June 17, 1941. J. H. KURLANDER 2,245,793

MULTIPLE FILAMENT LAMP

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Fig. 1.

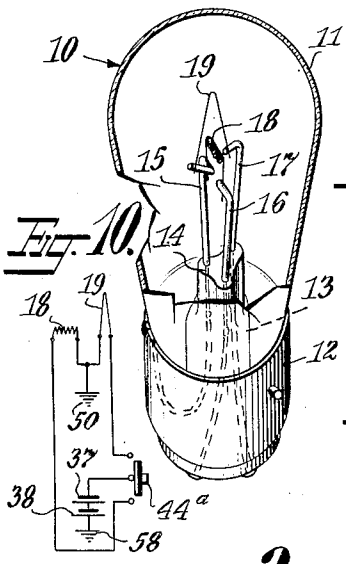


Fig. 10.

Fig. 8.

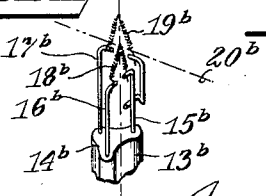


Fig. 4.

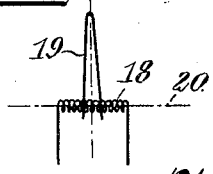


Fig. 7.

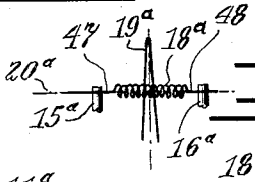


Fig. 9.

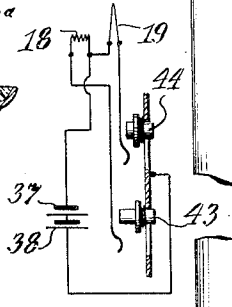


Fig. 3.

Fig. 2.

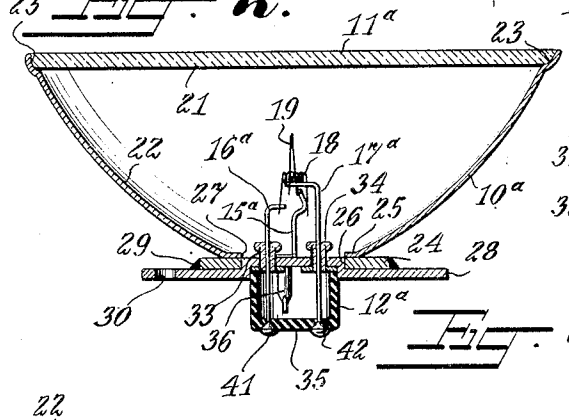
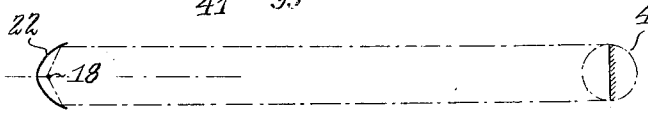


Fig. 5.



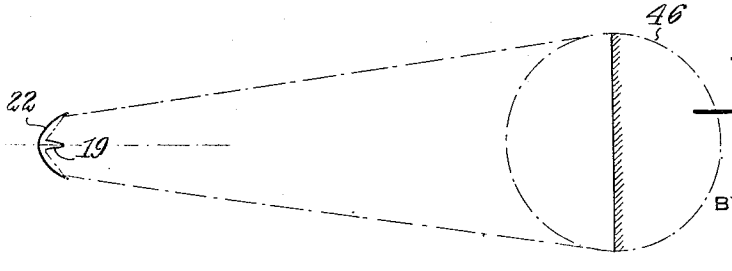


Fig. 6.

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Fig. 11.

