

(No Model.)

4 Sheets—Sheet 1.

A. G. CUMMINGS.

SEMAPHORE SIGNAL.

No. 340,490.

Patented Apr. 20, 1886.

Fig. 1.

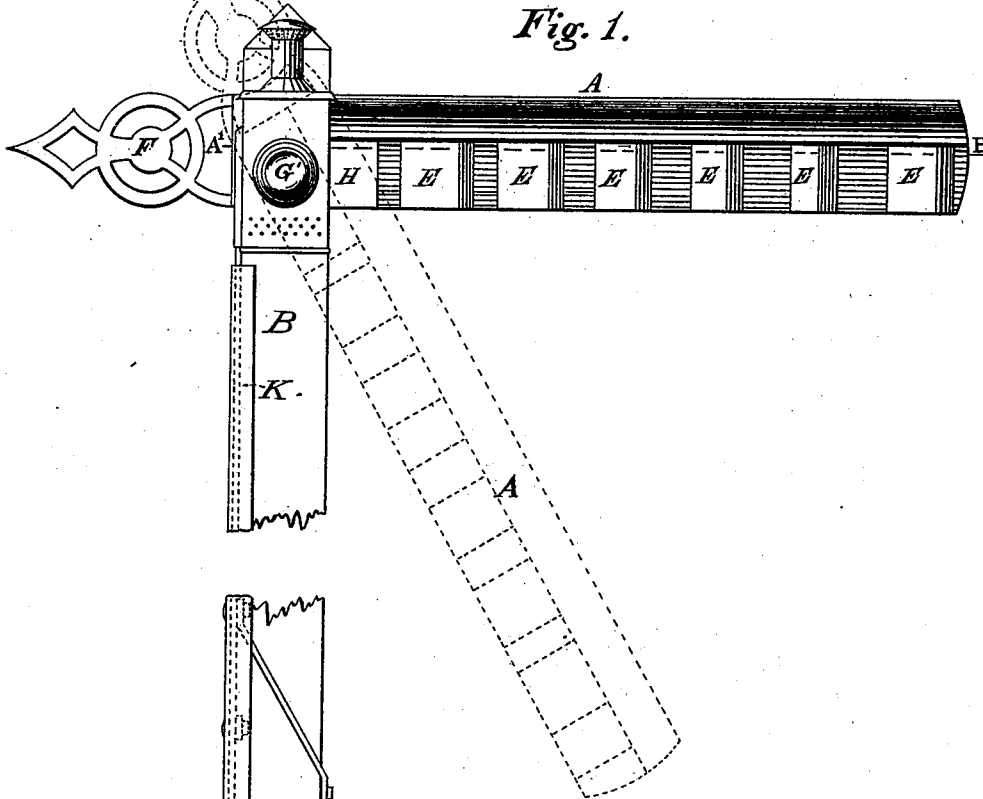
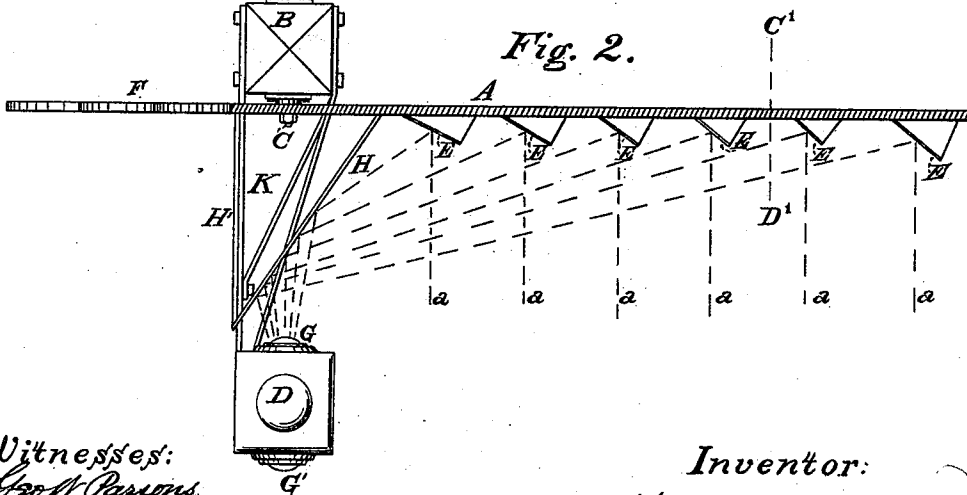


Fig. 2.



