L. W. CHUBB.

THERMO COUPLE.

APPLICATION FILED JUNE 20, 1914.

**1,241,496.** Patented Oct. 2, 1917.

Fig. 1.

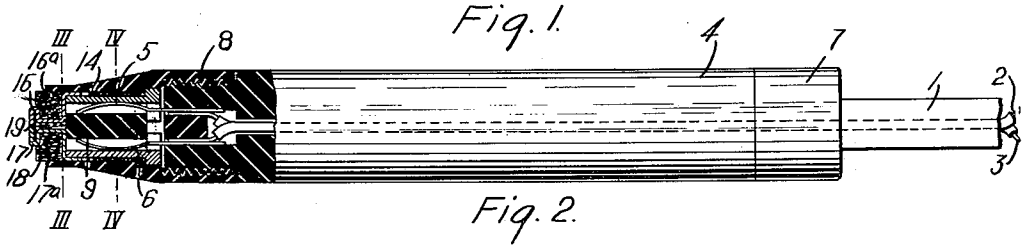



Fig. 2.

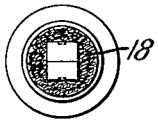



Fig. 3.




Fig. 4.




Fig. 5.

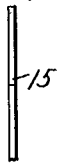



Fig. 6.




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## THERMO-COUPLE.

1,241,496. Specification of Letters Patent. Patented Oct. 2, 1917.

Application filed June 20, 1914. Serial No. 846,278.

*To all whom it may concern:*

Be it known that I, LEWIS W. CHUBB, a citizen of the United States, and a resident of Edgewood Park, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Thermo-Couples, of which the following is a specification.

My invention relates to thermo-couples and particularly to surface type thermo-couples.

One object of my invention is to provide a thermo-couple which may be employed to determine the surface temperature of a body.

Another object of my invention is to provide a detachable handle device for thermo-couples, so that, if one thermo-couple become damaged, another thermo-couple may be quickly substituted.

It is old in the art to provide thermo-couples for immersion in a fluid to determine the temperature of the same and it is also old in the art to provide thermo-couples to determine the surface temperature of a body. However, thermo-couples of the types heretofore constructed have been provided with insulating coverings, which do not allow of renewal without providing an entirely new thermo-couple and which conduct part of the heat away from the couple, thereby failing to give a true indication of the temperature.

I have provided a thermo-couple for accurately determining the surface temperature of a body, and I have provided also a detachable handle for the same.

In the accompanying drawing, Figure 1 is a side view, partially in elevation and partially in section, of a thermo-couple device embodying my invention; Fig. 2 is an end elevational view of a thermo-couple device embodying my invention; Fig. 3 is a sectional view taken on the line III—III of Fig. 1; Fig. 4 is a sectional view taken on the line IV—IV of Fig. 1; Fig. 5 is a side view of a thermo-couple element, and Fig. 6 is a front view of the thermo-couple element shown in Fig. 5.

A cable 1 containing two conductors 2 and 3 is mechanically connected to a handle 4, and the conductors 2 and 3 are electrically connected to resilient connectors 5 and 6, respectively. The handle 4 is screw threaded at its ends for the reception of caps 7 and 8. The cap 7 is usually constructed of metal and it is provided for clamping the cable 1 to the handle 4. The cap 8 is provided for protecting a supporting device 9, substantially as shown in the drawing.

The supporting device 9 comprises two segmental members 10 and 11 which are disposed around an insulating member 12 having slots 13 therein for the reception of the resilient connectors 5 and 6. The segmental members 10 and 11 are held in engagement with the member 12 by a plurality of turns of insulating cord or twine 14. A thermo-couple element 15, composed of two dissimilar metals welded end to end and rolled, is folded at points 16 and 17 and $16^a$ and $17^a$, substantially as shown. The ends thus formed are inserted in openings in a felt washer 18 and electrically connected to the segmental members 10 and 11. A thin sheet 19 of mica or other suitable insulating material is placed within the folded portion of the thermo-couple, substantially as shown. The supporting member 9 may be disconnected from the handle 4 by unscrewing the cap 8 and removing the member 9 from engagement with the resilient connectors 5 and 6. Another thermo-couple element and supporting member may be substituted quickly for the one shown if found necessary.

