No. 693,692. Patented Feb. 18, 1902.

A. C. EASTWOOD.

RESISTANCE COIL.

(Application filed Sept. 26, 1901.)

(No Model.)

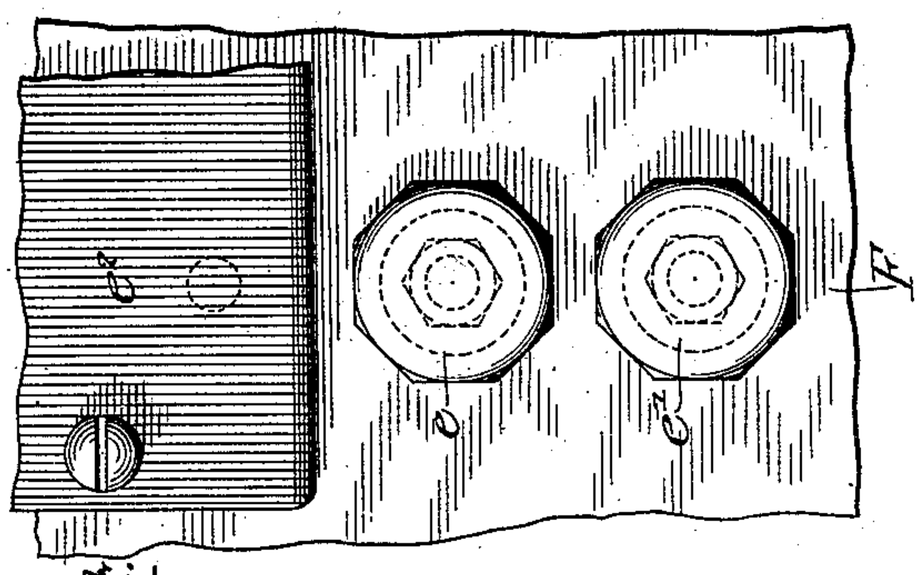

FIG. 4.

