

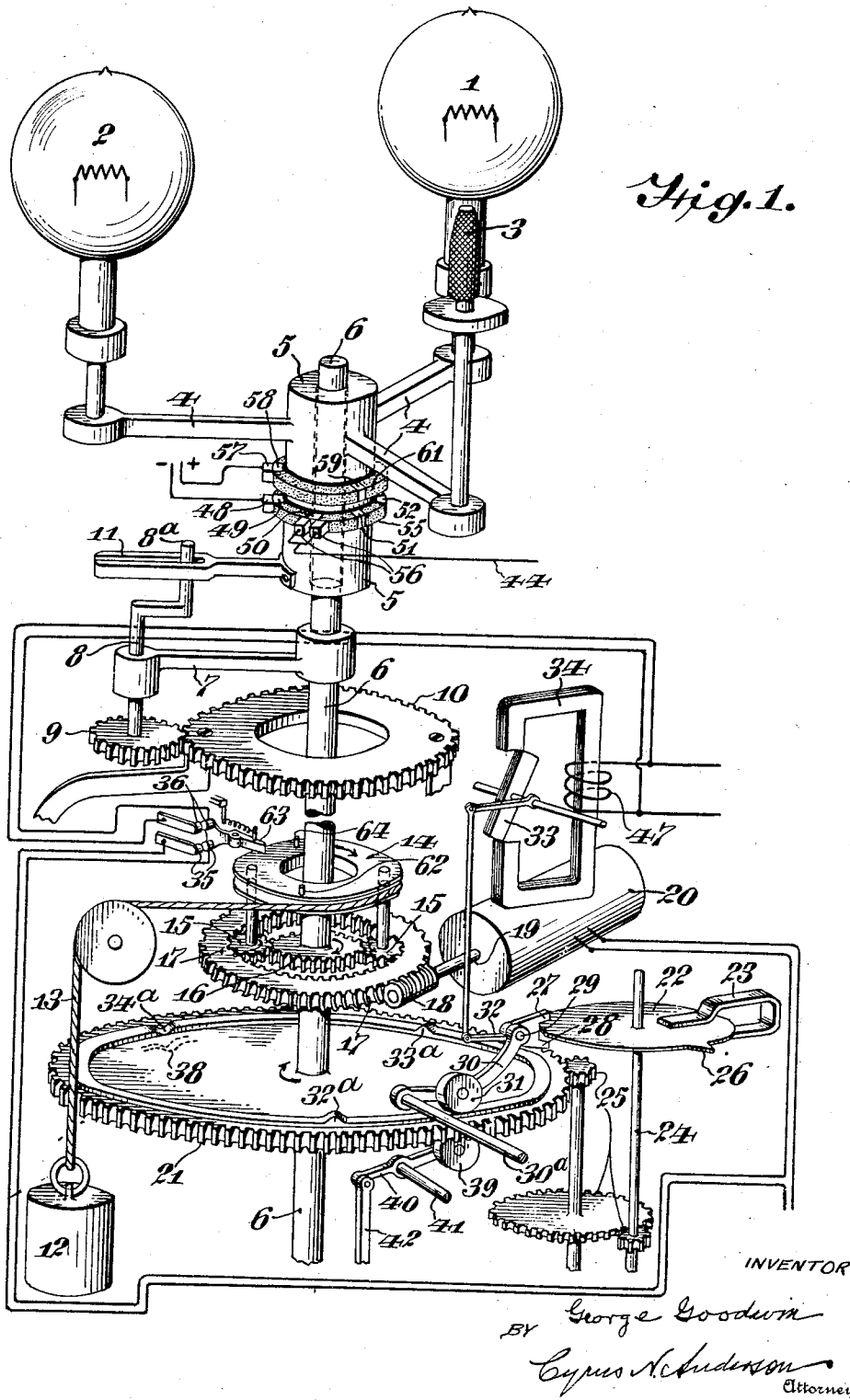
April 21, 1931.

