UNITED STATES PATENT OFFICE.

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MANUFACTURE OF INCANDESCENT LAMPS.

SPECIFICATION forming part of Letters Patent No. 430,932, dated June 24, 1890.

Application filed October 20, 1882. Serial No. 74,780. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented a new and useful Improvement in the Manufacture of Incandescing Electric Lamps, (Case No. 492,) of which the following is a specification.

The object I have in view is to exhaust the inclosing-globes of incandescing electric lamps to an almost complete vacuum in a simple and efficient manner, which will not require the use of vacuum-pumps or other complicated apparatus.

The lamp when ready for the exhausting process consists of a glass stem supporting the carbon filament and having the leading-in wires sealed within it, such glass stem being sealed within an outer inclosing-globe, from the top of which extends a long glass tube or stem.

In carrying out my invention I fill the globe through the tube or stem with a liquid, preferably one the tension of whose vapor is low even at high temperatures and at the freezing-point is practically nothing, so that such vapor condenses readily and completely at the freezing-point, oil of turpentine being exceedingly suitable for the purpose. I then invert the lamp and immerse the end of the stem in a bath of the same liquid. I then heat the liquid to form turpentine or other vapor, (according to the liquid used,) and continue this heating until the tension of the gas is sufficient to drive all the oil out into the stem. The heating may be accomplished either by heating the globe externally or by passing an electric current through the incandescing filament. The stem is then sealed off at a point above the liquid. An atmosphere of turpentine or equivalent vapor thus remains in the lamp and the remaining portion of the stem. I now again heat the bulb, at the same time immersing the end of the stem or exhaust-tube in a powerful freezing-mixture. The heating of the vapor drives out such vapor from the globe and the freezing-mixture causes said vapor to be condensed in the exhaust-tube. This tube is again sealed off, this time close to the lamp-globe, so that the globe now contains a vacuum. The filament of the lamp is heated to high incandescence during the latter external heating of the globe, in order to drive out any occluded gases which might otherwise remain in the pores of the filament or in the clamps which hold it. If desired, a common air-pump might be used to remove a portion of the vapor from the globe, and so hasten the exhausting process. If desired, a small glass bulb may be attached to the lamp-globe containing charcoal or other absorbent material to take up any vapor which may fail to condense in the tube, this bulb being afterward sealed off from the globe.

I am aware that patent to Maxim, No. 230,953, dated August 10, 1880, describes a process consisting in displacing the air in a lamp-globe by liquid gasoline and then expelling such liquid in such manner as to leave in the globe an atmosphere of hydrocarbon vapor.

What I claim is—

1. The process of exhausting the inclosing-globe of an incandescing electric lamp, consisting in filling said globe with a liquid, inverting the globe, heating said globe, and expelling all of said liquid by the tension of the vapor produced by said heating, and again heating said globe externally to expel said vapor, the carbon filament of the lamp being heated to incandescence by an electric current during the latter external heating, substantially as set forth.

2. The process of exhausting the inclosing-globe of an incandescing electric lamp, consisting in filling said globe with a liquid the tension of whose vapor is low at high temperatures, inverting the globe, heating said globe, and expelling all of said liquid by its vapor-tension, and again heating said globe to expel the vapor, at the same time lowering the temperature of the exhaust-tube to condense said vapor, substantially as set forth.

3. The process of exhausting the inclosing-globe of an incandescing electric lamp, consisting in filling said globe with a liquid, inverting the globe, heating said globe, and expelling all of said liquid by its vapor-tension, sealing off the exhaust-tube at some distance from its connection with the lamp, heating

the globe, while at the same time the temperature of the remaining portion of the exhaust-tube is greatly reduced, thereby expelling the vapor from the globe and condensing it in the tube, and finally sealing off the tube close to the globe, substantially as set forth,

4. The process of exhausting the inclosing-globe of an incandescing electric lamp, consisting in filling said globe with oil of turpentine, inverting the globe, heating said globe, and expelling all of the oil by the tension of its vapor, and again heating said globe to expel said vapor, substantially as set forth.

This specification signed and witnessed this 14th day of October, 1882.

THOS. A. EDISON.

Witnesses:
H. W. SEELY,
RICHD. N. DYER.