

No. 616,620.

Patented Dec. 27, 1898.

H. F. JOEL & F. FANTA.  
ELECTRIC INCANDESCENT LAMP.

(Application filed July 29, 1896.)

(No Model.)

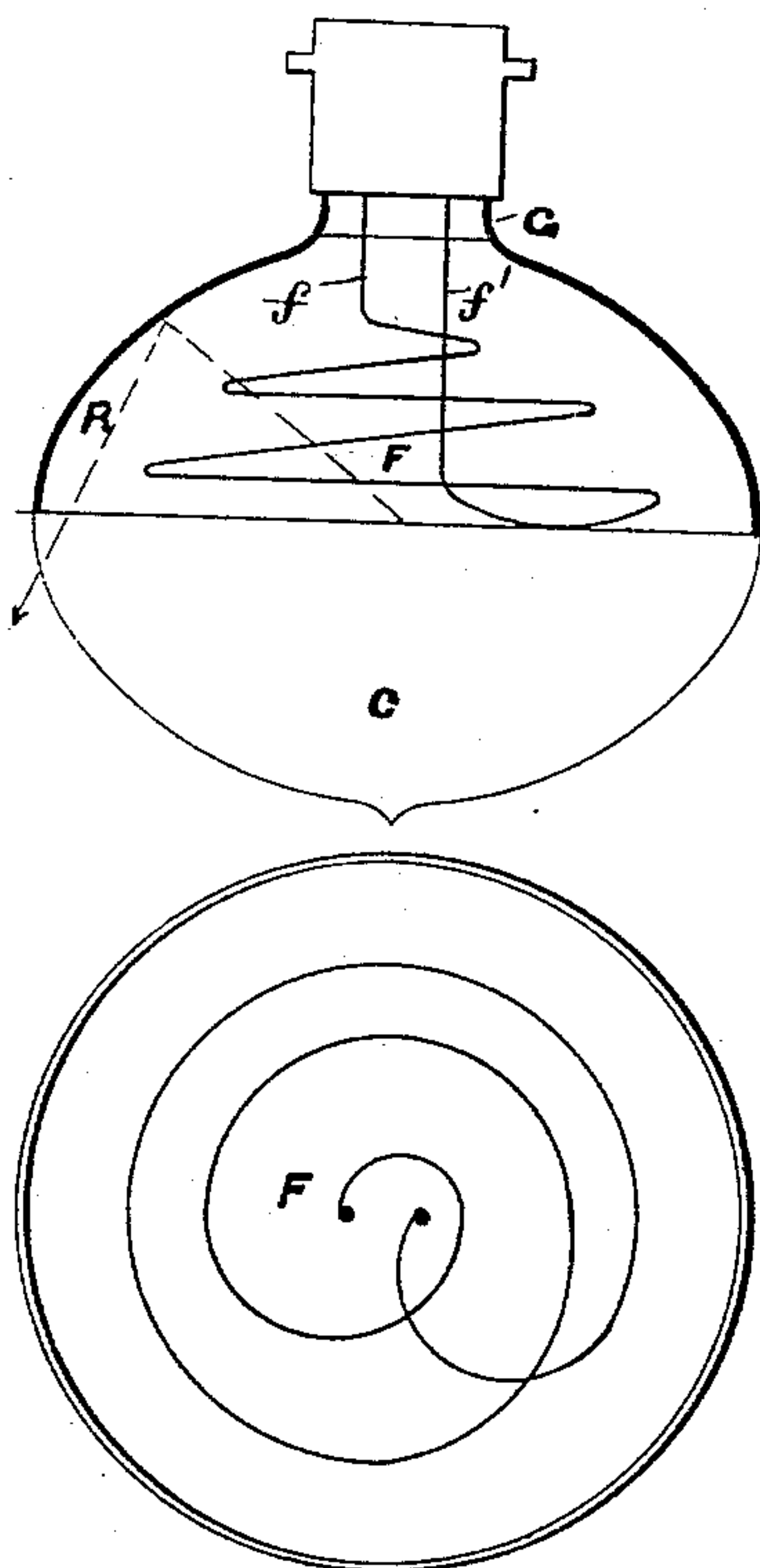


FIG. 1.

