

March 18, 1947.

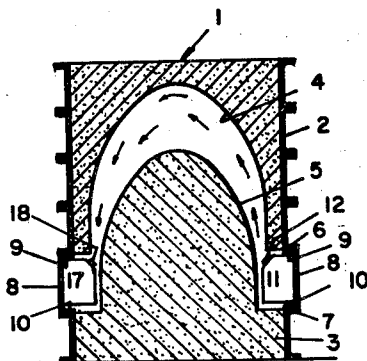
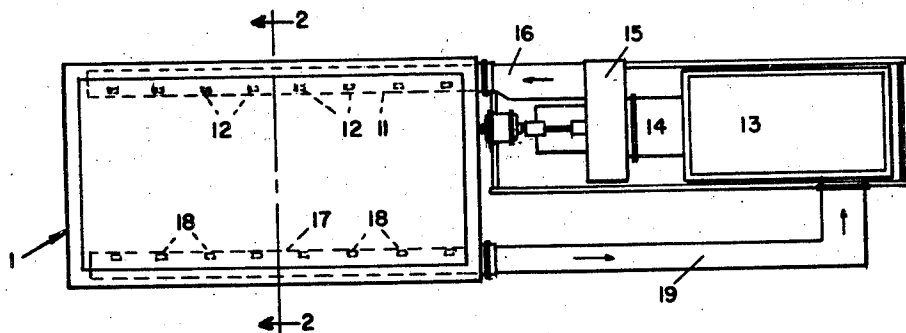
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2,417,673

APPARATUS FOR DRYING FOUNDRY MOLDS

Filed July 15, 1943

3 Sheets-Sheet 1



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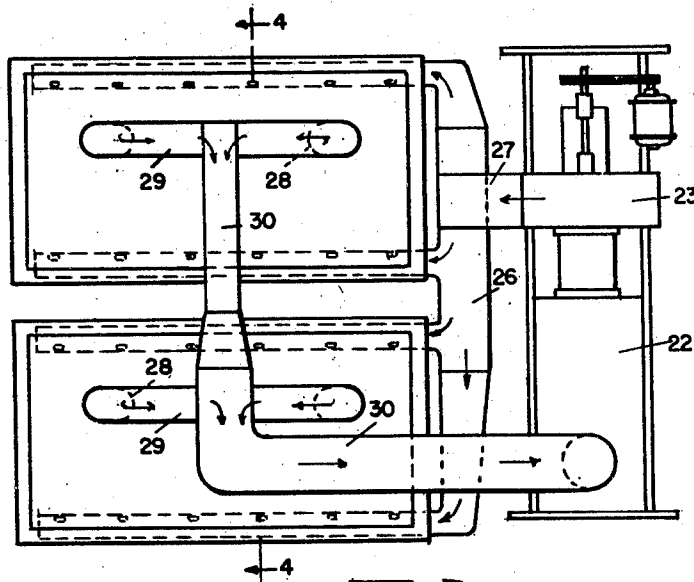


