R. S. WILE.

METHOD OF MELTING METALS AND ALLOYS.

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Patented Aug. 19, 1913.

Fig. 1.

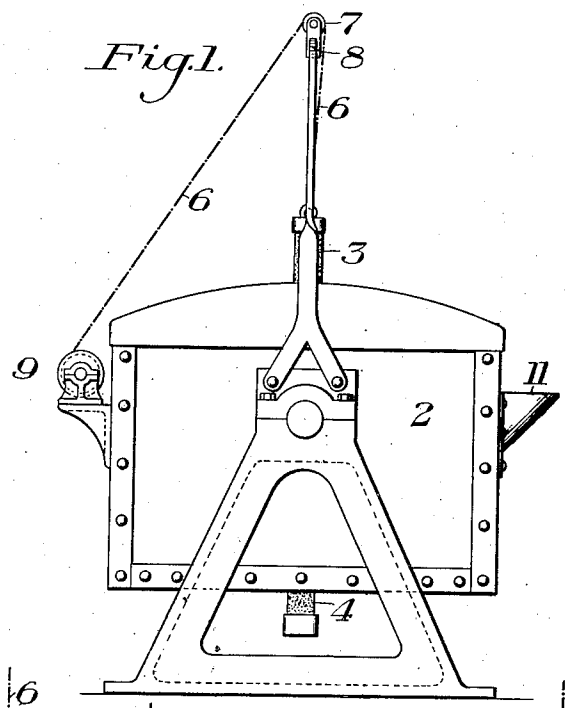


Fig. 2.

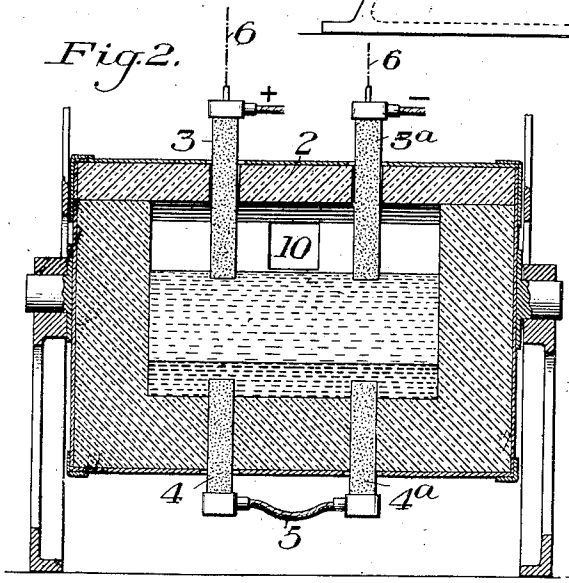
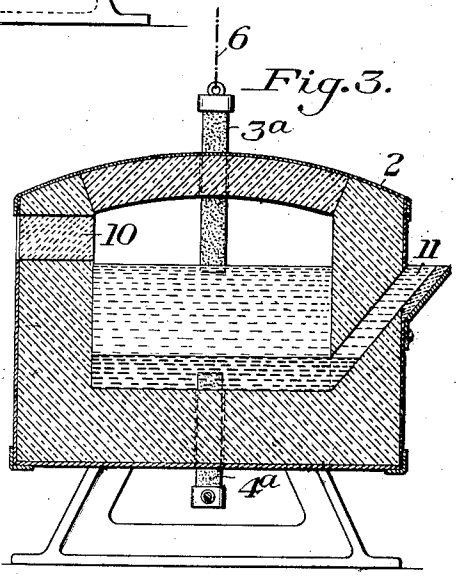


Fig. 3.



WITNESSES

R. A. Balderson

D. B. Fleming

INVENTOR

Raymond S. Wile

by Baldwin Dyer & Rowley

his attys

UNITED STATES PATENT OFFICE.

RAYMOND S. WILE, OF PITTSBURGH, PENNSYLVANIA.

METHOD OF MELTING METALS AND ALLOYS.

1,070,568. Specification of Letters Patent. Patented Aug. 19, 1913.

Application filed November 22, 1911. Serial No. 661,757.

To all whom it may concern:

Be it known that I, RAYMOND S. WILE, a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Methods of Melting Metals and Alloys, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an end elevation showing one form of furnace for carrying out my invention; Fig. 2 is a longitudinal vertical section of the same; and Fig. 3 is a vertical cross section.

My invention relates to melting of alloys which are liable to oxidation or vaporization when melted in the open air.

The object of my invention is to prevent or reduce the alloys due to such oxidation or volatilization during melting, and to that end it consists in forming under electrically developed heat a bath of high melting point, such as a glassy or slag-like bath, and feeding into such bath the metals and alloys to be melted and melting them by the heat of the bath while covered by the inert melted material.

