

Nov. 2, 1937.

O. S. FIELD

2,097,785

LIGHT SIGNAL FOR RAILROADS

Filed July 23, 1930

6 Sheets-Sheet 1

FIG. 1.

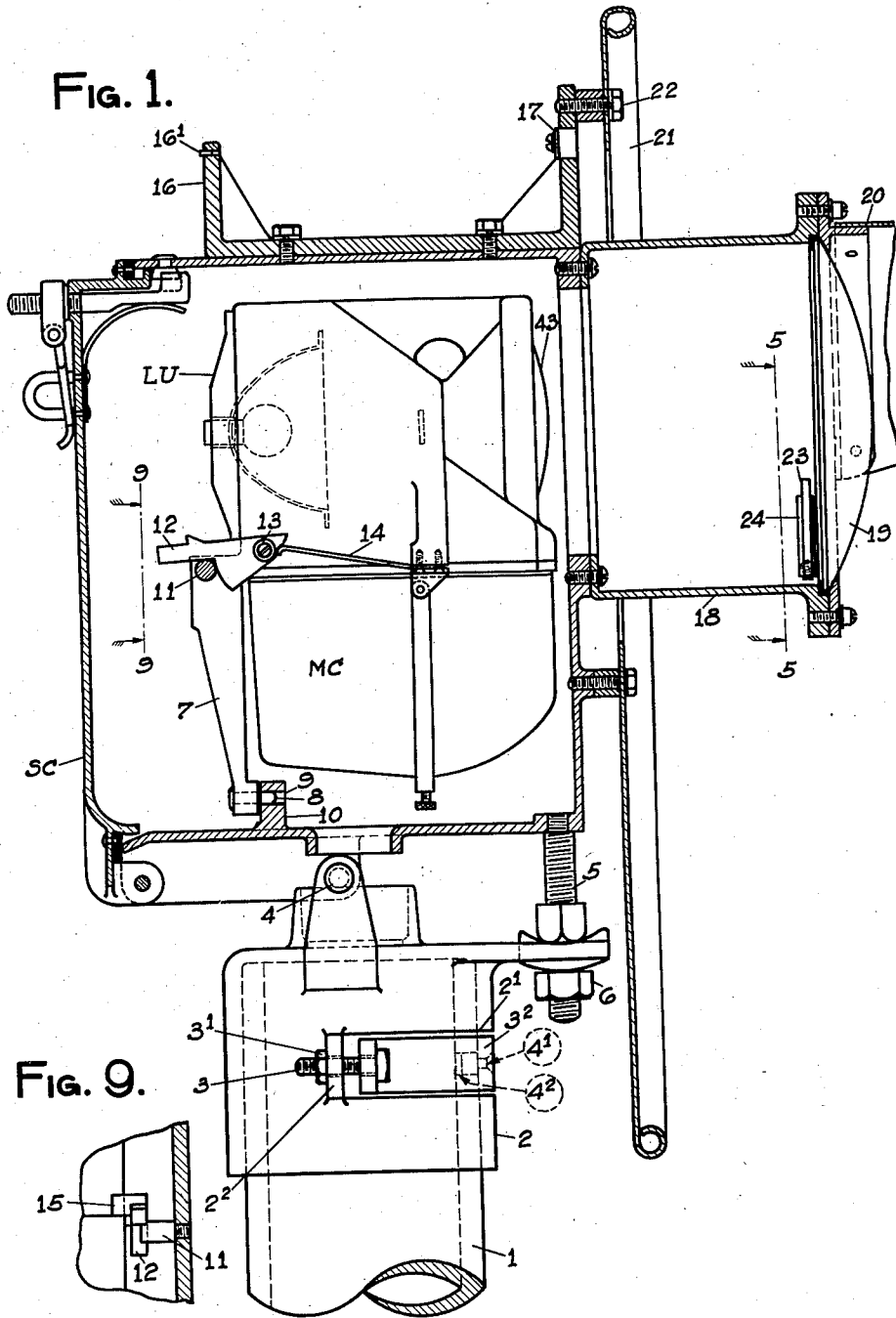
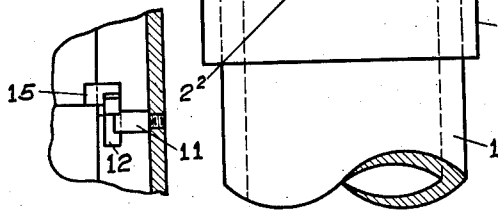


FIG. 9.



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LIGHT SIGNAL FOR RAILROADS

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6 Sheets-Sheet 2

FIG. 2.