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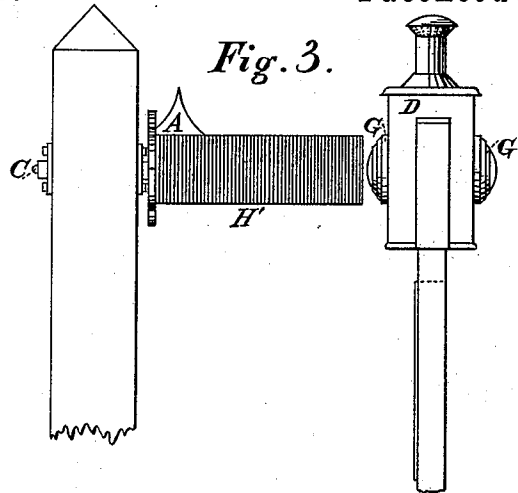


Fig. 4.

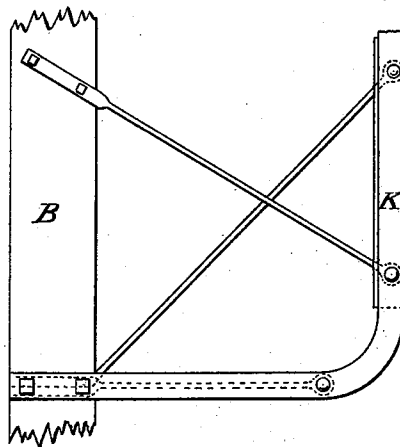
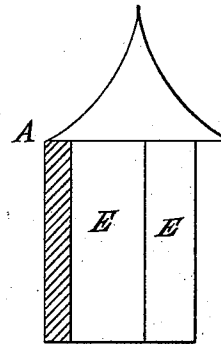
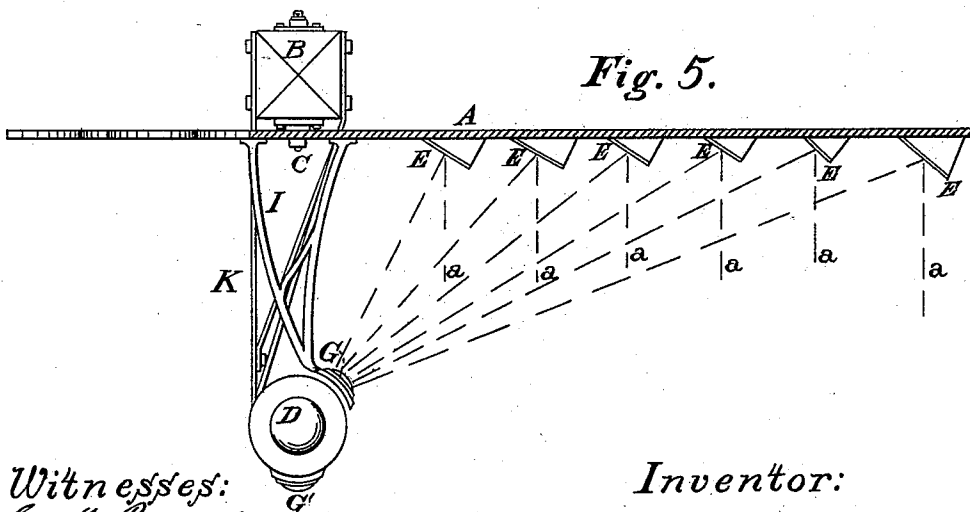


Fig. 5.



