

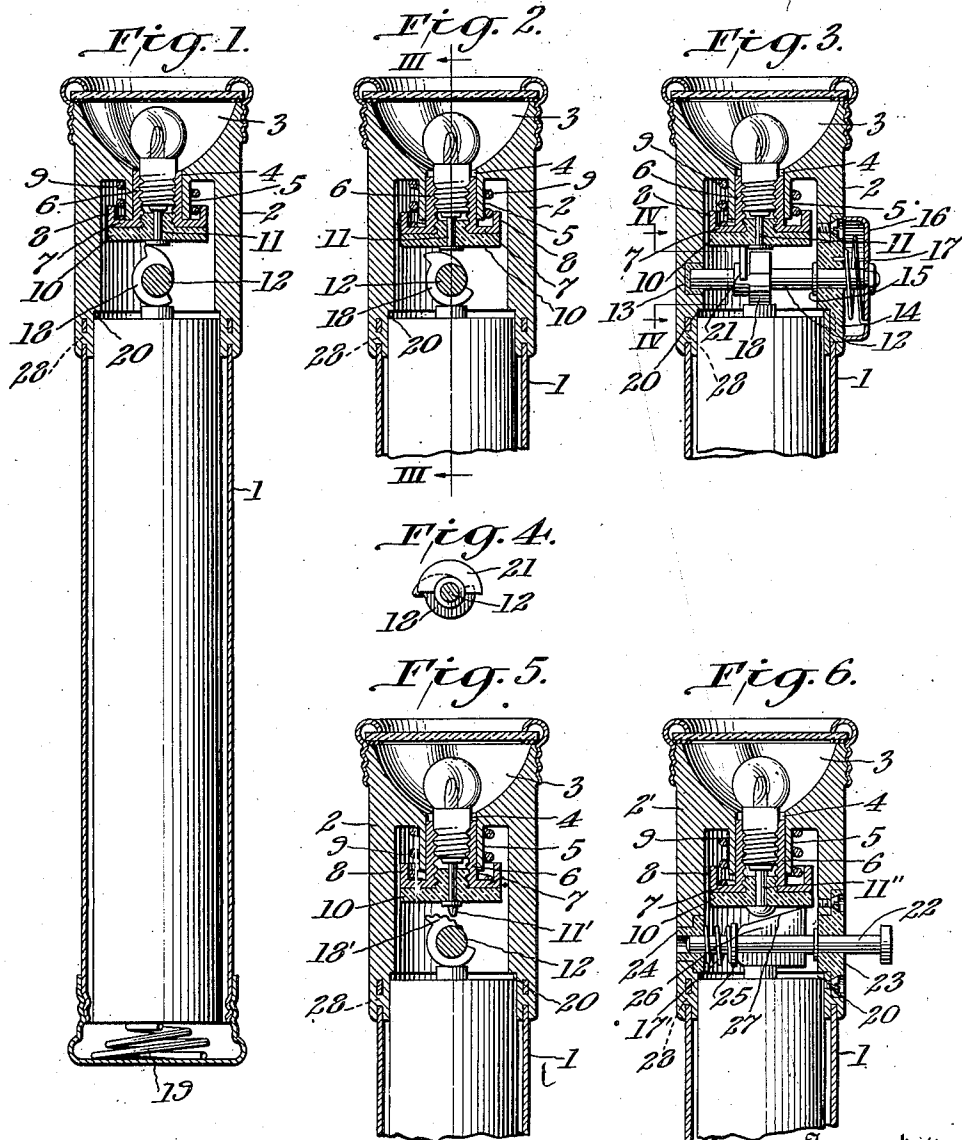
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FOCUSING AND SWITCH MECHANISM

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## UNITED STATES PATENT OFFICE.

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## FOCUSING AND SWITCH MECHANISM.

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This invention relates to focusing and switch mechanism for electric lighting devices. The invention is available for use in any connection where such means are desirable, but it has particular reference to the adjustment of the position of lamp bulbs with relation to the reflectors of portable battery operated lamps, and to completing the electrical circuit including the battery and the filament of the bulb.

