July 27, 1937. C. H. BRASELTON 2,088,544

ELECTRIC RADIATION DEVICE

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Fig. 1.

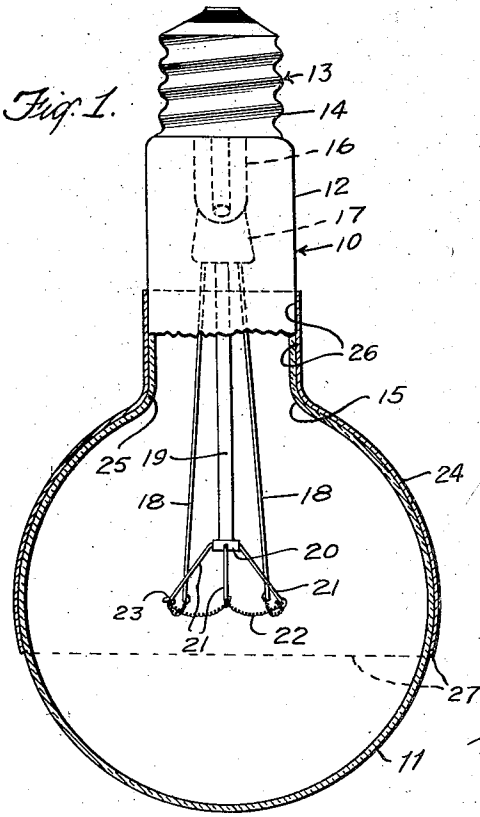


Fig. 10.

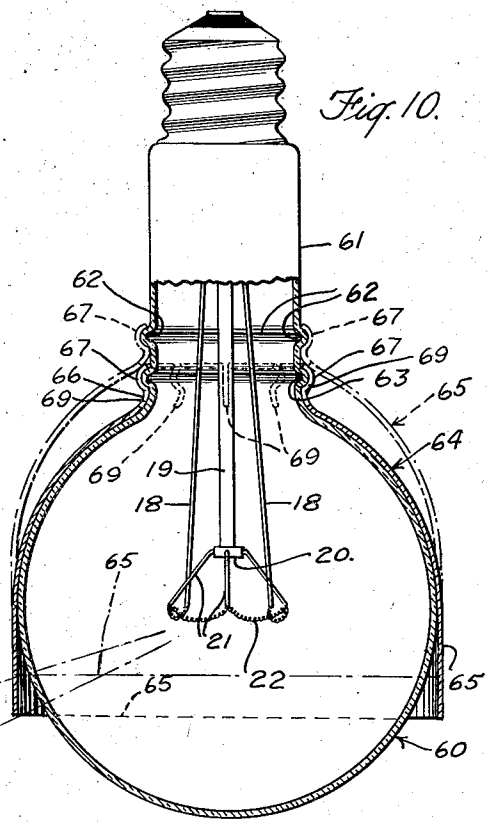


Fig. 11.

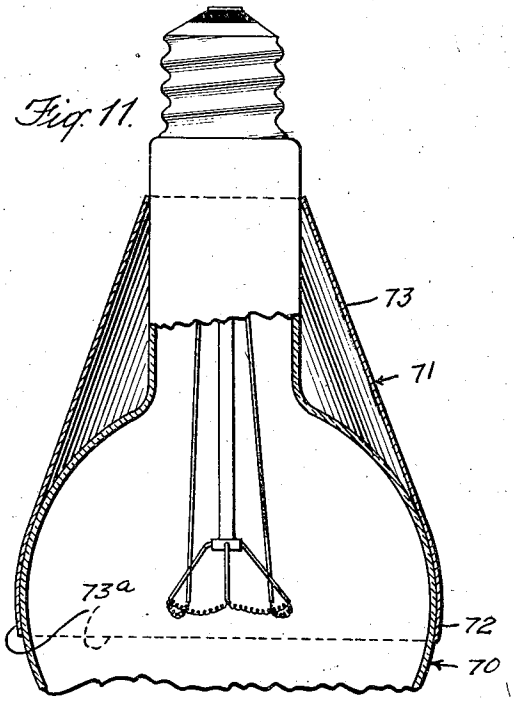
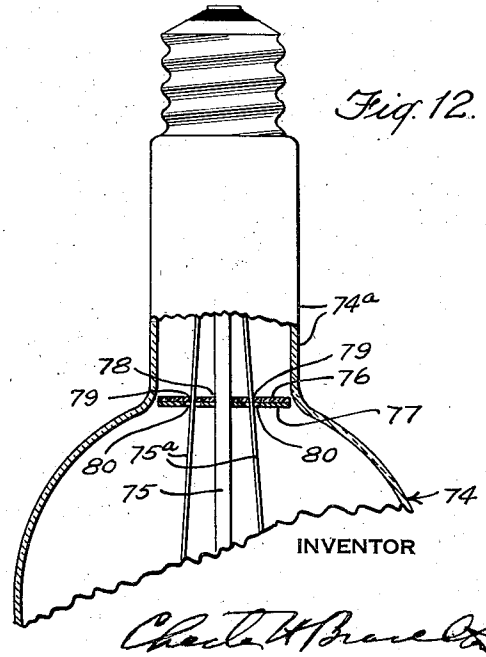


Fig. 12.



