No. 704,448. Patented July 8, 1902.

A. C. EASTWOOD.

RHEOSTAT.

(Application filed Apr. 10, 1902.)

(No Model.)

Fig. 1.

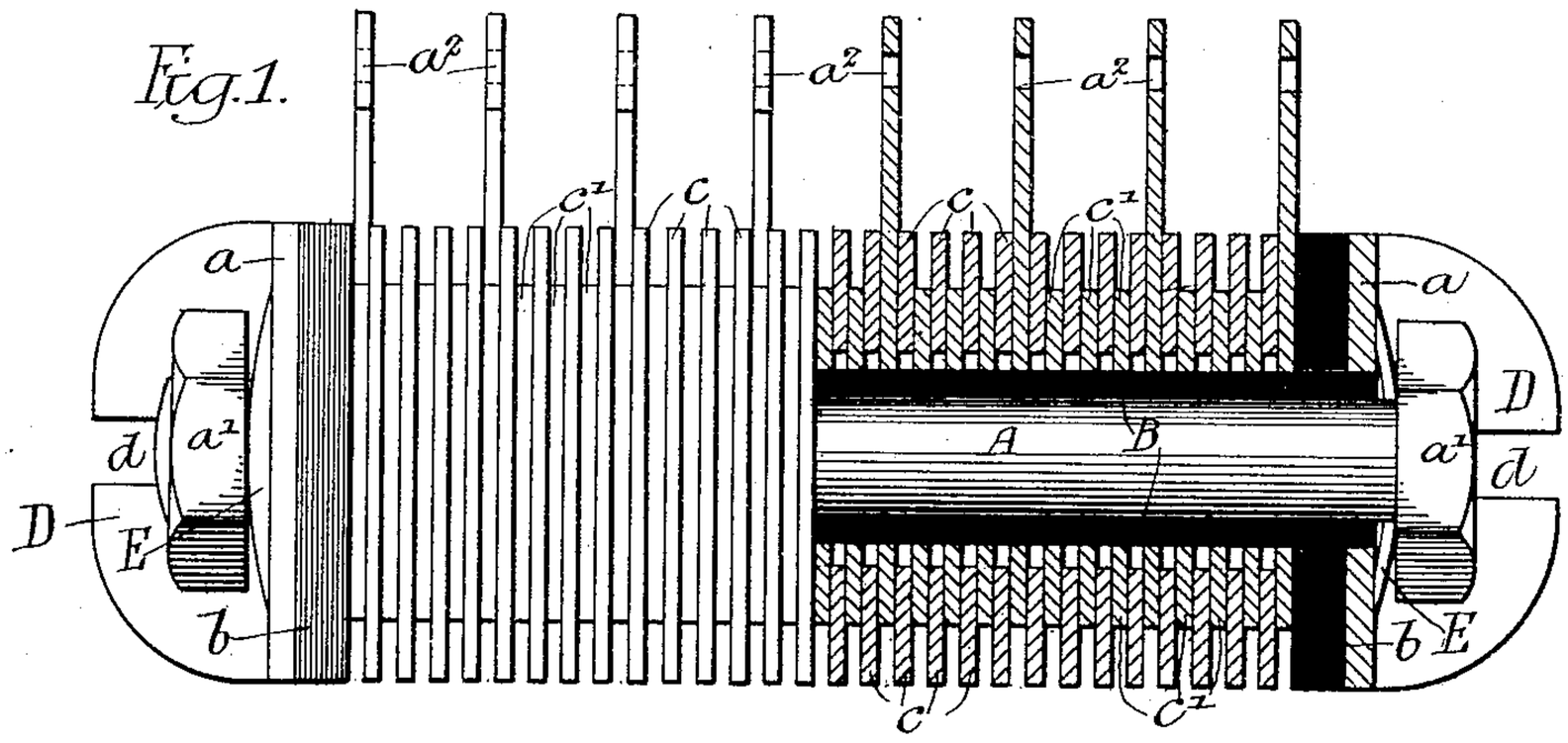


Fig. 3.

