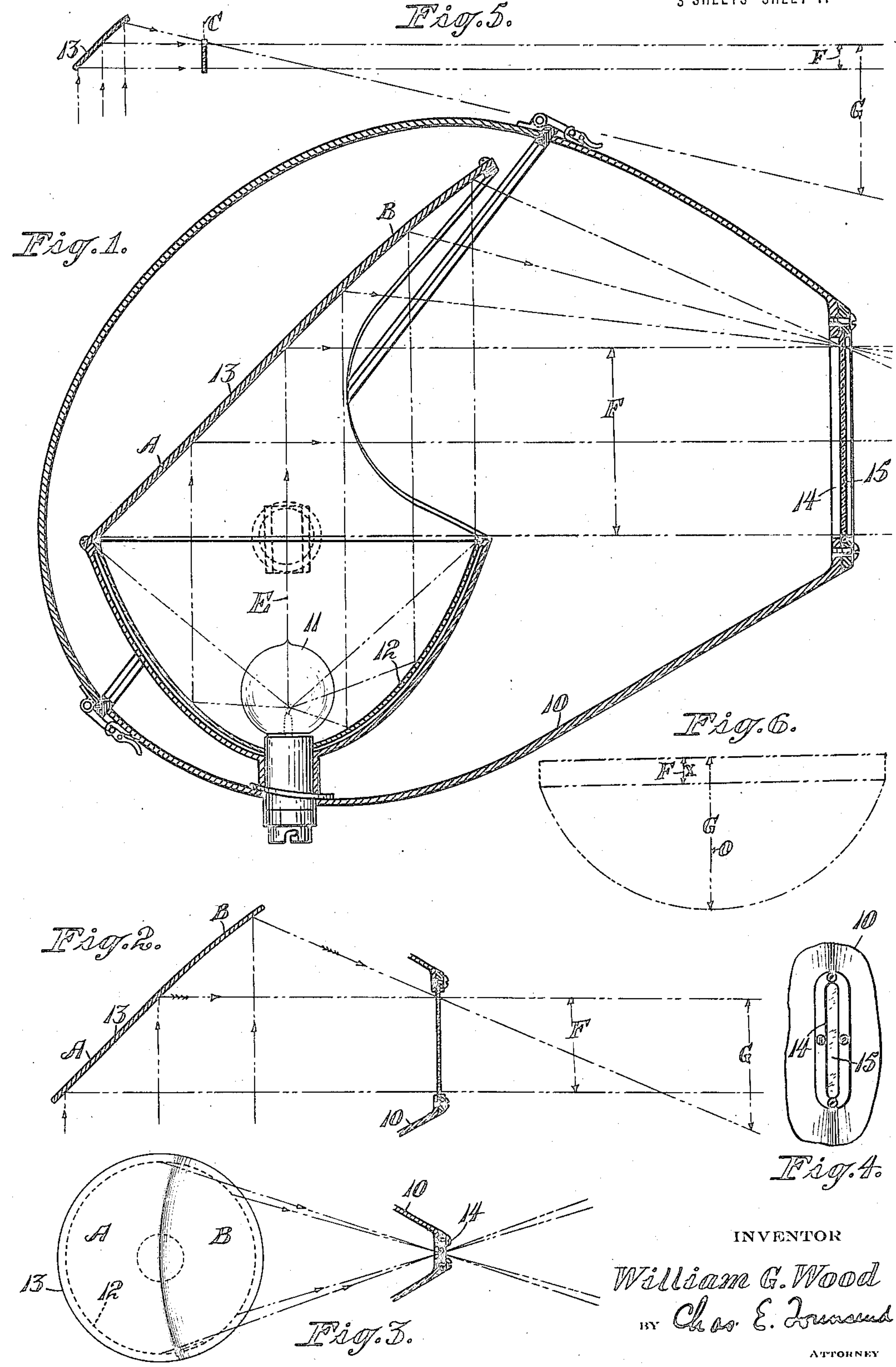

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Fig. 7.

