May 26, 1936. A. A. JOHNSON 2,042,316

ELECTRIC SIGNAL

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FIG. 1

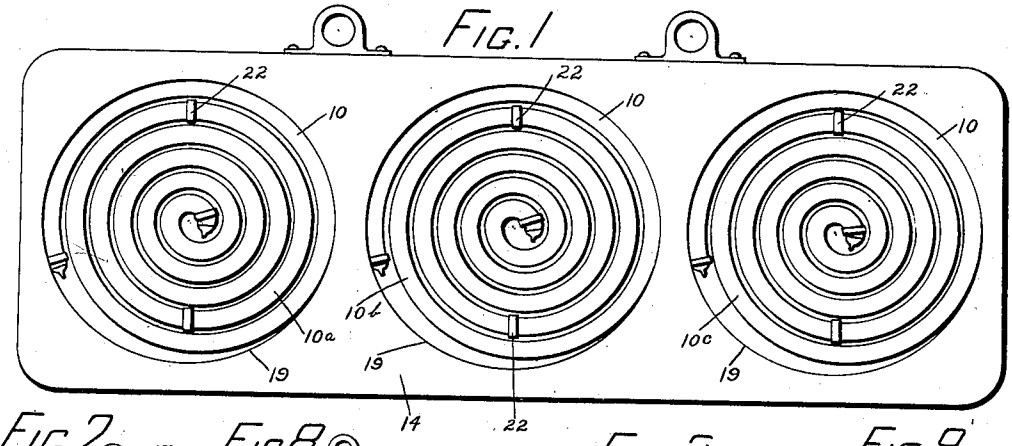


FIG. 2

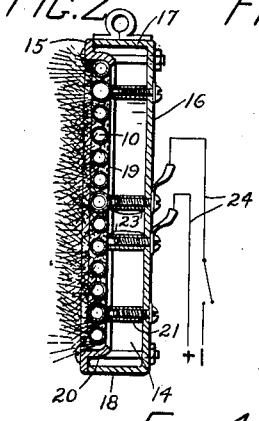


FIG. 8

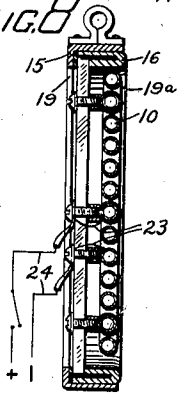


FIG. 3

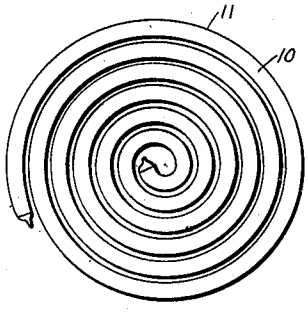


FIG. 9

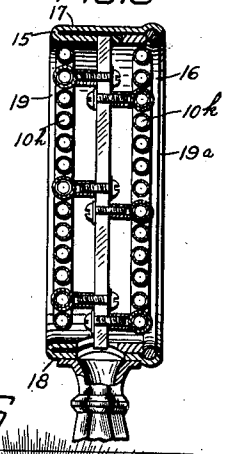


FIG. 4

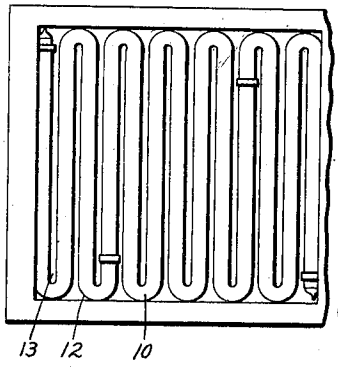


FIG. 5

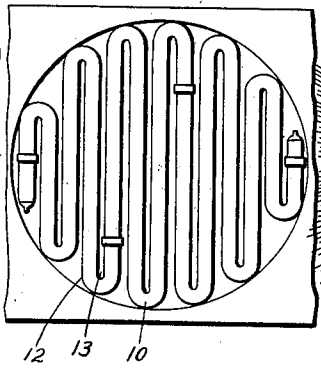
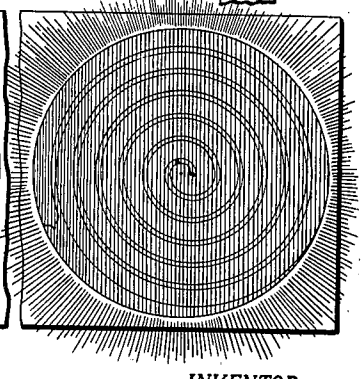


FIG. 6



INVENTOR.

