This invention relates to the manufacture of linings for electric furnaces and the like. In a known type of induction furnace which may be cited as an example, an interior channel or passage, usually roughly V-shaped, communicates at its two ends with the hearth of the furnace. This channel receives a portion of the molten bath which acts as the secondary and the molten metal is circulated through the channel, thereby establishing a circulation of the bath for the effective transmission of heat to the charge. Such a furnace is shown in U. S. patent to James R. Wyatt, No. 1,201,671.

The channel referred to, because of the high temperatures involved, is bounded by refractory material. According to known practice, the channel is formed by tamping refractory material around a form or pattern of the shape of the desired channel, allowing the refractory material to set, and removing the form. If expansion of the form, after the refractory material has been tamped into place, is not prevented, the surface of the refractory lining is liable to be cracked or otherwise injured by such expansion. Attempts have been made to provide forms for the purpose described that are so constituted that expansion is prevented. These attempts, however, for one reason or another have not resulted in a satisfactory solution of the problem.

It is the principal object of the present invention to provide a method of and means for manufacturing furnace linings effectively and economically and such that injury to the lining is avoided.

With this general object in view the invention consists in the methods, combinations, features, details of construction, and arrangements of parts which will first be described in connection with the accompanying drawing and then more particularly pointed out.

In the drawing—

Figure 1 is a view in vertical section showing more or less conventionally an induction furnace prior to completion, with a templet constructed in accordance with the invention located in the channel; Figure 2 is a view in front or rear elevation (enlarged) of the templet, with parts broken away and in section; Figure 3 is an edge view of the same with parts broken away and in section; and, Figure 4 is a sectional view taken on the line 4—4 of Figs. 2 and 3.

Referring to the drawing, the furnace illustrated as an example comprises a furnace body 13 formed of fire brick or other suitable material, and enclosed in a metal casing 12. Within the body is a furnace lining 13 of suitable refractory material. The furnace has a pouring spout 14 and a charging door 15 communicating with the hearth 16. Communicating with the lower part of the hearth are the two ends of a substantially V-shaped channel indicated at 17. This channel is bounded by the refractory lining 13, the outer defining surfaces merging into the straight walls of the hearth and the inner surfaces merging into a rounded hearth bottom, as shown in Fig. 1.

Surrounding the upper ends of the channel is the core 18 of a transformer primary, suitably wound and connected, the inner leg of the core being encased in a shell 19. When the furnace is in operation the molten metal in the channel acts as the transformer secondary.

The lower part of the furnace lining, that is, the part which bounds the channel, is formed by tamping refractory material about a templet and removing the templet after the refractory material has properly set. While various refractory materials having various consistencies, may be used, a dampened granular material having a consistency somewhat like damp sand has been found suitable. According to the present invention, there is provided a templet having substantially the shape of the channel to be formed and capacitated to be rendered collapsible. This may be accomplished, for example, by a templet having a plurality of divided and spaced portions movable one toward another under pressure, but temporarily held in a given relative position by a removable reinforcement, whereby the templet may be rendered collapsible by the re—
moval of such reinforcement. While such a templat may vary in construction, in the embodiment here illustrated as an example, the templat comprises a V-shaped wooden frame or form 20, the legs of the V being connected at the top by two spaced straps 21 which define a groove at the bottom of the furnace pool. The outer edges of the V merge into straight sides corresponding to the sides of the hearth at its juncture with the channel. The inner edges of the V merge into a curve which is continued by the bottom edges of the straps 21, this curve corresponding to the rounded portion of the furnace lining at the bottom of the hearth.

To form the divided and spaced portions, in the present exemplification, the wood frame above described is saw-cut, as indicated at 23, this cut having substantial width and extending through the form parallel to the faces thereof to point adjacent the top of the form (Fig. 3). This cut divides the form into two spaced portions united at the top but movable one toward the other under pressure, whereby the form is capacitated to collapse or contract inwardly. In normal spaced relation, however, the two portions provide a form of the shape of the desired channel just as if they were uncut.

The templat is provided with a removable reinforcement for temporarily holding the divided portions in given normal spaced relation, this reinforcement being of sufficient strength to enable the form to withstand the tamping pressure. In structures embodying the invention to the best advantage this reinforcement is of such material that it may be removed or rendered readily removable by the application of heat. Although capable of various constructions, in the embodiment here illustrated reinforcement is effected by means of a body of wax, such as paraffin. As shown, the templat has an interior passage 24 extending from the top of the form down through the V to the top at the opposite side. That is, the passage extends through the form, its ends being open at the top of the form.

