

UNITED STATES PATENT OFFICE.

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MOLD FOR CASTING.

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To all whom it may concern:

Be it known that I, ALEXANDER E. OUTERBRIDGE, Jr., a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Molds for Metal Castings, which improvement is fully set forth in the following specification.

My invention consists in preparing combustible material—such as textile fabrics, paper, &c., and designs made thereof, and natural objects, such as ferns, grasses, &c.—so that the same may be used either as molds or as faces for molds for metal castings by converting such substances into a refractory form of carbon, in which the shape of the material or object is preferably preserved, permitting molten metal to be poured directly thereon without changing them, whereby a faithful or exact copy in reverse or “negative” may be obtained upon the face of the casting, which may then be used as a die for embossing leather, stamping metal, or for other purposes.

In carrying out my invention I take any desired material—such as lace, cloth, or other fabrics, fiber, &c., or natural objects, such as leaves, plants, &c.—and carbonize the same in a suitable manner, thus producing a matrix material retaining its original form and design, while acquiring new properties of incombustibility, rendering it suitable for use as parts of molds for metal castings.

The method of forming a mold in sand which is to be faced with the refractorily-carbonized object does not differ in any way from the ordinary method of making what is technically termed a “green-sand mold” for common castings. A pattern of the proper size and shape to produce the casting is laid upon a smooth board or other surface, and the “drag-box” of a molding-flask is placed over it. Molding-sand is then sifted over the pattern and rammed down upon it. When the box is full, it is inverted and the upper half of the flask or “cope” is put over it. Sand is sifted over the other side of the pattern, as before, and when the upper box is full the flask is opened, the pattern gently rapped to loosen it from the sand, and it is then drawn out of the mold. Any detached particles of sand are blown away and the carbonized material is laid smoothly upon

the wall of the mold. If the carbonized material is sufficiently large to project slightly beyond the edges of the mold, it does not need to be fastened thereto, since the closing of the flask securely pins the edges of the material between the cope and drag and holds it firmly in its proper position. Suitable runners or gates having been provided, the molten metal is poured into the mold, and the carbonized material, yielding to the pressure of the metal, is forced against the wall of the mold on one side and is partly embedded in the casting upon the other. Experience has proved that the most delicate carbonized fabrics are easily manipulated in this manner without risk of breaking or becoming otherwise injured by the pressure of the incoming metal. Even though the surface of the mold be convex, concave, or irregular in shape, the carbonized fabric will accommodate itself to such irregularities of surface without tearing. If the design is too small to admit of this method of treatment, it may be readily attached to the surface of the mold by means of small pins made of carbonized wood or fiber, or other refractory substance.

If desired, the face of the mold upon which the carbonized material is to be laid may be formed from a plate of carbon, iron, or other substance capable of resisting the heat of the molten metal. The carbonized design may either be laid upon the plate and fastened at the edges in the manner described, or it may be glued to such substance with flour-paste, molasses, or other adhesive material, and then thoroughly dried or baked in an oven. I have found that several castings may be made from one carbonized design attached to carbon or metal plates in this manner.

The method of forming a “dry-sand” mold for use with carbonized designs does not differ from ordinary practice. The design may either be loosely laid on the face of the mold and held at the edges, or it may be glued to the wall of the mold before baking, as already described. I may also prepare a matrix or mold by mixing saw-dust, wood-pulp, and finely-ground carbon—such as anthracite coal-dust, &c.—with molasses, glue, coal-tar, pitch, &c., making a paste, dough, or plastic compound which is pressed upon any form or pattern

which it is desired to reproduce in metal, and treating the compound, as will hereinafter be described, so as to produce a hard-carbon mold suitable for making therefrom one or more

5 castings.

The method of producing carbonized articles may be varied, but in their production three important principles are involved, as follows: First, partial exclusion of air and substitution therefor of a carbon atmosphere in the carbonizing-receptacle; second, slow distillation of volatile elements in the materials; third, intense and prolonged heating of the partly-charred materials in the receptacle in order to drive off remaining foreign elements, and to change the carbon from its readily-combustible form of ordinary charcoal into a more refractory condition.

The objects to be carbonized are preferably first saturated in their interstices with finely powdered carbon. (Ground anthracite coal or other form of carbon is used.) They are then packed either in an iron case, a black-lead crucible, clay-retort, or any other receptacle which will resist a high temperature—say of 1,000° Fahrenheit. The interstices in the receptacle are usually then filled with finely-ground carbon, a closely-fitting lid (not hermetically sealed) is put on, and the case, with its contents, is heated in an oven at a very moderate temperature—say 300° Fahrenheit—for several hours. By this process of slow heating in a carbonaceous atmosphere all volatile compounds are distilled off from the materials, and, owing to the exclusion of oxygen, no oxidation or combustion of the fabrics can occur. The completion of this stage of the process is indicated by the cessation of smoke escaping from beneath the lid of the case. The box or crucible is now gradually heated in a forge or other fire, and then kept at a glowing temperature for about two hours, more or less, after which it is removed from the fire and cooled.

The contents, when taken out of the box, are shaken to remove the coal-dust and tested in a blast-lamp. If the process has not been carried to a sufficient point, the partially-carbonized objects, will be found to resemble ordinary charcoal in their degree of combustibility—that is, they will become ignited and slowly burn even after removal from the flame, leaving a white ash, and would be unsuitable for the purposes. If, however, the operation

is completed, the carbonized objects are found to approximate the graphitic form in their refractory character, they can be heated, as before stated, white-hot, and on removal from the flame no combustion whatever is observed, and, finally, when subjected to an intense heat at the apex of a blow-pipe flame, (or oxidizing-point,) they may be slowly consumed, without leaving any visible ash.

The plastic molds, made of either pulp, papier-maché, or of powdered carbonized substances held together by glue, molasses, &c., are all subjected to a similar treatment, in order to thoroughly carbonize the compound. Otherwise it would be highly dangerous to attempt to make castings from molten metals in them. The result of the treatment is that all volatile compounds, water, or other substances capable of exploding, flaming, or blowing the molten metal out of the mold and destroying it are removed, and the mold, being unaffected by the molten metal, can be used again unless its form is such that the contraction of the metal in cooling should destroy it.

The particular method of carbonizing the objects is of course susceptible of variation to suit particular cases; but the scientific principles involved are unchangeable.

I am aware that it is not new to make a sand mold and face or dust the same with powdered carbonaceous material for producing a smooth casting, and therefore I do not claim the same.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A mold or the face of a mold consisting of refractorily-carbonized material retaining the shape and outlines or the design of the original object, substantially as described.

2. The process of forming a refractory material for a mold or the face of a mold, consisting, first, in slowly heating the object packed in a suitable receptacle, whereby the distillation of the volatile elements is effected, and, second, in heating to a high temperature the receptacle and inclosed carbonized object, substantially as described, whereby a non-combustible material is obtained, as stated.

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Witnesses:

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