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FIG. 7

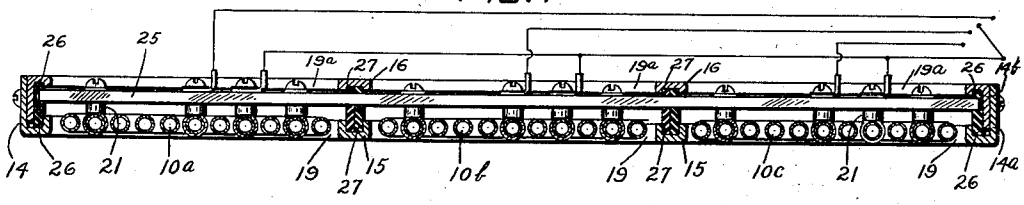


FIG. 10

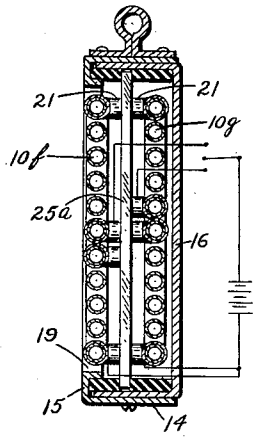


FIG. 13

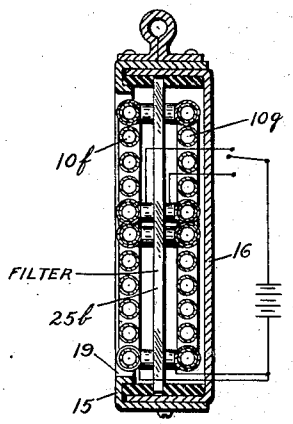


FIG. 11

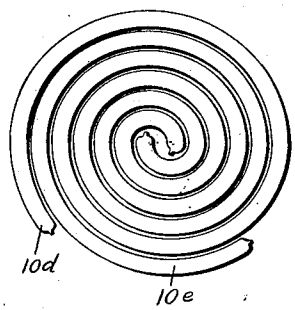
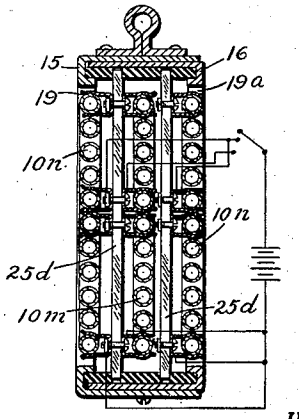


FIG. 12



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Patented May 26, 1936 2,042,316

UNITED STATES PATENT OFFICE

2,042,316

ELECTRIC SIGNAL

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Application November 7, 1930, Serial No. 494,019

7 Claims. (Cl. 177—329)

This invention relates to electric signals, and more particularly, to the provision of a signaling device including a luminous-gas tube, such for instance as the neon tube.

The far penetrating and long visibility characteristic of luminous-gas tubes has long been recognized.

An object of the present invention is to so arrange a luminous-gas tube in a compact tortuous path within a defined area, and preferably in a single plane, that light emanating from adjacent portions of the tube are in co-mingling relation so that the tube simulates a single lens or like source within the area in which it is compacted. This may be accomplished in several ways, some of which are shown herein. In one instance, the tube is wound in a closely compacted spiral; in another, it is bent to and fro to form a rectangular grid; and in another instance, it is bent to and fro zig-zag fashion with each stretch of the tube having a different length than its neighbor so as to provide a grid having a generally circular outline.