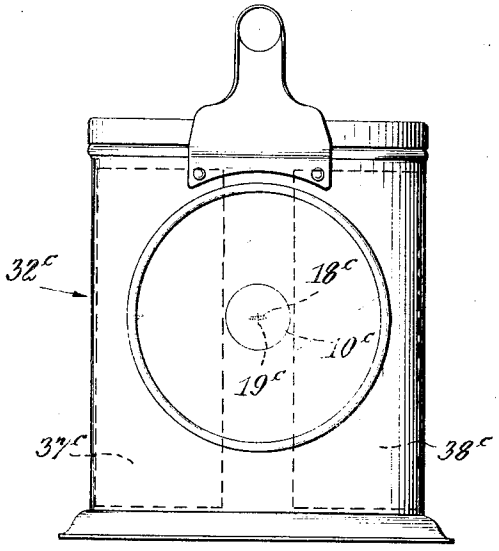


Fig. 12.

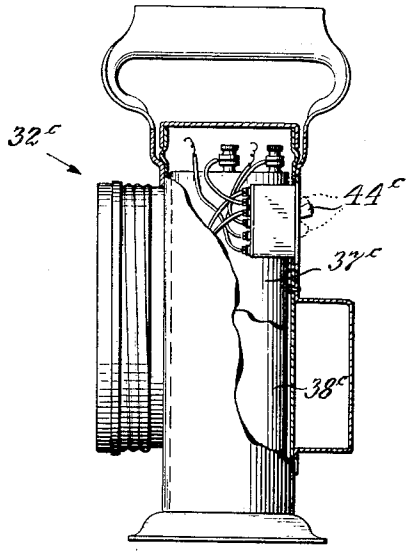


Fig. 13.

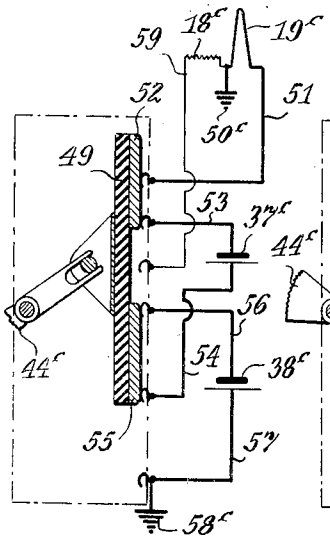


Fig. 14.

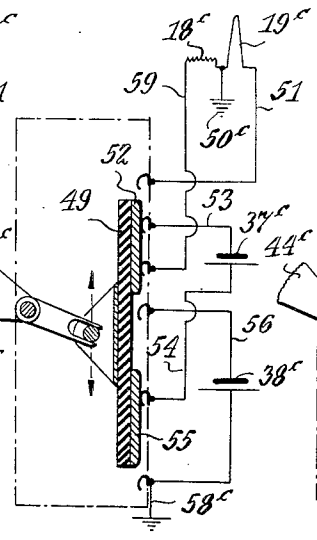
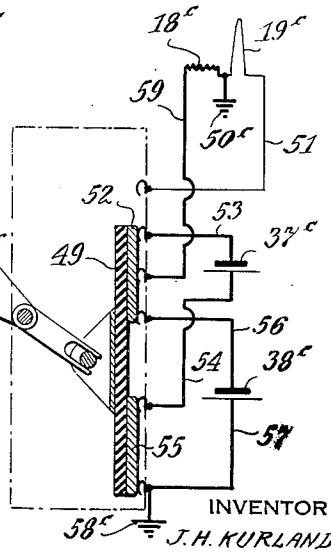


Fig. 15.



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UNITED STATES PATENT OFFICE

2,245,793

MULTIPLE FILAMENT LAMP

John H. Kurlander, Nutley, N. J., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application September 30, 1937, Serial No. 166,528

10 Claims. (Cl. 240—10.6)

This invention relates to incandescent electric lamps and, more particularly, to lamps used in reflector-type light projectors such as searchlights, handlights, flashlights, and other similar devices, where a desirably parabolic reflector is employed for throwing the light in one general direction.

The principal object of my invention, generally considered, is the provision of a multiple filament lamp adapted to be employed with a reflector in projectors, so that variations in the diameter or intensity of the beam of light may be obtained at will.