In the drawings, in which I show one form of apparatus for carrying out my invention, 2 represents a tilting furnace which may be made of sheet steel of any desirable structure lined with fire clay, refractory bricks or other desirable refractory material. Electrodes enter this furnace proper through the top and bottom, and I have shown two electrodes 3 3^a, projecting through the top, and two electrodes 4 4^a projecting through the bottom. The bottom electrodes preferably project above the inner face of the bottom lining, and the upper electrodes project downwardly a sufficient distance to enter the bath of molten glassy or inert molten material. In the form shown, the current enters through electrode 3 and passes through the bath to electrode 4, thence through connector 5 to electrode 4^a, thence upwardly through the bath to electrode 3^a and out. The upper electrodes are preferably carried on flexible connections 6 6, which extend over pulleys 7 on a top bail or bar 8, carried by the furnace, and thence down to a winding drum 9, mounted in bearings on the rear side of the furnace. This gives a simple and efficient mechanism for raising and lowering the electrodes, as desired in the operation.

10 designates a charging door which is normally closed by a suitable refractory lined closure, and 11 is an outlet channel which leads from the bottom of the furnace upwardly and outwardly at an angle and opens at one side thereof. The upper end of this spout should, of course, be above the level of the bath in the furnace.

In carrying out my invention, I feed in to the furnace suitable material to form an inert molten bath, preferably of high melting point, such as a glassy mixture, or quartz or borax and silica. Such materials are melted under the electrically developed heat flowing between the electrodes and thus form a molten bath in the furnace. The furnace is now ready for melting the desired metal or alloy, which is fed through a charging opening, such as shown, and will sink in the inert bath and become melted by the heat of such bath. The melted metal or alloy sinks to the bottom of the furnace and is entirely protected from the atmosphere during and after melting and until tapping. The material is preferably fed in from time to time, so as to keep a pool of the molten metal or alloy at the bottom of the bath, and the operation may go on as a substantially continuous one, tapping the metal from the furnace, as desired, by tilting the furnace and supplying fresh material to be melted by feeding it from time to time through the charging opening or openings. While the layer of molten metal is maintained underneath the glassy bath, the current will pass down through the slag bath, enter the molten metal, and thence flow along the molten metal and thence up through the slag to the upper electrode. The slag acts as a conductor for the current and by using suitable mixtures, a temperature can easily be obtained up to 5500° F.

As shown in the drawing, the mass or volume of melted inert material must be large compared to the mass or volume of the melted metal underneath; for the temperature of the inert material would be reduced too much by the chilling action of the cold metal thrown in unless this were the condition. If the amount or volume of slag were relatively small, its temperature would be so reduced by throwing in the cold metal to be melted that the slag would become

sticky or pasty, and in order to bring it up to the proper temperature again the electrical pressure would have to become so high as to be dangerous. This pasty or sticky condition of the slag bath would also prevent other metal thrown in from passing through the slag layer and thus burn the metal which would be exposed to the air.

The advantages of my invention will be obvious to those skilled in the art, since loss in melting is greatly decreased, and the melting is cheaply and rapidly carried out. It is also found from the actual results of my method that the metal casting is stronger and of better quality, since the weakness due to the presence of oxids is removed. It will also be noted that in the case of an alloy, the alloy will retain its specific proportions, whereas in ordinary melting operations, these proportions become varied on account of the oxidation and vaporization losses. In this latter respect, my process is of very great advantage over any open melting process.

The type of furnace may be widely varied, the method may be applied to any metal or alloy, and other changes may be made without departing from my invention.

I claim:

1. The herein described method of melting metals and alloys, which consists in forming in a suitable furnace by means of electrically developed heat an inert molten bath of glassy or slag-like nature and of a higher melting point than that of the metal or alloy, said bath lying in a substantially uniform layer in the furnace, feeding the unmelted metal or alloy to be melted into said bath and fusing it by contact therewith as it passes therethrough, said metal or alloy being fed in such quantities that the layer of molten metal resulting therefrom is always substantially thinner than the overlying protective inert bath, and tapping out the molten metal or alloy at intervals.

2. The herein described method of melting metal and alloys, which consists in feeding the metal or alloy into and through an inert or molten bath of glassy or slag-like nature and of a higher melting point than that of the said metal or alloy, said bath being of substantially uniform depth within the furnace, utilizing said bath as a resistance element for the generation of heat to maintain its molten condition, and regulating the feeding of the metal or alloy and the tapping out of the molten metal or alloy to keep the layer of the latter substantially thinner than the overlying protecting layer of the inert bath.

3. The herein described method of melting metals and alloys, which consists in maintaining a molten bath of inert slag-like nature by utilizing the same as a resistance element for the passage of electric current, feeding the metal or alloy to be melted into this inert bath, and maintaining the molten metal or alloy in a layer underneath the inert bath, said layer being shallower than the layer of inert material, whereby the heat radiated from the inert bath keeps the layer of molten metal at the desired temperature without the necessity for raising the inert bath to a temperature above the boiling point of any of the metal elements contained in the molten metal.

In testimony whereof, I have hereunto set my hand.

RAYMOND S. WILE.

Witnesses:
JOS. M. DENTEL,
ED. STANDISH.