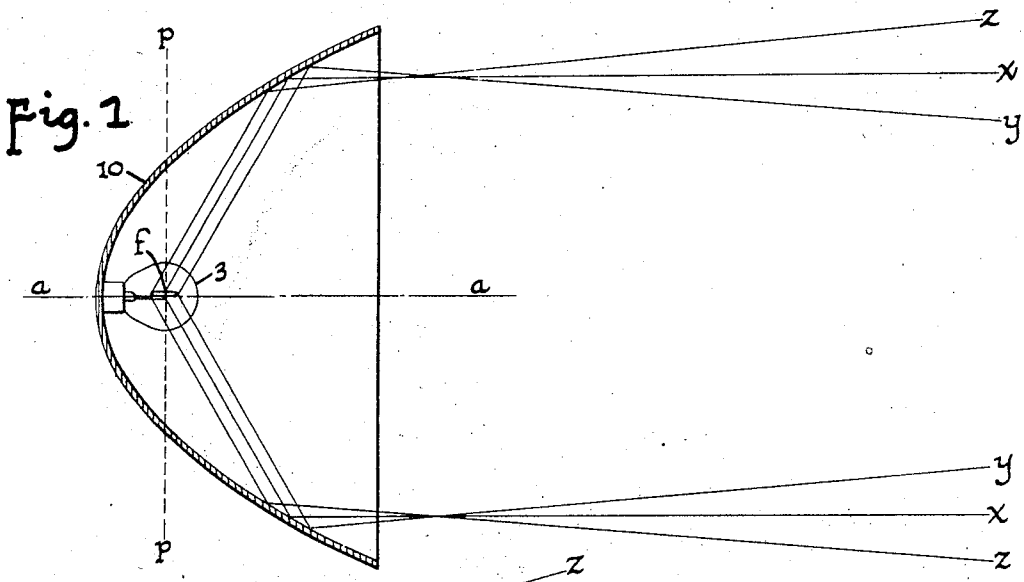
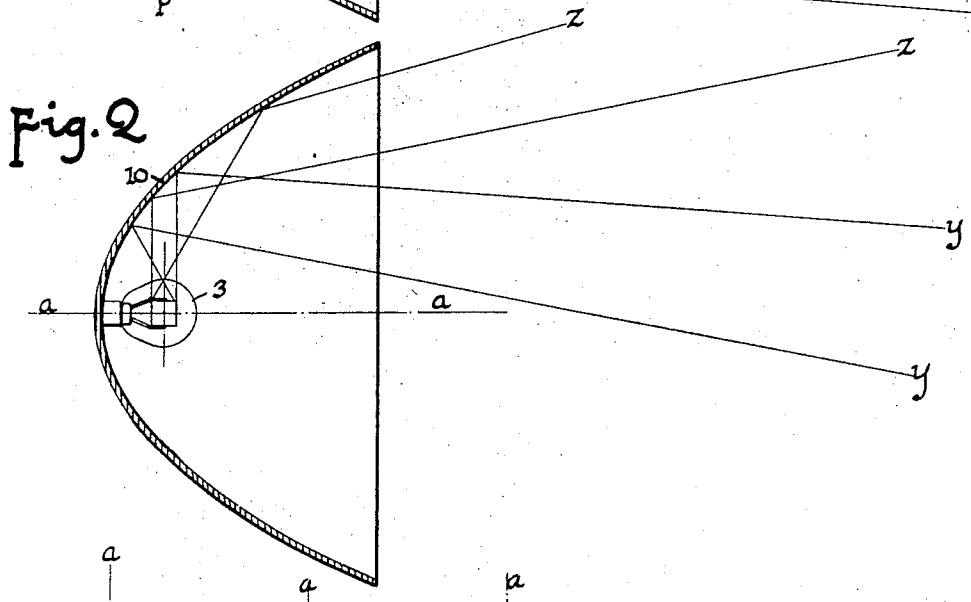
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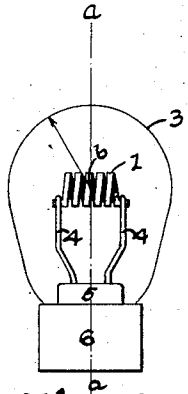


