(No Model.)

H. P. DAVIS.

RESISTANCE COIL.

No. 513,457. Patented Jan. 23, 1894.

Fig. 1.

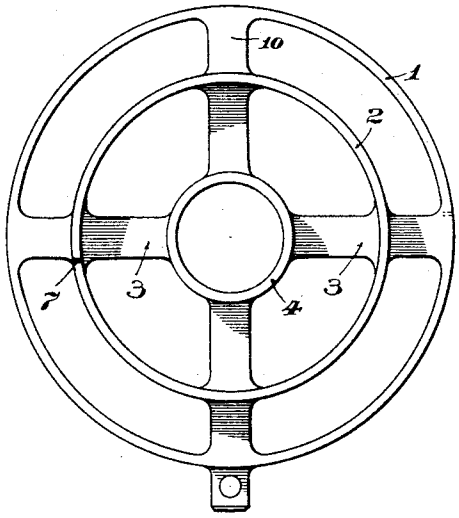


Fig. 2.

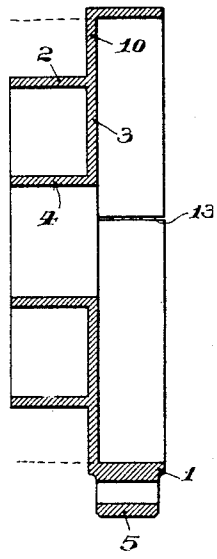


Fig. 3.

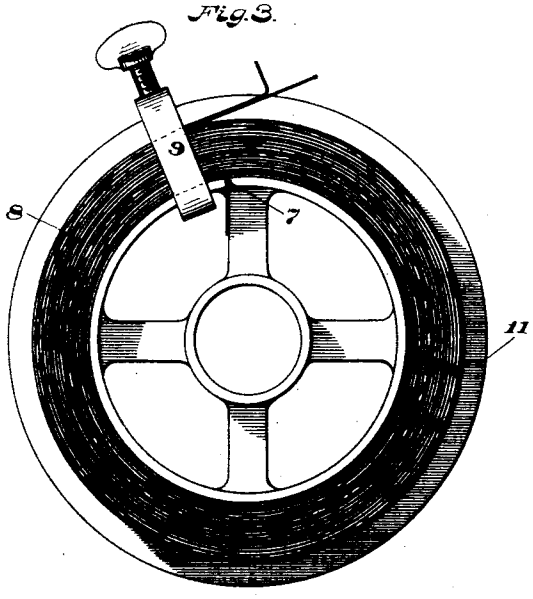
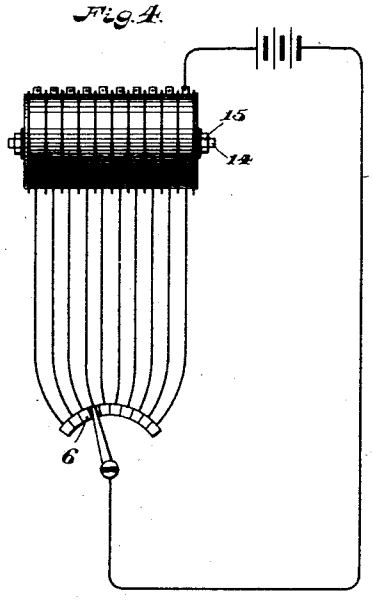


Fig. 4.



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HARRY P. DAVIS, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, OF SAME PLACE.

RESISTANCE-COIL.

SPECIFICATION forming part of Letters Patent No. 513,457, dated January 23, 1894.

Application filed April 22, 1893. Serial No. 471,450. (No model.)

To all whom it may concern:

Be it known that I, HARRY P. DAVIS, a citizen of the United States, residing in Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Resistance-Coils, (Case No. 551,) of which the following is a specification.

My invention relates to improvements in resistance coils, for use with rheostats or in other connections, and particularly to such as are employed for controlling the current used for actuating electric railway cars.

One object of my invention is the production of a form of resistance coil which shall occupy the minimum space and shall cost as little as possible both for material and for labor.

A further object of my invention is the production of a form of coil which can be quickly and easily wound and as easily and quickly associated with other similar coils for the purpose of producing a series of coils for use with a rheostat.

A further object of my invention is to provide a form of resistance coil wherein a cheap and simple skeleton frame is employed in connection with a cheap resistance material of comparatively low resistance, whereby heating of the coils is to a great extent avoided.

In the accompanying drawings which illustrates my invention, Figure 1 is a top view of a skeleton frame such as is used at the end of a series or pile of coils. Fig. 2 is a median transverse section of the same. Fig. 3 is a top view of an intermediate frame of a series, showing the coils in place, and illustrating the method of attachment of the coils to the frames and the electrical connections; and Fig. 4 shows a side view of a series or pile of coils as arranged according to one method with a rheostat.

The skeleton frames which are adapted to be associated as described below in forming a pile are essentially formed of two concentric rings, 1 and 2, which may be circular as shown, or may have any other shape desired. These rings are provided with radial arms, 3, whereby they are kept together, and with which they are preferably cast in one piece. It is of course consonant with the spirit of my invention to have these rings made of any material, and connected together in any way; the casting of the rings, or such casting in one piece with the radial arms or other means for holding them together, is not deemed essential. To these two rings I prefer to add a third, shown at 4, for a purpose explained hereinafter. This one is also preferably cast in one piece with the other rings and with the radial arms 3.

