No. 848,954. PATENTED APR. 2, 1907.

L. E. BARRINGER.

PROCESS OF MAKING RESISTANCE DEVICES.

APPLICATION FILED FEB. 5, 1906.

Fig. 2.

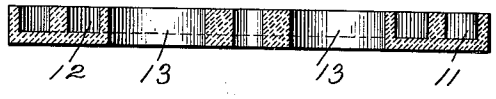


Fig. 4.

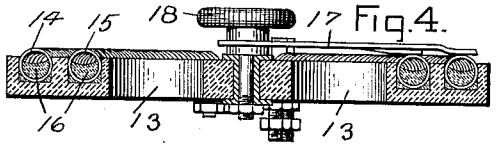


Fig. 1.

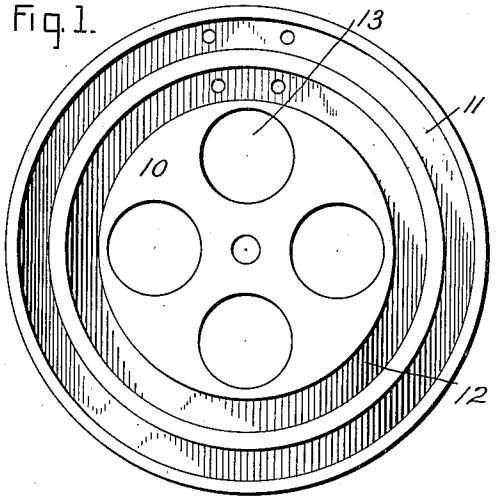


Fig. 3.

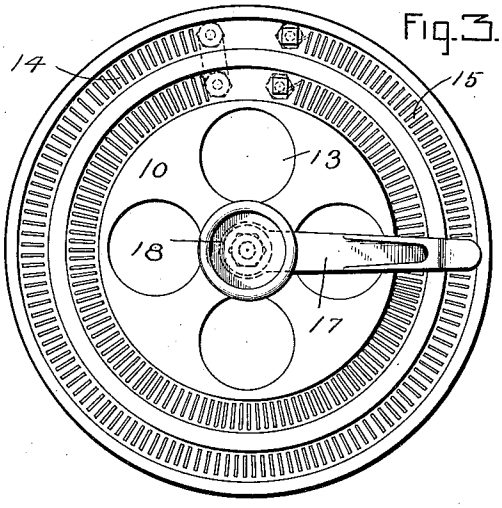


Fig. 6.

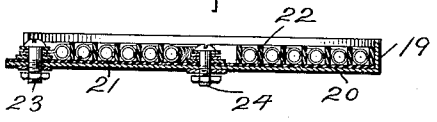


Fig. 8.

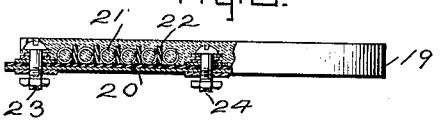


Fig. 5.

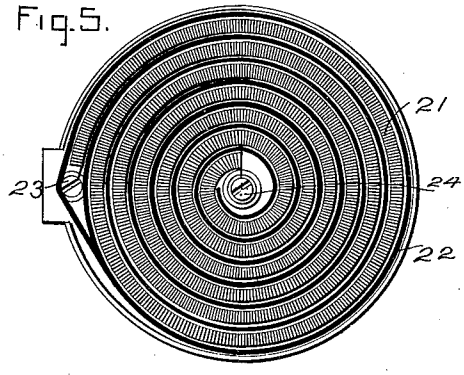
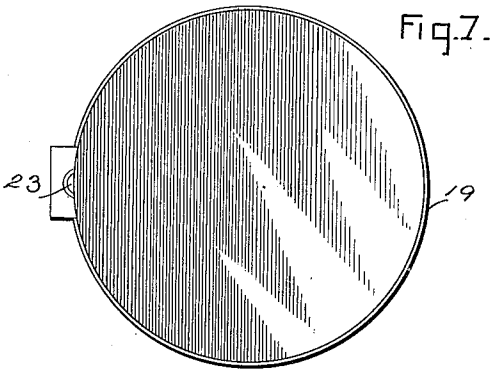


Fig. 7.



