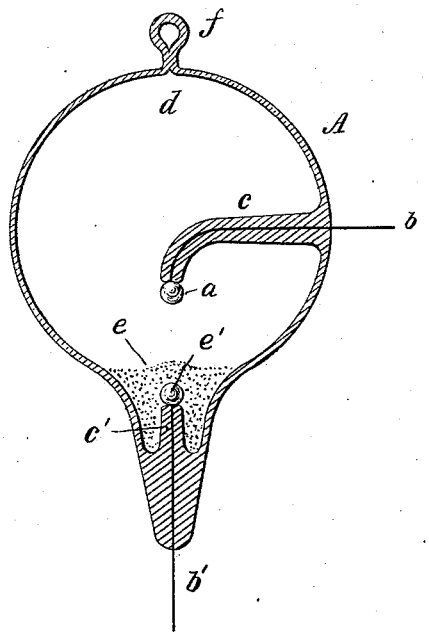
(No Model.)

C. F. BECK.

INCANDESCENT ELECTRIC LIGHTING.

No. 303,357. Patented Aug. 12, 1884.

Fig 1.



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INCANDESCENT ELECTRIC LIGHTING.

SPECIFICATION forming part of Letters Patent No. 303,357, dated August 12, 1884.

Application filed July 5, 1884. (No model.) Patented in France April 25, 1884, No. 100,171.

To all whom it may concern:

Be it known that I, CHARLES FREDERICK BECK, of Paris, in the Republic of France, have invented a new and useful Improvement in Electric Lighting, whereof the following is a specification.

My invention is based upon the discovery that when an electric discharge takes place in an atmosphere holding in suspension fine particles of refractory solid material of proper resisting power the particles in the path of the spark become incandescent, and that under proper conditions the incandescence can be rendered practically constant. By the application of this discovery I am not only enabled to produce a brilliant light of long duration with a comparatively weak current and slight expenditure of energy, but, furthermore, I avoid the objections commonly found in incandescent lamps in which carbon or similar material is used, due to the breaking or wasting of the incandescent material, since in my method this material is used in such a form as to be indestructible under ordinary conditions.

I will now proceed to describe, by reference to the accompanying drawing, a practical mode of carrying out my invention. Said drawing represents a central vertical section through the lamp proper, which consists of a small hermetically-sealed glass globe, A, similar in general construction to those in common use for incandescent lamps. Within the globe are two electrodes, *a a'*, consisting of platinum balls, arranged at a distance of about eighteen (18) millimeters apart, and respectively connected with platinum wires *b b'*, which pass out through the sides of the globe. Those portions of the wires *b b'* which are in the interior of the globe A are surrounded by glass insulating-sleeves *c c'*, fused at one end into the surface of the globe itself, and tightly sealed at the other end around the wires at their junction with the balls *a a'*. The globe thus formed is exhausted of air through an orifice, (such as is ordinarily left at the point *d* in the manufacture of globes for incandescent lamps,) after which I introduce a small quantity of pure charcoal reduced to an impalpable powder and perfectly dry. The amount is indicated by the dotted portion *e*, and should be about sufficient to cover the lower ball, *b'*, when the electrodes are arranged vertically in the manner shown. I then introduce dry nitrogen gas, in quantity not sufficient to fill the globe without expansion—say about one-half of the cubic capacity—and allow a very slight amount—in fact, a mere trace—of the vapor of metallic mercury to enter with it. The globe A is then hermetically sealed, as shown at *f*, and the wires *b b'* are connected with the source of electricity—such as, for instance, a galvanic battery provided with an ordinary Ruhmkorff coil and automatic circuit-breaker adapted to produce a very rapid succession of discharges or sparks between the electrodes *a a'*. The discharges create a circulation of the gaseous contents of the globe A, the particles of carbon are disturbed and become suspended in the moving atmosphere, and are carried in a continuous stream through the path of the discharge. They are then heated by the passage of the current; and as the circulation continues and the particles are repeatedly subjected to this action their temperature gradually rises, so that ultimately those at any given moment in the path of discharge become temporarily incandescent, presenting the appearance of a luminous mist of great brilliancy, and if the succession of discharges be sufficiently rapid the effect is that of a fixed or constant light.

The charcoal I have found best adapted for the purpose is that obtained from loose cotton or "batting," reduced as nearly as possible to the condition of pure carbon, in impalpable powder, and so dried that the particles shall not adhere to each other nor to the surrounding surfaces.

I have specified nitrogen gas as the best vehicle known to me for effecting the necessary circulation of the solid particles, as it is inert so far as injurious action upon the carbon is concerned, and permanent or not decomposable by the electric discharge. I prefer to use the gas in a rarefied condition, in order to promote its mobility, and I have found that the addition of a trace of mercurial vapor, as described, enhances the operation, probably by affording a better conductor for the discharge than the gas alone. The form of apparatus above described for carrying out my method can be modified, and also other elements may be employed within the globe, without sub-

stantial departure from the method itself. Thus the electrodes may be arranged horizontally instead of vertically, and the powder disposed between them. So also, instead of a galvanic battery and induction-coil, other sources of electricity may be employed, it being only essential that the discharges should be in rapid succession, or, if a continuous discharge be effected, that it should be of proper character to insure the incandescence of the solid particles.

Instead of charcoal, a fine powder of calcined magnesia, or other refractory oxide affording proper electrical resistance, may be used as the incandescent medium. I therefore do not limit my claim to the mechanical means employed in the production of the light.

I am aware that it is not new to produce flashes of light by passing an electrical discharge through rarefied gases confined in a translucent envelope, as in the case of the well-known Geissler tubes; and I am also aware that the brilliancy of the ordinary arc light between carbon points is commonly attributed to the passage of incandescent particles between the poles. The former of these methods differs from my invention in that the atmosphere of the Geissler tubes, &c., has not been charged with the solid particles necessary for the production of an incandescent medium; and in the case of the arc light the movement of the particles is not only due to a different mode of operation from that of my method, but involves, essentially, the gradual consumption of the electrode itself, so that the action cannot be permanent; whereas in my invention the solid material, having been previously comminuted, undergoes no change in use. I therefore disclaim the methods and apparatus of which, on the one hand, the Geissler tube, and on the other, the simple electric arc between carbon poles, are the type.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The hereinbefore-described improvement in the art of electric lighting, which consists in passing an electric discharge through previously-comminuted particles of solid material in a confined inert atmosphere, substantially as set forth.

2. The hereinbefore-described improvement in the art of electric lighting, which consists in supplying to the path of an electric discharge in a confined inert atmosphere previously-comminuted particles of solid material, such supply being established and maintained by the action of the discharge itself, as set forth.

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Witnesses:
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