M. H. WELSH.

INCANDESCENT ELECTRIC LAMP.

APPLICATION FILED MAR. 16, 1910.

988,416. Patented Apr. 4, 1911.

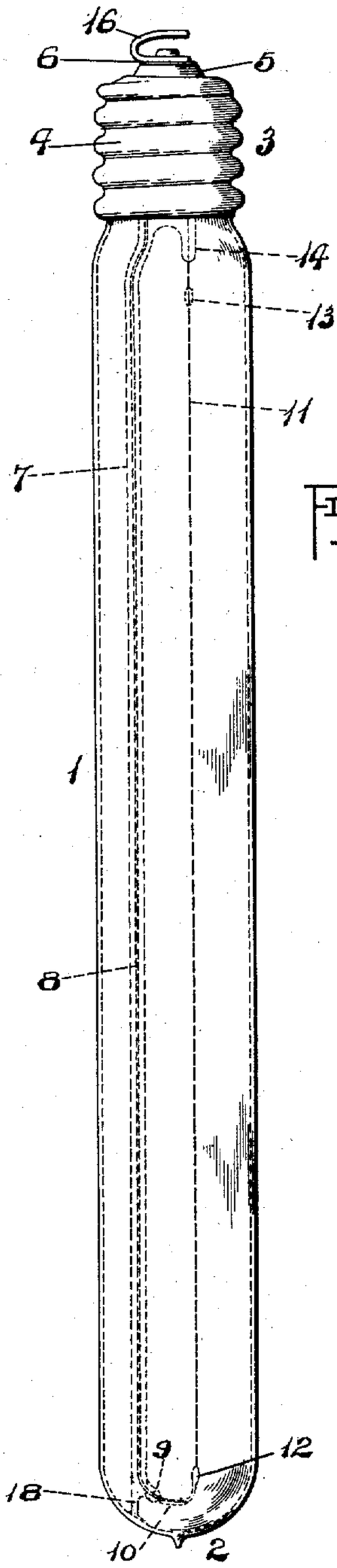

FIG. 1.

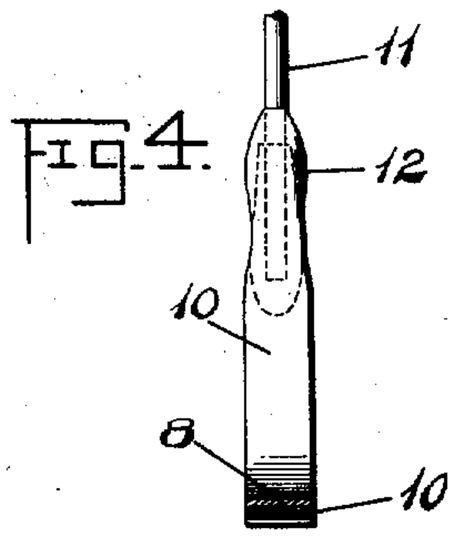

FIG. 4.

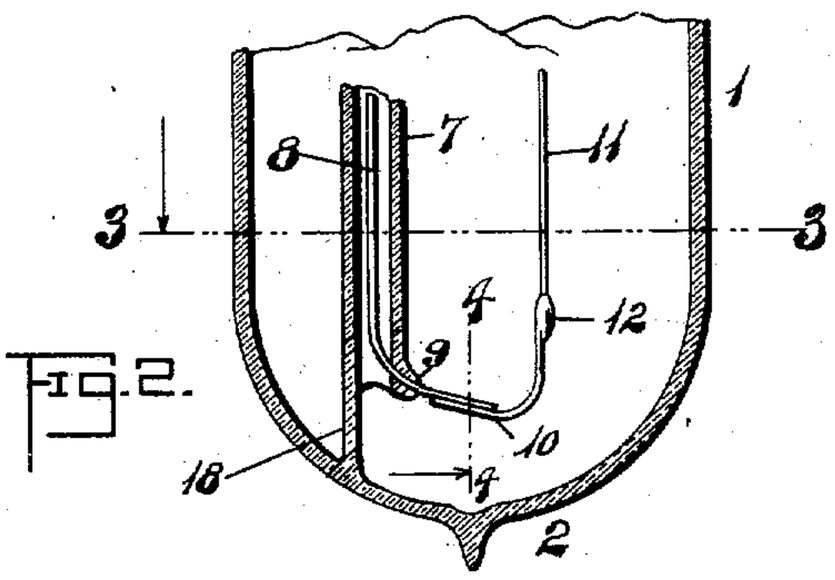

FIG. 2.