Another object of my invention is to obtain variations in the diameters and/or intensities of projected beams of light, by employing, in a single bulb, two or more filaments of different wattages and/or forms.

A further object of my invention is the combination of a straight helically-coiled filament and a U-shaped uncoiled filament in a single bulb, and so connecting said filaments, that by merely switching the energizing current from one to the other, beam shapes and intensities peculiar to each of the forms used may be selected, or both filaments may be simultaneously energized.

A still further object of my invention is the utilization of a plurality of filaments in a single bulb so as to obtain the maximum range of beam spread, or approximately equal beam spreads with different beam intensities, said filaments being used with a reflector and well focused with respect thereto.

An additional object of my invention is the provision of a multiple filament lamp adapted for use on different voltages.

Other objects and advantages of the invention, relating to the particular arrangement and construction of the various parts, will become apparent as the description proceeds.

Referring to the drawings illustrating my invention:

Fig. 1 is a perspective view, with parts broken away, of a lamp embodying my invention.

Fig. 2 is a longitudinal sectional view of another embodiment of my invention.

Fig. 3 is an elevational view, partly in longitudinal section, of a flashlight casing and enclosed dry cells, utilizing a lamp embodying my invention, the lamp illustrated being one of the form disclosed in Fig. 2.

Fig. 4 is a diagrammatic representation of one manner in which filaments of my improved form of lamp may be arranged.

Fig. 5 is a diagram showing how a concentrated beam of light is obtained when using a lamp containing filaments arranged as shown in Fig. 4.

Fig. 6 is a diagram showing how a more diffused or distributed beam of light is obtained when using a lamp constructed as illustrated in Fig. 4.

Fig. 7 is a view corresponding to Fig. 4, but showing another embodiment of my invention.

Fig. 8 is a perspective view, corresponding to Fig. 1, but showing another form of mount embodying my invention.

Fig. 9 is a wiring diagram of the flashlight shown in Fig. 3.

Fig. 10 is a modification of the wiring diagram shown in Fig. 9.

Fig. 11 is a front elevational view of a hand projector device utilizing a lamp embodying my invention.

Fig. 12 is an elevational view of the hand projector shown in Fig. 11, looking from the right, part of the casing being broken away to more clearly show the interior construction.

Fig. 13 is a wiring diagram showing the circuit in the device when the switch is positioned so as to energize the higher voltage filament by the cells acting in series.

Fig. 14 is a view corresponding to Fig. 13, but showing the switch in neutral position.

Fig. 15 is a view also corresponding to Fig. 13, but showing the switch positioned so that the lower voltage filament is energized by the cells acting in parallel.

Referring to the drawings in detail, and first considering the embodiment of my invention illustrated in Fig. 1, there is shown a lamp 10 comprising a bulb 11, a base 12, and a flare tube 13. Extending from the press 14 of the flare tube 13 are three lead-in conductors and supports 15, 16, and 17 serving to supply current to the filaments 18 and 19. The filament 18 in the present embodiment is of the helical or coiled bar type with its axis disposed transverse to that of the lamp 10 and bulb 11 thereof. The filament 19, on the other hand, is uncoiled or generally straight, but bent like a harpin into a U or V shape so as to straddle the filament 18, said filament 19 being generally coaxial with the lamp 10 and bulb 11 thereof.

The support or leading-in conductor 15 serves as a common return conductor for both filaments 18 and 19, conductor 16 being connected to the other end of the filament 18 and the con-

ductor 17 being connected to the other end of the filament 19.

Fig. 4 shows diagrammatically how the filaments 18 and 19 are arranged with respect to one another; that is, the filament 18 has its axis 20 transverse to that of the enclosing bulb, while the filament 19 lies in a plane perpendicular to said axis 20, the dimension of the filament 19 longitudinally of the enclosing bulb 11 being desirably substantially greater than its dimension transverse to said bulb.

