No. 810,714. PATENTED JAN. 23, 1906.

W. CHURCHILL.

ART OF SIGNALING.

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Fig. 1.

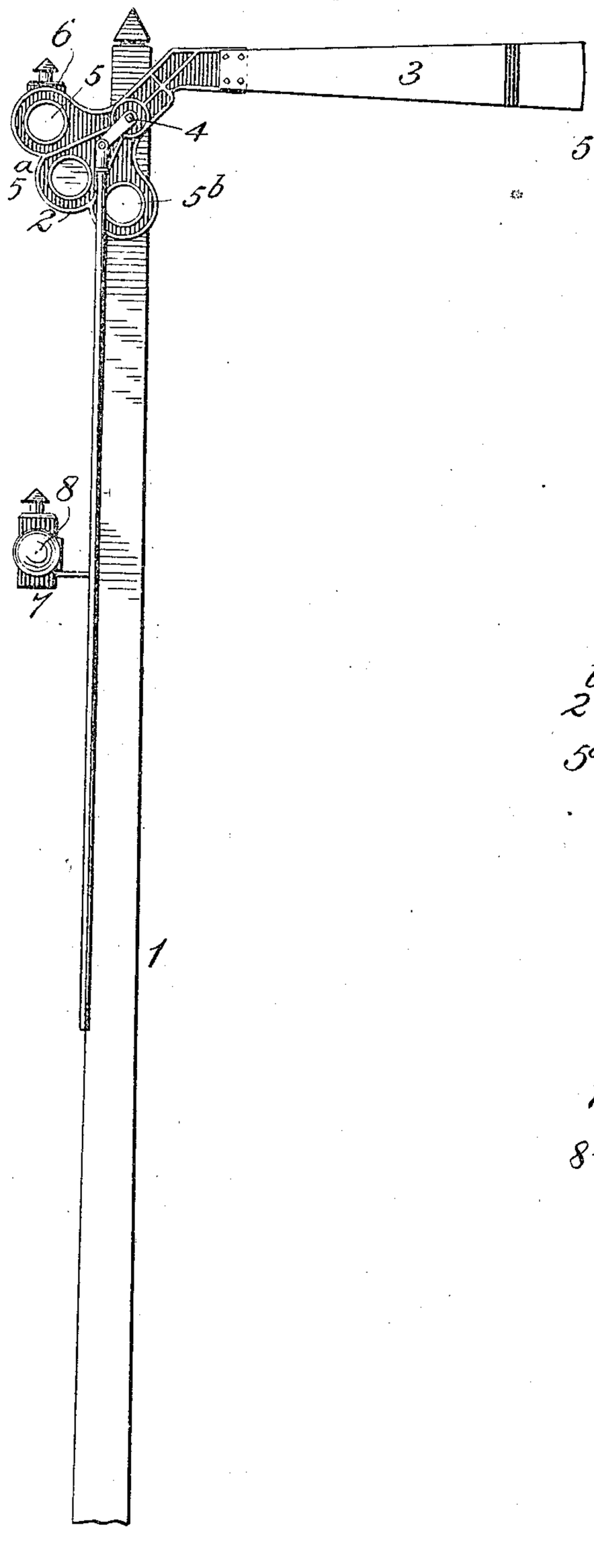
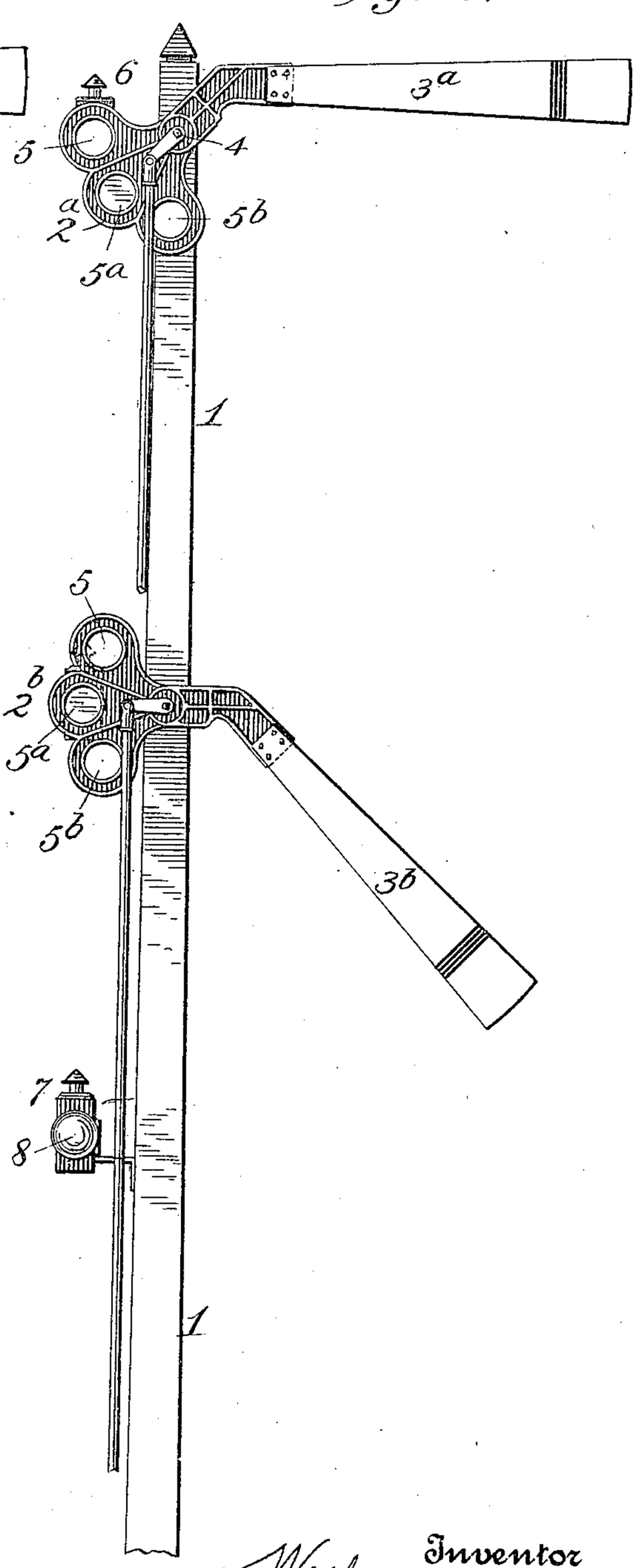