In Fig. 2 it is made clear that the rings 2 and 4 project in one direction, and the ring 1 projects in the opposite direction. The end frames of each pile are provided with binding posts 5, for the purpose of making connection with the circuits to be controlled, and where such piles are used in connection with rheostats, 6, as in Fig. 4, a binding post will be found necessary upon each frame of the series. The resistance coils are applied to these skeleton frames in the manner indicated in Fig. 3. The frame is put on a lathe, and the resistance wire or strip is easily secured to the frame by introducing the end thereof into the slit 7 of the ring 2. This is shown in Fig. 3. The frame is then revolved in the lathe, and the successive convolutions of the resistance material are separated from each other by means of insulating material, the winding being continued until a sufficient thickness 8 of the combined resistance and insulation has been produced. The clamp 9 is then applied and the coil may be laid aside until it is used in building up a pile. Between the coil and the supporting surface 10, Fig. 2, is laid a ring of insulating material 11. I have found that scraps of mica may be utilized in building this form of coil, which renders the cost of insulation merely nominal. The resistance material which I prefer to employ in this coil is sheet iron, and a cheap grade of this material answers every purpose admirably. The resistance of this material being low, the heating of the coils is greatly reduced, and the greater length of coil necessary for producing a given resistance is rendered possible by the cheapness of the material and the compact form of the structure. The air being free to circulate

through the skeleton frame, and these being in conducting relation to the iron, cooling is further enhanced.

In practice I employ narrow strips of sheet iron and I find it possible to use even very small pieces of mica scrap between the convolutions, cut to the proper width, and preferably overlapping. The thickness of the layer of convolutions is indicated by the dotted lines on the left of Fig. 2, and is such as to fully occupy the space between the ring 2 of one frame and the ring 1 of the next. Thus when the frames are associated all movement of the coils is obviated and the utmost compactness is obtained. This is very important in street railways, where space is extremely limited.

In associating the frames and coils in a pile, the coils of one frame are slipped into the ring 1 of the next, and the free end 12 of the coil is slipped into the slit 13 of the ring 1. The two frames are insulated from each other by means of the mica or other insulating layer 11, but are in electrical connection through the coil, the two ends of which are respectively projected through the slits 7 and 13. Only one of these slits will be necessary in the end frames of a series. At one end frame, the inner ring 2 will be slit, and at the other end frame the slit will be in the ring 1. These slits may be sawed or otherwise formed. It is seen that any desired number of these frames may be thus associated in a pile, the material of the frames being in series with the coils. Thus it is only necessary to connect the successive frames themselves to the contacts of a rheostat to enable one to place as many coils in series in a given circuit as is desired. This is indicated in Fig. 4.

As shown in Fig. 4, the series of frames is supported upon a shaft, 14, which passes through the inner rings of the frames 4, and is preferably provided with threaded ends so that the frames may be securely clamped into one series by means of the nuts 15. I find this a convenient mode of supporting the frames, but any other mode may be employed without departing from the invention.

The advantages incident to my invention will therefore be seen to be, quickness of manufacture, the use of unskilled labor, compactness of single members as well as of groups, ease of connection to a rheostat, cheapness of materials, and coolness, due to low resistance and skeleton supports.

What I claim is—

1. A frame for resistance coils having two similarly shaped rings projecting therefrom in opposite directions.

2. A frame for resistance coils having two concentric rings of similar shape, projecting in opposite directions therefrom and cast in one piece with radial arms joining them.

3. A frame for resistance coils consisting of three concentric rings, cast in one piece with radial arms joining them.

4. A frame for resistance coils consisting of three concentric rings, cast in one piece with radial arms joining them, the outer and middle ring being of similar form and projecting in opposite directions, and the inner and middle ring projecting in the same direction from the frame.

5. A frame for resistance coils having two similarly shaped rings projecting therefrom in opposite directions, each of said rings having a slit.

6. A frame for resistance coils having two similarly shaped rings projecting therefrom in opposite directions, the inner one being slit, and the outer one having a binding post.

7. In a resistance coil, a spiral strip of resisting material, and mica scraps interposed between the convolutions thereof.

8. A frame for resistance coils having two similarly shaped rings projecting therefrom in opposite directions, the inner of said rings having a slit, in combination with a resistance spiral of metal, having one end projecting through said slit, and insulation between successive convolutions of said coil.

9. In a series of two or more associated resistance coils, two or more frames having two concentric rings of similar shape projecting in opposite directions, the inner ring of one frame bearing a resistance coil, and with said coil, fitting within the outer ring of the next frame.

10. In a series of two or more associated resistance coils, two or more frames having concentric rings of similar shape projecting in opposite directions, the inner ring of one frame and the outer ring of the other being slit; in combination with an insulated resistance coil wound upon the inner ring of one frame and having its end projecting through the slit thereof, said inner ring and coil fitting within the outer ring of the other frame, and the outer end of said coil projecting through the slit in said outer ring.

11. In a series of two or more associated resistance coils, two or more frames having three concentric rings, the middle and outer ones being of similar shape, insulated resistance coils wound upon said middle rings of one frame, and said middle ring and its coil fitting within the outer ring of the next frame; and a supporting bar fitting the inner ring of all the frames, and having means for clamping the frames together.

In testimony whereof I have hereunto subscribed my name this 20th day of April, A. D. 1893.

HARRY P. DAVIS.

Witnesses:
JAMES WM. SMITH,
HAROLD S. MACKAYE.