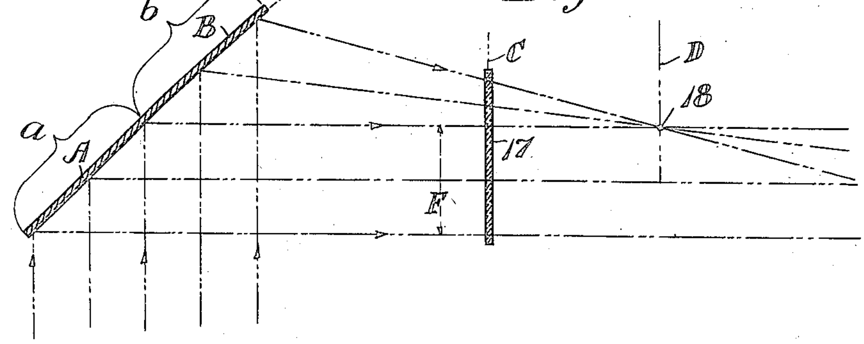


Fig. 8.

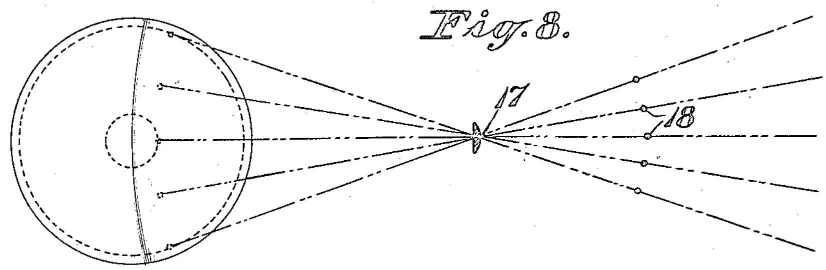


Fig. 9.

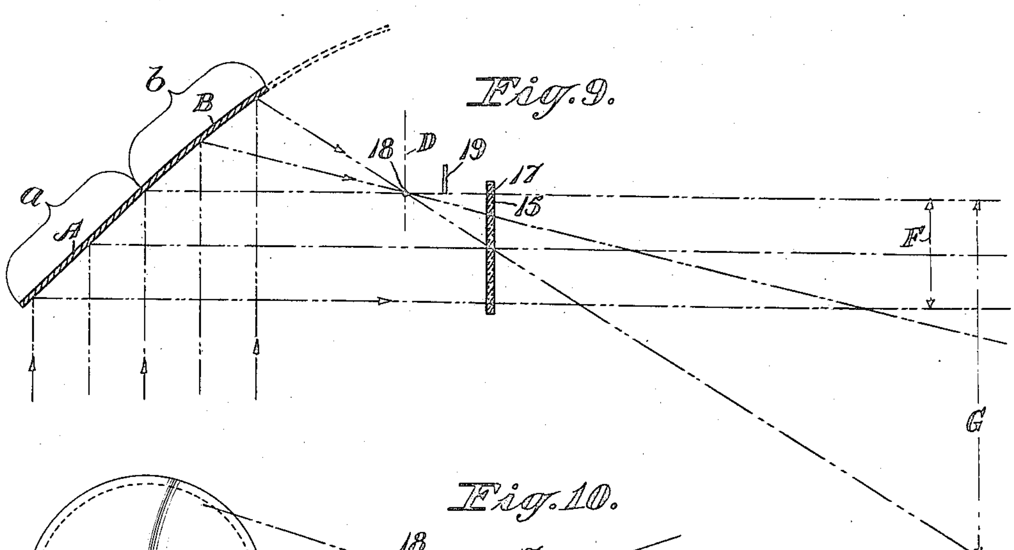
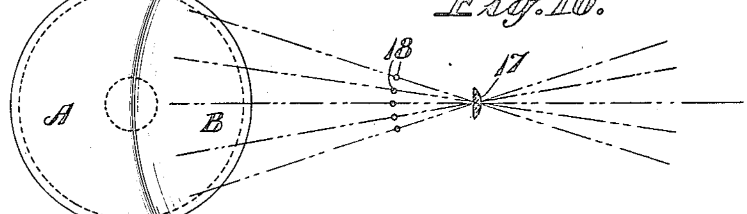


Fig. 10.



