J. MARSCHALL.

THERMO ELECTRIC BATTERY.

APPLICATION FILED JULY 10, 1908.

985,426. Patented Feb. 28, 1911.

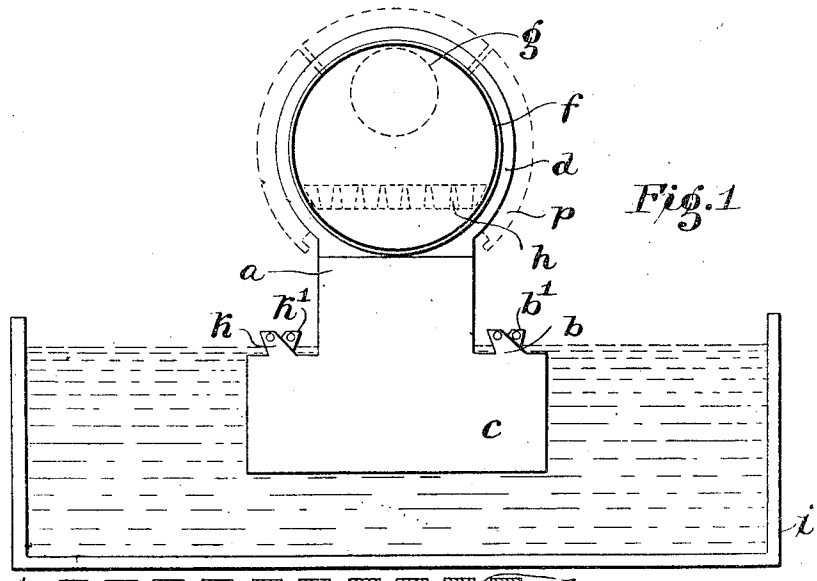

Fig. 1

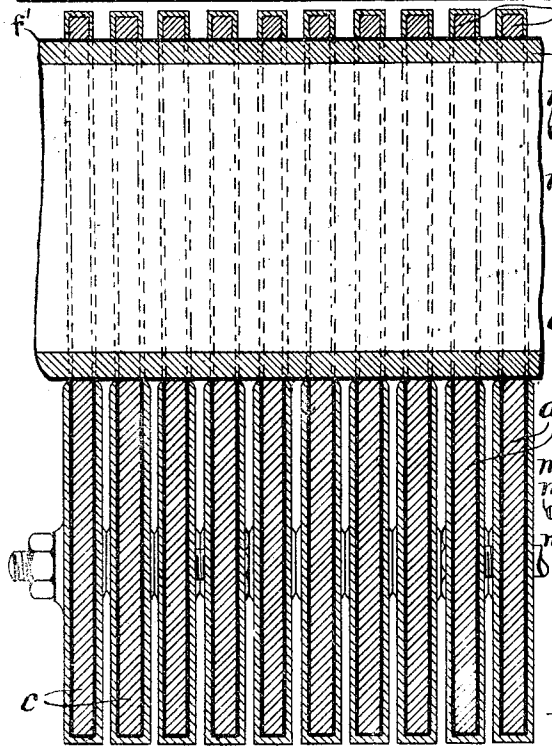

Fig. 2

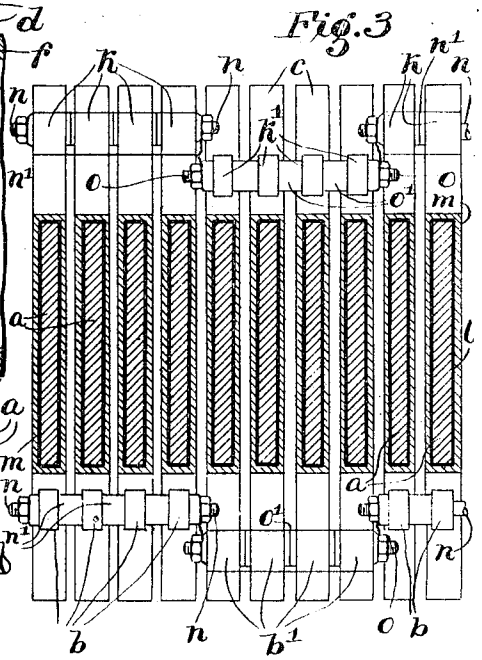

Fig. 3

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UNITED STATES PATENT OFFICE.

