R. C. HARRIS.

ELECTRIC RESISTANCE.

APPLICATION FILED FEB. 18, 1911.

1,006,655.

Patented Oct. 24, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

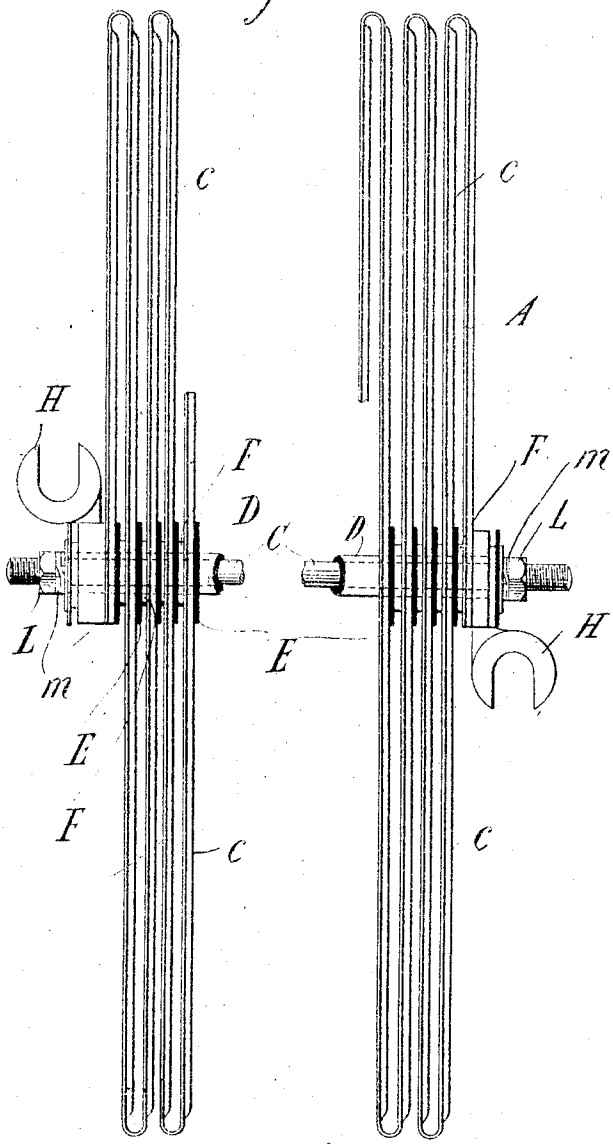
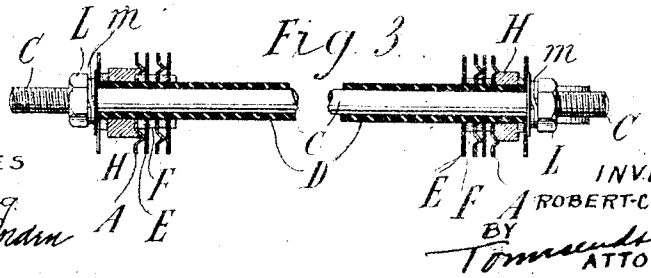


Fig. 3.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 2.

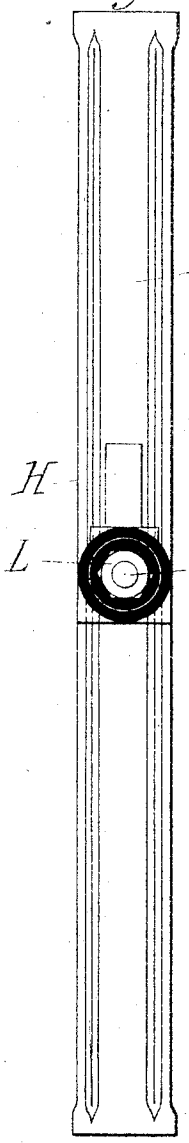


Fig. 6.

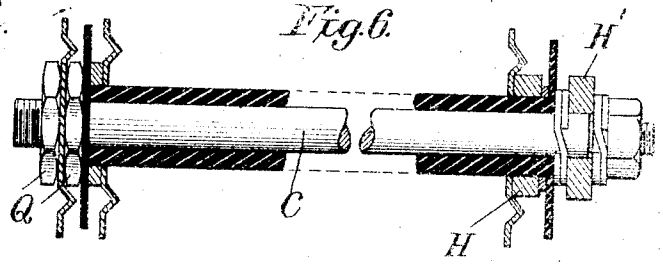


Fig. 4.

