

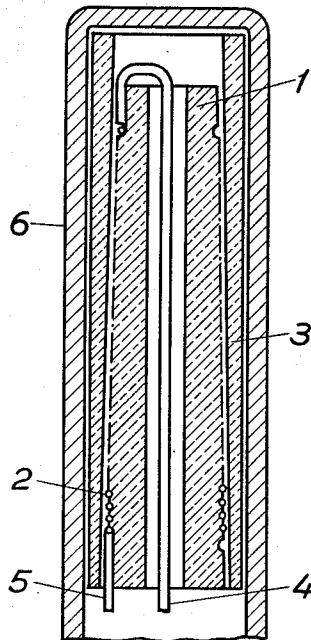
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U. LAMM

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RESISTANCE ELEMENT FOR PYROMETERS

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Inventor
Uno Lamm
By *Emerson*
Attorney.

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RESISTANCE ELEMENT FOR PYROMETERS

Uno Lamm, Ludvika, Sweden, assignor to Allmänna Svenska Elektriska Aktiebolaget, Vasteras, Sweden, a Swedish corporation

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Pyrometers for continuous measuring of high temperatures, especially for regulating purposes, often consist of electric resistance elements forming part of a bridge connection or the like. In order to present an exactly reliable temperature coefficient, such resistance elements should consist of pure metals, for practical reasons generally in the form of wire. However, even the most heat resistant of the pure metals, as platinum and its homologues osmium and iridium, are sensitive at high temperatures to certain common impurities of the air, especially carbon monoxide and dioxide. For this reason, resistance elements for pyrometers have been made of platinum wire embedded in glass or quartz. However, glass becomes too soft at high temperatures and at the same time rather highly electrically conductive, and quartz attacks platinum under similar conditions. For these reasons, pyrometers of this kind could not be employed above temperatures of about 500° C.

It has now been found that reliable resistance element for pyrometers up to 1000° C. can be obtained by enclosing a metal wire in porcelain, steatite or similar ceramic material in an airtight manner. Such materials still retain their shape up to 1500° C. and thereby efficiently protect the wire. If such qualities are chosen which are employed for high class electric insulators, the conductivity even at high temperatures does not become so high as to influence appreciably the result of the resistance measuring. The same applies to the glaze qualities generally used for such porcelain. The glaze which can be used for a resistance element for 1000° C. should still be highly viscous at 1400° C. For this purpose, the molecular proportion between SiO_2 and basic oxides should be at least 5, and the latter should also contain magnesia. Such a glaze does not attack the platinum wire.

As a suitable example of the construction of such a resistance element the following may serve, which is illustrated in the accompanying drawing.

1 is a slightly conical porcelain tube having an external helical groove containing a fine platinum wire 2 (for instance round wire having a diameter of 0.2 millimeter). After the tube and the wire have been covered with a glazing mass, a porcelain tube 3 which is slightly conical internally is applied outside them, and the whole is heated to such a high temperature as to make the glazing mass at least high-viscous so as to fill out the interspace and enclose air-tightly the wire in the helical groove as well as the return

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conductor 4 led through the inner tube. The latter, as well as the leading-in conductor to the other end of the wire, is preferably also made of platinum or the like and with considerably larger dimensions than the helical wire, so that a possible influence on the said conductors by corrosion or the more uncertain temperature thereof do not appreciably affect the total resistance. The porcelain tube glazed together with resistance wire and leading-in conductors is introduced into the closed end of a tube 6 made of a refractory metal alloy, for instance chromium-nickel-iron, said tube being preferably sufficiently long to reach through the furnace wall and into the furnace with a length corresponding to that of the resistance helix. At the other end, the metal tube is preferably combined with a space containing a connection plate. The conductors inside said metal tube may be insulated by surrounding porcelain or steatite beads.

A platinum wire of the aforesaid diameter and of 1 to 2 meter length, forming part of a differential connection, as of a Wheatstone bridge, has been found sufficient for creating a regulating power which can be amplified by means of transducers (D. C. saturable inductances).

I claim as my invention:

1. A resistance element for pyrometers, comprising a porcelain core, a wire of a metal having a high melting point and low chemical affinity wound on said core, a porcelain tube tightly surrounding said core and wire, and a glaze having a high point of fusion filling the space between said core and tube and the interstices between the windings of said wire and gas-tightly enclosing said wire.

2. A resistance element for pyrometers, comprising a porcelain core, a platinum wire wound on said core, a porcelain tube tightly surrounding said core and wire, and a glaze having a high point of fusion filling the space between said core and tube and the interstices between the windings of said wire and gas-tightly enclosing said wire.

3. A resistance element for pyrometers, comprising a slightly tapered porcelain core having a helical groove therein, a wire of a metal having a high melting point and low chemical affinity wound in said groove, a porcelain tube having a slightly tapered hollow space tightly surrounding said core and wire, and a glaze having a high point of fusion filling the space between said core and tube and the interstices between the windings of said wire and gas-tightly enclosing said wire.

4. A resistance element for pyrometers, comprising a porcelain core, a wire of a metal having a high melting point and low chemical affinity wound on said core, a porcelain tube tightly surrounding said core and wire, and a glaze of a composition which is still highly viscous at 1400° C. filling the space between said core and tube and the interstices between the windings of said wire and gas-tightly enclosing said wire.

5. A resistance element as claimed in claim 1 comprising also leading-in wires of considerably larger diameter than the wire wound on the porcelain core.

6. A resistance element as claimed in claim 1 comprising also a tube of a chromium-iron alloy surrounding said porcelain tube and leading-in conductors.

UNO LAMM.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
441,488	Hensley et al.	Nov. 25, 1890
1,350,910	Abbott	Aug. 24, 1920
2,135,078	Hubbard et al.	Nov. 1, 1938
2,233,182	Randolph	Feb. 25, 1941
2,271,975	Hall	Feb. 3, 1942

FOREIGN PATENTS

Number	Country	Date
514,212	Great Britain	Nov. 2, 1939