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Cross Reference

526,721

## UNITED STATES PATENT OFFICE.

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## COMPOSITION OF MATTER FOR ELECTRIC CONDUCTORS.

SPECIFICATION forming part of Letters Patent No. 526,721, dated October 2, 1894.

Application filed May 16, 1894. Serial No. 511,477. (No specimens.)

*To all whom it may concern:*

Be it known that I, DUNCAN MACFARLAN, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Conducting and Resisting Compound Structures for Electric Currents, of which the following is a specification.

My invention has relation to the manufacture of conducting and resisting compound structures for the control of electric currents.

The principal objects of my invention are first, to provide a compound conducting and resisting structure for regulating or controlling electric currents; second, to provide a mineral matter having combined in a compound state therewith substances becoming part thereof and in its inclusion in a circuit adapted to control the same; third, to provide a compound structure, which in a circuit is adapted to regulate ampèreage of a lamp or lamps included therein as well as control voltage of the current by permitting lessening at will of the same; fourth, to provide a compounded structure, in which in a circuit division of the current by suitable means is permitted for different purposes with the voltage differentiated with respect to the current from the source of electric energy; fifth, to provide a compounded structure adapted to furnish such resistance to an electric current as requirements demand; sixth, to provide a compounded structure which included in a circuit will control with certainty the resistance offered thereby to a current of high voltage and of the same to be graduated so as to become practically imperceptible and of being increased at will to maximum limits of energy of the circuit; seventh, to provide a compound conducting and resisting structure which in a circuit is adapted to produce a weak current therethrough by its offer of resistance to the high voltage of said current and to permit of the absolute control thereof within the limits of maximum voltage; eighth, to provide a compounded mineral structure of differential conductivity and resistance for controlling electric currents; ninth, to provide a compounded mineral structure in the form of threads, cylinders, blocks, bars or other shapes or configurations for inclu-

sion in a circuit and adapted to control the current and resistance offered thereto; and tenth, to provide a compounded mineral structure of low conductivity and differential resistance for the regulation of voltage and ampèreage within maximum limits of the current from a source of electric energy.

My invention stated in general terms, comprises a compounded conducting and resisting structure for electric currents as hereinafter described and claimed.

In order that my invention may be understood by those skilled in electric science, to which the same is applicable, I will now proceed to describe the structure and some of the methods by which my invention may be carried into effect.

I have practically demonstrated that mineral matter, such as asbestos, mineral wool or the like, known non-conductors of heat and unaffected by water, have certain inherent resisting properties, when included in an electric circuit. When either matter has combined with it certain other substances, conductivity is insured in the compound in a structure form in addition to its marked inherent resisting properties. If a certain percentage of asbestos or mineral wool, as filamentous strands, powder or in other somewhat similar form, is combined with graphite, these materials establish with the asbestos or mineral wool a compound which in the path of electric energy, will not only become a conductor for such current, but will offer resistance thereto in inverse ratio to the current of the circuit to absolutely control the same. For example, with a voltage of one thousand or greater, or, in fact, any voltage, it is possible, as practice has demonstrated, to reduce such voltage to the fractional part of one volt and to increase the same at pleasure from that point of lowest potential to the maximum power or potential of the circuit with perfect safety; and moreover, that while said compounded structure will be heated by such current, it is absolutely indestructible.

The amount of asbestos or mineral wool employed with the other materials, it should be borne in mind, must be in a certain ratio to the resistance required and the conductivity demanded for the inclusion of the current therethrough or about the structure for

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the intended purpose, the resistance of the structure decreasing as the poles of the circuit are drawn toward each other and in the path of the compounded structure included in such circuit.

5 A good working formula with a voltage of fifty-four controlling a thirty-two candle power lamp, is about thirty parts of asbestos or mineral wool to forty parts of graphite, 10 five parts of sugar and twenty-five parts of water, such being one of many combinations of materials which may be employed for the carrying of my invention into effect. The sugar or dextrine, molasses, gums, cements or other somewhat analogous materials 15 constitute a binder for such mixture or compounded mineral or other substances for aiding in the cementing of the same together. Preference, however, is given to the use of 20 sugar, as it crystallizes under the influence of heat, and as practice has demonstrated, the structure after proper admixture of the same in a mortar or other suitable appliance is rigid or solid. This structure may be in the 25 form of threads, blocks, cylinders, bars or other shapes or configurations and to which or around which one end of a wire from a source of electric energy is attached and the other end to another part of such a com- 30 pounded structure, to establish the circuit therethrough or about the same and without burning up in the passage of the current therethrough or over the surface thereof.

In the practice of my invention with the 35 use of the materials hereinbefore stated most excellent results have been obtained. Furthermore good results have been obtained by the combining of the materials specified hereunder and in about the proportion of 40 each material entering into the several combinations to be mentioned.

