Sept. 18, 1923. 1,468,456

W. H. BRISTOL

THERMOELECTRIC COUPLE

Filed Sept. 14, 1922

Fig. 1.

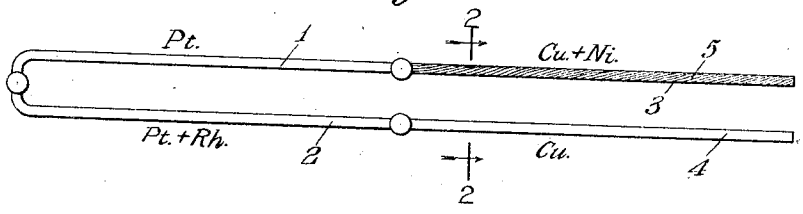


Fig. 2.





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THERMOELECTRIC COUPLE.

Application filed September 14, 1922. Serial No. 588,137.

To all whom it may concern:

Be it known that I, WILLIAM H. BRISTOL, a citizen of the United States, and a resident of Waterbury, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Thermoelectric Couples, of which the following is a specification.

The invention relates to thermo-electric couples, more particularly of the compound type as set forth in my prior U. S. Letters Patent #764,177, and in U. S. Letters Patent #1,025,715. Couples of this type consist of an active or fire-end portion and an extension portion, the latter setting up at the junctions with the former secondary couples whose thermo-electric effects are arranged to neutralize each other. For example, a couple may consist of a fire-end portion of platinum and platinum rhodium joined at one end, the other end being connected with wires respectively of an alloy of copper and nickel and of copper. As set forth in Patent No. 1,025-715, the wire of copper alloy may vary from 95% to 99.9% copper with 5% to 0.10% nickel. Such a couple sets up an allowable voltage, for temperature variations at the cold end between 32° F. and 212° F., amounting to an average of 0.635 milli-volts. This voltage will not, however, seriously affect the correctness of the reading of temperatures to which the fire-end of the couple is exposed, as the couples thus provided with extension portions set up secondary couples, at the respective junctions of the extensions with the fire-end portion, which substantially neutralize each other.

However, it has been found extremely difficult to provide alloy wire in lots of uniform composition; and, therefore, it is rendered difficult to hold the voltage set up within the prescribed limit of 0.635 milli-volts for the temperature variation noted. It is the object of the present invention to so arrange the extension wire that this difficulty is readily overcome and the desirable compensating or neutralizing effect attained. For example, instead of constructing the alloy portion of the extension of a single wire of exactly the proper composition, the same is composed of a plurality of strands which differ as to their potential relative to the particular thermo-electric element of the fire-end portion of the couple to which the stranded wire is joined, the strands being so selected, however, that their total effect will set up substantially the desired neutralizing voltage.

In the accompanying drawings, a couple has been illustrated embodying the novel arrangement, Fig. 1 being an elevation thereof and Fig. 2 a transverse section taken on the line 2—2, Fig. 1.

As shown, the couple consists of the primary or fire-end and active portion composed of the two elements 1 and 2 joined at the one end and respectively of platinum and alloy of platinum and 10% rhodium. To the free end of this couple is connected the extension portion consisting of the elements 3 and 4 of an alloy of copper with nickel and of substantially pure copper, respectively. In accordance with the invention, the former is of stranded wire, the individual strands 5 of which have different potential values relatively to the element 1. The element 4 may, of course, also be of stranded wire, all the strands, however, being of substantially pure copper.

As a specific example, with one portion of the extension of copper, the other extension wire may be composed of alloy wire of seven strands giving, when joined to the primary couple element, for the couple as whole, the following respective voltages over a variation of temperature from 32° F. to 212° F. at the cold end.

0.655	milli-volts.	
0.57	"	"
0.70	"	"
0.60	"	"
0.66	"	"
0.645	"	"
0.615	"	"

The average of these compound couple voltages will be 0.635, which is within the prescribed limit.

Furthermore, if the other element, for example, copper, should not be substantially pure copper as required, and therefore alter the allowable voltage set up, this could be compensated for thru changing the voltage set up by the stranded portion of the extension, the average voltage of same being made higher or lower as required by the condition of the copper extension portion.

In this manner, it becomes a comparatively simple matter to effect the desired balance, and there is not required the extreme care otherwise necessary in preparing the alloy wire so that all batches shall run sub-

stantially uniformly as to the percentage of alloying metal.

I claim:—

1. An extension portion for compound thermo-electric couples, consisting of a stranded wire, the individual strands of which have different potential values in the couple.

2. A compound thermo-electric couple consisting of an active or fire-end portion and an extension portion joined thereto, one element of which is an alloy composed of stranded wire, the individual strands of which differ as to their potential value relatively to the particular element of the active portion to which said stranded wire element is joined, the effect of the strands of wire being such as to form secondary couples at their respective junctions whose combined effect results in a predetermined voltage of the compound couple.

Signed at New York in the county of New York and State of New York this 12th day of September, A. D. 1922.

WILLIAM H. BRISTOL.