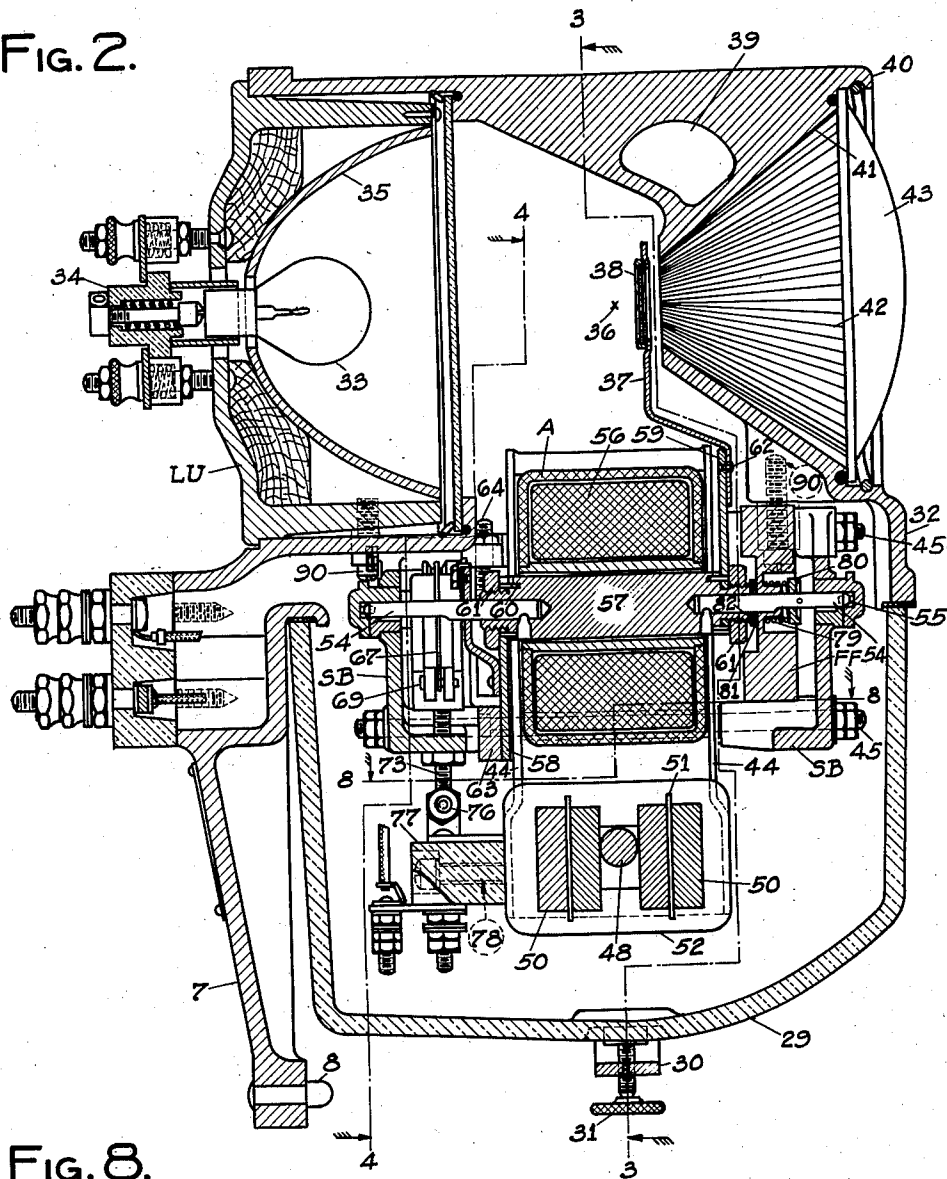
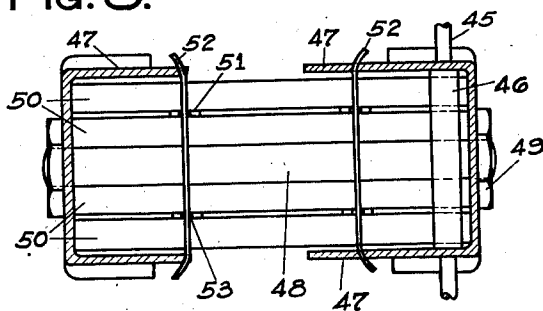


FIG. 8.