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Fig. 6.

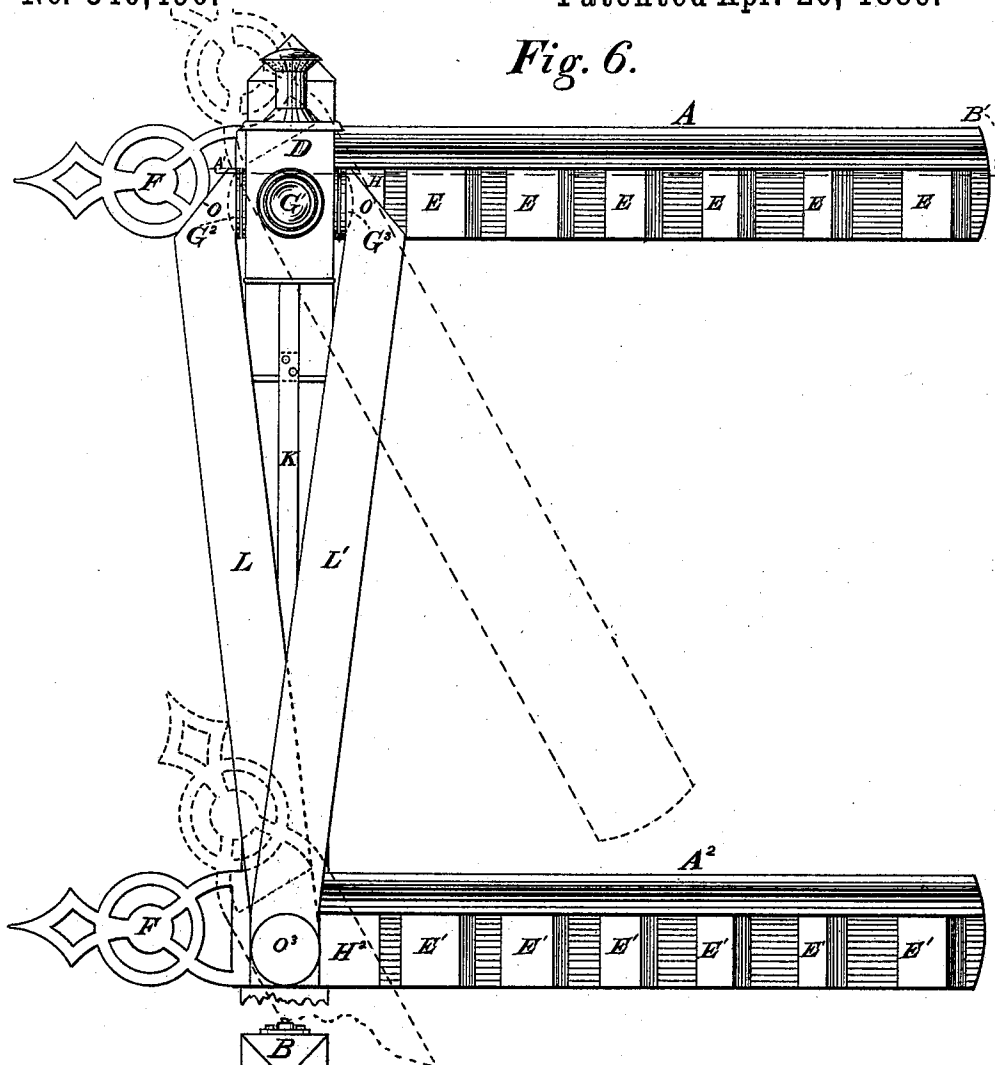
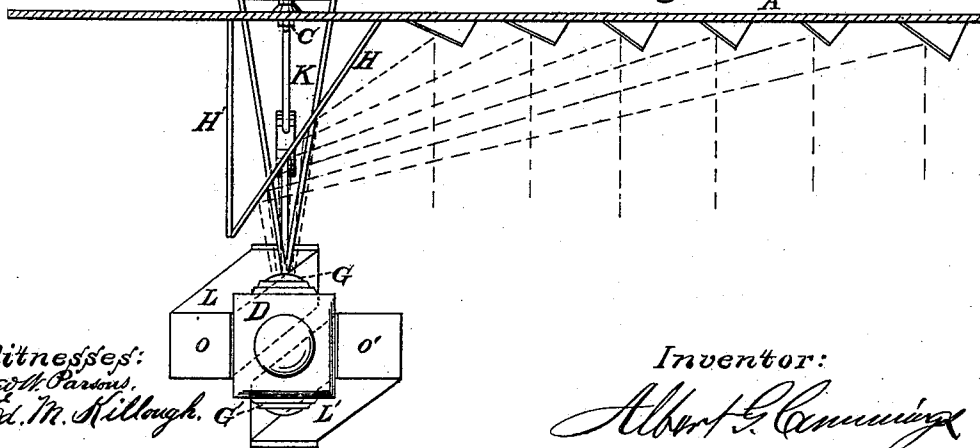