FIG. 3

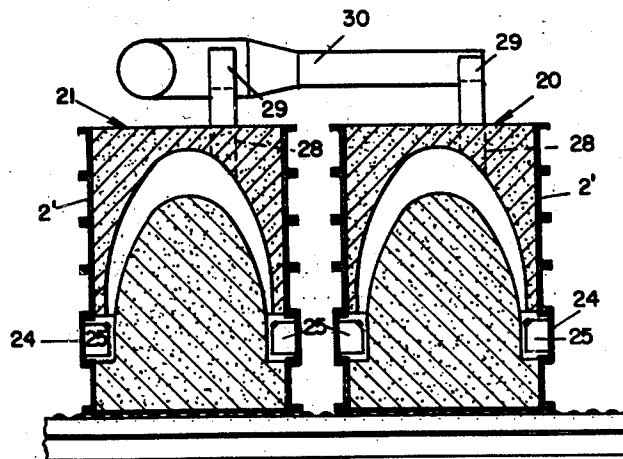


FIG. 4

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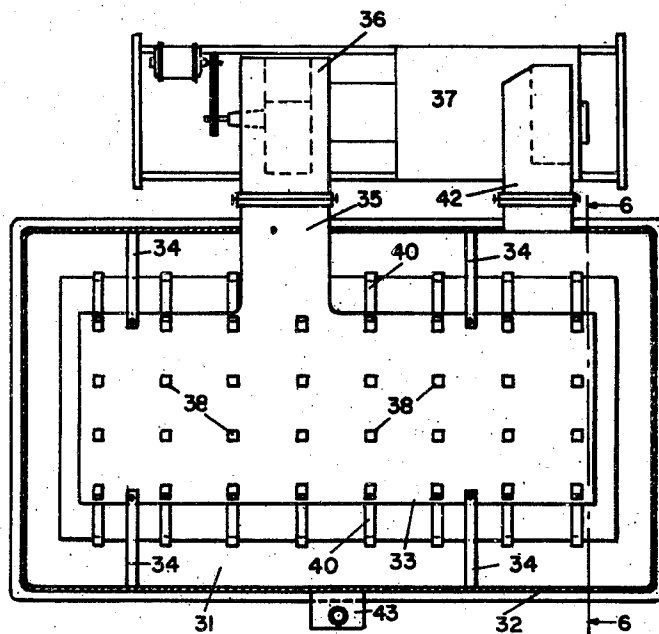


FIG. 5

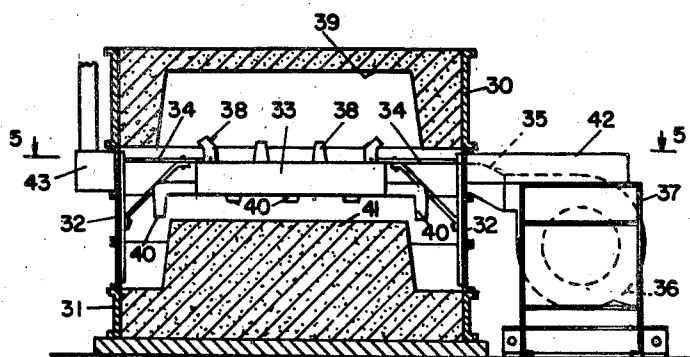


FIG. 6

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UNITED STATES PATENT OFFICE

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APPARATUS FOR DRYING FOUNDRY MOLDS

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6 Claims. (Cl. 22—87)

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The present invention relates to apparatus for conditioning foundry molds and the like and has particular reference to the baking and drying of the green sand in such molds in a zone adjacent the mold-forming surface thereof.

In metal founding practice, after the green sand is so patterned or formed in the mold body or flask (the latter of course including copes and drags, if need be), the sand must be so treated or conditioned as to be enabled to come in contact with the molten metal without causing certain disadvantageous results. Green sand molds have therefore previously been treated or conditioned by either one of two general methods. One of these methods is the surface or skin drying process whereby heat is applied to the mold-forming surface of the sand, such as by a gas torch played over such surface, or by heat radiated from a gas, electrical or solid fuel burner. The other method generally employed to condition green sand molds involves the subjecting of the entire mold body to a baking or heat soaking operation in a drying oven. It will readily be appreciated that the first of these two general methods of treatment is subject to the disadvantage of uneven application of heat to the mold-forming surface and the inefficient and uneconomical transmission of heat; the second general process having the disadvantage of requiring relatively long periods of time for effecting the penetration of the drying or baking heat throughout the entire mass of the mold body, not to mention the excessive amount of heat required.

In the co-pending U. S. patent application of C. A. Barnett, co-applicant herein, Serial No. 408,063, filed August 23, 1941, there has been disclosed a mold conditioning process and apparatus wherein the mold body, containing the green sand, is placed upon a continuously moving conveyor and subjected to a blast of heated air which is so directed as to impinge uniformly upon the sand mold-forming surface, producing rapid and uniform drying of such surface throughout an even depth zone. However, it is not feasible or practical to employ a continuous conveyor for all types and sizes of foundry molds. Either the space required by such a conveyor and its associated housing and forced air heating apparatus would be too large when considered in proportion with the number or sizes of the molds conditioned, or the cost of such an apparatus would be out of proportion.

Our present invention, therefore, is directed to the provision of an apparatus for conditioning and drying sand molds which are of such a size

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and weight as to prevent them from practically and economically being transported upon a continuous conveyor type of drying oven, and wherein the mold body itself, including the cope and drag (and even cheek if need be) are utilized as the enclosing housing through which the mass of heated air is circulated to effect the uniform drying and baking of the green sand in the zones adjacent the mold forming surfaces thereof.

