

Patented Mar. 26, 1929.

1,706,858

UNITED STATES PATENT OFFICE.

HUBERT A. MYERS, OF TOLEDO, OHIO, ASSIGNOR TO THE METAL CASTINGS HOLDING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF DELAWARE.

PROCESS OF TREATING MOLDS FOR PRODUCING SOFT CASTINGS.

No Drawing.

Application filed August 30, 1926. Serial No. 132,651.

My invention primarily has for its object the production of soft machinable castings containing metal having the required standard chemical and physical characteristics as to composition and tensile and compression strength. The particular object of the invention is to prevent "chilling" of the castings.

By my invention castings such as ferrous metals may be produced in iron molds or molds formed of iron and alloys of iron and at the same time prevent the "chill" commonly caused by reason of the difference in the temperature between the molten metal and the metal of the molds and prevent pitting in the casting due to localized gasification. The invention also has for its object to prevent pitting of the mold by reason of the chemical reactions that exist between the ingredients of the metal mold and the chemical reactive ingredients of the molten metal and also to prevent the erosion commonly produced by the molten metal in its movement through parts of the mold.

A great variety of processes and materials and devices have heretofore been used with the object of overcoming or avoiding these deleterious results. Heretofore so far as I am aware "chilling" of the metal invariably occurs although the matrix surfaces of the mold may be thoroughly blanketed by heat insulating or refractory materials or materials that are both refractory and heat insulating in character, without preventing "chilling" of the metal. By my invention I utilize a material that effectively prevents the crystalline structure of the metal commonly known as the chill or commonly produced in "chills" or "chilled" castings. According to analyses it has been found that the composition of the iron existing at the surface of the castings produced in the use of my invention conforms substantially to the composition and condition of the iron in the body of the casting, namely, that portion of the casting located well within the interior of the casting. This has been shown by pectrographic analysis, both by direct and reverse appearances of the ingredients of the metal, as well as by well known hardness tests.

In the conduct of my invention I treat the mold with a material that reacts with the molten metal while still in the fluid or molten state to prevent the formation of the "chill." It reacts to prevent the undesirable structure of the metal particularly at the surface of

the molten metal of the casting. This reaction takes place during the short interim while the temperature of the mold is raised.

In preparing the mold I find it highly desirable to first bring about substantially the same conditions or reactions in the surface of the mold and preferably to a much greater extent or degree than is produced in making each of the castings in the mold. Thus in preparing the mold I produce near and within the surface of the mold by precipitation and also deposition an excess of carbon which may produce the heat insulating effect with respect to the metal of the mold. Pectrographic analysis of the metal of the mold, particularly, at its matrix surface indicates a remarkable excess of carbon which acts the same as other graphitized or amorphous coatings of carbon placed on the surface of the mold. I have found that unless the mold is sufficiently treated with a suitable reactive agent containing and releasing carbon at a high temperature, non-chilled and non-pitted castings cannot be produced by any of the processes or materials or devices of which I am aware.

In carrying out my invention I coat the mold with a carbon containing material which will give up its carbon at a high temperature and the compound and the liberated carbon will penetrate the mold. A portion of the material enters the pores of the mold which are accentuated in size upon raising the temperature of the mold and a portion releases its carbon and the carbon, while nascent, either by its own activity or by the activity of ingredients of the mold or the elements with which it is in combination in the material, penetrates the metal of the mold and increases the free carbon content at and near the surface of the mold. The process is readily conducted by repeatedly coating the mold with the carbon containing compound and making a plurality of castings in the mold when thus coated. In each succeeding casting there is a notable decrease in the "chill" of the casting and a notable decrease in the pitting of the casting. If, after thorough treatment or impregnation of the mold, the mold is coated with a heat insulating material of any of the kind commonly used for blanketing metal molds, a soft and smooth ferrous metal casting may be produced having the standard characteristics as to the composition and tensile and compression strength

according to the batch introduced into cupola from which the metal is drawn, that is, the casting will conform substantially to that produced in sand molds except that the casting will be smooth instead of rough which is characteristic of sand castings.

Thus in the conduct of my invention I first prepare the ferrous molds by repeatedly coating them with a reactive material that will effectively protect the surface of the mold and subject it repeatedly to a high temperature preferably to the heat of the molten ferrous metal until pitting materially decreases or substantially ceases. However, in making commercial castings I blanket the mold with a suitable heat insulating or refractory material such as graphitic carbon or magnesium oxide or other foundry mold facings in addition to the carbon containing material which will react to prevent the undesirable structure present in "chilled" castings.