Fig. 2.



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UNITED STATES PATENT OFFICE.

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ART OF SIGNALING.

No. 810,714. Specification of Letters Patent. Patented Jan. 23, 1906.

Application filed October 17, 1905. Serial No. 283,134.

To all whom it may concern:

Be it known that I, WILLIAM CHURCHILL, a citizen of the United States, residing at Corning, in the county of Steuben and State of New York, have invented new and useful Improvements in the Art of Signaling, of which the following is a specification.

My invention relates to the art of signaling, more especially that in use on railroads, whereby the night-signals are rendered more distinct, certain, and readily distinguishable from other lights which may and are known to frequently mislead railroad employees, with disastrous results, and thus greatly lessen the danger resulting from misunderstood signals.

The invention is also designed to decrease the cost of such signaling, and, although more especially intended for railroad practice, is equally adaptable to marine and other species of night-signaling.

It has long been the practice in railroad-signaling to use for the indications at night beams of light of different colors produced either by making use of lenses of the various colors required—such as red, green, yellow, &c.—or by using a clear flint lens for projecting a beam of approximately parallel rays through pieces of colored glass, technically known as "roundels," because usually round in shape, inserted in openings in the casting termed the "spectacle," and which balances the semaphore-arm on the opposite side of the pivot upon which the arm is hinged. As the blade is moved up and down the spectacle is similarly, though in reverse direction, moved back and forth, so that each of the several colored glasses may at the will of the operator rest in front of the lens of the semaphore-lamp and a beam be projected through it from the light. In many instances a single arm with a spectacle containing the combination of colors used is employed. Such a device is generally called a "one-armed" indication. In some cases a two-armed indication is employed, the upper and lower arms being mounted on the same pole, the signal being given by the position of the two blades by day and at night by two colored lights instead of the one light of the one-armed indication. When such a two-armed indication is given, a combination of lights employed may, for example, be as follows: Two reds for "stop," a red and a yellow for "caution," and two greens for "safety," or a variety of other combinations may be used.

It is a well-known principle of color theory or chromatics and of the psychology of color that two colors, whether lights or reflecting-surfaces, when exhibited in close proximity very materially alter each other's appearance. A light of any given hue when combined in proper proportion with a light of a certain different hue produces a white light. Such colors are called "complementary" and are more distinctly different in hue than any two colors not complementary. Thus red and a bluish green are complementary colors. Red and orange or red and purple are not and are more similar in hue than the first-named pair. When two complementary colors are exhibited closely together, both appear to be more thoroughly saturated—that is, more intensely vivid in effect. To illustrate, if red and bluish green are shown together the red appears more vividly and distinctly red and, similarly, the bluish green appears of a more saturated hue. When two colors not complementary are shown together, the effect is to change the apparent hue of both colors so that they seem more nearly complementary—that is, more distinctively different in hue than when viewed singly. For example, when orange and red are shown together the effect is to make the red appear more vividly red—that is, more distinctly different from the orange—and to make the orange look yellower—that is, less close to the red in hue than when seen alone. This principle of contrast has never been employed, so far as I am aware, to render the color value of the signal indications more distinct. It is proposed under my present invention to take advantage of this principle of contrast and at the same time provide a two-light indication, whether a two-armed semaphore indication is used or not.