Briefly outlined, our invention comprises a source for generating and delivering a forcibly projected body of heated air to a distributing manifold located in the interior of the mold flask, with means for supporting the upper and lower parts of the latter, such as the cope and drag, in spaced apart, and in enclosing position.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a top plan view of a single mold drying apparatus involving the principle of our invention;

Fig. 2 is a vertical, sectional view taken substantially along line 2—2 of Fig. 1;

Fig. 3 is a top plan view of a multiple mold drying apparatus involving the principle of our invention;

Fig. 4 is a vertical, sectional view taken substantially along line 4—4 of Fig. 3;

Fig. 5 is a horizontal view taken substantially at the parting of the mold, of a modified form of our mold drying apparatus, and taken substantially along line 5—5 as indicated in Fig. 6; and

Fig. 6 is a vertical, sectional view taken substantially along line 6—6 of Fig. 5.

Now referring more particularly to Figs. 1 and 2, the apparatus shown therein includes a mold body or flask indicated generally at 1, which in turn is made up of the upper portion or cope 2 and the lower portion or drag 3. The cope 2 is filled with a body of mold sand forming the mold surface 4 and the drag 3 likewise contains a body of sand forming the other mold surface 5. When the cope 2 and drag 3 are assembled in normal position for the casting operation, i. e., with the flask flange 6 contacting the flange 7 at the part-

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ing, the mold surfaces 4 and 5 define the desired form of mold cavity. However, as best shown in Fig. 2, the cope 2 and drag 3 are herewith assembled, and for the purposes of our invention in such a manner that they are spaced apart at the parting by means of the channel shaped spacer 8 having flanges 9 and 10 abutting the flanges 6 and 7, respectively, around the parting edges of the cope and drag. The channel 8 thus constitutes a vertical wall member forming a continuation of the flask walls, viz., the walls of the cope 2 and drag 3. A distributing outlet manifold 11 is mounted on the inside of one side of the spacer 8 and has a plurality of air stream directing nozzles 12 so disposed as to project a plurality of heated air streams upwardly and against the sand mold forming surfaces 4 and 5, substantially as indicated by the arrows in Fig. 2.

A heater 13, consisting of a heat transfer chamber and a burner for gas or solid fuel (or utilizing electrical heat energy if suitable), is located adjacent the mold 1 and has its outlet 14 connected to the blower 15 whose outlet is in turn connected through the conduit 16 to the manifold 11. A return manifold 17 having intake openings 18 is located on the inside of the side wall of the spacer 8 opposite to that upon which the distributing manifold 11 is mounted. The return manifold 17 is connected through the return or recirculating conduit 19 to the intake of the heater 13.

Thus, it will be seen that in operation, a mass of heated air is delivered from the heater 13 to the interior mold forming surfaces 4 and 5 of the mold body 1 and is there forcibly projected against and along such surface in order to dry and bake the green sand to a uniform depth and temperature, without requiring the heating of the entire mold body as would otherwise be the case if it were attempted to enclose the mold or its parts in a heating oven. Air entering the return manifold 17 and recirculating duct 19 is, of course, reheated and recirculated through the interior of the mold until the mold sand drying operation is complete. Thus, there is no loss of heated air to the atmosphere.

In the form of construction shown in Figs. 3 and 4, two mold bodies or flasks indicated generally at 20 and 21 are mounted side by side and receive their heated, drying air from the common source comprising the heater 22 and blower 23. As will best be seen from Fig. 4, the flasks 20 and 21 are each similarly spaced apart at the parting by the spacers 24, as was the case with the previously described construction of Figs. 1 and 2. In the case of the construction of Figs. 3 and 4 however, both of the manifolds 25, mounted on the inside of the opposite sides of the spacers 24, are outlet distributing manifolds, each of the manifolds 25 being connected to the common header conduit 26 which in turn is connected to the outlet duct 27 from the blower 23.

The body of mold sand in each of the copes 2' is provided with outlet passages 28, much in the nature of a gate or riser in the mold, which in turn are connected to the recirculating ducts 29. The ducts 29 are connected to the common return or recirculating duct 30 leading to the intake of the heater 22.

Thus in operation, the heated mass of air from the heater 22 is introduced to the sand mold forming surfaces in the interior of the mold bodies 20 and 21 from the directing nozzles of the manifolds 25, as substantially indicated by the arrows in Fig. 3, to effect the desired baking and drying treatment of the green mold sand, thence it is

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withdrawn from the interior of the molds 20 and 21 through the passages 28 to the recirculating ducts 29 and 30 to be reheated and recirculated.