In this way, I am able to provide a signal device for vehicle traffic control, for instance, or for railroad use, which includes a shallow casing, and is very economically manufactured and satisfactory in use.

Another object of this invention is to provide a signal device having a single light source, which may be viewed from either direction. To do this, the luminous-gas tube signal of the present invention is mounted in a hole in a casing defined by aligned openings in the front and back walls thereof so that when the tube is energized, the light may be viewed through either the hole in the front of the casing, or that in the back of the casing. And, in this connection, a further feature of this invention is the provision of a supporting wall in the casing having the luminous-gas tube which is transparent, usually of clear colorless glass so that while intersecting the hole in the casing, the support for the luminous-gas tube does not filter the light generated thereby.

A still further object of this invention is the provision of a signal device having signal lightings of different colors, covering substantially the same area, and at substantially the same place with regard to the field of vision, and adapted to be energized alternately. With this arrangement, the driver of a vehicle, or other person observing the signal, may observe the alternately given signals without shifting his gaze from one point to another. Moreover, this arrangement permits a double signaling device to be made substantially the size of a single signaling device, thus effecting a saving in cost of material and labor, and providing a neat, less obtrusive signal which in the case of motor vehicle control must of necessity occupy a conspicuous place.

In one form of this invention, this is accomplished by winding two luminous tubes while in parallel relation, in spiral form, and in a single plane so as to form in effect a two-lead spiral. However, this form is not preferable in all cases since the adjacent portions of one tube are of necessity spaced from each other by the other tube. It is preferable, therefore, that each tube be arranged in tortuous compact form in a separate plane, and that these be superimposed one in front of the other. When this is done, according to the present invention, the uppermost or outermost of the superposed luminous-gas tubes is made of colorless glass so that when the lowermost, or innermost tubes energize, the light passes through the uppermost tube without being filtered thereby.

And a still further feature of the present invention is the provision of a signal having a plurality of luminous-gas tubes adapted to produce light of different colors and covering substantially the same area, and at substantially the same place with regard to the field of vision, and yet be visible from each direction, that is from either the front or the back of the casing. This is accomplished, according to the present invention, either by having the plurality of tubes in parallel relation wound in spiral form, or having the separate tubes each compactly arranged in a single plane, and then superposed one above the other, and in either case arranging the tubes in a hole in the casing defined by aligned openings in the front and back walls of the casing.

In the case of red and green signals produced by luminous-gas tubes, the red signal light is produced by a tube of colorless glass, while the green signal light is at present obtained by producing a blue light within the tube and filtering this light with yellow coloring matter in or on the surface of the tube. Hence, when producing a signal device having superposed luminous-gas tubes, and adapted to produce red and green signals, it is preferable, according to the present invention, to have the tube producing the green signal interposed between tubes producing the red signal, so that the green light may pass through either of the red-light-producing devices without being filtered; while the latter may be energized simultaneously, so that each one be-

comes visible from the side of the green-light-producing tube at which it is located.

This arrangement, for the present, is considered preferable because so far as I am aware, green colored light has not been produced by a luminous-gas tube made of colorless glass.

If the signals are of such different colors which can be produced by luminous-gas tubes made of colorless glass, only one tube for each color need be provided. As an example, a bluish light and a reddish light is now produced by luminous-gas tubes of uncolored glass, and these may be superposed so that the light emanating from one tube may pass through the other without being filtered. Other features and advantages will hereinafter appear.

In the accompanying drawings which illustrate several embodiments of this invention:—

Figure 1 is a front view of a three-light signal device made in accordance with this invention.

Fig. 2 is a vertical section of one form of signal device made according to this invention.

Fig. 3 is a view of one of the luminous-gas tubes employed in the form of the invention shown in Figs. 1 and 2.

Fig. 4 shows a modification of the invention wherein the tube is folded zig-zag in a single plane in grid form.

Fig. 5 also shows the tube arranged in grid form, but the folds are of decreasing length from the center outwardly to locate the tube within a circular area.