JOHANNES MARSCHALL, OF DRESDEN, GERMANY.

THERMO-ELECTRIC BATTERY.

985,426. Specification of Letters Patent. Patented Feb. 28, 1911.

Application filed July 10, 1908. Serial No. 442,804.

To all whom it may concern:

Be it known that I, JOHANNES MARSCHALL, a subject of the German Emperor, and a resident of 198 Grossenhainerstrasse, Dresden, in the Empire of Germany, have invented certain new and useful Improvements in Thermo-Electric Batteries, of which the following is a specification.

The subject matter of the present invention is an improved thermo-electric battery.

In thermo-electric batteries known heretofore it was customary to make the cells of such size that the electric resistances of the same were not equal to one another. For constructive reasons such an arrangement was not desirable.

Now the subject matter of the present invention is a thermo-electric battery in which the two constituents of the cells have almost exactly the same resistance. The construction of the present thermo-electric battery further has the advantage in one special constructional form that the individual cells are easily accessible without having to take apart the entire battery. Namely the separate cells have ring shaped parts with which they are pushed over the cylindrical surface of the heater. They can then be rotated around the axis of the heater and be very conveniently brought in this manner into the required position for being repaired.

In order that the invention may be clearly understood, reference is made to the accompanying drawing in which one embodiment is represented by way of example, and in which:

Figure 1 is a vertical section through the battery. Fig. 2 is a cross sectional elevation of the battery without the bath taken on the vertical center line of Fig. 1, and Fig. 3 is a horizontal section through the middle portion of Fig. 1.

Referring to the drawing, the battery is made as follows: From an iron, nickel, German silver, or like plate an annular member d having a correspondingly large shoulder c is stamped out, two small lugs k, b, each having a hole through the same being provided on each shoulder, as is clearly shown in the drawing. The manufacture of the individual cells is now continued as follows: Both surfaces of the connecting portion a between the shoulder and ring, the shoulder c and the lugs k and b of the part of the cell which has been stamped out are coated completely with a film of varnish l (Fig. 3); enamel or any other suitable insulating layer may also be used instead of varnish. The portions a and c and the lug k, but not the lug b, are then made electrically conducting again both back and front on the surface of the varnish by either graphite, a metallic powder, tin-foil or sulfid of silver being applied on the varnish. The lug b remains without this electrically conducting coat. The entire stamped part of the cell prepared in the manner indicated above is then galvanized in an electrolytic bath and thereby provided with a coat m. The coat m however, is deposited directly on the ring d without any layer of varnish thereon. Here also the lug b remains free from the electrolytic deposit, so that the iron or the like of which the part consists remains clean and bright when the varnish is removed. In this manner a thermo-electric cell is produced, the contact surfaces of which extend over the entire ring d. The portion a, which is made relatively short and having a large cross-sectional area, serves as conductor from the real thermo-electric cell to its terminals, namely to the lugs k and b. The portion c which dips into an oil, petroleum or like bath serves as cooling surface. The lugs k and b slanting in one direction are connected by bolts n in groups and connecting rings n^1 are located between the lugs k and b. The lugs k^1 and b^1 sloping in the other direction are connected by bolts o in groups and connecting rings o^1 are located between the lugs b^1 and k^1 whereby two sets of groups of lugs are obtained which slant in opposite directions. The heated contact of the metals is on the annular member d, that is the ring which rests on the heating pipe f which may be of iron for instance. The second metal, for instance copper, is directly produced on the ring d on its entire surface. The heated contact between the two metals therefore rests on the entire heating pipe f. In case said heating pipe f is a conductor an insulating layer f', for instance of thin asbestos sheeting is provided between said pipe f and the ring d. The part or neck a below the annular member d is separated from the electrical conducting material thereon by a layer of varnish l as above stated. The current flows through both metals forming the part a which are insulated from each other, that is from the heated contact at d through the one metal, for instance iron, to the lug b which is free from any coating and through