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Fig. 2.

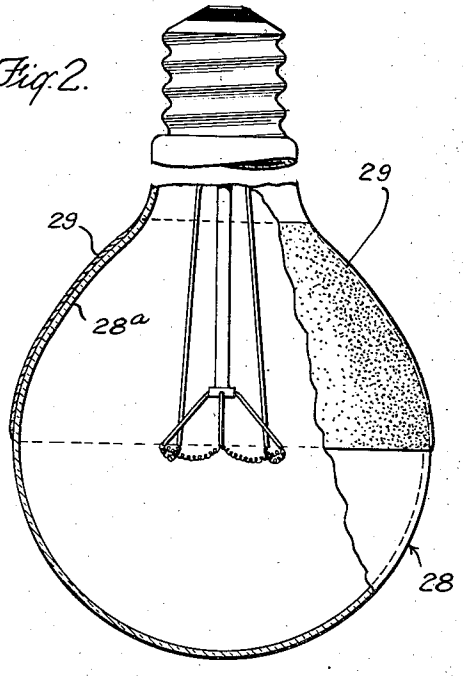


Fig. 3.

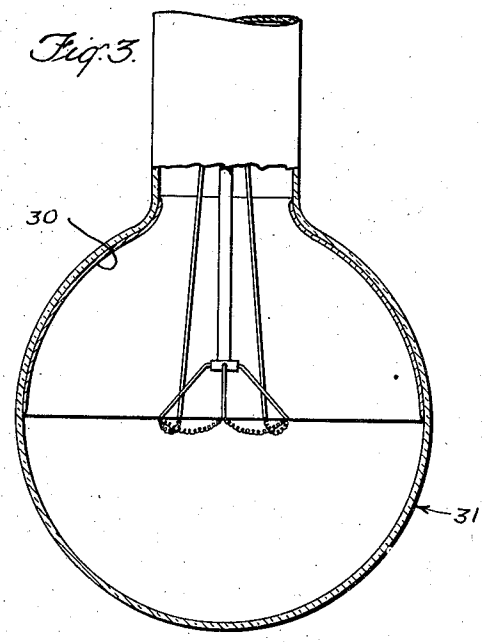


Fig. 4.

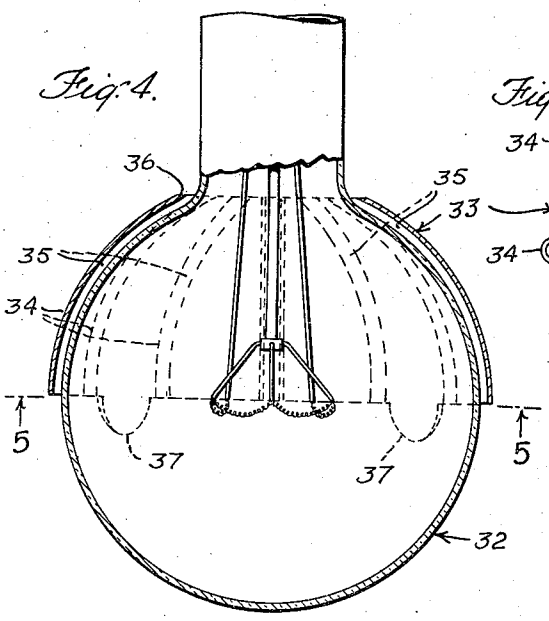
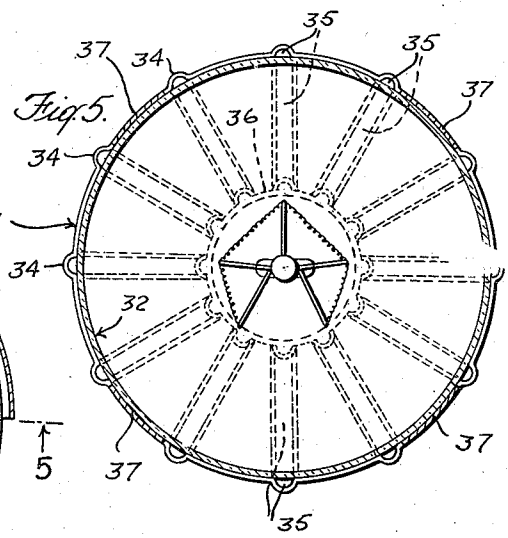


Fig. 5.