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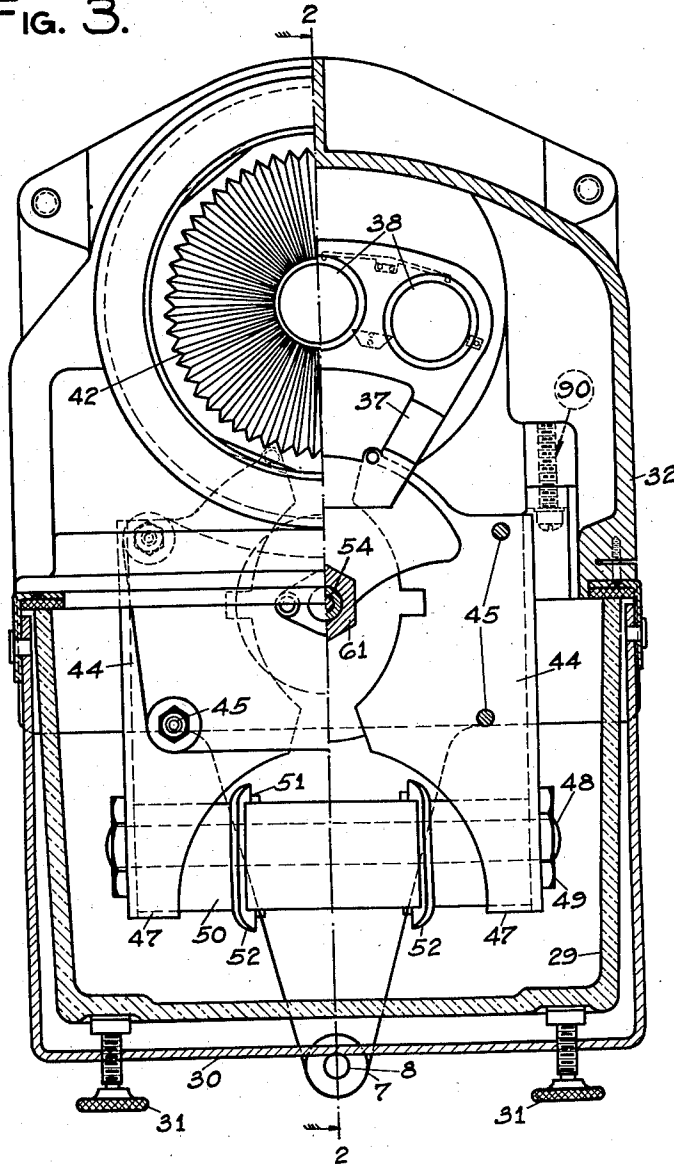
2,097,785

LIGHT SIGNAL FOR RAILROADS

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6 Sheets-Sheet 3

FIG. 3.



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LIGHT SIGNAL FOR RAILROADS

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FIG. 4.

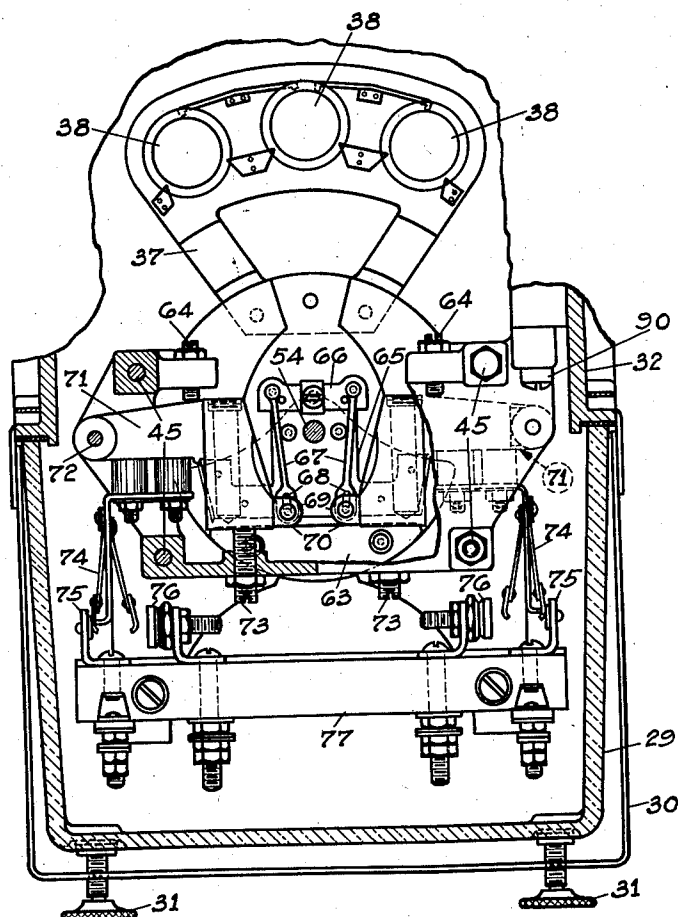


FIG. 5.A.

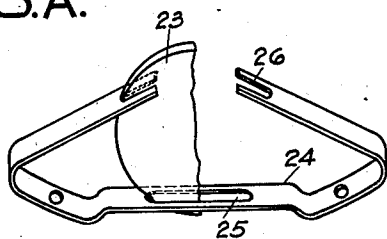


FIG. 6.

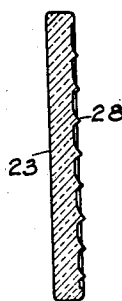


FIG. 7.

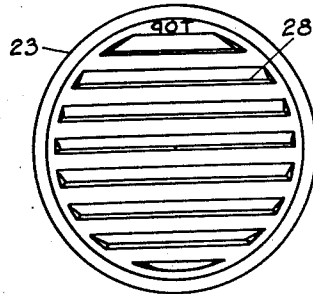
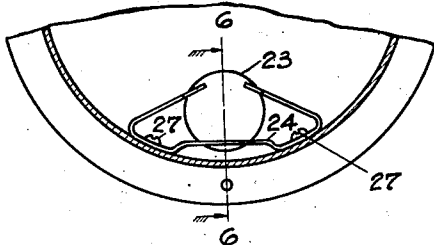


FIG. 5.



