(No Model.)

A. PATTERSON.

THERMO ELECTRIC BATTERY.

No. 262,111. Patented Aug. 1, 1882.

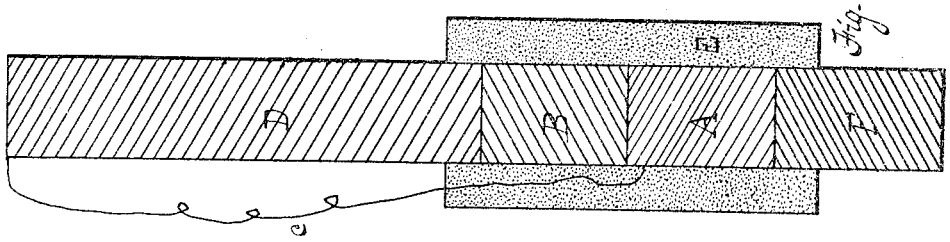

Fig. 4.

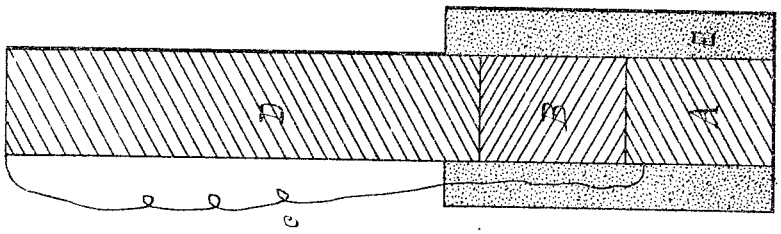

Fig. 3.

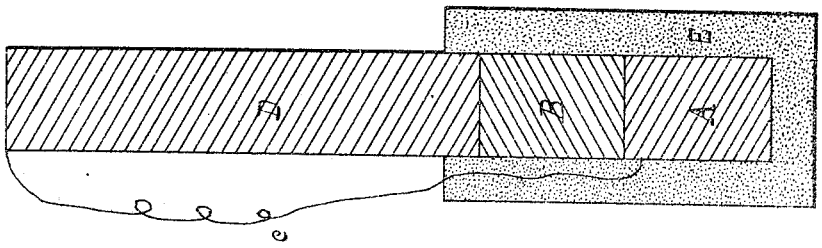

Fig. 2.

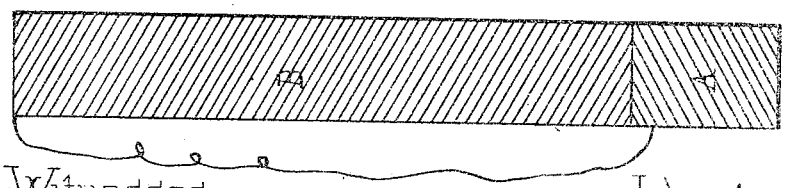

Fig. 1.

Witnesses

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THERMO-ELECTRIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 262,111, dated August 1, 1882.

Application filed May 6, 1882. (No model.)

To all whom it may concern:

Be it known that I, ANDREW PATTERSON, a citizen of the United States, residing at Idlewood, in Allegheny county, State of Pennsylvania, have invented certain new and useful Improvements in the Construction of Thermo-Electric Batteries; and I hereby declare that the following is a full, clear, and exact description of my invention, that will enable others skilled in the art to which it appertains to make and use the same.

It is well known that in many cases the thermo-electric "couples" in ordinary use are variously affected both as to the course and force of their current by a variation of the temperature applied to the "junction," and also by the application of a higher temperature to one or the other element of the couple.

The object of my invention is to obviate these irregularities of action, and to secure other advantages to be hereinafter specified.

