

UNITED STATES PATENT OFFICE.

ACHILLES DE KHOTINSKY, OF GELNHAUSEN, PRUSSIA, GERMANY.

MANUFACTURE OF CARBON FILAMENTS.

SPECIFICATION forming part of Letters Patent No. 429,534, dated June 3, 1890.

Application filed February 3, 1890. Serial No. 339,081. (No model.)

To all whom it may concern:

Be it known that I, ACHILLES DE KHOTINSKY, a subject of the Emperor of Russia, residing at Gelnhausen, Kingdom of Prussia, Germany, have invented new and useful Improvements in the Manufacture of Carbon Conductors for Electric Incandescent Lamps, whereof the following is a specification.

From the raw materials heretofore nearly exclusively employed in the production of carbon conductors for incandescent lamps it is difficult in an extensive manufacture to obtain a considerable number of conductors that are absolutely alike in transverse section and in quality. From this deficiency there results in the employment of the conductors in incandescent lamps an unequal luminous power and unequal consumption of current. The cause of this deficiency is that the raw material has a fibrous structure, which is still present in the conductors after their carbonization, as may be plainly observed under the microscope, and wherefrom results a low degree of elasticity and inconsiderable and non-uniform density of the conductors.

The object of my invention consists in the manufacture of carbon conductors for incandescent lamps which do not possess the said disadvantages. For this purpose I use as raw material natural purified cellulose, preferably cotton which has been freed from fatty matter, and thereupon treated with muriatic or hydrofluoric acid, or both, in view of extracting mineral substances. Such cellulose I treat in well-dried state with sulphuric acid having a density of about 50° Baumé. The resulting gelatinous mass is washed first with water and thereupon with alcohol, so as to free the same from every trace of acid. The product thus obtained is colloid cellulose, which is absolutely homogeneous and amorphous, and which possesses the remarkable property of being soluble in distilled water. (This property is, however, inherent to the substance only if it is entirely void of acid.) From the said colloid cellulose carbon conductors may be produced in two different manners.

First. The colloid cellulose is dissolved in distilled water, the solution is poured on plates of glass, and the water is allowed to

evaporate. The plates of cellulose thus obtained are cut or otherwise divided into strips. Previous to their being divided the plates may be passed between smooth rollers or pressed between even metal plates for the purpose of increasing their density and making their thickness more uniform.

Second. The colloid cellulose is dissolved in distilled water, the solution is evaporated *in vacuo* with the aid of sulphuric acid to the consistency of sirup, and this mass is pressed through a perforated plate having orifices of the desired form and size, the threads issuing from the said orifices being collected in a vessel containing ethyl alcohol, or any other suitable liquid which has the property of precipitating cellulose from its solutions in amorphous state. These strips or threads are carbonized as usual, and employed in the manufacture of incandescent lamps in known manner.

By means of the described process an unlimited number of carbon conductors may be produced which are absolutely alike in their physical properties, in their transverse section, and in density. Besides this, the new conductors have greater density than other carbon conductors, as is proved by their higher specific gravity and inferior specific resistance. Finally, their elasticity is such that when having horseshoe form, or even when made with a loop, they may be bent straight without breaking, while on being thereafter released they rebound to their original state like a steel spring.

I am aware that heretofore conductors for electric lamps have been produced by converting fibrous cellulose by means of sulphuric acid into a gelatinous or fluid substance, forming sheets or strips therefrom, and treating these with an alkali in view of neutralizing the acid. In this case the solvent contained in the said substance is sulphuric acid, and the acid is neutralized after the sheets or strips have been formed. In contradistinction to this method I produce gelatinous (colloid) cellulose which is soluble in water, a product heretofore entirely unknown, the said product being indeed also obtained by treating the fibrous cellulose in the first place with sulphuric acid, but only under the

condition that the acid have a determinate
degree of concentration of 50° Baumé, or a
little above or below, and in thereupon wash-
ing the colloid cellulose first with water,
5 (which does not act as solvent so long as
any acid remains in the substance,) and sub-
sequently with alcohol, in view of removing
the last traces of acid. From this product I
then make the sheets, plates, or threads by
10 dissolving it in pure water and proceeding
further as described. The acid is therefore
according to my process completely removed
from the colloid cellulose before it is formed
into plates or threads.

15 I claim as my invention—
The process of manufacturing carbon con-

ductors for incandescent lamps, which con-
sists in treating natural purified cellulose
with sulphuric acid of about 50° Baumé,
washing the product first with water and sub- 20
sequently with alcohol, forming strips or
threads from the colloid cellulose thus pro-
duced, and carbonizing them, substantially
as described.

In testimony whereof I have hereunto set 25
my hand in the presence of two subscribing
witnesses.

ACHILLES DE KHOTINSKY.

Witnesses:

JEAN GRUND,
ALVESTO S. HOGUE.