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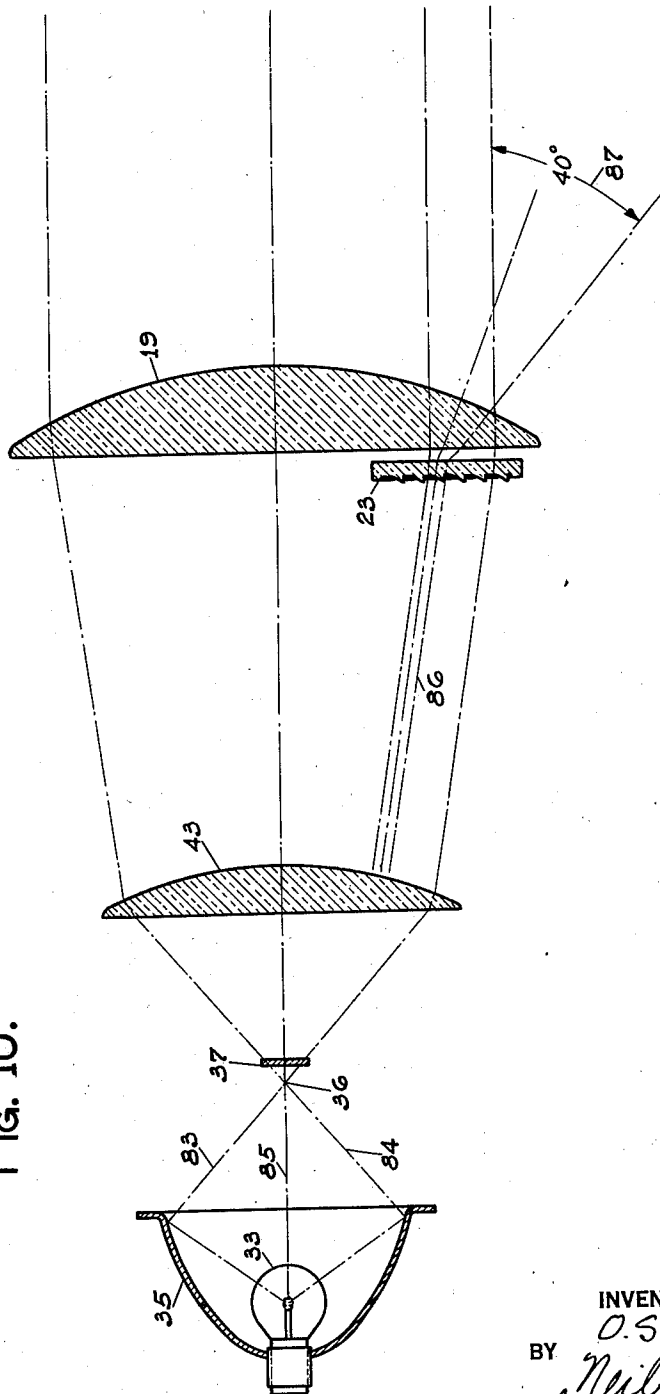
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FIG. 10.



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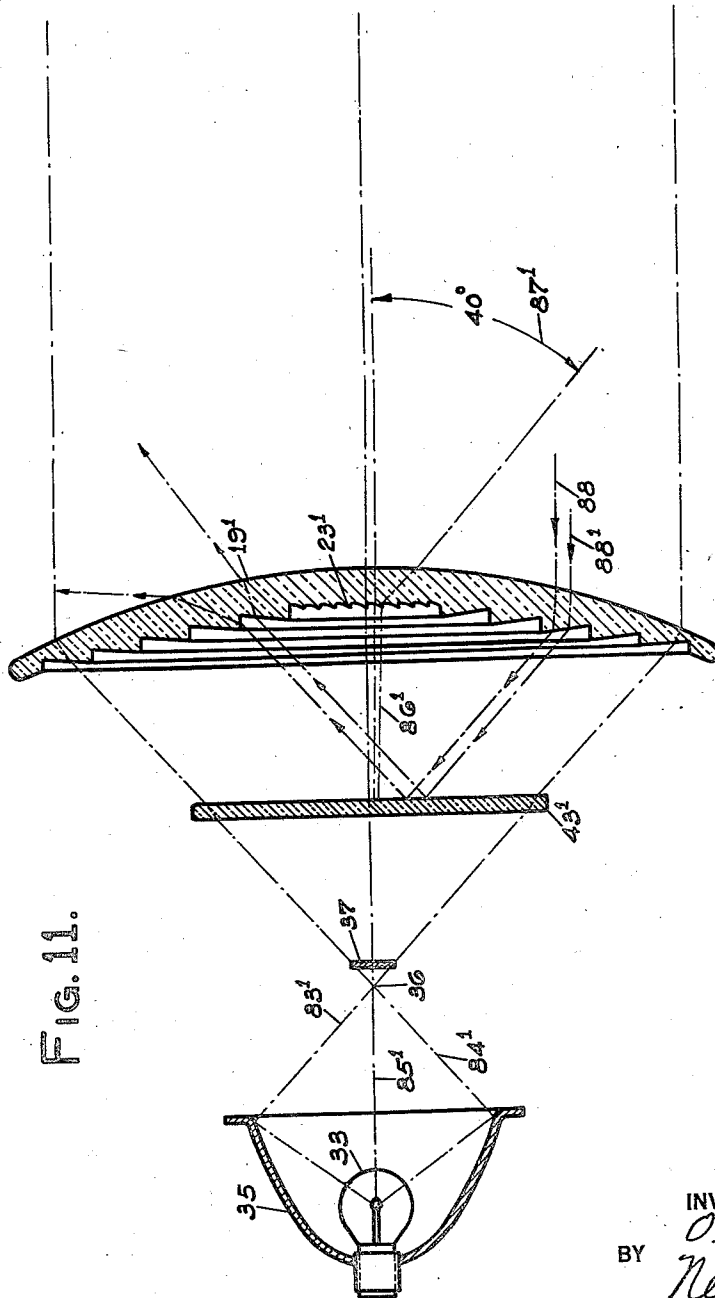
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LIGHT SIGNAL FOR RAILROADS