Referring now to the embodiment of my invention illustrated in Fig. 2, there is shown a lamp 10a having a bulb 11a, comprising a lens or outer face portion 21 and a reflector portion 22 formed as a part thereof, and desirably parabolic or paraboloidal in contour. The lens or outer face portion 21 is, of course, formed of glass or other light-transmitting medium, while the reflector 22 may be either formed of metal, with the inner preferably parabolic or paraboloidal surface polished or coated with light-reflecting material, or of glass or similar material, the inner surface of which is coated with light reflecting material such as aluminum or silver. The reflector portion 22 and the lens or cover portion 21 are secured together at the periphery of said cover by fusion or in any desired manner, as indicated at 23.

The base 12a of the lamp 10a comprises an annular disc 24 secured to the reflector portion 22 in any desired manner, as indicated at 25. This disc has an aperture 26, registering with a corresponding aperture 27 in the reflector portion 22, and receiving a base plate portion 28, said plates 28 and 24 being secured together in any desired manner as by welding, indicated at 29. The plate may have apertures or slots 30 therein, for receiving attaching members 31 on a flashlight casing or other holding device 32, such as illustrated in Fig. 3.

The filaments 18 and 19 may be secured, in the bulb 11a of the lamp of the present embodiment, by supporting leading-in conductors 15a, 16a, and 17a. The common or return conductor 15a may be grounded to the plate 28, as indicated, the conductors 16a and 17a extending through sleeves 33 and 34 of glass or other insulating material. The leading-in conductors 16a and 17a are continued outwardly to pass through and hold an insulating base element 35 which serves as a cover and protection for the exhaust tube 36.

The main difference between the lamps 10 and 10a is that the lamp 10a has a reflector as part of its construction, and the filaments 18 and 19 are focused with respect thereto, while for the lamp 10, although the filaments 18 and 19 have a common focal point, there would have to be supplied a preferably parabolic reflector, and said lamp mounted so that its filament would be focused with respect to said reflector. The filament diagram of Fig. 4, however, not only represents the filament arrangement in the lamp 10, but also that in the lamp 10a.

Fig. 3 shows a holding device or flashlight casing 32 housing a plurality of dry cells 37 and 38, held by means of a screw cap 39. The outer or front end of the casing is enlarged as indicated at 40, so as to receive a lamp 10a of the character shown in detail in Fig. 2. Contact members 41 and 42, adapted to respectively engage the outer ends of leading-in conductors 16a and 17a, are provided so that the coiled and uncoiled filaments 18 and 19 are respectively controlled by the switches 43 and 44. The manner in which these switches are connected to the filaments and cells is shown most clearly by the diagram in Fig. 9. Said diagram indicates that when, for example, the switch 43 is closed, as when the operating button is pulled back, a circuit is made including the cells 37 and 38 and filament 18, causing said filament to incandesce and give off the desired light. It will be understood that either one or both of the filaments may be operated by closing one or both of the switches 43 and 44.

Fig. 10 is an alternative wiring diagram for the filaments 18 and 19, when employed in a projector or flashlight as shown in Fig. 3, and when the ends of the filaments adjacent one another are grounded, as indicated at 50. In this case, when a sliding switch 44a is employed and the cells 37 and 38 are connected in series, one end of the battery so formed is grounded at 58. When the switch 44a is moved in one direction, or raised, the filament 19 is energized through switch 44a, cell 37, and cell 38 to ground 58. When switch 44a is lowered, or moved in the opposite direction, filament 18 is energized through said switch, cells 37 and 38 to ground 58, as will be clear from inspection.

When the filament 18 is operated, a concentrated beam of light is produced, as represented in Fig. 5. In other words, because the filament 18 is substantially focused with respect to the reflector 22, and inasmuch as said filament is of the concentrated type having no appreciable length axially of the reflector, there is very little dispersion of the light and a relatively small intense spot 45 is produced at a distance from the lamp. This spot, because of the transverse elongation of the filament 18, is slightly oval or elliptical, but this divergence from circular is relatively slight.