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Fig. 6

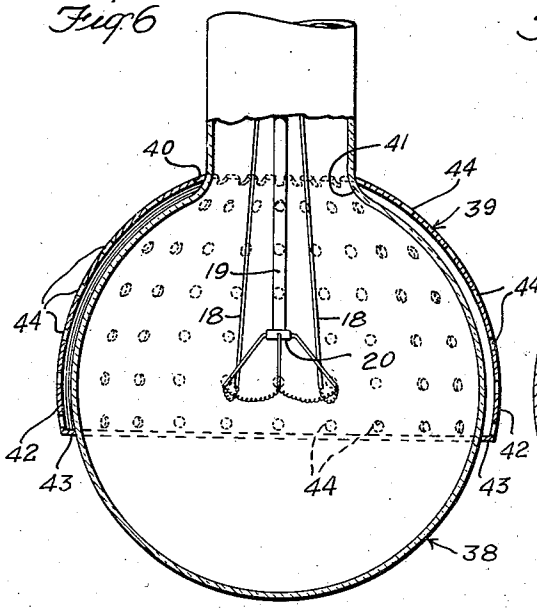


Fig. 9.

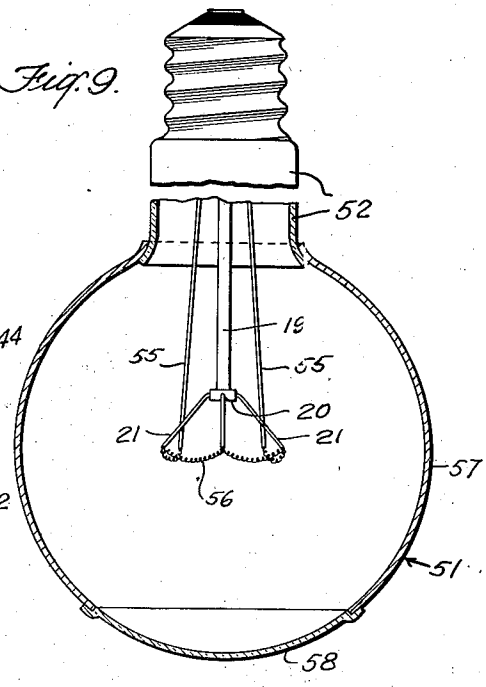


Fig. 7.

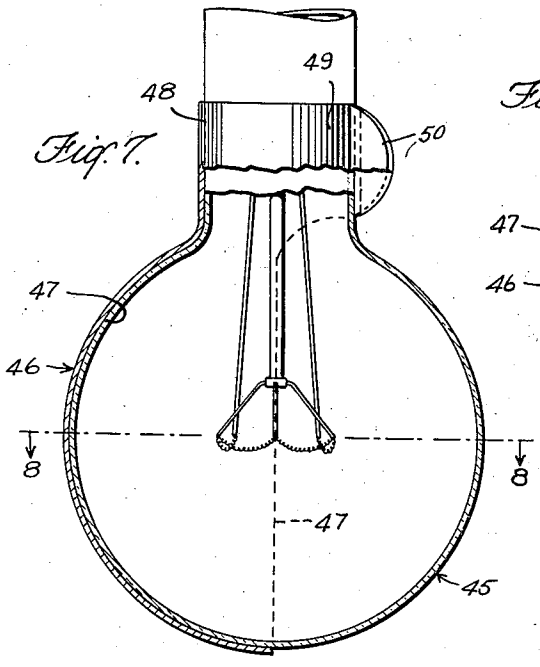
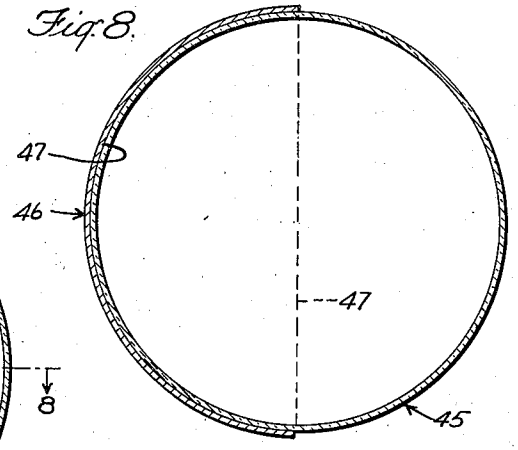


Fig. 8.



