

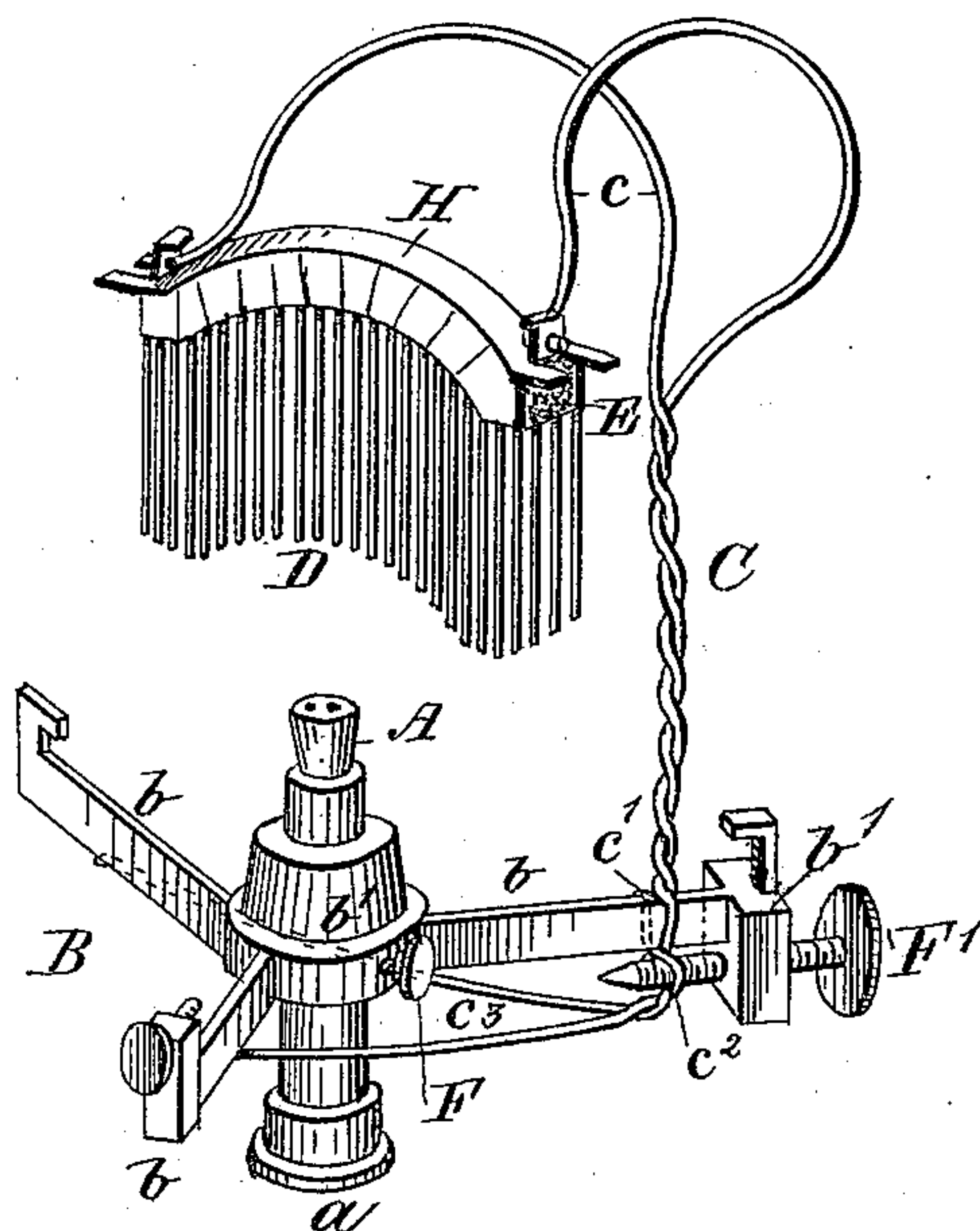
(No Model.)

O. B. FAHNEHJELM.

METHOD OF PRODUCING LIGHT BY INCANDESCENCE.

No. 450,099.

