No. 616,620. Patented Dec. 27, 1898.

H. F. JOEL & F. FANTA.

ELECTRIC INCANDESCENT LAMP.

(No Model.) (Application filed July 29, 1896.)

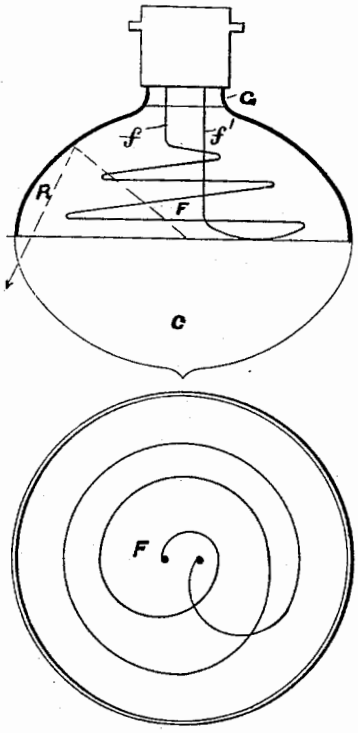
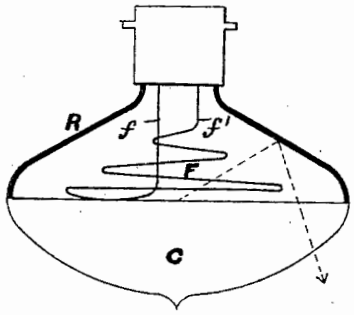
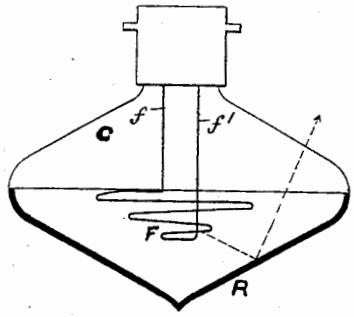


FIG. 1.





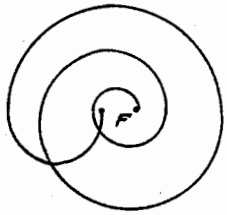


FIG. 2.

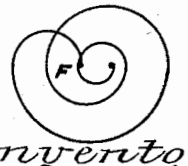


FIG. 3.

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UNITED STATES PATENT OFFICE.

HENRY FRANCIS JOEL AND FERDINAND FANTA, OF LONDON, ENGLAND, ASSIGNORS TO THE IMPROVED ELECTRIC GLOW LAMP COMPANY, LIMITED, OF SAME PLACE.

ELECTRIC INCANDESCENT LAMP.

SPECIFICATION forming part of Letters Patent No. 616,620, dated December 27, 1898.

Application filed July 29, 1896. Serial No. 600,977. (No model.)

To all whom it may concern:

Be it known that we, HENRY FRANCIS JOEL and FERDINAND FANTA, residing at London, England, have invented Improvements in Electric Incandescent Lamps, of which the following is a specification.

The invention has been patented in England, No. 23,111, dated December 3, 1895.

This invention relates to that class of incandescent electric lamps in which a part of the bulb is either plated or otherwise provided with a coating for the purpose of transforming such coated part of the glass bulb into a reflector; and it consists in structural improvements in the relative disposition of the filament to the reflecting-surface when the latter is of a conoidal or spheroidal form and in the disposition of the transparent part of the globe to the reflective portion, whereby the direct and reflected light from such a lamp is concentrated in a given direction with maximum efficiency and with a uniformity of light cast upon any object which it is desired to illuminate without the necessity of frosting or otherwise obscuring the transparent part of the lamp, which diminishes efficiency.

It has been found that the photometric value and the uniformity of direct and reflected light cast upon such surfaces as a book or paper on a desk or table by a lamp made according to our invention is increased by from forty to fifty per cent. above the average efficiency of other pear-shaped lamps where the latter is provided with a reflecting-surface as to which no regard has been taken as to the relative disposition of the body and leads of the filament thereto or of the disposition of the transparent part of the globe to the reflecting-surface or in which frosting is necessarily used to produce uniformity of light.

In electric incandescent lamps as at present known with part-plated surfaces or with reflecting-coatings upon part of the surface of the bulb, whether of the ordinary pear-shaped, spherical, or other forms especially designed for specific purposes, in which neither of the above-mentioned desiderata have been taken into account, the luminosity of the filament is not utilized to its full extent, a double or multiple image is produced on the illuminated surface, and, moreover, owing to the direct light from and also the brighter reflection of the two inlet and outlet branches of such filament by the mirror, bright lines and shades are shown on the surfaces or objects on which the light is thrown. This defect has usually attempted to be dealt with by the partial obscuring of the glass opposite to the reflected, but with the consequent considerable loss of light. By our invention we obviate these disadvantages without loss of light, and for this purpose we construct the incandescent filament relatively to the reflector, which is adapted to have a directive or condensing effect upon the light, so as substantially to lie in a surface corresponding to the form or geometric conformation of the reflecting-surface or mirror. In order to avoid the brighter and disturbing reflection from the straight portions of the filament, (in and out branches,) we either prevent the incandescence until we reach the bulb of the filament or else so arrange same in respect of the bulb of the incandescent filament that it is an axis perpendicular to the center of the reflector, and thus hidden from sight when looking at the reflecting part or mirror from the spectator's side, so that the reflection from these branches is immersed in or, so to say, covered by that of the body or bulk of the filament. The spires of the filament should intersect the plane passing through the axis of the lamp in such a manner that the points of intersection, if joined together, represent a line or surface coaxial with and equidistant from that of the reflecting-surface.