Filed July 23, 1930

6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,097,785

LIGHT SIGNAL FOR RAILROADS

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Application July 23, 1930, Serial No. 470,056

5 Claims. (Cl. 177—329)

This invention relates in general to light signals, and has more particular reference to a light signal wherein a single light source, in cooperation with a movable screen carrying a plurality of colored transparent members, operates to give a plurality of different signal indications.

The present application is a continuation in part of applicant's copending application Ser. No. 123,437 filed August 10, 1926, now Patent No. 1,835,150 dated December 8, 1931, and entitled "Light signals."

Among the objects of the present invention is to provide a light signal of the character in question which is simple in construction, cheap to manufacture, readily accessible for inspection and repair, and has a long useful life.

A further object of the present invention is to provide means to effectually prevent phantom indications due to light from outside of the signal passing into the signal and reflecting out again. This is accomplished, broadly, by providing a funnel shaped member running inwardly to the movable spectacle, with longitudinal corrugations on the inner surface of the same, whereby to cause any light entering the signal to be reflected transversely from the corrugations to thereby diffuse the same.

A further object of the present invention is to provide an improved means for inserting and fixing in place, a mechanism casing in the signal casing.

A further object is to provide a motor element having a permanent magnetic field whereby to minimize the requirement for power sources at the signal location, so that primary batteries can be readily used and thereby obviate necessity for a power line or storage batteries.

A further object of the invention is to provide an optical system including condensing lenses whereby light from the single light source can be more economically utilized so that a relatively low powered light source can be used satisfactorily. This permits the use of primary batteries for energizing the light source instead of requiring storage batteries or a power light.

A further object of the invention comprises providing a novel friction fly wheel, carried on the shaft of the armature of the motor element, for preventing rebound when the motor moves to energized position.

A further object of the present invention is to provide a novel and improved centering means for bringing the motor element, when de-energized, to its neutral position in an accurate and certain manner.

A further object of the present invention is to provide an auxiliary lens, including an arrangement of prisms, for producing a close up indication by redirecting a portion of the light flux from the light source to an inclined position with reference to the optical axis of the main lens system. The auxiliary lens is arranged for adjustment so as to vary the position of the close up indication about the optical axis of the lens system proper.

Further objects, purposes and characteristic features will appear as the description progresses, reference being made to the accompanying drawings, showing, solely by way of example, and in no manner in a limiting sense, one form which the invention can assume. In the drawings:—

Fig. 1 is a side elevational view, with parts shown in section, of a light signal in accordance with the present invention.

Fig. 2 is a sectional view, on line 2—2 of Fig. 3, viewed in the direction of the arrows.

Fig. 3 is a half sectional, half elevational, view on line 3—3 of Fig. 2, viewed in the direction of the arrows.

Fig. 4 is a sectional view on line 4—4 of Fig. 2, viewed in the direction of the arrows.

Fig. 5 is a sectional view on line 5—5 of Fig. 1, viewed in the direction of the arrows.

Fig. 5A is a perspective view of a portion of the auxiliary lens and its mounting.

Fig. 6 is a sectional view on line 6—6 of Fig. 5, viewed in the direction of the arrows.

Fig. 7 is a rear elevational view of the auxiliary lens shown in Fig. 6.

Fig. 8 is a sectional view on line 8—8 of Fig. 2, viewed in the direction of the arrows.

Fig. 9 is a fragmentary sectional view, on line 9—9 of Fig. 1, viewed in the direction of the arrows.

Fig. 10 is a diagrammatic view of the optical system, showing the paths traversed by various of the light rays emanating from the light source.

Fig. 11 is a view similar to Fig. 10, of a modified form of lens system.

Referring now to the drawings, and first to Fig. 1, there is here shown a signal pole 1, on which is carried a cap 2, adjustable horizontally thereon and then fixable in adjusted position. The cap 2 has a transverse slot 2¹ formed therein, with lugs 2² at the inner ends of the slot, to receive threaded bolts 3 and nuts 3¹ for drawing a U-shaped strap 3², having an inwardly projecting pin 4¹, against the post 1, pin 4¹ fitting into a receiving socket 4², in post 1, to thereby

anchor the strap to the post, and adjustably connect the cap 2 to the anchored strap.