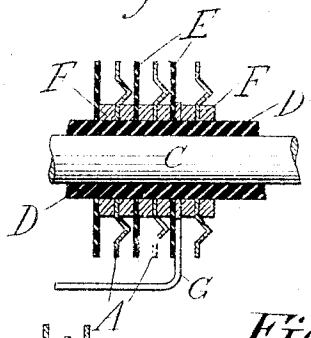


Fig. 7.

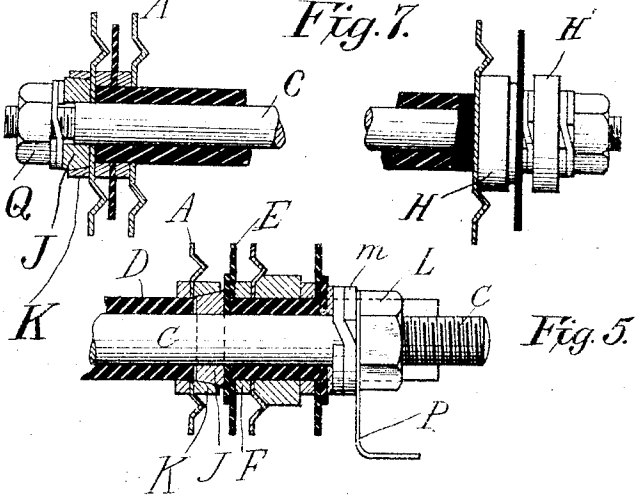
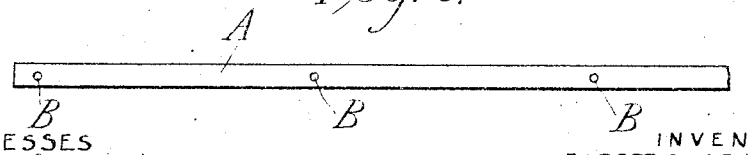


Fig. 5.

Fig. 8.



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UNITED STATES PATENT OFFICE.

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ELECTRIC RESISTANCE.

1,006,655. Specification of Letters Patent. **Patented Oct. 24, 1911.**

Application filed February 18, 1911. Serial No. 609,460.

To all whom it may concern:

Be it known that I, ROBERT CHARLES HARRIS, a subject of the King of Great Britain and Ireland, residing at Gateshead-upon-Tyne, in the county of Durham, England, have invented Improvements in or Relating to Electric Resistances, of which the following is a specification.

This invention relates to resistances of the strip type and has for its object to provide an improved arrangement whereby the cost of construction is reduced the strip being supported by but one binding rod and requiring no slotted holds or special bends to allow for expansion.

According to the invention the strip is punched with a series of holes, pitched apart as required, and then bent to a form that will bring all the holes into alinement and produce a resistance unit having stable loop-like portions arranged alternately at opposite sides of a binding rod that extends through the holes. Preferably the holes in the strip are equidistantly spaced and the strip corrugated to within a short distance of regions midway between the holes thereby producing stiffened loops of equal length. In some cases however the holes might be unequally spaced, so as to enable loops at one side of the rod to be made longer than loops on the other side thereof, or to enable both long and short loops to be arranged at each side of the rod, the long loops alternating with the short loops. In other cases the holes could be arranged to gradually increase in pitch until the center is reached, and then to decrease. The resultant unit would in this case have a circular form. The binding rod may be made of insulating material or of metal covered with a suitable insulator. The loops of the strip of the unit may be separated in various ways. Thus a single insulating washer may be placed between each adjacent pair of faces of the strip. Or a number of washers may be placed between such pairs of faces, in which case one washer need alone be of insulating material.

In the accompanying drawings, Figure 1 is a side elevation of the two end portions of one form of resistance unit according to the invention. Fig. 2 is an end elevation of the left hand portion of Fig. 1 and Fig. 3 is a central horizontal section corresponding to Fig. 1. Fig. 4 is a central horizontal section of a portion of a modified form of resistance unit and Fig. 5 is a similar view illustrating a further modification. Figs. 6 and 7 are views similar to Fig. 3 of still further modifications. Fig. 8 shows a portion of strip material for use in units shown in the preceding figures.

In the example according to Figs. 1 to 3, A is the strip, corrugated longitudinally at *b* and *c* to within a short distance of the regions where it is bent or folded, the strip previous to corrugation being punched with holes B as shown in Fig. 8. C is the binding rod of metal covered with suitable insulating material D. E are insulating washers and F metal washers placed between the folds of the strip. H are the terminals serving to support the unit. L are nuts and *m* spring washers serving to clamp the strip, washers and terminals together.

