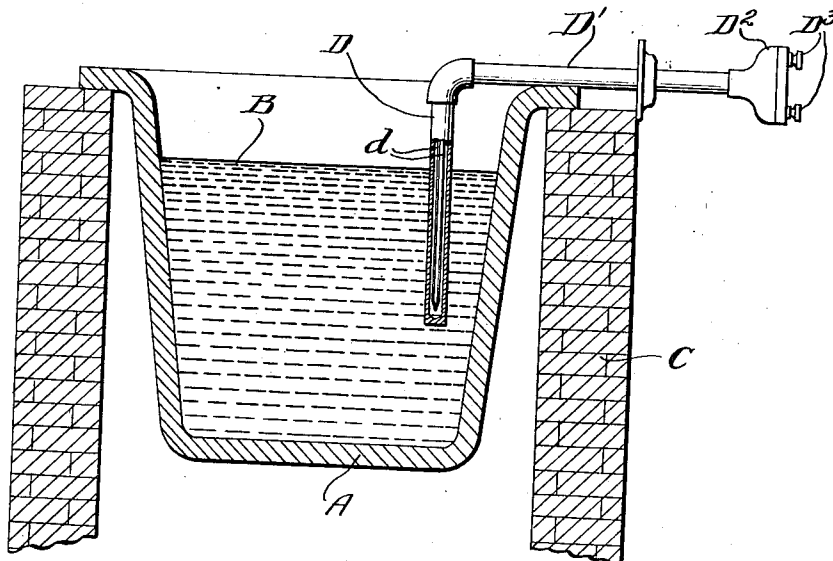


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R. P. BROWN
THERMOCOUPLE CASING
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THERMOCOUPLE CASING.

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To all whom it may concern:

Be it known that I, RICHARD P. BROWN, a citizen of the United States, and resident of Philadelphia, Philadelphia County, and State of Pennsylvania, have invented certain new and useful Improvements in Thermo-couple Casings, of which the following is a specification.

The present invention comprises an enclosing tube or casing for a thermo-couple which is of novel composition. The invention was devised with the object of providing a satisfactory and durable casing for a thermo-couple immersed in a bath of a hot molten metal such as lead, or the zinc containing alloy used in making zinc die castings. Such a metal bath corrosively attacks thermo-couple casings formed of the metals heretofore employed for the purpose with such rapidity as to make the life of such a tube quite short.

In accordance with the present invention, I form the portion of the casing of a thermo-couple to be immersed in a bath of molten metal of the kind referred to, out of a chromium iron alloy of the same composition as the so-called "stainless" iron now in extensive use because of its resistance to surface oxidation under certain conditions which, however, are very different from those attending the use of a thermo-couple casing inserted in molten lead and zinc baths.

The composition of a chromium iron alloy which has given excellent results in practice as a casing material for a thermo-couple used as above described is as follows: carbon .10%, silica .20%, manganese .30%, chromium 13.00%, iron 86.40%. The iron chromium alloy referred to may be employed in casings of various forms. A desirable mode of forming such a casing consists in drilling an axial hole of suitable diameter in a bar of the alloy, the hole extending from one end of the bar nearly but not quite to the opposite end.

The accompanying drawing is a somewhat conventional sectional elevation of a melting pot with a thermo-couple mounted therein.

In the drawing A represents the melting pot proper, containing a body B of molten metal such as lead or the zinc alloy employed

in the formation of the so-called zinc die castings. As shown, the pot A is mounted in a heating chamber or furnace C. The thermo-couple structure comprises a tubular casing element D which is vertically disposed and extends down into the molten metal bath B and a horizontal portion D' to which the upper end of the section D is connected as by means of an elbow fitting. The section D' extends horizontally through the wall of the chamber C. At its outer end the section D is connected to the usual thermo-couple casing head D² provided with terminals D³ for connecting the external leads (not shown) to the thermo-couple conductors d, which are united to form a thermo-couple hot junction located within the casing section D adjacent the closed lower end of the latter. The casing section D may be formed as described by drilling a hole in a bar of the iron chromium alloy described above, the hole extending downward nearly to but not quite to the lower end of the bar.

In practical use I have found that a thermo-couple casing section D of the kind illustrated in the drawing and formed of the iron chromium alloy referred to above will, when used in a bath of molten lead, or a bath of the alloy used in forming so-called zinc die castings, have a life many times greater than that of any material heretofore employed in the formation of thermo-couple casings. The invention is particularly useful in maintaining the proper temperature of a molten lead bath employed in hardening and heat treating dies. For this purpose the temperature of the bath is in the neighborhood of 1500° F., and at that temperature molten lead attacks and rapidly destroys iron and iron nickel alloys and other materials heretofore employed in forming thermo-couple casings. The corrosive action of the lead is augmented, I believe, by the presence of other substances as zinc, ordinarily present in small amounts in such lead baths. The alloys used in the manufacture of so-called zinc die castings usually contain approximately 5% of aluminum, approximately 3% of copper, and approximately 92% of zinc. This alloy at the temperature maintained in the melting or heating pot which is in the neighborhood of 1500°, also

rapidly attacks and destroys iron, and iron and nickel alloys, and other materials heretofore employed in the formation of thermocouple casings. A thermocouple tube formed of the iron chromium material specified above in accordance with the present invention and used in lead and zinc alloy baths described above, ordinarily has an effective life of many months.

10 The use of the improved thermocouple casing tubes is desirable, of course, because it reduces the frequency with which such tubes must be renewed. It is also durable because the failure of the protective casings occasionally results in the destruction of the thermocouple elements which may be quite expensive, and furthermore, the failure of a thermocouple in use from any cause may have serious consequences because of the resultant deleterious effect on the expensive dies being hardened and heat treated, or on the character of the castings produced.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. A thermocouple casing formed of an iron chromium alloy resistant to the corrosive action of molten lead and zinc.
2. A thermocouple casing formed of an iron chromium alloy containing about 13% of chromium.
3. A thermocouple for insertion in molten metal comprising a casing part formed of an iron chromium alloy.
4. A thermocouple adapted to be inserted in a bath of a molten lead or zinc and comprising a casing formed of an iron chromium alloy resistant to the corrosive action of molten lead and zinc.

Signed at Philadelphia, in the county of Philadelphia and State of Pennsylvania, this 24th day of November, A. D. 1925.

RICHARD P. BROWN.