We so construct and form the clear portion of the glass of the lamp-bulb that the rays of light from the filament and the reflecting-surfaces may pass through the glass as nearly as possible at right angles to the plane of the surface of the glass—that is, directly through the glass at the shortest intervening space and at its point of least refraction, and thus with least loss of light.

In the accompanying drawings we show examples of incandescent lamps constructed ac-

cording to our invention, all characterized by the essential points for increased efficiency as to uniformity upon white surfaces and photometric value of their combined, direct, and reflected light concentrated by the form of the reflector upon a given object, such characteristics being the largest diameter lying in the plane between the reflective and transparent surfaces, tending to the passage of the light through the transparent medium in as direct a manner as possible, the form of reflector being conoidal, parabolic, or elliptical for concentration of the light upon specific objects and the conformation of the body of the filament being adapted to lie in a surface parallel to and coaxial with that of the reflector and the leads brought within the main body of the filament and passing approximately through an axis normal to the center of the reflecting-surface to prevent bright lines and irregularities of light cast by the lamp, thus giving an extreme uniformity of concentrated light, most noticeable upon white surfaces, such as books or papers.

Figure 1 shows a globe formed as an oblate spheroid, the largest diameter lying in the plane between the reflecting-surface R and the transparent portion C, the continuous filament F passing from and returning to the cap G in two leads *f f'*, lying approximately in an axis normal to the center of the reflecting-surface within the body of the filament, which is entirely within and surrounded by the reflective surface R and is formed so that the body of the filament lies in a surface equidistant from and coaxial with the reflective surface. Fig. 2 has its upper reflective surface R conoidal and the lower transparent portion C of the glass globe elliptical, the filament F and leads *f f'* being disposed to the reflective surface as described for Fig. 1. Fig. 3 is a double conoidal lamp with the reflective surface R on its lower part for reflection upward on the ceiling, the arrangement of filament F and leads *f f'* relative to the reflecting-surfaces being as described for Figs. 1 and 2.

It is pointed out that the approximate perpendicularity of the passage of the reflected rays through the transparent portion of the lamp depends largely upon the flattened form of the lamp, with largest diameter in plane between the reflective and transparent portions, and that the forms as shown are adapted for being blown in the usual way, which is essential for cheapness, for thinness of material, and great resisting power with thin material against the extreme atmospheric pressure, being vacuum-lamps.

We are aware that an incandescent lamp with flat reflector and flat transparent face that might appear to fulfil the condition of our invention is known; but such a lamp by the diffusion of its flat reflector does not produce directive and concentrated reflective light, and therefore has not the especial photometric efficiency of the construction we claim; nor can such a lamp be made by the usual and cheap method of blowing, nor in glass of the thinness peculiar to blown lamps, such as those we show; nor is such lamp adapted by its flat shape to carry external pressure except with extreme thickness of glass, which would much reduce the photometric value of the transmitted light.

Having now described our invention, we declare that what we claim, and desire to secure by Letters Patent, is—

1. In combination in an incandescent lamp, a globe adapted by its shape to be blown in thin glass, with resisting strength to external atmospheric pressure, a reflecting-surface carried thereby, external to and partially enveloping an inclosed filament and adapted by its conoidal or trumpet-like shape to converge and reflect the rays of said filament in a definite direction, an incandescent filament of several spires of a continuous convolution, lying substantially in a surface, coaxial with and equidistant from said reflecting-surface, on all sides of the same, to produce a powerful concentrated uniform and directive light without irregular lines of vivid intensity therein, substantially as described.

2. In combination in an incandescent lamp, a globe adapted by its shape to be blown in thin glass with resisting strength to external atmospheric pressure, a reflecting-surface carried thereby of parabolic or spheroidal form, and an incandescent filament within such reflector bent into such a form from a continuous length, to provide a body of several convolutions lying in a surface coaxial with and equidistant from the said reflecting-surface on all sides of the same, to produce a concentrated, uniform and directive light, substantially as described.

3. In an incandescent lamp the combination with a part of the globe having a conoidal or spheroidal shape, carrying a reflecting-surface, surrounding uniformly and enveloping the leads of the filament, of an incandescent filament having its inlet and outlet leads extended vertically from the apex or center of the reflector and brought close together within the ambit of the main body of the filament-loop, said main body extending laterally beyond and covering the axis of the leads relatively to the eye of the observer, and being formed of spires of a continuous filament, lying substantially in a surface coaxial with and equidistant from the reflecting-surface on all sides of the same, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY FRANCIS JOEL.
FERDINAND FANTA.

Witnesses:
RICHARD A. HOFFMANN,
CHARLES H. CARTER.