Fig. 3

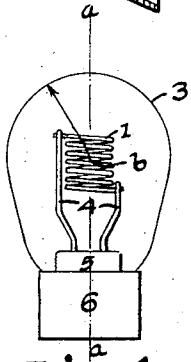


Fig. 4

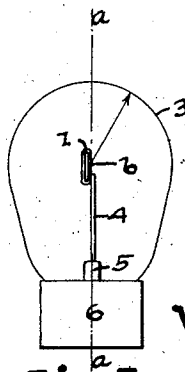


Fig. 5

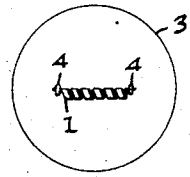


Fig. 6

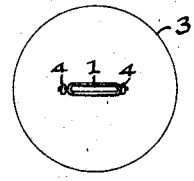


Fig. 7

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Fig 8

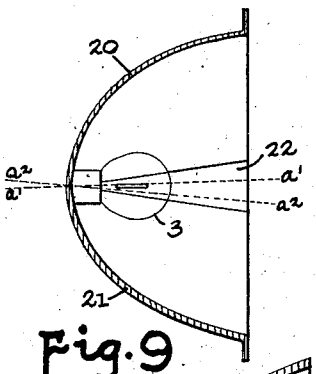


Fig.9

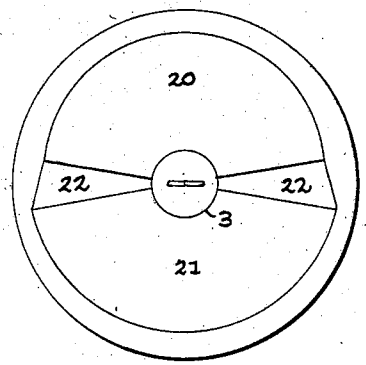


Fig.10

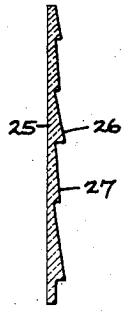


Fig.11

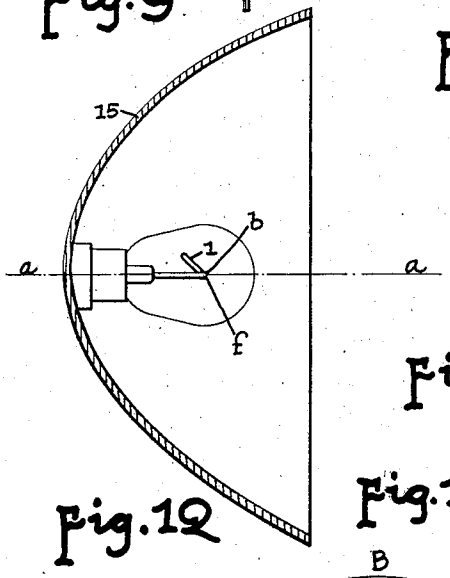


Fig.12

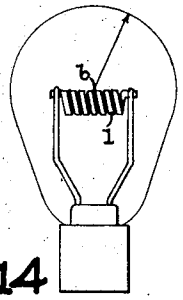


Fig.14

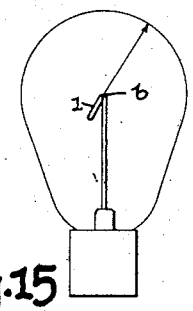


Fig.15

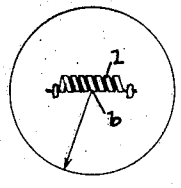


Fig.16



Fig. 17

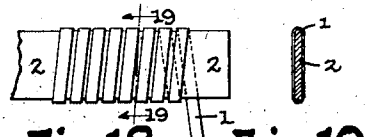


Fig.18 Fig.19

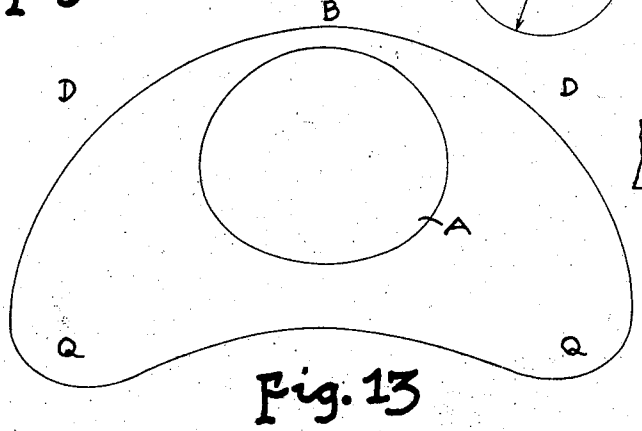


Fig. 13

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Patented July 5, 1927. 1,634,528

UNITED STATES PATENT OFFICE.

WILLIAM H. WOOD, OF SOUTH EUCLID, OHIO.

LAMP.

Application filed July 13, 1925. Serial No. 43,159.

