W. H. KELLER.

ELECTRIC RESISTANCE DEVICE.

APPLICATION FILED JUNE 2, 1915.

1,240,457. Patented Sept. 18, 1917.

Fig. 1.

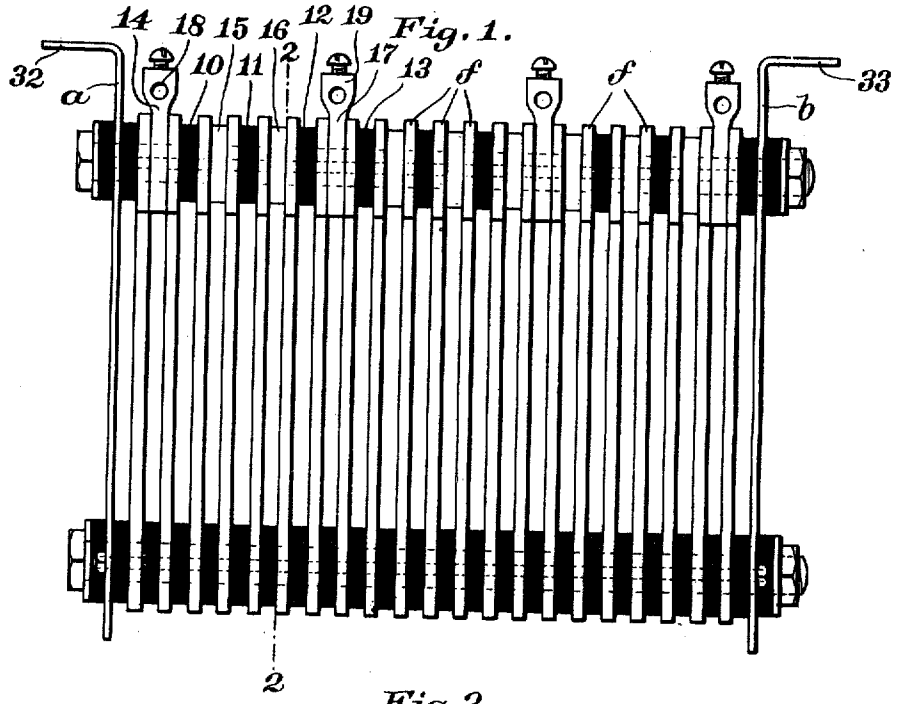
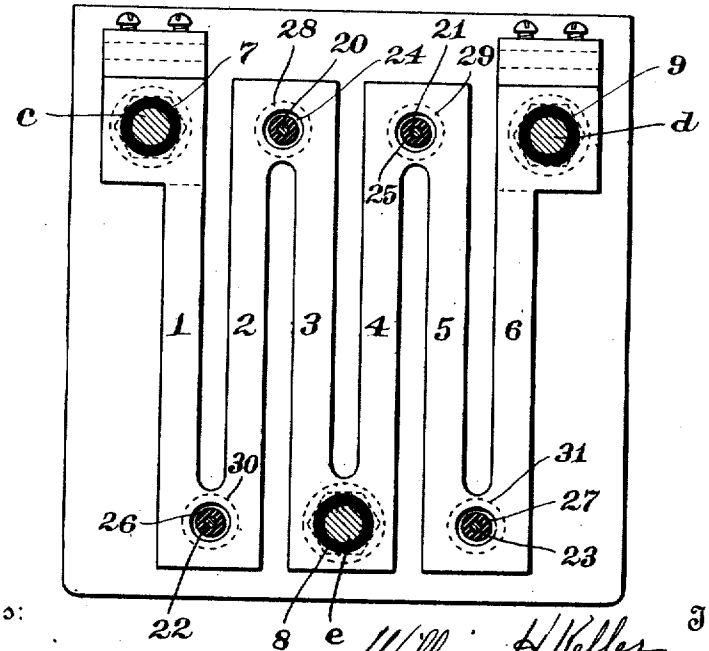


Fig. 2.



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ELECTRIC RESISTANCE DEVICE.

