

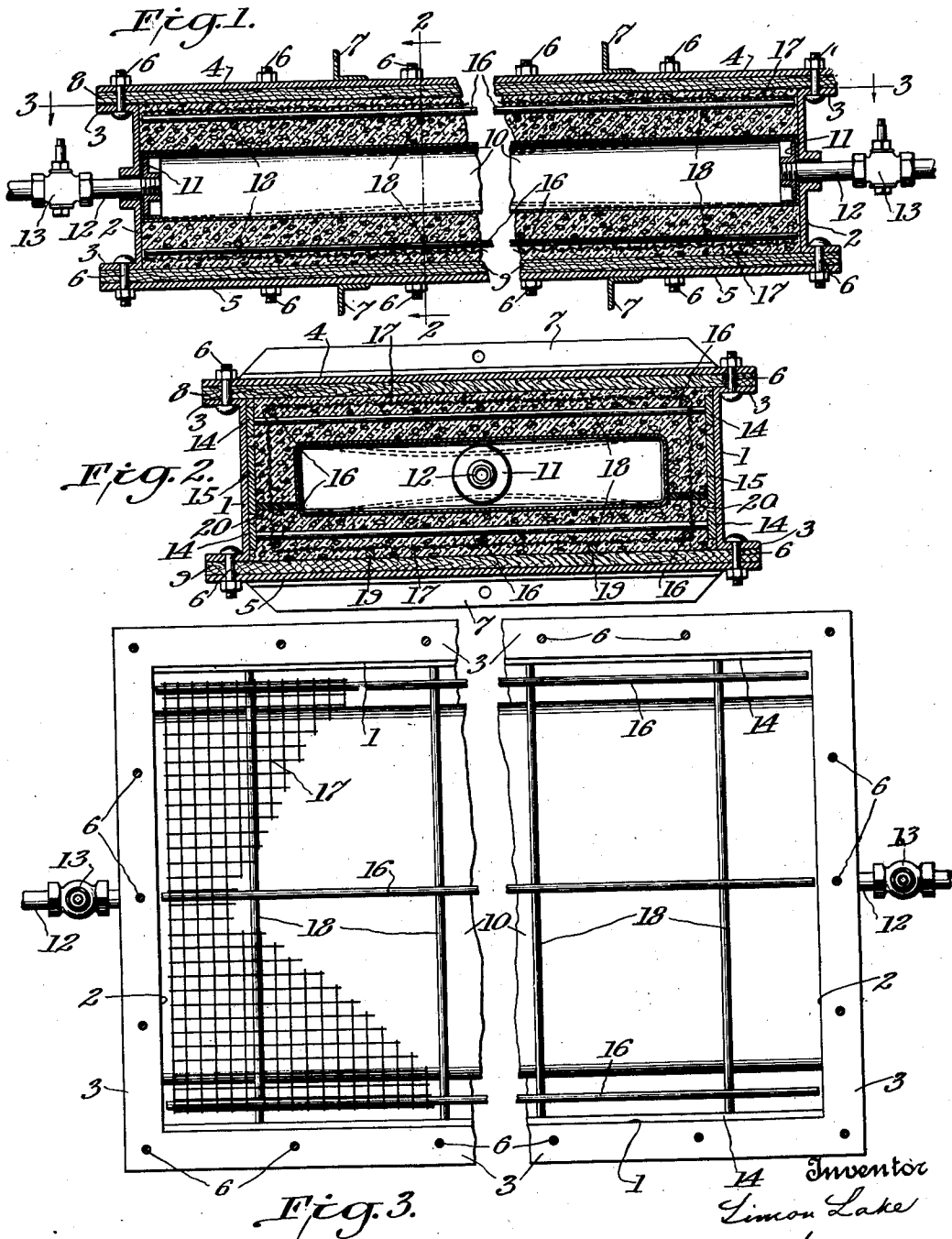
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METHOD OF AND APPARATUS FOR MOLDING CONCRETE

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UNITED STATES PATENT OFFICE.

SIMON LAKE, OF MILFORD, CONNECTICUT.

METHOD OF AND APPARATUS FOR MOLDING CONCRETE.

Application filed January 7, 1921. Serial No. 435,697.

To all whom it may concern:

Be it known that I, SIMON LAKE, a citizen of the United States, residing at Milford, in the county of New Haven and State of Connecticut, have invented a certain new and useful Improvement in Methods of and Apparatus for Molding Concrete, of which the following is a full, clear, and exact description.

10 This invention relates to a method of and apparatus for molding hollow concrete bodies.

The object of the invention is to provide a hollow concrete body of greater strength and density of texture than it has heretofore been possible to produce with the use of known methods and apparatus, and to so speed up production by artificial seasoning of the concrete as to materially lessen the cost of manufacture and equipment, the repeated use of forms being consequently expedited. The invention also contemplates the impregnating and insulating of concrete bodies such as structural elements for building purposes, to the end that such elements may form structures practically impervious to moisture and heat and cold, and of such nature as to render them as nearly as possible non-transmitters of sound.