G. GOODWIN

1,802,145

LAMP SUPPORTING AND CONTROLLING MEANS FOR LIGHTHOUSES AND THE LIKE

Filed Sept. 24, 1928 3 Sheets-Sheet 1



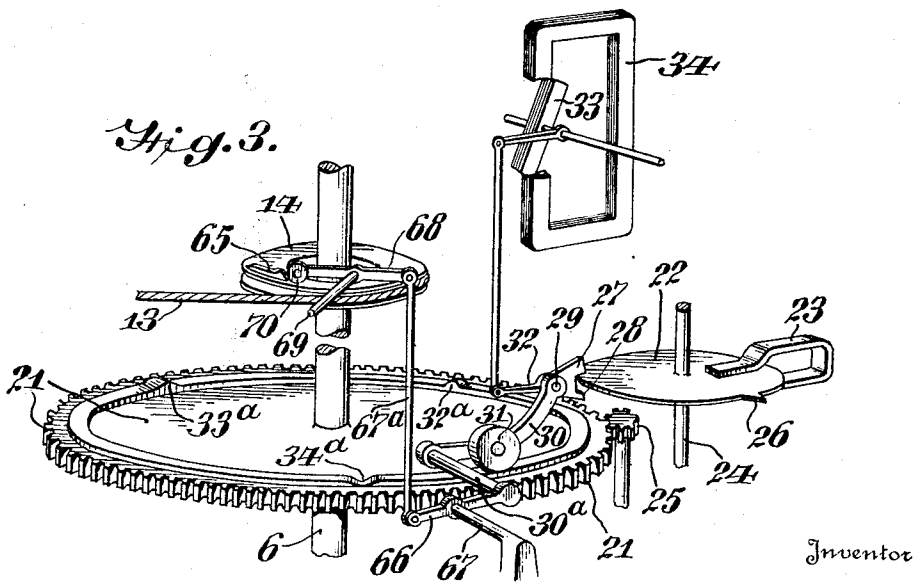
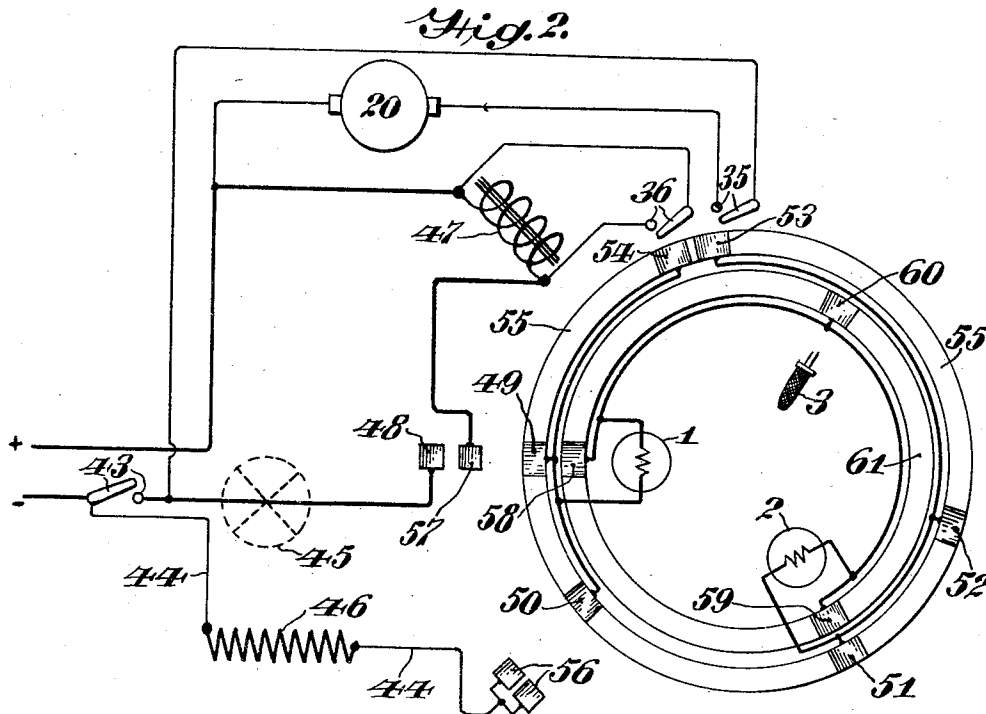
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LAMP SUPPORTING AND CONTROLLING MEANS FOR LIGHTHOUSES AND THE LIKE

Filed Sept. 24, 1928 3 Sheets-Sheet 2



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LAMP SUPPORTING AND CONTROLLING MEANS FOR LIGHTHOUSES AND THE LIKE

Filed Sept. 24, 1928 3 Sheets-Sheet 3

Fig. 4.

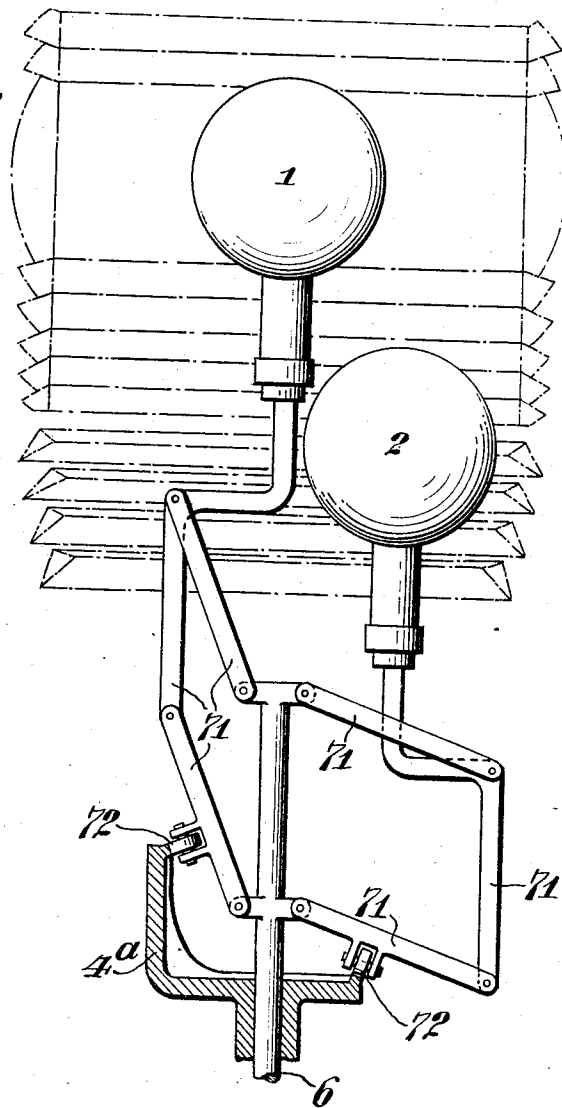
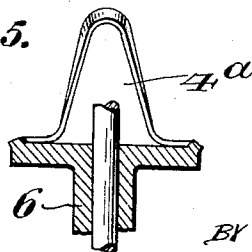


Fig. 5.



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UNITED STATES PATENT OFFICE

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LAMP SUPPORTING AND CONTROLLING MEANS FOR LIGHTHOUSES AND THE LIKE

Application filed September 24, 1928, Serial No. 307,917, and in Great Britain October 11, 1927.

This invention relates to lights for illuminating light houses and for other like purposes wherein it is necessary that a light shall be maintained continuously, and it comprehends mechanism whereby the lighting may be restored if it should become extinct by reason of the failure of a light.

The advantage of being able to automatically restore illumination in light houses and the like after the failure of a light therein is recognized, but up to the present time there has been no general adoption of means for effecting that purpose. One of the reasons for such failure has been the amount of supervision called for by the structures heretofore known for restoring illumination in case of the failure of a light.