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Fig. 13.

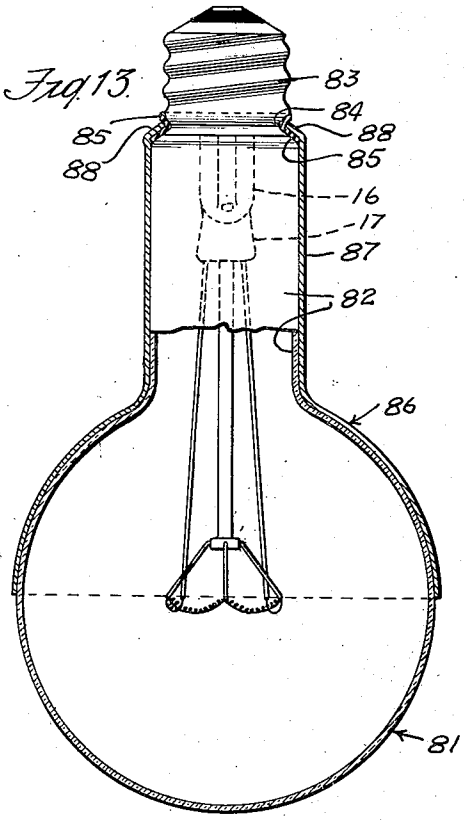


Fig. 14.

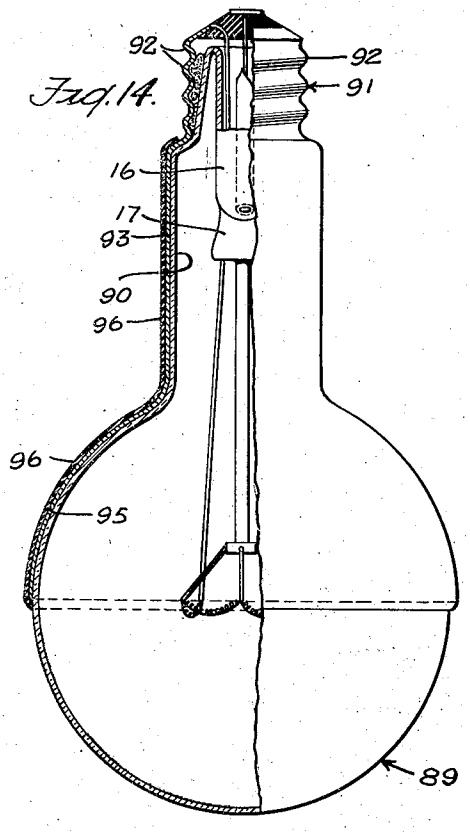
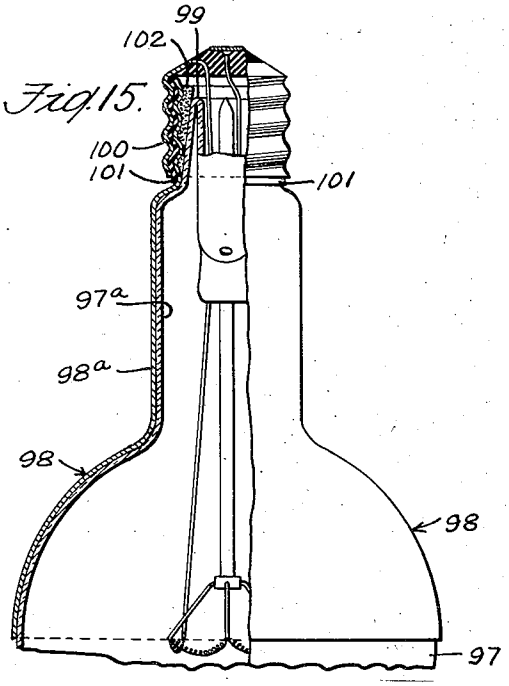


Fig. 15.



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UNITED STATES PATENT OFFICE

2,088,544

ELECTRIC RADIATION DEVICE

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Application July 27, 1932, Serial No. 624,943

2 Claims. (Cl. 250—35)

This invention relates to electric radiation devices and more particularly to types which are designed to produce a large proportion of the radiation of certain invisible rays, such as ultra-violet or infra red.

One of the objects of the invention is to provide an electric lamp with means to increase the amount of useful invisible radiation produced by the radiating source.

Another object of the invention is to provide an electric radiating device with external means to increase the amount of radiation of invisible rays from the source.

