

June 21, 1932.

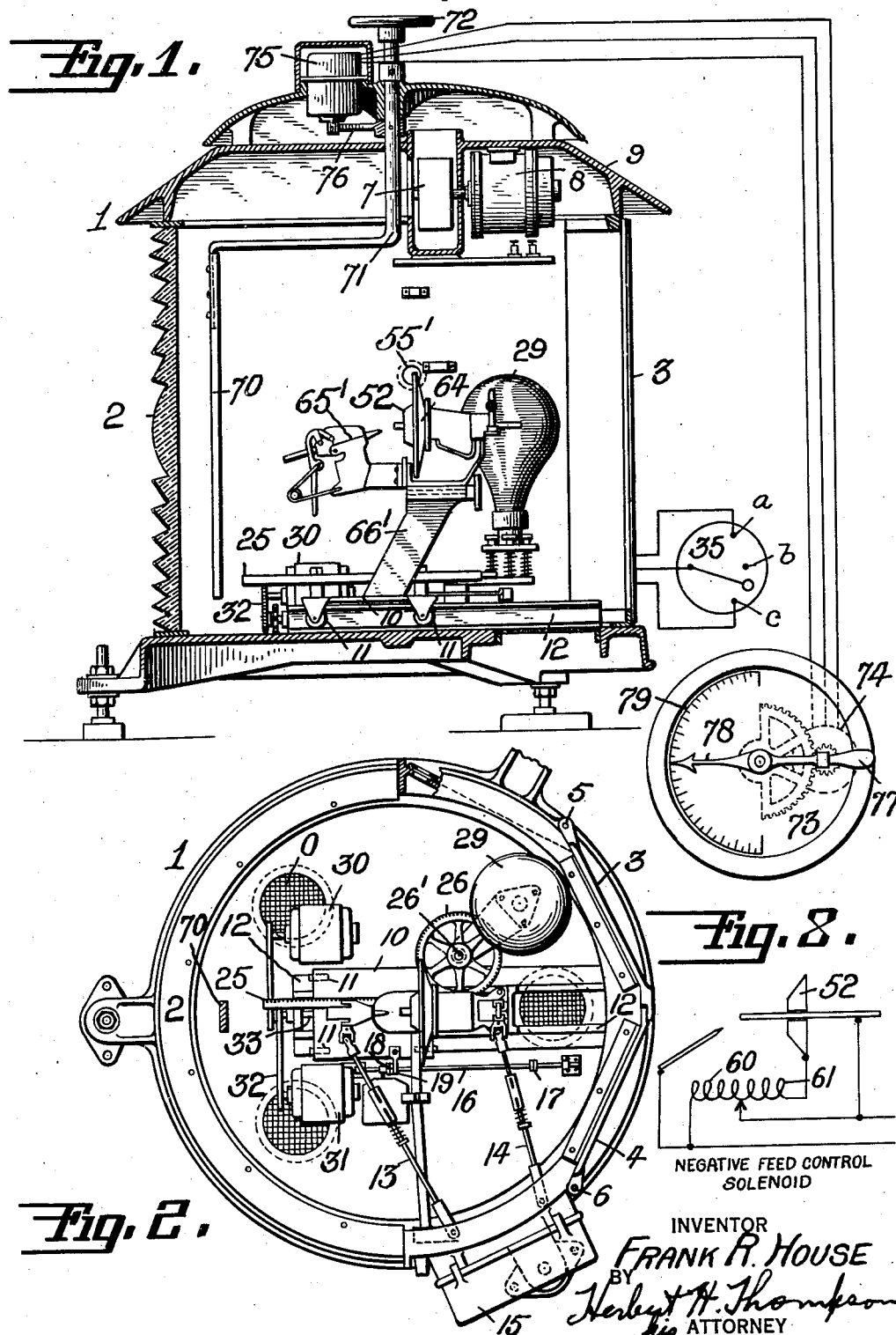
F. R. HOUSE

1,864,436

LANDING FIELD LIGHT

Filed Sept. 30, 1930

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Fig. 3.