This invention relates to lamps and has for its object the provision of an improved type of projecting lamp for vehicle use, such as automobiles, motor trucks, aeroplanes, etc., which shall be more easily focussed than other lamps; which shall afford an improved distribution of the light; which shall permit larger tolerance in manufacture; which shall be more easily manufactured and less liable to manufacturing imperfections; while further advantages and objects will become apparent as the description proceeds.

In the drawings accompanying and forming a part of this application I have shown certain preferred physical forms in which my inventive idea can be embodied, although it will be understood that these have been selected merely for illustrative purposes out of a great number of possible shapes and arrangements which can equally be employed within the scope of my invention and hence are not limiting upon me. Figs. 1 and 2 are longitudinal sectional views taken at right angles to each other through a spot-light comprising my invention; Fig. 3 is an enlarged plan view of one type of the lamp bulb shown in Figs. 1 and 2; Fig. 4 is a similar view of a modified type of lamp bulb which gives the same result; Fig. 5 is a side elevation of the lamp bulb shown in Fig. 3; Fig. 6 is an end elevation of the lamp bulb shown in Fig. 3; Fig. 7 is an end elevation of the lamp bulb shown in Fig. 4; Fig. 8 is a diagrammatic view showing the light pattern produced thereby; Fig. 9 is a side elevation of a head lamp embodying my invention; Fig. 10 is a front elevation of the lamp shown in Fig. 9; Fig. 11 is a vertical section through a headlight lens which may be used with certain forms of my invention; Fig. 12 is a sectional view through another head lamp embodying my improvements; Fig. 13 is a view of the light field produced by the devices of Figs. 9 to 12 inclusive; Fig. 14 is a top plan view of a lamp bulb shown in Fig. 12; Fig. 15 is a side elevation of the lamp bulb shown in Fig. 12; Fig. 16 is a front elevation of the lamp bulb shown in Fig. 12; Fig. 17 is a front elevation of a modified form of a lamp bulb; Fig. 18 is a side elevation of a filament mandrel showing the filament in the act of being wound thereon; and Fig. 19 is a cross section of the filament and mandrel.

My improved lamp is based upon the peculiar operation of a particular lamp bulb which I have invented when used in combination with a headlight reflector which has a focal point and an axis, namely a spherical surface or a paraboloid or one having paraboloid segments, said lamp bulb bearing a certain predetermined relation to the axis and focal point of said reflector. Said lamp bulb is characterized by having its filament wound into a helix whose cross section is markedly oblong so as to exhibit a substantial length and breadth combined with a thickness which is much less and is preferably substantially negligible. In this way the light source, instead of taking the form of a loop, or hairpin, or V, or bar as heretofore customary, exhibits the form, substantially, of a segment of a geometric plane.

Such a filament is much more easily made than almost any other form. It is made from a strand 1 of metallic ribbon of wire (so far as concerns the present invention the cross section of the strand is unimportant), wound with closely adjacent turns upon a thin flat mandrel 2. For practical use I have found a coil having a width of 4 millimeters and thickness of 1/2 millimeter very satisfactory, although other dimensions can be employed, and the length of the coil axially thereof can be as great or as little as desired, although I have found from 5 to 6 millimeters a very satisfactory dimension. The number of turns of the strand within the limits of this coil depends entirely upon the cross section, length, and specific resistance of the material and voltage for which it is designed. I have had successful results with a tantalum ribbon 1/2000th inch in thickness and 15/100th inch wide and making about 5 turns; but a tungsten strand because of its lower specific resistance requires different dimensions and I have also discovered that the cross section of the strand also has an influence upon its dimensions.

This filament is mounted inside a glass globe 3 in the usual manner, its ends being suitably joined to stiff leading-in wires 4—4

carried by the press 5 sealed in that end of the globe which is provided with the contact base 6. This filament can be mounted with the axis of the coil either transverse to the bulb axis as shown in Fig. 3 or longitudinal to the bulb axis as shown in Fig. 4, in which case the end elevation of the same will appear as in Figs. 6 or 7, respectively. There is also a considerable degree of latitude permissible in the relation between this filament and the globe axis. In the forms shown in Figs. 1 to 7 inclusive this filament is mounted with its plane parallel to and including the axis *a—a* of the bulb; and the forward end of the globe, which is preferably hemispherical as shown in Figs. 3, 4, and 5, has its center of curvature *b* preferably coinciding substantially with the geometrical center of this coil in order to prevent the occurrence of any image-glare. This type of lamp bulb is exceedingly satisfactory for searchlights, although when driven with the plane of the filament horizontal it is also useful as a headlight, and affords the same light pattern as those devices which are at the present day most extensively employed, namely the Ford vertically ribbed lens or the so-called "Flatlite" reflector; but in addition my device exhibits the advantage of a substantially indifferent focus and a very broad range of manufacturing tolerance.