It is an object of the present invention to provide apparatus or mechanism of relatively simple construction which can be relied upon to remain in effective working order and to operate efficiently for lengthy periods of time and which ordinarily will require attention only when there is no longer available an effective lamp for the replacement of a lamp which has failed.

In some cases illuminants of two different kinds may be made use of, one being a standby and adapted to be substituted for the other, although the latter also may be an independent source of the same kind of illuminant. Again, it may be desired to retract a light source bodily from the lens system (when the device or structure is employed in connection with such a system) when the exchange with another is being effected, whilst in other instances this precaution and operation may not be necessary. Apparatus embodying the invention has been devised so that it can be applied and employed to meet the various requirements which are met with in practice.

Broadly the invention includes the provision of light supporting or actuating means capable only of unidirectional rotation; the provision of mechanical means for rotating such light supporting means; and of a motor and gearing adapted to restore the mechanical driving means to its normal state after each complete rotation of the said light sup-

porting means; and the provision of means for automatically locking the said light supporting means at predetermined positions against rotation by an extraneously applied force; that is, against rotation except by the means provided for that purpose and which is effective in the operation of the structure.

It also is an object of the invention to provide means whereby upon the failure of the lights ordinarily employed the light supporting means will move into position to render the "standby" lighting means effective, and also to provide means which may be returned automatically into position to render one of the main lighting means effective.

I shall not undertake here to indicate all of the many objects and advantages of the invention, but further and additional objects and advantages thereof will be pointed out in the detailed description thereof which follows or will appear and become apparent from such description.

In order that the invention may be readily understood and its many advantages from a practical standpoint fully appreciated reference should be had to the accompanying drawings in which I have illustrated certain forms of construction embodying the invention.

In the drawings:

Fig. 1 is a diagrammatic perspective view of one construction of means embodying the invention;

Fig. 2 is a view showing a diagram of the electric wiring for supplying electric current to the main lights or lamps of the structure;

Fig. 3 is a view in perspective of a fragmentary portion of a modified construction of means embodying the invention;

Fig. 4 is a view in sectional elevation of a portion of a structure showing a modified means for positioning the lamps with respect to a lens structure; and

Fig. 5 is a view in sectional elevation showing a portion of the structure illustrated in Fig. 4 and taken in a plane at right angles to that in which Fig. 4 is taken.

In the construction as illustrated in Figs. 1 and 2 two electric lamps or lights 1 and 2

and a standby gas burner or light with mantle 3 are assumed to be carried on or supported by a revolving arm system 4 which hereinafter will be referred to as the light supporting means or, broadly considered, light actuating means. The axis of revolution of the said light supporting means is vertical and is noncoincident with the focus of the associated lens or lens structure (not shown), whether the latter be circumferentially complete or not, so that the various lamps or lights can be brought successively into the focus of the lens structure.

The light supporting means is provided at its center with an elongated hub or central portion 5 which is loosely mounted upon the upper end portion of the shaft 6 from which shaft projects an arm or bracket 7 rigidly connected therewith, which bracket carries and supports a vertically arranged spindle 8 provided at its lower end with a pinion 9 which engages a stationary toothed ring or gear 10 which is concentric with the shaft 6 and at its upper end with a crank having an upwardly extending projection 8^a which extends into the slot of a forked or slotted arm 11 which is rigidly connected with and projects laterally and radially from the hub 5 previously referred to. The arrangement and operation are such that when a lamp is located in operative position (as for example at the focus of a lens or lens system or structure the crank is directed radially inwards, due to the appropriate selection of gear ratios with the axis of the projection 8^a extending transversely of and in vertical alinement with the pitch circle of the pinion 9. Under these conditions external pressure applied to the lamp supporting means when a lamp is in operative position as above stated will produce no movement thereof, the engagement of the crank pin with the slotted arm 11 forming a lock to prevent such movement. It will be apparent, however, that upon rotation of the shaft 6, which rotation is adapted to be effected by the mechanism, and under the conditions as hereinafter stated, the arm 7 will be rotated or revolved and such rotation or revolution by reason of the engagement of the projection 8^a with the slotted arm 11 will cause rotation or revolution of the light supporting means consisting of the arms 4 or any other suitable means or devices.

The shaft 6, in the construction as illustrated, is adapted to be rotated by means of a weight 12 suspended upon a flexible connection 13 which is attached to and extends around a floating grooved ring 14 upon which planet pinions 15 are supported, which pinions mesh with the teeth of a sun wheel 16 rigidly mounted upon the said shaft 6. The said pinions also mesh with the internal teeth of a floating worm wheel 17, the external teeth of which are in engagement with a worm 18

upon the shaft 19 of an electric motor 20. Normally the worm wheel 17 is held stationary by the worm 18 and the driving shaft 6 also is held stationary by stopping or holding means as will be hereinafter explained. Upon the release of the said stopping or holding means the shaft 6 will be caused to rotate by the action of the weight 12 exerted through the flexible connection 13, grooved ring 14 and planet wheels 15 to the sun wheel 16 on the said shaft. It will be understood that when the said stopping means is operating to hold the shaft 6 the ring 14 is held against rotation due to the interlocking of the planet gears 15 with the sun wheel, the gear 16 and the floating worm gear 17, but upon release of the said stopping means rotation of the ring 14 is effected under the influence of the weight 12. The planet gears 15 are thus carried around the sun wheel 16 and being in engagement with the internal teeth of the stationary worm gear 17 the said planet gears are caused to rotate and to effect rotation of the gear 16 and of the shaft 6 in a clockwise direction as indicated by the arrow on said wheel. If the motor 20 should be started while the shaft 6 is held stationary by the stopping and holding means therefor the worm wheel 17 will be driven by the worm 18 and the planet gears 15 will be caused to travel idly around the sun wheel 16 and will cause rotation of the grooved ring 14 in a direction (anti-clockwise) to rewind the flexible connection 13 attached to the weight 12 and effect elevation of the latter.