Fig. 6 is intended to show the appearance of the tube shown in Figs. 1, 2 and 3 when energized, the light from each portion of the tube being in co-mingling relation with the light emitted from an adjacent portion of the tube so as to simulate a single light source or lens.

Fig. 7 is a central horizontal sectional view of the signal device shown in Fig. 1, modified to permit the signal to be viewed from either direction.

Fig. 8 is a transverse sectional view, similar to Fig. 2, but showing the modification of this invention shown in Fig. 7.

Fig. 9 is a view similar to Fig. 8, but showing the arrangement with tubes producing light of two different colors which may be viewed from either direction.

Fig. 10 is a view similar to Fig. 2, showing the arrangement wherein signals of different colors, for instance, red and green, may be viewed from one direction.

Fig. 11 is a front view, showing the arrangement wherein tubes producing lights of different colors are arranged parallel, and wound in a spiral so that either may be viewed from either direction.

Fig. 12 is a view similar to Figs. 8 to 10, showing the arrangement wherein three tubes are superposed, with the outer tubes made of colorless glass, and preferably producing red signals, while the inner tube is of colored glass, producing green light which may be viewed through the outer tubes from either direction.

Fig. 13 is a view, similar to Figs. 8 to 10, showing an arrangement wherein two luminous-gas tubes are superposed, and producing light of the same or different color, while a filter is interposed between the innermost tube and the point of vision to produce when energized, a still different color light, orange or green for instance.

As stated above, one of the salient features of this invention is the provision of a luminous-gas tube which is so formed that when energized, the light emanating therefrom produces a solid field of color and simulates light emanating from a single lens or filter, or from a bulb or other single light source. This may be produced in several ways.

As shown in Figs. 1, 2, 3 and 6, according to the present invention, a luminous-gas tube **10** may be wound in a spiral **11**, with the convolutions of the spiral so close to each other that light emanating from adjacent convolutions co-mingle and leave no visible sharp outline of the tube. This may be done without actually having the convolutions of the spiral touch, for I have found that a luminous-gas tube when energized appears to have a greater diameter than when unenergized, and that when portions of the tubes are adjacent each other, the line of demarcation between these portions almost completely disappears, as indicated in Fig. 6.

Or, if desired, the tube **10** may be folded back and forth to form a grid **12**, with the folds **13** lying each close to another, and in light co-mingling relative therewith; and these folds **13** may all be of the same length to fit within a rectangular area, as shown in Fig. 4, or they may decrease in length from the center outwardly so as to be located in a circular area, as shown in Fig. 5, according to whether it is desired to have the light emanating therefrom simulate a square or circular lens.

The tube **10** may be in a conical, concave, or other plane, if desired, but it is preferable that it be so formed that all active parts of it lie in the same flat plane, as shown in Fig. 2, for such an arrangement permits it to occupy very little space and allows its use in a shallow casing. Besides, several such tubes may be conveniently superimposed, as will hereinafter appear.

In the broader aspect of this invention, the luminous-gas tube **10** may be mounted in or on any suitable frame or casing for use. However, in the form at present preferred, the signal device comprises a casing **14** having a front wall **15** and a back wall **16**, and upper and lower walls **17** and **18**. The casing **14** is preferably quite shallow for it need not have any particular depth, due to the fact that the tube **10** as shown is arranged in a flat plane, and it is preferable that it be made shallow so as to be unobtrusive in appearance, and to effect a saving in the cost of manufacture.

In the form shown in Fig. 2, the front wall **15** of the casing is provided with an opening **19** and this may have a marginal inwardly extending flange **20**, and the tube **10** is placed in the opening in the casing in the plane of the flange **20**, and directly open to the atmosphere. Hence, light emanating from the tube **10** is not modified or reduced in intensity by any filtering device or lens.

To support the luminous-tube **10** in the form shown in Fig. 2, the back wall **16** of the casing is provided with lugs **21** adapted to engage certain of the convolutions of the spiral **11**. These have straps **22** by means of which the engaged convolutions are held to the lugs. Two of these lugs are provided with wire clearance passages so that the lead-in wires **23** for the inner and outer ends of the tube may be electrically connected to feed wires **24**. It is evident from Fig. 2 that the casing **14** is considerably deeper than necessary, and this depth is employed merely to give the casing greater strength and rigidity, and it should be understood that it may be made only slightly larger in depth than the diameter of the tube.

