

(No Model.)

2 Sheets—Sheet 1.

E. THOMSON.

INCANDESCENT ELECTRIC LAMP.

No. 335,160.

Patented Feb. 2, 1886.

Fig. 1

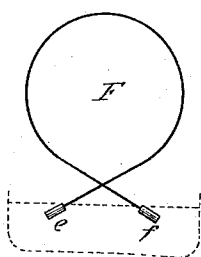


Fig. 2

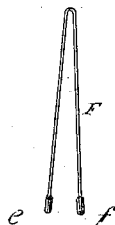


Fig. 5

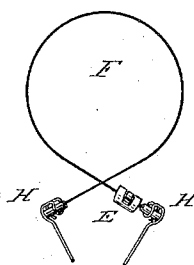


Fig. 3

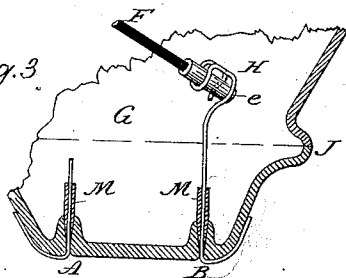


Fig. 6

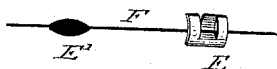


Fig. 7

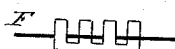
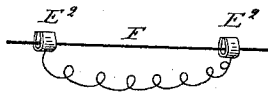


Fig. 8



Witnesses:
Ernest Abshagen
Chas. Dorney

Inventor:
Elihu Thomson
By his Attorney: H. B. Townsend

(No Model.)

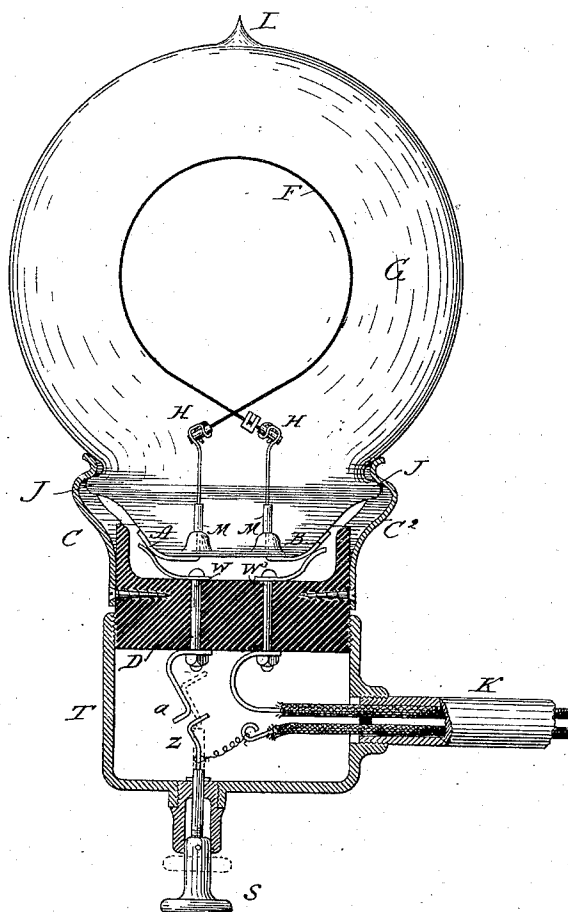
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Fig. 4.



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Inventor:

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UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF NEW BRITAIN, CONNECTICUT, ASSIGNOR TO THE
THOMSON-HOUSTON ELECTRIC COMPANY, OF BOSTON, MASS.

INCANDESCENT ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 335,160, dated February 2, 1886.

Application filed March 19, 1883. Serial No. 88,742. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of New Britain, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Incandescent Electric Lamps, of which the following is a specification.

My invention relates to incandescent electric lamps; and its object is to improve the construction of the lamp in the particulars described in detail in the following description, and specified in the claims at the end thereof.

The carbon filament of my lamp is plated at its ends with copper deposited thereon in the well-known manner by electro-deposition or otherwise, as is usual in the art for making connection with battery-carbons, carbon resistances, &c. The plated ends are inserted into holders formed of iron or platinum wires fused into the glass envelope of the lamp. To avoid the effects of differences of expansion, the part of the lamp where the wires enter is formed of a glass made with very fine particles of metal mixed therewith, so that its expansion is the average of that of the glass and metallic particles. To obtain this admixture, fine powdered glass and fine metal—as copper-dust, iron-dust, platinum-dust, or the like—are intimately mixed and fused, and while plastic formed into any desired shape for use.

In the accompanying drawings, Figure 1 shows the filament with its plated ends. Fig. 2 is another view of same. Fig. 3 shows the clamp for holding the end of the filament and illustrates also the manner of sealing the entering conductor. Fig. 4 shows in side view and partial section the complete lamp ready for use when exhausted of air and connected to the circuit-wires. Figs. 5, 6, 7, and 8 illustrate certain forms of resistance-adjusting clamps or devices for use with the incandescent filament.

The filament is plated with copper at its ends *e f*, Fig. 1, as usual in making connections to carbon and other poor conductors. The preferable form for the filament, and one which possesses numerous advantages, is that shown in Figs. 1 and 5. The filament is bent around into nearly a circle, but at the same

time the ends are displaced axially or out of the plane of the circle, as indicated in Fig. 1, and cross one another, but at a distance apart, as shown.

