

1

2,935,772

PREVENTION OF SCALE FORMATION ON CASTINGS

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This invention relates to metal casting. In particular it is directed to overcoming the disadvantages of scale formation which takes place on castings of metals during cooling.

During the cooling of castings from the high temperature at the time of casting to the ultimate room temperature a substantial amount of scaling occurs on ferrous alloys or alloys containing relatively readily oxidizable components. This is caused by the action of atmospheric oxygen on the susceptible metal.

Generally such scaling is removed in a variety of ways as by sand blasting or pickling, principally acidic.

In efforts to overcome or prevent the formation of scale it has been proposed to carry out the casting of readily oxidizable constituents of alloys by carrying out the casting, and in some instance even the melting, under an atmosphere of inert gases. Such gases may be truly chemically inert gases, and such as argon and other members of its group in the periodic system, or gases which are chemically inert under the conditions of operation. It has also been proposed to operate under vacuum. Such procedures involve the use of special or complicated equipment with consequent increases in the both capital and operating costs.

The problem of scale formation that normally occurs on cooling is especially of concern in precision casting where exact dimensions, sharp delineation of relatively small details and smoothness of surface finish is of utmost importance. In precision casting one seeks to produce castings having fine elements of relatively small thicknesses and sharp corners and edges.

Accordingly, the overcoming of the disadvantage of scaling is highly desirable in precision casting, because the scaling that normally occurs on such castings is a great disadvantage. To remove the normally formed scale from such castings, by sand blasting or pickling results in loss of the precise details sought for in precision casting.

It has now been found that the disadvantages of the normally-developed scaling can be overcome by a simple means which does not require the use of special equipment. It thus becomes possible to carry out the precision casting of ferrous alloys, or alloys containing readily oxidizable components, even in shops having no special equipment.

In its principal aspects this invention arises from the discovery that one can, immediately after pouring the metal into a mould designed for precision casting (moulds used in the lost wax process or such improvements in precision casting as exemplified by those described in the pending applications of Noel Shaw, Serial No. 347,829, filed April 9, 1953, issued as Patent No. 2,795,022 on June 11, 1957, and Clifford Shaw, Serial No. 414,884, filed March 8, 1954, now Patent No. 2,811,760, granted November 5, 1957, which are characterized by the feature of porosity throughout the mould) place a small amount of hexamethylene tetramine on the

2

exposed surface of hot metal in the riser and cover the mould with a suitable means for confining the gases developed therefrom, as for example, a simple open ended drum. In consequence of the high temperature of the metal which contacts the hexamethylene tetramine, the latter volatilizes to create an atmosphere surrounding the mould which provides a protective blanket that produces the advantages of this invention.

The effect of the atmosphere surrounding the mould developed in consequence of the volatilization of the hexamethylene tetramine, prevents decarburization at the surface of the casting. The effect of such atmosphere is to minimize scaling if it occurs at all; and, if it does occur, to be present in an altogether different form from that which normally occurs. If it does occur, it is far more rapidly removed than scaling such as normally occurs. The prevention of the decarburization of the metal thus allows for the easy and more rapid removal of the scale; and the surface thus left has the constitution of the casting as contrasted with that of the decarburized metal which is normally encountered.

Accordingly, it is among the principal objects of this invention to provide a novel method of overcoming the disadvantages of scale formation during the cooling of castings of ferrous metal or alloys containing a readily oxidizable component.

Such principal object is attained by means of heating hexamethylene tetramine by the heat of the hot metal in the mould produced immediately after casting, and suitably covering or enclosing the mould whereby a protective enveloping gaseous blanket is generated and maintained about the mould.

The following is an illustrative example of the process of this invention:

Example 1

A mould made in accordance with the procedure of Noel Shaw, Serial No. 347,829, filed April 9, 1953, is placed on the floor of the shop. There is then poured into this mould a molten ferrous alloy. After the mould is filled there is placed, preferably immediately, on the surface of metal in the riser hexamethylene tetramine (contained in a paper or other appropriate wrapper for convenience in handling). Then, a cover, as for example an open ended drum, is placed, preferably immediately, over the mould. If desired the lower edge of the drum where it rests on the floor, may be surrounded with sand to provide a seal. In consequence of the high temperature, the hexamethylene tetramine volatilizes and forms a gaseous blanket that envelops the mould during cooling.

It has been observed that the gaseous pressure generated during the gasification of the solid hexamethylene tetramine sometimes results in occasional puffs of gas which come through the sand seal when such is used. The operator supervising the operation can readily rearrange the sand so as to maintain the continuity of the seal.

The amount of hexamethylene tetramine used is such as to provide, on gasification, a suitable quantity of gas to form the gaseous blanket. For example, when the drum used, as described above, has a capacity of 30 gallons and the amount of metal poured into the mould was 20 pounds, 10 grams of the hexamethylene tetramine proved sufficient.

It will be apparent that it has now become possible to create a gaseous blanket that envelops a mould during the cooling that protects the metal, at the prevailing high temperature, from decarburization and interaction at the surface with gaseous oxygen, and thereby scaling is prevented or substantially reduced, and even if it occurs, the same may be readily removed. The metal

3

underlying the same is characterized by the absence of decarburization so as to preserve the fine details especially sought for in precision casting. The generation of the gaseous protective enveloping blanket is derived from the readily available hexamethylene tetramine and the use of a simple cover to confine the gaseous blanket around the object, involve no expenditure for elaborate equipment or the need to handle the heretofore used special gases in cylinders.

It will also be obvious that the instant means of creating the gaseous protective blanket from the solid hexamethylene tetramine may be used in other operations where metals which undergo scaling and/or decarburization or are otherwise affected at high temperature are being processed.

It will be understood that the foregoing description of the invention and the examples set forth are merely illustrative of the principles thereof. Accordingly, the appended claims are to be construed as defining the invention within the full spirit and scope thereof.

I claim:

1. A method of preventing scale formation on a metal casting during the cooling thereof in a mould which

4

comprises placing solid hexamethylene tetramine in proximity to the metal whereby the heat thereof causes volatilization of the hexamethylene tetramine and enclosing the mould so as thereby to maintain the gasified hexamethylene tetramine around the mould.

2. A method of preventing scale formation during the cooling of precision castings of ferrous metals which comprises pouring the ferrous metal into a mould, placing solid hexamethylene tetramine on the surface of the metal in the riser of the mould, and enclosing the mould whereby the hexamethylene tetramine undergoes gasification, and the thus gasified hexamethylene tetramine forms a protective gaseous blanket that surrounds the mould during cooling.

References Cited in the file of this patent

UNITED STATES PATENTS

1,324,458	McIntosh	Dec. 9, 1919
2,731,690	Coupland	Jan. 24, 1956

FOREIGN PATENTS

725,456	Great Britain	Mar. 2, 1955
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