In Fig. 1, there is illustrated a signal device

preferable for traffic control, and in this instance, the casing 14 is made wide enough to take as many different signal lights as is desired, either vertically or horizontally—three being shown in the accompanying drawings. Preferably, one luminous-tube 10a produces the red light, while the other 10b produces a yellow light, and the other 10c produces a green light, the casing having three spaced openings 19, one for each of the tubes 10a, 10b and 10c. These tubes are separately energized, and are controlled in the usual manner.

When it is desired to have the signals visible from both sides of the casing, for instance to control vehicle traffic in both directions, the casing may be arranged as shown in Fig. 7, wherein it has openings 19 in its front wall, and aligned therewith openings 19a in its rear wall 16; and each of the luminous-gas tubes 10a, 10b and 10c are preferably located in the casing, as shown in a hole extending therethrough, defined by the registered openings 19 and 19a. In this case, the tubes may be supported in any suitable manner, but preferably, a supporting wall 25 of transparent material is set up in the casing parallel with the front and back walls 15 and 16, and the luminous-gas tubes 10a, 10b and 10c are secured to this wall in the same manner that the tube 10 is secured to the wall 16 in the form of the invention shown in Fig. 2, namely, by lugs 21 which may and preferably are integral with the wall 25.

The wall 25 is preferably made of clear glass so that the light emanating from the tubes 10, may be viewed directly through the opening 19 in the front wall of the casing, and through the glass wall 25, and opening 19a, when viewed from the rear of the casing. In this way, only a single source of light is needed for controlling traffic coming in both directions.

To facilitate the mounting of the glass wall or partition 25, the casing 14 may be made of two parts 14a and 14b which telescope and have lugs 26 secured thereto for engaging opposite sides of the glass partition 25. Further, to prevent light emanating from one tube from being visible through an adjacent opening 19, if such should be found undesirable, the casing may be provided with opaque walls 27 engaging each side of the transparent wall 25, and dividing the casing into chambers, one for each luminous tube 10a, 10b and 10c.

The arrangement of the tubes shown in Fig. 7 is shown in the vertical section view Fig. 8.

As stated above, the present invention embraces the provision of a signal device wherein signals of different colors covering substantially the same area may be located at substantially the same place with regard to the field of vision. Such an arrangement is shown in the various forms of this invention illustrated in Figs. 9 to 13, and is of considerable advantage in practical use where it not only permits the signal device, including its casing, to be made of smaller dimensions, and thus less obtrusive, but it permits observations of the signals which are made effective separately without the observer shifting his point of vision. In other words, a person watching a red or danger signal and waiting for the green or "go" signal, would see the signals change without changing his point of vision.

In Figs. 10 and 13, the plurality of tubes are arranged to have its light viewed from only one side of the casing, and accordingly, the front wall 15 of the casing is provided with an opening 19 through which the signals may be viewed, and the rear wall 16 of the casing has no aligned opening; while the forms shown in Figs. 9, 11 and 12 are adapted to be viewed from either direction, and have aligned openings 19 and 19a in their front and back walls 15 and 16 respectively.

The luminous-gas tubes may be arranged in various ways so as to enable them to cover substantially the same area, and be at substantially the same place with regard to the field of vision. For instance, as shown in Fig. 11, tubes 10d and 10e may be arranged parallel, and wound in spiral form so that one spiral is nested with the other, and in the same plane, so as to constitute in effect a double-lead spiral. With such an arrangement, one tube, for instance, the tube 10d, may be made of clear glass, while the other tube 10e may be made of colored glass so as to produce, when energized, a different colored light from that produced by the tube 10d. More specifically, the tube 10d may produce a red light while the tube 10e generating a blue light may have its light filtered so as to emit green rays by a filtering coating of yellow on its surface. This arrangement, therefore, may be used in a casing having aligned openings 19 and 19a, and will produce alternate signals which may be viewed from either the front or the back of the casing, since the light from neither tube has to pass through the material of the other tube.