An essential feature of my invention is that the flattened or rolled portion of the thermo-couple must have a surface which is relatively larger than the surface of the conductors 2 and 3. It is also essential that the engaging portion of the thermo-couple be bare and flexible in order that the thermal resistance of the air film or intervening material between the thermo-couple and the surface, the temperature of which is to be determined shall be relatively low with respect to the thermal resistance of the conductors 2 and 3. That is, the relatively large bare engaging surface of the thermo-couple is so flexible that its entire contact surface may conform to the surface of an irregular member or body the temperature of which is to be determined to thus cause the thermal resistance of the contact to be relatively low.

The handle 4 and the cap 8 are usually constructed of molded insulating material. However, any other suitable material may be used in the construction of this device. Other methods of forming the thermo-

couple may also be employed, such as attaching each of the conductors to a third conductor.

In order to determine the surface temperature of a body, the thermo-couple element 15 is brought into engagement with the body surface (not shown) and the thermo electromotive force thus set up in the thermo-couple 15 is measured by any well known means, but preferably by the potentiometer method. Since the thermo-couple is placed in engagement with the surface, the temperature of which is to be determined, and since the engaging surface is relatively large with respect to the size of the conductors 2 and 3, the thermo-couple will be of substantially the same temperature as the surface of the body the temperature of which is to be determined.

My invention is not limited to the particular construction illustrated, but it is capable of various modifications within the scope of the appended claims.

I claim as my invention:

1. A thermo-couple comprising two dissimilar metals welded end-to-end and rolled to form a flat flexible engaging surface and means for so mounting the said thermo-couple that its entire flat surface may engage a surface the temperature of which is to be determined.

2. A thermo-couple comprising two dissimilar metals flattened at the junction thereof and so folded as to constitute a substantially flat flexible engaging surface that may so engage the surface the temperature of which is to be determined that the thermal resistance between the couple and the surface will be relatively small.

3. A thermo-couple comprising two substantially flat dissimilar metals so folded as to constitute a flexible engaging surface that is adapted to conform to the surface the temperature of which is to be determined.

4. A thermo-couple comprising two dissimilar metals welded end to end and rolled, and conductors connected thereto, said thermo-couple having a flexible flat engaging surface relatively larger than the surface of the said conductors.

5. A thermo-couple comprising two dissimilar metals folded to form substantially a straight flat section, an insulating member for resiliently supporting said thermo-couple in engagement with the surface the temperature of which is to be determined, a handle for said couple, and means for detachably connecting said thermo-couple to said handle.

6. In a thermo-couple, the combination with two metal conductors welded together end-to-end and folded at a plurality of points to form a substantially flat flexible engaging surface, of means for so resiliently supporting the engaging surface that it is adapted to closely engage the surface the temperature of which is to be determined.

7. In a thermo-couple, the combination with two flat-metal conductors welded together and folded to form substantially a flat flexible portion, of means for so mounting said thermo-couple that the entire flat flexible portion of the thermo-couple may be applied directly to a body to determine its temperature.

8. In a thermo-couple, the combination with two metal conductors welded together end-to-end and folded to form substantially a flat flexible section, of a detachable conducting and supporting member operatively connected to said conductors, a handle, and a sleeve for surrounding the detachable member and for detachably connecting said detachable member to said handle.

9. A thermo-couple for surface engagement comprising two metal conductors welded together, a resilient means for supporting said conductors in engagement with a surface the temperature of which is to be determined, a handle, and means for operatively connecting said thermo-couple to said handle.

10. In a thermo-couple device, the combination with a handle, of a thermo-couple having a substantially flat flexible surface, a supporting member for the thermo-couple, and means for surrounding the supporting member to operatively secure it to the handle.

11. A thermo-couple device comprising two dissimilar metals welded together at one end and so folded as to form a substantially flat resilient section having a relatively large area.

12. A thermo-couple comprising two dissimilar metals welded end-to-end and so rolled as to constitute a substantially flat surface, and resilient means for effecting engagement of all points of the flat surface with the surface the temperature of which is to be determined.

In testimony whereof, I have hereunto subscribed my name this 11th day of June, 1914.

LEWIS W. CHUBB.

Witnesses:
RAY P. JACKSON,
B. B. HINES.