In the modified form of construction shown in Figs. 5 and 6, the cope 30 and drag 31 of the mold body are assembled in spaced apart relationship by the spacer 32 for a sufficient distance to accommodate the distributing manifold 33. The manifold 33 is supported from the inside walls of the spacer 32 by means of the angle brackets 34 and is connected through the duct 35 to the blower 36 and heater 37. The manifold 33 has a plurality of directing nozzles 38 directed both upwardly and outwardly against the mold forming surface 39 of the cope 30 and the downwardly directed nozzles 40, directed toward the mold forming surface 41 of the drag 31. A recirculating or return duct 42 connects through the wall of the spacer 32 to the intake side of the heater 37. A vent 43 may be mounted through an opening in a wall in the spacer 32 opposite to that which the recirculating duct 42 is connected. The vent 43 may be utilized for withdrawing excess air from the interior of the mold, if found feasible.

The operation of the apparatus of Figs. 5 and 6 should be obvious and need not be here repeated.

Our above described invention, and the forms of apparatus embodying it, are particularly well adapted to the efficient and economical drying of green sand in foundry molds which are of such size and weight that they cannot readily be accommodated in an oven structure, or transported upon a continuous conveyor. Our invention thus not only overcomes the problem of conveying molds of this size for the purpose of sufficiently projecting a uniformly dry mass of heated air against their mold cavities, but also eliminates the necessity of a relatively large and cumbersome enclosing housing, inasmuch as the mold body itself constitutes the heat transfer chamber.

While reference hereinbefore has been made to the drying of green sand molds, it will be understood, of course, that our improved apparatus is equally adaptable to the drying of molds, generally, whatever the particular material of which they are composed whether sand, cement, plaster, clay, loam or other more refractory material.

Other modes of applying the principle of the invention may be employed, changes being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

We therefore particularly point out and distinctly claim as our invention:

1. In an apparatus for drying sand in foundry molds which consist of a mold body including separable upper and lower portions, the combination of means for generating and delivering a forcibly projected body of heated air, a spacer member having the same perimetric dimensions as those of said mold body and adapted to be inserted between the upper and lower mold body portions and adapted to form a continuation of the flask walls of said mold body, an air distributing outlet manifold mounted on the inside of said spacer member, and conduit means leading from said generating means through the walls of said spacer to said manifold.

2. In an apparatus for drying sand in foundry molds which consist of a mold body including separable upper and lower portions, the combination of means for generating and delivering a forcibly projected body of heated air, a spacer member having the same perimetric dimensions as those of the mold body and adapted to be in-

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serted between the upper and lower mold body portions and adapted to form a continuation of the flask walls of said mold body, an air distributing outlet manifold mounted on the inside of said spacer member, a plurality of nozzles on said manifold for directing heated air streams against the interior surface of said mold body, and conduit means leading from said generating means through the walls of said spacer member to said manifold.

3. In an apparatus for drying sand in foundry molds, the combination of a forced air heater, a spacer in the form of a vertical continuation of the mold flask walls and adapted to be inserted between the cope and the drag of the flask at the parting, a distributing outlet manifold carried by said spacer, conduits connecting said heater to said manifold, and means for circulating air from said heater and through said conduits.

4. In an apparatus for drying sand in foundry molds, the combination of a forced air heater, a spacer in the form of a vertical continuation of the mold flask walls and adapted to be inserted between the cope and the drag of the flask at the parting, a distributing outlet manifold mounted on the inside wall of said spacer, conduits connecting said heater through openings in said spacer to said manifold, and means for circulating air from said heater and through said conduits.

5. In an apparatus for drying sand in foundry molds, the combination of a forced air heater, a spacer in the form of a vertical continuation of the mold flask walls and adapted to be inserted between the cope and the drag of the flask at the

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parting, a distributing outlet manifold mounted on the inside wall of said spacer, said spacer having delivery and return openings through its wall, said delivery opening being in registry with said manifold, a delivery conduit connecting said heater to said delivery opening in said spacer, a return conduit connecting said return opening in said spacer to said heater, and means for circulating air from said heater and through said conduits.

6. In apparatus for drying sand in foundry molds, the combination of a forced air heater, a spacer in the form of a vertical continuation of the mold flask walls and adapted to be inserted between the cope and the drag of the flask at the parting, such cope having a passage from the mold cavity therein to the exterior thereof, a delivery conduit connecting said heater to said manifold through an opening in the wall of said spacer, a return conduit adapted and arranged to connect the passage in such cope to said heater, and means for circulating air from said heater and through said conduits.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
530,641	Hansen	Dec. 11, 1894
773,683	Smith	Nov. 1, 1904
1,752,483	Harrison	Apr. 1, 1930