When, however, the filament 19 is operated, a relatively dispersed beam of light is produced giving a relatively large spot of fairly weak illumination, as indicated at 46 in Fig. 6. This divergence is caused by the elongation of the filament 19 along the axis of the reflector 22 and lamp 10a, the light, however, being fairly uniform and not having a dark center, as would occur if the light source were not focused with respect to the reflector, because said filament is substantially focused with respect to said reflector, or at least a portion thereof intersects the transverse plane passing through the focus of said reflector 22.

The light from the filament 19 is of maximum dispersion without, however, being "doughnut" shaped, or with a dark center, because the filament is not entirely to one side or the other of the reflector focus. This dispersion from such a filament may be decreased, if desired, to more nearly approach that of the light transmitted by the other filament by employing an arrangement as shown in Figure 7. In this case a filament 19a, (like the filament 19 of Figure 4), is moved inwardly so that its center approximately coincides with the center of the filament 18a (like the filament 18 of Fig. 4 except that, as an alternative, its ends are shown to extend axially of the coil and be directly connected to leads 15a and 16a). This movement substitutes for the maximum range in beam spread provided by the arrangement shown in Fig. 4, an arrangement which gives an approximately equal or more closely approaching beam spread, but different beam intensities, assuming the light from the

filament 19ª is less than that from the filament 18ª.

Although I have shown the combination of a U-shaped straight or uncoiled filament with a straight, transversely disposed coiled or concentrated filament, it will be understood that my invention is not limited to such an arrangement, as I may substitute for either one or both of the filaments, a filament or filaments of the other type. It will therefore be seen that it is possible to obtain four combinations; that is, the first combination may be, as illustrated in Fig. 4, or Fig. 7, a straight coil, or C–6 type of filament, with a U or V shaped straight or uncoiled filament; that is, one of the S–2 type. For the S–2 type of filament may be substituted one of the C–2 type; that is, a filament extending like the filaments 19 and 19ª in Figs. 4 and 7, but of the coiled or helically formed type.

Likewise, I may substitute, in the arrangement shown in Fig. 4 or Fig. 7, a straight, transversely extending filament, or one of the S–6 type for the C–6 type illustrated, and designated by the reference characters 18 and 18ª. Likewise, I may transpose the types of filament illustrated in Figs. 4 and 7; that is, use a straight or uncoiled, transversely extending filament or one of the S–6 type, for those designated as 18 and 18ª, and use a helical filament, or one of the C–2 type, instead of those designated at 19 and 19ª. The use to be made of the light source will determine the most desirable combinations of filaments.

If a strong concentrated spot 45 is desired, as in Fig. 5, then a C–6 type of filament or one designated by the reference characters 18 or 18ª should be employed.

If, on the other hand, a relatively weak concentrated spot is desired, then a straight uncoiled or S–6 type of filament may be substituted for that designated as 18 or 18a.

If a relatively weak diffused or enlarged spot 46 is desired, then an uncoiled or S–2 type of filament such as designated by the reference character 19 or 19ª should be employed.

If, however, a relatively strong large spot 46 is required, then it is better to substitute a C–2 filament for the S–2 filament; that is, a coiled filament bent to U or V shape, for the filament designated as 19 or 19ª.

From the foregoing, it will be seen that I have devised a lamp adapted for use with a reflector, or incorporating a reflector, for projection purposes and comprising a plurality of filaments, which may be so connected that by merely switching on one or the other or both, beams of light of the desired intensity and distribution may be obtained, while at the same time avoiding the undesired dark center which occurs, if filaments are employed out of focus with respect to an associated reflector.

The essence of the invention lies in the manner in which two or more different filament forms are positioned with respect to each other so that by merely switching from one to the other, or another, of the filaments, beam shapes and intensities peculiar to each of the filament forms used may be selectively obtained.