Fig. 4 illustrates a modification wherein electrical connection is made with the unit intermediate of its length, G being a conductor or terminal located in contact with one of the metal washers F. As another mode of effecting connection with the strip of the unit intermediate of its length, suitable when the binding rod is of metal properly insulated, a collar may be formed on or fixed to the binding rod at the required position so as to make contact with the strip, there being then a terminal at each end of the strip and a terminal connected to the binding rod, the current passing through part of the latter.

A compound washer for carrying out the foregoing modification is illustrated in Fig. 5 where J is a collar split, preferably at one point, and having an exterior taper. K is a complete collar having a corresponding interior taper, the said collars when clamped together with the remaining elements causing good electrical contact to be made with the binding rod C. P represents a conductor or terminal in electrical connection with the clamping rod C.

In some cases in lieu of having a terminal arranged at opposite ends of the strip, one end of the latter can, as shown in Fig. 6 be clamped as by nuts Q to the rod C, one terminal H being employed in direct electrical connection with the opposite end of the strip and another terminal H^1 located adjacent to the terminal H in electrical connection with the rod C, the current there-

fore flowing the whole length of the binding rod.

Fig. 7 shows a further modification in which in lieu of the nuts Q one such nut Q and collars J and K as described with reference to Fig. 5 are employed for connecting the end of the strip to the rod C.

The form of the washers for separating the portions of the strip will depend upon the nature of the corrugations in the strip.

What I claim is:—

1. A resistance unit comprising a metal strip having perforations spaced throughout its length, and folded intermediate of the perforations so as to bring the latter into alinement, and a support extending through said perforations.

2. A resistance unit comprising a metal strip having perforations spaced throughout its length and folded intermediate of the perforations so as to bring the latter into alinement, an insulating rod extending through said perforations and insulating devices disposed between the several loops formed by the folds in the strip.

3. A resistance unit comprising a metal strip having perforations spaced throughout its length and folded intermediate of the perforations so as to bring the latter into alinement, an insulating rod extending through said perforations, a pair of metal washers threaded on the rod between each loop formed by the folds in the strip, an insulating washer between each pair of metal washers and means upon the rod for clamping the metal strip and washers together.

4. A resistance unit comprising a metal strip having perforations spaced throughout its length and folded intermediate of the perforations so as to bring the latter into alinement, an insulating rod extending through said perforations, insulators disposed between the sevaral loops formed by the folds in the strip, means clamping the strip and washers together upon the rod and a terminal in electrical contact with the strip intermediate of its length.

5. A resistance unit comprising a metal strip having perforations spaced throughout its length and folded intermediate of the perforations so as to bring the latter into alinement, an insulating rod extending through said perforations, a pair of metal washers threaded on the rod between each loop formed by the folds in the strip, an insulating washer between each pair of metal washers a terminal in electrical contact with one of said metal washers and means upon the rod for clamping the metal strip and washers together.

6. A resistance unit comprising a metal strip having perforations spaced throughout its length and folded intermediate of the perforations so as to bring the latter into alinement, a metal rod extending through said perforations, an insulating sleeve separating the strip from the rod, a spring metal washer embracing the rod and in electrical connection therewith, a clamping ring encircling the said washer and in electrical contact with both the ring and one portion of the strip intermediate of its length, insulating devices separating the several loops formed by the folds in the strip, devices on the rod for clamping the metal strip and washers together and a terminal in electrical connection with the rod.

7. A resistance unit comprising a strip of metal punched with holes at predetermined intervals, corrugated longitudinally to within a short distance of points midway between the holes and folded at such points to bring the holes into alinement and form stable loop-like portions extending alternately in opposite directions from the axis common to the alined holes.

8. In a resistance unit, the combination with a metal clamping rod, a strip of metal, folded into loops, threaded on said rod, and an insulating sleeve separating the strip from the rod, of a compound washer adapted to place the rod in electrical connection with the strip.

9. In a resistance unit, the combination with a metal clamping rod, a strip of metal, folded into loops, threaded on said rod, and an insulating sleeve separating the strip from the rod, of a compound washer adapted to place the rod in electrical connection with the strip, a terminal in electrical connection with the rod at one end of the unit and a terminal adjacent to the other terminal insulated from the rod and in electrical connection with the strip.

Signed at Gateshead this second day of February 1911.

ROBERT CHARLES HARRIS.

Witnesses:
THOMAS W. THOMPSON,
CHARLES P. YOUNG.