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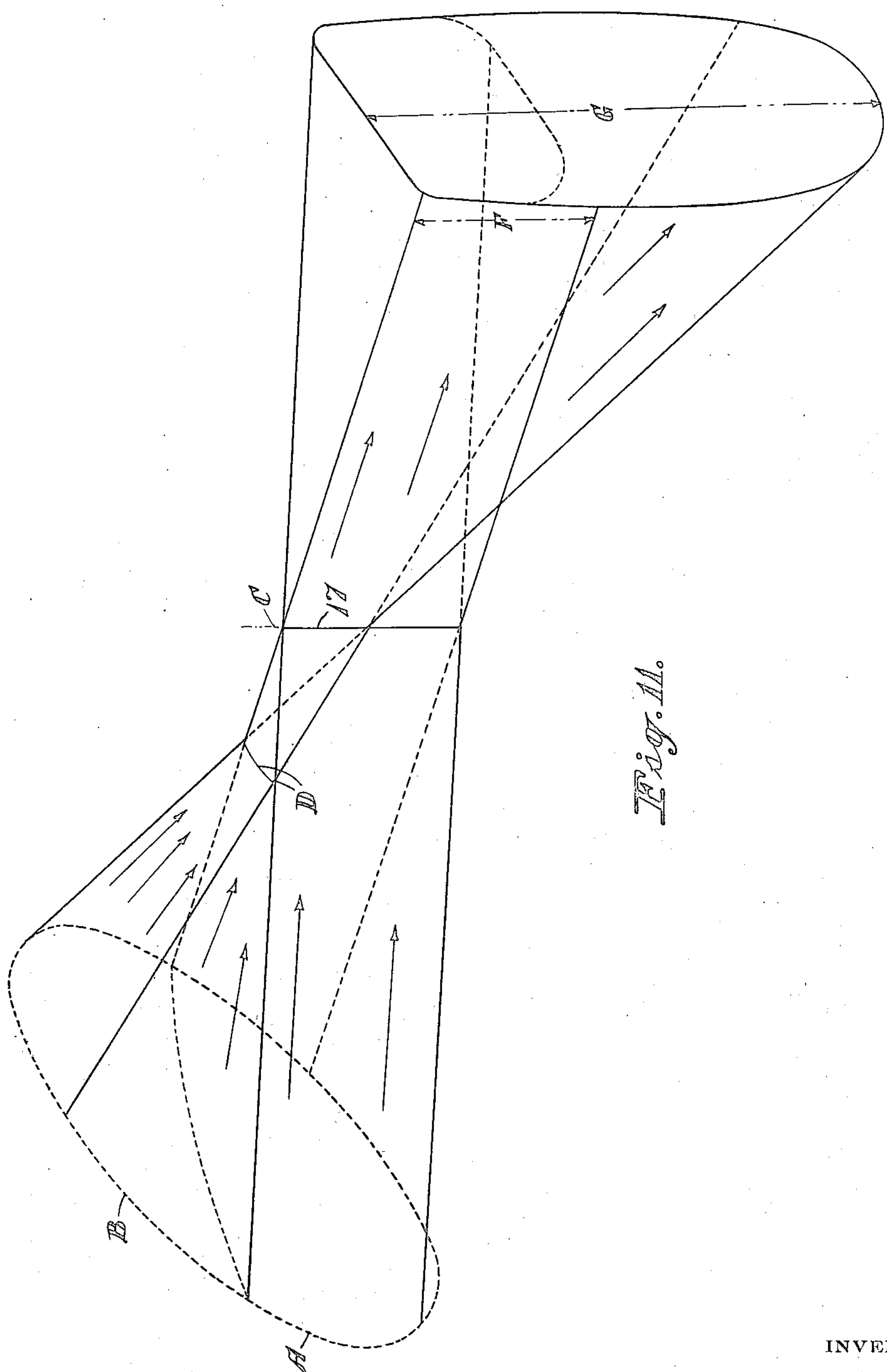

Fig. 11.

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UNITED STATES PATENT OFFICE.

WILLIAM G. WOOD, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO BERKELEY LIGHT CORPORATION, OF CARSON CITY, NEVADA, A CORPORATION OF NEVADA.