The purpose of the combination of different filament forms, desirably two, are preferably set forth as follows: first, to obtain the maximum range in beam spread; and, second, to obtain approximately equal beam spreads from two different filament forms by different beam intensities, while both beams come from filaments well focused with respect to the reflector, the connections being such that either or both beams may be projected by the mere operation of a selective switch.

To effect the first purpose, the filaments are disposed with relation to each other, as shown in Fig. 4, in which the major or coiled filament; that is, the one of the C–6 type, is indicated by the numeral 18, and the minor filament, or the one of the S–2 type, is indicated by the numeral 19. The C–6 filament, being highly concentrated and placed at the focal point of the reflector, will project a narrow beam of light of maximum intensity as shown in Fig. 5. The axis of the C–6 filament is indicated by the reference character 20.

The minor filament, or one of the S–2 type, is placed so as to lie in a plane at right angles to the axis of the C–6 filament and straddle it in such a manner that the filament legs, at the points where they are attached to lead-in wires, extend slightly below the axis 20. The major portion of the S–2 filament 19 then extends as far above or beyond the axis 20 of the C–6 filament, as is permitted by the length of wire used, which will depend upon the voltage of the minor filament 19. That portion of the S–2 filament above or beyond the axis 20 will then be effective in producing a large beam of light, as indicated by the reference character 46 in Fig. 6, which will be focused, or free from a dark center, because the filament ends or legs extend slightly below the axis 20, which contains the focal point of the reflector.

When it is desired to merely obtain one or both of two well focused beams by simply switching from one filament to another without, however, obtaining the maximum range in beam spreads, as described above, the filaments are disposed with relation to each other, as shown in Fig. 7. The major filament 18ª and the minor filament 19ª are so arranged that the latter is again disposed in a plane at right angles to the axis 20ª of the filament 18ª which it straddles, as illustrated. However, the filament 19ª is placed so that one half of it extends above or beyond the axis 20ª, while the other half extends below or to the other side of said axis.

With this arrangement, the major filament 18ª will project a narrow beam of maximum intensity when placed at the focal point of the reflector, as in the arrangement shown in Fig. 4. When the minor filament 19ª is switched on, it will, in effect, project two coincident beams of light of approximately equal size. That portion of the filament 19ª lying above or beyond the axis 20ª will project a circular beam of even illumination as will that portion on the other side of the axis. These two beams will merge as one beam of somewhat larger diameter than the beam represented in Fig. 5, but not as large as that represented in Fig. 6.

It will also be seen that Fig. 7 shows a slightly different form of coiled filament, in that the legs or straight portions 47 and 48 of said coil 18ª are shortened, extended coaxially with said coil, and secured to the supporting leads 15ª and 16ª which, for this purpose, are continued upwardly so that their ends extend slightly beyond the axis of the coil 18ª. This construction decreases the length of the filament ends, thereby reducing the proportion of those filament parts which are not as efficient for light production as the coiled portions. Although this construction has been shown in Fig. 7 only, it will be understood that the coiled filament 18 may have similar ends

or that the coiled filament 18a may have ends extending transverse to the filament axis as shown in Fig. 4.

Referring now to the embodiment of my invention illustrated in Fig. 8, there is shown a modified form of mount comprising a flare tube 13b from the press 14b of which extend three lead-in conductors and supports 15b, 16b and 17b, serving to supply current to filaments 18b and 19b. The filament 18b in the present embodiment is of a helical or coiled type bent to V shape; that is, it is of the C–2 type; with its axis coincident with the axis of the tube and adapted to be disposed coaxially with an associated reflector. The other filament 19b is of the same type; that is, coiled and bent to V shape; but disposed so as to straddle the filament 18b while at the same time be positioned coaxially with respect thereto.