In the further description which follows reference is made to the accompanying drawings, in which—

Figure 1 shows my invention applied to a semaphore-signal having a one-armed indication, and Fig. 2 shows the invention in connection with a semaphore-signal having a two-armed indication.

Where a one-armed semaphore indication is used, it is proposed to place upon the semaphore-pole 1 at a distance of six or eight feet

below, above, or sidewise from the point at which the blade 3 and the spectacle-casting 2 are hinged at 4 an auxiliary lamp 7, shown having a lens 8, the lamp being supplemental to the ordinary semaphore-lamp 6. The auxiliary lamp 7 shows constantly one fixed color and serves in some sense as a guide-light to make more definable the character of the signal-colors shown in conjunction with it, and thus providing at the same time a double signal which it is practically impossible to confuse with neighborhood lights or other near-by signals, such as lights in houses near the track or in signal-towers that in the past have been frequently mistaken, and with fatal results, for the semaphore-lamp. The color of the beam to be projected by the auxiliary lamp 7 should be such as to show off most effectively by contrast the various signal-colors displayed above or below it.

Referring to Fig. 1, let it be assumed that the roundel 5 is red, 5^a lunar white, and 5^b green. Now the lens 8 in the auxiliary lamp 7 may be yellow, which by contrast will intensify the hues of the signal-colors displayed above it. In Fig. 2, showing a two-armed indication, 2^a is the spectacle-casting of the upper semaphore-blade 3^a, and 2^b that of the lower blade 3^b. The four long-range signal color-glasses which can be employed with a kerosene-flame are red, yellow, green, and a pale-blue glass producing a bluish-white light commonly known as the "lunar white." Either one of these four may be employed for the auxiliary light mentioned. The best results would probably be secured either from the use of the lunar white or the yellow; but it is perfectly possible to use red or green.

The broad principles underlying my invention are those of enhancing the effect of a displayed signal by means of the law of color contrast and of providing at the same time double indications by simple and economical means. Thus, as will be readily seen, it is practicable to provide a two-light indication with a one armed semaphore-signal—something that has not been done heretofore—and at the same time to increase the distinctness of the colors displayed. Where this principle is applied to a two-armed indication with two lights displayed at night, one above the other, the roundels inserted in the spectacle attached to one blade may be all of one color, thus producing the same effect as that attained in the use of the auxiliary lamp 7, as described above, or a colored lens may be inserted in one of the semaphore-lamps and the openings in the spectacle in which the roundels 5 5^a 5^b are placed be left unfilled, or an auxiliary lamp showing a third light may be placed below or above or on one side. It would be perfectly feasible to use this auxiliary light upon a semaphore-pole where there are two blades governing movements upon the same track in opposite directions by simply having the auxiliary lamp provided with two lenses showing opposite directions at once. It is equally feasible to place the auxiliary lamp above or below the semaphore-blade, or with a two-armed indication it may, if desired, be placed between the points where the two blades are hinged, provided the respective lamps are kept far enough apart to prevent the different colors from blending at too short a range. A separation of six feet between the lamps is sufficient to prevent two lights from blending at any distance inside of a mile. It is immaterial to what type of semaphore-signal this principle of color contrast is applied and also as to what style of semaphore-lamp is used, the principle involved not concerning the construction of the lamp or the mode of operation of the signal. My invention may be applied to a manual block-signal system, to an automatic block-signal system, an interlocking signal system, or any other style of signaling apparatus requiring the display of colored lights.

Advantages derivable from the use of this invention may be summarized as follows: By taking advantage of the law of contrast, as explained, the hues of the respective signals displayed are rendered more distinct than heretofore known in railroad practice. Owing to the increase in distinctness secured by the contrasting or auxiliary lamp, it is possible, where desired, to use lighter reds, greens, &c., than could otherwise be displayed, the effect produced by the contrast compensating for the loss of distinctness incidental to the use of a lighter or less saturated tint of glass. A two-light indication, as stated above, is much less liable to be confused with extraneous lights than is a one-light indication. My invention makes it possible to secure a two-light indication under any and all circumstances. A two-light indication is provided with a one-armed indication at much less cost than is possible with a two-armed semaphore-signal and with great economy in the amount of glass required for producing the desired results with a two-armed indication, since one lens of solid color will for a second indication answer as well as a flint lens with three roundels in front of it. An auxiliary light of uniform fixed color is provided, furnishing a constant guide to the engineer in picking up a signal, as he is always obliged to look for the same fixed color first and then just above it for the precise color giving him his specific indication to proceed, observe caution, or stop.

