

No. 686,246.

Patented Nov. 12, 1901.

J. F. BACHMANN & A. VOGT.

ELECTRICAL RESISTANCE.

(Application filed Dec. 12, 1899.)

(No Model.)

Fig. 1.

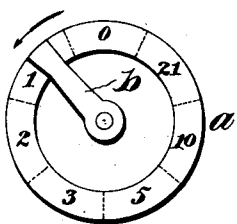


Fig. 2.

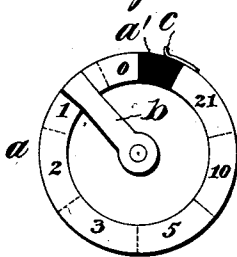


Fig. 3.

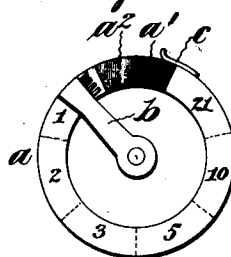


Fig. 4.

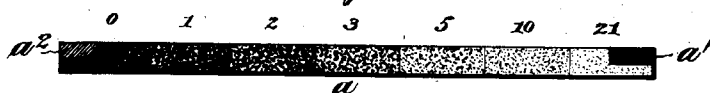


Fig. 5.

I a

Fig. 6.

II a

Fig. 7.

III a

Fig. 8.



Witness
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by *[Signature]*

UNITED STATES PATENT OFFICE.

JOSEF FRANZ BACHMANN AND ADOLF VOGT, OF VIENNA, AUSTRIA-HUNGARY, ASSIGNORS TO THE ELECTRIC RESISTANCE AND HEATING COMPANY, LIMITED, OF LONDON, ENGLAND.

ELECTRICAL RESISTANCE.

SPECIFICATION forming part of Letters Patent No. 686,246, dated November 12, 1901.

Original application filed November 22, 1898, Serial No. 697,192. Divided and this application filed December 12, 1899. Serial No. 740,097. (No model.)

To all whom it may concern:

Be it known that we, JOSEF FRANZ BACHMANN, residing at 81 Kaiserstrasse, Vienna VII, and ADOLF VOGT, residing at 41 Zentagasse, Vienna V, in the Empire of Austria-Hungary, citizens of Germany, have invented certain new and useful Improvements in Electrical Resistances, (for which we have obtained patents in the Argentine Republic, dated August 29 and September 19, 1899, No. 2,659; in Belgium, dated October 4, 1898, No. 138,204; in Brazil, dated August 3, 1899, No. 2,874; in Cape of Good Hope, dated May 26, 1899, No. 1,772; in Egypt, dated May 20, 1899, No. 92; in Finland, dated October 20, 1898, No. 898; in France, dated October 4, 1898, No. 281,883; in Great Britain, dated August 24, 1898, No. 18,232; in Hong-Kong, dated July 24, 1899; in India, dated July 10 and August 4, 1899, No. 205-99; in Italy, dated December 23, 1898, No. 49,504/XXXV-182, CII; in Luxemburg, dated June 23, 1899, No. 3,633; in Natal, dated May 27, 1899, No. 77-99; in Rhodesia, dated June 3, 1899, No. 64; in South Australia, dated June 14, 1899, No. 4,470; in Spain, dated November 9, 1898, No. 23,162; in Switzerland, dated October 4, 1898, No. 17,985, and in Tasmania, dated June 19, 1899, No. 2,506,) of which the following is a specification.

This invention has relation to electrical resistances composed of a mixture of a refractory non-conductive material, as an artificial-stone compound, with a conductive material, as described in our application for patent of the United States, Serial No. 697,192, filed November 22, 1898, of which the present application is a division.

The invention has for its object a resistance of annular or ring form of substantially uniform cross-sectional area and of regular or irregular form in cross-section, the conductivity of which decreases in a circular direction from maximum to minimum, in combination with an electric contact arranged to trail over the face of the resistance.

The invention has for its further object the provision of means for cutting the resistance

out of the circuit and the provision of means for short-circuiting the resistance.

That our invention may be fully understood we will describe the same in detail, reference being had to the accompanying drawings, in which—

Figures 1, 2, and 3 are plan views of a resistance embodying our invention. Fig. 4 is a longitudinal vertical section of the developed resistance, and Figs. 5 to 8 are cross-sections of the resistance, illustrating various forms.

For convenience of description we have shown the resistance, Figs. 1, 2, and 3, as divided into segments 0, 1, 2, 3, 5, 10, and 21, which may also indicate the successively-increasing resistance in ohms.

The resistance *a* is composed of a mixture of a non-conductive artificial stone compound with a conductor of electricity, as carbon, and is prepared substantially as described in our Letters Patent of January 30, 1900, No. 624,414—namely, by mixing the conductive and non-conductive constituents together with water or other suitable liquid to adapt the composition for molding or casting, the proportion of conductive material of the successive sections 0 1 2 3, &c., being decreased according to the desired proportional successively-increasing resistance, the part 0 being that of least resistance, as shown in Fig. 4. The molded resistance is then dried and heated to a high temperature either while embedded in carbon or in the presence of a reducing-gas.

With an annular resistance such as described we employ a revoluble electrical contact-arm *b*, and it is obvious by connecting the part 0 of least resistance and the contact-arm *b*, either through its pivot or otherwise, with the circuit-terminals and rotating said arm in the direction of arrow, Fig. 1, the resistance to the passage of the current can be increased from minimum to maximum, and vice versa, at will.