In making my improved couples, instead of the ordinary longitudinal plates and bars heretofore used, I use a compact mass of material for one or both elements, and, instead of applying the heat directly or equally to both elements at the junction, I apply the heat directly to one element only, the other being heated by conduction across the junction. Having in any given case determined by experiment which one of any two substances associated as a thermo electric couple should have the higher temperature to give the most energetic current, I make that one (which for the purpose of identification in the further description of my invention I call the "first" element) of a compact form—say a cube, a short cylinder, or any other convenient form—so that the heat received by it shall have the least practicable way of escape except across the junction to the other element, which I will call the "second" element. I thus designate the separate members of the couple as the "first" and "second" elements, and not as the "positive" and "negative" elements, for the reason that I wish to refer to them in their relation to the reception of heat and not in their relation to the direction of the current, for it is well known that the thermo-electric current may be from the less to the more heated element, although as a rule, other things being equal, it will be from the more to the less heated member or element of the couple. The second element I make of equal or larger section, and usually of considerably greater length, than the first, so that it (the second) may freely conduct and radiate all the heat it receives from the first, and thus maintain the largest and most constant flow of heat across the junction. I then join the first element to one end of the second, and by a suitable conducting-wire from the first element to the extreme end of the second I complete the electric circuit, as shown in the drawings, in which the figures severally show sections of various forms and modifications of my improved battery, and in which the same letters refer to the same parts in all the figures, A being what I term the "first" element and B being the "second" element of the couple. C is a conducting-wire. D is a supplemental heat conductor and radiator, to be joined to B, for reasons to be fully stated. E is a refractory insulating-envelope to protect the active parts from oxidation and to retain them in position. F is a supplemental heat-conductor, joined to A under conditions and for reasons to be fully stated. To set such a couple in action the necessary degree of heat is applied to the extreme end of A, and, passing through its substance, it (the heat) is transferred across the junction to B, giving rise to the thermo-electric current.

When for any reason, economic or otherwise, it may be desirable to use for the second element a less quantity of material than will be sufficient to freely conduct and eliminate the heat received from the first, I make the second element of dimensions similar to the first, but supplement its lessened radiating capacity by a supplemental conductor and radiator joined to it, (see D in Figures 2, 3, and 4,) which may be of a less expensive or more conveniently usable material. When found desirable, additional capacity for eliminating heat may be given to the second element by any convenient mode of artificial refrigeration, as by the application of water to its surface; or it may be made in the form of a receptacle to contain water to be evaporated from within it.

When either or both elements of my couple

are of materials that will be injured by the heat I envelop one or both, or so much as may be necessary to protect them, in a refractory non-conducting envelope, as is described in my Patent No. 255,855, issued to me April 4, 1882, for improvement in thermo-electric batteries. E in Figs. 2, 3, and 4 is such an envelope. It will, however, be found advantageous as favoring the elimination of heat in most cases that B—the second element—or its supplemental radiator D, Figs. 2, 3, and 4, shall be not covered by the envelope; and as the use of such envelope, as shown in Fig. 2, may unduly interfere with the sensitiveness of the apparatus, especially when low temperatures are to be employed, it is desirable in such cases, if the composition of the first element, A, will permit, that its extreme end shall project through the envelope, so as to receive the direct action of the heat. (See Fig. 3 in the drawings.) When the first element cannot be safely so exposed, and it is desired to have the greatest sensibility to the effect of heat, I join to the extreme end of A the supplemental heat-conductor F, Fig. 4, of a more resistant metal, to extend through the envelope into or toward the source of heat.

It will of course be understood that these couples are to be associated in series or batteries as other electric couples are associated.

In making my improved couples of various materials I have found good results with an arrangement, as in Fig. 2, using artificial sulphuret of copper for the first element and metallic lead as the second, with a radiator, D, of copper.

The advantages of this mode of constructing thermo-electric couples are greater certainty as to the direction and force of the current under wide ranges of temperature, a certain economy of space, and, if the materials to be used for the active parts are expensive, a very great economy in prime cost may be secured.

Having thus described my invention and stated its advantages, what I claim as of my invention, and desire to secure by Letters Patent, is—

1. The combination, as a thermo-electric couple, of two compact masses of dissimilar thermo electrically excitable substances, A and B, arranged to have the heat applied directly to one of them and by conduction across the junction to the other, as described and shown.

2. In combination with the said elements A and B, the supplemental heat-conductors D and F, as and for the purpose specified.

3. In combination with said elements A and B, the envelope E, partially inclosing said elements, as and for the purpose specified.

ANDREW PATTERSON.

Witnesses:
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