the second conducting metal to the lug *k* which is electrolytically coated. The cold contact is formed as shown in Fig. 3 as follows: The single elements which have been mounted with their rings *d* are formed into groups as shown in Fig. 3 so that four points, that is the lugs *b* are in contact with each other while the four lugs *k*, that is the copper produced thereon are in contact with each other. In the first group the lugs *b* have their free metallic surfaces while in the second group the lugs *k* show the copper produced thereon. When both groups are connected by wires as shown in the drawing then this is equivalent to a direct contact of both metals and there is the cold contact.

The thermo-electric cell according to the present construction has among others the advantage that the so-called cold places *b* and *k* are cooled very intensively by the portion *c* for they are part of said portion *c* which is located in the oil bath that is the cooling agent, and they are also protected well from radiation from the source of heat. Namely the cells have been pushed by means of the rings onto a hot pipe, the rings are completely covered from the outside by a heat insulating packing or cover *p*.

In the drawing the heating pipe is denoted by *f*, the flue within the same by *g*, and the grate by *h*, the latter being provided only if necessary when direct firing is to be used and not waste gases. The oil bath is denoted by *i*.

As one advantage as compared with constructions known heretofore it may also be mentioned that soldering is done away with, because the second constituent of the cell is attached electrolytically, galvanically, or galvanoplastically.

I claim as my invention:

1. A thermo-electric cell comprising a flat member having one portion covered with an electrically insulating layer, and a second part of said cell composed of a metal coating applied to the flat part or member covering both its insulated and uninsulated portions whereby both parts of the element are partly in direct contact with each other for producing the real thermo-cell and partly separated by an electrically insulating layer for producing the connections to be kept cool.

2. A thermo-electric cell comprising a flat member of metal sheeting having an annular portion, and a second portion covered with an electrically insulating layer, and a second part of said cell composed of a metal coating applied to the flat part or member covering both its insulated and uninsulated portions whereby both parts of the elements are partly in direct contact with each other for producing the real thermo cell and partly separated by an electrically insulating layer for producing the connections to be kept cool.

3. A thermo-electric battery comprising a tubular heater and a plurality of thermo-electric cells, each cell comprising a flat member or part of metal sheeting having an annular portion adapted to embrace the heater, and a second portion covered with an electrically insulating layer, and a second part of said cell composed of a metal coating applied to the flat part or member covering both its insulated and uninsulated portion whereby both parts of the element are partly in direct contact with each other for producing the real thermo-cell and partly separated by an electrically insulating layer, said latter portion being adapted to be placed in a cooling agent.

4. A thermo-electric battery comprising a tubular heater and a plurality of thermo-electric cells, each cell comprising a flat member or part of metal sheeting having an annular portion adapted to embrace the heater, and a second portion with lugs or terminals covered with an electrically insulating layer except one lug, and a second part of said cell composed of a metal coating applied to the flat part or member covering both its insulated and uninsulated portion except the lug which is free from insulation, both parts of the element being thus partly in direct contact with each other for producing the real thermo-cell and partly separated by an electrically insulating layer, and a cooling agent in which the last mentioned portion except the lugs is placed.

5. In a thermo-electric cell, a flat part or member of metal sheeting having an annular ring shaped portion, a neck portion, and a broader lower portion with lugs or terminals, said neck and lower portion having a layer of an electrically insulating material covering all parts except one lug, and a second part of said cell composed of a metal coating thereto applied in combination with the first covering both the annular ring portion and the insulated portion except the lug which is free from insulation, said second portion being thus in direct contact with the ring portion for producing the real thermo-cell and separated from the neck and lower broad portion by the insulating layer, and a cooling agent in which the last mentioned portion except the lugs is placed.

Signed at Dresden this 17th day of June 1908.

JOHANNES MARSCHALL.

Witnesses:

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