When such a bulb is mounted in a paraboloid reflector 10, the bulb axis coinciding with the reflector axis *a—a* and the focal point *f* thereof substantially coinciding with the point *b* (see Figs. 1 and 2), all rays rising at the focal point falling on the reflector will be reflected forwardly parallel to the axis as indicated at *x*, *x*; all rays originating at the forward margin of the reflector will be converged after reflection as shown at *y—y*; and all which originate in the rear edge of the filament will be diverged as shown at *z—z*. Considered in a horizontal plane the separation between the points *y* and *z* is comparatively small, while considered in the horizontal plane as in Fig. 2 the separation of the points *y* and *z* is very great. Accordingly there is produced a light field which is much elongated laterally but comparatively narrow vertically as shown in Fig. 8, and it will be found that movement of the lamp bulb axially of the reflector has a comparatively small amount of effect on the light pattern, partly because the axial length of the filament is very great compared with such movement and partly because any diminution of the diverging rays *z—z* tends to be neutralized by increase of the rays *y—y* which cross the axis to reinforce them (and vice versa). As a result a lamp is produced in which the entire field is uniformly illuminated with diffused light and wherein black spots and "ghosts" due to improper focusing, or imperfections in the reflector cannot occur.

It is possible to improve this as a headlight lamp even more by the addition of further expedients to eliminate the extreme upper corners of the light field and divert that portion of the light to more important and less obnoxious parts of the field. This may be effected in either of three ways: by means of a warped reflector shown in Figs. 9 and 10; by means of the glass lens as shown in Fig. 11; or by means of the rearranged filament as shown in Figs. 12 to 17.

In Figs. 9 and 10 I have shown a reflector of the type covered by my Patents Nos. 1,235,275 and 1,235,276. The reflector is made of a plurality of independent paraboloid portions, such as indicated at 20, 21, here shown as flared apart and having their marginal portions connected by inclined side wings 22 between which is mounted a lamp bulb 3 having a filament of the type shown in Figs. 1 to 7 inclusive. The result of such use is the production of an illuminated field as shown in Fig. 13, the maximum illumination occurring inside the oval A, the beam exhibiting an apex at the point B, substantial darkness at the points D—D and a considerable amount of light at the points Q—Q. A somewhat similar improvement in distribution is obtained by using in combination with the reflector shown in Figs. 1 and 2 a glass lens 26 as shown in Fig. 11, of the type having prismatic portions 26, 27 of different angles adapted to diffuse and direct according to a predetermined pattern. Such a lens combined with such a reflector and lamp bulb can be made to afford the pattern shown in Fig. 13.

The same result can be secured without a lens and with the paraboloid reflector 15 by modifying the position of the plane of the filament as shown in Figs. 12 to 17 inclusive, wherein the filament 1, instead of containing the axis *a—a*, meets the same at an oblique angle, the center of curvature *b* of the glass globe coinciding with the forward edge of the filament substantially midway of its length and the plane of the filament diverging rearwardly from the lamp axis at an angle of not above about 45°. When such a bulb is placed in a reflector with the point *b* coinciding with the focal point *f* (this is subject to considerable tolerance) the forward edge of the filament substantially horizontal and the body of the filament rising into the two upper rear quadrants of the paraboloid the same pattern is produced as is shown in Fig. 13. This aspect of my invention coincides with that set forth and claimed in my patent issued April 14, 1925, No. 1,533,360.

Viewed from above such last described lamp bulb appears as shown in Fig. 14. It

can either run straight from side to side or be bent into V shape as shown in Fig. 17. In either case the filament consists of a flat lattice defining and confined within substantially a single plane, which plane is oblique to the reflector axis and intersects the same substantially at the focal point.

The flat thin shape of the filament produces exactly the type of light beam most usefully employed with a paraboloid reflector. This shape is also advantageous in manufacturing for two reasons: first, because of its comparatively great width it is possible to make a mandrel which is used over and over instead of being destroyed by acid as in the case of the fine wire mandrels; and, second, because the angular shape of the mandrel holds the strands tightly thereon and the filament, when wound, exhibits less tendency to warp out of shape than when it is wound on a cylindrical mandrel.

Having thus described my invention what I claim is:

The combination with a reflector having a substantially horizontal axis and a focal point, of an incandescent lamp bulb having a filament consisting of a metallic strand wound in a closely adjacent series of oblong turns producing a flattened helix which exhibits substantial length and breadth combined with a comparatively small thickness and defines a plane which is symmetrically arranged relative to the vertical plane which includes said axis.

In testimony whereof I hereunto affix my signature.

WILLIAM H. WOOD.