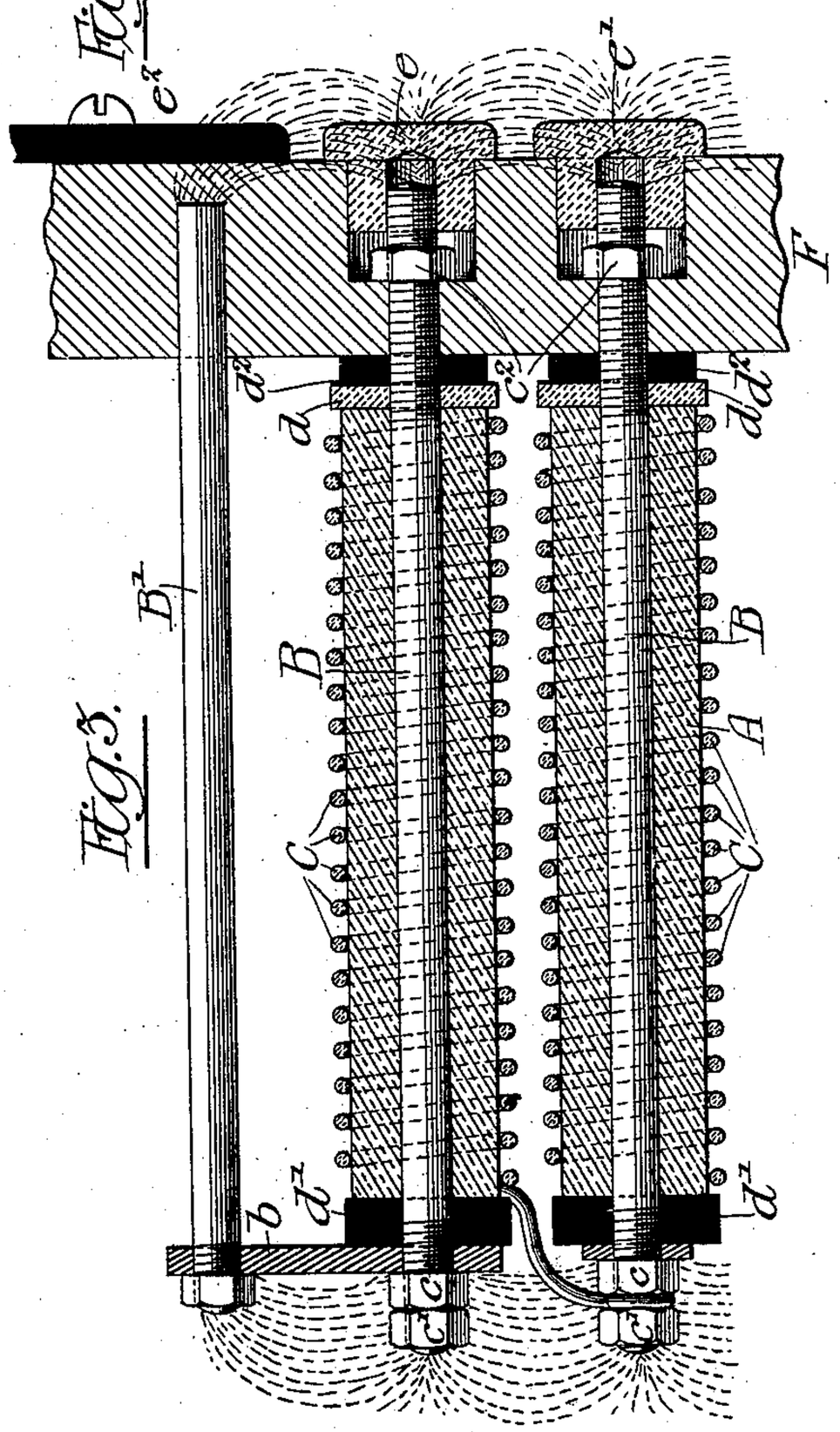

FIG. 3.

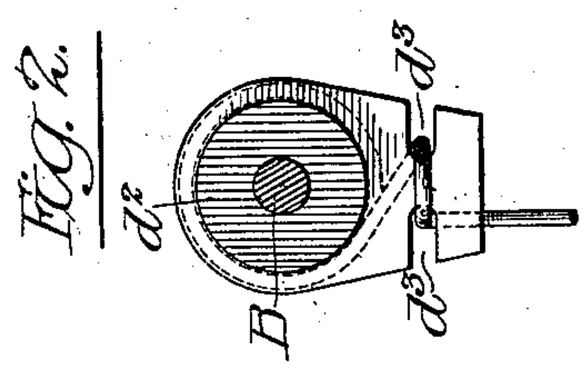

FIG. 2.