HEADLIGHT.

1,419,482. Specification of Letters Patent. Patented June 13, 1922.

Application filed February 5, 1920. Serial No. 356,486.

To all whom it may concern:

Be it known that WILLIAM G. WOOD, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, has invented new and useful Improvements in Headlights, of which the following is a specification.

This invention relates to projectors, and the present application is in the nature of a continuation in part of my prior application, Serial No. 209,833, filed January 2, 1918, and entitled "Reflector."

The object of the invention is to produce a light field, especially suited for automobile headlights, wherein the light rays of greater intensity illuminate that part of the roadway farthest from the car and the light rays of lesser intensity illuminate that part of the roadway nearest the car. That is the reverse of ordinary headlight illumination and is the ideal system for automobile headlights.

I accomplish this object by using any one of several different arrangements of reflectors and lenses, some of which are exemplified in the following description and illustrated in the accompanying drawings, in which:—

Fig. 1 shows a vertical central sectional view of a headlight and casing embodying my invention.

Fig. 2 shows a diagram in vertical section of the composite reflector employed in my device and illustrating one form thereof.

Fig. 3 shows a plan view of the arrangement shown in Fig. 2.

Fig. 4 shows a front elevation of the light emitting aperture in the front of the casing.

Fig. 5 shows a diagram in elevation of the composite reflector and the beam projected thereby.

Fig. 6 shows a diagram of the light field produced by the arrangement shown in Fig. 5.

Fig. 7 shows a diagram in elevation of a modified form of composite reflector, wherein the reflector produces a slightly different form of beam from that shown in Fig. 5.

Fig. 8 shows a plan view of the arrangement illustrated in Fig. 7.

Fig. 9 shows a diagram in elevation of the parts shown in Fig. 7 still further modified.

Fig. 10 shows a plan view of the arrangement illustrated in Fig. 9.

Fig. 11 shows a perspective of the beam projected by the device of Figs. 9 and 10.

Referring in detail to the accompanying drawings, I show a lamp housing 10 containing a source of light 11 in the bottom thereof, surrounding which source is a parabolic reflector 12, or means for producing parallel rays. The rays emanating from the light source are reflected by the part 12 in parallelism and strike a second reflector 13 in the upper part of the housing, said second reflector being a composite reflector, one part A of which is preferably a portion of a conical reflector and the other part B of which is a portion of a paraboloid, sphere or other concave reflector. The reflector 13 is a surface generated by revolving a parabolic arc, or other curve *b* and a tangent *a* at one extremity thereof, about an axis C parallel to the incident rays. In any instance, the part of the surface generated by the tangent will be in the nature of a section of a cone. When the axis of the parabolic arc is co-incident with the axis of revolution the surface of the reflector portion B is that of a section of a paraboloid, and the portion A is a section of the surface of a cone which is tangent to the surface of the paraboloid at the circle of junction, Figs. 1, 2 and 3. When the axis D of the parabolic arc is not coincident with the axis of revolution, as in Figs. 7 and 9, then the reflector portion B becomes such as to have two lines where the rays cross, one in a vertical plane, indicated at 17 and another in a horizontal plane indicated at 18.

The front of the housing 10 is preferably closed, except for a narrow vertical aperture 14 fitted with an objective lens 15, said lens being preferably a cylindrical lens. The lens 15 it will be noted is parallel with the axes C, D and E and is so positioned as to coincide with the vertical focal plane of all rays projected by the composite reflector 13.

The character of the beam projected by the reflector part A is wedge-shaped, the rays F projected thereby being parallel in a vertical plane and crossing within the aperture 14 and diverging in a horizontal plane as they pass therefrom. These rays F are preferably horizontal or inclined downwardly, and consequently continue out a great distance. When projected upon a screen or wall at a distance from the lamp, the field produced thereby corresponds to the portion marked X in Fig. 6. The character of the beam projected by the reflector portion B is such that the rays G converge in all planes, crossing each other and continuing out divergent in all planes. The field thereof is indicated at O in Fig. 6.

