UNITED STATES PATENT OFFICE.

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METHOD OR ART OF MAKING MOLDS FOR CASTING FLUID METALS.

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To all whom it may concern:

Be it known that we, CHARLES PACK and LEO FRANK NOCK, both citizens of the United States, residing at the borough of Brooklyn, city of New York, county of Kings, and State of New York, have invented certain new and useful Improvements in the Method or Art of Making Molds for Casting Fluid Metals, of which the following is a specification.

Our invention relates to the method or art of making molds for casting fluid metals and more particularly to molds used in the production of commercial finished castings, formed of plastic material.

In the production of commercial finished castings, and by "commercial finished castings," we refer to parts of machines and articles of manufacture, it is essential to preserve the dimensions of the castings and impart a smooth finish thereto, in order to avoid the necessity of machine work upon the castings and to adapt them to their particular uses.

Ordinarily plastic molds can be used but once, so that a method or art of producing such molds, commercially requires the production of a large number of identical patterns and the drawing of these patterns in a molten state to avoid the breaking down of walls, partitions and projections in the mold. Heretofore, it has been proposed to make patterns of this character by what is known as the die casting process, the material of said patterns being either wax or a low fusing metal. While in some designs of patterns, it is feasible to use wax, the use of this material is impracticable where the patterns are of complicated design since the wax has a sufficiently low melting point, to cause the heat of the hand of the workman in making the mold to soften the wax so as to deform the pattern, and wax is so frangible that slight pressure from the hand of the workman may break the edges or projections on the pattern in a manner to make the pattern worthless.

The use of low fusing metals for patterns in the method or art as heretofore practised, has been found unsatisfactory because the surface of such patterns readily oxidizes and when the pattern is melted in the plastic mold, the oxid in the form of dross has a tendency to adhere to the walls of the mold and remain thereon after the metal of the pattern has been poured therefrom, with a resultant formation of surface imperfections in the casting subsequently made in the mold.

By the method or art of our invention, we are enabled to use low fusing metal patterns in the production of the mold by interposing between the pattern and the wall of the mold, a thin stratum or film of a medium repellent to the material of the pattern, thus isolating the pattern from the material of the mold while the former is being reduced to a molten state. In practice we have found it most desirable to melt the pattern through the agency of a heated liquid medium which will be readily absorbed by the material of the mold and thus subject the entire superficial area of the pattern to the action of the heating medium which medium also prevents the adhesion of oxid to the wall of the mold, or acts as a solvent to prevent the formation of oxid while the material of the pattern is being melted, or to break any bond between the oxid found upon the pattern before the plastic has been formed about the pattern in making the mold. Since the heating medium also acts as a flux, its application to the pattern will facilitate the melting of the pattern and its flow from the mold when reduced to a molten state.

In the practice of our invention, we preferably make the patterns by the pressure die casting process, since this method is rapid, accurate and economical. The material of the mold is an absorbent plastic composition, well known in the casting art.

The invention consists primarily in a method or art of making molds for casting fluid metals, consisting in forming plastic material about a fusible pattern, melting said pattern while in the mold, causing the formation of a thin stratum or film, of a medium repellent to the material of the pattern between the mold and the pattern while it is being melted, flowing the molten material of the pattern from the mold, and drying the mold; and in such other novel steps and practices as are hereinafter set forth and described and more particularly pointed out in the claims hereto appended.

In the practice of the method or art of

the invention, we make a mold of plastic material, such as a mixture of gypsum (plaster of Paris) and a fibrous material, (such as asbestos), by forming said material while plastic about a pattern composed of a low fusing metal alloy, or other suitable fusible material. When the plastic material of the mold has set, we reduce the pattern to a molten state by subjecting the mold with the pattern contained therein to a liquid at a temperature at or above the melting point of the alloy or other material of the pattern. This liquid will by reason of the porosity of the material of the mold permeate the entire body of plastic in the mold in a manner to prevent the adhesion of the material of the pattern to, or its penetration into, the contiguous surface of the mold, in fact, forming upon this surface of the mold a substantially continuous stratum or film of this liquid which is interposed between the pattern and the mold.