Fig. 1 is a vertical central section through a tubular flashlight embodying the invention.

Fig. 2 is a similar view, through the upper portion only, showing the cam in circuit-breaking position.

Fig. 3 is a section on line III—III, Fig. 2,

Fig. 4 is a section showing the cam and supporting member, taken on line IV—IV, Fig. 3, looking in the direction indicated by the arrows,

Fig. 5 is a vertical central section through the upper part of a flashlight fitted with a modified form of the invention, and

Fig. 6 is a similar view illustrating a form of the invention in which a wedge is used to focus the lamp.

Referring to Figs. 1 to 4 of the drawings, reference numeral 1 denotes a tubular flashlight casing having a head member 2. This, as illustrated, is a die casting formed and secured to the casing as described hereinafter. The present invention, however, is in no way limited to any specific form of head or casing.

The reflector 3 is provided with an aperture 4 at its vertex. A depending sleeve 5 forms a slideway for longitudinal movement of a bulb-holder 6 having internal threads adapted to cooperate with those on the stem of an incandescent lamp. The holder 6 has a circular base 7 extending beyond the sleeve 5 and provided at its margin with an upstanding rim 8. The bottom coils of a spring 9, encircling sleeve 5, are received within the annular space defined by rim 8 and the topmost coil of the spring abuts against the base of the reflector. A disc of insulating material 10 is secured to the under surface of holder 6, as by threading the central portion of the disc to engage the threads of the holder. A conductive rivet 11 passes centrally through the disc and engages the inner terminal of the lamp.

Proceeding now to describe the parts in which my invention more particularly resides, a shaft 12 is journaled in insulating blocks 13 and 14 set into the walls of head 2, and one end of the shaft extends outwardly beyond block 14. A collar 15 prevents lateral movement of the shaft. A thumb-piece or finger piece 16 is secured to the

In devices of this kind, it is highly advantageous to provide adjusting means for shifting the position of the source of light within the reflector. Such construction permits the user of the lamp to secure at will a diffused or concentrated illumination according to his requirements. From the manufacturing standpoint, also, it provides a way to compensate for the unavoidable minor variations in construction and assembly which frequently result in the permanently defective focus of rigidly mounted bulbs. Various devices have been proposed to secure these and other advantages of the focusing construction.

I have devised a simplified and improved focusing mechanism, which in the preferred form of the invention operates also to make or break the electrical circuit through the filament. The construction comprises broadly a shaft operable from the exterior of the lamp casing and carrying a cam or equivalent means, adapted to adjust the position of a slidably mounted lamp bulb. The cam or equivalent means in certain adjusted positions may complete the electrical circuit through the lamp. An important advantage of this circuit-closing arrangement lies in the fact that a "wipe" or friction contact is made with both the inner terminal of the lamp and the brass cap on the central electrode of the battery. In this way clean metal surfaces are maintained and good electrical contact is assured. Moreover, the combination of the focusing and circuit-closing functions in a single element is a marked advance in battery lamp construction. Further novel and advantageous features of the invention will be apparent from the succeeding description, taken in connection with the accompanying drawings in which

projecting end of the shaft and is adapted to rotate the same. The thumb-piece may be made in the usual knurled or fluted circular form, or in any other suitable configuration. Insulating block 14 is of sufficient area to prevent contact of the thumb-piece with the head. A spring 17 may be placed between the thumb-piece and the head to keep the collar 15 under tension against the block, but the spring is not essential.

A cam or eccentric 18 is rigidly mounted or fast on shaft 12 and is in vertical alignment with the conductive rivet 11 and the central electrode of the battery. A spiral spring 19 beneath the battery presses it upwardly so that continuous contact is maintained between the central electrode and the cam. The head is preferably annularly recessed as shown at 20 so as to limit the movement of the battery toward the cam and lamp. A semicircular plate 21 is mounted on the shaft and extends upwardly therefrom to serve as a support for the bulb holder 6 when the cam is out of operative position, as shown in Figs. 3 and 4.

