G. C. WHITNEY.

MEANS FOR PRODUCING COLORED LIGHT EFFECTS.

APPLICATION FILED DEC. 27, 1916.

1,219,514. Patented Mar. 20, 1917.

Fig. 6.

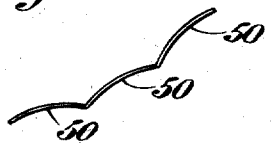


Fig. 1.

Fig. 7.

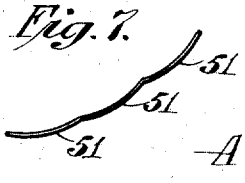


Fig. 2.

Fig. 3.

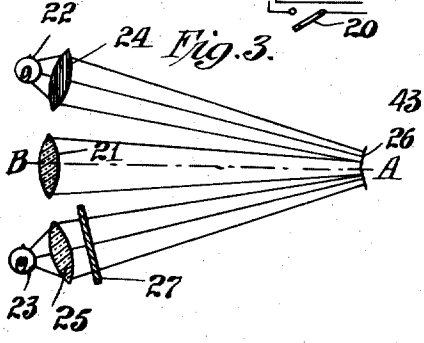


Fig. 5.

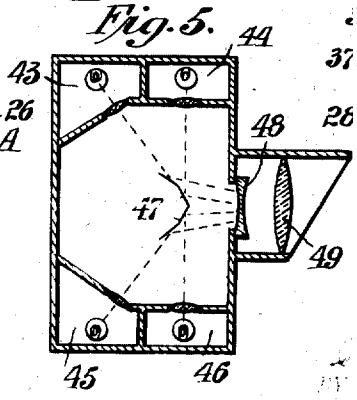
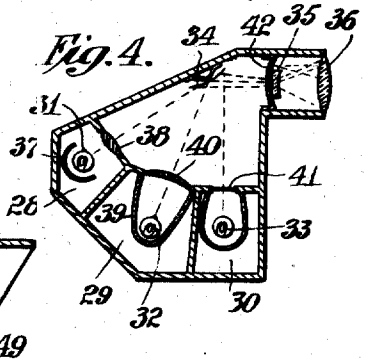


Fig. 4.



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MEANS FOR PRODUCING COLORED-LIGHT EFFECTS.

1,219,514. Specification of Letters Patent. Patented Mar. 20, 1917.

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To all whom it may concern:

Be it known that I, GILBERT C. WHITNEY, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Means for Producing Colored-Light Effects, of which the following is a specification.

My invention relates to the art of producing colored light effects by projecting a beam of colored light originating at one or more of a plurality of primary sources of light separate and distinct from one another, and each of a distinctive color, the projected beam being either of one definite color corresponding with that of some one of said several primary sources, or a resultant color due to the mixing and blending of colored light emanating from two or more of said primary sources; and the object of my invention is to provide certain improvements in and relating to apparatus or means for producing colored light effects of the general class or type above referred to, all as will hereinafter and at length more fully appear.

The particular embodiment of my invention disclosed in this present application is designed to be used as the visible luminous signal light of a block signal system used upon railways, and to display signal lights of three colors such, for example, as red, yellow and green, and is in the nature of an improvement in the means for producing colored light effects, for which I made application for Letters Patent upon the twenty-eighth day of September, 1916, Serial Number 122,649; although my invention may be readily adapted to display or project lights of two colors only, or of more than three colors. When so used my invention provides a signaling system in which signal lights of any one of two or more distinct colors, (as determined and controlled by the mechanical, electrical, pneumatic, or other kind of means for setting the signal lights of the system) are projected through and by means of an uncolored objective lens, which colored lights may thus be made to appear separately and in proper sequence at one and the same place; the color of the light displayed indicating to the engineer or motorman the traffic conditions in the block or blocks ahead of him, as will be appreciated.

