UNITED STATES PATENT OFFICE.

OTTO SCHALLER, OF SÜDENDE, NEAR BERLIN, GERMANY.

FILAMENT OR WIRE FORMED OF A SINGLE CRYSTAL.

1,256,930. Specification of Letters Patent. Patented Feb. 19, 1918.

No Drawing. Application filed May 16, 1914. Serial No. 839,122.

To all whom it may concern:

Be it known that I, OTTO SCHALLER, a citizen of the German Empire, and residing at Südende, near Berlin, German Empire, have invented a certain new and useful Filament or Wire Formed of a Single Crystal, of which the following is a full, clear, and exact description.

If a body or filament is formed of a single crystal, filling out its entire cross section and length, no subsequent alteration of the structure of such body can take place, since the crystal already formed, and which constitutes, as is well known the most stable form of material fills out or constitutes the whole body, so that there is no space for any subsequent increase of the size of the crystal nor for displacement of any kind. In other words a body of this structure is from the beginning in a condition of structural permanency.

Careful observations and experiments have shown that it is possible to produce metallic wires, the whole volume of which consists of a single crystal, even when the length is comparatively great.

We have found that this process is particularly advantageous in connection with substances having an initial inclination to form large crystalline structures.

The crystal formation constituting the object of the present invention and the basis of my application No. 839,121 of even date is produced in passing a crystalline or a fibrous structure, through a short zone of intense heat, at a certain speed. In order to obtain a crystal of great length, the speed at which the wire or filament is passed through the hottest zone, must in any case, be equal to or less than the speed of growth of the crystal generated. If the process is carried out in this manner, the crystal generated in the hottest zone, and constituting the entire cross section of the filament will grow, by dissolving the on-coming or following crystals in proportion to the movement of the filament.

The crystal filament may be produced from any metal or alloys of metals as also from solid solutions of metals, particularly if the structure is of a large crystalline nature.

Advantageously very finely divided tungsten metal is employed, which has been evenly and intimately mixed with about 2%, more or less of thorium oxid. A mixture of these substances is particularly suitable for the formation of the crystal filament although, as stated other metals might be employed.

We have found that single crystals of the kind described are flexible and perfectly ductile. Furthermore wires of this kind possess the valuable property that the usual mechanical or thermic effects will not produce structural alteration or recrystallization of the same.

These wires are consequently an improvement on all wires produced mechanically, by drawing or rolling or on the known process of formation, because in connection with all known wires recrystallization appears in time and cannot be avoided permanently.

The advantages are particularly noticeable in connection with the employment of crystal wires as filaments for electric glow lamps, because they do not become brittle nor do they break either in making the lamp or in use, since no alteration of the structure takes place.

I claim as my invention:—

1. A metallic filament consisting of a single crystal throughout its whole length.

2. A metallic filament consisting of a single crystal throughout its whole length and cross section.

3. A tungsten filament composed of a single crystal.

4. A tungsten filament consisting of a single crystal elongated to any practicable length.

In testimony whereof I affix my signature in the presence of two witnesses.

OTTO SCHALLER.

Witnesses:

WOLDEMAR HAUPT,

HENRY HASPER.