To operate the device, the thumb-piece is rotated to bring the cam surface into contact with the rivet 11, thereby completing the circuit through the filament of the lamp. If a fiber or other non-conductive casing is used, it will be understood that a metal strip may be provided to carry the current from the zinc electrode to the metal of the head 2 and thence to the outer terminal of the lamp. Further rotation of the shaft will cause the cam to move the bulb-holder 6 upwardly against the tension of spring 9, shifting the lamp with respect to the focus of the reflector 3. Fig. 1 illustrates the bulb in substantially its outermost position.

Fig. 5 illustrates an embodiment of the invention in which the rivet 11 is replaced by a pin 11' having a pointed lower end adapted to engage serrations on a modified form of cam 18'. In the device of Figs. 1 to 4, the lamp is held in adjusted position by the frictional engagement of the camming means with adjacent parts, and this is entirely satisfactory for most purposes. The cooperating pointed pin and serrated cam of Fig. 5, however, afford positive means for preventing slipping and may be used with advantage in some cases.

In the form of the invention illustrated in Fig. 6, a rod 22 is mounted in an insulating plate 23 secured to one side of head 2', and is depressible through an opening in an aligned insulating disc 24 set in the opposite side of the casing. A spring 17' bearing against an abutment 25 secured to the rod 22 opposes depression of the rod. A wedge member 26, having an inclined upper surface 27, is secured to the rod and is adapted to be moved thereby into or out of contact with the conductive rivet 11". The rivet

has a rounded lower end cooperating with the inclined surface and its upper end is in engagement with the inner lamp terminal. The base of wedge 26 is continuously in contact with the carbon pole of the battery. The expansive force of spring 17' is sufficient to hold the wedge in open circuit position, but is not great enough to displace the wedge when it is forced between the spring pressed battery and bulb-holder.

Fig. 6 illustrates the device out of operative position. To light the lamp, the rod 22 is pushed inwardly, bringing the inclined surface 27 into contact with the rivet 11" and closing the circuit through the filament. Further depression of the rod causes the wedge to move the bulb-holder upwardly until the desired focal adjustment is secured.

I prefer to make a metal head, of the type illustrated, to support the bulb and focusing mechanism. The head 2 is best made by die-casting a suitable metal or alloy. Various such materials are available, but by way of example it may be said that an alloy consisting of 90% aluminum, 4% nickel, and 6% copper, is suitable. Openings 28 are formed through the wall of casing 1 and the metal may be cast through and about these openings to anchor the head securely in position. In case a non-metallic tube, for example a fiber tube, is used, the head metal should have a relatively low melting point and should set rapidly so as to avoid charring or burning of the fiber or the like. I have found that die-casting is the most advantageous method of preparing metal heads for battery lamps. By this process a unitary reflector and casing head, provided with all necessary threads and orifices, may be formed by a single operation and at the same time rigidly secured to the battery casing.

In all the forms of the invention, the adjustment will preferably be such that when the circuit is first closed the lamp will be in proper focus for the purpose for which the device is primarily intended. For example, in "spotlight" devices, on closing the circuit the source of light may be so positioned as to give a narrow, powerful beam. If it is desired to increase the area of illumination the bulb is moved forwardly to the desired extent. The frictional engagement of the cooperating parts of the focusing device, under the compressive force of springs 9 and 19, holds them securely in any adjusted position.