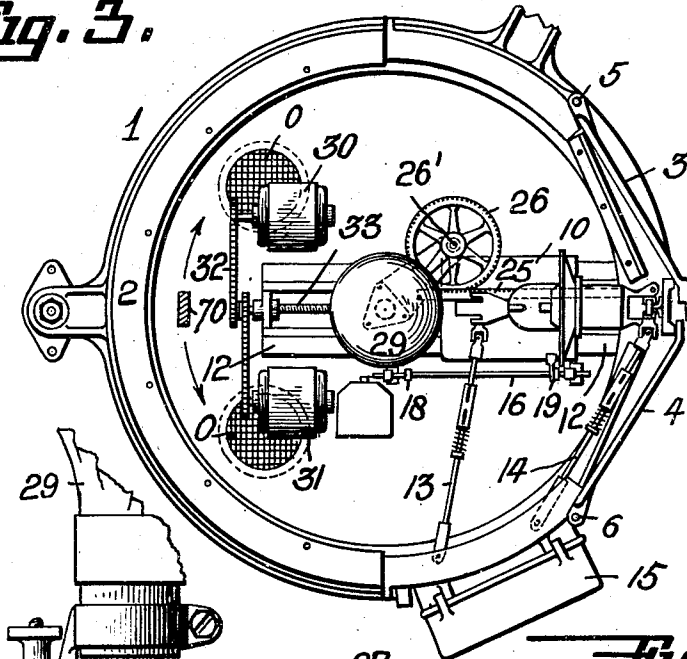


Fig. 4.

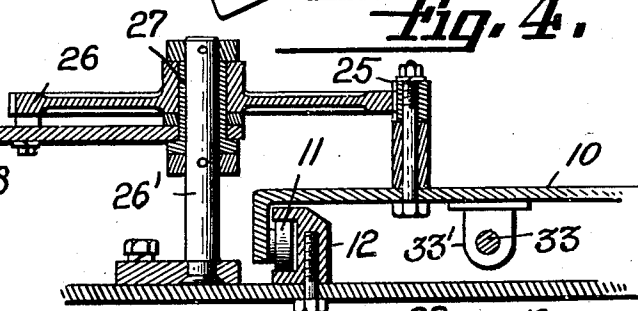


Fig. 5.

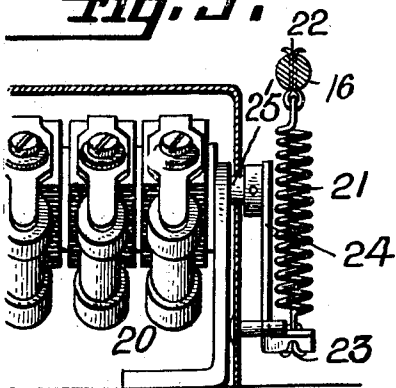
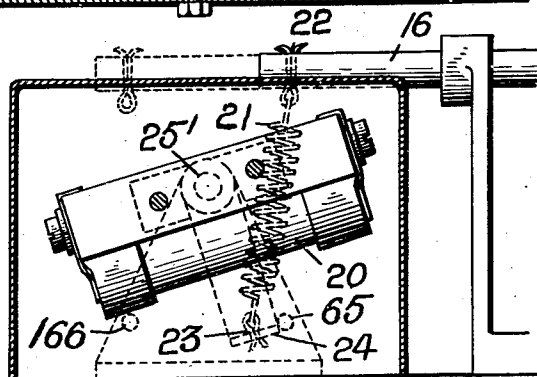


Fig. 6.



