S. LAKE.

CONCRETE BUILDING CONSTRUCTION.

APPLICATION FILED MAR. 10, 1917.

1,273,073.

Patented July 16, 1918.

5 SHEETS—SHEET 1.

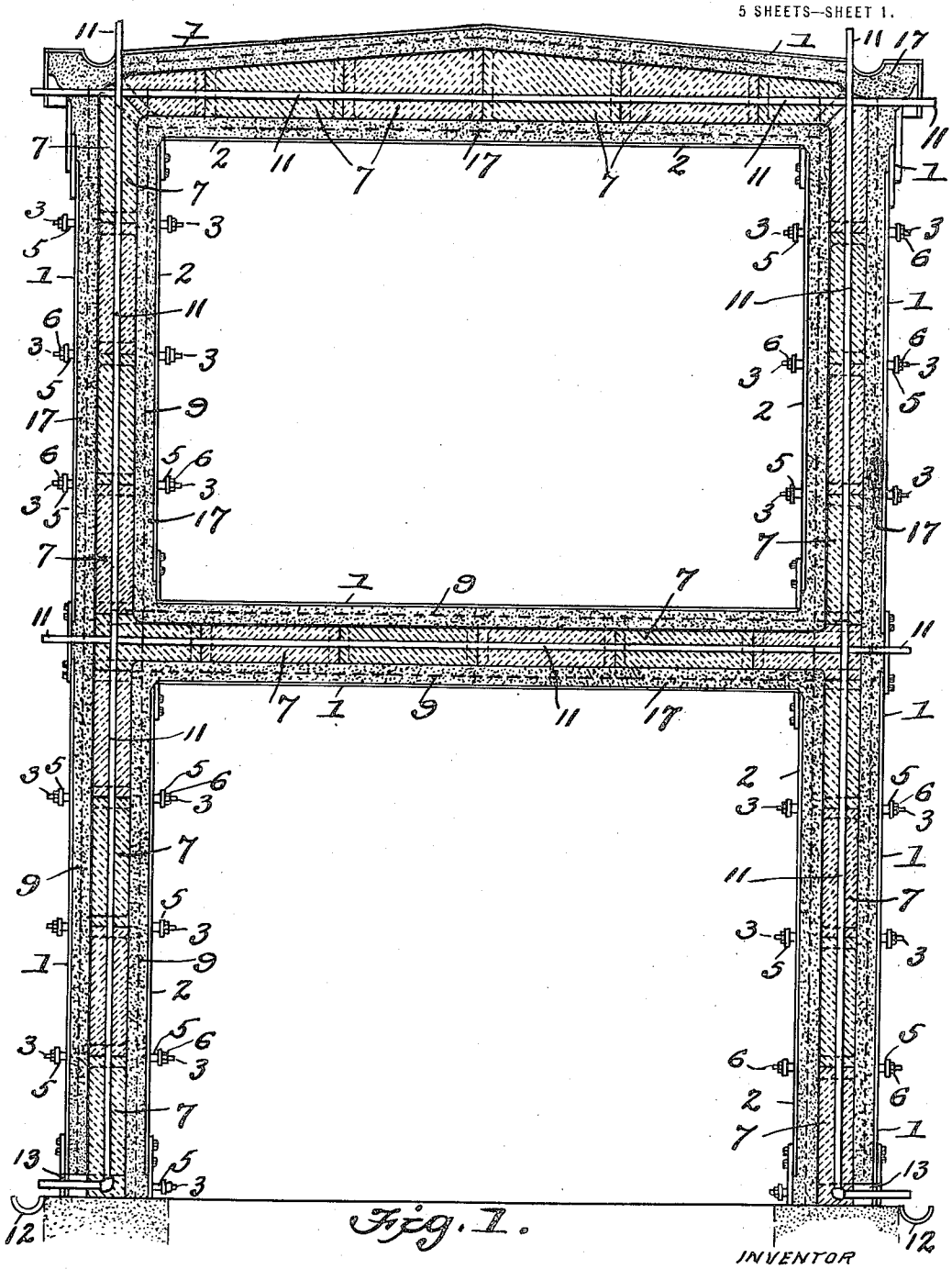


Fig. 1.