The lamp is very easily operated: the thumb of the hand holding the flashlight can readily depress the rod 22 or rotate the thumb-piece 16 to secure the desired adjustment. It will be noticed also that a "wipe" or friction contact is made on every actuation of the cam or wedge, thus insur-

ing good electrical connection. Various other advantages of the present invention will be apparent, especially those which inhere in the use of a single element as both focusing and circuit-closing means. It will be clear, however, that separate switch means might be used with the focusing mechanism and that such mechanism presents important improvements, whether or not it is used also to complete the circuit. On the other hand, the switch means is capable of advantageous use in non-focusing constructions. Focal adjustment is preferably effected by shifting the bulb with respect to the reflector, but the bulb may be rigidly mounted and the reflector may be made adjustable with respect to it. The particular mechanical construction described herein is susceptible to many variations, without departing from the essential nature of the invention, and such variations are within the scope of the appended claims.

I claim:

1. In an electric lighting device, the combination of a reflector, a lamp adjustable relatively to said reflector, a source of electric current, a finger piece, and means operated by the finger piece both to adjust the lamp to focus it relatively to said reflector and to electrically connect and disconnect the lamp and the source of current.

2. In a portable battery lamp, the combination of a reflector, a lamp bulb, said reflector and bulb being relatively adjustable, a battery having a contact adjacent the bulb, a finger piece, and means operated by the finger piece both for effecting relative focusing adjustment of said lamp and said reflector and for electrically connecting and disconnecting said bulb and the adjacent battery contact.

3. A flashlight comprising a reflector and a lamp relatively adjustable to alter the spread of the reflected light, in combination with a battery, and cam means for controlling the electrical connection of said battery and said lamp and also for effecting such relative adjustment.

4. In a flashlight, the combination with a casing, a lamp bulb and a reflector therein capable of relative movement, of an eccentric in the casing rotatable to relatively adjust the bulb and the reflector in the direction of the reflector axis to focus the light, and means accessible from the exterior of the casing for rotating the eccentric at will to effect such adjustment.

5. In a flashlight, the combination with a lamp and a reflector, of a shaft beneath the reflector rotatable transversely of the reflector axis, and an eccentric fast on said shaft and rotatable thereby to move the lamp along the axis of the reflector.

6. A flashlight comprising a casing, a reflector, a lamp bulb adjustable with rela-

tion to the reflector, a movable shaft beneath said bulb, and eccentric means fast on said shaft and arranged to move said bulb along the longitudinal axis of the flashlight.

7. The invention according to claim 6, in which the shaft is rotatable from without the casing.

8. A flashlight comprising a casing, a battery, a reflector, a lamp bulb adjustable with relation to the reflector, a movable shaft beneath said bulb, and eccentric means secured to said shaft and arranged to move said bulb along the longitudinal axis of the flashlight, the eccentric means being arranged to engage one terminal of the battery and one terminal of the lamp.

9. A flashlight comprising a casing, a reflector, a bulb-holder slidable with respect thereto, a shaft beneath said bulb-holder, means exterior to the casing for rotating said shaft, and eccentric means fast on said shaft and adapted to move said bulb-holder along the longitudinal axis of the flashlight.

10. A flashlight comprising a casing, a reflector, a bulb holder slidable with respect thereto, a shaft beneath said bulb holder, means exterior to the casing for rotating said shaft, and eccentric means secured to said shaft and arranged to move the bulb holder along the longitudinal axis of the flashlight, the bulb holder and the eccentric means having cooperating members for retaining the holder in adjusted positions.

11. A portable battery lamp comprising a casing, a reflector having a central aperture therein, a bulb holder slidable in said aperture, a spring tending to move said holder away from the reflector, a rotatable shaft, means mounted on the shaft to limit downward movement of the holder, and a cam secured to the shaft and adapted upon rotation of the same to adjust the position of the holder.

12. In an electric lighting device, the combination of an incandescent lamp, a reflector therefor, a contact in circuit with said lamp, and means for effecting relative focusing adjustment of said lamp and said reflector to alter the spread of the reflected light, such adjusting means comprising means operative to wipe said contact.

13. In an electric lighting device having a casing, a circuit comprising a lamp, an electrode and a terminal connected to said lamp, a shaft movable from without the casing, and eccentric means secured to said shaft and adapted to make a wiping contact with such electrode and terminal.