WITNESSES.

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UNITED STATES PATENT OFFICE.

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PROCESS OF MAKING RESISTANCE DEVICES.

No. 848,954. Specification of Letters Patent. Patented April 2, 1907.

Application filed February 5, 1906. Serial No. 299,447.

To all whom it may concern:

Be it known that I, LAWRENCE E. BARRINGER, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Processes of Making Resistance Devices, of which the following is a specification.

This invention relates to the manufacture of resistancedevices—such as rheostats, heaters, and the like—and has for its object the improvement in the methods of making the same whereby the resistance-conductor may be insulated and embedded in such a manner that it will withstand a high temperature for an extended period without injury, which will be inexpensive to manufacture and at the same time exceedingly durable and efficient.

In my previous application, Serial No. 274,409, filed May 11, 1905, I have described and claimed a process whereby the insulating material which I propose to use in this case may be produced. In a subsequent case filed under even date with this application I have disclosed the embedding of electrical conductors in the insulating compound. While for certain purposes the embedding of the resistance in the material as carried on in the application above referred to is perfectly satisfactory, I have found that for certain other purposes it is convenient to embed an insulating-conductor after the base or support has been formed—*i. e.*, the conductor is not pressed into the compound during the process of formation. I have found that by inserting the resistance-coil in a groove in the base which has been prepared and then filling the groove and the interstices of the coil with my insulating compound, which is thinned down for the purpose, preferably to about the consistency of cream or thicker, if desired, and then hardening the whole by steam treatment a very cheap, durable, and efficient resistance device may be produced.

In carrying out my invention in one of its forms I produce a rheostat by pressing the base therefor from my insulating material and having the base preferably grooved, so as to admit a resistance-coil. This base may either be hardened by steam before the coil is inserted therein or after, as is desired. Generally it will be sufficient to insert the resistance-coil in the base, fill in with the fluid insulation, and after drying treat with the steam, thereby hardening the device at one treatment. In certain other cases, however, owing perhaps to intricate shape of the base, which might be broken, it may be molded and steam-hardened and then again treated after the coil is inserted. A rheostat made up in this way will stand a red heat for a long interval without injury and likewise sudden change of temperature—as, for instance, it may be plunged in water while at a high temperature without destroying or even rupturing the same. Heating devices may also be made up from this material, the base not necessarily being composed of insulating material, the principal feature being that the coil is embedded in the insulation without being pressed into it and then steam-hardened.

In the accompanying drawings I have shown two embodiments of my invention; but it should be understood that these devices are intended merely to illustrate two of the possible forms which my invention may assume, and I wish it to be understood that I do not limit my invention to these specific types of devices nor to the material used, since various modifications as to the arrangement of parts and materials which are within the spirit of my invention will suggest themselves to those skilled in the art.

Referring to the drawings, Figure 1 is a plan view of a rheostat-base made in accordance with my invention. Fig. 2 is a sectional view thereof. Fig. 3 is a plan view of the rheostat after the resistance-conductor has been embedded therein and showing the controlling-arm. Fig. 4 is a sectional view thereof. Fig. 5 is a plan view of a heater made in accordance with my invention before the resistance is embedded. Fig. 6 is a sectional view thereof. Fig. 7 shows my heater completed by embedding the resistance; and Fig. 8 is an elevation thereof, partly in section.

The construction and arrangement of the device shown in Figs. 1 to 4 will be clear from the foregoing description. The base 10 is pressed into the form shown, having the grooves 11 and 12 and the lightning-holes 13. The material of which it is composed is a mixture of asbestos or other fibrous substance, with a definite quantity of calcium

hydrate and flint or silica. Other materials, such as magnesium hydrate or magnesium oxid, may be used, it being only essential that a substance be employed which will combine with silica to form a silicate under steam treatment. It is preferable in mixing materials to be combined in this manner that amounts corresponding with the molecular proportions be used, the approximate formula of the silicate formed being