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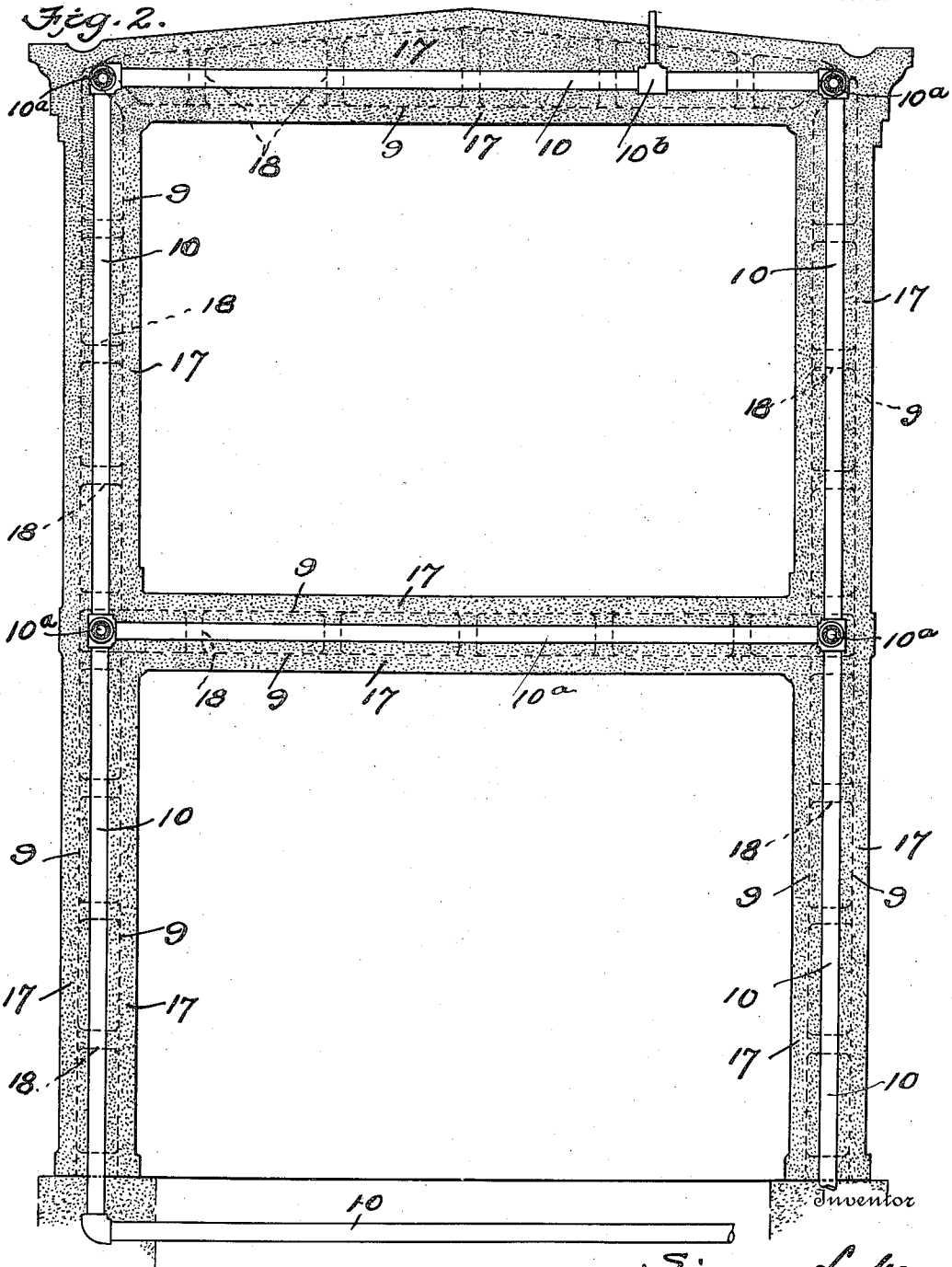
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5 SHEETS—SHEET 2.

Fig. 2.



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5 SHEETS—SHEET 3.

Fig. 3.

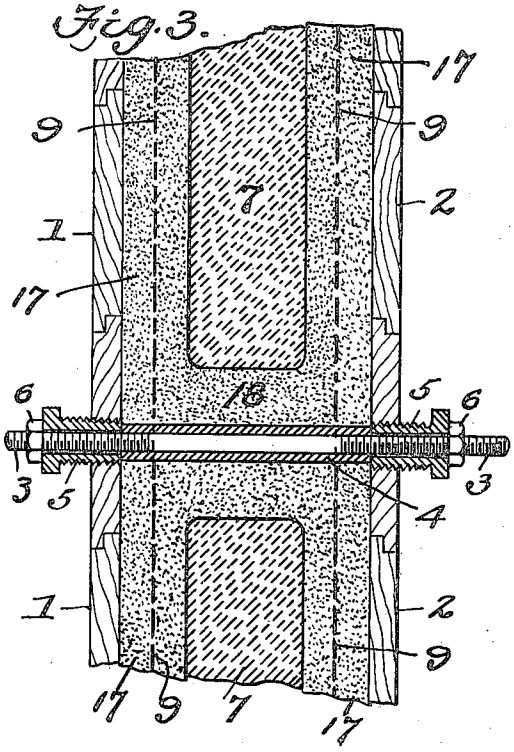


Fig. 4.