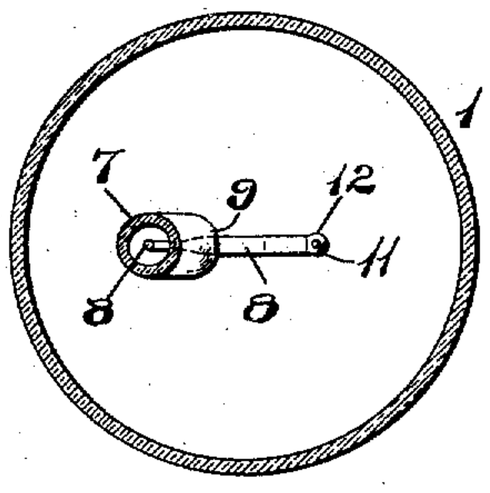

FIG. 3.

WITNESSES

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INCANDESCENT ELECTRIC LAMP.

988,416. Specification of Letters Patent. **Patented Apr. 4, 1911.**

Application filed March 16, 1910. Serial No. 549,633.

To all whom it may concern:

Be it known that I, MAURICE H. WELSH, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain Improvements in Incandescent Electric Lamps, of which the following is a specification.

This invention relates to that class of incandescent electric lamps known as "line lights", and in which the filaments are arranged and held each in a straight line from end to end of itself.

The objects of the invention are to provide in such lamps an elongated bulb which needs to be supported at one end only; to provide such a bulb at one end with an ordinary supporting base, adapted to screw into an ordinary lamp socket, so that special fixtures are not needed; to extend through the elongated bulb a non-incandescent conductor for the current and supporting means for said conductor and the filament at the end of the bulb opposite its supporting base; to provide improved means for holding the filament taut when hot and expanded and allowing it to contract without breaking when cooled; to enable the incandescent filament to face in any direction without disturbing the electrical contact of the lamp with its socket, and to obtain other advantages and results as may be brought out in the following description.

Referring to the accompanying drawings, in which like numerals of reference indicate corresponding parts in each of the several figures, Figure 1 is a side view of my improved lamp; Fig. 2 is a central longitudinal section of the tip of the lamp or end farthest from its supporting base; Fig. 3 is a cross-section taken on line 3, 3 of Fig. 2, and Fig. 4 is an enlarged sectional view of the thermostatic filament support, taken on line 4—4, Fig. 2, and looking in the direction indicated by the arrow.

In said drawings, 1 indicates a tubular glass bulb of any desired size, for example ten or twelve inches long and an inch or so in diameter. One end 2 of said tubular bulb is rounded and closed as in all incandescent bulbs, and at the other end is the supporting base 3 which is exteriorly-threaded to screw into a lamp socket (not shown). The said base 3 comprises an outer shell 4 forming one of the terminals of the lamp, and the other terminal leads through the center of the insulating material 5 with which the shell 4 is filled to a brass contact plate 6 at the center of the end of the base 3, as is common in incandescent bulbs.

Within the tubular bulb 1 is a long slender stem 7, which I have shown as glass tubing, although it might be of other material. This stem 7 can be held in place in the bulb in any suitable manner, but I have shown it fixed at one end to the base 3 of the bulb, and anchored at its other end, as at 18, to the inner wall of the bulb. This anchoring is preferably done by fusing an integral lip or projection of the tube 7 to the wall of the bulb, as shown, so that the end of the stem is fixed or made fast to the inner wall of the bulb against any movement with respect thereto. Through the said tubing 7 extends a conductor 8, as copper wire, from one of the lamp terminals, and at the other end of the bulb said conductor bends laterally through the wall of the tubing 7 or a portion thereof, as 9, sufficient to attach the said conductor to the tubing. The lips 18 preferably projects from a point of the end edge of the tubular support 7 at one side of the opening thereof, as shown, so as to leave the end open for the conductor 8. Said conductor then projects through the end opening of the tubular support at a distance away from said lip and anchorage, and is attached to the end edge of the support at the opposite side of the opening from said lip, so that the opening is not necessarily closed. This construction is extremely simple, and yet the anchorage of the support and attachment of the conductor to said support can be independently effected, as described. Under some conditions, a greater portion of the non-incandescent conductor 8 might project from the stem 7 than is shown in the drawings, or the tubular portion of the stem might be omitted and the conductor support itself except at its opposite ends. Outside the tubular stem 7, the conductor 8 has attached to its side away from the supporting base 3 of the bulb, preferably by welding; an arm 10 which extends beyond the conductor and then bends forward to have the adjacent end of the filament 11 fastened thereto in alinement therewith, as by a carbon paste 12. The other end of the filament 11 is similarly secured, as at 13, to a wire of platinum or the like projecting from the other terminal of the base 3 through a pro-

jection 14 at the base of the stem 7. The filament 11 is put in place before the bulb is exhausted and sealed, so as to not be loose or slack to any great extent when cold, and the ratio of coefficients of expansion of the conductor 8 and angular arm 10 is such that a thermostatic support is provided which under the heat of the current will bend or swing toward the adjacent end of the bulb sufficiently to hold the filament taut and take up any slackness due to expansion or increased length of the same when hot. The filament is thus automatically kept taut as it is heated or cooled by the electric current being turned on or off.