The invention consists in a method of and apparatus for forming hollow concrete bodies having the characteristics above recited, wherein the body in course of molding is subjected to great internal pressure by means of a partially collapsible expandible core adapted to be positioned in a mold and surrounded with concrete and thereafter expanded by air pressure so as to compact the concrete in the mold and express therefrom through porous mold-boards, assembled in connection preferably with the top and bottom of the mold, all air and surplus moisture contained in the concrete mixture, whereby a uniform density and homogeneous texture is imparted to the concrete and voids caused by trapped air and uncombined moisture done away with. After the pressure caused by the air admitted to the core has so expressed all air and surplus moisture, steam is admitted to the core, whereby further expansion is produced and heat applied for the double purpose, respectively, of further densifying the concrete and drying it, and fusing the coating

of waterproof material with which the core is covered before use and driving this coating into the pores of the concrete so as to fill the same and by reducing the porosity of the texture of the concrete increase its imperviousness to moisture, heat and cold, all as I will hereinafter explain and finally claim.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated, Figure 1 is a central, longitudinal, vertical section showing the apparatus of my invention with a concrete body being cast therein. Figure 2 is a transverse vertical section taken on the line 2—2 of Fig. 1. Figure 3 is a section taken on the line 3—3 of Fig. 1 and showing the core and reinforcing members in position, but omitting the concrete.

It will be understood that various forms of apparatus may be substituted for those herein shown, except as hereinafter claimed, but as a suitable apparatus for the purpose of properly carrying out my method, I show a form composed of a frame, consisting of side and end members 1 and 2, respectively, preferably formed in one piece and of any desired material, and provided with flanges 3, to which the top 4 and bottom 5 are secured in any suitable manner, as by a plurality of bolts 6. The top and bottom are reinforced by means of transverse bars 7 so as to increase the resistance of same to internal pressure.

Interposed between the flanges 3 and the top 4 and bottom 5 are mold-boards 8 and 9, respectively, formed of some porous material, for a purpose hereinafter appearing. I have found that balsa wood is suitable for these boards.

Adapted to be positioned within the mold is a core 10, preferably formed of sheet metal of such thinness as to give the core the proper resiliency for its purpose, as will later appear, and this core is provided at its ends with connection members 11 forming screw-connections for pipes 12 through which air and steam may be introduced to the interior of the core, control of same being provided for by means of valves 13.

In the particular form of block herein shown as being molded, longitudinal side recesses are formed, and for this purpose

members 14 and 15 may be used, same being so supported within the mold as to be capable of withdrawal therefrom when the mold is lifted off of the finished molded body.

If desired, suitable reinforcement may be cast into the body, and I have shown such reinforcement as consisting of a plurality of longitudinally extending rods 16, of such number as to give the required strength, these rods being contained within a tubular reinforcing member of wire mesh, or expanded metal, indicated at 17. Transverse rods 18 may also be cast within the body, these rods being capable of withdrawal after the cast body is finished, to leave openings transversely through the element for construction purposes.

When reinforcement, as shown, is used in casting the concrete body, I prefer to provide the bottom mold-board 9 with supporting members 19 to correctly position the reinforcement with respect to the bottom of the mold and thereby maintain it in proper position within the body of concrete during the molding operation.

20 indicates a layer of semi-fusible insulating material, adapted to increase the imperviousness of the concrete body and to bond therewith as will be hereinafter described.

In molding hollow concrete bodies according to my method, I prefer to proceed as follows:—The body of the mold, comprising the side and end members 1 and 2, respectively, is set up upon and bolted to the bottom 5, with the mold board 9 secured therebetween. Into this mold is poured enough concrete to reach approximately the level to which the bottom of the core will extend. Then the core with the surrounding reinforcing members will be forced down into this concrete until the reinforcing members rest upon the members 19, the bottom of the core being slightly pressed into the surface of the concrete. This pressure will to a certain extent collapse the bottom of the core, as indicated in dotted lines in Figs. 1 and 2. With the core thus in position, fusible insulating material in plastic form is poured around the core to form the layer 20. After pouring in this plastic insulating material, the mold is filled to the top with concrete, the weight of same being sufficient to partially collapse the top of the core and to hold the bottom thereof partially collapsed, also as indicated in dotted lines in Figs. 1 and 2. Then the upper mold board and the cover 4 are bolted in place and compressed air is turned into the core through one of the valves 13, the other of said valves remaining closed. Sufficient air pressure will be introduced into the core to cause its collapsed top and bottom to distend, thereby imparting considerable pressure to the surrounding

concrete. It is well known that in nearly all mixtures of concrete there is considerable trapped air, and cement which has not been completely hydrated, also that there is considerable uncombined water present. The distending of the core, and the pressure upon the concrete thereby obtained, is sufficient to densify the texture of the concrete and to cause the cement therein contained which has not been completely hydrated to combine with the free water, and also to force out of the concrete mixture through the porous mold boards 8 and 9 all trapped air and surplus moisture. When this pressure in the core has been maintained for such a period as to have accomplished the desired result, evidence thereof being observable in the cessation of bubbling or seepage at the edge of the mold boards, the air pressure will be relieved from the core by opening the previously closed valve 13, so that the air may escape.