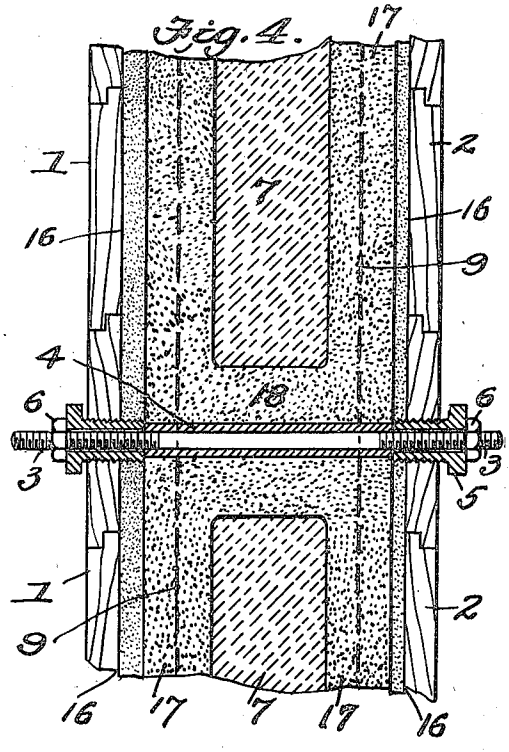


Fig. 5

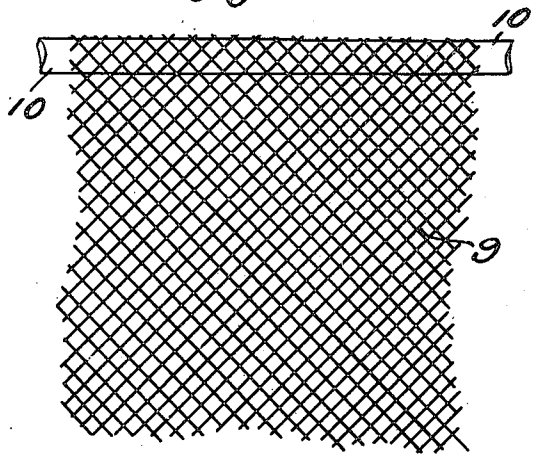
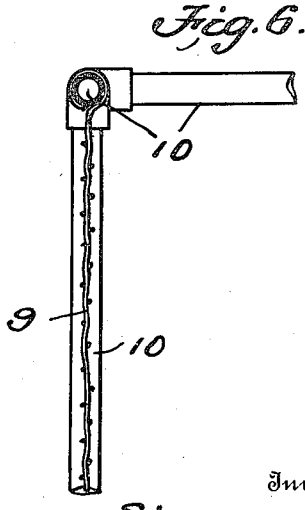


Fig. 6.



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5 SHEETS—SHEET 4.

Fig. 7.

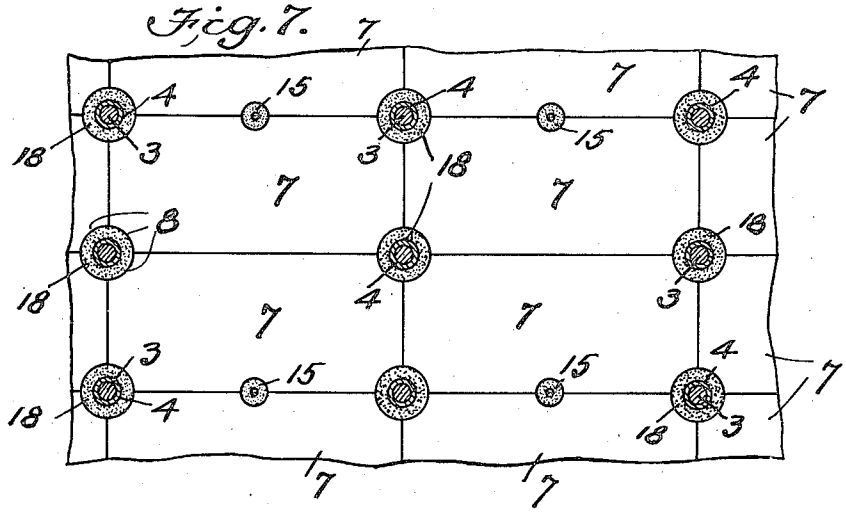


Fig. 8.