The control of the movements and operation as thus far described may be effected in various ways. The means provided for that purpose and which will now be described comprises a toothed wheel 21 mounted upon and rigidly connected with the shaft 6. The speed of rotation or movement of the lamp supporting means may be controlled by the employment of a suitable governor such as an eddy current brake which comprises a metal disc 22 and an associated magnet 23 (which may be a permanent magnet), the spindle 24 of the said disc being geared to the toothed wheel 21 as by means of the gear train designated as a whole by the reference number 25. A projection 26 upon the brake disc 22 forms a part of the stop mechanism by means of which the rotation of the shaft 6 is controlled. For co-operation with the projection 26 I have provided a stop device comprising a trigger having twin projections 27 and 28 spaced from each other as illustrated. The operation of the said stop device is controlled by the co-operation or mutual action of an electro-magnetically responsive device and cam means or devices movable with the shaft 6. The arrangement and operation are such that unless the electro-magnetic device is energized the cam mechanism

cannot act to arrest or stop the shaft and the light supporting means actuated thereby in any position except that at which the standby lamp or light source is in use, nor can the light supporting means remain stationary with the standby lamp in use if thereafter the said electro-magnetic device is energized. If the electric current for the main lights and for energizing the said electro-magnet should fail or if the filaments of both or all of the said lights should become broken so that the said electro-magnet becomes de-energized the light supporting means will rotate until the standby light is brought into operative position, which may be the focus of a lens structure or system. Immediately upon restoration of the current through the electro-magnet to energize the same the means for actuating the light supporting means is returned to initial position after which it operates to rotate the light supporting means to bring a main light into operative position instead of the standby light.

In the construction as illustrated the stop device comprising the twin stop projections 27 and 28 is pivotally supported upon a pivot 29 upon one end of a lever 30 pivotally connected at its opposite end to a stationary support 30^a. The lever 30 is provided intermediate of its length with a roller 31 which is adapted to contact with and to be elevated by cam projections 32^a and 33^a which are provided on the control wheel 21 previously referred to and to which the governing means is geared as hereinbefore described. The roller 31 is also adapted to be lowered into and to engage a depression 34^a provided in the upper side of the wheel 21 as illustrated. In the first case the stop projection 28 is elevated in a direction toward the disc 22 and toward the plane of movement of the projection 26 thereon, and in the other or second case the opposite stop projection 27 is lowered in a direction toward the plane of travel of the said projection 26. Whether or not in these respective cases and positions the appropriate stop projection 28 or 27 actually moves into the path of movement of the projection 26 depends upon whether the tail piece 32 of the pivoted stop device which is connected in the manner shown to the armature 33 of an electro-magnet 34 is depressed due to the energizing of the said electro-magnet or not depressed due to the said electro-magnet being de-energized. The positions of the stop projections 27 and 28 depend not only upon the position of the lever 30 as controlled by the roller 31 but also upon the position of the pivoted stop device which is controlled by the position of the armature 33 of the electro-magnet which in turn is dependent upon the energized or de-energized condition of the said magnet.

The manner in which the construction operates or functions will be understood after

the electric connections diagrammatically shown in Fig. 2 have been described, but before describing these connections it should be explained that the grooved ring 14 whereon the flexible connection 13 which supports the weight 12 is wound is adapted, at the completion of a revolution thereof, to close a switch which comprises contacts 35 in the circuit of the motor 20 as shown. The switch also comprises contacts 36 which are employed to short circuit the energizing winding 47 of the electro-magnet 34 associated with the stop mechanism for controlling the light supporting means and to which reference has been made already. The gas for the standby lamp mantle 3 may be supplied through the shaft 6 which may be tubular for that purpose, there being a pilot light and valve means of any suitable or known kind or character operated as by a hump or a depression on the wheel 21, the said hump or depression being in addition to the humps and the depression already referred to herein and employed for co-operating in the arresting and holding of the light supporting means in desired position. Communication between the gas supply and the tubular shaft may be established through a suitable mercury seal or revolving joint.

In the construction as illustrated a hump or projection for the last named purpose is shown in dotted lines at 38 upon the under side of the wheel 21 which hump or projection is adapted to contact and co-operate with a roller 39 mounted upon one end of a lever 40 pivotally supported intermediate its ends upon a support 41 and having connection at its outer end with the upper end of a link 42 the lower end of which has connection with a gas control valve, not shown. The mode of supplying gas to the lamp forms no part of the present invention and may be effected and controlled by various means other than that suggested.

The electric circuit employed is indicated diagrammatically in Fig. 2 of the drawings and comprises the supply line indicated by the plus sign and the return line indicated by the minus sign. Means for controlling the flow of current through the circuit, such as a switch 43, located in the minus line may be provided for opening and closing the circuit through the electric lamps or lights. The said switch may be located at a convenient point for operation at a distance from the said lights. A lead 44 extends from a point in one of the main lines beyond the control switch 43 (and a flasher 45 if one should be employed) which lead includes a resistance 46. The said lead constitutes an auxiliary circuit for the winding 47 of the electro-magnet previously mentioned. The said lead provides means whereby a sustaining current may pass through the filament of the lamp which is in operation, the said current being restricted by the resistance 46 to an amount

which does not cause any appreciable glow of the lamp filament when the switch 43 is closed. This auxiliary circuit is adapted to be opened and closed by contacts which co-operate with contacts carried upon the hub 5 of the light supporting means which hub also supports and carries other contacts through which the lamps are connected in circuit with the mains, the electro-magnet winding 47 being in series with circuits of the said lamps.