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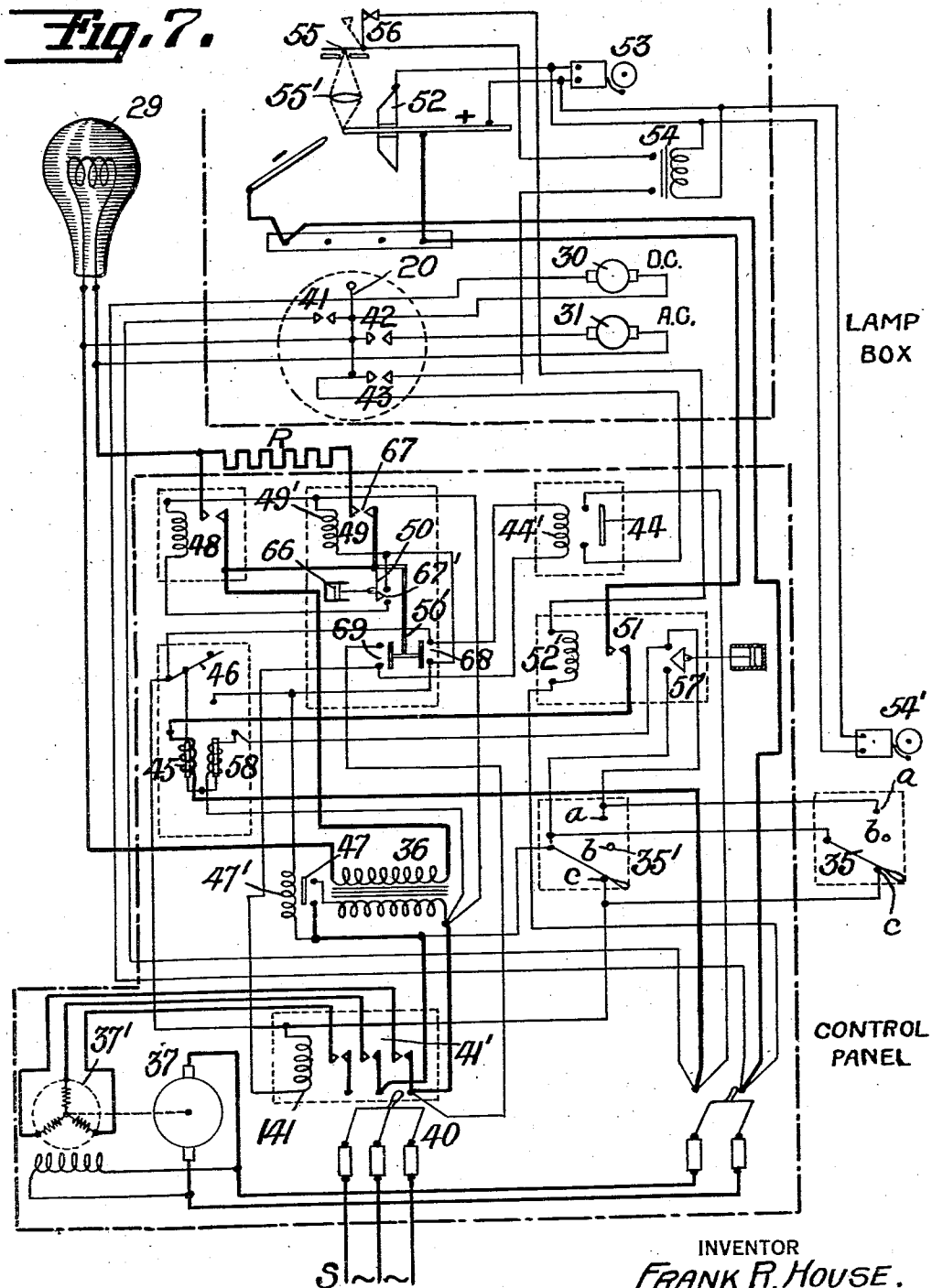
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UNITED STATES PATENT OFFICE

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LANDING FIELD LIGHT

Application filed September 30, 1930. Serial No. 485,391.

This invention relates to landing field floodlights or beacons for airplanes and more especially to the high intensity arc type of landing field light. Since it is one of the first essentials of such lamps that they be at all times in condition to light and remain lighted, I provide a stand-by system by which a high power incandescent light is automatically placed in position and turned on in case the arc lamp is extinguished for any reason. Preferably I locate the incandescent light within the same housing as the arc lamp, thereby saving the cost of an extra housing and lens. Preferably also I provide a means by which either the arc lamp or incandescent light may be lighted at will and also a means whereby, after the arc is extinguished, it will automatically be relighted when the main switch is again thrown on.

Referring to the drawings in which the preferred form of the invention is shown,

Fig. 1 is a vertical section through a flood-light housing enclosing my combined arc and incandescent lamp unit.

Fig. 2 is a top plan view of the same, partly in section, with the cover removed.