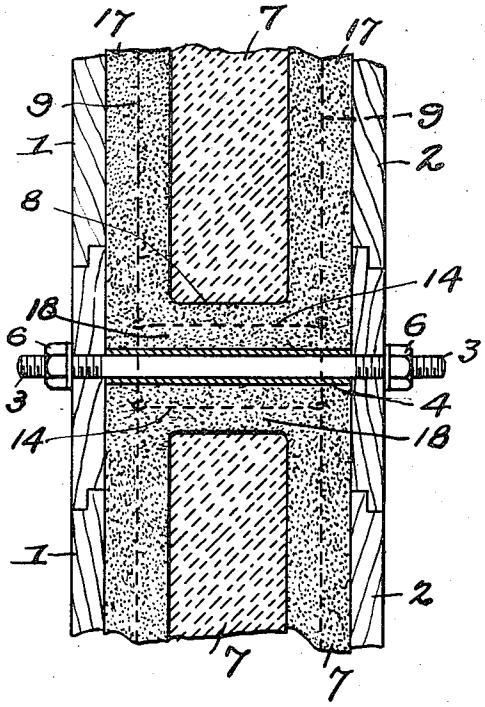
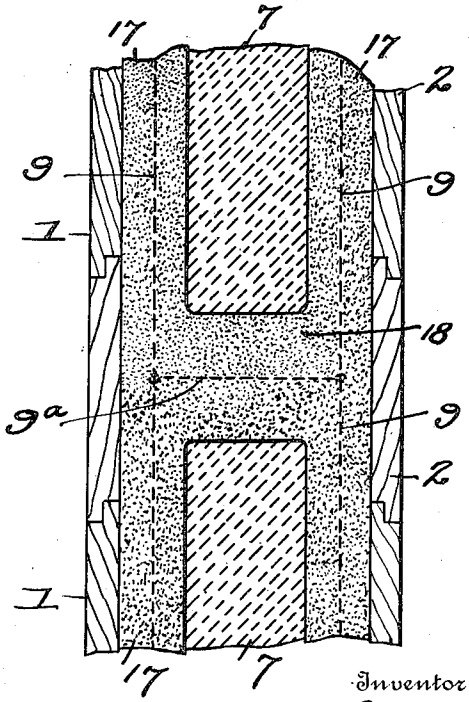


Fig. 11.



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5 SHEETS—SHEET 5.

Fig. 9.

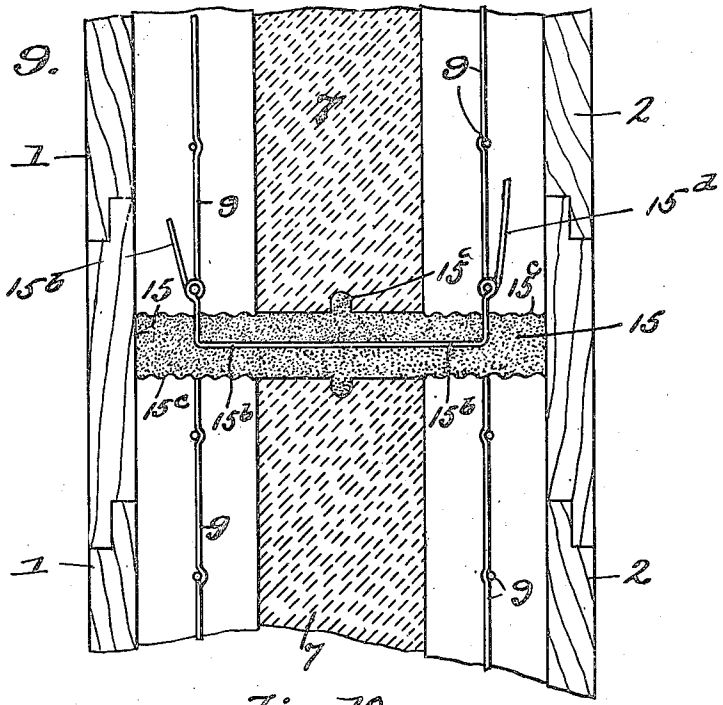
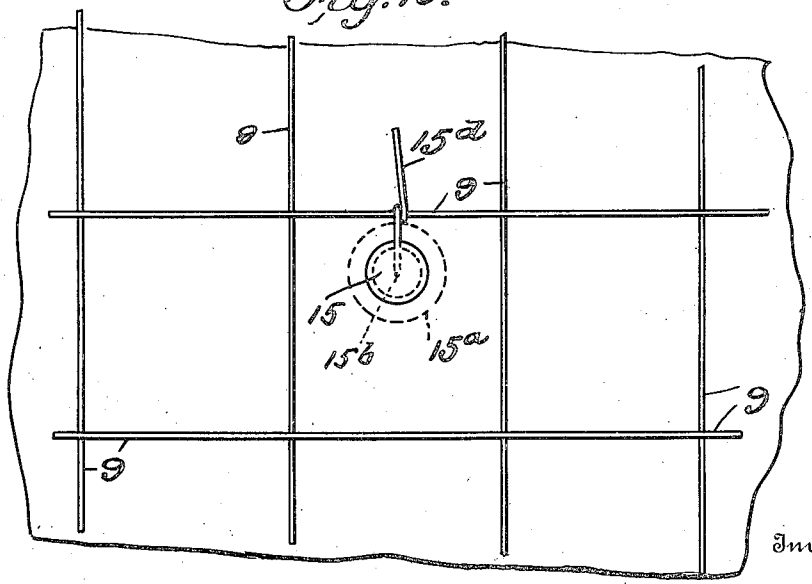