It is considered highly desirable by signal engineers to provide at least three distinct night-signals to indicate "danger," "caution," and "safety;" but the only two thoroughly satisfactory single colors available are red and green. Where yellow is used alone as a third signal, it is liable to be confused with neighborhood-lights, and where the lunar white is employed there is danger of a

slight confusion with an electric arc; but when the color displayed is always shown by contrast with a fixed light the differences in color are so much more marked that three distinct signal combinations are available, no one of which is of short range or liable to give rise to confusion. The fact that the application of this principle makes three distinct signals possible is of the highest importance. Although yellow or clear flint is often used as a third signal, it has never been felt by signal engineers that it when used alone is satisfactory, and although the lunar white probably gives a more distinct indication than the yellow, yet no one-light combination can be as effective as a two-light combination.

Under certain meteorological or atmospheric conditions—such as those incident to fogs, smoke, &c.—the hues of signal-lights are known to be materially changed, and under such common conditions the advantages of my invention are especially noticeable. Thus under such conditions a yellow light is liable to be given a reddish tint; but if it is displayed in conjunction with a red signal the latter, and indeed both, will by distinction or contrast be instantly recognized.

Having thus described my invention, I claim—

1. As an improvement in the art of signaling, the combination of a lamp, a colored signal-glass adapted to receive a beam of light from the flame of said lamp, and an auxiliary lamp located in proximity to the said signal-glass, said auxiliary lamp being adapted to constantly exhibit a fixed color which by contrast shall intensify the color of the light visible through said signal-glass, substantially as set forth.

2. As an improvement in the art of signaling, the combination of a lamp, signal-glasses of varied colors adapted to be moved across or in front of and to receive a beam of light from the flame of said lamp, and an auxiliary lamp located in proximity to the said variedly-colored and movable signal-glasses, said auxiliary lamp being adapted to constantly exhibit a fixed color which by contrast shall intensify the color or hue of the signal-glass at the time resting in front of the flame of the lamp first mentioned, substantially as set forth.

3. As an improvement in the art of signaling, the combination of a lamp, signal-glasses of varied colors adapted to be moved across or in front of and to receive a beam of light from the flame of said lamp, and a lamp located in proximity to the said variedly-colored and movable signal-glasses, said lamp being adapted to constantly exhibit a fixed color which by contrast shall intensify the color or hue of the signal-glass at the time resting in front of the flame of the lamp first mentioned, substantially as set forth.

4. As an improvement in the art of signaling, a pole or support, a semaphore-lamp carried thereby, signal-glasses of varied colors pivotally mounted on said pole or support and adapted to be moved across or in front of and to receive a beam of light from the flame of said lamp, and a second lamp located in proximity to said variedly-colored and movable signal-glasses, said second lamp being adapted to constantly exhibit a fixed color which by contrast shall intensify the color or hue of the signal-glass at the time resting in front of the flame of the lamp first mentioned, substantially as set forth.

5. As an improvement in the art of signaling, the combination of a support, a lamp carried thereby, a spectacle pivotally mounted on said support having inserted therein signal-glasses of varied colors adapted to be moved across or in front of and to receive a beam of light from the flame of said lamp, and a second lamp located in proximity to the said variedly-colored and movable signal-glasses, said second lamp being adapted to constantly exhibit a fixed color which by contrast shall intensify the color or hue of the signal-glass at the time resting in front of the flame of the lamp first mentioned, substantially as set forth.

6. As an improvement in the art of signaling, a lamp with a clear lens, and an appertaining semaphore-arm and a spectacle, the latter containing variedly-colored roundels, combined with a second lamp with a clear lens, and an appertaining semaphore-arm and a spectacle, the latter containing roundels of the same color in each opening, thus producing a fixed color contrasting with the said variedly-colored roundels inserted in front of the first-mentioned lamp, substantially as set forth.

7. As an improvement in the art of signaling, a lamp and an appertaining semaphore-arm and a spectacle, the latter containing variedly-colored roundels, combined with a second lamp and an appertaining semaphore-arm and a spectacle, the latter having unfilled openings, a colored lens contrasting with the said variedly-colored roundels being inserted in said second lamp, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM CHURCHILL.

Witnesses:
GEORGE H. HOWARD,
C. B. BULL.