Fig. 3 is a view similar to Fig. 2 showing the arc moved out of position and the incandescent lamp into focal position.

Fig. 4 is an enlarged sectional detail of the central portion of the lamp unit.

Fig. 5 is a sectional end view of the control switch on the unit.

Fig. 6 is a sectional view at right angles to Fig. 5.

Fig. 7 is a wiring diagram of the device.

Fig. 8 is a wiring diagram showing a modified arrangement for operating the lamp changer.

My dual lamp unit is shown as mounted within a flood-light housing 1 having a Fresnel lens 2 at the front and outwardly opening doors 3 and 4 at the back thereof, said doors being hinged respectively at 5 and 6. The housing is provided with the usual ventilating screen apertures 7 at the bottom thereof and exhaust fan 8 driven by the motor 9 in the top cover 10 thereof. The arc lamp mechanism, consisting of positive and nega-

tive electrode holders 64 and 65, is mounted on a column 66 on a carriage 10. Said carriage is shown as mounted on rollers 11, the carriage being mounted to roll back and forth on a trackway or double tread rails 12. The feeding of the electrodes is preferably accomplished through extensible shafts 13 and 14 which are driven from suitable arc controlling means (not shown) within the control box 15. To one side of the carriage may be mounted a rod 16 having a pair of spaced stops 17 and 18 thereon. As the carriage is advanced to its focal position, a lug 19 on the carriage strikes the forward stop 18 and moves the rod 16 forward slightly to throw a multi-point switch 20, which may be of the tumbler type (three unit) from the position shown in Fig. 6 to the other position. This may be accomplished by securing a spring 21 between said rod 16 as by cotter pin 22, and a cotter pin 23 on a bell crank lever or arm 24 mounted on the shaft 25 of said tumbler switch. It will readily be seen that as the rod 16 moves to the dotted line position that the tumbler switch will be snapped from the position shown with arm 24 against stop pin 65 to the opposite position with arm 24 against pin 166.

There is also mounted on the carriage a means for moving the incandescent lamp 29 into position as the arc lamp is moved out of position. Such means may comprise a rack bar 25 with which the teeth of the large gear 26 engage. Said gear is secured to the sleeve 27 (Fig. 4) which supports the base 28 holding the incandescent lamp 29. It will readily be seen, therefore, that as the arc unit is moved to the right in Fig. 2, the lamp unit will be rotated about the shaft 26 of the gear 26 to swing the lamp around to the position shown in Fig. 3, the arc lamp at that time being moved to the rear and out of the way. Preferably the rear of the arc lamp unit strikes the rear doors 3 and 4 as it is moved back and opens them slightly so as to emit a shaft of light to warn the operator that the arc is extinguished. This also puts the arc lamp in a readily accessible position for recarboning or repairs.

The movements of these parts are preferably controlled from one or more electric mo-

tors, preferably a D. C. motor 30 and an A. C. motor 31. Each of these motors is connected as by a chain 32 to rotate the screw shaft 33 which is threaded through a nut 33' (Fig. 4) fixed under the arc lamp carriage 10. The two motors are arranged to run in opposite directions when excited and the D. C. motor 30 operates to move the arc from its inoperative to its focal position, while the A. C. motor 31 operates to move the arc in a reverse direction. Motor 30 may be referred to, therefore, as the advancing or replacement motor and motor 31 as the retracting motor. It is obvious that a single A. C., D. C. reversible motor may be used instead of the two motors, if desired.

