

UNITED STATES PATENT OFFICE.

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METALLIC FILAMENT FOR INCANDESCENT ELECTRIC LAMPS.

986,558.

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No Drawing.

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To all whom it may concern:

Be it known that I, KARL FARKAS, a citizen of the Kingdom of Hungary, and a resident of New York, in the county and State of New York, have invented certain new and useful Improvements in Metallic Filaments for Incandescent Electric Lamps, of which the following is a specification.

This invention has reference to improvements in electric conductors for producing light.

It pertains particularly to light emitting conductors used in incandescent electric lamps constituting therein the so-called metallic filament which requires relatively little current for becoming incandescent. Such metallic filament is of rather great length and therefore presents a large light emitting surface.

Metallic filaments for incandescent electric lamps consist of highly refractory elementary substances as for instance tungsten, molybdenum, metallic osmium, chromium, iridium or ruthenium, etc. These metallic filaments are made from the compounds and salts of such highly refractory substances preferably by producing *in vacuo* a coating of same on a fine metallic conductor, said coating being formed by decomposing vapors of salts by means of the electric current.

In order to obtain such refractory coatings which may be drawn out I introduce into the vacuum with the vapors of the salts of the highly refractory elementary substances the vapors of a salt of a ductile metal which possesses the property of being easily drawn out and which ductile metal may be evaporated at a relatively low temperature, such metal forming with the refractory elementary substance practically an alloy, as for instance silver.

For the purpose of effecting a rather quick decomposition of the vapors of the salts of highly refractory elementary substances and ductile metal *in vacuo*, for instance vapors of chlorid of tungsten and chlorid of silver I introduce simultaneously with these vapors or immediately thereafter some vapors of pyrogallol.

In carrying the invention into effect I substantially proceed as follows: A fine metallic conductor is placed between the clamps of a support to which current may be supplied. The support with metallic conductor is

placed into a receiver of glass from which the air is then exhausted. Now vapors of a salt of a highly refractory elementary substance such as chlorid of tungsten and vapors of a salt of a ductile metal such as chlorid of silver for instance are introduced and preferably simultaneously therewith some vapors of pyrogallol. By heating electrically the metallic conductor the vapors within the receiver are decomposed and a refractory coating is produced on said metallic conductor in a quick manner by virtue of the presence of the vapors of pyrogallol which latter is an organic substance and when its vapors are decomposed atomistic carbon is formed. The carbon *in statu nascenti*, acts as a cementing means for the refractory coating just forming and while in the incandescent state. Pyrogallol acts as a reducing agent and absorbs oxygen in considerable quantities, as is well known. This substance takes up the oxygen from the metal oxids or oxids of the highly refractory elementary substances of which the refractory coating is primarily composed whereby a partial reduction is effected. When the coating has thus been produced the vapors within the receiver are removed and hydrogen gas is introduced in the usual manner and the refractory filament electrically heated whereby the coating or deposition is reduced to an elementary substance. If desired the conductive core, when consisting for instance of silver, may be volatilized.

The proportions in which the vapors of chlorid of tungsten, chlorid of silver and pyrogallol are mixed may be varied considerably. The large bulk of the gas mixture naturally is the vapor of the chlorid of tungsten to which some vapors of chlorid of silver and pyrogallol are added. Of the first mentioned vapor 85 per cent., for instance, may be allowed to enter the receiver mixed with 8 per cent. of the vapor of the silver salt and 7 per cent. of pyrogallol vapor. The vacuum in the receiver, which at the start is about or slightly above 29 inches, will be reduced by the introduction of the vapor mixture to about 20 inches. When the coating has been produced as described the excess of the vapors is removed and hydrogen gas introduced into the evacuated receiver which, in the well known manner, completes the reduction of the coating to elementary tungsten. The conducting core

within the metallic filament may be volatilized by the electric current or not, as desired, before the filament is placed into a lamp globe.

5 I claim as my invention:

1. The process of producing compound metallic filaments for incandescent electric lamps consisting in heating electrically a fine metallic conductor in a rarefied atmosphere of vapors of a salt of a highly refractory elementary substance mixed with some vapors of a salt of a ductile metal and some vapors of pyrogallol producing thus a coating on the fine conductor, and reducing said coating to metal.

2. The process of producing compound metallic filaments for incandescent electric lamps consisting in heating electrically a fine metal wire in a rarefied atmosphere of vapors of a tungsten compound mixed with some vapors of a silver salt and some vapors of pyrogallol producing thus a refractory coating on the fine conductor, and reducing said coating to metal.

3. The process of producing compound metallic filaments for incandescent electric lamps consisting in heating electrically a fine metal wire in a rarefied atmosphere composed of about 85% of vapors of a tungsten compound, about 8% of vapors of a silver salt, and about 7% of pyrogallol vapor, producing thus a refractory coating on the fine conductor, and reducing said coating to metal.

4. The process of producing compound metallic filaments for incandescent electric lamps consisting in heating electrically a fine silver wire in a rarefied atmosphere of about 20 inches composed of about 85% of vapors of a tungsten compound, about 8% of vapors of chlorid of silver, and 7% of pyrogallol vapors, producing thus a refractory coating on the fine conductor, and reducing said coating to metal.

5. In process of producing compound metallic filaments for incandescent electric lamps having an inner conductive core the step or phase of decomposing simultaneously by the action of the electric current vapors of a compound of a highly refractory metal mixed with some vapors of a salt of a ductile metal and some vapors of pyrogallol.

6. In process of producing compound metallic filaments for incandescent electric lamps having an inner conductive core the step or phase of decomposing in a previously evacuated space simultaneously by the action of the electric current vapors of a tungsten compound mixed with some vapors of a silver salt and some vapors of pyrogallol.

Signed at New York, N. Y., this 5th day of August, 1909.

KARL FARKAS.

Witnesses:

LUDWIG K. BOHM,
GUY V. WILLIAMS.