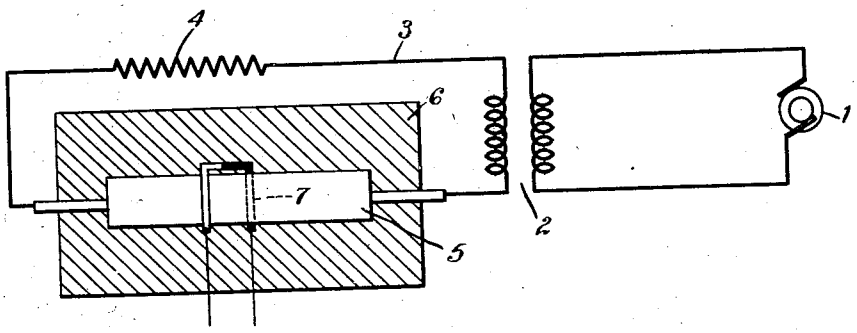
J. SLEPIAN.

CONSTANT TEMPERATURE DEVICE.

APPLICATION FILED JULY 10, 1918.

1,367,102. Patented Feb. 1, 1921.



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CONSTANT-TEMPERATURE DEVICE.

1,367,102. Specification of Letters Patent. Patented Feb. 1, 1921.

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To all whom it may concern:

Be it known that I, JOSEPH SLEPIAN, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Constant-Temperature Devices, of which the following is a specification.

My invention relates to constant-temperature devices and particularly to methods of, and means for maintaining the temperature of, one junction of a thermo-couple constant.

One object of my invention is to provide means whereby the junction of a thermo-couple may be subjected to a salt mixture that has a definite melting point to thereby maintain the thermo-couple at a constant temperature, irrespective of the change in heating of the mixture or the ambient temperature to which it is subjected.

A further object of my invention is to provide a device of the above-indicated character that shall be simple and inexpensive to construct and effective in its operation.

In practising my invention, I provide a salt mixture that becomes conductive at a definite temperature. The junction of a thermo-couple, or other device that is to be maintained at a constant temperature, is disposed adjacent the surface of the mixture and the mixture is heated by an alternating current. Since the mixture has a definite melting point and is of such substances that its composition remains unchanged, irrespective of the melting caused by heating of the same, the thermo-couple will be maintained at a constant temperature in a film of the melted mixture. The mixture may be, for example, a hydrated salt having an indifferent point in its solubility curve such as zinc sulfate ($7H_2O$). This is a solid below 50° C. but becomes a saturated solution at 50° C. Above this temperature it becomes a water solution of zinc sulfate. Therefore, if, at 50° C. heat is removed from the solution, the zinc salt precipitates out but it crystallizes with 7 molecules of water to produce the solid salt to have the same composition as the solution. Thus, since the remaining solution retains the same composition, irrespective of the heat applied thereto, the temperature remains at 50° until the whole mixture has been converted into a solid zinc sulfate, with 7 molecules of water of crystallization.

The single figure of the accompanying drawing is a diagrammatic view of a constant-temperature device embodying my invention.

A source of alternating current 1 is operatively connected, through a transformer 2, to a circuit 3 comprising a resistor 4 and a conductor 5. A salt mixture 6 is disposed around the conductor 5 and one junction 7 of a thermo-couple is disposed adjacent the inner surface of the mixture 6 and the conductor 5.

The mixture 6 is composed of a salt having a definite melting point, at which temperature it becomes a conductor. Thus, when the current traversing the conductor 5 so heats the mixture 6 as to cause the same to melt in a film around the conductor 5, the current will flow through two parallel paths, one through the conductor 5 and the other through the melted film of the mixture. The junction 7 of the thermo-couple will be disposed in the melted film of the mixture and, if the mixture is of the proper materials, the junction will be maintained at a constant temperature, irrespective of changes in current traversing the conductor 5. That is, since the composition of the mixture does not change, irrespective of the precipitation caused by the application of heat, the temperature will be maintained at the melting point under all conditions.

The mixture 6 may be a pure salt, such as lead iodid which, at ordinary temperatures, is a solid and non-conducting but which becomes a good conductor when it melts at 61° C. The mixture may also be eutectic or a molten mixture of two solids, such as bismuth-chlorid and ferric-chlorid in which the latter salt occurs in proportion 23% by weight. Above 171.5° C., this mixture is a fluid and, on cooling, both the bismuth-chlorid and the ferric-chlorid precipitate out but always remains in the proportion of 23% ferric-chlorid. Thus, since the composition of the remaining mixture does not change when heat is withdrawn, the mixture will remain at 171.5° C. until the whole mass has become solid.

