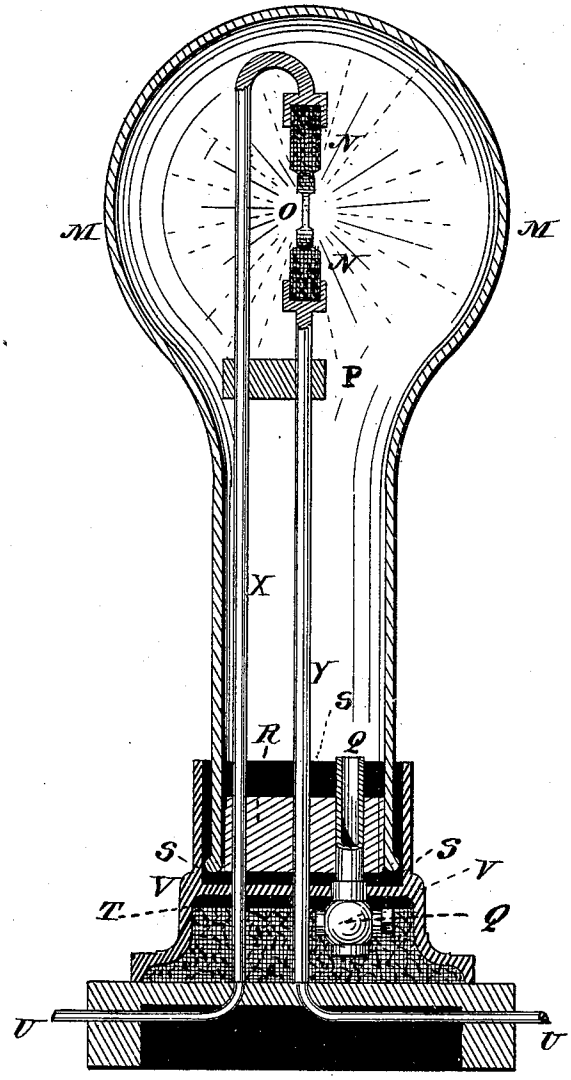
H. S. MAXIM.
Electric Lamps.

No. 230,953. Patented Aug. 10, 1880.



Witnesses;-
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UNITED STATES PATENT OFFICE.

HIRAM S. MAXIM, OF BROOKLYN, NEW YORK, ASSIGNOR TO SPENCER D. SCHUYLER, OF NEW YORK CITY.

ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 230,953, dated August 10, 1880.

Application filed October 4, 1878.

To all whom it may concern:

Be it known that I, HIRAM S. MAXIM, of the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Electric Lamps, of which the following is a specification, reference being had to the accompanying drawing, which forms a part hereof.

My invention relates more particularly to the class of lamps known as "incandescent" lamps, in which light is produced by the incandescence of a continuous strip or conductor of low conductivity, forming part of an electrical circuit.

In such lamps, as they have been heretofore constructed, the incandescent part of the lamp has usually been surrounded with a closed glass globe, and in order to protect such part from atmospheric oxygen the air has been more or less perfectly exhausted from the globe, and in some cases nitrogen has been introduced into the globe to displace the air.

It has been found extremely difficult in practice, if not altogether impossible, to remove or exclude all air from the globe by such means, and, as is well known, the conductor or light-giving part of the lamp deteriorates very rapidly if even a very small amount of free oxygen comes into contact with it when it is highly heated. This is especially true when the incandescent part of the lamp is made of carbon.

My improvement consists in displacing the air contained in the transparent globe with a liquid hydrocarbon, preferably gasoline, and then expelling such liquid by heat and exhausting the globe, so as to leave in it a hydrocarbon vacuum or a highly-attenuated atmosphere of hydrocarbon vapor surrounding the conductor or light-giving part of the lamp. I have also devised an improved method of sealing the mouth of the globe.

In the drawing, M is a glass globe made with a long neck, as shown, so as to remove the sealed part to some distance from the hot carbon. N N are carbon connections supported by the rods X and Y. O is a thin slip of very dense carbon joined to its supports N N with ball-and-socket joints of the same material, so as to prevent the fracturing of the conductor by any slight change of position with reference to its supports. P is a clamp for holding the rods X and Y. Q is a cock, and R is a plug, of wood or other insulating material, fitted to the mouth of the globe M, and having holes through it to receive the rods X and Y and the cock Q. S is wax or pitch melted and applied to the plug R for the purpose of making a tight joint and rendering the plug impervious to air. T is wax applied to the cock Q and its connections to prevent leakage. U U are the electrical connections, and V is a base, which may be made of brass, iron, or other suitable material.

The lamp is prepared for use as follows: The carbon conductor and its supports being placed in position, and the plug R sealed into the mouth of the globe with melted shellac and copal, and the whole cemented into the base, the lamp is inverted and filled through the cock Q with a very light gasoline. This should be allowed to remain in the lamp for about two days, or until it has penetrated into all the pores of the carbon and its attachments, and displaced all traces of atmospheric oxygen, when the inverted lamp is placed in hot water and the cock Q opened. The gasoline is quickly volatilized and driven out, and the rush of gasoline vapor carries out all air-bubbles. When about half the gasoline is thus boiled out, the lamp is removed from the hot water and placed right side up, and the cock is again opened while there remains quite a pressure of vapor in the globe, so as to blow out the remainder of the liquid gasoline. Care should be taken to close the cock before any air can get in. The cock is then attached to an exhausted receiver, or to an air-pump, and all the vapor remaining in the globe is exhausted as perfectly as practicable. When this is done there will remain only an extremely rarefied vapor of gasoline in the globe surrounding the conductor, and the cock is closed and sealed with wax, so as to prevent all leakage of air.

Upon the heating of the carbon conductor by the passage of the current its great heat decomposes the gasoline vapor immediately contiguous to it and precipitates a slight coating of carbon taken from it upon the hottest part of the incandescent conductor, which is thus slightly increased in size at its weakest

points and made of greater density, while if there should be any trace of free oxygen present it would be taken up by the fine particles of carbon at the moment of their liberation from the hydrogen, and not attack the solid carbon at all.

Any other suitable hydrocarbon may be used in place of gasoline, although I prefer gasoline on account of its capacity for penetrating all the pores of the carbon and driving out the air contained in them.

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

1. In an electric lamp having its light-giving part inclosed in a sealed globe, a hydrocarbon vacuum or highly-rarefied hydrocarbon vapor, substantially as described.

2. In an electric lamp, a continuous conductor of carbon, adapted to be rendered incandescent by the passage of a current of electricity, in combination with a sealed globe inclosing such conductor in a hydrocarbon vacuum or highly-rarefied hydrocarbon vapor, substantially as described.

3. The process of producing a vacuum in the globe of an electric lamp, which consists in displacing the air contained in it with a liquid hydrocarbon, expelling a portion of such hydrocarbon by heat, and exhausting the remainder, substantially as described.

4. The combination, in an electric lamp, of the plug R, the base V, the globe M, and the cock Q with the wax or pitch S and T, substantially as described.

HIRAM S. MAXIM.

Witnesses:
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