The positioning of the filaments 18b and 19b along the axis of the lamp is desirably such that there is a slight overlap; that is, the legs or free ends of the filament 19b extend toward the lamp press 14b beyond the vertex of the filament 18b. The filaments 18b and 19b are so mounted with respect to the lamp bulb as in Fig. 1, that they may be focused with respect to an associated reflector. In a lamp, as shown in Fig. 2, they may be so mounted with respect to the reflector portion that the focus of said portion lies on a line including parts of both filaments. That is, the focus of the reflector portion desirably lies on a line, such as that designated by the reference character 20b, which intersects the legs of the outer or upper filament 19b and passes slightly below the vertex of the filament 18b. Another way of stating this is to say that the focal point of the reflector is disposed approximately coincident with the vertex of the inner or lower filament 18b. In this way, when the lamp is used by the energization of either filament, there is no part of the beam which is dark, and the "doughnut" shape of beam, which might be produced if a filament were employed, no part of which was focused with respect to the reflector, is avoided.

When using the lower filament 18b, a more concentrated beam of one approximating that shown in Fig. 5, is produced. When using the filament 19b, a beam having a wider distribution is produced, or one approximating the size of that between the beams illustrated in Figs. 5 and 6. It will therefore be seen that the embodiment of Fig. 8 illustrates a construction with which some of the advantages of my invention may be secured, although said arrangement is admittedly not quite as good, for most purposes, as the forms previously disclosed. It will also be seen that, as in the embodiments of Figs. 4 and 7, a straight or uncoiled filament may be substituted for either or both of the coil filaments 18b and 19b.

Referring now to the arrangement shown in Figs. 11 to 15 inclusive, it will be understood that if lamp filaments of different voltages are employed, it may be desired to use the cells 37c and 38c in a hand projector device 32c in series for the higher voltage filament and in parallel for the lower voltage filament, thereby getting maximum efficiency. For example, suppose that a lamp 10c, as shown in Fig. 11, generally like the lamp 10a of Fig. 2 is used with the device 32c of Figs. 11 and 12, and that the light-giving elements 18c is a 1¼ volt, .60 ampere filament, while the light-giving element 19c is a 2½ volt, .15 ampere filament. Under such circumstances, it is desirable to use the filament 18c with the cells 37c and 38c in parallel, and the filament 19c with the cells 37c and 38c in series.

To secure such a result, the wiring diagram would be modified to one such as illustrated in Figs. 13, 14, and 15, so that when the switch 44c is operated from the neutral position illustrated in Fig. 14, to move the sliding contact member 49 upward, or in one direction, to the position shown in Fig. 13, the filament 19c, when one end is grounded at 50c, is put in circuit with the cells 37c and 38c in series through conductor 51, contact plate 52, conductor 53, cell 37c, conductor 54, contact plate 55, conductor 56, cell 38c and conductor 57 to ground at 58c. When the switch 44c is operated to move the sliding contact member downward, or in the other direction, to the position shown in Fig. 15, the filament 18c, one end being grounded at 60c, is put in circuit with the cells 37c and 38c in parallel through conductor 59 and contact plate 52, where the current divides between conductors 53 and 56 to cells 37c and 38c, said current then converging from said cells through conductors 54 and 57 to plate 55 grounded at 58c.

Although I have specifically described the exact combinations of filaments illustrated in Figs. 4, 7, and 8, it will be understood that I may effect substitutions of coiled filament for straight or uncoiled filament, and straight or uncoiled filament for coiled filament, as previously described and with corresponding modifications in the effect, and that two independent leads for each filament may be employed, instead of using a common return lead, or three leads for two filaments. It will also be understood that although preferred embodiments have been disclosed, yet other modifications may be made within the spirit and scope of the appended claims.

I claim:

1. In combination with a reflector, an electric lamp comprising a bulb enclosing minor and major overlapping incandescible filaments with axes intersecting at the focus of said reflector, the minor filament being bent to hairpin shape and extending along the longitudinal axis of the bulb, whereby when energized a relatively dispersed beam of light is projected by said reflector, and the major filament being coiled and extending substantially perpendicular to said axis, whereby when energized a relatively concentrated beam of light is projected by said reflector.