One method of controlling the motors and lamps is shown in Fig. 7. The remote control master switch is shown at 35 and a second controlling switch may be mounted on the switchboard panel shown at 35'. Each switch preferably has three positions; (a) for the incandescent light, (b) the inoperative or open circuit position, and (c) the arc lamp position. An A. C. supply S is shown for the system, the same supply being used to operate the incandescent light through the transformer 36. For furnishing the D. C. supply for the high intensity arc, I show an A. C.—D. C. motor generator set 37 operated from the main, three-phase supply S. In addition to hand switch 40, I show a circuit breaker 41' positioned between the A. C. supply and the A. C. motor 37' which is controlled by a winding 141 thereon controlled from relays 45 and 49 so that when the arc is extinguished for any reason the circuit through 141 is broken at 69 on relay 49 and switch 41' opens, shutting down the motor generator set but leaving the circuit to lamp 29 closed. The above described switch 20 has the front contact 41 in circuit with the D. C. advancing motor 30 and two back contacts 42 and 43, the former being in circuit with the A. C. retraction motor 31. The latter contact 43 is placed between relay 44 and the automatic throw-out thermostat 55 and/or relay 54. The winding of relay 44 is only excited when both contact 46 on relay 45 and contacts 68 on relay 49 are closed. The former is controlled jointly by opposed windings, 45 in series with the arc and 58 in circuit with a delayed action contactor 57 on relay 51, the action being that switch 46 is closed and remains closed when 45 or when 45 and 58 are excited, but is opened when the arc circuit through 45 is broken and coil 58 is excited. Switch 46 is also biased to the open position when both windings are de-energized.

Let us assume that the arc is operating. In this condition the switch 20 is swung to the right in Fig. 7, closing contacts 42 and 43 through the arc safety thermostat and the A. C. retraction motor and holding open con-

tact 41 in circuit with the D. C. advancing motor. Since the former circuit is closed, coil 52' of relay is excited and holds the main arc circuit closed at 51. Should the arc fail or relay 51 open, the series current relay 45—58 on the panel will open the switch 46, which results in connecting the supply of A. C. power to the incandescent lamp by the de-energization of the solenoid 47' on relay 47. This will also open the A. C. supply to the motor generator set at the relay switch 41', as explained, thereby cutting off the D. C. supply. At the same time coil 49' or relay 49 will be deenergized, closing contacts 67 and 68 and opening contacts 69.

In the wiring diagram a slow starting method of lighting the incandescent lamp is shown because for a large capacity incandescent lamp it is necessary to bring it up to full brilliancy slowly. The incandescent lamp will, therefore, be dimly illuminated at first through resistance R, and the A. C. retracting motor will operate pulling the arc lamp out of position and the incandescent lamp into position. Upon the closing of delayed action switch 67 by spring arm 50, relay 48 closes, cutting out R and bringing the lamp up to full illumination.

When the lamp exchange is completed the lamp column engages the switch 20 and trips it to reverse position, that is, swinging it to the left in Fig. 7, thus closing the contact 41 and opening contacts 42 and 43, thus breaking the circuit through the retraction motor 31. The retracting movement of the lamp is, therefore, arrested at the proper position and the apparatus now operates as an incandescent unit. If desired, additional positive stops may be provided which act immediately after the circuit is broken through either motor.

Let us assume now that the lighting unit is completely turned off by the opening of switch 35 or 35' and that the arc has been repaired or recarboned in the meantime. When the switch 35 or 35' is again closed, the motor generator set 37 will immediately start up because the coil 141 has been deenergized by the opening of back contacts 69 on arm 50' of relay 49 when the switch 35 was open. Power is, therefore, available to the D. C. replacing motor 30 which immediately starts to return the arc into its operating position. The main arc D. C. contactor 51 is held open by the current in the coil 52', but relay 44 is held open since the circuit of coil 44' is open at 68. Therefore, the circuits to the change-over relay are inoperative. When the arc reaches its focal position the switch 20 is moved to the right in Fig. 7, i. e., to its original position described above, thus closing the circuit on the A. C. retracting motor at 42, closing the relay circuit on the arc controls at 43 and opening the circuit on the D. C. replacing

motor at 41. The latter action halts the movement of the arc lamp at the proper focal position. Closing of switch 43 closes relay 51, so that the arc will now begin to operate and from this point on the cycle of operation is repeated.

In order to make the system entirely automatic and provide for a shut down in case of arc failure from any cause whatever, I have shown in Fig. 7 two automatic means for replacing the arc which may be used either separately or together and in Fig. 8 I have shown still a third method. The arc is shown as provided with a nose cap 52 which is placed in circuit with a local alarm such as a bell 53 and a remote alarm 54' which may be placed adjacent the switch 35. When the arc approaches the nose cap 52 too closely, the stray current leaking to the insulated nose cap 52 will operate the alarm bells, warning the operator that the arc is burning back too far. When the alarm sounds, the operator may throw switch 35 or 35' or the equivalent, shutting off the arc and replacing it by the incandescent light. Unless one promptly shuts the arc down, the current in this circuit will go on increasing and build up sufficient strength in the relay 54 to open that switch. Relay switch 54 is in series with switch 43 so that when either is opened it breaks the circuit through the winding 52' of the relay 51 thus opening the main contact switch 51 of the arc circuit. This type of control is known as the third electrode type and is described more completely in Patent No. 1,690,550 to M. L. Patterson, dated November 6, 1928.