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To all whom it may concern:

Be it known that I, WILLIAM H. KELLER, citizen of the United States, and resident of Norton, in the county of Wise and State of Virginia, have invented certain new and useful Electric Resistance Devices, of which the following is a specification.

This invention relates to devices interposed in electric circuits for producing resistance therein.

It has particular relation to that class of devices comprising reflexed grids which have the greater part of their surfaces exposed to the atmosphere. The advantages of this class of structures are well known.

With cast iron grids, bosses for spacing the grids apart were readily formed on the grids when they were cast. The cast iron grids however are extremely fragile and the loss by breakage is very large.

The loss by breakage can be removed by forming the grids of material such as steel which can be punched from a sheet of metal. This provides an inexpensive manner of forming the grid, and the material being inexpensive, it is practicable to make it in a plane sheet, and of such dimensions that, when firmly clamped, it will support itself in proper position without the necessity of providing strengthening ribs or other special construction of the grids. Further, these ribs, etc., operate against compactness by necessitating the placing of the grids at greater distances apart. When the grids are made in plane sheets (they not then having any spacing bosses) they may be separated by pieces interposed between them, such as washers threaded on the clamping rods, these washers being of conducting material where a connection is desired and of insulation where it is desired to insulate.

I have found that where punched steel grids in plane sheets, as referred to, are employed, even if they are tightly clamped together at first, the heating and cooling incident to the use of the resistance causes the grids to work loose, so that sometimes the tips of the reflexed portions of one grid will fall over against an adjacent grid. This of course short circuits a portion of the resistance and detracts from the usefulness of the devices. This condition of affairs can be remedied by tightening up the clamping means from time to time, particularly during the first few days of the use of the device. It has been found however practically impossible to cause the operators to attend to this tightening of the grids with the results as noted.

This condition can be largely alleviated by placing the clamping means under a very high tension initially but this is liable to break the clamping rods unless they are of large size. The large size is objectionable however because it requires too much of the grids to be cut away in making passage for the clamping rods.

According to the present invention I keep the clamping rods within a reasonable size and insure that the grids shall not come in contact with each other even if they work loose, by providing insulating separating means at points removed from the clamping means, as for instance, at points of flexure.

I further provide a grid wherein the separating means as described is provided and wherein the reflexed portions of the grid are all of the same length. If any of the reflexed portions were shortened up to make room for clamping or separating devices this would mean that there would have to be more bars in the grid and consequently a greater width of grid, for a given resistance.

The metal washers used as spacers and connectors between the grids are rendered specially liable to corrosion by reason of the increase and decrease of temperature during the use of the apparatus. This tends to decrease the efficiency of the contact which is liable to grow worse and worse as time goes on. It is a further object of the invention to provide improved connecting means between adjacent grids. This I do by making the connecting and spacing means of galvanized metal. This reduces the tendency to corrosion and presents clean contact surfaces to the grids.

Other objects of the invention will appear hereinafter.

In the accompanying drawings which illustrate the invention Figure 1 is the side view of a rheostat embodying the invention and Fig. 2 is a section on the line 2—2 of Fig. 1.

Referring to the drawings, the frame in which the grids are to be mounted comprise the end plates *a* and *b* between which extend the clamping bolts *c*. *d* and *e*. having

nuts outside the ends of the plates as shown. Between the plates are arranged grids *f*.

The structure of the grid is shown best in Fig. 2, from which it appears that each grid comprises the reflexed portions 1, 2, 3, 4, 5 and 6, thus providing a long path for the current in going from one side of the grid to the other. At one end of each of the outside bars of the grid is a hole, through which the bolts *c* and *d* pass, while at the middle of the grid upon the opposite side from the holes mentioned is another hole, through which is threaded the bolt *e*. The grids are ordinarily insulated from the bolts *d*, *c*, and *e*, by insulating sleeves or bushings, as 7, 8 and 9, which envelop the bolts. The grids are spaced from each other on the clamping bolts by means of washers. These washers, as 10, 11, 12, and 13, may be of insulating material, it being desired to insulate adjacent grids from each other at these points, while washers, as 14, 15, 16 and 17 may be of metal, it being desired to electrically connect the adjacent grids at these points. Where desired the metal washers may be extended into terminals as 18 and 19 for receiving the ends of the wires, by which external connections are to be made. Preferably the insulating bushings and washers referred to are made of mica, although other insulating material might be employed.

