

UNITED STATES PATENT OFFICE.

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COLD EXHAUSTION OF INCANDESCENT ELECTRIC LAMPS AND THE LIKE.

No Drawing.

Application filed September 25, 1923. Serial No. 664,777.

To all whom it may concern:

Be it known that I, DANIEL SNYDER GUSTIN, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Cold Exhaustion of Incandescent Electric Lamps and the like, of which the following is a specification.

10 This invention relates to the exhaustion of evacuated devices in such a manner that the envelopes thereof need not be heated during such exhaustion and especially to the manufacture of incandescent electric lamps.

15 An object of my invention is the cold exhaustion of incandescent electric lamps and the like, employing some carbonaceous material for the purpose of removing moisture or preventing its action.

20 Another object of my invention is the employment of an oxygen flush in the manufacture of vacuum-type incandescent electric lamps and the like, together with the introduction of graphite or other carbonaceous material into said lamps on the filaments thereof, so that it is unnecessary to employ heat during the evacuation thereof, as residual moisture therein is cleaned-up by said material when the filament is incandescent.

30 A further object of my invention is the simplification of the exhaust schedule for the manufacture of vacuum-type incandescent electric lamps, by the addition of a small proportion of graphite or a carbon compound very rich in carbon to a phosphorous getter for the purpose of cleaning-up moisture.

40 Other objects and advantages of the invention will become apparent as the description proceeds.

In my copending application Serial No. 639,460, filed May 16, 1923, gas-filled incandescent lamps and getters therefor, and assigned to the Westinghouse Lamp Company, I have disclosed an organic getter especially adapted for use in gas-filled incandescent electric lamps. Such a getter may be applied to the lamp filament in the form of a solution or introduced as a vapor with the gas filling and is especially designed to obviate the necessity of heating the lamp bulb during the exhausting process. It is so active

that it is adapted to clean up moisture, which may remain in the bulb through failure to heat the same during exhaust.

Such organic compounds as naphthalene, benzidine and the like, as disclosed in said application, have been found to work very well in gas-filled lamps as they remove moisture or prevent its action. However, they release hydrogen and other gases when the lamp becomes hot, which is not desirable in a lamp of the vacuum type. For securing the desired results, that is, for eliminating heating during exhaust and removing moisture chemically, I have found that the nearer the carbonaceous material, used as a moisture clean-up, approached pure carbon, the less tendency there was to release such gases.

Aquadag and later graphite were employed for this purpose, applied to the filament along with the usual getters. Other suitable materials include lamp-black, coal, charcoal and other similar carbon compounds poor in the hydrogen content. These substances make it possible to manufacture lamps of the vacuum type which do not become gaseous on heating and in this respect, are as good as regular process lamps.

My invention will be better understood by the following more detailed description thereof.

A preferred method of manufacturing vacuum-type lamps according to my invention comprises gettering the filament with a regular phosphorous-cryolite getter to which has been added a small proportion of graphite. A preferred formula for my getter is 41 grams of cryolite, 12 grams of phosphorous, 10 grams of graphite and about 27 cubic centimeters of the usual amyl-acetate, nitro-cellulose binder solution. The getter may be applied to the filament in any desired manner as by the usual gettering cup and preferably should be applied in such quantity as to constitute from 3 to 4% by weight of the filament. The filament may be mounted in the usual manner and such mount preferably sealed into a bulb, the bulb exhausted to a moderate degree, flushed with oxygen, preferably exhausted and flushed twice more, although the exact number of times is immaterial, as it is merely desired to substitute substantially pure oxygen for the air origi-

nally present therein. The lamp may then be exhausted so as to leave about 300 microns of oxygen therein, after which it is tipped-off as usual.

5 The filament is preferably flashed at higher current than usual so as to obtain the necessary temperature to volatilize the graphite. After the flashing operation, it is found that a very good vacuum is secured in
10 the lamp, as the phosphorus in the getter cleans up the oxygen efficiently, forming phosphorus pentoxide and any residual moisture is eliminated by the graphite and the phosphorus pentoxide.

15 Although graphite has been mentioned as the preferred material for this purpose, it is to be understood that other similar forms of carbon and carbon forming materials, examples of which have been mentioned, may
20 be used within the spirit and scope of my invention.

The exact action of the graphite, or other form of carbon, in cleaning up residual moisture is not definitely understood but it may
25 be some action resulting in the formation of a compound such as formaldehyde, according to the equation, $C + H_2O = H_2CO$. In other words, the water may combine directly with the hot graphite or other form of carbon.
30 Another possible explanation is that the volatilized graphite or the like, physically occludes water vapor or other deleterious material.

Although this theory of the operation of
35 my getter or clean-up material in removing moisture is advanced, I do not wish to be restricted thereby, as it is immaterial by what means the clean-up is effected, so long as the desired results are secured. The main
40 point to be noted, is that I have found that graphite, other similar forms of carbon, hydrocarbons poor in hydrogen and carbon compounds very high in carbon are very efficient for the clean-up of moisture in incandescent electric lamps, particularly those of
45 the vacuum type, and obviate the formation of deleterious gases which result when hydrocarbons such as naphthalene, benzidine and the like are used. Although such gases

are not very undesirable in small proportions in gas-filled lamps, yet they have a more pronounced deleterious effect in vacuum-type lamps.

Although I have described what I now consider the preferred method of practicing
55 my invention, it is to be understood that the same is merely illustrative, that my invention is not limited to vacuum-type lamps and that it is not essential that an oxygen flush be used in combination with my preferred
60 getter, that a hot exhaust may be employed, if desired, with improved quality resulting and other modifications may become apparent to those skilled in the art within the spirit and scope of the appended claims. 65

What is claimed is:

1. The method of manufacturing incandescent electric lamps of the vacuum type comprising applying a getter consisting of a mixture of phosphorous and graphite to a filament, sealing said filament into a bulb,
70 exhausting said bulb without the aid of heat, flushing with oxygen, cold exhausting again and flashing said filament to effect a gas and moisture clean-up therein. 75

2. The method of manufacturing incandescent electric lamps of the vacuum type comprising sealing a filament, to which has been applied a regular phosphorus getter containing a small proportion of graphite,
80 into a bulb, cold exhausting and flushing said bulb a plurality of times with oxygen, again exhausting cold, tipping off and flashing said filament to effect a gas and moisture clean-up therein. 85

3. The method of manufacturing incandescent lamps of the vacuum type comprising sealing a filament, to which has been applied a phosphorus getter containing a small proportion of carbon, into a bulb, cold-exhausting said bulb, tipping off the bulb
90 and flashing the filament to heat the getter and effect a gas and moisture clean-up.

In testimony whereof, I have hereunto subscribed my name this 24th day of September 1923. 95

DANIEL SNYDER GUSTIN.