Instead of or in addition to this type of control, I may use auxiliary thermostat 55 on the lamp on which rays are directed by lens 55' and which is normally closed, but when the positive electrode burns back too far the thermostat opens the contact 56 breaking the circuit to the switch 43 as before. This type is known as the auxiliary thermostat type, another form of which is described more fully in the copending application No. 337,577, Robert Bohmfeldt inventor, safety mechanism for arc lamps, filed February 5, 1929, and assigned to the assignee of the present application. In this application, the thermostat is of the normally open type, while according to my invention, I prefer a normally closed type of thermostatic switch 55. If, after an emergency changeover to the incandescent lamp, the lamp has been repaired or replaced in operating shape and switch 35 is again closed, the arc will again place itself in the operating position automatically as above described, but if it fails to start after a predetermined interval determined by the time lag switch 57, the incandescent light will again replace the arc because, unless current is established through 45, the closing

of switch 57, after an interval which completes a circuit through an opposed winding 58 on the relay 45, will open the switch 46, throwing in the incandescent lamp as before described.

Fig. 8 shows a simple form of automatic control. In this figure the winding 60 represents the main voltage winding controlling the feed of the negative electrode. On this main winding is placed an opposed winding 61 which may be affected by a center tap and which is placed in series with the insulated nose cap 52. When sufficient stray current leaks to the nose cap by reason of the approach of the arc flames the influence of the winding 60 will be overcome and the arc lengthened out by feeding the negative backwards, decreasing the current, and if the positive continues to approach the nose cap, finally breaking the arc due to excessive arc length.

When switch 35 is put on position *a*, only the incandescent lamp will be lighted and if at that time the arc lamp is in the focal position, it will be moved out of position automatically and lamp 29 moved into position, since contact 35-*a* is across contacts 57 and coil 58 is energized while 45 is not, thus holding switch 46 open.

To improve the operation of my floodlight, I prefer to employ a shadow bar 70 preferably positioned vertically within the lamp in front of the light source. The purpose of this bar is to prevent the beam from blinding the aviator when landing or taking off into the beam, and for this purpose the bar is preferably made adjustable about its pivotal axis of support 71 so that the shadow may be positioned at will by the operator as by handwheel 72. Preferably the shadow bar may be positioned from a distance and for this purpose a controller 73 is provided, which may be positioned adjacent the remote control switch 35. Said controller contains a transmitter 74 for actuating at a distance a repeater motor 75 of any desired form, the latter being geared to a gear sector 76 secured to shaft 71. The controller is shown as provided with an operating handle 77 which is preferably geared to the transmitter 74 so that the handle will rotate through the same angle as the shadow bar 70. Preferably the handle is also equipped with an indicator 78 which may read on a scale 79 and the controller is preferably positioned so that the indicator 78 points in the same direction as the shadow cast by the bar 70. By this means the operator may quickly position the bar so that the shadow cast thereby is effective to prevent the direct beam from striking the eyes of the aviator.

In accordance with the provisions of the patent statutes, I have herein described the principle and operation of my invention, together with the apparatus which I now con-

sider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means. Also, while it is designed to use the various features and elements in the combination and relations described, some of these may be altered and others omitted without interfering with the more general results outlined, and the invention extends to such use.

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

1. A lighting unit comprising a single lamp housing and focusing system, an arc lamp therein normally positioned at the focus and slidably mounted so as to be moved out of focus, a pivotally mounted auxiliary incandescent lamp, and means for swinging said incandescent lamp into focus as the arc lamp is moved out of focus and vice versa.