With this arrangement of parts, cap 2 can be readily adjusted angularly on post 1, by tightening one of the nuts 3', and loosening the other, to thus turn the cap on the anchored strap.

Carried by the cap 2 is a signal casing SC, pivoted as at 4 to the cap 2, and having an adjusting means, comprising a threaded stud 5 and nut 6, for tilting the casing SC in a vertical plane on its pivot point 4.

Carried within the signal casing SC is a mechanism casing MC, having a depending bracket 7, carrying a pin 8 at its lower end for engagement in an aperture 9 in a lug 10 carried by the signal casing. The signal casing has two pins 11, in its sides, for cooperation with two latches 12, pivoted at 13 to the mechanism casing, and biased by springs 14 in a counter-clockwise direction as viewed in Fig. 1, whereby to snap the catches 12 over the pins 11 and thereby hold the mechanism casing MC in position in the signal casing SC on the two horizontal pins 11 and the lower pin 8. The latches 12 have offset lugs 15 for contacting with the upper face of bracket 7 to limit the rotation due to springs 14, when the mechanism casing is removed from the signal casing.

Carried on the top of the signal casing SC, is a sighting device including an apertured member 16 and a member 17, carrying cross hairs or the like for defining a point in space, with the aperture 16 and the cross hairs defining a line in space parallel to the optical axis of the lens system in the light signal, whereby to permit readily directing the focussed signal beam to any desired point.

Carried on the front of the signal casing is an adapter 18, having at its outer end a lens 19, shown as a plano-convex lens of the condensing type, for directing light beams passing there-through in a substantially cylindrical beam. Carried on the adapter 18 is a sunshade or visor 20, and carried by the signal casing is a background 21 fastened in place by screws or the like 22.

In combination with the lens 19, is an auxiliary lens 23, carried in a bracket 24 fastened to the adapter 18, the bracket 24, having a lower aperture 25, and two forked, infacing ends 26, for rotatably receiving the lens 23, whereby it can be rotated in the bracket 24 as desired, the bracket 24 being held in place by means of screws or the like 27.

The auxiliary lens 23, as shown best in Figs. 6 and 7, includes a plurality of parallel, spaced, substantially straight prisms 28, arranged to redirect light passing therethrough in a downward direction at an angle of substantially 40° from the horizontal when the lens 23 is positioned with the top portion, indicated by the word "Top", at the top. The functions and advantages of this arrangement of parts of the auxiliary lens will appear as the description progresses.

Referring now more particularly to Fig. 2, the mechanism casing MC is here shown in section, and comprises a preferably transparent bowl 29, held by means of a strap 30 and thumb screws 31, in position against the main portion 32 of the mechanism casing.

Carried in a socket in the casing portion 32, is a light unit LU, including a light source 33, shown as an incandescent bulb adjustably carried in a mounting 34 so as to position it at one of the conjugate foci of an elliptical reflector 35, the other conjugate focus of the reflector being

at the point 36, immediately to the rear of a movable spectacle 37 carrying a plurality of different colored glasses 38, as more readily seen in Fig. 4. The light unit LU can be readily slipped into place in the casing portion 32 and held therein by a bayonet joint or the like, as shown in the application of which this is a continuation. The mechanism casing is provided with a hand hole 39 for facilitating handling of the same.

In the front of the casing portion 32 is an aperture 40 for receiving a conical member 41 having longitudinal corrugations 42 covering its entire inner surface. These corrugations 42 have sharp edges, and smooth faces, whereby to cause light entering through the plano-convex lens 43, which is positioned over the outer larger opening of the cone member, to be reflected back and forth from one side of the cone to the other, if it strikes on the pointed edges of the corrugations, and if these edges are not so sharp as to substantially prevent any reflection, and to be reflected from one inner face to the other of the various corrugations if it strikes at such points.

Furthermore, if the cone member 41 were to be smooth on its inner surface, then the entire surface would act to reflect light entering from the outside, back and forth across the cone as the light travels inwardly, to prevent any light so entering, from leaving the casing, without first having passed through the spectacle 38, so as to prevent any washing out or dimming of the color of the signal glass then in controlling position.

It will be noted that the cone member 41 has its inner open end immediately adjacent the spectacle 37, whereby any light from outside that reaches the spectacle 37 must either reach it directly and pass therethrough or else be reflected back and forth by the cone member until it is so diffused that it cannot pass out again in a manner to give a phantom indication. Were there any flat reflecting faces anywhere adjacent the focal point 36, light from the outside might reach the same and be reflected outwardly again to give a false indication, this being particularly the case if such reflecting surface were at the outer side of the spectacle.

By the above arrangement, little or no light from the outside can enter the casing and be reflected out again, without first passing through the spectacle 38, and due to the opening cover 43 being spaced a considerable distance from the focal point 36 and to the fact that no other surface is adjacent this focal point, any such light as does reflect out of the casing before passing through the spectacle 38, reflects from points considerably spaced from the focal point 36, and hence does not fill the opening 40 with the reflected light. Accordingly such light as thus reflects out can at most produce only bright spots at the opening or on the closure for the opening instead of covering the entire opening and thus tending to wash out or gray the color of the indication then in force.

