

UNITED STATES PATENT OFFICE.

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METHOD OF INSULATING ELECTRICAL CONDUCTORS.

No. 798,260.

Specification of Letters Patent.

Patented Aug. 29, 1905.

Application filed December 3, 1904. Serial No. 235,346.

To all whom it may concern:

Be it known that I, WILLIAM H. BRISTOL, a citizen of the United States of America, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Methods of Insulating Electrical Conductors, of which the following is a specification.

My invention relates to a method of insulating electrical conductors, and in particular to conductors in which the electric current is used to generate heat or in which heat is used to generate an electric current, such as resistance-coils, electric heaters, thermo-electric generators, and pyrometers.

My method consists, essentially, in forming an insulating material in the condition of a paste or paint and which on drying forms a hard, fireproof, and electrically-non-conductive material, then applying this paste or paint to the conductors to be insulated so as to embed them therein, and finally heating the whole to dry and harden it.

The insulating material consists of a mixture of a finely-powdered fire-resisting material which is substantially non-conductive electrically—such as carborundum, corundum, clay, &c., or a mixture of one or more of these—with a solution of silicate of soda, which acts as a binder for the loose material. The carborundum or other fire-resisting material is ground in any convenient manner to a fineness of from 1 F. to 3 F. The dry silicate of soda is also powdered, but not necessarily to such a degree of fineness as the fire-resisting material, and the constituents are then intimately mixed in the proportion of from one to twenty parts, by weight, of fire-resisting material to one part, by weight, of the silicate of soda. The proportion of the silicate of soda depends upon the use to which the insulating material is to be put. For very high temperatures the proportion of silicate of soda should be comparatively low, as the mass otherwise becomes plastic and a conductor of electricity. By lowering the proportion of silicate of soda, however, the strength of the material is impaired and it tends to crumble. When ready to be applied, a sufficient quantity of the mixture is taken and thoroughly stirred with enough water to give the desired consistency. It is, however, usually more convenient to use the commercial water solution of the silicate, which is of about 1.4 specific gravity. The powdered fire-resisting material in this case is mixed with the solu-

tion to the desired consistency. The solution may of course be diluted with water to lower the proportion of silicate. In applying this material to the construction of an electric heater or resistance-coil a thin sheet of asbestos or mica or a slab made of the said insulating material is taken and about this or an insulated form is wound a layer of the resistance-wire. This layer is then painted with a thin coat of the insulating material, which is allowed to dry and harden. Another layer of wire is then wound around the former and another coat of insulating material applied, &c.

After being applied the material is dried by heating, either by a current of electricity of gradually-increasing strength passing through the conductors or by applying heat externally to the entire mass. On drying it forms a hard compact mass electrically non-conductive and capable of resisting high temperatures, especially such temperatures as are encountered in electric heating apparatus and the like. In some instances it is advantageous to give the surface a glaze or to coat it with a varnish or the like in order to render it completely impervious to moisture.

By mixing the solution of silicate of soda with finely-powdered carborundum or corundum or clay, &c., or a mixture of these a paste or paint is obtained which can very readily be applied and which permeates the spaces between the conductors, completely insulating them and also forming a protective covering for the conductors themselves. The mass does not crack nor deteriorate under severe tests. Asbestos fiber, thread or sheet, can frequently be used to advantage in connection with this insulating material.

In winding a resistance-coil, electric heater or the like a thin sheet of asbestos may be placed over each layer of wire and insulating material before applying the next layer of wire and insulating material. This sheet of asbestos serves to prevent any possible short-circuiting during the winding due to the insulating material not having completely hardened and makes it unnecessary to wait for the insulating material to become perfectly hard before winding on the succeeding layers of resistance-wire. The insulating material soaks through the asbestos and makes a solid mass of the whole, firmly embedding the conductors therein and insulating them. The insulating material is also very well adapted for protecting the elements of a thermo-electric couple, such as used in electric pyrometers or

in thermo-electric generators. The elements of such a couple may be very effectively protected and insulated by simply dipping such a couple or series of couples into a bath of the insulating material and then withdrawing it and allowing it to harden and then finally subjecting it to heat. Of course the couple may first be wound with an asbestos thread or strip and then dipped, or the insulating material may simply be applied as a paste or paint to the parts to be protected and insulated.

What I claim as my invention, and desire to secure by Letters Patent, is--

1. The herein-described method of electrically insulating conductors, which consists in forming an intimate mixture of a powdered fire-resisting material, electrically non-conductive, with a solution of silicate of soda, wrapping asbestos about said conductors, applying said mixture in the form of a paste or paint so as to embed said conductors therein, and finally heating to dry and harden said material.
2. The herein-described method of electrically insulating conductors, which consists in forming an intimate mixture of powdered carborundum with a solution of silicate of soda to the desired consistency; then applying said

mixture to said conductors so as to embed them within said mixture, and finally heating to dry and harden the whole.

3. The herein-described method of electrically insulating conductors, which consists in forming an intimate mixture of powdered carborundum with a solution of silicate of soda, wrapping asbestos about said conductors, applying said mixture in the form of a paste or paint so as to embed said conductors therein, and finally heating to dry and harden said material.

4. The herein-described method of electrically insulating conductors, which consists in forming an intimate mixture of powdered carborundum and a solution of silicate of soda, applying this material in the form of a paste or paint so as to embed said conductors therein; and finally heating the whole and glazing the surface thereof.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 1st day of December, 1904.

WILLIAM H. BRISTOL.

Witnesses:

FREDK. F. SCHUETZ,
ROENA H. YUDIZKY.