However, with this arrangement, the adjacent portions of each tube are spaced by the intervening portions of the other tube, and hence the field of light produced will not be as solid as when the tube is arranged, as shown in Fig. 3, 4 or 5. Therefore, in many cases, it is preferable to have the tubes in a multi-light signal superimposed one upon the other, as shown in Figs. 9, 10, 12 and 13.

As shown in Fig. 10, the tubes 10f and 10g are so superimposed, and so located in the casing 14 as to be viewed through the opening 19 therein. When thus arranged, the tube 10f, which is of clear glass, is placed uppermost or outermost so that the light emanating from the tube 10g may pass through it without being filtered, although of course it may be deflected and diffused thereby.

The tubes 10f and 10g when superimposed, may be supported in any suitable manner. However, it is preferable that they be supported by a light-transmitting wall 25a, supported in the casing 14, as the wall 25 is supported in the form of the invention shown in Fig. 7. The wall 25a may have lugs 21 on each side thereof to support the tubes 10f and 10g on opposite sides of the wall. When, as contemplated in the form of the invention shown in Fig. 10, the tube 10f produces a red light, while the tube 10g produces a green light, the wall 25a is made of clear colorless glass so as not to filter the light emanating from the tube 10c.

However, the partition wall between the tubes may, if desired, constitute a filter for the light emanating from the lowermost or innermost tube. Hence, as shown in Fig. 13, the partition 25b may be colored so that light rays emanating from the tube behind it are filtered or modified thereby. More specifically speaking, the partition 25b may be yellow, while the tube 10g may produce a red light so that when the tube 10g is energized, a light of orange hue will be seen by an observer. Or, the tube 10g may produce a blue light which after passing through the partition 25b becomes green as viewed. Clearly, other combinations of colors may be obtained by

substituting tubes producing light rays of other colors for the tube 10*g* and by substituting for the filter partition wall 25*b* filters of other kinds.

As shown in Fig. 9, these superposed signal light tubes may be arranged to be viewed through both the front and the back of the casing, and accordingly, the casing here shown is provided with aligned openings 19 and 19*a* supporting a wall 25*c* carrying a tube 10*h* and 10*k* respectively on its front and back sides. In this case, the tubes 10*h* and 10*k* are each made of transparent colorless glass so as not to filter the light emanating from the other tube.

I am not advised whether or not it is possible at present to commercially produce a luminous-gas producing a green light directly and without filtering by a coating on the tube itself or without passing it through a filter, but it is common knowledge that several different colors of light may be produced by clear glass tubes, and under such conditions any desired tubes may be used in the form of my invention shown in Fig. 9.

Hence, for the purposes of this disclosure, the tube 10*h* may be considered to produce a red light, while the tube 10*k* may be considered to produce a blue light. To obtain red and green signals, which may be viewed from either or both directions, and which may be produced under present commercial conditions, the form of the invention shown in Fig. 12 may be practiced. In this instance, three luminous tubes 10 are employed, and these are supported by transparent partition walls 25*d*.

The central tube 10*m* is arranged to emit green light rays which pass unfiltered through both the openings 19 and 19*a*, and on both sides of the tube 10*m* where is arranged a tube 10*n* each in direct communication with the atmosphere so that light may be emitted from each directly to the observer, and be unfiltered by the presence of the tube 10*m* or the material of which it is made. As proposed, in practice, both of the tubes 10*n* are connected in parallel to be energized simultaneously while the tube 10*m* is adapted to be energized alternately with the tubes 10*n*.

Referring to the broader aspect of this invention, namely, the provision of a signal light comprising a spirally wound luminous-gas tube, attention is called to the fact that the tube itself being cylindrical in cross-section, and being spirally wound, has light diffusing and deflecting properties in itself, and hence there is needed no lens or other extraneous means which might diminish the volume of the light more or less in order that the light may be observed from a wide angle.