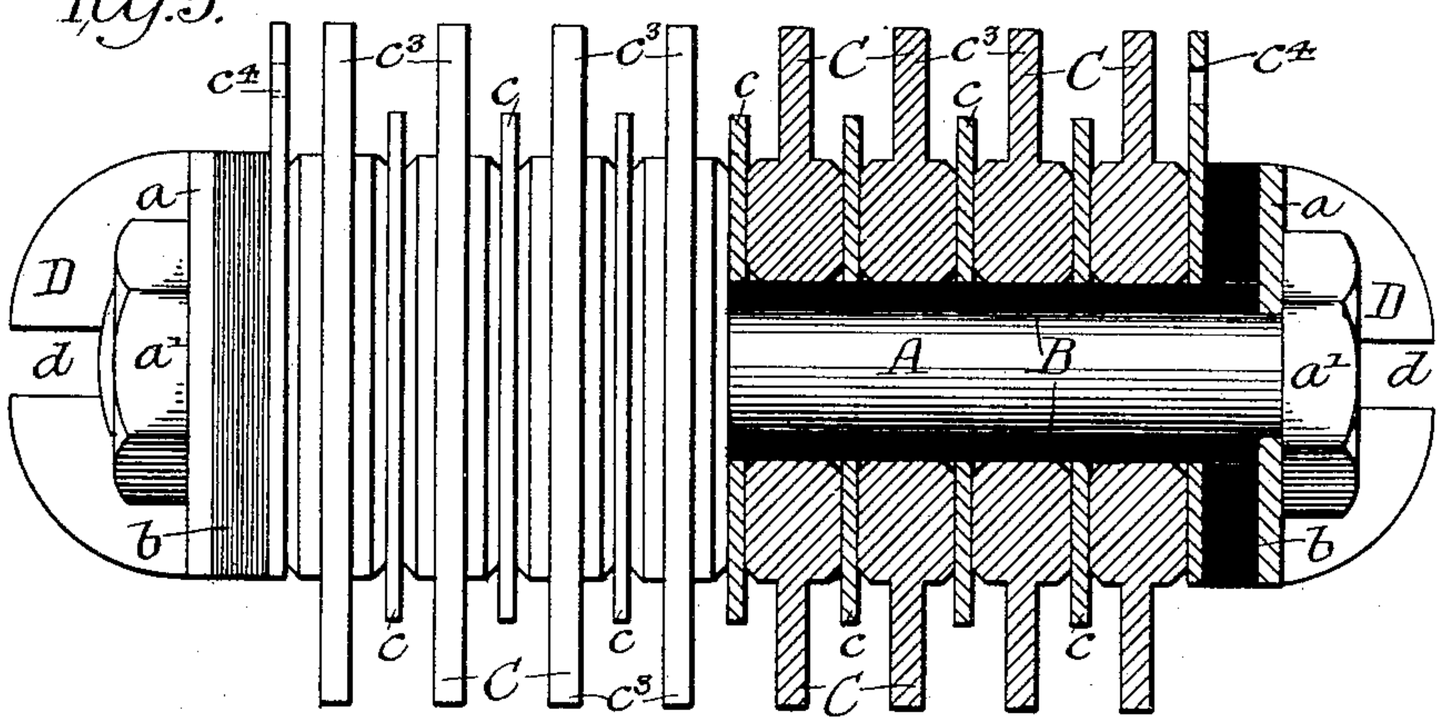
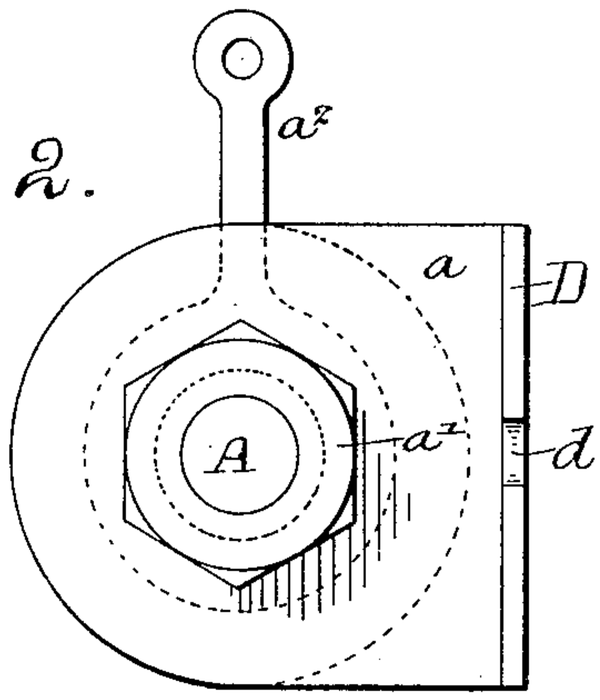