In the construction as illustrated the return or minus line of the electric current supply lines is connected to a brush or contact 48 which is adapted to engage successively contacts 49, 50, 51, 52, 53 and 54 upon a segmental ring 55 of insulating material, the said contacts thereby being insulated from each other and from the metal portions of the structure, while the lead 44 from such main is connected to twin brushes or contacts 56 which likewise are adapted to engage the set of contacts 49 to 54 above referred to, it being understood that only contacts 49 and 51 are intended to cooperate with the brush or contact 48 and that only contacts 50, 52, 53 and 54 co-operate with the twin brushes 56. That is, in the operation of the device the light 1 or 2 is active only when the contact or brush 48 is in contact or engagement with the contact or brush 49 or 51, one of the contacts or brushes 56 at such time being in contact either with the contact or brush 50 or 52. The engagement or contact of the brush or contact 48 with the contacts 50, 52, 53 or 54 does not in any way affect the operation of the device. The plus or positive line of the supply main on the other hand is connected to a brush or contact 57 which is adapted to engage or contact with the contacts 58, 59 and 60 mounted upon a segmental ring 61 by which the said contacts are insulated from each other and from metal portions of the structure. These contacts 58, 59 and 60 are connected to the lamps 1 and 2 as indicated in Fig. 2 of the drawings.

In the construction as illustrated there may be said to be three conditions, but these conditions may be increased by the inclusion or provision of an additional number of main lights similar to the lights 1 and 2.

These conditions may be described as follows:

Condition 1: The electro-magnet 34 when energized causes upward movement of the lower stop projection 28 to a position adjacent the governor disc 22 but not into the plane of movement of the projection 26 upon the said disc. If it should now happen that the roller 31 of the pivoted lever support 30 should be raised or elevated by contact with either of the cam projections or humps 32^a or 33^a on the wheel 21 which is mounted upon the shaft 6 such lever 30 is elevated so as to move the lower projection 28 into position to be engaged by the projection 26. Upon contact of the projection 26 with the projection

28 movement of the wheel 21 together with that of the parts actuated thereby is stopped and held in such position with a light 1 or 2 in the required operative position until a change in the conditions takes place. The change in condition which is contemplated might be the failure of the current in the main supply lines or it might be the breaking of the filament of the lamp corresponding to that particular position of the light supporting means or it might be due to some other cause. Upon such change in condition rotary movement of the wheel 21 is resumed and is continued until in operative condition is restored which may be the placing of the next or second main light in operative position or it may be that the wheel 21 will continue to rotate until the standby lamp 3 is brought into operative position; that is, a position coincident with the focus of the lens or lens system in a construction of the character of that which has been assumed.

Condition 2: When the electro-magnet 34 is de-energized by failure of current to flow through the coil 47 thereof the upper stop projection 27 is moved downwardly toward the governor disc 22 into position adjacent thereto but not into the plane of movement of the projection 26 thereon. If when the electro-magnet is thus de-energized the roller 31 mounted upon the control lever 30 enters the depression 34^a in the toothed wheel 21 the said stop projection 27 is thereby moved into position to be engaged by the projection 26 upon the disc 22. Movement of the wheel 21 into position to cause the roller 31 to engage the notch 34^a causes movement of the standby lamp or light 3 into operative position. The arrangement and the construction are such that gas would then be supplied to the standby burner. It will be understood, as has been indicated already, that instead of a gas light an electric light may be employed as the standby light, in which event the current should be drawn from some source independent of that of the main supply current for the main lights 1 and 2.

Condition 3: It is only when the standby lamp 3 is in operative position that the flexible cord 13 is rewound upon the drum 14 and the weight 12 thereby elevated. Such rewinding and elevation of the weight is accomplished as follows, to wit: when the parts for actuating the lights and moving them from inoperative to operative positions have reached a point such that the standby light occupies the operative position in the structure they are stopped in that position and at such time the grooved ring 14 will have rotated to a position to cause a pin 62 thereon to contact or engage a snap-over switch arm 63 of known construction and through the contacts 35 close the circuit of the electric motor 20. At the same time the winding 47 of the electro-magnet 34 is short circuited by

the engagement of the contacts 36 so that although current may then flow through the lamp filaments the upper projection 27 will remain in engagement with the projection 26 because of the fact that at such time the roller 31 occupies a position in the notch 34^a in the wheel 21. It will be seen, therefore, that under these conditions the wheel 21 is held against rotation and that in consequence the light supporting means is also held against rotation. The motor 20, however, having been put into operation as already indicated, operates through the worm wheel 17 to operate the grooved ring or drum 14 to rewind thereon the flexible cord or rope 13 to elevate the weight 12. In the operation of the grooved ring or drum 14 to rewind the said cord the pin 64 thereon contacts with the snap-over switch 63 to open the contacts 35 and 36 whereupon operation of the motor 20 is discontinued and the electro-magnet re-energized which results in a movement of the pivoted stop device to carry the projection 27 out of the plane of movement of the stop 26 so that the wheel 21 may resume its rotation to effect rotation of the light supporting means in the manner as heretofore described.

In service or use the operation may be described briefly as taking place as follows:

Assuming that the device is functioning and that the electric light or lamp 1, which may be referred to as the first of the lamps, is in operative position, as, for example, as the focus of a lens structure, it remains in such position until something happens to render the said light or lamp ineffective such as the breaking of the filament or the failure of current in the main supply lines. Assuming, however, that the lamp 1 is in position and operating, current flows from the plus line of the main supply lines through the electro-magnet winding 47, brush or contact 57, contact 58, the filament of the said lamp 1, contact 49, brush or contact 48 and thence through the switch 43 to the minus or return line. If the control switch 43 should be open or if while the said switch is closed the contact of the flasher 45 is open (when a flasher is used) a sustaining current flows into and through the filament of the lamp and thence through the contacts 50, 56, lead line 44 and the resistance 46 therein back to the minus line so that the electro-magnet 34 is retained in energized condition.