I have discovered that cyanogen compounds particularly, the salts of cyanogen when applied to the surface of ferrous molds efficiently protect the molds and prevent "chilling" of the casting and in order to obtain castings that conform to standard requirements as to chemical composition and physical characteristics I utilize preferably one or more of the alkali earth cyanides. Whether it is due to the metals of the alkali or of the alkaline earth metals that causes the introduction of carbon into the face of the mold and the prevention of objectionable crystalline structure in the castings there is produced by the use of such compounds exceedingly soft castings from which "chill" is absent.

When the mold has been sufficiently treated with the material containing carbon that is active at high temperatures, I preferably dilute the material with suitable heat insulating materials such as plumbago or commercial magnesium oxide, in order to maintain the mold surface substantially constant in its effective character as well as provide sufficient material to react on the molten iron at its surface to materially reduce or prevent the chill structure or composition. Thus I may use a coating of 100% of the carbon liberating material, such as, potassium or sodium cyanide, or I may reduce it to 1% using in mixture therewith plumbago, magnesium oxide and similar heat insulating materials well known in the art and heretofore used for facing molds and particularly those used for heat insulating the surfaces of iron molds. I have found it preferable to use as low as 1% of potassium or sodium cyanide in the mixture where the molds are continuously used in making castings. I may thus make a mixture of powdered cyanide and magnesium oxide or plumbago in any proportionate quantities, preferably, as low as 1% or 2% of the cyanide. It is possible to use the molds

after they have been thoroughly treated with the cyanogen compound and without the incorporation of the cyanogen in the blanketing or heat insulating material.

In the use of the cyanogen compound, I have found it particularly efficient in producing soft machinable thin wall castings, when about 1% of the potassium or sodium cyanide is used in the coating mixture. I have been able to produce possibly the best castings by using the molds after having been treated with potassium or sodium cyanide and coating them with a mixture of about 1% of potassium or sodium cyanide and magnesium that may be applied wet, that is, mixed with water and directed on to the mold by an air gun and then further coating the mold with plumbago.

In the claims appended hereto wherein I refer to the matrix of the mold I refer to the part or a part of the matrix that it is desired to protect and also I include by the term matrix the surface of the sprue hole and areas contiguous to the outer end of the sprue hole. Thus the term "matrix" will include matrices which are formed only in part or entirely by the surfaces of ferrous metals and other parts may be formed by the use of sand or other materials.

Also in the claims where I refer to a single compound it is intended to cover and include thereby an equivalent compound or a plurality of similar or equivalent compounds. In order to reduce the number of claims I have omitted claiming a plurality which I consider to be covered and included by reference to a single compound.

I claim:

1. The process of treating ferrous molds for ferrous castings which consists in coating the matrix of the mold with a material containing cyanogen salt and heating the mold, and the coating to liberate carbon from the cyanogen salt.
2. The process of treating ferrous molds for producing ferrous castings which consists in coating the matrix of the mold with a material containing cyanogen and heating the mold and coating to produce decomposition of the cyanogen.
3. The process of treating ferrous molds for ferrous castings which consists in coating the matrix of the mold with a material containing cyanogen salt and heating the mold and the coating to produce decomposition of the cyanogen salt.
4. The process of treating ferrous molds for ferrous castings which consists in coating the matrix of the mold with a material containing potassium cyanide and heating the mold and the coating to produce decomposition of the potassium cyanide.
5. The process of treating ferrous molds for producing ferrous castings which consists in coating the matrix of the mold with a ma-

terial containing cyanogen and heating the mold and the coating near the temperature of molten ferrous metal to liberate carbon from the cyanogen.

5 6. The process of treating ferrous molds for ferrous castings which consists in coating the matrix of the mold with a material containing cyanogen salt and heating the mold and the coating near the temperature of
10 molten ferrous metal to produce decomposition of the cyanogen salt.

7. The process of treating ferrous molds for producing ferrous castings which consists in coating the matrix of the mold with a ma-

terial containing a cyanogen compound, heating the mold and subsequently coating the mold with a mixture containing cyanogen compound and a heat insulating material and heating the mold. 15

8. The process of treating ferrous molds for producing ferrous castings which consists in repeatedly coating the matrix of the mold with a cyanide salt and heating the mold to produce decomposition of the cyanide salt. 20

In testimony whereof I have hereunto
25 signed my name to this specification.

HUBERT A. MYERS.