Fig. 2.



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UNITED STATES PATENT OFFICE.

ARTHUR C. EASTWOOD, OF CLEVELAND, OHIO, ASSIGNOR TO THE ELECTRIC CONTROLLER AND SUPPLY COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 704,448, dated July 8, 1902.

Application filed April 10, 1902. Serial No. 102,234. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR C. EASTWOOD, a citizen of the United States, and a resident of Cleveland, Ohio, have invented certain Improvements in Rheostats, of which the following is a specification.

My invention consists of an improved form of electrical resistance designed for use in connection with electric controllers, speed-regulators, motor-starting boxes, field-regulating rheostats, dimmers, electrical heaters, and similar apparatus commonly employed for limiting or regulating the flow of an electric current by means of ohmic resistance.

The object of my invention is to produce an electrical resistance or rheostat which is simple and economical to manufacture and which while being of substantial construction is so made that its surface available for radiating heat may be indefinitely increased without unduly multiplying the number of parts.

A further object of the invention is to provide a rheostat having the characteristics above noted which shall be unaffected by heat and moisture.

These objects I secure as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation of the preferred form of my improved rheostat, the same being partly in section to show its interior construction. Fig. 2 is an end elevation of the rheostat shown in Fig. 1, and Fig. 3 is a slightly-modified form of my invention which is particularly adapted to continuously absorb and dissipate a relatively large amount of electrical energy.

In the above drawings, A is a metallic bar or rod having at one end a head *a* and provided with threads at its other end for the accommodation of a nut *a'*. Upon this bar as a support is placed a tube of some insulating material B, as fiber or porcelain, provided at its ends with washers or rings *b*, also of insulating material. Carried upon this tube B and between the end pieces *b* are a number of thin metallic plates *c* and *c'*, whose surfaces are coated with a thin film or sheet of an electrical conducting material of relatively high resistance. This sheet may be applied chemically, electrochemically, mechanically, or by a combination of these methods and is preferably in the form of a basic oxid of the metal upon which it is deposited. By a "basic oxid" is meant one which will neither absorb oxygen nor give up oxygen, and while I preferably employ such a compound it will be understood that I do not limit myself to the same, since I may, if desired, employ other chemical compounds of the metal forming the plates *c* and *c'* as well as compounds of other metals. The particular metal which I have found to give the best results is sheet iron or steel in the form of thin plates, as noted, coated with a thin film or sheet of the oxid of iron having the chemical composition denoted by the symbols Fe_3O_4.

It will be seen that the plates *c* are of greater diameter than the plates *c'*, extending beyond the edges of these latter, so as to expose a considerable surface of their area for the purpose of radiating heat and permitting further circulation of air. I also preferably form the two sets of plates with the holes through them of different diameters, so that any bur formed in punching said plates may not interfere with the contact between their surfaces.

As shown in the figures, there are plates c^2, formed with a projecting arm, placed at intervals between the plates *c* and *c'*, these arms providing for the attachment of wires from any desired form of electrical apparatus and being made either of the same metal as that composing the plates *c* and *c'* or of different metal. It is evident that by varying the relative diameters of these latter two sets of plates the heat-radiating surface of the device may be adjusted to dissipate any required amount of electrical energy.