Still another object of the invention is to provide an electric lamp in which a portion of the radiation from the source is redirected to the source to raise the temperature thereof.

Another object of the invention is to provide a lamp with a reflector formed substantially as a part of the light bulb itself for increasing the amount of invisible rays projected in a given direction from the lamp.

A still further object of the invention is to provide an electric lamp having a reflector adapted to be mounted on the lamp bulb in which the heat is effectively radiated, thus preventing overheating of the parts.

Other objects of the invention and objects relating particularly to the method of constructing and mounting the reflector upon the light bulb will be apparent as the description of the invention proceeds.

Several embodiments of the invention have been illustrated in the accompanying drawings in which:

Fig. 1 is a sectional side elevational view of one form of the invention which may be preferred;

Fig. 2 is a view similar to that of Fig. 1 but showing a reflector applied to the bulb in a different manner;

Fig. 3 is a similar view of a lamp showing the reflector attached to the inside of the bulb;

Fig. 4 is a sectional side elevational view of a lamp provided with a modified form of ventilated reflector;

Fig. 5 is a sectional view taken transversely to the axis of the bulb on the line 5—5 of Fig. 4;

Fig. 6 is a sectional side elevation of a lamp provided with a reflector which is spaced slightly from the surface of the bulb;

Fig. 7 is a sectional elevational view of a lamp provided with a reflector for directing rays transverse to the axis of the lamp;

Fig. 8 is a sectional view of the lamp of Fig. 7 taken transversely to the axis of the lamp on the line 8—8 of that figure;

Fig. 9 is a sectional elevational view of a lamp in which the bulb itself is composed largely of metal;

Fig. 10 is a sectional elevational view of another embodiment of the lamp in which the angle of redirected rays is adjustable;

Fig. 11 is a sectional elevational view of a lamp with a reflector designed to save a large amount of light which would normally be lost in the neck of the lamp;

Fig. 12 is a fragmentary sectional elevation of another form of lamp in which rays normally lost in the neck of the lamp are saved and redirected;

Fig. 13 is a sectional side elevational view of a lamp in which the reflector is mounted on the base but insulated therefrom;

Fig. 14 is a sectional side elevational view of a modified form of lamp in which the reflector is integral with the base; and

Fig. 15 is a fragmentary sectional side elevational view of a still further modification of the lamp in which the reflector extends into the base of the lamp.

Reflectors for redirecting visible radiation have been widely used with electric lamps and in some instances have been mounted or even coated upon the lamp bulb itself. However, in the case of certain invisible radiation such as ultra-violet radiation, the use of a reflector closely associated with the bulb has certain heretofore undiscovered properties which markedly increase the efficiency of the lamp. Ultra-violet radiation from a heated metal filament increases roughly as the square of the temperature, reaching a maximum when the metal is near its melting point. A reflector properly designed and positioned so that it redirects a portion of the radiation back on to the filament of a lamp will raise the surface of the filament to a higher temperature than it could be maintained by the passage of current therethrough and thus increase the ultra-violet radiation therefrom.

Referring now more specifically to the drawings, the invention is shown in Fig. 1 with an envelope 10 composed of a material which is transparent to the radiation for which the lamp is designed, such as "uviol", quartz, or the like, which permits ultra-violet rays to pass therethrough. The envelope has an enlarged spherical portion 11 similar to those of ordinary electric light bulbs of 150 watts or more, terminating in a cylindrical neck 12 which is cemented in a base 13 provided with threads 14 for screwing into a standard electric light socket. The portion 15

of the envelope, however, between the point of largest diameter and the neck, is preferably curved to form a more spherical surface than is usually the practice with this portion of the bulb. A stem tube 16 fused to the end of the neck portion of the bulb and extends inside thereof terminating in a press 17 in which the lead wires 18 are sealed. A glass rod 19 is also fused to the press 17 and extends axially of the bulb to a point just short of the center of the spherical portion 11 of the envelope and terminates in a small bead 20 in which a plurality of support wires 21 are sealed. The lead wires 18 extend beyond the glass rod 19 and a coiled filament 22 made of tungsten or other refractory metal, which may be heated to a high temperature and which when so heated is rich in the production of the desired invisible rays, such as ultra-violet, has its ends attached to the ends of the support rods 18 and is bent in the form of a portion of a circle lying in a plane transverse to the axis of the bulb and passing through the center of the spherical portion 11. The support wires 21 have small loops 23 through which the filament is threaded for supporting the body of the filament at spaced points along its length.