In order to insure that the grids are properly spaced apart, even though the tightening of the clamping means may not be properly attended to, and without necessitating an undue magnitude of the clamping bolts, rods 20, 21, 22, and 23 are passed through holes in the grids at their points of flexure. These rods are insulated from the grids by insulating bushings 24, 25, 26 and 27 and carry insulating washers as 28, 29, 30 and 31 interposed between the grids. These rods 20, 21, 22 and 23 are much smaller than the clamping rods. They serve to support the insulating washers which separate the grids, and ordinarily have slight, if any, clamping effect. They may be held in position by being extended through the end plates, outside of which nuts may be applied to them.

Each grid is punched from a sheet of steel of suitable thickness, and all the parts of the punched grid lie in a plane sheet. Other forms of iron and steel may be employed but do not realize all the advantages to the same extent as the steel.

The metal washers interposed between the grids for making connections between the same, as before referred to, are of galvanized metal, preferably steel. This insures against deterioration of the connection by corrosion and provides a good contact surface.

The end plates *a* and *b* may be provided with feet 32 and 33, by means of which the rheostat may be bolted or screwed to a suitable support.

What I claim is:—

1. In an electric resistance device, the combination with a plurality of reflexed resistance grids formed from sheet metal and of substantially uniform thickness throughout, and having the greater part of their surfaces exposed to the air, clamping means including rods extending transversely of the planes of said grids for clamping the grids together, means for insulating said grids from said clamping rods, metallic and insulating spacing members adjacent said clamping rods and interposed between adjacent grids, whereby the grids are spaced apart from one another, and whereby the grids are insulated from each other or electrically connected together at desired points, rods extending transversely of the planes of said grids at points removed from said clamping rods, and carrying insulating pieces insulating the grids from the rods and from each other, the said insulating pieces of different rods being separated and individual to each rod.

2. In an electrical resistance device, the combination with a plurality of reflexed resistance grids having the greater part of their surfaces exposed to the air, clamping means including rods extending transversely of the planes of said grids for clamping the grids together, means for insulating said grids from said clamping rods and from each other adjacent to said rods, and insulating separating means interposed between adjacent grids at each place of flexure.

3. In an electrical resistance device, the combination with a plurality of reflexed resistance grids having the greater part of their surfaces exposed to the air, of means for clamping the grids together, comprising rods extending through said grids, means for insulating said grids from said rods and from each other adjacent to said rods, rods smaller than the clamping rods passing through said grids at each point of flexure, and carrying insulation, insulating the grids from each other.

4. In an electrical resistance device, the combination with a plurality of reflexed resistance grids having their reflexed portions of substantially the same length, and having the greater part of their surfaces exposed to the air, of means for clamping the grids together comprising clamping rods extending through said grids, means for insulating said grids from said rods and from each other adjacent to said rods and rods passing through each point of flexure of said grids and carrying insulation, insulating the grids from each other.

5. In an electrical resistance device, the combination with a plurality of reflexed re-

sistance grids having the greater part of their surfaces exposed to the air, the whole of each grid lying in a plane sheet, of means for clamping the grids together comprising rods extending along said grids, means for insulating said grids from said rods and from each other adjacent to said rods, rods extending along said grids at their points of flexure, insulating bushings and washers carried by the last mentioned rods for insulating the grids from each other and washers carried by the clamping rods, the last mentioned washers being interposed between adjacent grids, being of metal where electrical connection is desired and being of insulation where it is desired to insulate the grids.

6. In an electrical resistance device, the combination with a plurality of reflexed resistance grids, having the greater part of their surfaces exposed to the air, the said grids being punched from sheet steel and having the reflexed portions of a grid of substantially equal length, of means for clamping the grids together, comprising rods extending along said grids, insulating bushings and washers on said clamping rods, grid connecting washers upon said clamping rods, rods smaller than said clamping rods passing through said grids at each point of flexure and insulating bushings and washers carried by the last mentioned rods.

Signed at Norton, in the county of Wise and State of Virginia.

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