Carried by the casing portion 32, are two spaced side brackets SB, supported by studs 90. Between these support brackets are carried two boxlike field members 44, by means of through bolts 45, with spacers 46 between the substantially parallel sides 47 of the field pieces, to permit tightening up the connection without collapsing the field pieces.

Carried by means of a through bolt 48, and nuts 49, is a permanent magnetic field structure including four permanent magnets in the form of four bars 50, two at each side of the bolt 48.

Each pair of magnets 50, is spaced by spacers 51, with the magnetic bars and bolt 48 held together in a bundle by means of two spaced circular washers 52, passing around the same and fitting into slots 53 in the spacers 51 whereby to hold the entire permanent magnetic field structure of the motor element in proper position.

Carried on spindles 54, pivoted at 55 in knife edge bearings, is an armature A, having an armature winding 56, on a core 57, with vanes 58 and 59 pinned to the core 57 by pins 60 and held rigidly in place by nuts 61. As can be readily seen in Fig. 2, the vanes 58 and 59 are positioned respectively below and above the axis of the core 57 whereby, when the winding 56 is energized to make the vanes respectively of positive and negative polarity, the spindle 54 will be rocked either clockwise or counter-clockwise by the attraction of the permanent magnetic field, the permanent magnetic bars 50 making one of the boxlike field members 44 positive and the other negative. By reversing the polarity on the winding 56, the polarity of the vanes 58 and 59 can be reversed and hence the direction of rotation reversed.

Carried by the vane 59 is the spectacle 37, connected thereto by suitable means, such as rivets 62, whereby the spectacle can be moved to position any one of its three colored glasses 38 in front of the focal point 36, the center glass 38 being positioned at the focal point 36 when winding 56 is de-energized, and the outer glasses 38 being so positioned when the winding 56 is energized with one or the other polarity.

Carried by the vane 58, is a counter-weight 63, for balancing the weight of the spectacle 37. For defining the energizing positions of the vanes 58 and 59, there are provided adjustable stop screws 64 against which the vane 58 strikes when it reaches its energized position in either direction.

For accurately and positively returning the armature and its connected parts to neutral position, upon the de-energization of winding 56, there is provided a centering mechanism. Fastened to the vane 58, is a plate like arm 65, to the top of which is fastened a crown 66 and to this crown 66 are pivoted two arms 67 each of which has a longitudinal slot 68 in its lower end for receiving a pin 69 carried in the bifurcated end 70 of a centering weight 71 which is pivoted at 72. Each centering weight normally rests on an adjustable stop screw 73, when the parts are in neutral position.

With the structure above described, on the armature A moving to an energized position, as for example, clockwise, as viewed in Fig. 4, the left hand arm 67 is raised to thereby raise centering weight 71, whereby, upon the armature being de-energized, the centering weight moves the parts back to neutral position. As the same time the right hand arm 67 is permitted to move downwardly due to its slot 68, while the right hand centering weight 71 remains in its neutral position, resting on the screw stop 73.

Carried by one of the centering weights 71, are movable contacts 74, which cooperate with fixed contacts 75 and 76 carried on an insulating bar 77 bolted, as by means 78, to the box like field members 47.

When the armature winding 56 is energized, and the vanes 58 and 59 are moved to energized position to cause vane 58 to strike against one of the stop screws 64, there is a tendency for the parts to rebound from the stop screws before

finally coming to rest thereagainst. This tendency to rebound is very effectually prevented by means of a friction fly wheel FF, loosely carried on one of the spindles 54, with a spring 79 sleeved between the friction fly wheel and a collar 80 pinned to the spindle 54, whereby to bias the fly wheel inwardly to compress friction discs 81 positioned between the fly wheel and a shoulder 82 on the core 57.

With the arrangement of parts just described, when the armature is moved to energized position, the friction fly wheel FF continues to rotate after the vanes have been brought to a stop, by rotating on the spindle 54, to thereby absorb the kinetic energy of the parts and prevent the rebound by attempting to carry the rotation beyond the position of the screw stop 64.

Referring now to the diagrammatic showing in Fig. 10, there is here represented the elliptical reflector 35, the light source 33, the focal point 36, the spectacle 37, the inner plano-convex lens 43, the outer plano-convex lens 19, and the auxiliary lens 23, in their approximate relative positions occupied in the actual light signal.

The parts are arranged so that light emanating from the light source 33, and striking the reflector 35, is concentrated at the conjugate focus 36 of the elliptical reflector, and then spreads out sufficiently to practically fill any one of the colored glasses 38 carried by the spectacle 37. After passing through one of the colored glasses it continues to spread out to substantially cover the inner condensing lens 43. On passing through the lens 43 the light is concentrated sufficiently to just cover the outer condensing lens 19 through which it passes to be directed outwardly in a substantially cylindrical beam. This is all indicated by the light rays 83, 84, and 85 which are traced in the diagram shown.

