

No. 726,293.

PATENTED APR. 28, 1903.

J. W. HOWELL.  
EXHAUSTING LAMPS.  
APPLICATION FILED NOV. 9, 1897.

NO MODEL.

FIG. 1.

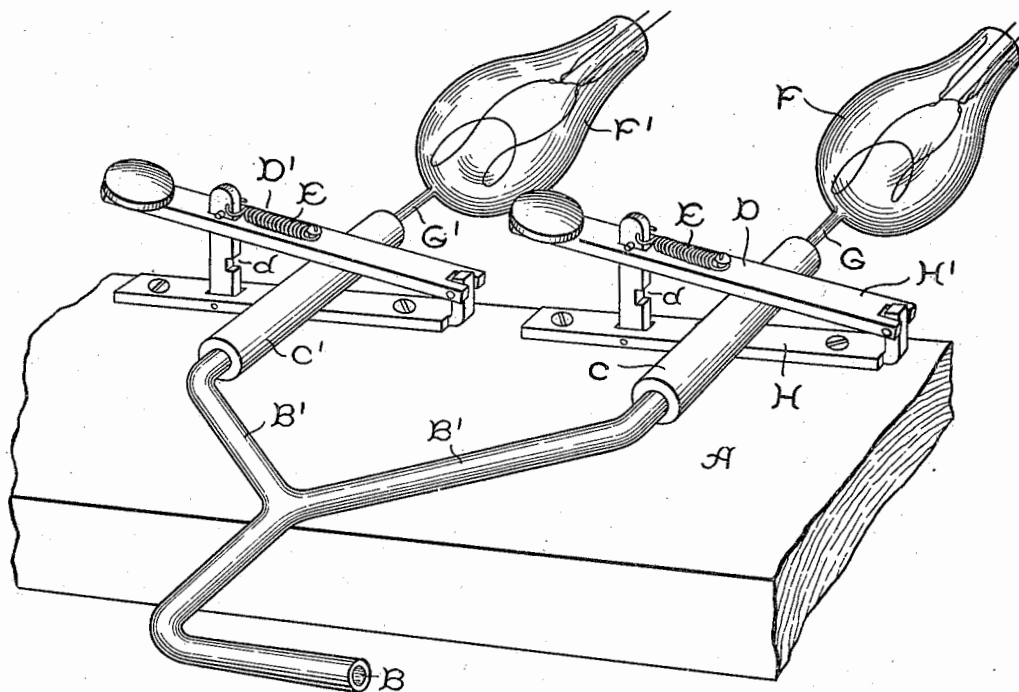
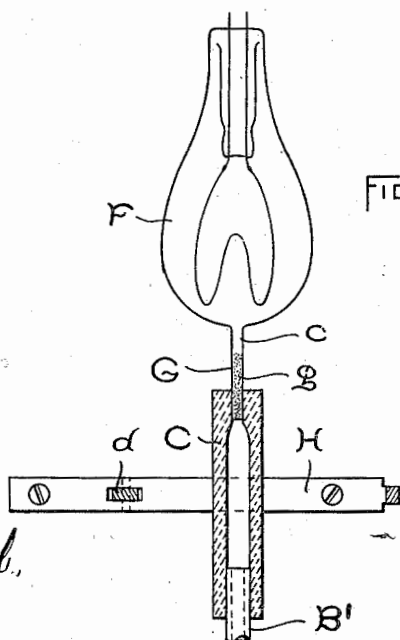


FIG. 2.



WITNESSES,

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INVENTOR,  
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Geo. B. Blodgett,  
att'y.

# UNITED STATES PATENT OFFICE.

JOHN W. HOWELL, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## EXHAUSTING LAMPS.

SPECIFICATION forming part of Letters Patent No. 726,293, dated April 28, 1903.

Application filed November 9, 1897. Serial No. 657,959. (No specimens.)

*To all whom it may concern:*

Be it known that I, JOHN W. HOWELL, a citizen of the United States, residing at Newark, in the county of Essex, State of New Jersey, have invented certain new and useful Improvements in Exhausting Lamps, of which the following is a specification.

My present invention relates to the manufacture of incandescent electric lamps, and particularly to the now well-known chemical processes of exhausting the bulb. These processes have come into some use, and they depend for their utility upon the fact that the ordinary mechanical or mercurial pumps are incapable without considerable expense of time of obtaining the necessary perfection in the vacuum which is required for any extended life of the filament. In order to save the extended treatment necessary under the pump, the chemical processes referred to have been used, they consisting in introducing within the vacuous inclosure, and generally within the same tube which is used in exhausting, (and which is afterward sealed off in making the completed lamp,) a chemical which will readily combine when heated with the remnant of gases which are released during the final incandescence of the filament in the process of manufacture. In the ordinary ways of using these processes the selected chemical is placed in the tubulature of the lamp. After the vacuum is obtained as far as desired by mechanical means the tubulature is sealed below the chemical. The filament is then brought to intensive incandescence and the chemical heated to drive vapors in the lamp-bulb, which by combination perfect the vacuum. The tube is then sealed above the chemical or between it and the lamp, the superfluous portion of the tube being, as usual, cut off. The process thus outlined is, however, open to some objections. Among others it is found that the application of heat to the tube in the first sealing is apt to volatilize too much of the chemical, introducing too much vapor within and tending to discolor the bulb of the lamp. The moment of best exhaustion by the mechanical pump must also be seized to perform the first sealing off of the lamp. This, however, is a definite moment, while