2. A lighting unit comprising a single lamp housing and focusing system, an arc lamp therein normally positioned at the focus, an auxiliary incandescent lamp, means responsive to failure of the arcing tips of the electrodes to keep in focus, and means brought into action thereby for extinguishing the arc, moving said arc lamp out of the focus and said incandescent lamp into focus and lighting up said incandescent lamp.

3. A lighting unit comprising a single lamp housing and focusing system, an arc lamp and an incandescent lamp therein, means for lighting either lamp at will, and means for automatically bringing the illuminated lamp into focus if out of focus and moving the other lamp out of focus.

4. A lighting unit comprising a housing and beam condensing system, an arc lamp mechanism therein, an incandescent lamp also therein, means for lighting either lamp at will, and means responsive to the lighting of a lamp for moving the illuminated lamp into the focus of the condensing system if out of focus at the time of lighting.

5. A lighting unit comprising a housing and beam condensing system, an arc lamp mechanism therein, an incandescent lamp also therein, means for lighting the arc, means responsive thereto for moving said arc lamp into the focus of the condensing system, if out of focus, and means for automatically removing the arc lamp from and moving the incandescent lamp into focus and lighting the latter on failure of the former.

6. A lighting unit comprising a single lamp housing and focusing system, an arc lamp therein normally positioned at the focus, an auxiliary incandescent lamp, means for turning on the arc, and delayed action means responsive to failure of the arc to function within a predetermined interval for turning off the arc and moving it out of position, and

means for simultaneously turning on the incandescent lamp and moving it into position.

7. A lighting unit comprising a single lamp housing and focusing system, an arc lamp therein normally positioned at the focus, an auxiliary incandescent lamp, means responsive to the burning of the positive electrode back too far for breaking the arc circuit, and means brought into action thereby for moving the arc lamp out of position and the incandescent lamp into position and for lighting the latter.

8. In a floodlight for airports, an adjustable shadow bar mounted therein, a repeater motor for turning the same, a transmitter for operating said repeater motor, and manually operative means for turning said transmitter, said means having an indicator which turns therewith and is adapted always to point in the direction of the shadow cast by said bar.

9. In a floodlight for airports, an adjustable shadow bar mounted therein, a repeater motor for turning the same, a transmitter for operating said repeater motor, and manually operative means for turning said transmitter, said means adapted always to point in the direction of the shadow cast by said bar.

10. A lighting unit comprising a single lamp housing and focusing system, an arc lamp therein normally positioned at the focus, an auxiliary incandescent lamp, means responsive to the burning of the positive electrode back too far for breaking the arc circuit including a thermostatic circuit breaker, a relay and motor brought into action thereby for moving the arc lamp out of position, and means also brought into action thereby for bringing the incandescent lamp into position and for the lighting the latter.

11. A lighting unit comprising a single lamp housing and focusing system, an arc lamp therein normally positioned at the focus, an auxiliary incandescent lamp, means responsive to the burning of the positive electrode back too far for breaking the arc circuit, means including a third electrode for preventing damage to the lamp, a bucking coil on the negative feed control solenoid in circuit with said third electrode for breaking the arc, and means for simultaneously bringing the incandescent lamp into position and lighting the same.

12. A lighting unit comprising a single lamp housing and focusing system, an arc lamp therein normally positioned at the focus, an auxiliary incandescent lamp, a door for obtaining access to the interior of said housing, means responsive to improper functioning of the arc, and means brought into action thereby for moving said arc lamp out of focus and said incandescent lamp into focus and lighting up said incandescent lamp, said movement acting to bring said

arc lamp adjacent said door when moved out of focus for the purpose specified.

13. A lighting unit comprising a single lamp housing and focusing system, an arc lamp therein normally positioned at the focus, an auxiliary incandescent lamp, a signal responsive to improper functioning of the arc, and means whereby, upon operation of said signal, said arc lamp may be extinguished and moved out of focus and said incandescent lamp may be moved into focus and illuminated.

14. A lighting unit comprising a single lamp housing and focusing system, a slidably mounted arc lamp therein normally positioned at the focus, a pivotally mounted auxiliary incandescent lamp, means for extinguishing the arc and means brought into action thereby moving said arc lamp out of focus and for illuminating said incandescent lamp and swinging it into focus.

In testimony whereof I have affixed my signature.

FRANK R. HOUSE.