More particularly stated, the object of invention in this present case is to provide means for producing colored light effects in which light from the several primary sources referred to is concentrated upon a mirror located in or substantially in the axis of the objective lens by means of which light is projected, which mirror becomes a secondary source of light as the light which falls upon it is reflected and projected through and by the objective lens employed in my device, as will hereinafter appear. Because of the fact that the efficiency of a mirror is high, that is, that almost all the light which falls upon it is reflected, and but little is absorbed, when the mirror is in proper condition, it follows that substantially all the light emanating from the several primary sources will be rendered available at the mirror as a secondary source of light, and will be reflected therefrom and projected by the objective lens of the system but little if any reduced in intensity, whereby a maximum of brightness and intensity of the projected ray or beam of light is secured.

With the above and other objects of invention in view, my invention consists in the improved means for producing colored light effects illustrated in the accompanying drawings, described in the following specification, and particularly claimed, and in such variations and modifications thereof as will be obvious to those skilled in the art to which my invention relates.

In the drawings accompanying and forming a part of this application, and wherein the preferred embodiment of my invention is illustrated:—

Figure 1 is a view employed to illustrate the optical principles of my invention.

Fig. 2 is a similar view illustrating a modification of my invention;

Fig. 3 is a view illustrating a form of my invention in which the principal elements thereof are arranged differently than in Figs. 1 and 2;

Fig. 4 is a view illustrating in a conventional manner the way in which the several elements employed in my invention, and arranged substantially as in Figs. 1 and 2, may be supported in proper relation with one another within a suitable casing;

Fig. 5 is a view illustrating a modified form of my invention adapted to project or display signal lights of four colors;

Fig. 6 is a view showing a modified form of the mirror employed in my device, and;

Fig. 7 is a view showing another modified form of the mirror.

Referring to the drawings, Figs. 1 to 3 inclusive are views in the nature of diagrams employed to illustrate the optical principles of my invention, while Figs. 4 and 5 are views showing in a conventional manner some of the various ways in which the elements of my invention may be supported by and within a suitable casing, and the invention rendered available for practical use in and as a part of a signaling system for use upon railways, as above explained.

In Fig. 1 of the drawing, the reference numerals 8, 9 and 10 designate red, yellow, and green lenses shown as arranged in a single plane and to one side of the axis A—B of the system and of the uncolored or clear glass objective lens 11; and 12, 13, and 14 designate incandescent electric lamps, one associated with each lens, which lamps in connection with the lenses associated with them provide a plurality of primary sources of light differing in color from one another, as the color of the light emanating from a lamp, as modified by the lens associated with it, will be obviously dependent upon the color of the lens associated with the lamp in question.

Light emanating from the several primary sources above referred to is concentrated by the lenses upon a mirror shown in Fig. 1 as made up of a plurality of plane surfaces 15, 16, and 17; the lamps being located, approximately, one at one of the conjugate foci of each lens, while the other foci of the lenses are at or adjacent the portions of the mirror upon which the light from the several lamps, individually considered, is concentrated; the arrangement of the mirror relative to the lamps being such that the light concentrated thereupon by the several lenses will be reflected along the axis A—B of the system. The mirror thus becomes a secondary source of light, the color of which will depend upon which particular one of the incandescent lamps is lighted at a given time; and the rays from all the lamps, after being reflected by the mirror, are nearly parallel with and lie close to the axis A—B of the system and of the objective lens; for the reflecting surfaces of the mirror are of but slight area, and lie close to one another, the light from the several primary sources being focused upon the said areas whereby an intense illumination is produced upon extremely small areas.

The rays of light reflected from the mirror as aforesaid are approximately parallel with the axis A—B of the objective lens 11, and, in the form of my invention illustrated in Fig. 1, they pass through a diffusing lens 18 of clear glass, the purpose of which is to spread the beam and secure a more uniform distribution throughout the entire area of the objective lens through which the light is projected, the arrangement and proportion of the parts being commonly such that the projected beam is made up of parallel or slightly diverging rays, as is usual in signaling systems.

The diffusing lens 18 is employed in cases in which the focal length of the objective lens is less than the distance between the center of said lens and the mirror. In the form of my invention illustrated in Fig. 2 the colored lenses, the lamps, and the mirror are the same as in Fig. 1, but no diffusing lens is used; because the objective lens 19 is so chosen that its focus is approximately coincident with the mirror, whereby light emanating from the mirror as a secondary source will be projected by the objective lens as a beam made up of parallel, or slightly diverging rays, the same as in the arrangement illustrated in Fig. 1.