If the filament of the lamp 1 should break the electro-magnet 34 is de-energized which results in movement of the projection 28 of the pivoted stop device to release the stop 26 whereupon the supporting means for the lights is revolved by the weight 12 in the manner as hereinbefore described until the electric lamp 2, which may be regarded as the second lamp, has moved into operative position. When this occurs the contact 59

is brought into contact with the brush or contact 57, the contact 51 into contact with the brush or contact 48, and one of the contacts 56 into contact with the contact 52. It will be seen that when the contacts are thus established the filament of the lamp 2 is placed in the circuit in series with the coil 47 of the electro-magnet.

Assuming that only two main lamps are employed, such as 1 and 2 illustrated, and that the filaments in both of them are disrupted or broken then the wheel 21 will rotate until the standby lamp has been brought into operative position which occurs at the moment of the engagement of the roller 31 with the notch 34^a. The light or lamp supporting means will remain in such position until new lamps have been substituted for those having broken filaments whereupon the conditions will have been established for permitting and causing the light supporting means to then resume its movement so as to bring the first lamp 1 into operative position.

If it should happen that the supply of current from or through the main supply lines is discontinued the electro-magnet will be de-energized so that the lamp supporting means may and will revolve until the standby light 3, which in the constructions shown is illustrated as a gas lamp but may consist of an electric light or lamp as has been indicated already, is in operative position. When the said standby lamp is in operative position the brush 57 will engage the contact 60 while the twin brushes 56 will engage the contacts 53 and 54 thereby completing the circuit through the lamps and through the lead 44 and resistance 46 therein so that a light sustaining current only would flow through the lamp filaments upon restoration or resumption of the current flow. Upon restoration of the current after failure thereof, as just described, operation of the electric motor 20 is effected to rewind the flexible cord 13 upon the grooved ring or drum 14 to elevate the weight 12 whereupon if either one or both of the lamps 1 and 2 be in good condition the electro-magnet 34 is energized and the lamp supporting means released and caused to rotate until it stops at the first of the said electric lamps which is in proper condition.

As has been indicated already, the number of main electric lights or lamps which may be employed may be varied within practical limits and also as has been indicated the standby light or lamp may be or consist of an electric light instead of a gas light.

In Fig. 3 of the drawings I have shown a modified construction in which as an alternative to short circuiting the electro-magnet 34 during the rewinding of the grooved ring 14 to elevate the weight 12 the contacts 35 alone are retained and the depression 34^a in the toothed wheel 21 which corresponds to the

standby position of the light supporting means is made deeper so that when the roller 31 of the lever 30 drops thereinto it will cause movement of the stop projection 27 into a position in the plane of movement of the stop 26 independently of whether the electro-magnet 34 is de-energized. In such modified construction the grooved wheel 14 is provided with a cam projection 65 which is adapted to contact with a roller 70 upon the inner end of a lever 68 pivoted intermediate its ends upon a stationary support 69. A link 67^a is pivotally connected at its upper end to the opposite end of the said lever 68 and at its lower end to the outer end of a lever 66 pivoted intermediate its ends to a stationary support 67. The support 30^a in this construction is mounted upon the opposite or inner end of the lever 66 as shown. When the roller 70 upon the inner end of the lever 68 is engaged by the cam projection 65 the roller 31 is slightly elevated so as to position it at the point occupied by it while in the notch 34^a of the construction shown in Fig. 1. It will be seen that when the roller is thus elevated the electro-magnet 34 will then release or hold the wheel 21 depending upon whether it is or is not energized.

In the constructions heretofore described it will be noted that the light supporting means revolves so that the said lights may be brought successively into operative position; that is, into positions coincident with the focus of the lens or lens structure, not shown, it being assumed for purposes of description that the device is used in connection with the lens system of a light house or the like. It will be understood, however, that the device may be employed for any other purpose for which it may be found to be suitable.

In cases where the device is used in connection with a lens system or structure and where the accommodation within the said lens system or structure for a number of lights or lamps is restricted the lamps may be supported upon means by which they may be raised and lowered into and from operative positions, or vice versa, one after another. Each of the lights for example may be carried or supported by a parallel motion link system 71 as shown in Fig. 4 of the drawings. Such a modified arrangement may be operated by means of a rotating supporting or actuating device or means 4^a, the supporting surface of which is in the form of a cam. Rollers 72 provided upon one of the links of each couple of parallel links of the link system rest upon the said cam surface so that upon rotation of the said cam supporting device the said links are actuated to move the lights into and from operative position with respect to the lens structure or system indicated in dotted lines in said Fig. 4. It will be apparent that either the cam device or member 4^a may be rotated or that said cam

device may be held stationary and the shaft 6 to which the link system is connected rotated. In either case the lamps carried by the respective couples of parallel links will be moved into and from operative position with respect to the lens structure or system.

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

1. Apparatus of the character described comprising means for supporting a plurality of lamps one of which is a standby for the others, means for effecting unidirectional rotation of said lamp supporting means, a stop for interrupting the rotation of said lamp supporting means to position a lamp in a predetermined location, means for causing bodily movement of said stop, and means for causing pivotal movement thereof to render the same effective.

2. Apparatus of the character described comprising rotatable means for supporting a plurality of lamps, means for causing movement of the said supporting means to carry the respective lamps into a predetermined operative position, stop devices for interrupting the movement of the said supporting means to position a lamp in a predetermined location, and power means operating automatically to return the said last mentioned means to initial position after a predetermined one of the said lamps has been moved into the said predetermined operative position.

3. Apparatus of the character described comprising means for rotatably supporting a plurality of lamps, one of which is a standby for the others, means for causing rotation of the said lamp supporting means to bring the respective lamps into a predetermined operative position, stop devices for interrupting the rotation of said lamp supporting means to position a lamp in a predetermined location, and means acting automatically to return the said last mentioned means to its initial position after the said standby lamp has reached the said predetermined position independently of the means for rotatably supporting said lamps.