Another class of substances suitable for this purpose is a solution of hydrated salt having an indifferent point in its temperature solubility curve. An example of this

class of substance is a solution of zinc sulfate which is saturated at 50° C. Above 50° C., it is a water solution of zinc sulfate. If heat is removed from such a substance at 50° C., the zinc salt precipitates out but crystallizes with 7 molecules of water to cause the solid salt to have the same composition as the original solution. Thus, as the salt precipitates out, the remaining solution has the same composition, and, therefore, since the melting point of a salt having such a composition is always 50° C., the temperature of the device, such as the junction 7 of the thermo-couple, is maintained constant until the whole solution has been converted into a solid zinc sulfate, with 7 molecules of water of crystallization.

Another material that may be used for the mixture 6 is a eutectic mixture of a solid crystallizing with two different proportions of water in a water solution. An example of such a mixture is a solution of ferric-chlorid in water having the proportion of 17 gram molecules of ferric-chlorid to 100 gram molecules of water. Such a mixture is a true solution above 35° C., and, when heat is removed therefrom at 35° C., a solid precipitate forms which is a mixture of ferric-chlorid ($7H_2O$) and ferric chlorid ($5H_2O$) in such proportions as to produce the same total composition as the original solution. Thus, when part of such a solution solidifies, the remaining composition is unchanged and the temperature of the same will remain at 35° C. until the whole is converted into a solid mixture of two hydrated iron salts.

The essential feature of my invention is that the device, the temperature of which is to be maintained constant, is subjected to a salt that, when heated, does not change its composition but which melts at a definite temperature to become a conductor, and thus, irrespective of the amount of melting caused by the heating, its composition is always the same and is maintained at a definite temperature. That is, the temperature will remain at the melting point of the salt, irrespective of a change in the heating current or the ambient temperature to which it is subjected.

My invention is not limited to the specific salt solutions described, as various substances may be employed without departing from the spirit and scope of my invention, as set forth in the appended claims.

I claim as my invention:

1. A constant temperature device comprising heating means, and a substance that is adapted to become conducting at a definite temperature and have a constant composition, the means to be maintained at a constant temperature being disposed adjacent the heating means and the substance.

2. A constant-temperature device comprising a heating means, and a body of normally non-conducting material that is adapted to become conducting at a definite temperature disposed adjacent the heating means to maintain a constant temperature.

3. A constant-temperature device comprising a heating member, electric means for heating the same, a salt having an indifferent point in its temperature-solubility curve disposed adjacent the heating member to maintain constant the temperature of a thermo-couple disposed adjacent the surface of the said mixture.

4. A constant-temperature device comprising a conductor, electric means for heating the conductor, a body of hydrated salt having an indifferent point in its temperature solubility curve surrounding the conductor and adapted to become a conductor at a definite temperature to maintain at that temperature a thermo-couple disposed adjacent the surface of the conductor.

5. The method of maintaining a device at a constant temperature which consists in heating a zinc sulfate ($7H_2O$) mixture and placing the device adjacent the surface of the mixture.

6. The method of maintaining a constant temperature which consists in heating a body of hydrated salt having an indifferent point in its temperature solubility curve with an electric current.

7. The method of maintaining a device at a constant temperature which consists in electrically heating a conductor and a body disposed therearound that is adapted to melt and become a conductor at a predetermined temperature and disposing the device in a film of the body at the surface thereof.

8. A constant-temperature device comprising a hydrated salt mixture having an indifferent point in its temperature-solubility curve, and means for heating the same, said mixture being such that, when heat is removed, the salt precipitates out and so crystallizes with water that the solid salt has the same composition as the original mixture.

9. A constant-temperature device comprising a hydrated salt mixture having an indifferent point in its temperature-solubility curve, and means for heating the same, said mixture being such that, when heat is removed, the salt precipitates out and so crystallizes with water that the solid salt has the same composition as the original mixture to maintain the temperature thereof constant, irrespective of the heat applied thereto.

10. The method of maintaining a device at a constant temperature which consists in heating a body that is adapted to melt and become a conductor having the same

composition as the original body, and disposing the device in a film of the melted body.

11. The method of maintaining a device at a constant temperature, irrespective of the heat applied thereto, which consists in disposing the device in a salt mixture that melts at a predetermined temperature and maintains a constant composition.

12. The method of maintaining a constant temperature which consists in heating a body of hydrated salt having an indifferent point in its temperature-solubility curve to the temperature of that point and then supplying heat energy to compensate for the radiation losses.

In testimony whereof, I have hereunto subscribed by name this 22nd day of June, 1918.

JOSEPH SLEPIAN.