In this connection it may be stated that while the size of the mirror may be varied considerably, it will ordinarily be small as compared with the lenses employed. I have in practice used a mirror of the general form shown in Figs. 1 and 2, and the total length of which was but three-fourths of an inch; from which it will be appreciated that if the middle portion of the mirror be considered as located precisely at the focus of the lens 19, or of the lens system comprising the lenses 11 and 18, the upper and lower portions thereof will be but very little out of focus; not enough to at all interfere with the use of the invention in and as a part of a commercial railway signaling system.

The several incandescent lamps together with the colored lenses associated with them thus form a plurality of sources of light, each of a distinctive color dependent upon the color of the lens in each case, while the mirror reflects the light emanating from the primary sources with a minimum of loss due to absorption or other causes, and projects the light thus reflected along and approximately parallel with the axis A—B of the uncolored objective lens and through the latter as a visible signal light. The mirror thus becomes a secondary source of light, and the color of the projected beam will obviously correspond in color with the color of the primary source in operation at any particular time.

It will be appreciated that if more than one of the primary sources is illuminated and in operation at one and the same time, the color of the beam of light projected by the objective lens 11 or 19 will be a resultant color due to a mixing of the colors of the

primary sources lighted and in operation at the time. In a railway signaling system, however, it is necessary to display signal lights of distinctive and widely variant colors, to which end my invention includes means, shown conventionally as the switches 20, for controlling the primary sources of light so that one only of them may be in operation or illuminated at a time. Under such conditions it will be obvious that if the lamp 14 only, for example, is illuminated, green light will be concentrated upon the mirror by the green lens 10, and a green beam will be projected by the uncolored objective lens; and likewise a yellow, or a red beam, when the lamp 13, or the lamp 12, is in operation.

When my invention is used in connection with and as a part of a block signal system upon a railway the switches 20, (or other devices whereby the lamps are controlled, so that light of one color only will be projected at a given time to form a visible signal light of a definite and predetermined color) will be operated and controlled by suitable electrical, mechanical, pneumatic, or other mechanism, the same generally speaking, as the signal lights are regulated and controlled in block signal systems at present in use. This present invention, however, has to do only with the means for producing and projecting properly colored visible signal lights using lamps of any kind or type as ultimate sources of light, among which may be mentioned oil burning lamps, gas lamps, etc.; and the means for controlling the lamps employed so as to produce visible signal lights of definite colors, as is required in block signal systems, as well as the particular kind or type of lamps used as ultimate sources of light, form no part of the invention to which this present application relates.

In the arrangement of the principal elements of my invention illustrated in Fig. 3, the primary sources of light are arranged angularly about the axis A—B of the uncolored objective lens 21 as an axis; and light emanating from the primary sources 22, 23, is concentrated by the lenses 24, 25, onto the mirror 26, from which the rays are reflected and projected through the objective lens in the same manner as hereinbefore explained. As illustrated in this figure the focus of the objective lens is at the mirror, although it will be appreciated that a diffusing lens could be used in connection with an objective lens of shorter focal length. This view also shows how colored light may be secured by the use of a colored slide or screen 27 used in connection with a clear or uncolored lens, as the lens 25; thus avoiding, if that be deemed desirable, the use of lenses which are themselves colored.

It will be appreciated that in order to adapt my invention, the principles of which have been explained by the use of the diagrams appearing in Figs. 1, 2, and 3, for use in a railway signaling system, the various elements must be so arranged that the light from each of the primary sources is so confined and shielded that it cannot interfere with light from another source or sources, and so arranged that light from an external source cannot interfere with the light emanating from the primary sources considered collectively; to which end the various elements are located and held in proper positions relative to one another within a suitable casing having separate compartments for the various sources of colored light; two of the various forms which said casing may assume being illustrated, conventional, in Figs. 4 and 5.