Fig. 7.



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Fig. 8.

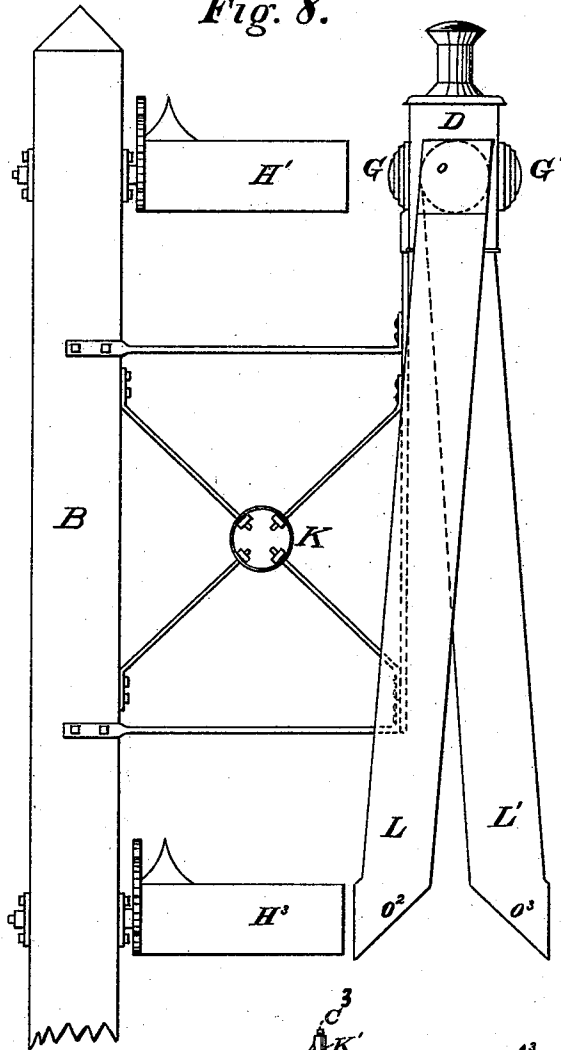
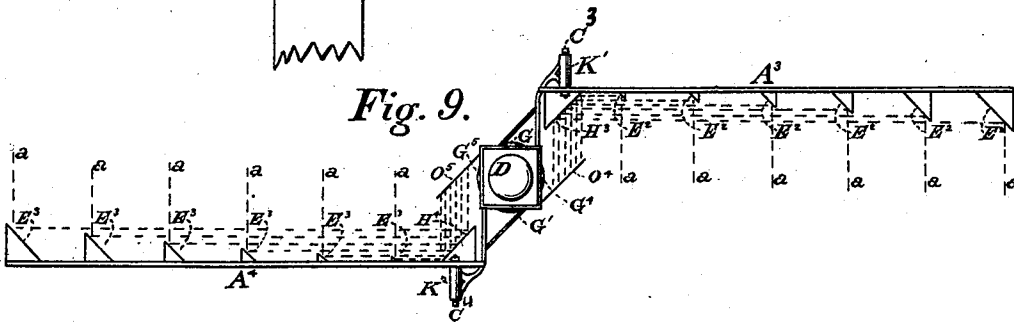


Fig. 9.