the sealing occupies several seconds at least. In addition there is more or less loss from collapse of the tubes, permitting air to leak into the bulb. These objections are obviated by the improved method of exhausting which I adopt. In this I connect the lamp-bulbs, as usual, to the mechanical pump; but I employ for the purpose a piece of very thick and substantial rubber tubing, which is slipped over the pipe leading to the pump and into the end of which the lamp-tubulature is inserted after the chemical has been placed in the latter. I find this a convenient and reliable form of connection, which is capable of being closed with promptness by an ordinary pinch-cock and one which will maintain the vacuum unimpaired long enough to effect the final exhaustion of the lamp by chemical means. It is of course understood that so long as the connection to the pump is open it is difficult to obtain a proper vacuum in the bulb. After the connection to the pump is closed the lamp-filament is brought to incandescence, the chemical being, if necessary, also heated slightly; but as this operation is in my process practically independent of sealing it may be performed with some exactitude. The tube is then sealed off and the lamp is completed in the usual way.

The essence of my invention therefore consists in the closing of the connection between the lamps and the pump without the use of heat, so that an excess of the chemical used to perfect the vacuum is not volatilized.

It consists also in the detail of the process by which I am enabled, in addition to the advantages already pointed out, to perform the sealing operation much more expeditiously and with a saving in the amount of tube necessary under the old process.

The accompanying drawings show a convenient method of carrying out the process which I have indicated above, the apparatus employed being simple and cheap.

Figure 1 is a perspective view of two lamps in the process of sealing; and Fig. 2 is a view, partly in section, showing the connection of the lamp to the pump.

In Fig. 1 I have not illustrated the pump, which may be of any well-known form. The details of such apparatus being well known,

I have not deemed it necessary to illustrate it. A is the base or bench, at which the workman is employed. B is the tube or pipe leading to the pump, which is branched into two tubes B' B'. Upon each of these latter is a short stout piece C C' of rubber tubing sufficiently heavy to stand without collapsing, the pressure brought upon it by the vacuum-pump. Embracing each tube is a pinch-cock D, consisting of one member H, screwed to the base-board, and another, H', hinged to the first. A latch having a detent *d* and a spring E is also provided for holding the pinch-cock closed. The lamps are indicated at F F', the tube being shown at G.

In Fig. 2 a portion of the same parts is shown, partly in plan, partly in section. The chemical employed is shown at *g*.

The operation of the device is as follows:  
 20 When the vacuum is nearly complete, the pinch-cock D is closed, the bar H' being held down by the detent *d*. The filament is then brought to incandescence by the electric current in the usual way, and the chemical *g* may  
 25 also be heated, if desired. When the exhaustion has reached the desired stage, the tube G is closed by sealing at the point *c*, (see Fig. 2,) and the lamp may then be completed in the usual way. The sealing being effected  
 30 above the chemical, no considerable portion of the latter will be volatilized, the vacuum will not be impaired, nor will the globe be discolored.

What I claim as new, and desire to secure  
 35 by Letters Patent of the United States, is—

1. The process of exhausting incandescent-lamp bulbs to form a high vacuum herein set

out, which consists in connecting the tubulature containing a suitable chemical to the pumps, exhausting to the desired degree, 40 then closing the pump connection below the chemical without the use of heat; then bringing the filament to incandescence and causing the chemical to react on the remanent gases, and then sealing the lamp between the 45 chemical and the bulb.

2. The method of exhausting lamp-bulbs to form a high vacuum, which consists in inserting a chemical exhausting agent in an extended open-ended tube leading from the 50 bulb, exhausting the bulb through said tube to the desired degree by treatment on the pumps, closing the pump connection below the chemical without heating the tube, bringing the filament to incandescence, then heating the chemical to volatilize a small portion thereof and completing the exhaustion by its reaction on the remanent gases, and finally sealing the lamp between the chemical and bulb, as set forth. 60

3. The method of exhausting bulbs to form a high vacuum, which consists in pumping off the air from the bulb, closing the connection between the pump and bulb without the aid of heat, volatilizing the chemical within 65 the bulb to absorb the remanent gases, and then sealing off the bulb.

In witness whereof I have hereunto set my hand this 6th day of November, 1897.

JOHN W. HOWELL.

Witnesses:

S. N. WHITEHEAD,  
 M. MAYNARD.