Light rays passing through the inner condensing lens 43 and striking the auxiliary lens 23, as, for instance, the light ray 86, is caused by the prisms 28 of the auxiliary lens 23, to be directed downwardly substantially 40° from the direction at which the ray 86 entered, so that this ray, on passing through the outer condensing lens 19, follows a path approximately 40° removed from the cylindrical beam, as indicated by the arrows 87. The various quantitative figures given above with regard to the light rays, can of course be varied within limits, without departing from the present invention. For example, the condensing lenses 43 and 19 might be arranged so as to give a resulting beam from the light signal which instead of being cylindrical, might be slightly conical in either direction from the spherical. Also, the auxiliary lens 23 could be so arranged and have its prisms so proportioned that the depression of the light passing therethrough might be somewhat more or less than the 40° set above.

As was explained above, the auxiliary lens 23 can be turned in its supporting bracket 24 so as to move the top, indicated by "Top", in either a clockwise or counter-clockwise direction, whereby to cause the depressed beams passing through the auxiliary lens 23 to lie to one side or the other of the main cylindrical light beam, instead of below it as indicated in Fig. 10. By turning the lens 23, through an angle of 180°, the close-up indication can be caused to fall directly above the main cylindrical beam, whereby to produce a close-up indication for a dwarf or low signal. With a high signal the close-up indica-

tion is normally positioned, as shown in Fig. 10, to be directed downwardly instead of upwardly.

By employing condensing lenses to thereby utilize the light flux to the greatest advantage, it is possible to use a relatively low powered light source 33. By being enabled to use a low powered light source, and by also employing a permanent magnetic field structure for the motor element, the total amount of energy required to operate the light signal is cut down to such a small value that primary batteries can be depended on for operating the signal and thus obviate necessity for a power line or storage battery at outlying points where the signals are located. The only power required at the signal location is that required for energizing the armature A, and the low powered light source 33.

A satisfactory indication has been obtained, under bright daylight conditions, at distances of 3500 to 4500 feet, with a light source constituted by a three watt, four volt, incandescent bulb. Thus it can be seen that the condensing lens optical system, together with a permanent magnetic field structure for the motor element, produces a combination which permits the use of primary energy sources for operation of outlying signals.

It can also be readily seen from the above, that the conical member 41, for directing light outwardly from the spectacle 37, effectually prevents outside light, on coming into the spectacle, from reflecting from any point near the conjugate focus 36, and thereby causing a phantom indication.

In the form of lens system shown in Fig. 11, the lens 43 of Fig. 10, is replaced by a piece of plane glass 43; while the outer lenses 19 and 23 of Fig. 10 are replaced by a stepped lens 19¹ of the Fresnel type, with a bull's eye 23¹ formed substantially like the auxiliary lens 23 of Fig. 10, to give a close-up indication as shown in Fig. 11.

In the case of the Fig. 10 form, as well as the Fig. 11 form, the optical member 43 and 43¹ used to seal the front opening in the casing MC, is positioned a considerable distance from the focal point 36. Accordingly, any light, (usually white light) entering the signal through the front lens 19 or 19¹, and reflecting from the surface of the inner optical member 43 or 43¹, is diffused away from the main beam, on energizing from the signal, and hence cannot wash out the color of the main beam, as might be the case if these inner optical members were positioned substantially at the focal point 36. This is illustrated by beam 88 in Fig. 11.

The above rather specific description of one form of the present invention, is given solely by way of illustration, and is not intended, in any manner whatsoever, in a limiting sense. Obviously, the invention can assume many different physical forms, and is susceptible of numerous modifications, and all such forms and modifications, as come within the appended claims, are intended to be covered by this application.

Having described my invention, I now claim:—

1. In a light signal, in combination with a light source, a conical tube positioned to allow light from the source to pass through it from the small to the large end, to the outside of the signal, and longitudinal corrugations on the inner surface of said tube for diffusing light entering the same from the outside before such light can reach the light source.

2. In a light signal, in combination with a light source, a conical tube positioned to allow light flux from the source to pass through it, from the small to the large end, to the outside of the signal, and longitudinal, sharp edged, corrugations covering the inner surface of said tube for diffusing light entering the same from the outside.

3. In a light signal, in combination, a casing, a light source in the casing, a signal means, light directing means for directing light from the source through the signal means, an outer opening in the casing, an inwardly tapering hollow cone extending from the outer opening to the signal means, and sharp edged longitudinal corrugations completely covering the inner surface of the cone.

4. In a light signal, in combination with a light source, an inwardly tapering conical tube positioned to allow light flux from the source to pass therethrough to the outside of the signal, longitudinal sharp edged corrugations covering the inner surface of said tube for diffusing light entering the same from the outside, and a signal glass immediately to the rear of the tube and substantially covering the inner opening of the tube.

5. In a light signal, in combination with a light source, a flaring tube positioned to allow light from the source to pass through it from the small to the large end to the outside of the signal, and longitudinal corrugations on the inner surface of said tube for diffusing light entering the same from the outside before such light can reach the light source.

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