The envelope may be filled with an inert gas, for instance a mixture of about 84% of argon and 16% of nitrogen, at a pressure such that the pressure at operating temperature will be in the neighborhood of one atmosphere.

In order to increase the temperature of the surface of the filament and also the reflection of the invisible rays from the lamp, I provide a shell 24 shaped to conform with the surface 15 of the lamp and being therefore substantially spherical. The reflector has an opening 25 at its center which receives the neck of the envelope and whose edges are extended into a sleeve 26 which extends a short distance from the neck of the bulb. This shell may be formed of very thin metal, such as aluminum preferably with an inner surface of aluminum oxide, which is reflective to ultra-violet rays as well as the rays of the visible spectrum and may fit in close contact with the envelope. The lower edge 27 of the shell may extend down slightly beyond the point of largest diameter of the bulb and this end may be spun to a slightly smaller diameter so as to hold the reflector securely in place upon the surface of the bulb.

With the reflector positioned as just described, radiation of invisible rays from the filament which normally would pass upwardly and be entirely lost, are redirected by the reflector toward the filament and also thrown downwardly and out at the lower portion of the lamp, thereby raising the temperature of the surface of the filament and greatly increasing the amount of radiation produced directly below the lamp. Owing to the fact that the filament occupies a rather large area in the center of the envelope, the rays will be dispersed to a great extent but the amount of dispersion may be controlled somewhat by changing the curvature of the portion 15 of the envelope and the conforming reflector, and varying the position of the lower edge 27.

If desired, the metallic reflecting surface may be formed integral with the bulb. Thus, in Fig. 2, a lamp bulb 28 has been shown having a parabolic upper portion 28*a* but otherwise similar to that already described, and a surface 29 of aluminum or other desirable reflecting metal is applied to the upper part 28*a* by spraying which may be accomplished in accordance with the well known Schoop process where a wire is fed through a region of intense heat and blown as a spray upon the surface. Thus the reflecting metal may be caused to adhere closely to the envelope so as to be substantially integral with it. In Fig. 3 the metallic reflecting surface 30 is sprayed onto the interior of the bulb 31. In both of these constructions other methods of applying the metal may be used such as painting it on, but where relatively high temperatures are encountered the spraying is much more satisfactory.

For lamps adapted or designed to operate on a high wattage, the temperature of the bulb and associated reflector may be raised to a high figure, and with such a lamp it may be advantageous to provide ventilating means to prevent the envelope and reflector from becoming too hot. In Fig. 4 such a construction is illustrated in which the envelope 32 formed similarly to those already described is provided with a reflector 33. This reflector comprises a shell mounted to conform to the surface of the lamp over which it fits but is provided with a plurality of ridges or corrugations 34 extending from the bottom of the reflector up to the top thereof and leaving small channels or ducts 35 between the surface of the envelope and that portion of the reflector forming the corrugations. Any number of these corrugations may be used around the reflector, twelve having been shown as giving ample ventilation, although if desired, the reflector may comprise a shell which is completely corrugated similar to the filler of a piece of corrugated cardboard. The upper part of the shell has a hole 36 which fits over the neck of the bulb and the edge of which rests upon the envelope forming an anchor for the upper end. At the lower end of the reflector I prefer to provide a plurality of lugs 37 which extend down beyond the point of largest diameter of the bulb and are urged inwardly by the inherent resilience of the metal so as to hold the reflector rigidly in place upon the envelope. Although the corrugations in this form of the device interrupt the evenness of the surface of the reflector and increase the dispersion therefrom, the amount of redirected radiation which is lost is comparatively small.

Another modification of the invention in which the reflector is ventilated so as not to become overheated is illustrated in Fig. 6 where the bulb 38 has a reflecting shell 39 placed over it which may be similar to those already described but which is slightly larger than the bulb itself so as to be spaced a short distance from it, say in the neighborhood of an eighth of an inch, throughout its entire surface. The hole 40 in the upper end of the reflector is of such a size that it fits close to the neck of the bulb and the edge rests against the curve 41 in the neck to hold the reflector in spaced relation to that portion of the bulb while the lower rim 42 is inturned below the point of greatest diameter forming a flange 43 which rests against the wall of the bulb. A plurality of holes 44 are provided through the surface of the reflector which permit air to pass in and out thus keeping a constant movement of cooling air between the bulb and reflector and preventing overheating thereof.