$$CaOSiO_2 2.3H_2O,$$

the percentage of water varying somewhat. For instance, when slaked lime and flint are used in the proportion of seventy-four to sixty there will be no excess of either lime or flint. The exact proportions of these materials may be varied, however, throughout a considerable range, and I have found that for certain classes of work the proportions of forty per cent. asbestos, thirty-eight per cent. flint, and twenty-two per cent. calcium hydrate give very satisfactory results. If desired, the fibrous material may be omitted; but its presence adds to the strength. These ingredients after being thoroughly mixed and moistened are molded into the desired form under a pressure sufficient to give a densely-compressed body. This base may then be steam-hardened at this stage of the process or not, as desired, although in certain cases, as where the base is of intricate form, it may be necessary to harden it before further handling. The resistance-coils 14 and 15 are then inserted in the grooves 11 and 12, respectively, and the grooves filled, or nearly so, with my insulating material 16. This material 16 is of substantially the same character as that of the base 10, with the exception that the fibrous material is omitted, and it is thinned down so that it can be easily poured or at least laid into the grooves and interstices of the coil without compression. It possesses the same qualities as the material of the base, in that it will be converted into a silicate under steam treatment. When the coil is embedded in the base by means of the material 16, the whole is placed under steam treatment for a suitable period—say about five hours. I have found that a pressure of one hundred and fifty pounds, corresponding to a temperature of 181° centigrade, will be sufficient to harden the material in the time above mentioned. The coils 14 and 15 are arranged so that they are above the surface of the base, and a controlling-arm 17, provided with an operating-handle 18, is provided for engaging the coils to vary the resistance.

In Figs. 5 to 8 I have shown my invention applied to a heating device. In this case the base 19 may be made of metal enameled or not, as desired. The base is made dish-shaped, as shown, and a layer of mica 20 or other insulating material is placed upon the bottom thereof. A spiral coil 21 is laid upon the insulation, the turns of the spiral being insulated from each other by the strips of mica 22, which in some cases may be omitted to allow the compound to run down between the coils, while the binding-posts 23 and 24 form the terminals of the spiral. The base or receptacle 19 is now filled with my insulating material, so that the coil is completely embedded, as shown in Figs. 7 and 8. The device is then treated with steam, as above described.

It will be seen from the foregoing that I have provided a method of producing rheostats and heaters which is exceedingly valuable, especially in cases where for various reasons it would not be practicable to press the conductors into the material. When hardened, the whole device becomes like slate or soapstone and may be heated to a high temperature and suddenly cooled without injury. The material, moreover, lends itself readily to various formations by molding and may also be easily machined.

In the foregoing I have set forth in accordance with the patent statutes certain methods of carrying out my invention, while the invention itself and the scope thereof will be indicated in the claims annexed hereto.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The process of making a resistance device which consists in forming a base from a material which will harden under steam treatment, mounting a resistance-coil in said base, applying a quantity of said material in a more fluid form to said coil and base and finally hardening the whole with steam.

2. The process of making a resistance device which consists in forming a base from a material which will be converted into a silicate by steam, mounting a resistance-coil in said base, applying a similarly-convertible material in a more fluid form to the coil to secure it in place and treating the whole with steam.

3. The process of making a resistance device which consists in pressing a grooved base from a compound which will be converted into a silicate by steam, inserting a resistance-coil in said groove, filling the groove with a similarly-convertible material and subjecting the whole to steam treatment.

4. The process of making a resistance device which consists in pressing a grooved base from a compound of silica and a hydrate, placing a resistance-coil in the groove, filling said groove with a similar compound in a more fluid condition and subjecting the whole to steam treatment.

5. The process of making a resistance device which consists in pressing a grooved base from a compound of a fibrous material with silica and a hydrate, placing a resistance-

coil in the groove, filling said groove with a fluid compound of silica and a hydrate and subjecting the whole to steam treatment.

6. The process of making a resistance device which consists in placing a resistance-coil in a suitable base, filling the interstices of said coil with a compound of silica and a hydrate and subjecting the whole to steam treatment.

7. The process of making a resistance device which consists in forming a grooved base from a compound of a fibrous material with hydrous silicate of calcium, mounting a resistance-conductor in said groove, filling the groove with a compound of silica and a hydrate and subjecting the whole to steam treatment.

In witness whereof I have hereunto set my hand this 2d day of February, 1906.

LAWRENCE E. BARRINGER.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.