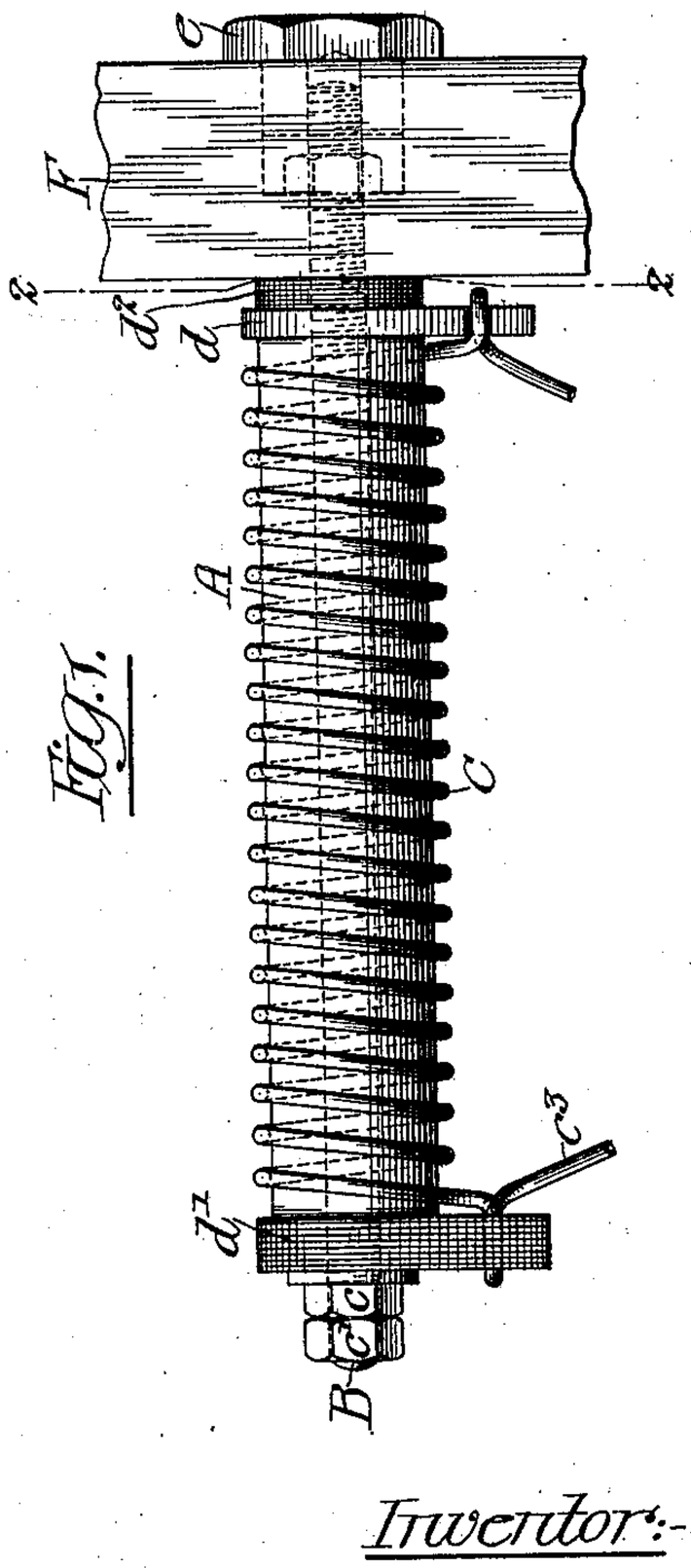

FIG. 1.

Witnesses:-
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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.

RESISTANCE-COIL.

SPECIFICATION forming part of Letters Patent No. 693,692, dated February 18, 1902.

Application filed September 26, 1901. Serial No. 76,660. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR C. EASTWOOD, a citizen of the United States, residing in Cleveland, Ohio, have invented certain Improvements in Resistance-Coils, of which the following is a specification.

My invention relates to certain improvements in resistance-coils, having for its object provision of a self-supporting coil which while simple and inexpensive to construct shall be durable and efficient in use, a further object being to provide a coil which shall automatically break or blow out any arc formed between the adjacent contact-segments forming the terminals of a series of coils or between a segment and a contact arm or brush bearing upon the same. These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a side view of my improved coil, showing it as attached to a slab of insulating material. Fig. 2 is a sectional view on the line 2 2, Fig. 1. Fig. 3 is a side view, partly in section, of a series of my improved resistance-coils, in which is indicated the magnetic field when an electrical current is flowing through the resistance-coils; and Fig. 4 is an end view of Fig. 3.

In such apparatus as at present constructed the resistance is made up of coils, grids, or other forms mounted in a suitable frame or case. Wires are carried from various points in the bank of resistance to suitable contacts mounted on a slab of marble, slate, or other insulating material. An arm provided with suitable brushes or contact-fingers is arranged to make electrical contact with the above-mentioned contact segments or buttons, and motion of the arm cuts in or out sections of the resistance, as may be required in the operation of the apparatus. These connections from the resistance-sections to the contact buttons or segments are frequently complicated and difficult to make and greatly increase the number of parts in a given piece of apparatus. Further, in the class of apparatus as above described when the contact-brush passes from a contact of higher potential to one of lower potential an arc is likely to be set up between these points, which is in many cases destructive. Many means have been devised for combating this arc, principal among them being a magnet so arranged that the poles are in proximity to the contacts. It is found very difficult, however, to properly direct the lines of force from the magnet to efficiently blow out the arc. Another method consists in dividing up the required resistance into a great number of small parts and providing a separate contact for each section, thus reducing the difference of potential between adjoining segments. This of course greatly increases the number of contact-segments, connections, &c., and where any considerable amount of resistance is employed becomes very costly. In my improved resistance unit the core upon which the coil is wound forms its connection to the contact segment or plate. Hence connecting-wires from the sections of resistance to their respective contact-segments are dispensed with. Further, the insulating-tube upon which the coil is wound supports it in position, thus again reducing the number of parts. By the selection of certain materials and combining them in proper relations I am enabled to disperse any arc which may be formed between the contact-segments more effectively than by any means at present known to the art. I can therefore disregard the difference of potential between adjoining segments and construct a given piece of apparatus with fewer sections of resistance, and hence fewer contact-segments and connections, than has been heretofore possible. Thus by means of my invention I can greatly reduce the complication and number of parts, and hence the cost of any piece of apparatus in which it is used.

In the drawings, A is a core of heat-resisting insulating material, such as porcelain or asbestos.

B is a rod of magnetic material passing through the core and provided with threads to accommodate at one end the nuts *c* and *c'* and at the other end the plate *d*, the nut c^2, and the contact-plate *e*. The plate *d* is made of copper, brass, or other conducting material and is threaded in place on the rod B. The plate *d'* at the other end of the coil is made of insulating material and is adapted

to slip over the end of the rod B. The nut c when drawn up serves to clamp the various parts of the coil firmly in place ready for receiving the turns of resistance-wire C. One end of the wire C is passed successively through two holes in the insulating-plate d', thus serving to retain it in place. The end c^3 is left of sufficient length for the connection that may be required. For ordinary series connection in a bank of resistance this free end c^3 is clamped under the nut c' of the next neighboring coil. After winding the coil the other end c^4 is passed alternately through slots d^3 in the plate d and then given a turn at right angles, as is clearly shown in Fig. 1. This holds the wire in place ready for soldering or other electrical connection to the plate d.