Patented Apr. 7, 1891.



Witnesses  
Paul M. Kuobloch  
Samuel Owen Edmonds

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his atty

# UNITED STATES PATENT OFFICE.

OTTO BERNHARD FAHNEHJELM, OF STOCKHOLM, SWEDEN, ASSIGNOR, BY  
MESNE ASSIGNMENTS, TO THE FAHNEHJELM INCANDESCENT GAS LIGHT  
COMPANY, OF CHICAGO, ILLINOIS.

## METHOD OF PRODUCING LIGHT BY INCANDESCENCE.

SPECIFICATION forming part of Letters Patent No. 450,099, dated April 7, 1891.

Application filed December 26, 1883. Serial No. 115,500. (No model.) Patented in Germany November 17, 1883, No. 29,498; in Belgium November 30, 1883, No. 63 217; in England December 12, 1883, No. 5,646; in Austria-Hungary January 15, 1884; in France February 5, 1884, No. 158 572; in Italy February 10, 1884, No. 16,377, and in Sweden March 20, 1884.

*To all whom it may concern:*

Be it known that I, OTTO BERNHARD FAHNEHJELM, a subject of the King of Sweden, residing at Stockholm, in Sweden, have invented  
5 certain new and useful Improvements in Methods of Producing Light by Incandescence, (for which I have obtained Letters Patent in Great Britain, No. 5,646, dated December 12, 1883; in  
Belgium, No. 63,217, dated November 30, 1883;  
10 in France, No. 158,572, dated February 5, 1884; in Italy, No. 16,377, dated February 10, 1884; in Sweden, dated March 20, 1884, said Swedish patent bearing no number; in Germany, No. 29,498, dated November 17, 1883, and in Austria-Hungary, dated January 15, 1884, but not  
15 numbered;) and I do hereby declare the following to be a full, clear, and exact description of the invention.

It has heretofore been proposed to make an  
20 incandescent light by supporting various materials of various shapes in a fuel-gas flame. I have discovered, however, that the effectiveness of such a light is greatly increased if the incandescing material is supported in the  
25 gas-flame, so as to disturb its natural shape as little as possible. My method of producing the said result is based upon the principle that the flame temperature of a gas-flame is lessened by disturbing the free and natural  
30 burning thereof; that if burned without unnecessary disturbance or breaking up it will produce sufficient heat to render the proper bodies incandescent and produce a satisfactory light; and to this end my invention consists in the method by which I accomplish the  
35 result stated.

I so divide and separate the materials to be rendered luminous and incandescent that they will present sufficient surface to disseminate the proper amount of light and so arrange them that they will not materially disturb the free burning of the flame or break  
40 up the same to any unnecessary extent, and thus utilize to the greatest possible extent the calorific value of the gas. Any suitable mineral refractory body or bodies may be employed and suspended or held in contact with the ordinary fuel-gas flame to produce light

by incandescence—such, for instance, as magnesia, zircon, lime, and other analogous refractory mineral substances or oxides—and any suitable arrangement of devices to hold  
50 such a body in proper position relatively to the flame may be resorted to and any suitable or ordinary gas-burner may be used. Such body or bodies must, however, be employed in such a manner as that they will disturb the free burning of such flames to the  
55 slightest possible extent and at the same time be subjected to the heat thereof. In order to accomplish this result I have found by continued experiment and practice that it is necessary that the said body or bodies be attenuated, and also arranged in such relation to the burner that their free ends shall be sub-  
60 jected to the gas-flame and that the axes of the bodies be substantially parallel with the axis of the flame, so that such body or bodies may thereby present the slightest opposition possible to the flame as it ordinarily burns,  
65 and that the tips or free ends of the said body or bodies, when grouped, should be arranged in different planes, so as to conform in general to the shape of the flame.