Fig. 10.



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UNITED STATES PATENT OFFICE.

SIMON LAKE, OF MILFORD, CONNECTICUT.

CONCRETE BUILDING CONSTRUCTION.

1,273,073. Specification of Letters Patent. Patented July 16, 1918.

Application filed March 10, 1917. Serial No. 153,892.

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 certain new and useful Improvements in Concrete Building Construction, of which the following is a specification.

The primary intent of this invention is to devise a fire and moisture proof building of novel structure, as well as method of formation, which is free from joints and not susceptible to the deleterious action of settling, since it particularly involves a one-piece structure securely braced, stayed, and reinforced in every direction.

The invention relates to a structure of concrete, or like self-hardening building material, fashioned by a mold and strengthened by reinforcements embedded in the material at the time of molding the same.

The invention contemplates a mold and a core disposed within the mold and formed of some fusible material, such as paraffin, asphalt, or a combination of elements providing a composition which may be softened and caused to flow by the action of heat, the spaces formed between the core and the mold being filled with concrete or like plastic building material, as are more fully set forth in the following description, illustrated in the accompanying drawings, and hereinafter more particularly claimed.

In the accompanying drawings, illustrating the invention, in the several figures of which like parts are similarly designated:—

Figure 1 is a vertical section of a building having all parts in place, after the body forming material has been supplied to the mold, and with the core and core fusing means still in position.

Fig. 2 is a view similar to Fig. 1 showing more particularly the tubular reinforcement which may be utilized to prevent expansion or for other purposes, the mold being removed.

Fig. 3 is an enlarged cross sectional detail.

Fig. 4 is a view similar to Fig. 3 having the plates or elements comprising the mold moved outward to provide spaces for receiving the material forming the finishing coat.

Fig. 5 is a detail view of a portion of the reinforced means.

Fig. 6 is a section of the reinforcing means shown in Fig. 5, taken at right angles thereto.

Fig. 7 is a face view of a portion of the core showing a plurality of blocks or elements properly arranged.

Fig. 8 is a sectional view similar to Fig. 3 showing a modification.

Fig. 9 is a sectional view similar to Fig. 8 showing a further modification.

Fig. 10 is an elevation of part of the reinforcement, core, and centering and holding means for such parts.

Fig. 11 is a view similar to Fig. 8 of a further modification.

In carrying out the invention, a mold is a necessary adjunct, since it gives proper shape to the concrete or other self-hardening plastic material utilized in the formation of the building or like structure. This mold may be of any nature, and comprises plates or elements which are spaced apart the required distance and so disposed according to the desired outline of the completed structure. In a general way the mold comprises exterior plates or elements 1, and inner plates or elements 2. The several plates when set up are connected by suitable spacers and ties to hold them in predetermined position during the filling of the building material into the mold space and the hardening or setting of such material, after which the mold is removed. As indicated most clearly in Figs. 3 and 4, the mold forming elements, or plates 1 and 2, are connected by means of ties 3, and are held apart by spacers 4, the latter being mounted upon the ties and coming between the plates or mold members 1 and 2. The ties 3, preferably consist of threaded rods, and the spacing elements 4 consist of tubing of proper length, the same being slipped upon the ties so as to come between the mold elements. Thimbles or collars 5 are mounted upon end portions of the ties, and constitute means whereby the plates or mold members 1 and 2 may be moved outward a short distance from the opposing faces of the structure to provide spaces for receiving the material desired to form the finishing coat to the walls. These thimbles or collars may be of any formation to admit of the purpose being accomplished. Adjusting nuts 6, mounted upon the threaded ends of the tie-rods 3, engage the mold members 1 and 2 more or less directly, and hold the same in the required adjusted position.