Between the insulating end pieces *b* and the head and nut of the rod A, I place angle-shaped pieces of metal D, slotted, as shown at *d*, for the reception of a bolt or other device for retaining the rheostat in position.

In order to provide for the longitudinal expansion of the rheostat caused by its rise in temperature when in operation, I place a spring-washer E, of any well-known form, between the head or nut of the bolt and the angle-piece D. Under ordinary conditions the expansion of the various parts would have no material effect; but in my device un-

less there were some yielding member, as the spring-washer, the pressure between the various plates of metal would be increased and the resistance of the rheostat thereby varied. By providing, however, the yielding member I am enabled to maintain the electrical resistance of the rheostat practically constant irrespective of the expansion due to the heat generated.

When a considerable amount of electrical energy is to be dissipated for an extended period of time, I employ the form of device illustrated in Fig. 3, in which the supporting parts of the device are the same as in Fig. 1, while certain of the conducting members are made with a considerable mass of metal, as indicated at C, Fig. 3. Here the plates *c* are, as before, preferably of iron coated with a basic oxid, while the plates C are made of metal which is a good conductor of heat—as, for instance, copper—these being formed with a relatively large mass or body adjacent to that portion of their surface in contact with the intermediate plates *c* and having extended flanges or webs c^3 projecting beyond the said plates. These webs carry away the heat and dissipate it, as before, by radiation and conduction. Connection is made to the device through the terminal pieces c^4.

It will be noted that very little insulating material is required in the constructions illustrated, these being simple and substantial and of such design that by a very slight modification their resistance may be varied to meet the various requirements of the different kinds of work in which rheostats are employed.

It will of course be understood that in operation the current passes in at the contact or terminal pieces and through the various plates *c* and *c'*, meeting with resistance whenever it passes from plate to plate, owing to the comparatively low conductivity of the sheet of oxid coating the surfaces of said plates. The heat generated at these points of contact is quickly dissipated by the relatively large heat-radiating surfaces formed by the outwardly-projecting portions of the alternate plates.

I claim as my invention—

1. A rheostat consisting of a series of plates of relatively high electrical conductivity having coatings of relatively low conductivity, with means yieldingly holding said plates in contact with one another, said plates being connected to each other through said coatings, substantially as described.

2. A rheostat consisting of a series of plates of relatively high electrical conductivity having coatings of relatively low conductivity, certain of said plates extending beyond the edges of others and thereby providing heat-radiating surface, with means yieldingly holding said plates in contact with one another, substantially as described.

3. A rheostat consisting of a series of plates of relatively high electrical conductivity having coatings of relatively low conductivity, said plates having openings through them and having certain of their number extending beyond the others, a supporting member extending through said openings having means for yieldingly retaining the plates in contact with one another, substantially as described.

4. In a rheostat, the combination of metal plates having their surfaces coated with a material of relatively low electrical conductivity, bodies of metal between said plates of relatively large mass, said bodies having portions thinner than the remainder thereof extended beyond said plates, thereby providing heat-radiating surface, the plates and said bodies of metal being electrically connected through the said coatings, substantially as described.

5. A rheostat consisting of a series of metallic plates, said plates having upon their surfaces a coating of a material of relatively low conductivity, and being electrically connected through said coatings, said plates having a relatively large body portion adjacent to their contact-surfaces and having portions extending beyond said surfaces of less thickness than said body portions, with plates of uniform thickness alternating with said other plates, substantially as described.

6. A rheostat consisting of a series of plates having openings through them, a supporting member extending through said openings, certain of said plates extending beyond the edges of others and certain of the openings through the plates being of a size different from those through the others, substantially as described.

7. The combination in a rheostat of a series of metal plates of relatively great thickness at certain points, plates of substantially uniform thickness alternating with said other plates, said plates of uniform thickness having a coating of relatively low electrical conductivity upon their surfaces, with means for retaining said plates in contact with one another, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR C. EASTWOOD.

Witnesses:
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