By having the rays from both reflector parts A and B cross within the aperture 14, I am enabled considerably to reduce the width of said aperture and thus prevent any substantial portion of the light source or reflectors from being seen by an observer stationed in front of the lamp. In so concealing the light source and reflecting surfaces, much of the glare that is present in ordinary headlights is eliminated. Also this reduced light emitting aperture has the further advantage of cutting out stray and vagrant rays which, if allowed to pass through, would cause more or less spreading and diffusion of the light and prevent the formation of a beam of sharp outline such as is characteristic of the present lamp.

By locating the horizontal crossing line for the rays G back of the lens 15, as shown in Fig. 9, I am enabled to employ a baffle or diaphragm 19 positioned as shown in Fig. 9 to cut the uppermost rays from the reflector portions A and B sharply and clearly. This is best attained by locating the baffle 19 a distance to the rear of the lens 15 corresponding to the focal length of said lens.

It is important in the construction of a headlight that the rays forming the upper portion of the beam be horizontal or inclined downwardly in order that the light may not be thrown into the eyes of an operator of an approaching vehicle and also to insure that such rays will serve to illuminate the part of the roadway nearest the car. On the other hand, the rays F of the wedge-shaped beam projected by the reflector part A should be horizontal or slightly below in order that they may continue out and illuminate objects farthest from the car since such rays F are of greater intensity than the rays G. The reason for the greater intensity of the rays F is to be found in the fact that they are reflected from a considerable portion of the reflector 13 and since they diverge only in one plane they lose little of their intensity even at a considerable distance from the lamp. On the other hand, the rays G will have less intensity owing to the fact that they diverge in all planes and there is not the concentration that is to be found in the case of the rays F. Moreover, a part of the rays from the upper portion of the reflector 13 combine with the rays from the lower portion. Hence, the intensity of the part X of the field is reinforced and strengthened thereby.

From the foregoing, it will be seen that the reflector 13 produces two beams, each of a different character, one whose rays converge in a single plane only and another whose rays converge in all planes, all of the rays of both beams crossing on the same vertical axis, and the upper part of the light field being formed by allowing the rays, which converge in but one plane, to continue out divergently in the same plane, reinforced by a portion of the rays of the other beam, which after leaving the aperture diverge in all planes and hence illuminate a larger field, including a considerable area beneath that portion of the field of increased intensity.

Other forms of reflectors 13 suitable for accomplishing my objects may be produced by revolving either a straight or curved (regular or irregular) line, or any combination of these, about an axis which is parallel to the incident rays.

The various modifications shown in Figs. 7 to 11 inclusive embody the same combination of parts as shown and described in the preceding figures, except that the composite reflector is differently shaped. In all cases the composite reflector is formed by revolving a curved line *b* and a tangent *a* at one extremity thereof about an axis C, which axis is parallel with the incident rays. This axis C in every instance coincides with the position of the light emitting aperture in the housing. This method of forming the horizontal curvature of the composite reflector will insure a common vertical crossing line at C for all of the rays. The rays reflected by the portion *b* may also cross each other on a horizontal line at other points or positions which will be determined by the curvature of the line *b*. In Fig. 7 et. seq., the curvature of *b* is such as to cause the rays to cross again at 18. In all of the figures I show the axis C the same distance from the reflector, but in Figs. 7 and 8 the crossing points or line 18 is in front of the axis C, whereas in Figs. 9, 10 and 11 these points 18 are behind the axis C, from which it follows that the curvature of the reflector portion B in a vertical plane is less in the case of Figs. 7 and 8 than in the case of Figs. 9, 10 and 11. The purpose of these modifications is to show that the beam projected by the composite reflector may have a plurality of focal planes or crossing lines differently positioned and also to demonstrate as in the case of Figs. 9, 10 and 11 the use of a screen or baffler member 19 arranged within the housing at the required distance from the objective lens 15.

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

1. A headlight for vehicles comprising a housing, a source of light in the housing, means to project parallel rays therefrom and a composite reflector to receive the parallel rays and having means to project them out from the housing in the form of a beam having downwardly inclined rays diverging in a plurality of planes to illuminate objects nearest to the vehicle, said reflector also having means to project rays substantially horizontally and diverging in one plane only whereby to illuminate objects a greater distance from the vehicle.