In practising the invention, the primary step consists in placing the mold in position according to the configuration of the structure to be formed. After the mold is set up and made secure by means of the spacers 4 and ties 3, the core and reinforcing means are placed in position. In assembling the parts due regard must be had for convenience in properly placing the several elements. The core and reinforcing means may be placed in position at the time the mold is being set up. The core is indicated at 7, and preferably comprises a plurality of fusible blocks or elements of any desired size for convenience of handling, and of a shape to conform to the structure to be built. This core may be of any material adapted to be affected by heat so as to be reduced to a liquid state, whereby it may flow from the structure after the same has been completed, a portion of such material permeating the inner walls of the structure, and coating such walls to render them moistureproof. It is proposed to utilize paraffin, asphalt or a composition of elements to produce the material employed in the formation of the core. Such material is molded into elements or blocks of desired size and shape, and such blocks or elements are disposed within the mold to provide spaces at the sides of the core for receiving the spacers and ties, and such openings being of a size to receive portions of the building material, whereby the spaced walls are united by bonds or ties. As indicated in Fig. 7, the corners of the blocks or elements comprising the core are cut away so that when the blocks or core elements are in position, openings are provided to receive the spacers 4 and ties 3, and portions of the building material forming the bonds or ties, whereby the spaced parts of the walls are connected.

Reinforcements 9 are arranged in the spaces formed between the core 7 and the mold members, or plates 1 and 2. The reinforcements 9 may be of any nature generally employed in structural formations of concrete or like material. The reinforcements may consist of rods, wire fabric, or like well known means. It is to be understood that the reinforcing means 9 is so disposed as to become embedded in the building material, and may be held in position in the mold in any desired or convenient way.

Fig. 2 illustrates a tubular framework 10, the same conforming to the mold space and occupying a central position therein. The tubes or pipes comprising the framework 10 may be of any size and are coupled by means of fittings in a manner well understood. The framework 10 provides supplemental reinforcing means, and being of tubular formation provides for the circulation of a cooling medium therethrough, and the same may be utilized for ventilating purposes, or for carrying off waste from water fixtures, or may provide conduits for any purpose whatsoever. The framework 10, by reason of its formation, is self-supporting, and may be utilized as sustaining means for the reinforcing means 9, particularly when the latter consists of wire fabric, the latter being attached to the elements of the framework 10 substantially as indicated in Figs. 5 and 6. By circulating a cooling medium through the framework 10 undue expansion of the structure is prevented when applying heat to liquefy the core, so that the same may flow off, and, at the same time, coat the inner walls.

Heating pipes 11 are disposed in the mold, preferably at equal distances from the mold plates or members 1 and 2, and extend through the core 7. The pipes 11 are designed to receive a heating medium such as steam, the latter being supplied thereto when it is desired to liquefy the core, as when the structure is otherwise completed and becomes set. The heating medium may be supplied to the pipes 11 from a suitable source in any convenient and desired way. The pipes 11 are provided in sufficient number and disposed in a manner to insure proper heating of all portions of the core to insure the fusing of the same, and a flowing off of the core material which is collected for future use. Troughs 12 are located at the base of the structure to receive the core material as the same flows from the structure. The troughs 12 may empty into suitably placed receptacles (not shown) for catching the material. Suitable outlets 13 are formed in the lower portion of the structure and mold for the exit of the material when the same is flowing. The heating pipes 11 are removed after the core has been melted and caused to flow off. In this respect the heating pipes 11 differ from the tubular framework 10, which becomes a part of the structure, since said tubular framework is utilized as reinforcing means in the manner hereinbefore stated.

In the modification illustrated in Fig. 8, ties 14 serve to connect oppositely disposed reinforcements, 9, and these ties 14 may be of any desired structural form. Fig. 9 shows concrete elements 15 of a length to fit between the spaces 1 and 2, and formed with central enlargements 15^a. Wires 15^b are molded in the elements 15 and their ends engage the reinforcements 9.

In accordance with the invention, the tubular frame is first set up, one wall of the mold is then set up as a preliminary step and the reinforcing and core means are placed in position, after which the building material, such as concrete, or other similar plastic self-hardening material is supplied to the mold space to fill the same, and

after such material is hardened or set sufficiently to permit of the mold being removed with safety, such mold may be detached if the walls of the structure are to be finished in any of the usual ways by troweling, or if such walls are to be coated by a finishing material flowed thereon, the mold plates or elements 1 and 2 are loosened and moved outward so as to leave a relatively small space between the opposing sides of the concrete structure and the mold elements into which plaster of Paris, cement, or other finishing material may be flowed. Fig. 4 illustrates the mold plates or elements 1 and 2 moved outward from the walls of the concrete structure, leaving spaces for the reception of a finishing coat 16, which is flowed into such spaces. Because of the relatively small dimension of the finishing coat spaces, the finishing material may be caused to flow into and to completely fill such spaces by jarring or vibrating the mold plates as by delivering blows thereon, or by tamping the material as it is fed into the mold.

