UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

MANUFACTURE OF CARBON FILAMENTS.

SPECIFICATION forming part of Letters Patent No. 411,020, dated September 17, 1889.

Application filed December 6, 1886. Renewed February 11, 1889. Serial No. 299,557. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in the Manufacture of Carbon Filaments, (Case No. 698,) of which the following is a specification.

The object of my invention is to produce carbon filaments of unusually high resistance for the incandescent conductors of electric lamps.

My invention consists, mainly, in making carbon filaments by forming filaments of clay or other plastic substance which can be baked hard, baking the same, covering the same with carbon, and then eating away the baked plastic material by hydrofluoric acid or other suitable solvent, leaving a filamentary shell of carbon well adapted for use as the high-resistance incandescent conductor of an electric lamp.

In carrying my invention into effect I take a quantity of ordinary clay or similar plastic refractory substance—such as an oxide made into a plastic mass by mixing it with a liquid—and form filaments therefrom, preferably by forcing the substance by pressure through suitable cylindrical dies and then bending the plastic filaments thus formed into the desired shape; or, instead of this, the plastic substance may be rolled into sheets and the filaments cut or stamped therefrom in the shape required. Such filaments are then slowly baked in a suitable receptacle until they have shrunk to about as great an extent as they will shrink, and are then put in a chamber or carbonizing-mold containing powdered anthracite coal and heated to a white heat, whereby hard porcelain-like filaments are formed. These filaments are then placed in another tube, chamber, or mold and heated to a white heat in the presence of a volatile compound containing carbon, or while a decomposable gas or vapor containing carbon is passed through the chamber. Each filament thus receives a hard even coating of carbon upon its entire surface. After this the filaments are immersed in or treated with hydrofluoric acid or other acid or solvent which will eat away the clay or other material from within the carbon. The carbon itself, however, not being affected by the solvent, a filamentary shell of carbon is left, which is well adapted to be used as the conductor of an incandescent electric lamp, its especial advantage being its very high resistance, which enables the attainment of unusual economy in the amount of metal required for conductors to convey current to the lamps.

A modified method of coating the porcelain filament with carbon consists in first rubbing the filament with plumbago, so that it has a complete conducting-surface, and then passing an electric current through such surface, so as to heat it to incandescence while it is surrounded by a decomposable liquid, vapor, or gas containing carbon. The deposit of hard carbon is thus formed on the filament, which is then eaten away by the acid, as already described.

What I claim is—

1. The method of making carbon filaments for electric lamps, consisting in forming filaments from a plastic refractory material, baking said filaments, coating said filaments with carbon, and then removing the refractory material by a solvent, substantially as set forth.

2. The method of making carbon filaments for electric lamps, consisting in forming filaments from a plastic refractory material, baking said filaments, heating said filaments in the presence of a decomposable compound containing carbon, and then removing the refractory material by a solvent, substantially as set forth.

This specification signed and witnessed this 26th day of November, 1886.

THOS. A. EDISON.

Witnesses:
WM. PELZER,
E. C. ROWLAND.