When a metal pattern is used, the presence of the stratum or film of liquid will have the effect of dissolving any oxid which may have already formed on the metal pattern or which may have a tendency to form thereon when heat is applied to the mold. This result may be secured in two ways,—by applying a coating of suitable chemical to the pattern so that the liquid will upon contact therewith place it in solution, or by placing the chemical in solution in the liquid before subjecting the mold thereto. In either manner the surface of the pattern while in the mold and while being melted will be subjected to an oxid solvent and there will be a thin stratum or film of liquid repellent to the material of the pattern interposed between the surface of the pattern and the mold. By using a solution containing the oxid solvent, we secure the further advantage that the pores of the material of the mold will be filled with the solvent and thus insure absolute uniformity in the chemical action throughout the entire area of the pattern.

The solvent used will vary according to the alloy of which the pattern is made, and any well known alloy having a low fusing point may be used. We have secured good results with the use of zinc chlorid and aluminum chlorid as an oxid solvent.

The liquid used is preferably filtered or distilled water and while melting the pattern, this water is maintained at substantially its boiling point, although a lower temperature or a higher temperature may be used according to the melting point of the metal, or the alloy, or the condition which practice may determine to be most highly desirable for securing the rapid melting of the pattern or avoiding injury to the material of the mold.

After the molten metal of the pattern has been entirely removed from the mold, the mold is dried. No particular degree of temperature is required for the drying operation. We have found that molds may be readily dried at a very low or a high temperature, although a low temperature is probably preferable with most molds.

After the mold is thoroughly dried, molten metal is poured thereinto from a ladle or in any other desired manner.

We have found in practice that metal having a high fusing point may be readily cast in the manner herein described and that narrow partitions and cores of very small dimensions can be readily formed in the mold; and that these partitions and cores will not be disentegrated by the treatment to which the mold is subjected to reduce the pattern to a molten state, and will not break down when the molten metal is poured into the mold.

The patterns are preferably made in a metal die or mold, the molten metal being forced into said die or mold under pressure. By the use of a master metal die or mold and a duplication of said die or mold in plastic material in the manner herein described, castings may be produced in sufficient number and with sufficient rapidity to make the method or art commercially practicable.

It is essential to the practice of our method or art that the material of the plastic mold be absorbent and that the heating agent for melting the pattern within the mold, be a liquid of a density which will permit it to readily permeate the entire mold so that when the molten material of the pattern is drawn from the mold, the entire surface of the plastic, including the cores will be sufficiently saturated or damped to prevent any portion of the pattern entering the pores of the material of the mold or adhering thereto.

In practice, we have found it to be most desirable to incorporate an oxid solvent in solution in the liquid used for saturating the material of the mold and melting the material of the pattern, although it is not our intention to limit the invention to the use of any particular oxid solvent since such may be varied, to get the best results, with different alloys. Such solvents are well known in the metallurgical art and the selection of any particular solvent is dependent upon the skill of the metallurgist.

Having described the invention what we claim as new and desire to have protected by Letters Patent is:—

1. The method or art of making molds for casting fluid metals consisting in forming plastic material about a fusible pattern, melting said pattern while in the mold, causing the formation of a thin stratum or film of a medium repellent to the material of the pattern between the mold and the pattern

while it is being melted, flowing the molten material of the pattern from the mold, and drying the mold.

2. The method or art of making molds for casting fluid metals consisting in forming absorbent plastic material about a fusible pattern, subjecting said mold with the pattern therein to a liquid, repellent to the material of said pattern and maintained at a temperature at or above the melting point of the material of said pattern, flowing the molten material of the pattern from the mold, and drying the mold.

3. The method or art of making molds for casting fluid metals consisting in forming absorbent plastic material about a pattern formed of a low fusing metal alloy, subjecting said mold with the pattern therein to a liquid containing an oxid solvent in solution, and maintained at a temperature at or above the melting point of the material of said pattern, flowing the molten metal of the pattern from the mold, and drying the mold.

4. The method or art of making molds for casting fluid metals including the step of melting a fusible pattern while the mold is saturated with a medium repellent to the material of the pattern.

5. The method or art of making molds for casting fluid metals consisting in casting a pattern formed of a low fusing metal alloy in a metal mold, forming soft plastic material about said pattern, subjecting said mold with the pattern therein to a liquid containing an oxid solvent in solution, and maintained at a temperature at or above the melting point of the material of said pattern, flowing the molten metal of the pattern from the mold, and drying the mold.

In witness whereof, we hereunto affix our signatures in the presence of two subscribing witnesses, this 24th day of July, 1916.

CHARLES PACK.
LEO FRANK NOCK.

Witnesses as to both signatures:
J. KRALUND,
HERMAN RAU.