

# UNITED STATES PATENT OFFICE.

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## PROCESS OF MAKING CASTINGS OF ALUMINUM AND ALUMINUM ALLOYS.

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*To all whom it may concern:*

Be it known that I, EARL BLOUGH, a citizen of the United States, and resident of Parnassus, Westmoreland county, and State of Pennsylvania, have made a new and useful Invention Relating to Processes of Making Castings of Aluminum and Aluminum Alloys, of which the following is a specification.

This invention relates to processes for casting aluminum and aluminum alloys, and relates especially to processes of casting aluminum, aluminum alloys, and so forth, in molds comprising ordinary foundry sand and carbonaceous difficultly oxidizable material of a dense character, the aluminum alloys being quickly chilled and thus given increased strength and toughness by reason of the increased heat conductivity of the mold caused by the carbonaceous material. For this purpose 10 to 20 per cent. or so of finely ground carbonaceous material may be incorporated with ordinary foundry sand without impairing its desirable qualities in green sand molding, although, of course, the proportion of carbonaceous material used may vary considerably.

The carbonaceous material is preferably dense, difficultly oxidizable and comprises crystalline carbonaceous material so as to best give the desired increase of heat conductivity to the mold and effect the proper chilling of the casting. Suitable fixed difficultly oxidizable carbonaceous material may be prepared by finely grinding 50 parts of good petroleum coke and 25 parts of electric light carbon or similar material and thoroughly incorporating them with 25 parts of coal tar pitch as in a suitable kneading machine. The mixture may be formed into suitable blocks under heavy pressure in any desired apparatus, such as an extrusion press, and the molded pieces are then preferably thoroughly carbonized for a considerable time at high temperature. This may be readily done by packing them in a suitable electric furnace and subjecting them for ten days or more to an intense heat greatly in excess of the heat of the metal used in the casting process. In this way the volatile material is thoroughly expelled and the carbon is given a very dense apparently crystalline structure so as to be a very good heat conductor and difficultly oxidizable. This material may be ground in any way to the desired fineness which should approximate that of the sand with which it is

incorporated. For ordinary fine castings where a good grade of foundry sand is used this carbonaceous material may be ground so that about 85% passes through a hundred mesh sieve and about 60% passes through a two hundred mesh sieve.

When 15% or so by volume of this fine fixed carbonaceous material is thoroughly incorporated with ordinary foundry sand the bonding properties of the sand are substantially unimpaired and green sand molds may be made with the same facility as where ordinary foundry sand alone is employed. When such molds are poured in the casting of aluminum alloys the metal in contact with the face of the mold is suddenly chilled by reason of the increased conductivity of the mold caused by this highly conductive carbonaceous material and the castings are given a finely crystalline structure and a very considerable increase in tensile strength. With an ordinary aluminum alloy containing about 8% of copper the tensile strength is increased from 15% to 25% in this manner. The castings have the same soundness as castings formed in ordinary sand molds, since the venting qualities of the sand are unimpaired by the incorporation of such carbonaceous material which also because of its fixed character does not cause blowing by the evolution of any gaseous material when the hot metal comes into contact therewith. Molds made of this material can be dumped and the sand riddled without difficulty, and as the carbonaceous material is not readily oxidizable the sand may be used repeatedly without special treatment and without substantial diminution of its valuable chilling properties, only needing to be sufficiently dampened or tempered before being forced into the flasks to form molds in the ordinary green sand molding process. The ingredients specified in the illustrative composition may be replaced in whole or in part by other carbonaceous material, preferably of a dense or crystalline character and having the other properties referred to.

Having described this invention in connection with illustrative compositions and methods of procedure, to the details of which disclosure the invention is not, of course, to be limited, what is claimed as new and what is desired to be secured by Letters Patent is set forth in the appended claims.

1. The process of making castings of alu-



minum alloys which consists in forming a green sand mold from ordinary foundry sand with which about 15% of finely ground, dense, difficultly oxidizable, carbonaceous material, substantially fixed at the heat of the molten metal used, has been incorporated and in casting the metal into said mold thus quickly chilling the metal and strengthening the casting by the increased heat conductivity of the mold.

2. The process of making castings of aluminum alloys which consists in forming a mold from ordinary foundry sand with which a considerable proportion of finely ground, dense, carbonaceous material, substantially fixed at the heat of the molten metal used, has been incorporated without destroying the bonding properties of the sand and in casting the metal into said mold thus quickly chilling the metal and strengthening the casting by the increased heat conductivity of the mold.

3. The process of making castings of aluminum alloys which consists in forming a green sand mold from ordinary foundry sand with which a considerable proportion of carbonaceous material, substantially fixed at the heat of the molten metal used, has been incorporated without destroying the bonding properties of the sand and in casting the metal into said mold thus quickly chilling the metal and strengthening the casting by the increased heat conductivity of the mold.

4. The process of making castings which consists in forming a green sand mold from sand with which a considerable proportion of finely ground, carbonaceous material has been incorporated and in casting the metal into said mold, thus quickly chilling the

metal and strengthening the casting by the increased heat conductivity of the mold.

5. The process of making castings comprising a large proportion of aluminum which consists in forming a green sand mold from sand with which a considerable proportion of finely ground, heat conductive, difficultly oxidizable, carbonaceous material substantially fixed at the heat of the molten metal used has been incorporated and in casting the metal into such mold thus strengthening the casting by the increased chilling action of the mold.

6. The process of making castings of aluminum alloys which consists in forming a green sand mold from ordinary foundry sand with which less than 25% of finely ground, difficultly oxidizable, carbonaceous material substantially fixed at the heat of the molten metal used has been incorporated without destroying the bonding properties of the sand and in casting the metal into said mold thus strengthening the casting by the increased chilling action of the mold.

7. The process of making castings comprising a large proportion of aluminum which consists in forming a green sand mold of material comprising less than 25% of finely ground, difficultly oxidizable, inert, highly heat conductive material and in casting the metal into said mold thus strengthening the casting by the increased chilling action of the mold, said mold being substantially free from carbonaceous material volatile at the heat of the metal used.

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Witnesses:

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