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UNITED STATES PATENT OFFICE.

ALBERT G. CUMMINGS, OF HARRISBURG, PENNSYLVANIA.

SEMAPHORE-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 340,490, dated April 20, 1886.

Application filed May 2, 1883. Serial No. 93,648. (No model.)

To all whom it may concern:

Be it known that I, ALBERT G. CUMMINGS, a citizen of the United States, residing at Harrisburg, in the county of Dauphin and State of Pennsylvania, have invented a new and useful Improvement in Semaphore-Signals, of which the following is a specification.

My invention relates to a form of signal commonly known as a "semaphore-signal," as used on railways, from which the information is determined by the position of an arm pivoted on a post or other means of support and capable of being revolved in a vertical plane.

Heretofore the semaphore-signals used for railway-signaling have been made in various forms, and have been used in various positions as daylight-signals, and whenever it has been required to use a signal at night or in darkness it has been necessary to depend on arrangements of colored glasses moved in front of lamps, by which certain colors will be shown when "danger" is to be signaled, and other colors shown when "safety" is to be signaled.

The employment of lights of various colors has always been attended with difficulties and dangers not necessary to be enumerated; and it is the object of my invention to supply a semaphore-arm signal that will be visible in the absence of daylight in whatever position it may be placed, and that will, by the position in which it is seen, convey the desired information to the beholder essentially the same as the semaphore-signals heretofore used by daylight convey information to the beholder by the position in which the semaphore is seen. I attain this object by apparatus illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation showing the semaphore-arm in a horizontal position by full lines and in a lowered position by broken lines. Fig. 2 is a plan with the semaphore in section on line A' B' of Fig. 1. Fig. 3 is an end elevation of the semaphore as shown in Figs. 1 and 2. Fig. 4 is an enlarged cross-section of the semaphore-arm on line C' D', Fig. 2; and Fig. 5 is a plan view of the semaphore with a modification of details hereinafter described. Fig. 6 is a side elevation of two semaphores illuminated by one lamp. Fig. 7 is a plan view of the same with the semaphore-arm A in section on line A' B' of Fig. 6. Fig. 8 is an end elevation of the device shown in Figs. 6

and 7. Fig. 9 is a plan view of an arrangement showing two semaphores to be visible from opposite directions and illuminated by one lamp.

In Figs. 1, 2, 3, and 4 I show an illuminated semaphore-arm, A, constructed with a number of reflecting-surfaces which will reflect the light of a lamp and have the appearance of a series of signal-lights when seen from the point of observation. The semaphore-arm A is pivoted to the post B by axis C, and by means of a suitable bracket, K, I mount a lamp, D, provided with a lens, G, so that the center of the lamp D or lens G will be in line with the center of the axis C.

To the semaphore-arm A, I attach a main reflector, H, arranged between the axis C and the lamp D at such an angle that the rays of light emitted by the lamp D will be reflected onto the semaphore-arm A, which is provided with several signal-reflectors, E E, &c. The reflectors E E, &c., are secured in the semaphore-arm at such an angle that the rays of light reflected onto them by the main reflector H will be reflected and projected in lines parallel to the axis C toward the point from which the semaphore should be visible, as indicated by broken lines *a a*, &c.

From the proper point of observation the semaphore will have the appearance of a series of lamps, although only one lamp is required.