The concrete material forming the structure is indicated at 17, and comprises spaced parts which are joined by means of bonds or ties 18 (Figs. 3, 4, 7, 8, and 11) constituting portions of the building material, which have passed through the openings 8 of the core when filling such material into the mold. After the concrete material has set, the cores 7 are removed by the application of heat, the same causing the material to melt and flow through the outlets 13. The heat is applied and diffused throughout the structure by means of the heating pipes 11 through which the steam or other heating medium is caused to flow. When the core is reduced to a liquid state, a portion of the material permeates and coats the inner walls of the structure bordering on the core space, thereby rendering such walls moisture-proof and preventing dampness passing therethrough from the outside. The material forming the core having been recovered, may be used in further operations, or in any desired way. During the fusing of the core, and to prevent undue expansion of the structure and the metallic reinforcements thereof, a cooling medium is circulated through the tubular framework 10, such cooling medium usually consisting of water, although it is to be understood that air or other fluid may be advantageously employed. After the core has been removed from the structure, the heating pipes 11, not being required for further service, are withdrawn.

If it be required to supply fire clay or like material to the spaces previously occupied by the cores, such material may be flowed into the core spaces, and in the event of the structure being subjected to excessive heat to such an extent as to cause the exterior walls to crack, the inner layers of fire clay or like material will sustain and prevent serious damage, or a collapse of the building. This inner filling of fire clay may be rapidly dried by the application of heat, which may be supplied through the pipes 11 before the withdrawal of such pipes from the structure.

The tubular framework 10 may be utilized in different ways as hereinbefore indicated, and if required, the same may be filled with concrete or like material which will result in the provision of an additional reinforcing means, and, at the same time, prevent the interior of the pipes from being corroded by dampness.

It is proposed to form the structure as a whole in one-piece, including the exterior walls, partitions, floors, and roof, hence the building is not liable to suffer injury from settling, and, at the same time, is proof against dampness and from the action of the elements, as there are no joints to open and admit currents of air, or to produce weakness in the building.

It will be understood from the foregoing that I provide a building structure which is strengthened and reinforced by a framework susceptible of use for carrying off noxious odors, vapors, or gases, or for supplying pure air, or as means for carrying off waste from water fixtures of various kinds, or as conductors for supplying water, or gas, or for receiving electric wires, or for carrying steam or hot water to radiators for heating purposes.

The elements 15 are formed of concrete and have the wires 15^b molded therein. The ends of the wires 15^b project to engage the reinforcements 9 and hold them in the required position in the mold spaces at the sides of the core. The annular enlargements 15^a of the elements 15 enter corresponding openings formed in the core sections and hold them in the desired position and prevent any lateral displacement thereof. The ends of the elements 15 may be corrugated as shown at 15^c, or otherwise formed to insure positive association between the elements and the spaced portions of the walls. The elements 15 serve as centering and holding means both for the cores 7 and the reinforcements 9.

In the arrangement of the elements 15, it is not necessary that the same be disposed between every two sections or blocks of the core. While I have shown horizontal members 10^a connecting the framework 10 at the joints thereof, it will be well understood that additional horizontal connections may be made at various points in order to provide a thoroughly rigid structure. It will also be understood that transverse fabric members 9 may be arranged in the ceiling,

and also that the flooring and roof sections of the building may have their ends tied to the horizontal pipe members 10^a, whereby the vertical members of the framework 10 are not only thoroughly braced, but the said fabric members also sustain the weight of the material forming the floor and roof sections of the building.

The centering and holding members 15 for the cores 7 and reinforcements 9 may be molded of any material, concrete being preferred, and may be of any size as to diameter and length, but it is essential that they correspond in length to the thickness of the wall or like part of the structure, so as to engage the opposite mold members 1 and 2, and properly space or hold the cores and reinforcements in the required relative position. The ends of the wires 15^b project through the sides of the members 15 to any distance, as indicated at 15^d, to make positive engagement with mesh elements or other desired members of the reinforcements 9 as may be required or found most convenient.