To produce incandescence rapidly, to diffuse a sufficient volume of light, and to facilitate the suspension and adjustment of the refractory body relatively to the gas-flame and also to produce the same at such a cost  
75 as to be within the means of the general public, I prefer to employ a mineral substance or oxide capable of being converted into attenuated bodies of suitable form. These attenuated bodies I assemble in groups and suspend  
80 or place such groups in contact with an open flame of water-gas. In a separate application for patent filed on or about August 4, 1884, and numbered 139,649, and in certain Letters Patent of the United States granted  
85 to me on the following dates and known by the following numbers, respectively: February 17, 1885, No. 312,452, and December 15, 1885, No. 332,650. I have fully described the method of obtaining these attenuated refractory mineral bodies, the method of and means  
90 for grouping the same together and holding



or suspending them in the open flame of a jet of water-gas and for adjusting the refractory bodies relatively to the zone of combustion or greatest heat of such flame, and therefore such details are not herein described.

In the accompanying drawing I have illustrated by an isometrical view one mode of grouping the attenuated bodies and holding or suspending the same in proper relation to the burner to subject them to a water-gas flame and also one form of such attenuated body.

In the drawing, A indicates an ordinary fan or fish-tail or other gas-burner; B, the shade-holder composed of radial arms *b*, secured to an interiorly-threaded sleeve *b'*, adapted to be screwed to the exteriorly-threaded burner-pipe *a*, to adapt said shade-holder for vertical adjustment on the pipe *a*.

C is a standard formed by twisting together two wires, the untwisted portion forming at one end diverging arms *c*, by which standard the group of attenuated refractory bodies D is held or from which said group is suspended.

These refractory bodies I have shown in the form of needles, and they are composed of a refractory mineral substance or oxide of the character of those hereinbefore set forth, said bodies or needles being at one end embodied in a refractory or non-combustible substance—such as common clay, fire-clay, or other like substance or cement, as indicated at E—their free ends being held or suspended in the flame of the burner A.

The refractory substance or cement is contained in a sheet-metal holder H, which holder is suspended from the arms of the support C. The group of mineral refractory bodies are adjusted vertically relatively to the burner-flame by screwing the shade-holder up or down and locking the same in position by means of a set-screw F, and said group of refractory bodies is adjusted laterally or horizontally relatively to the flame as follows: The untwisted wire at the opposite end is formed into a loop *c'*, that embraces one of the shade-brackets, and below this is a second loop *c''*, into which takes a set-screw F', that works in a threaded opening formed in a depending lug *b'* on said bracket-arm *b*, the untwisted free end *c'''* of the standard-wires bearing against the under side of the bracket-arms *b*, as shown, to firmly hold the standard C in position.

Any other desired and suitable mode of

suspending or holding the refractory body or bodies within the burner-flame and of adjusting the same relatively to said flame may, however, be adopted.

By converting the refractory mineral bodies into the form of needles or other attenuated form they may be very rapidly brought to a state of incandescence, while at the same time a large surface is obtained by which the light is diffused and from which it is radiated.

In the manufacture of these refractory bodies I prefer to employ magnesia, zircon, alumina, lime, or other analogous materials or mixture of two or more of such substances, owing to the intense light obtained therefrom.

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

1. The herein-described method of producing light by incandescence, which consists in subjecting the free ends, arranged in different planes, of a group of attenuated bodies of refractory material to contact with a gas-flame, whereby the free burning of the flame is disturbed to the slightest possible extent, as described.

2. The herein-described method of producing light by incandescence, which consists in subjecting the free ends, arranged in different planes, of a group of attenuated refractory mineral bodies to contact with a gas-flame with the tips or free ends of such bodies conforming in outline to the shape of such flame, whereby the free burning of the flame is disturbed to the slightest possible extent, as described.

3. The herein-described method of producing light by incandescence, which consists in subjecting the free ends, arranged in different planes, of a group of attenuated bodies of refractory material—such as needles or lamellæ—to contact with a gas-flame, the axes of the bodies being substantially parallel with the axis of the flame, whereby the free burning of the flame is disturbed to the slightest possible extent, as described.

In testimony whereof I affix my signature in presence of two witnesses.

OTTO BERNHARD FAHNEHJELM.

Witnesses:

C. A. DELLURK,  
NERE A. ELFWING.