4. Apparatus of the character described comprising means adapted to be rotated for supporting a plurality of lamps, one of which is a standby for the others, a rotatable shaft for supporting the said lamp supporting means, said lamp supporting means being loosely and rotatably mounted on said shaft, means for causing unidirectional rotation only of said shaft, means for locking the said shaft against rotation, and means interposed between the said shaft and the said lamp supporting means for effecting rotation of the latter and for preventing rotation of the latter while the locking means for the said shaft is in locked position.

5. Apparatus of the character described comprising rotatable means for supporting

main and standby lamps, the former adapted to be supplied with electric current for rendering the same luminous and the latter with an illuminant from an independent source, a rotatable shaft upon which said lamp supporting means is loosely mounted, rotatable means interposed between the said shaft and the said lamp supporting means whereby the rotary movements of the said shaft are transmitted to the said lamp supporting means, means for causing rotation of the said shaft in one direction only, and means for returning the last mentioned means to initial position after it has arrived at a predetermined position in the operation of the said apparatus independently of said shaft.

6. Apparatus of the character described comprising means for supporting a plurality of main and standby lamps, the former adapted to be supplied with electric current as an illuminant and the latter adapted to be supplied with an illuminant from an independent source, a shaft upon which the said lamp supporting means is loosely mounted, means interposed between the said shaft and the said lamp supporting means for causing rotation of the latter when the said shaft is rotated, the said means operating to hold the said lamp supporting means stationary when the respective lamps have been located in a predetermined operative position, a rotatable member supported independently of said shaft, means for causing rotation of said member, connections between said member and the said shaft whereby when the said member is rotated in one direction rotation of the said shaft is effected, and means operating to return the said member to initial position after it has arrived at a predetermined position in the operation of the said apparatus.

7. Apparatus of the character described comprising rotatable means for supporting a plurality of electric lamps to which electric current as an illuminant is supplied from a suitable source and a standby lamp to which a suitable illuminant is supplied from an independent source, a rotatable shaft upon which the said lamp supporting means is mounted, means including a rotatable member for causing rotation of the said shaft and the said lamp supporting means in one direction to transfer the said respective lamps to a predetermined operative position, and means for returning the said rotatable member from the position occupied by it when the said standby lamp has reached the said predetermined operative position without affecting the said shaft or the said lamp supporting means.

8. Apparatus of the character described comprising means for supporting a plurality of main lamps and a standby lamp, a rotatable shaft upon which the said lamp supporting means is loosely mounted, means for causing

rotation of said shaft in one direction, means interposed between the said shaft and the said lamp supporting means and having operative connection with both for causing rotation of the said lamp supporting means when said shaft is rotated, the said interposed means operating to hold the said lamp supporting means against movement upon said shaft after a lamp has been placed in operative position until rotation of the said shaft is resumed, a stop device for holding the said shaft against rotation, and automatically acting means for releasing said stop device upon the failure of one of the said main lamps.

9. Apparatus of the character described comprising means for rotatably supporting a plurality of main lamps and a standby lamp adapted to be substituted for the former in case of failure thereof, the said main lamps adapted to be rendered luminous by an electric current and the said standby lamp adapted to be rendered luminous by an illuminant from a source independent of that for the main lamps, a shaft upon which the said lamp supporting means is loosely mounted, means for causing rotation of said shaft in one direction only, the said means including a rotatable member which completes its rotation in one direction upon the arrival of the said standby lamp in operative position, means operating to return the said member from its last named to its initial position without affecting the said shaft, means interposed between the said shaft and the said light supporting means and having operative connection with both for causing rotation of said light supporting means when said shaft is rotated, stopping means for holding the said shaft against rotation when a main light is in operative position and is illuminated, means for releasing the said stopping means to permit rotation of said shaft upon the failure of the main lights, the means for causing rotation of the said shaft operating to transfer the standby lamp into operative position upon failure of all the main lamps, means for re-engaging the stopping means to hold the shaft against rotation during the period that such standby lamp remains in operative position and until the cause of the failure of said main lamps has been removed, and means for thereupon releasing the said shaft and permitting rotation thereof until a main lamp in condition to be illuminated arrives at the operative position.

10. Apparatus of the character described comprising means for supporting a plurality of main electric lamps and a standby lamp, the illuminant for which is derived from a source independent of that for the main lamps, a shaft upon which the said lamp supporting means is mounted, a rotatable member supported independently of the said shaft, means for applying force to said mem-

ber for causing rotation thereof in one direction, connections between the said member and the said shaft whereby such rotation of the said member causes rotation of said shaft to effect rotation of the said lamp supporting means to carry the respective lamps into predetermined operative position, means operating upon the completion of rotation of the said member under the influence of said force to return the said rotatable member to initial position without affecting the said shaft, and means for holding the said shaft against rotation when any one of the said lamps is in predetermined operative position and means operating automatically to cause said last named means to release said shaft upon the failure of the said main lamps to permit the said standby lamp to be carried into operative position.

11. Apparatus of the character described comprising means for supporting a plurality of main electric lamps and a standby lamp, the illuminant for which is derived from a source independent of that for the main lamps, a shaft upon which the said lamp supporting means is mounted, a rotatable member supported independently of the said shaft, means for applying force to said member for causing rotation thereof in one direction, connections between the said member and the said shaft whereby such rotation of the said member causes rotation of said shaft to effect rotation of the said lamp supporting means to carry the respective lamps into predetermined operative position, means operating upon the completion of rotation of the said member under the influence of said force to return the said rotatable member to initial position without affecting the said shaft, means for holding the said shaft against rotation when any one of the said lamps is in predetermined operative position and means operating automatically to release said holding means upon the failure of the said main lamps to permit rotation of said shaft to carry a standby lamp into operative position.