✓ Mineral wool, ten per cent.; black lead, twenty per cent.; chloride of aluminium, ten per cent.; kaolin, forty per cent.; water, 45 twenty per cent.

Asbestos or mineral wool, twenty-five per cent.; graphite, twenty-five per cent.; silver, twenty per cent.; gum or sugar, five per cent.; water, twenty-five per cent.

50 Asbestos, thirty per cent.; graphite, twenty per cent.; German silver, twenty per cent.; gum or sugar, five per cent.; water, twenty-five per cent.

55 Asbestos or mineral wool, twenty-five per cent.; silicate of soda, twenty per cent.; water, twenty-five per cent.; graphite, thirty per cent.

60 Asbestos or mineral wool, forty per cent.; water, twenty-five per cent.; graphite, twenty per cent.; rubber and gutta percha, fifteen per cent.

Asbestos, twenty-five per cent.; water, twenty-five per cent.; graphite, thirty per cent.; cement, twenty per cent.

65 Asbestos, forty per cent.; black lead, thirty per cent.; sugar, five per cent.; water, twenty-five per cent.

Chloride of aluminium, twenty per cent.; black lead, ten per cent.; kaolin, twenty per cent.; water, twenty-five per cent.; powdered 70 asbestos, twenty-five per cent.

Chloride of aluminium, twenty per cent.; graphite, twenty per cent.; kaolin, ten per cent.; water, ten per cent.; asbestos, twenty per cent.; asphalt or coal tar, ten per cent.; 75 cement, ten per cent.

These materials being employed with the base asbestos or mineral wool either of which of itself has the inherent property of offering resistance to an electric current, and either 80 of said materials are to be used in proportion the resistance bears to the conductivity required. In a word, practice has demonstrated from numerous experiments conducted, with the different materials in a combined state 85 as hereinbefore mentioned, among many others, for example, asbestos or mineral wool with iron, iron ore, brass, brass filings or other metallic conducting matter or materials, that electric motive force of a current is susceptible 90 of being divided by the inclusion of such a compounded structure in the circuit of a source of energy to reduce the potential of current thereof from an abnormally high one 95 instantly to practically no current at all and to be able to graduate the current through such a resisting structure by means of switches or similar appliances. In a word, with a dynamic voltage of two thousand in 100 contact with such resisting structure there can be derived therefrom by the manipulation of the switch or other appliance a current of one volt or a fraction thereof, and such current can be increased therefrom to the maximum voltage of the dynamic or other 105 source of energy. Moreover, it may be here remarked that this can be accomplished without burning out the structure in the drawing of the current with its offered resistance.

My invention is adapted among its many 110 uses for faradic or galvanic applications, cautery and other medical purposes with most excellent results. Moreover, such a compounded structure in its different shapes or forms is employed under the aforesaid conditions in 115 the absence of wires or conductors, except those used as collectors or feeders to the structure from the dynamic or other source of energy.

Practice has demonstrated that the com- 120 pounded structure of my invention in the form of a thread, cord or the like of a dimension of one-eighth to one inch in diameter, included in a circuit of one thousand volts is susceptible of offering such a resistance there- 125 to as to instantly reduce the current for different uses to a fractional part of a volt and so as to be able to increase the current therefrom with great regularity to the maximum capacity of the circuit with the structure 130 therein with absolute safety and without shock to those handling the same.

It may be here remarked that while certain materials have been mentioned combined in

certain proportions one with respect to the other and respectively having inherent properties of conductivity in application to electric energy and of offering resistance thereto, 5 other somewhat analogous materials may be employed with good results in connection with asbestos or mineral wool in the one instance, in order to insure the proper resisting action and of graphite in the other in order to insure 10 a greater or less degree of conductivity in the compounded structure, these materials being used in varying proportions and depending upon the respective degrees of conductivity and resisting properties to be obtained for the different uses to which such a 15 compounded structure is to be applied in the different branches of the arts allied to electrical science and mechanics as a means of propulsion thereof.

20 It may be here remarked that in the composition of a structure such as hereinbefore described, the asbestos or mineral wool forms the body or base of the compound as well as furnishing a resisting property in the structure and the other materials hereinbefore 25 specified in variable proportions are of different degrees of conductivity under certain con-

ditions. The sugar, dextrine, molasses, gums, clays, cement and the like, employed in the composition of the structure constitute the 30 binder, as aforesaid, therefor, so that after baking or drying under the required degree of heat, pressure or otherwise, the structure will assume its required shape or form for the particular use.

35 Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A conducting and resisting compound structure for an electric current, composed 40 of asbestos or mineral wool, graphite and a binder, substantially as described.

2. A baked conducting and resisting compound structure, composed of filamentous strands of asbestos, graphite and a binder, 45 substantially as described.

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

DUNCAN MACFARLAN.

Witnesses:

THOMAS M. SMITH,  
RICHARD C. MAXWELL.