The modifications described above are directed towards reflecting bulbs which direct the light axially from the enlarged end of the bulb but in many instances it may be desirable to direct the light from the bulb in a direction perpendicular to the axis of the bulb. In Figs. 7 and 8, a lamp for producing this effect is shown. In this con-

struction the bulb 45 is exactly similar to the bulb already described, while the reflector 46 comprises a shell 47 which fits around approximately half of the spherical portion of the bulb and is provided with an extension 48 at its upper end terminating in a pair of resilient wings 49, which pass around the neck of the bulb and by their inherent resiliency hold the reflector securely in place. The wings may have flared ends 50, if desired, to aid in positioning the reflector.

In Fig. 9 a modification of the invention is illustrated in which the bulb 51 consists of three parts: a neck 52 which may be of ordinary glass and which carries the usual stem tube supporting the press (not shown), the lead-in wires 55 and the filament 56, a central spherical shell 57 of a metal such as aluminum having a good reflective characteristic for the ultra-violet rays, and a window 58 in the end of the metal shell 57. The window 53 is made of a substance, such as "uviol" glass, which will permit the invisible rays to be projected. Both the glass neck 52 and the window 58 are fused to the metal center shell 57 and form a gas-tight joint therewith so that in all respects the bulb may be treated as an ordinary glass bulb, it being exhausted and filled with the desired inert gas in the usual manner. This arrangement has several advantageous results, for, besides the fact that the construction may be somewhat cheaper owing to the small size of the window 58 which passes the invisible radiation, the radiation is concentrated through that small opening and hence the light is adapted to be used in all instances where invisible radiation is desired to be projected on a small spot, as in the treatment, for instance, of the gums with ultra-violet radiation without throwing radiation on other parts of the face of the patient.

As also mentioned above, the dispersion of light from the lamp is determined by the configuration of the reflector and the opening at the lower end thereof. In some instances it may be desired to provide a means to vary the area of the projected radiation, and if so the construction shown in Fig. 10 may be used. In this figure a bulb 60, made similarly to the bulbs already described, is provided with a neck 61 upon which are formed a pair of annular ridges 62 and 63, (two being shown for the purpose of illustration) the former down near the juncture of the neck and enlarged portion of the bulb and the other spaced somewhat above that. A reflector 64 is provided similar to the reflector shown in Fig. 1 but having a cylindrical lower edge 65 which does not become smaller in diameter but maintains the maximum diameter of the reflector to its lower edge. Thus formed the reflector is free to slip easily on and off of the bulb. The upper end of the reflector is formed into a sleeve 66 which fits over the neck of the bulb and the extreme upper edge 67 is flared out and then in again forming an annular groove 68 which is adapted to fit over the ridge formed in the neck of the bulb. A plurality of slots 69 are provided spaced around the upper edge of the reflector and extending down a short distance to permit the portions of the edges between each two slots to have enough resiliency so that the reflector may be moved on the neck until the grooves engage with either of the ridges in the neck. In this manner the reflector may be mounted on the bulb as shown in Fig. 10 at which time the lower edge of the reflector will define the angle at which the rays are directed from the bulb as indicated by the dotted lines, or the reflector may be raised to its uppermost position when the angle of radiation will be materially increased.

In all of the preceding described constructions, considerable radiation passes up through the neck of the bulb and is completely lost as it cannot be redirected downwardly. In order to save some of this radiation and put it to useful work, I provide the construction shown in Fig. 11 in which a bulb 70, similar in shape and construction to those already described, is provided with a reflector 71, whose lower surface 72 may be spun around the bulb in the manner described for the reflector of Fig. 1, but whose upper surface 73 does not conform to the upper surface of the bulb. I form the reflector so that there is a substantially straight line between the point of largest diameter of the bulb and the upper edge of the reflector which is adjacent the neck of the bulb near the base thereof. The lower edge 73*a* may be spun over the large part of the bulb, as in Fig. 1, to hold the reflector in place. The result of this construction is that ultraviolet radiation passing upwardly through the neck strikes the wall of the conical reflector and is redirected towards the opposite side from which it is redirected again downwardly and finally finds its way out at the lower and enlarged end of the bulb. In this way considerable radiation is saved.

Another way of preventing the loss of radiation through the neck of the bulb and redirecting this radiation for useful purposes is disclosed in Fig. 12 wherein the bulb 74 is similar to the bulbs already described, and is provided with a neck 74*a* through which pass the rod 75 for supporting the filament and the two lead-in wires 75*a*. At a point just a little above where the enlarged part of the bulb joins the neck 74*a* I position a disc 76 of mica or other insulating material which may have its lower side coated with a metal surface 77 of aluminum or other reflective metal for the desired radiation, so that no radiation can pass the disc. The disc may be fused, if desired, to the glass rod as at 78, and may be provided with holes 79 through which the lead-in wires pass. The metal surface, however, is ended short of the holes 79 as at 80 so that there will be no possibility of short-circuiting with the lead-in wires. This construction with the disc may be used with any of the other arrangements described above, with the exception of the construction of Fig. 11, with increased radiating efficiency.