If in the use of the resistance it is desirable or necessary that means should be provided for cutting it out of the circuit, we in-

terpose between the parts of minimum and maximum conductivity an insulation a' , Fig. 2, which may be of any desired character—as a segment of marble, slate, or the like—and for the purpose of preventing sparking and injury to the sliding contact-surfaces on the opening of the circuit by the moving of the contact-arm b onto the insulation a' we provide a metallic resilient contact c , secured to the part 21 of maximum resistance to electrically connect said arm with the resistance.

Under some conditions of use it is or may be desirable or necessary to provide a means for short-circuiting the resistance a , to which end we apply to the part 0 a metallic contact a^2 , Fig. 3, so that by connecting said contact instead of the part 0 with one of the circuit-terminals the said resistance will be short-circuited whenever arm a is placed on said contact, as will be readily understood. The difference of conductivity of the sections 0 to 21 of the annulus a is of course determined according to the purposes to which it is to be applied. This construction offers, in addition to facilitating the accurate regulation, the advantage that a very uniform load on the cross-sectional area is obtained, as in practice the resistances are more highly tried at their short-circuiting parts than at the cutting-out parts, owing to the fact that with all resistances that do not have to regulate for maintaining a constant current the strength of current increases as the contact-arm approaches the short-circuiting point. In the construction of resistance described the unequal heating due to the above fact is prevented.

The sliding contact-arm b can either be made with a flat contacting surface, as shown in Figs. 1 and 2, or it may be constructed in the form of a brush by providing it with lamellae, as shown in Fig. 3.

The annular resistance may have any desired form in cross-section; but the cross-sectional area should of course be substantially uniform. In Figs. 5 to 8 we have shown various forms, those shown in Figs. 5, 6, and 7 presenting great facility for mounting the resistance either on an external or internal insulated support, while the construction shown in Fig. 5 provides a means for supporting the resistance both externally and internally, and in Fig. 8 we have shown the resistance as provided with an inclined contact-face a^3 . Of course when the resistance is constructed as shown in Fig. 8 the insulation a' and the metallic contact a^2 , if provided, will be conformably constructed.

Having thus described our invention, what we claim as new therein, and desire to secure by Letters Patent, is—

1. A graduated resistance, comprising a number of divisions each of a different specific resistance and all of the same cross-section, and composed of mixtures of a conductive and non-conductive material, in combination with a conductive contact arranged to

trail over said divisions, substantially as set forth.

2. A graduated resistance, comprising a number of divisions each of a different specific resistance and all of the same volume, and composed of mixtures of conductive and non-conductive material, in combination with a conductive contact arranged to trail over said divisions, substantially as set forth.

3. An electrical resistance consisting of an annulus composed of a mixture of a non-conductive refractory material and of a conductor of electricity as described, the conductivity of said annulus decreasing in a circular direction from maximum to minimum and an insulation interposed between the parts of maximum and minimum conductivity; in combination with an electric contact-arm arranged to trail over the face of the resistance and an electric contact secured to the resistance and arranged to electrically connect the contact-arm with the resistance when said arm is moved onto the insulation, for the purpose set forth.

4. An electrical resistance consisting of an annulus composed of a mixture of a non-conductive refractory material and of a conductor of electricity as described, the conductivity of said annulus decreasing in a circular direction from maximum to minimum and an insulation interposed between the parts of maximum and minimum conductivity; in combination with an electric contact-arm arranged to trail over the face of the resistance and an electric contact secured to the part of minimum conductivity of said resistance and arranged to electrically connect the contact-arm with the resistance when said arm is moved onto the insulation, for the purpose set forth.

5. An electrical resistance consisting of an annulus of irregular cross-section but substantially uniform cross-sectional area, and composed of a mixture of a refractory non-conductive material and of a conductor of electricity such as described, the conductivity of the resistance increasing in a circular direction from minimum to maximum; in combination with a contact arranged to trail over the face of said resistance, for the purpose set forth.

6. An electrical resistance consisting of a channeled annulus of substantially uniform cross-sectional area and composed of a mixture of a refractory non-conductive material and of a conductor of electricity as described, the conductivity of the resistance increasing in a circular direction from minimum to maximum; in combination with a contact arranged to trail over the face of said resistance, for the purpose set forth.

7. An electrical resistance consisting of an annulus composed of a mixture of refractory non-conductive material and a conductor of electricity as described, the conductivity of which increases in a circular direction from minimum to maximum, an electric contact

and insulation terminals interposed between the parts of maximum and minimum conductivity; in combination with an electric contact-arm arranged to trail over the face of said resistance, for the purpose set forth.

8. An electrical resistance consisting of an annulus composed of a mixture of refractory non-conductive material and a conductor of electricity as described, the conductivity of which increases in a circular direction from minimum to maximum, an electric contact and insulation terminals interposed between the parts of maximum and minimum conductivity; in combination with an electric contact-arm arranged to trail over the face of said resistance and means for preventing sparking when said contact-arm is moved onto the insulation, for the purpose set forth.

9. An electrical resistance of annular form, consisting of a subdivided annulus, the divisions of which are of substantially equal vol-

ume and of different specific resistances, the conductivity of said annulus increasing from minimum to maximum, an insulation interposed between the parts of maximum and minimum resistance and a conductive contact arranged to trail over said divisions, substantially as set forth.

10. A graduated resistance, comprising a number of divisions in juxtaposition, each of a different specific resistance and a conductive contact arranged to trail over said divisions, substantially as set forth.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

JOSEF FRANZ BACHMANN.
ADOLF VOGT.

Witnesses:

GERALD L. SMITH,
C. S. HOPKINS.