This passage or chamber 24 is filled with melted paraffin 25 or the like which is allowed to harden. In order to prevent the melted paraffin from escaping during pouring through the saw-cut, there is provided, in the present embodiment, outer and inner strips 26 of adhesive tape secured to the edges of the form to cover up and close the saw-cut. These strips are illustrated in Figs. 2 and 4 but are omitted in Fig. 3 for convenience of illustration. These strips also serve to prevent any of the granular refractory material getting into the saw-cut during tamping.

With the hardened paraffin in place, the two divided portions of the form are held in their normal spaced relation in a manner to withstand the tamping pressure during the formation of the lining structure.

There is provided means whereby the reinforcement may be removed. Although capable of various constructions, in the present embodiment a resistor strip or wire 27 is embedded in the wax, its ends extending out from the top of the form as appears in Fig. 2. This resistor strip may be threaded through the passage 24 before the paraffin is poured in. When it is desired to render the form collapsible, the resistor 27 is connected up in a suitable circuit, the resistance setting up heat which melts the paraffin. The melted paraffin is then removed in any suitable manner, for example, by an air blast applied to either end of passage 24.

With the construction described, the templat with the hardened paraffin in place is suitably positioned and the refractory material is tamped about the same to form the furnace lining. During this tamping the form is rigid and withstands tamping pressure so as to constitute a proper form for the channel desired. After the refractory material has been tamped, the paraffin is removed as above described and the templat is rendered contractible, since the divided portions can move toward each other. As a result, the form can contract, if necessary, under the pressure set up during the setting of the lining, thus avoiding injury to the lining. Moreover, in the case of wooden forms, should the form absorb moisture from the wet refractory material, any tendency of the wood to swell is taken care of by the contraction. After the lining has properly set heat is applied in any suitable manner to the wooden form, preferably accompanied by an oxygen blast, and the entire form, including the strips of tape, is consumed. During this heating and burning, the form will not expand against the furnace lining but will contract or collapse inwardly, thus avoiding damage to the lining. Upon removal of the form, the desired channel for the molten bath remains.

It will be apparent that the wooden frame or form may be constructed of such separate parts fitted and secured together as may be desired to facilitate manufacture and assembly.

With the templat described the furnace lining may be properly produced and the form removed without injury to the lining.

What I claim is:

1. A templat for the purpose described having its body, throughout at least the greater part of its extent, formed in two separate and disconnected parts normally separated by a substantial space, said parts
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6. A templet for the purpose described comprising a wooden form having substantially the shape of the channel to be formed, said form being provided with a cut extending through the form to a point adjacent the top thereof and dividing the form into two spaced portions united at the top but movable under pressure one toward the other, and a removable reinforcement for temporarily holding said portions in given spaced relation.

7. A templet for the purpose described comprising a wooden form having substantially the shape of the channel to be formed, said form being provided with a cut extending through the form to a point adjacent the top thereof and dividing the form into two spaced portions united at the top but movable under pressure one toward the other, and having a passage extending therethrough for receiving a body of wax to temporarily hold the divided portions in given spaced relation, and a strip of combustible material secured to the form along said cut to close the same and confine the wax.

8. The method of making the refractory structure of an electric furnace or the like having an interior channel, which comprises forming a pattern formed, at least throughout the greater portion of its extent, by two separate and disconnected parts, inserting a removable reinforcement between said parts to hold the same temporarily in given spaced relation, whereby the pattern has the shape of the channel to be formed, tamping refractory material about the reinforced pattern, removing said reinforcement and removing the pattern.

9. The herein described method of making the refractory structure of an electric furnace or the like having an interior channel, which comprises forming a wooden frame having the shape of the channel to be formed, cutting through the wooden form to within a short distance of the top thereof to provide a plurality of divided and spaced portions movable under pressure one toward another, inserting a removable reinforcement between said portions to hold the same temporarily in given spaced relation, tamping refractory material about said frame, removing said reinforcement, and causing combustion of the wooden frame to remove the same.

10. The herein described method of making the refractory structure of an electric furnace or the like having an interior channel, which comprises forming a wooden frame having the shape of the channel to be formed and having a passage extending therethrough, cutting through the wooden frame to within a short distance of the top thereof to provide a plurality of divided...
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and spaced portions movable under pressure one toward another, pouring melted paraffin into said passage, allowing the paraffin to harden to temporarily hold the divided portions in normal spaced relation, tamping refractory material about said frame, applying heat to the paraffin to melt the same, removing the melted paraffin, and causing combustion of the wooden frame to remove the latter.

In testimony whereof, I have hereunto set my hand.

RICHARD C. JETER.