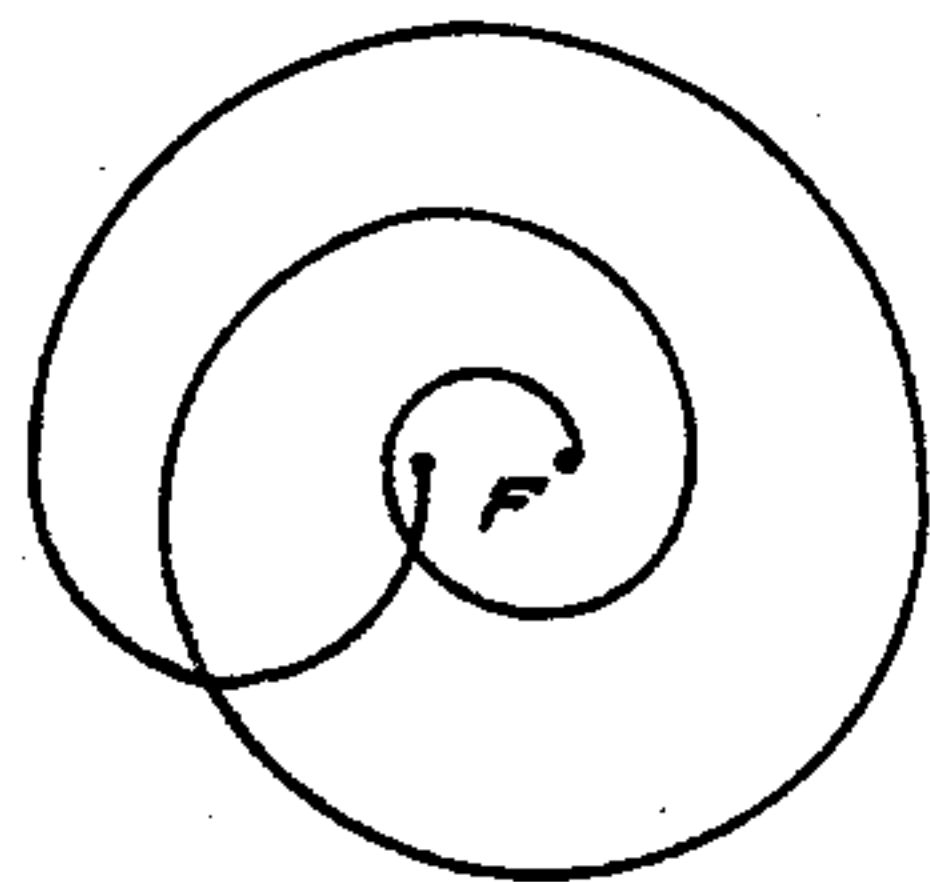