Fig. 4 illustrates a form of casing adapted to accommodate an arrangement of the elements of my invention substantially the same as that illustrated in Figs. 1 and 2, and having internal chambers or compartments 28, 29 and 30, within which primary sources of light 31, 32, and 33 are located; the light from which several sources is concentrated upon a mirror 34, and reflected thereby and projected through the diffusing lens 35 and objective lens 36 as a colored beam the color of which depends upon the color of the lenses or screen associated with the particular primary source lighted. The primary source 31 is shown as having a reflector 37, and the light as passing through a red lens 38; the primary source 32 is shown as equipped with a parabolic reflector 39, and with a yellow lens 40 for concentrating the parallel rays projected by the reflector upon the mirror; while the primary source 33 is shown as having a reflector of such form that it will concentrate the rays upon the mirror, the color effect being produced by means of a green slide or screen 41. These, as will be appreciated, are each and all well known means for producing colored light and for concentrating the same upon the mirror; and these as well as other equivalent schemes for producing colored light may be used as primary sources of colored light wherever such a source is to be used in adapting my invention to use as a part of a signaling system. In the adaptation of my invention illustrated in this figure, I show the beam reflected from the mirror as passing through an opening provided in a reflector 42, the purpose of which is to reflect the light reflected from the inner surface of the objective lens 36, whereby a more effective projection of the beam of colored light is secured.

Fig. 5 illustrates a form of practical adaptation of my invention in which the containing casing is provided with four compartments 43, 44, 45 and 46, each con-

taining a primary source of light; the light from all of which sources is concentrated upon a mirror 47, and reflected therefrom through a diffusing lens 48 and the objective lens 49; the latter being shielded in order to prevent the light from the headlight of a passing locomotive from falling upon it, whereby the liability of phantom signals being produced is reduced. This form of my invention is adapted to display or project signal lights of four colors, as will be appreciated.

Figs. 6 and 7 show the mirror larger than in Figs. 1 and 2, and the separate reflecting portions thereof as slightly concave as shown at 50, Fig. 6, and as slightly convex as shown at 51, Fig. 7; the former of which constructions results in a concentration of the reflected beam, while the reflected beam is dispersed by the latter construction. Either of these constructions of mirror may be used in adapting my invention to practical use, if it is deemed desirable to do so.

While the lenses illustrated in the various figures of the drawing are of the conventional form having curved surfaces, it will be appreciated that stepped, prismatic, or other of the various forms of lenses in common use, particularly in railway signaling systems, may be used wherever a lens is to be used in adapting my invention to practical use in a railway signaling system.

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

1. In a device of the class described, a plurality of sources of light differing in color from one another; means for controlling said sources so that light may emanate from one only of them at a time; a single uncolored objective lens; and a mirror arranged so as to reflect light emanating from said several sources and project the same through said uncolored lens.

2. In a device of the class described, a plurality of sources of light differing in color from one another; means for controlling said sources so that light may emanate from one only of them at a time; an uncolored objective lens; a mirror arranged so as to reflect light emanating from said several sources and project the same through said uncolored lens; and a lens located between said mirror and said objective lens and adapted to disperse the light reflected by said mirror.

3. In a device of the class described, a suitable casing; a plurality of sources of light differing in color from one another located within said casing; means for controlling said sources so that light may emanate from one only of them at a time; a single uncolored objective lens carried by said casing; and a mirror located within said casing and arranged so as to reflect light emanating from said several sources and project the same through said uncolored lens.

4. In a device of the class described, a suitable casing; a plurality of sources of light differing in color from one another located within said casing; means for controlling said sources so that light may emanate from one only of them at a time; an uncolored objective lens carried by said casing; a mirror located within said casing and arranged so as to reflect light emanating from said several sources and project the same through said uncolored lens; and a lens located between said mirror and said objective lens and adapted to disperse the light reflected by said mirror.

5. In a device of the class described, a plurality of sources of light differing in color from one another; means for controlling said sources so that light may emanate from one only of them at a time; a mirror; means for concentrating light emanating from said several sources upon said mirror; and a single uncolored objective lens through which light reflected by said mirror is projected.

