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METHOD OF PRODUCING GREY IRON CASTINGS IN PREHEATED REFRACTORY COATED MALE AND FEMALE DIES

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1 Claim. (Cl. 22—200)

This invention has reference to the production of cast iron articles and is a continuation-in-part of our application Serial No. 142,702 filed February 6, 1950 (now abandoned).

The production of grey cast iron articles without annealing in traditional permanent moulds wherein the working faces of the moulds are provided with a coating of refractory material which is given a coating of carbon is known. In the production of grey cast iron articles by such method it is necessary to control the rate of cooling of the casting within the mould. Such control for castings of different sectional thickness is effected by adjusting the thickness of the coatings to give the desired rate of cooling.

Our invention has for its object to provide an improved process for the direct production without annealing of grey cast iron articles.

According to the present invention grey cast iron castings are manufactured free from chill and without annealing from molten cast iron of the same composition as that normally producing white castings when cast by the traditional permanent mould process utilising uncoated metal moulds, such grey cast iron castings being produced by the process which comprises coating the faces of male and female dies forming a mold with an inert refractory dressing capable of withstanding the temperature of molten cast iron, heating the said dies, superimposing on the dressing a heat insulating coating capable of maintaining its properties when in contact with molten cast iron, pouring the molten cast iron into the heated female die of said mold, promptly introducing the heated male die into the molten metal contained in the female die and shaping the metal therewith while it is at least 2° C. above its melting point and while it is sufficiently fluid to be shaped by that force only necessary to cause displacement of the molten metal and without imparting an impact blow thereto, allowing the shaped molten metal in the mold to solidify, then removing immediately the male die and removing the resulting shaped grey iron casting from the mold.

The invention will now be described by way of example as applied to the manufacture of a grey cast iron article of about ⅛" cross sectional thickness.

In this example a female iron die and complementary male iron die are used, any suitable means being provided by which the male die can be introduced to and removed from the female die.

The faces of the dies are coated with a suitable refractory dressing capable of withstanding the temperature of molten cast iron. That is, a dressing which is inert to chemical and physical change at a temperature of 1200° C. to 1600° C. The dressing may be a paste formed of silica flour and clay. Alternatively, the refractory dressing may be formed of silica flour and bentonite or about 13% bentonite, about 12% dextrine, about 60% plumbago and about 15% silica flour. It will be understood, however, that any commercially available chill or die coat having characteristics similar to the refractory dressings specifically set forth may be used.

The dies are initially heated to a temperature of not less than 200° C. and not in excess of 550° C., this being conveniently done by means of gas burners.

This heating initially serves to dry the refractory dressing. Further the heating of the dies enables relatively thin cast iron articles of say ⅛" thick, to be produced without premature solidification of the molten metal. Where thicker cast iron articles are required the necessity of preheating the dies is mainly to ensure drying of the refractory dressing.

Thereafter the refractory dressing is coated with a heat insulating coating capable of maintaining its properties when in contact with molten cast iron which has a temperature of 1200° C. to 1600° C. Such coating is preferably in the form of a film of lamp black applied by means of a smoking acetylene flame. The insulating coating, alternatively, may be formed of about 95% kieselguhr and about 5% bentonite suspended in water and sprayed on the refractory dressing. As a further alternative the heat insulating coating may be formed of about 95% graphite and about 5% bentonite, the mixture being suspended in water and sprayed on the refractory dressing.

Into the heated female die is introduced molten cast iron having an approximate composition of total carbon 3.3%, silicon 2.6%, manganese 0.5%, sulphur 0.1%, phosphorus 1%, the molten metal being at a temperature of about 1350° C. Surface impurities are immediately removed from the molten metal. The male die of the mold is promptly introduced into the female die to shape the molten metal therein to the shape defined by the dies when closed. This shaping of the molten metal must be effected while the molten metal is at least 2° C. above its melting point. As it is in a fluid state it is shaped by the co-operating dies without the application of an impact blow or substantial mechanical force, the force applied being only that required to cause displacement of the molten metal. In practice we find that the male die should be introduced into the female die to shape the molten metal therein within 15 seconds of the introduction of the molten metal.

The shaped molten metal is allowed to solidify, the male die is removed immediately after solidification of the metal and the article thereafter extracted from the female die.

The article so produced has the characteristics of a grey iron casting free from chill.

The metallurgical explanation of this is not fully understood.

The immediate removal of the male die after solidification is essential in order to obtain a grey iron casting free from chill.

In casting a number of articles in succession by the process above set forth the refractory dressing of the faces of the dies is covered by a film of lamp black, or other suitable heat insulating coating, prior to making each casting.

The temperature of the dies should be controlled by any suitable means, for example by currents of air, to such temperature that the film of lamp black or other heat insulating film is not burned and adheres to the refractory dressing on the die faces.

Cast iron articles can be produced by this method much more quickly than by the usual method of casting.

What we claim is:

In the manufacture of grey cast iron castings free from chill without annealing from molten cast iron of the same composition as that normally producing white castings when cast by the conventional permanent mold process

utilizing uncoated metal molds, the process which comprises coating the faces of male and female dies forming a mold with an inert refractory dressing capable of withstanding the temperature of molten cast iron, preheating the said dies to temperatures within the range of from 200° to 550° C., superimposing on the refractory dressing a heat insulating coating capable of maintaining its properties when in contact with molten cast iron, then pouring the molten cast iron into the preheated female die, promptly introducing the preheated male die into the molten metal contained in the female die, and shaping the metal therewith while it is in the entirely fluid state and at least 2° C. above its melting point and while it is sufficiently fluid to be shaped by that force only necessary to cause displacement of the molten metal and without imparting an impact blow thereto, allowing the shaped

molten metal to solidify, then immediately removing the male die and removing the resulting shaped grey iron casting from the mold.

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