The advantages possessed by the form shown are, chiefly, the absence of inequality of illumination in different directions, such as occurs with filaments of which portions lie in one plane. In the form shown no two parts of the filament are in the same vertical plane.

I am aware that a somewhat similar form has been used in a prior lamp; but in it the filament takes one and a half turn, and the connecting ends are nearly parallel and vertical, while in my invention they are tangents to the circle of the filament and cross each other at a large angle, but not in the same plane.

Another advantage is the increased rigidity of the filament and lessened liability to fracture from shocks. This is due to the fact that no two portions of the filament take the same direction.

In Fig. 3 a wire clamp, *H*, is shown, enveloping in part the plated end of the filament *F*. The form given to the clamp is preferably that shown, and is made by a bend to the right upward, then to the left at nearly right angles, then downward and forward and up on the other side of the end *e*, then to the right and downward on the same side. The curves are such as to clasp the end *e* securely and with some elasticity. The form is given before the insertion of the end *e*. It is then easy to insert the filament by springing its end *e* into the part *H* from above. The wire *H* is continued through the shell *G* to form the entering conductor of the lamp and bent on the outside at *B*. It is made of iron or platinum, and when of more expansible substance than the glass *G* it is, before sealing into the same, surrounded by a covering, *M*, of my mixture of fine metal and glass before referred to. This is preferably tapered at the lower part and fused into a tapered hole in the internal nipple in the case *G*. The wires *A B* form the terminals of the lamp.

The complete lamp is shown in Fig. 4. The beading at *J J* is the line of union between the case or globe *G* and the wire-holding base, the

opening in the case or globe G being just sufficient to admit the filament F before sealing the joint at J J. The lamp is then exhausted of air and gases and sealed ready for use.

5 The spring-clips C C² catch upon the beading J J, before mentioned. The said clips C C² are supported from a block, D, of insulating material. Through this block wires W W' are led, and serve to make contact with the wires A B
10 when the lamp is in place. Fastened to W' is a wire from the circuit coming through the bracket-tube K, and to W is connected a bent spring, α , so arranged as to make contact with a connector, Z, and catch the same, so as to
15 hold the parts in contact when the button S and metal piece Z together are raised, and to hold the connector Z until the button S is pulled downward. The piece Z is guided suitably in the casing T, and is connected with
20 the other circuit-wire by a flexible connection coming from K. The button S is of rubber or insulator, or, if of metal, is of course insulated from the circuit. In order to equalize the wear upon the different parts of the fila-
25 ment F, it is advisable that the direction of the current through the said filament be changed at intervals of a day or several days. This is readily accomplished by reversing the current in the supply-mains themselves every
30 few days, or by reversing the position of the lamp in its holder, or by other well-known means, such as reversing-keys operated at suitable intervals automatically or otherwise. This reversal tends to prevent the undue thin-
35 ning of the one leg of the filament—a tendency at present known in the art.

It is often a matter of importance in the manufacture of incandescent lamps that an equalization of the electrical resistances of the
40 incandescing conductor be effected. This is ordinarily accomplished by using lengths of conductor sufficient to yield equal resistances, or, better, such lengths and thicknesses as will with the electro-motive force provided be
45 heated to equal temperatures. I find a simple adjustment of resistance can be effected by the means shown in Figs. 5, 6, 7, and 8. A small spring-clip of platinum-foil or the like,
50 E, is put upon the filament, and serves to in-crease the conducting-power at the point where

it is applied. The filament being constructed with an excess of resistance, clips of variable length or conducting-power are applied, which may be adjusted to shunt or reduce the resistance of any portion of the filament to the re-
55 quired degree. Fig. 7 shows a long clip where the adjustment needed is considerable. In Fig. 6, E' is a drop of carbon paste applied and afterward carbonized for the same purpose.
60

In Fig. 9, E² E² are adjustable spring-clips applied to the conductor and electrically connected by a flexible wire, so that by bringing the clips nearer together or farther apart the
65 resistance of the incandescing portion of the lamp may be increased or diminished.

What I claim as my invention is—

1. In an electric lamp, an entering conductor fused in an admixture of glass or other vitreous material and fine dust of platinum, iron,
70 copper, or the like, as and for the purpose described.

2. In an incandescent electric lamp, a spring-clamp formed of a conducting-wire, bent as described, to leave a side opening for the in-
75 sersion of the end of the incandescent conductor.

3. The combination, substantially as described, in a switch or incandescent lamp, of a spring, α , bent at its end, as shown, and a
80 connecting-spring, Z, also bent and movable vertically to and from the former, the spring α being inclined to the line of movements of Z, so that when the latter is forced upward beyond the angle α it will be held in place.
85

4. The combination, with the incandescing illuminating-conductor of an electric lamp, of a resistance-equalizing clip upon said con-
90 ductor, as and for the purpose described.

5. The combination, with carbon filament forming the light-giving body in an electric lamp, of an adjustable resistance-equalizing clip, as and for the purpose described.

Signed at New Britain, in the county of Hartford and State of Connecticut, this 15th
95 day of March, A. D. 1883.

ELIHU THOMSON.

Witnesses:

W. O. WAKEFIELD,
E. WILBUR RICE.