12. Apparatus of the character described comprising means for rotatably supporting a plurality of main lamps and a standby lamp, a circuit including the said main lamps whereby electric current may be supplied thereto, means for supplying an illuminant to the standby lamp from an independent source of supply, an electro-magnet in the said circuit in series with the said lamps, a shaft upon which the said lamp supporting means is mounted, a rotatable member supported independently of the said shaft, a weight suspended from said rotatable member and adapted to cause rotation thereof in one direction, connections between the said rotatable member and the said shaft whereby when caused to rotate by said weight rotation of the said shaft is effected to cause movement of a lamp into a predetermined op-

erative position, means interposed between the said shaft and the said lamp supporting means for holding the latter against movement relatively to the said shaft when a lamp occupies said operative position, a stop device for holding the said shaft against rotation when a lamp is in said operative position, means interposed between the said electro-magnet and the said stop device and operating to release the latter to permit rotation of the said shaft upon the failure of a main lamp, and means operating upon the completion of rotation of the said member under the influence of the said weight to return the said member to initial position.

13. Apparatus of the character described comprising means for supporting main and standby lamps, the latter adapted to be supplied with an illuminant from an independent source of supply, a circuit for supplying electric current to the said main lamps, a shaft upon which the said lamp supporting means is loosely supported, means for causing rotation of said shaft in one direction only, means interposed between said shaft and lamp supporting means to cause movement of the said lamps respectively into a predetermined operative position, said last named means including a crank-shaft, means having rigid connection with the said first named shaft for supporting said crank-shaft and causing the latter to revolve with the said first named shaft, means for causing independent rotation of said crank-shaft, an arm having rigid connection with the said lamp supporting means and movable connection with the crank-arm of said crank-shaft, means for returning the second named means into initial position without affecting the said first named shaft or the lamps carried thereby, a brake device for retarding the rotary movement of the said first named shaft, and means for locking said first named shaft in stationary position when an active lamp is located in the said predetermined operative position.

14. Apparatus of the character described comprising means for supporting main and standby lamps, the latter being supplied with an illuminant from an independent source, a circuit including the said main lamps for supplying electric current thereto, a unidirectionally rotatable shaft upon which the said lamp supporting means is loosely mounted, a connection between said shaft and said lamp supporting means whereby upon rotation of the former rotation of the latter is effected, the said connection operating to hold the said lamp supporting means against movement upon said shaft when a lamp occupies a predetermined position, means rotatable alternately in opposite directions, connections between the said rotatable means and the said shaft whereby the latter is adapted to be rotated in one direction only, means oper-

able upon the completion of a rotation of said rotatable means to return it to initial position without affecting the said shaft, stop devices for controlling the rotary movements of said shaft, and means controlled and actuated by a flow of current through the said circuit for controlling the said stop devices.

15. Apparatus of the character described comprising means for supporting main and standby lamps, a circuit for supplying electric current to the said main lamps, an independent source of illuminant for said standby lamp, the said circuit including an electro-magnet in series with the said main lamps, a shaft upon which the said lamp supporting means is mounted, means for causing rotation of said shaft to place the said lamps respectively in a predetermined operative position, cam devices carried by the said shaft, stop devices including a pivotal stop and a rotatable stop, means whereby rotation of said shaft causes rotation of the said rotatable stop, connections between the said pivotal stop and the movable armature of the said electro-magnet, the said cam devices and the movements of the said armature co-acting to cause movements of the said pivotal stop into the path of movement of the said rotatable stop whereby the latter may contact with the former under predetermined conditions to hold the said shaft against rotation while the said conditions are maintained.

16. Apparatus of the character described comprising a shaft, supporting and actuating means for a plurality of lamps mounted upon said shaft, the said lamps including main lamps and a standby lamp, rotatable means mounted independently of said shaft, means operatively connected with the said rotatable means for causing rotation thereof in one direction, means interposed between said rotatable means and the said shaft whereby said rotation of said rotatable means causes rotation of the said shaft and lamp actuating means in one direction to move the said lamps respectively to a predetermined operative position, means for holding the said shaft against rotation while a lamp occupies said predetermined position, a normally inactive electric motor, means for rendering said motor active when the said rotatable means has completed its rotation in one direction under the influence of the said means which is operatively connected therewith, and means interposed between the said motor and the said rotatable means whereby operation of said motor returns the said rotatable means to its initial position independently of said shaft.

17. Apparatus of the character described comprising a shaft, supporting and actuating means for a plurality of lamps mounted upon said shaft, the said lamps including main lamps and a standby lamp, rotatable means mounted independently of said shaft, means operatively connected with the said

rotatable means for causing rotation thereof in one direction, means interposed between said rotatable means and the said shaft whereby said rotation of said rotatable means causes rotation of the said shaft and lamp actuating means in one direction to move the said lamps respectively to a predetermined operative position, means for holding the said shaft against rotation while a lamp occupies said predetermined position, a normally inactive electric motor, means for rendering said motor active when the said rotatable means has completed its rotation in one direction under the influence of the said means which is operatively connected therewith, means interposed between the said motor and the said rotatable means whereby operation of said motor returns the said rotatable means to its initial position, the said means for rendering the motor active being actuated to render the said motor inactive upon the arrival of said rotatable means at such initial position.

18. Apparatus of the character described comprising a shaft, means loosely mounted upon said shaft for supporting a plurality of lamps, one of which lamps is a standby for the others, means for effecting unidirectional rotation of the said shaft, means interposed between the said shaft and the said lamp supporting means for causing the latter to rotate with the said shaft to place a lamp in a predetermined position, the said last named means including an arm rigidly mounted upon the said shaft and projecting radially therefrom, a crank shaft rotatably mounted in the outer end of said arm and carried by the said arm about the axis of the said first named shaft, means for causing rotation of said crank shaft, an arm rigidly connected with the said lamp supporting means and projecting radially therefrom and having movable connection with the crank arm of said crank shaft, a stop for interrupting the rotation of the said first named shaft to position a lamp in a predetermined location, means for causing bodily movement of said stop, and means for causing pivotal movement thereof to render the same effective.

In testimony that I claim the foregoing as my invention, I have hereunto signed my name this 3rd day of September A. D., 1928.

GEORGE GOODWIN.