2. In a projector, a composite reflector having a portion provided with means to reflect parallel incident rays so as to converge them in one plane and another portion to reflect parallel incident rays so as to converge them in a plurality of planes, all of said rays crossing on a straight line, and means to project parallel light rays against the composite reflector.

3. A lamp comprising a housing having a narrow vertical light emitting aperture, a source of light within the housing, means to project parallel rays from the source of light, and a composite reflector within the housing to receive the parallel rays, said composite reflector having one portion provided with means to reflect the rays so as to converge in one plane and another portion to reflect the rays so as to converge in different planes, all of said rays crossing within the narrow light emitting aperture.

4. A lamp comprising a source of light, means to project parallel rays therefrom and a composite reflector to receive the parallel rays, said composite reflector having a portion provided with means to project a wedge-shaped beam, and another portion provided with means to project a conical beam.

5. A lamp comprising a source of light, means to project parallel rays therefrom, and a composite reflector to receive the parallel rays, said composite reflector having a portion provided with means to project a wedge-shaped beam and another portion provided with means to project a conical beam, the parts of said reflector being so arranged that the rays of the wedge-shaped beam are substantially horizontal and the rays of the conical beam are inclined downwardly.

6. A lamp comprising a housing having a narrow vertical light emitting aperture in the front thereof, an objective lens for said light emitting aperture, a source of light in the housing, and means co-operating with the source of light to project a convergent beam through the narrow aperture, said means comprising a reflector shaped to produce a field of light having a band at its upper portion of comparatively great intensity and a curved lower portion of less intensity.

7. A lamp comprising a housing having a narrow vertical light emitting aperture in the front thereof, an objective lens for said light emitting aperture, a source of light in the housing, and means co-operating with the source of light to project a convergent beam through the narrow aperture, said means comprising a reflector shaped to produce a field of light having a band at its upper portion of comparatively great intensity and a curved lower portion of less intensity, and means in focus with the objective lens to cut the upper border of the beam sharply.

8. In a projector, means to produce parallel light rays, a composite reflector to receive said parallel rays having one portion in the form of a section of a cone and another portion in the form of a section of a concave figure, both of said portions having their principal axes parallel to each other and to the incident rays.

9. In a projector, means to produce parallel light rays, and a reflector to receive the parallel rays, said reflector having a surface generated by revolving a parabolic arc about an axis eccentrically located with respect to the axis of said arc and parallel thereto.

10. In a projector, means for producing parallel light rays and a reflector to receive said parallel rays, said reflector having a surface generated by revolving an arc of a curved body, the axis of revolution of which is parallel to the incident rays and eccentrically located with respect to the axis of the concave body.

11. In a projector, means to produce parallel light rays and a reflector to receive said parallel rays, said reflector having a surface generated by revolving a curved line and a tangent at one extremity thereof about an axis parallel to the incident rays.

12. In a projector, means for producing parallel light rays and a reflector to receive the parallel rays, said reflector having a surface generated by revolving a parabolic arc and a tangent at one extremity thereof about an axis eccentric with the axis of the parabolic arc and parallel thereto.

13. In a lamp, means to produce parallel light rays, a unitary reflector having a portion shaped so as to reflect parallel incident rays convergently in one plane and another portion shaped to reflect parallel incident rays convergingly in all planes, all

of said rays crossing on a straight line and continuing out divergently.

14. In a projector, means to reflect parallel incident rays convergently in one plane and means to reflect parallel incident rays convergently in a plurality of planes, all of said rays crossing on a vertical line, and continuing out divergently.

15. In a projector, means to produce parallel light rays, means to reflect parallel incident rays convergently in one plane and means to reflect parallel incident rays convergently in a plurality of planes, all of said rays crossing on a vertical line and continuing out divergently, said reflecting means being so arranged as to cause the rays which diverge in one plane to illuminate the upper portion of the field, and those which diverge in a plurality of planes to illuminate the same portion of the field and a considerable area beneath.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM G. WOOD.

Witnesses:
VALERIE DE REMER,
JOHN H. HERRING.