I do not describe any particular manner of constructing the semaphore-arm A, or of securing to it the reflectors H E E, &c.; nor do I describe any means for operating the semaphore-arm A to place it in different positions, as those details are within the skill of a constructor, and may be varied as desired without departing from the scope of my invention. I prefer to extend a portion, F, of the arm A beyond the axis C, and make it of sufficient weight to counterbalance the larger portion of the arm A, so that it may be freely revolved to any desired position.

As shown, I employ for the main reflector H and the signal-reflectors E E, &c., mirrors with plane surfaces, as it is a well-known fact that such mirrors will reflect the greatest volume of light toward a given point; but if it is desired to have greater range, for the purpose of having the signal visible from several

points of observation, the signal-reflectors E E, &c., may be made with curved surfaces, and when so made the volume of light will be decreased in proportion to the increased range. Likewise the signal-reflectors E E, &c., may be made of various kinds of surfaces—such as corrugated, ribbed, checkered, &c., as the purpose for which the signal is used may render most expedient, and in all these details my invention may be varied without departing from its scope. The best result is secured when the reflectors are arranged as shown—*i. e.*, to project the light toward a beholder supposed to be at a point directly in front of the semaphore-arm, the reflectors being arranged in accordance with the natural law, that the angle of reflection will equal the angle of incidence, and this arrangement secures the best result, because at said point of observation the signal will be visible during the whole of a complete revolution. It will, however, be observed that the signal may be arranged to be visible from a point to one side by simply fixing the signal-reflectors E E, &c., at the proper angle. However, when so arranged, the signal will be visible during only a portion of a revolution.

The manner of using my invention may be varied in several ways from that I have shown without changing the scope of the invention. For instance, the semaphore-arm may be arranged at such an angle to the axis C that the semaphore will project forward, having the lamp supported nearer to the post with a shorter reflector, H, in which case the signal-reflectors E E, &c., will be more nearly parallel with the axis, and therefore will each reflect and project toward the point of observation a smaller or narrower beam of rays than the arrangement I have shown; or if the lamp be supported farther from the post the principal reflector H may be fixed more nearly parallel to the axis C, and the signal-reflectors E E, &c., more nearly at right angles to the axis C, and therefore will each reflect and project toward the point of observation a broader beam of rays than the arrangement I have shown; but after consideration of the various results I prefer such an arrangement as I have shown.

As shown in Figs. 1, 2, and 3, the lamp D is provided with two lenses, G and G'. The use of the lens G is to focus the light and project the rays onto the main reflector H with directness. The lens G' simply serves as a central signal-light, and may be dispensed with if only reflected light is to be shown.

In Fig. 5 I show another form of my invention, in which the main reflector is dispensed with, although believed not to be as desirable as a form as shown in Figs. 1, 2, and 3.

As shown in Fig. 5, the lens G is not attached to the lamp D, but is attached to the semaphore A and moves with it, the lamp D being made in a globular form to freely permit the lens G to move around it. In this form the office of the lens G is to focus and project the rays of light directly upon the

semaphore-arm A, the rays of light being reflected and projected forward by the reflectors E E, &c., as shown in Figs. 1, 2, and 3; or the reflecting portion of the semaphore may be one reflector of required length arranged at such an angle that rays of light will be received and reflected. With this arrangement there may also be arranged in front of the reflecting portion of the semaphore a translucent plate of glass, which, being rendered luminous by the reflected light, will make the semaphore visible.

As shown in Figs. 6, 7, and 8, the light from lamp D is made to illuminate two semaphores, placed one above the other, with their respective axes on the same vertical plane. In this arrangement two other lenses, G² and G³, are provided, and the rays of light which they focus and project after being reflected by reflectors O, O', O², and O³, fixed in the angles of tubes L and L', (which are preferably made with interior reflecting-surfaces,) will produce the effect of the rays of light projected through the lenses G and G', the light which lens G² transmits being reflected onto the main reflector H², and thence to the signal-reflectors E' E' E' E', &c., by which the light is projected and reflected toward the observer, the light which lens G³ transmits being reflected toward the observer by the reflector O³ to make a central signal-light for semaphore A². If this central light is not wanted for semaphore A², it can be dispensed with by leaving out lens G³, tube L', and reflectors O' and O³.