2. In combination with a reflector, an electric lamp comprising a bulb enclosing a plurality of overlapping incandescible filaments with axes intersecting at the focus of said reflector, one of said filaments being generally straight, bent to hairpin shape, and extended along the reflector axis, whereby when energized a relatively dispersed beam of light is projected by said reflector, and another of the coiled bar type with a straight axis intersecting that of said reflector, whereby when energized a relatively concentrated beam of light is projected by said reflector.

3. In combination, an electric lamp comprising a bulb enclosing a relatively low voltage, high power, coiled filament, with a straight axis, and a relatively high voltage, uncoiled filament, bent to straddle said coiled filament, and of relatively low power, said filaments being coaxially disposed with regard to one another, a pair of power sources, a pair of switches, and means connecting said filaments to said power sources through said switches, so that the high power filament

is energized by the combined current from said sources in parallel, and the other by the combined voltage of said sources in series.

4. In combination, an electric lamp comprising a bulb enclosing a plurality of incandescible filaments, one of said filaments being of relatively low voltage, high power, of the coiled bar type, and having its long axis straight and extending transverse to the bulb, and another filament being of a relatively high voltage, low power, uncoiled, and having its corresponding axis extending longitudinally of said bulb, a pair of power sources, a pair of switches, and means connecting said filaments to said power sources through said switches, so that the high power filament is energized by the combined current from said power sources in parallel, and the other by the combined voltage of said power sources in series.

5. In combination, an electric lamp comprising a bulb enclosing a plurality of incandescible filaments, one of said filaments straddling another and coaxially disposed with respect thereto, but offset axially, so that the mid-point of one lies in a plane transverse to the bulb axis, which substantially corresponds with that of the ends of the other, said first-mentioned filament being of relatively high voltage and low power, and said other filament being of relatively low voltage and high power, a pair of power sources, a pair of switches, and means connecting said filaments to said power sources through said switches, so that the first-mentioned filament is energized by the combined voltage from said power sources in series, and the other by the combined current from said power sources in parallel.

6. In combination with a reflector, an electric lamp comprising a bulb enclosing a plurality of incandescible filaments, one of said filaments being hairpin shaped, straddling another, and extending along the axis of projection of said reflector, the straddled filament being coiled, the focus of said reflector lying on the axes of both filaments, and lying in a transverse plane including end portions of the straddling filament, whereby when the straddling filament is energized a relatively dispersed beam of light is projected by said reflector, and when the straddled filament is energized a relatively concentrated beam of light is projected by said reflector.

7. In combination with a reflector, an electric lamp comprising a bulb enclosing a pair of incandescible filaments, both of said filaments being coiled and bent to V-shape and one straddling the other, the vertex of the straddling filament being disposed outwardly of the straddled filament and the ends of the former lying in a transverse plane approximately including the vertex of the latter and focus of the reflector, whereby a relatively dispersed beam of light is projected by the reflector when the straddling filament is energized, and a relatively concentrated beam of light is projected by said reflector when the straddled filament is energized.

8. In combination, an electric lamp comprising a bulb enclosing a pair of incandescible filaments, a projector casing serving as a lamp mounting and enclosing a pair of dry cells, a pair of switches, and means connecting said filaments to said cells through said switches, so that one of said filaments may be energized by said cells connected in series, and the other by said cells connected in parallel.

9. In combination, an electric lamp comprising a bulb enclosing a relatively low voltage, high power filament, and a relatively high voltage, low power filament, a pair of power sources, a pair of switches, and means connecting said filaments to said power sources through said switches, so that the high power filament is energized by the combined current from said power sources in parallel, and the other when said power sources are connected in series.

10. In combination, an electric lamp comprising a bulb enclosing a main filament, and an auxiliary filament requiring approximately double the voltage and one-quarter the current needed for the main filament, a pair of power units, a pair of switches, and means connecting said filaments to said power units through said switches, so that the main filament is energized from the power units connected in parallel, and the auxiliary filament from the power units connected in series.

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