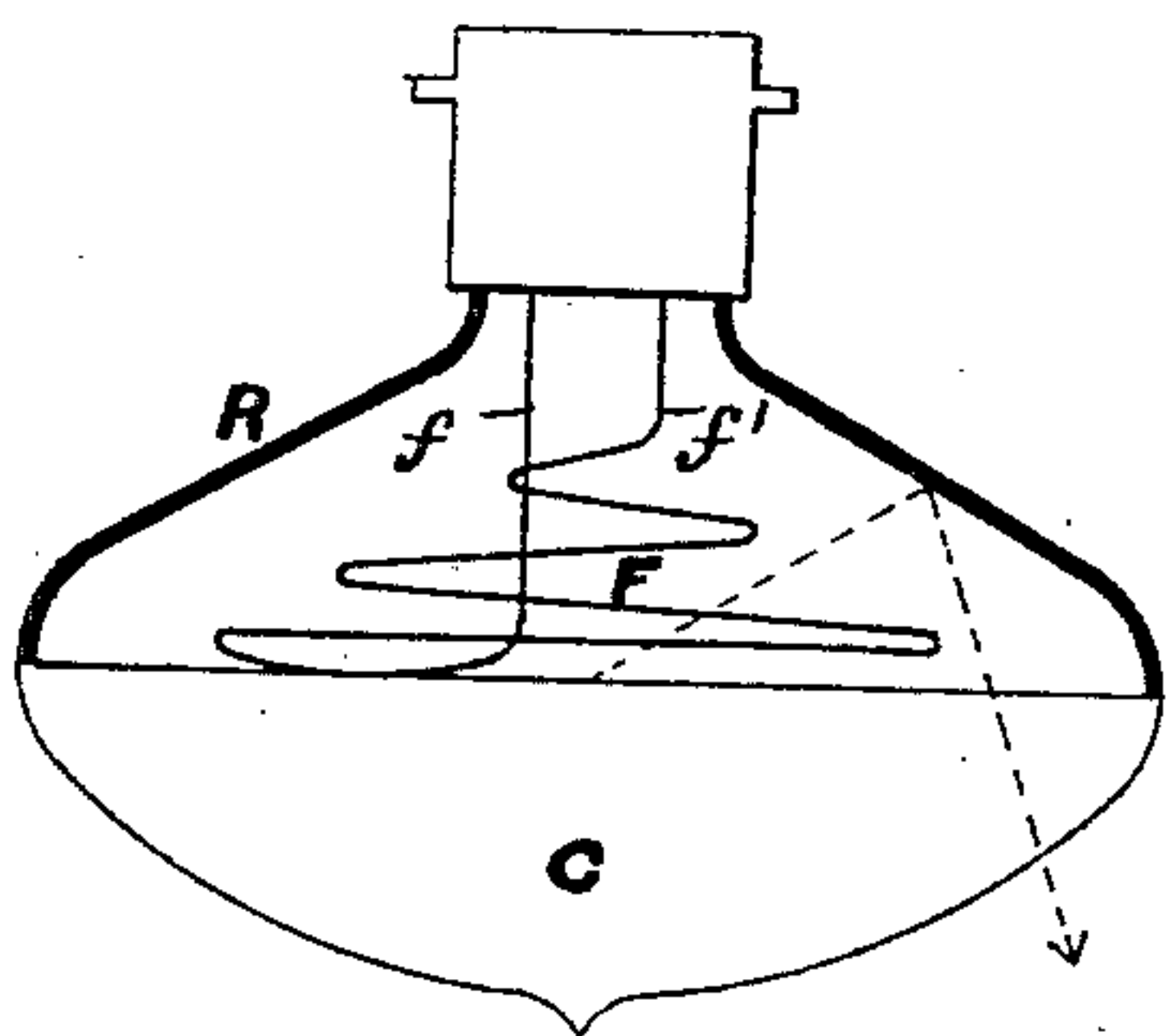