As shown in Figs. 6, 7, and 8, the semaphores A and A² cannot be completely revolved on their axes, in consequence of their interfering with the bracket K; but if the purposes for which the semaphores A and A² will be used require a complete revolution of the semaphores, the form of the bracket K may be modified to admit of such complete revolution.

As shown in Fig. 9, the light from lamp D is made to illuminate two semaphores on the same horizontal plane to be visible and observed from opposite directions. In this arrangement the post B is cut sufficiently short to allow the lamp D to be fixed thereon, while the axes C² and C⁴ and semaphores A³ and A⁴ will be supported by brackets K' and K², attached to the post and extending upward, the counterweight F being dispensed with; and other sufficient counter-weight may be attached to the rod by which the semaphore is operated.

The light transmitted through lenses G⁴ and G⁵ is reflected by means of reflectors O⁴ and O⁵ onto the main reflectors H³ and H⁴; thence reflected onto the signal-reflectors E² E², &c., and E³ E³, &c., which serve to reflect and project the light toward the respective points of observation in the manner already described, while the lenses G and G' show central signal-lights for the respective semaphores, as before mentioned, referring to Figs. 1, 2, 3, and 4.

As shown, my invention is applied to sig-

nals moved in a vertical plane, which I consider best for the purpose; but it is obvious that it can also be applied to signals moved in a horizontal plane; or the signal may be stationary and have the light thrown upon it by movements of the lamp or by movements of reflectors arranged to reflect the light upon the signal; or the signal may be wholly stationary, such as may be necessary at street or road crossings of railroads or other points wherever it may be desired to attract the attention of persons approaching. These and other modifications need not be more particularly described, as they are within the skill of a constructor without departing from the scope of my invention.

The lights I prefer to use are clear white lights, as I propose by my improvement to provide a good and reliable signal and avoid the various difficulties arising from use of colored lights. Nevertheless, the lights may be colored lights or combinations of colored lights as may be expedient in the various purposes to which my improvement may be applied.

The lenses before mentioned may be of colored glass, by which colored lights all of one color will be exhibited by the semaphore, or the lens giving the central signal-light may be of a different color, producing a combination, or a spectacle of colored glass may be arranged to swing before the lamp, so that the signal, when in position of "safety," will show all clear light, and when in position of "danger" will show colored light, or vice versa, or the combination may be effected as may be desired, in all of which it will be found that my improvement makes a signal easily discernible and not likely to be mistaken for any

other at present known or employed for a night-signal.

As the semaphore-arm may be turned to any desired position, and the light of the lamp will continue to be reflected onto the reflecting-surfaces of the semaphore and render it visible to the observer in front, this improvement may be employed in any system of signaling that may be desired, according to a code agreed upon, as every movement—such as a complete revolution or partial revolution—any position, or combination of positions and movements will all be equally visible at a great distance, and thus render communication by a signal-service as practicable at night as banner-signaling has heretofore been in daylight.

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

1. The combination of a lamp and a semaphore with a reflector arranged thereon to project light from the lamp onto the semaphore, substantially as and for the purpose specified.

2. A signal-lamp provided with reflectors arranged to give light to two semaphores provided with series of reflecting-surfaces, said semaphores facing in the same direction, all combined substantially as and for the purpose specified.

3. A signal-lamp provided with reflectors $O^1 O^2 O^3$, arranged to illuminate two semaphores facing in the same direction and provided with reflecting-surfaces, substantially as and for the purpose specified.

ALBERT G. CUMMINGS.

Witnesses:

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CHAS. A. PARSONS.