14. An electric lighting device comprising a lamp and a reflector capable of relative movement, a terminal in circuit with said lamp, a battery having an exposed electrode, a member adapted to engage such electrode and said terminal, and means for moving said member to make a wiping contact with

such electrode and terminal and simultaneously to adjust the relative position of the lamp and reflector.

15. In a flashlight, the combination of an incandescent lamp, a reflector therefor, a battery having a contact in circuit with said lamp, and means for effecting relative adjustment of said lamp and said reflector to alter the spread of the reflected light, such adjusting means comprising means operative to wipe said contact.

16. In a flashlight, a lamp, a reflector, a battery, a casing enclosing the lamp, reflector and battery, a rotatable finger piece accessible from the exterior of the casing, and a rotary cam within the casing between the battery and the lamp, rigidly connected with said finger piece, and rotatable thereby for relatively adjusting the lamp and the reflector.

17. A flashlight comprising the combination of a casing, a reflector, an incandescent lamp, a holder therefor adjustable relatively to said reflector to alter the spread of the reflected light, a battery in said casing in circuit with said lamp, cam means in said casing between said battery and said holder arranged to move the holder in one direction, and a spring acting in opposition to the cam and arranged to move the holder in the opposite direction independently of the cam when the cam is operated to permit such movement.

18. A battery-operated hand lamp comprising the combination of a lamp bulb, a battery in circuit therewith, a reflector, a switch for making and breaking such circuit, and means operated by the switch for effecting relative adjustment of said lamp bulb and said reflector to alter the spread of the reflected light.

19. In a flashlight, the combination with a casing body, of a casing head cast in interfitting relation to a portion of said body to form with the body a unitary indivisible casing.

20. In a flashlight, a casing body, and a die cast casing head permanently secured thereto, the casing head having a cavity in one end, provided with a reflecting surface.

21. The combination with a casing body, of a member provided with a reflecting surface, one of such parts being cast onto the other to provide interfitting portions uniting it to such other part.

22. In a lighting device, the combination with a casing body; of a head cast in interfitting relation to a portion of said body and comprising a cavity having a reflecting sur-

face, said head also having coupling means formed integral therewith; a cover glass; and means cooperating with said coupling means to retain said glass on said head in front of said surface.

23. In a flashlight including, a lamp, a battery in circuit with the lamp, and a reflector, the combination of a switch for closing the circuit to the lamp and means adapted to be actuated by the switch for changing the relative positions between the lamp and reflector for focusing the rays from the lamp.

24. In a flashlight including a lamp, a battery in circuit with the lamp, and a reflector, the combination of a movable switch for closing the circuit to the lamp, and means having connections with the switch movable by the switch for varying the relation between the lamp and reflector for focusing the rays from the lamp.

25. In a flashlight including a lamp, a battery in circuit with the lamp, and a reflector, the combination of a movable switch for closing the circuit to the lamp, and means having connections with the switch and movable by the switch for varying the position of the lamp relative to the reflector for focusing the rays from the lamp.

26. In a flashlight including a lamp, a battery in circuit with the lamp, and a reflector, the combination of a movable switch for closing the circuit to the lamp, means carried by the lamp adapted to be moved by the actuation of the switch for shifting the position of the lamp relative to the reflector for focusing the light rays of the lamp.

27. In a flashlight including a lamp, a battery in circuit with the lamp, and a reflector, the combination of a movable switch for closing the circuit to the lamp, means embracing the lamp and actuated by the movable switch for moving the lamp relative to the reflector.

28. In a flashlight including a lamp, a battery in circuit with the lamp, and a reflector, the combination of a movable switch for closing the circuit to the lamp, said reflector having a perforation through which the lamp is movable, means operated by the switch for closing the circuit and varying the position of the lamp relative to the reflector and whereby the lamp is moved through the perforation in said reflector for focusing the light rays.

In testimony whereof, I affix my signature.

NEVIL MONROE HOPKINS.