In the modification shown in Fig. 11, the reinforcements 9 embedded in the spaced side portions of the wall structure, or like part, are connected by means of ties 9^a which are preferably embedded in the concrete bond or tie portions 18 of the building structure. These ties 9^a are secured to the reinforcements 9 in any convenient and substantial way.

It will be further understood from the construction illustrated in Figs. 9 and 10 of the drawings, that where the holding members 15 are employed, the ends of the wires 15^b will be of sufficient length to permit the ends 15^d thereof to be wrapped around or anchored to the adjacent horizontal or vertical strand of the wires of the reinforcements 9, hence facilitating the anchoring of the elements 15 within the material 17 constituting the walls of the building. It will also be further understood that by providing the members 15 with annular enlargements 15^a, the fusible blocks 7 will be provided with corresponding recesses to receive the said enlargements, thereby facilitating the arrangement of the fusible blocks or core members 7 into position within the mold, or plates or elements 1 and 2, and hence facilitating the adjustments of the core members 7 in vertical alinement with respect to the plates or elements 1 and 2.

While I have shown my invention as adapted particularly to the construction of dwellings constructed of concrete, it is to be understood that the invention is equally adaptable to the building of foundations, tunnels, and in fact, any structure in which plastic concrete is employed, and in which a mold or form is used in forming the structure; and I desire it understood that various modifications may be made without departing from the broad idea of my invention. I have described and illustrated the broad idea of providing troughs 12 at the base of the building for collecting the fusible material (forming the molds of the walls, ceilings, and floorings of a building), at the base of the walls, but it will be distinctly understood that similar troughs 12 may be arranged at various points upon the sides of the walls or below and adjacent to the floorings, or ceilings of the building as might be suggested to anyone skilled in the art to which my invention relates.

It will be further understood that the pipes 10 will be provided with suitable connections such as is shown at 10^b, in Fig. 2, for flooding the same, and that suitable connections (not shown) will be provided at their lower ends for draining the water flooded or led into said pipes, but as the latter connections will be readily understood, it is not thought necessary to illustrate them or to describe them in detail.

What I claim is:—

1. Means for forming a hollow wall building construction, comprising inner and outer mold members suitably spaced apart and supported in such relation, and a core of fusible material arranged in the space between the mold members and subdividing said space into spaces surrounding said core to receive building material in a plastic state, the fusible core being liquefied and removed after the said building material hardens.

2. Means for forming a hollow wall building construction, comprising inner and outer mold members suitably spaced apart and supported in such relation, and a core composed of fusible material in sections arranged in the space between the mold members and subdividing said space into spaces to receive building material in a plastic state, the fusible core being thereafter liquefied and removed when said building material hardens.

3. Means for forming a hollow wall building construction, comprising inner and outer mold members suitably spaced apart and means to support them in such spaced relation, and a core of fusible, waterproof material arranged in the space between the mold members and subdividing said space into spaces to receive building material in a plastic state, the fusible core being liquefied after the building material hardens and when so liquefied adhering in a greater or less quantity to the adjacent portions of the wall and the remainder removed and recovered.

4. Means for forming a hollow wall building construction, comprising inner and outer mold members suitably spaced apart and means to support them in such spaced rela-

tion, and a core of fusible material provided with transverse openings at intervals and arranged in the space between the mold members and subdividing said space into spaces to receive building material in a plastic state which also flows through the transverse openings in the core and bonds the material on opposite sides of the core, the fusible core being thereafter liquefied and removed.

5. Means for forming a hollow wall building construction, comprising inner and outer mold members suitably spaced apart and means to support them in such spaced relation, and a core composed of sections having the adjacent corners cut away to form transverse openings, said sectional core being arranged in the space between the mold members and subdividing said space into spaces to receive building material in a plastic state to form the hollow wall, some of the material flowing through the core openings to tie the hollow wall at intervals, the fusible core being thereafter liquefied and removed.

6. Means for forming a hollow wall building construction, comprising a mold having inner and outer members suitably spaced apart and means to support them in spaced relation, and a sectional fusible core having its sections arranged edge to edge within the mold between its inner and outer members, said core sections having matching cut away portions at their meeting edges to form transverse openings which communicate with the wall spaces on opposite sides of the core.

7. Means for forming a hollow wall building construction, comprising inner and outer mold members suitably spaced apart and supported in such relation, and a core of fusible material arranged in the space between the mold members and subdividing said space into spaces surrounding said core to receive building material in a plastic state, and means to liquefy the fusible core after the building material is hardened to effect the removal of such core.

In testimony whereof I have hereunto set my hand this 21st day of February, A. D. 1917.

SIMON LAKE.

Witnesses:
MARY E. LYDDY,
ALICE M. BREYER.