Further, it should be noted that since it may be placed at, near or beyond the opening in the casing, the luminous-gas tube of the invention may be viewed from a position very close to, if not actually in the plane in which the tube 10 is located.

Other variations and modifications may be made within the scope of this invention, and portions of the improvements may be used without others.

Having thus described the invention, what is claimed as new and for which it is desired to obtain Letters Patent, is:—

1. A signal device including a casing having front and back walls, aligned openings in said front and back walls forming a hole through the casing, and a plurality of tubes arranged in tortuous compact form in the casing and superposed within the hole defined by the openings in the front and back walls of the casing, each portion of each tube being closely adjacent another portion thereof and in light co-mingling relation therewith so that light rays emanating from the tube simulate when viewed from the front or back of the casing a single light source or lens in the opening in the casing, and a transparent plate extending across the hole in the casing which extends from back to front thereof, and means for supporting said light tubes by and on said plate in registry with the opening in the casing.

2. A signal device including a casing having front and back walls, a plurality of spaced openings in the front and back walls, each opening in the front wall being aligned with an opening in the back wall, and a plurality of gaseous discharge light tubes each arranged in tortuous compact form within an area defined by the aligned openings in the front and back walls of the casing, each active portion of each tube being closely adjacent another portion thereof and in light co-mingling relation therewith so that light rays emanating from each tube simulate when viewed from the front or back of the casing a single light source or lens in its related openings in the casing, a transparent plate extending longitudinally of the casing and across the holes in the casing which extend from back to front thereof and defined by the aligned openings and means for supporting the light tubes by and on said plate in registry with the openings in the casing.

3. A signal device including a casing having front and back walls, a plurality of spaced openings in the front and back walls, each opening in the front wall being aligned with an opening in the back wall, and a plurality of gaseous discharge light tubes at least one for each pair of aligned openings being arranged in compact form to substantially cover the area defined by its associated wall openings so that light rays emanating from each tube simulate when viewed from the front or back of the casing a single light source or lens in its related openings in the casing, and a transparent plate extending longitudinally of the casing and across the holes in the casing, which extend from back to front thereof and are defined by the aligned openings, means for supporting the tubes by and on said plate in registry with the openings in the casing, and partitions in the casing preventing the light emanating from one tube from being visible through an adjacent opening in the casing.

4. A signal device including a casing having front and back walls, aligned openings in the front and back walls of the casing, a plurality of gaseous discharge light tubes arranged in tortuous compact form within an area defined by said openings, each active portion of each tube being closely adjacent another portion thereof and in light co-mingling relation therewith so that light rays emanating from either tube simulates when viewed from the front or back of the casing a single light source or lens in the opening in the casing, and means for supporting said tubes in superposed relation, each tube substantially covering the other tube to diffuse light which shines through it from the other tube.

5. A signal device including a casing having front and back walls, a plurality of spaced openings in the the front and back walls, each opening in the front wall being aligned with an opening in the back wall and forming a hole

through the casing, a plurality of gaseous discharge light tubes each arranged in the casing in the hole formed by the aligned openings in the front and back walls of the casing so that light rays emanating from each tube may be viewed from within the front or the back of the casing, a transparent plate, extending longitudinally of the casing and across the holes in the casing which extend from back to front thereof and are defined by the aligned openings, means for supporting the light tubes on said transparent plate in registry with the openings in the casing, and partitions in the casing preventing the light emanating from one light tube from being visible through an adjacent opening in the casing.

6. A signal device including a casing having front and back walls, aligned openings in said front and back walls forming a hole through the casing, a pair of gaseous discharge light tubes arranged in the casing in the hole defined by the openings in the front and back walls of the casing, a transparent plate extending across the hole in the casing, and means for supporting one of said light tubes by and on each side of said plate in registry with the hole in the casing in overlapping relation.

7. In combination, a transparent plate, a pair of luminous-gas tubes and means for supporting one tube by and on each side of said transparent plate in overlapping relation.

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