In the drawing the angle piece 10 is of material having a lower coefficient of expansion than the conductor 8, and obviously if the angle piece had a higher coefficient of expansion than the conductor it would be secured to the side of the conductor next to the far end of the filament.

A further important feature of my improved lamp is that it is supported entirely from one end, by a base of the same sort as those now so commonly in use on ordinary incandescent bulbs, and hence the lamp can be applied directly to ordinary fixtures without requiring a lot of special work.

In order that good electrical connection may be made by the contact plate 6, even though in order to have the filament 11 facing in a given direction the base 3 may not be screwed clear into its receiving lamp socket, a U-shaped leaf spring 16 is secured by one arm to said contact plate 6, the other arm forming a resilient contact, as clearly shown in Fig. 1. Obviously any other form of spring adapted to the purpose might be employed.

I have used the words "incandescent" and "non-incandescent" herein to distinguish between members which become incandescent when the lamp is lighted and those which do not, and of course do not mean that the incandescent member is always incandescent. I have also spoken of the filament as "straight" to distinguish it from the usual looped filament, and mean only that it is intended to occupy in use a substantially straight line. I have also used the expression "thermostatic support" as a term to express the construction set forth, viz. a support comprising longitudinal sections having different coefficients of expansion, whereby bending will occur upon change of temperature.

Having thus described the invention, what I claim is—

1. An incandescent electric lamp, comprising a bulb provided with a supporting base, an insulating tube projecting into the bulb from said base and having an inner open end, a lip projecting from the edge of said open end at one side of the opening and being attached to the inner wall of the bulb, a non-incandescent conductor extending from said base through said tube, said conductor projecting from the inner end of the tube at a distance from said lip, another non-incandescent conductor projecting into the bulb from said base, and an incandescent filament extending between said conductors in circuit therewith.

2. An incandescent electric lamp, comprising a bulb provided with a supporting base, an insulating tube projecting into the bulb from said base and having an inner open end, a lip projecting from the edge of said open end at one side of the opening and being attached to the inner wall of the bulb, a non-incandescent conductor extending from said base through said tube, said conductor projecting from the inner open end of the tube and being anchored thereto at the opposite side of the end opening from said lip, another non-incandescent conductor projecting into the bulb from said base, and an incandescent filament extending between said conductors in circuit therewith.

3. An incandescent electric lamp, comprising a bulb, non-incandescent conducting supports terminating in said bulb, and an incandescent filament extending between the ends of said conducting supports in circuit therewith, one of said conducting supports having a thermostatic portion adapted when heated to hold the filament taut.

4. An incandescent electric lamp, comprising a bulb, a straight incandescent filament in said bulb, and non-incandescent conducting supports for the ends of said filament, one of said conducting supports having a thermostatic portion extending transversely to the filament and adapted when heated to bend away from the other support.

5. An incandescent electric lamp, comprising a bulb, a straight incandescent filament in said bulb, and non-incandescent conducting supports for the ends of said filament, one of said conducting supports having a portion extending transversely to the filament and comprising longitudinal layers whose planes of separation are transverse to the filaments, the layer next the other support having a higher coefficient of expansion than the layer away from said other support.

6. An incandescent electric lamp, comprising a bulb, a straight incandescent filament in said bulb, and non-incandescent conducting supports for the ends of said filament, one of said conducting supports having its end portion disposed transversely to the filament and terminating short of it, and an angle piece having a lower coefficient of expansion than said conductor with one arm secured against the side of said conductor away from the support at the other end of the filament and the other arm connected to said filament.

7. An incandescent electric lamp, comprising a bulb provided with a base having an exteriorly threaded outer shell and a contact plate insulated from said shell, non-incandescent conductors extending from said shell and contact plate respectively into the bulb to different distances from the said base, an incandescent filament extending between said conductors in circuit therewith, and a contact spring upon said contact plate.

MAURICE H. WELSH.

In the presence of—
CHAS. C. CURRY,
RUSSELL M. EVERETT.

Correction in Letters Patent No. 988,416.

It is hereby certified that Letters Patent No. 988,416, granted April 4, 1911, upon the application of Maurice H. Welsh, of Newark, New Jersey, for an improvement in "Incandescent Electric Lamps," were erroneously issued to Standard Electric Lamp Co., as assignee of the entire interest in said invention, whereas said Letters Patent should have been issued to the inventor, *Maurice H. Welsh and Standard Electric Lamp Co., jointly*, said Standard Electric Lamp Co. being assignee of *one-half* interest only; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of June, A. D., 1912.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.

7. An incandescent electric lamp, comprising a bulb provided with a base having an exteriorly threaded outer shell and a contact plate insulated from said shell, non-incandescent conductors extending from said shell and contact plate respectively into the bulb to different distances from the said base, an incandescent filament extending between said conductors in circuit therewith, and a contact spring upon said contact plate.

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