F is a slab of insulating material on which are mounted the contact-buttons e. It will be readily seen that the rod B passes into the insulating-slab and is clamped in place by a nut c^2 at the base of a counterbored hole. The contact-segments, here shown as octagonal buttons, are screwed in place on the end of the rods B. A washer d^2 is placed between the end plate d and the back of the slab F to provide a square bearing. Supposing the current enters the coil at the end c^3, it will pass through the various turns of the coil to the end plate d and thence through the rod B to the contact-button e'. It is evident that the turns of the coil C are so disposed about the rod of magnetic material B that when current passes through the coil C the rod B will be strongly magnetized. Fig. 3 shows clearly the magnetic field which is set up between neighboring coils, (the turns of the coils and connections being omitted for the sake of clearness,) the course of the magnetic lines being indicated by the dotted lines. It will be noted that these lines pass directly through the gap or space between the contact-buttons $e\ e'$, and as this is the point at which an arc may be caused by the difference of potential between the contact-buttons they will effectively disrupt this arc.

In Fig. 3, F is the insulating-slab, on which are mounted a series of resistance-coils and their contact-buttons $e\ e'$, e being the first coil in a series or bank of resistance. e^2 is a dead-block of insulating material on which the contact-arm rests when the resistance is out of circuit. Since the form of this contact-arm has no part in this invention, it has not been shown. As the contact-arm passes from e to e^2 an arc would ordinarily be set up at this point, since the circuit is opened by this movement. To dispel this arc, a rod of magnetic material B' is magnetically connected to the rod B by the strap b, and a magnetic field thus set up through the gap between e and e^2.

It will be seen that I have provided a resistance-coil which, in addition to its other functions, acts as the blow-magnet to break any arc formed between its contact plates or buttons and the contact-arm. The coils are self-contained and independent of each other to an extent which allows the removal of individual coils in any easy manner. The contact-plates as they wear out may be cheaply and easily replaced, it only being necessary to unscrew them from the end of the rod B, an operation requiring but little time and no dismantling of the apparatus.

I claim as my invention—

1. In a resistance-coil the combination of a body of insulating material, turns of resistance material wound thereon, and a rod of magnetic material extending through said body electrically connected to the turns of resistance material, with contact-plates also in circuit with the said coil and within the magnetic field passing through said rod when a current flows through the coil, substantially as described.

2. The combination in a resistance-coil, of a core of magnetic material, a coil of resistance material surrounding the same and contact-pieces electrically connected to the coil and to the core, said pieces being within the magnetic field set up from the said core when a current flows through the coil, substantially as described.

3. A series of resistance-coils, contact-pieces therefor placed within the magnetic field of a current passing through said coils, the lines of force of said field breaking any arc formed between said contact-pieces, substantially as described.

4. The combination in a resistance-coil of a body of insulating material, a rod of magnetic material passing therethrough, a contact-plate electrically connected to said rod, and a coil of resistance material wound on the body of insulating material also electrically connected to the rod, the contact-plate being within the field of the current passing through the coil and the rod, substantially as described.

5. A series of resistance-coils, each coil being provided with a core of magnetic material to which it is electrically connected, a contact-plate on each core, adjacent cores and their contact-plates being placed relatively near to each other whereby the magnetic field produced when a current passes through one of the coils extends within the space between adjacent contact-plates, substantially as described.

6. The combination of a tube of insulating material, a rod of magnetic material passing therethrough, a contact-plate fastened to the end of the rod, turns of resistance material wound on the said tube, and a metal plate electrically connected to the rod, one end of the coil of resistance being connected to the plate, said plate being within the magnetic field set up through the rod when a current passes through the coil, substantially as described.

7. The combination of a core of magnetic material, a slab of insulating material through which said core passes, a coil of wire wound on the core and having one of its ends elec-

trically connected to the same, means for clamping the core with its parts to the slab, and a contact-piece detachably connected to an end of the core, the said piece being removable independently of all parts of the coil and core, substantially as described.

8. A resistance-coil wound around a core of magnetic material and connected electrically to said core at one end of the same, a contact-plate also electrically connected to the same end of the rod and means at the other end of said rod for making connection to another coil, the said magnetic core serving to direct the magnetic field when a current flows through the coil of resistance material, substantially as described.

9. The combination of a slab of insulating material, a resistance-coil having a core of magnetic material to which one of its ends is electrically connected, means for clamping said coil to said slab of insulating material, means for connecting the other end of the coil to an adjacent coil and a contact-plate electrically connected to one end of the said core and within the magnetic field set up where a current passes through the coil, 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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HERBERT P. GLIDDEN.