FIG. 2.

Witnesses:

*E. R. Bolton*  
*Edmund*

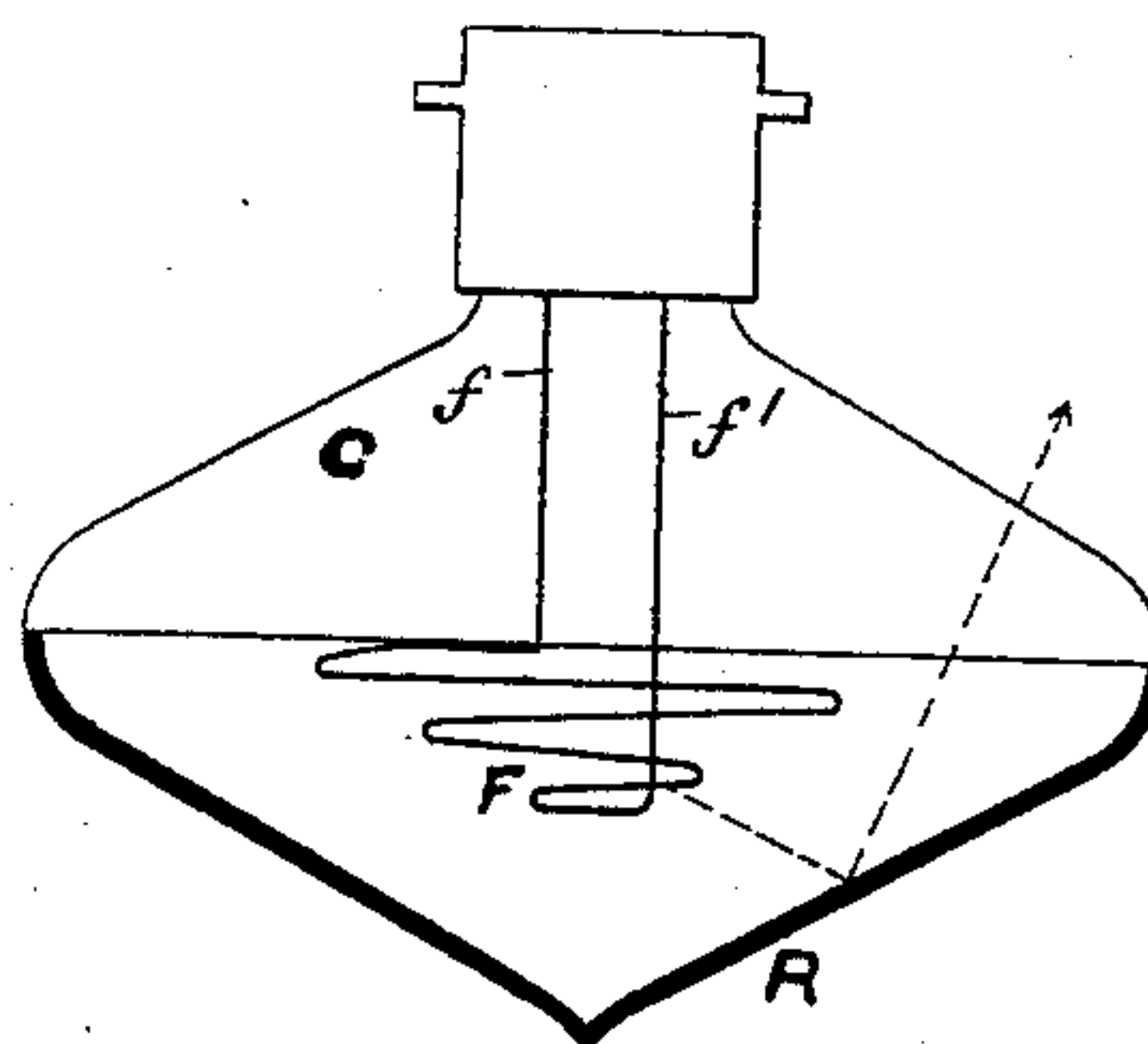
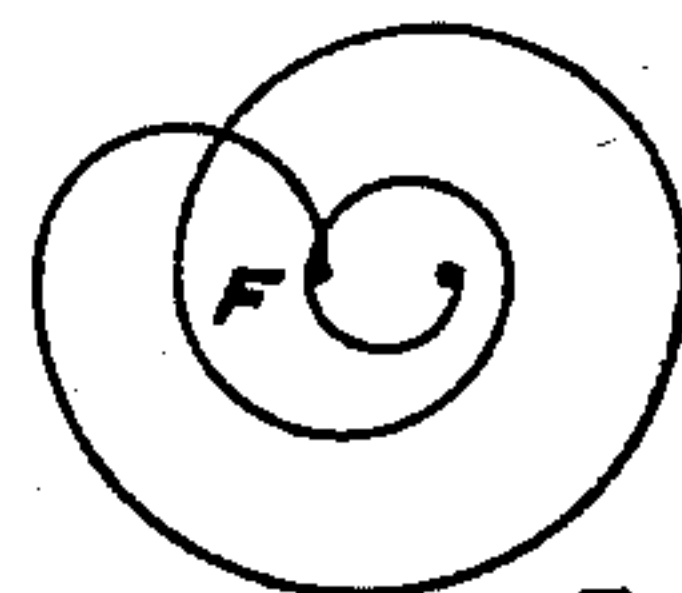


FIG. 3.