In some instances it may be desirable to anchor the reflector securely to the base of the lamp and this may be done with the construction shown in Fig. 13. In this figure a bulb 81 is shown similar to the bulbs already described, and provided with a neck 82 upon the end of which is cemented a screw base 83. The base 83 is provided with a groove 84 around the edge thereof adjacent the neck of the bulb, and a ring 85 of insulating material is placed over this groove. The reflector 86 which may be similar in configuration to the reflector of Fig. 1, for instance, is provided, however, with a neck portion 87 which extends upwardly and terminates at a point slightly above the groove in the base. When the reflector is positioned on the bulb the upper edge 88 of the reflector's neck is spun inwardly, forcing the insulation into the groove in the base and securing the reflector

and insulation securely in position thereupon. The insulation ring, of course, forms a means to insulate the reflector from the base so that there will be no possibility of a short circuit or a shock when the bulb is being screwed into a lamp socket.

In Fig. 14 is illustrated another embodiment of the invention which provides a very rigid construction. Here a bulb **89** is provided with the usual neck **90** and a special base **91** having screw threads **92** therein is provided with a tubular extension **93**, the outer end **94** of which is enlarged into the reflector **95** which may be similar to any of the reflectors already described. In order to prevent any shock when screwing the bulb into a socket or removing the bulb, or prevent any short-circuit, the outside of the reflector **95** is coated with an insulating paint **96** which may be any desirable insulating paint capable of withstanding a rather high temperature without melting or burning, and which has sufficient insulating qualities to prevent any danger from the use of the bulb.

Another embodiment of this construction whereby the reflector is anchored by the base, is illustrated in Fig. 15 in which a bulb **97** is provided with a neck **97***a* slightly smaller than the neck of the bulb described above. The reflector **98** which is shaped to conform with the upper portion of the bulb has a sleeve **98***a* which fits over the neck of the bulb and extends all the way to the end **99** of the neck. The base **100** fits over the end of the reflector neck and the neck of the bulb, being separated from the reflector by an insulating bushing **101** which eliminates any electrical connection between the two. In this case the base is cemented on in much the usual way by means of cement **102** which rigidly secures the base, insulating bushing, reflector neck, and bulb neck together in a compact rigid form.

It is evident that in all of the modifications described above, I have provided an electric radiating device in which the invisible radiation is increased by means of the auxiliary reflector. In all cases, with the exception of the construction shown in Fig. 14 in which the reflector is protected by an insulating paint, the reflector is separated from the base of the lamp so that it will have no electrical contact therewith. In each modification the reflector is positioned at a minimum distance from the source of radiation thus producing a maximum amount of reflected radiation upon the filament to raise its surface temperature and consequently the ultra-violet radiation therefrom.

While the invention has been described in connection with a gas-filled lamp, it is also applicable to one operating in a vacuum. Also, while the combination of ultra-violet and visible radiation is perhaps preferable in the present instance, combinations of various other radiations including infra red and visible radiation may be produced and come within the spirit of this invention.

Other materials besides "uviol" and quartz may be used provided they will permit the passage of ultra-violet radiation of wave lengths less than 3,100 Angstrom units. Moreover, while reference has been made to aluminum as the material for the reflector, the oxide of aluminum is to be preferred. Other materials such as chromium, magnesium oxide, steel, zinc, nickel, aluminum paint, and powdered silica, may also be used with good results.

Many modifications may be made in the construction shown and described above and the constructions of various modifications may be combined together to produce advantageous results, and I do not, therefore, desire to limit myself to what has been shown and described except as such limitations occur in the appended claims.

The word "lamp" as used above and in the claims to follow is intended to mean any device for producing either visible or invisible radiation or both together.

Having thus described my invention, what I desire to claim is:

1. A reflector adapted for use in connection with a lamp having an approximately spherical contour and a tubular extension thereon, said reflector being of approximately conical form with open ends, the smaller end enclosing the lamp extension but displaced therefrom and the larger end terminating in a spherical shell sector enclosing and contacting with the spherical bulb portion on both sides of a plane extending through the lamp center at right angles to the lamp axis.

2. A radiating device comprising a source of ultra-violet radiation, a casing for the source formed of spherical walls transparent to ultra-violet radiation, a base for supporting said casing and source, and a reflector having spherical areas mounted on, supported by and in contact with said casing but separated and displaced from said base, said source lying at the approximate center of said spherical areas.

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