6. In a device of the class described, a plurality of sources of light differing in color from one another; means for controlling said sources so that light may emanate from one only of them at a time; a mirror; means for concentrating light emanating from said several sources upon said mirror; an uncolored objective lens through which light reflected by said mirror is projected; and a lens located between said mirror and said objective lens and adapted to disperse the light deflected by said mirror.

7. In a device of the class described, a plurality of sources of light; means for controlling said sources so that light may emanate from one only of them at a time; a mirror; means for concentrating light emanating from said several sources upon said mirror; a single uncolored objective lens through which light reflected from said mirror is projected; and means for determining the color of the light emanating from said several sources.

8. In a device of the class described, a plurality of sources of light; means for controlling said sources so that light may emanate from one only of them at a time; a mirror; means for concentrating light emanating from said several sources upon said mirror; an uncolored objective lens through which light reflected from said mirror is projected; means for determining the color of the light emanating from said several sources; and a lens located between said mirror and said objective lens and adapted to disperse the light reflected by said mirror.

9. In a device of the class described, a plurality of sources of light; means for controlling said sources so that light may ema-

nate from one only of them at a time; a mirror; a plurality of lenses differing in color from one another and one of which is associated with each of said sources, whereby colored light emanating from said several sources is concentrated upon said mirror; and a single uncolored objective lens through which light reflected by said mirror is projected.

10. In a device of the class described, a plurality of sources of light; means for controlling said sources so that light may emanate from one only of them at a time; a mirror; a plurality of lenses differing in color from one another and one of which is associated with each of said sources, whereby colored light emanating from said several sources is concentrated upon said mirror; an uncolored objective lens through which light reflected by said mirror is projected; and a lens located between said mirror and said objective lens and adapted to disperse the light reflected by said mirror.

11. In a device of the class described, a plurality of sources of light; means for controlling said sources so that light may emanate from one only of them at a time; a mirror; means for concentrating light emanating from said several sources upon said mirror; a plurality of members differing in color from one another and one of which members is associated with each of said sources, whereby the color of the light emanating from said sources is determined; and a single uncolored objective lens through which light reflected by said mirror is projected.

12. In a device of the class described, a plurality of sources of light; means for controlling said sources so that light may emanate from one only of them at a time; a mirror; means for concentrating light emanating from said several sources upon said mirror; a plurality of members differing in color from one another and one of which members is associated with each of said sources, whereby the color of the light emanating from said sources is determined; an uncolored objective lens through which light reflected by said mirror is projected; and a lens located between said mirror and said objective lens and adapted to disperse the light reflected by said mirror.

13. In a device of the class described, a plurality of sources of light differing in color from one another; means for controlling said sources so that light may emanate from one only of them at a time; an uncolored objective lens; a mirror arranged so as to reflect light emanating from said several sources and project the same through said objective lens; and a reflector located adjacent said objective lens.

14. In a device of the class described, a plurality of sources of light differing in color from one another; means for controlling said sources so that light may emanate from one only of them at a time; an uncolored objective lens; a mirror arranged so as to reflect light emanating from said several sources and project the same through said objective lens; and a reflector located between said mirror and objective lens, and having an opening through which the reflected light passes.

15. In a device of the class described, a suitable casing; means for dividing the interior of said casing so as to provide a plurality of separate lamp compartments; a plurality of colored members associated one with each of said lamp compartments, whereby the color of the light emanating therefrom is determined; a plurality of primary sources of light, one located within each of said lamp compartments; means for controlling said primary sources so that light may emanate from one only of them at a time; a single uncolored objective lens carried by said casing; and a mirror located within said casing and arranged so as to reflect light emanating from said light compartments and project the same through said objective lens.

16. In a device of the class described, a suitable casing; means for dividing the interior of said casing so as to provide a plurality of separate lamp compartments; a mirror located within said casing; means whereby colored light is caused to emanate from said several lamp compartments and is concentrated upon said mirror, the light emanating from the several compartments being of different colors; means for controlling the light emanating from said several lamp compartments; and a single uncolored objective lens carried by said casing and through which light reflected by said mirror is projected.

In testimony whereof I have signed my name to this specification this 23 day of December, 1916.

GILBERT C. WHITNEY.