*Inventors*  
*Henry Francis Joel*  
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*By* *Richard R.*  
*their Attorneys.*

# 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,  
 5 and reflected light concentrated by the form  
 of the reflector upon a given object, such  
 characteristics being the largest diameter ly-  
 ing in the plane between the reflective and  
 transparent surfaces, tending to the passage  
 10 of the light through the transparent medium  
 in as direct a manner as possible, the form of  
 reflector being conoidal, parabolic, or ellip-  
 tical for concentration of the light upon spe-  
 cific objects and the conformation of the  
 15 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 ap-  
 proximately through an axis normal to the  
 20 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.

25 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  
 30 cap G in two leads  $ff'$ , lying approximately  
 in an axis normal to the center of the reflect-  
 ing-surface within the body of the filament,  
 which is entirely within and surrounded by  
 the reflective surface R and is formed so that  
 35 the body of the filament lies in a surface  
 equidistant from and coaxial with the reflec-  
 tive surface. Fig. 2 has its upper reflective  
 surface R conoidal and the lower transparent  
 portion C of the glass globe elliptical, the  
 40 filament F and leads  $ff'$  being disposed to  
 the reflective surface as described for Fig. 1.  
 Fig. 3 is a double conoidal lamp with the re-  
 flective surface R on its lower part for reflec-  
 tion upward on the ceiling, the arrangement  
 45 of filament F and leads  $ff'$  relative to the re-  
 flecting-surfaces being as described for Figs.  
 1 and 2.

It is pointed out that the approximate per-  
 pendicularity of the passage of the reflected  
 50 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 por-  
 tions, and that the forms as shown are adapt-  
 55 ed for being blown in the usual way, which  
 is essential for cheapness, for thinness of ma-  
 terial, and great resisting power with thin  
 material against the extreme atmospheric  
 pressure, being vacuum-lamps.

60 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 pro-  
 65 duce directive and concentrated reflective  
 light, and therefore has not the especial pho-

tometric 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, 70  
 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 photo-  
 metric value of the transmitted light. 75

Having now described our invention, we de-  
 clare that what we claim, and desire to se-  
 cure by Letters Patent, is—

1. In combination in an incandescent lamp,  
 a globe adapted by its shape to be blown in 80  
 thin glass, with resisting strength to external  
 atmospheric pressure, a reflecting-surface  
 carried thereby, external to and partially en-  
 veloping an inclosed filament and adapted  
 by its conoidal or trumpet-like shape to con- 85  
 verge 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, 90  
 on all sides of the same, to produce a power-  
 ful concentrated uniform and directive light  
 without irregular lines of vivid intensity  
 therein, substantially as described.

2. In combination in an incandescent lamp, 95  
 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 100  
 such reflector bent into such a form from a  
 continuous length, to provide a body of sev-  
 eral convolutions lying in a surface coaxial  
 with and equidistant from the said reflecting-  
 surface on all sides of the same, to produce a 105  
 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-sur- 110  
 face, surrounding uniformly and enveloping  
 the leads of the filament, of an incandescent  
 filament having its inlet and outlet leads ex-  
 tended vertically from the apex or center of  
 the reflector and brought close together with- 115  
 in the ambit of the main body of the filament-  
 loop, said main body extending laterally be-  
 yond and covering the axis of the leads rela-  
 tively to the eye of the observer, and being  
 formed of spires of a continuous filament, 120  
 lying substantially in a surface coaxial with  
 and equidistant from the reflecting-surface  
 on all sides of the same, substantially as de-  
 scribed.

In testimony whereof we have signed our 125  
 names to this specification in the presence of  
 two subscribing witnesses.

HENRY FRANCIS JOEL.  
 FERDINAND FANTA.

Witnesses:

RICHARD A. HOFFMANN,  
 CHARLES H. CARTER.