Before the core 10 is placed in the mold, it is coated with a substance which is fusible under known temperature and pressure. For this coating I have found bitumastic, pitch, asphaltum, paraffin, or any one of these substances mixed, if desired, with sawdust or with ground cork suitable.

After the air has been allowed to escape from the core, the escape valve 13 is allowed to remain open and the core is connected with a source of supply of steam. Steam is then allowed to circulate through the core at a moderate rate, so as to gradually warm up the surrounding concrete and further assist in its complete hydration and hasten its drying. After the entire body of concrete has become evenly, or substantially evenly, warmed, the valve 13 is closed and the steam pressure in the core is increased until the core is still further expanded and its coating fused and driven or forced into the surrounding concrete, thus waterproofing it and filling all of the pores. This steam heating of the body of concrete also serves to partially fuse the layer of insulating material 20 and cause it to bond with the concrete.

After a sufficient time has elapsed to have completely accomplished the desired result, the steam is shut off, the pipes 12 unscrewed and removed, the bottom of the mold unbolted, and the mold slipped off of the cast concrete body. The external dimensions of the core having been reduced by the fusing of its coating, the core may then be easily withdrawn.

Hereinabove I have referred to the transverse rods 18 as being removable, and in order that this removal may be easily accomplished, I coat the rods 18, before their insertion, with a fusible compound such as is used for coating the core. The heat of the steam in the core may be sufficient to fuse the coating of these rods, but if it is not,

they may be heated by passing an electric current through them, and their coating thus fused.

In the drawings I have illustrated a hollow concrete slab such as might be used for floors or walls of buildings, and the like, but it is to be understood that my invention is eminently well adapted to the casting or molding of bodies having very thin walls. Moreover, by changing the form of the mold and core, hollow columns and the like structural elements may be readily molded.

The invention lends itself also to a marked degree to the casting of designs upon concrete bodies, such designs being either in relief or in intaglio, the only change necessary in the apparatus being the substitution in the mold of plates or boards bearing the desired designs instead of the plain mold boards shown.

The rapid drying and waterproofing of the concrete also tend to lengthen the life of the metallic reinforcing members, because no free moisture remains in the finished casting, and no water can later enter it to corrode them.

It is to be understood that I do not consider my invention as limited to the particular method herein recited, nor to the particular apparatus herein shown and described, except as hereinafter claimed, various changes in the mode of procedure of molding, and in the arrangement and construction of the apparatus, being possible within the spirit of the invention and the scope of the following claims.

What I claim is:—

1. A method of molding hollow concrete bodies, which comprises subjecting such bodies to internal pressure and heat and the action of a waterproofing material.

2. A method of molding concrete bodies, which comprises filling a mold provided with porous walls with concrete surrounding a hollow core, and introducing pressure to the interior of said core to drive off air and moisture from said concrete through said porous walls.

3. A method of molding hollow concrete bodies, which comprises filling a mold with concrete surrounding a coated expansible core, applying air pressure to the core to compress the concrete, and then applying

steam pressure to the core to fuse the coating thereof and force it into the concrete. 55

4. A method of forming hollow concrete bodies, which comprises partially filling a mold with concrete, placing in said mold upon said concrete an expansible core, placing around said core and upon said concrete an insulating material, completing the filling of said mold with concrete, and applying heat and pressure to the interior of said core to expand same and compress and dry said concrete and bond it with said insulating material. 60 65

5. A method of molding hollow concrete bodies, which comprises partially filling a mold with concrete, placing within said mold a partially collapsible hollow core, completing the filling of said mold with concrete the weight whereof will partially collapse the core, and applying pressure to the interior of said core to expand same and compress said concrete. 70 75

6. A method of molding hollow concrete bodies, which comprises partially filling a mold with concrete, placing within said mold a partially collapsible hollow core coated with a fusible waterproofing material, completing the filling of said mold with concrete the weight whereof will partially collapse the core, and applying pressure and heat to the interior of said core to expand same and compress said concrete and fuse said coating and force same into said concrete. 80 85

7. In an apparatus for molding hollow concrete bodies, a mold provided with porous members and adapted to receive a concrete mixture, and an expansible core adapted to be positioned within said mold and to be expanded therein to express air and excess moisture from said concrete through said porous members. 90 95

8. In an apparatus for molding hollow concrete bodies, a mold, a top and a bottom therefor provided with porous members, and a partially collapsible expansible core adapted to be positioned within said mold, for the purpose specified. 100

In testimony whereof I have hereunto set my hand this 6th day of January A. D. 1921.

SIMON LAKE.