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ASSIGNORS TO THE CARBORUNDUM COMPANY, OF NIAGARA FALLS, NEW YORK,
A CORPORATION OF PENNSYLVANIA.

ELECTRICAL CONDUCTOR.

1,121,601.

Specification of Letters Patent.

Patented Dec. 22, 1914.

No Drawing. Original application filed November 21, 1911, Serial No. 661,584. Divided and this application
filed September 24, 1913. Serial No. 791,641.

To all whom it may concern:

Be it known that we, THOMAS B. ALLEN and LEONARD B. COULTER, residents of Niagara Falls, in the county of Niagara and State of New York, have invented a new and useful Improvement in Electrical Conductors, of which the following is a full, clear, and exact description.

Our invention relates to electrical conductors, particularly those of the ceramic type, formed, for example, by a mixture of silicon carbide, crystalline alumina, or similar materials combined with ceramic or other binder and graphite or other conducting material. Such mixtures have been formed into shape and then heated to vitrify the ceramic binder; but conductors of this class have been found to have very uneven or unequal electrical conductivities. It has also been found very difficult to produce an article having a high conductivity, since the high percentage of graphite or other conductive material seriously affects the mechanical strength of the article. Conductors formed of graphite and clay have also been tried, but are found unsatisfactory since they shatter and are otherwise destroyed when subjected to a high voltage electrical discharge.

In the manufacture of electrical conductors embodying our invention we can use a large number of porous articles; and may use different forms of finely divided conductive material, such, for example, as the colloidal solution of graphite in water, commonly known as "aquadag", or the colloidal solution of graphite in oil, commonly known as "oilbag", or the colloidal solution of metals which are electrical conductors. We may also use other conductive material suspended in water or other liquid vehicle.

We will now describe one specific method of manufacture which we prefer in connection with impregnating the silicon carbide articles with graphite. We take a rod consisting of 70 per cent. by weight of silicon carbide and 30 per cent. by weight of a ceramic binder, consisting preferably of feldspar and kaolin. This rod is then immersed in a colloidal solution of graphite in water containing 10 per cent. by weight of graphite. It is advisable to subject the vessel containing the rod and the "aquadag"

to a vacuum or pressure or both alternately, as under these conditions a much greater degree of impregnation takes place. After standing in the solution for a certain length of time, preferably two to three hours, the rod is removed and heated to a temperature of from 350° to 400° C., in order to completely dehydrate it. The rod is then ground on its surface to remove the surface deposit of graphite and it then is in a finished condition. As a concrete example, a rod 8 inches long, one inch in diameter, treated in the manner described, will be found to have an electrical resistance of substantially one hundred ohms.

The electrical resistance of the product will vary according to the porosity of the article, since the degree of impregnation is proportional to the porosity of the article. This porosity may be varied by altering the coarseness of the silicon carbide, the porosity increasing with the coarseness of the carbide. The porosity is also increased by increasing the proportion of silicon carbide to that of the binder. We have further found that the electrical conductivity of the article may be increased still further by repeating the impregnation with graphite a second or even a third or more times. In this way an article may be obtained having a very low electrical resistance. We have also found it is advantageous to coat the article with a glaze of any well known composition in order to prevent oxidation thereof by the air when raised to high temperatures.

The advantages of our invention will be obvious to those skilled in the art since the difficulties with synthetic conductors of this character are obviated and a practical commercial method provided by which a conductor of high efficiency may be obtained. The articles so made have a very uniform electrical conductivity and do not shatter under the discharge of high voltage current. They are found to retain their conductivity even under continual discharge and while heated to red heats. They are therefore highly useful in, for example, the lightning arrester industry, on account of high carrying capacity.

Many variations may be made in the materials employed for the article and for impregnating it, without departing from our

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invention. The method of impregnating may be varied and the conducting material may be suspended in air or gases instead of in liquids.

- 5 The present application is a division of our copending application Serial No. 661584, filed November 21, 1911.

We claim:

- 10 1. As a new article of manufacture, an electrical conductor consisting of a porous body impregnated with graphite of a fineness of subdivision equal to that of colloidal graphite when freed from moisture.

- 15 2. As a new article of manufacture, an electrical conductor comprising a porous body having its pores filled with graphite, of a fineness of subdivision equal to that of colloidal graphite when freed from moisture.

- 20 3. As a new article of manufacture, an electrical conductor comprising a body of silicon carbid impregnated with graphite, of a fineness of subdivision equal to that of colloidal graphite when freed from moisture.

- 25 4. As a new article of manufacture, an electrical conductor comprising a porous

base of silicon carbid impregnated with finely divided conductive material and characterized by substantially uniform electrical conductivity and high resistance to electrical discharge.

5. As a new article of manufacture, an electrical conductor comprising a porous base impregnated with graphite of a fineness of subdivision equal to that of colloidal graphite when freed from moisture and having a coating which is impervious to oxygen at high temperatures.

6. As a new article of manufacture, an electrical conductor comprising a porous base impregnated with graphite of a fineness of subdivision equal to that of colloidal graphite when freed from moisture and having a vitrified coating which is impervious to oxygen at high temperatures.

In testimony whereof, we have hereunto set our hands.

THOS. B. ALLEN.
LEONARD B. COULTER.

Witnesses:

ROY LINCOLN,
H. C. MARTIN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."