(No Model.)

2 Sheets—Sheet 1.

P. H. JACKSON.

DAMP PROOF AND WATER TIGHT CELLAR.

No. 462,953. Patented Nov. 10, 1891.

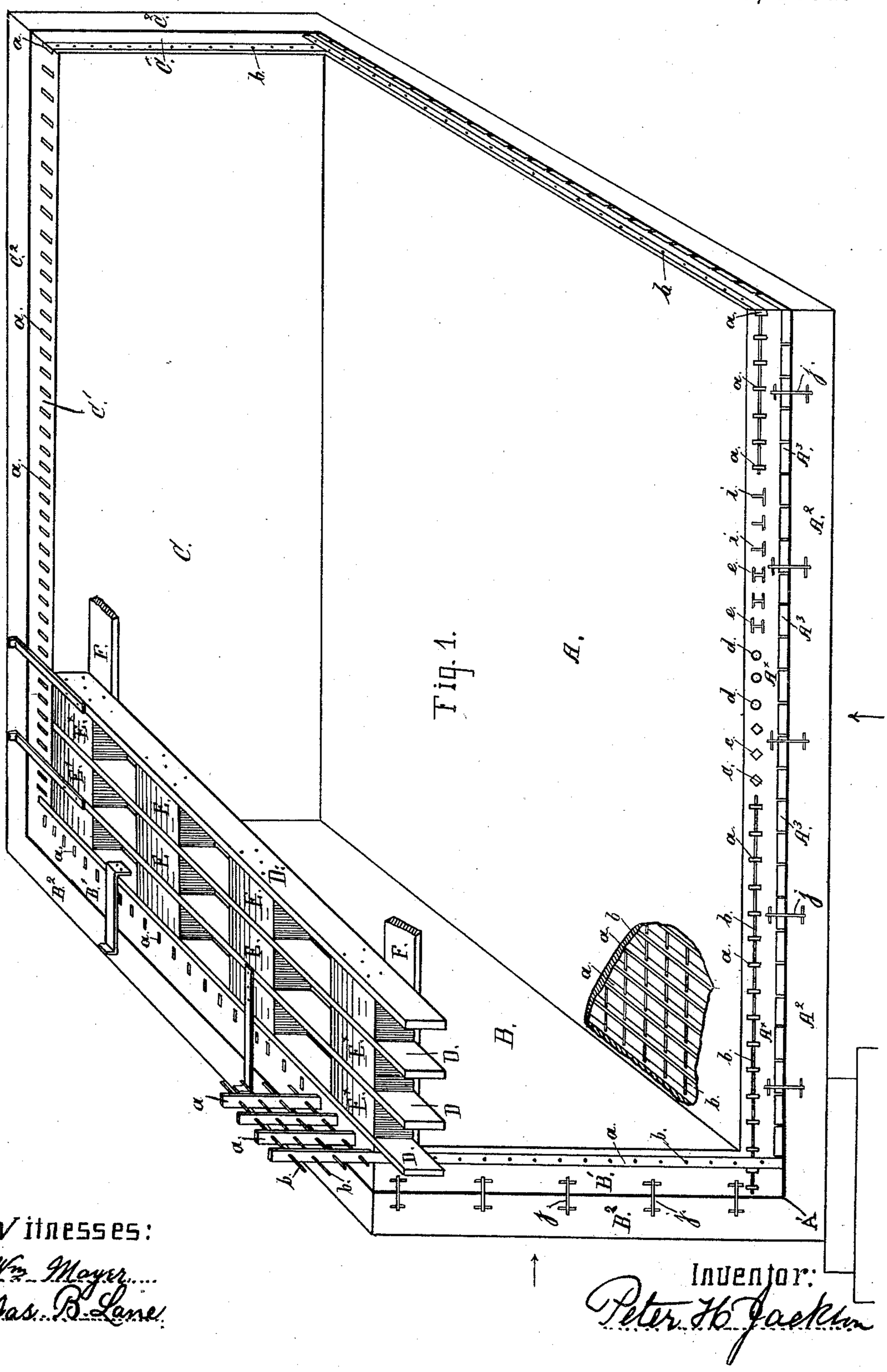

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

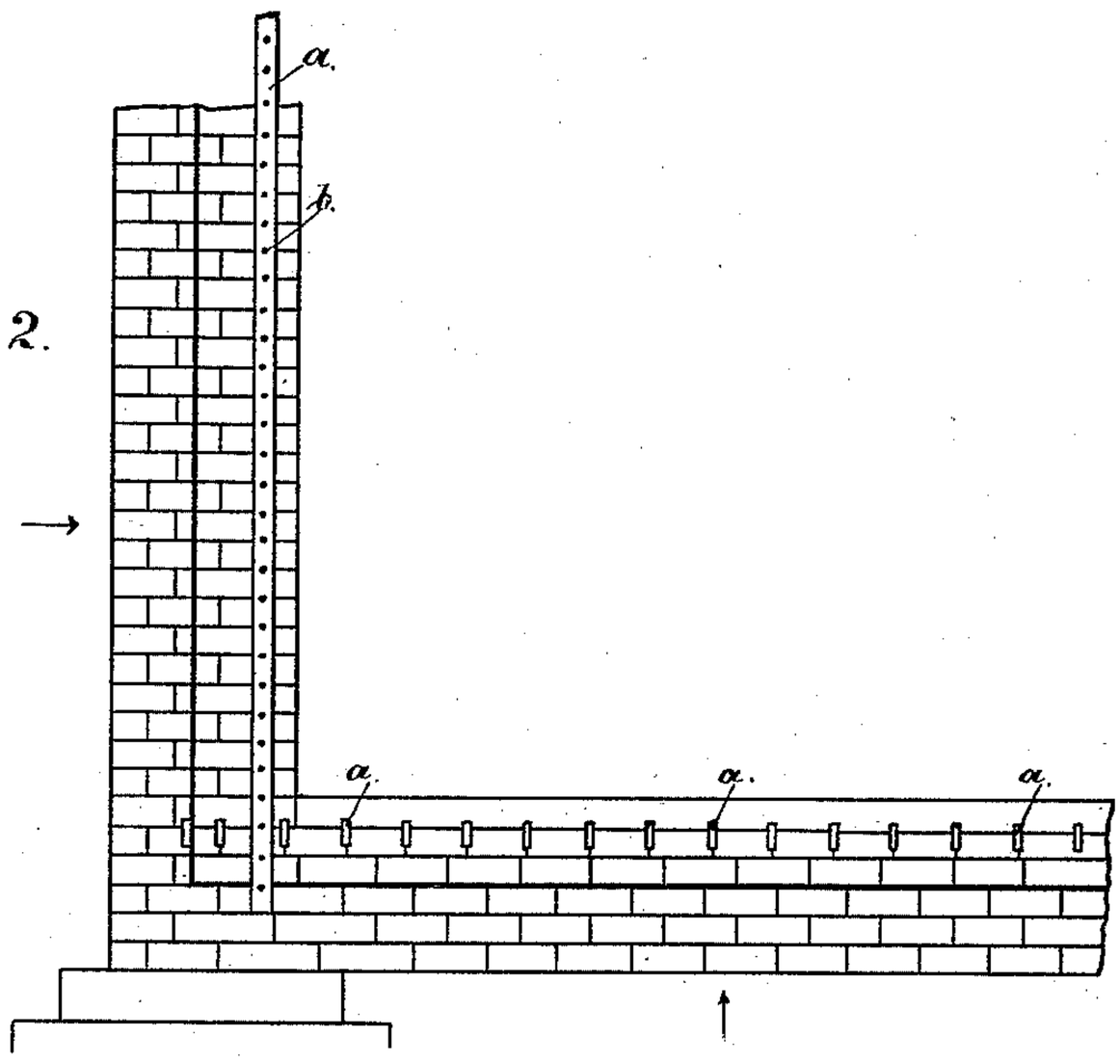
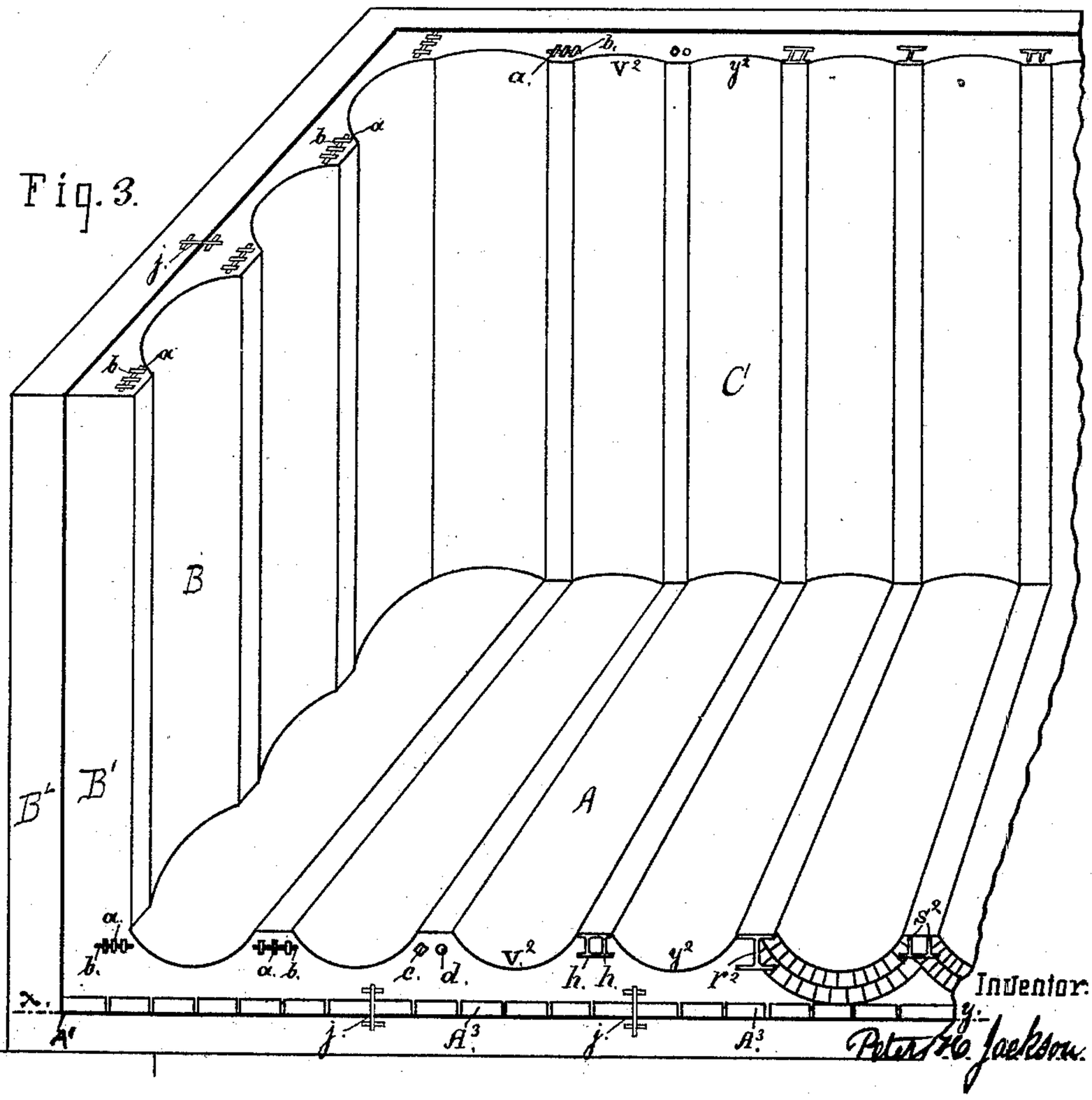


Fig. 3.



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Jas. B. Lane

Inventor:

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UNITED STATES PATENT OFFICE.

PETER H. JACKSON, OF SAN FRANCISCO, CALIFORNIA.

DAMP-PROOF AND WATER-TIGHT CELLAR.

SPECIFICATION forming part of Letters Patent No. 462,953, dated November 10, 1891.

Application filed September 4, 1886. Serial No. 212,749. (No model.)

To all whom it may concern:

Be it known that I, PETER H. JACKSON, of San Francisco, State of California, have invented certain new and useful Improvements in the Construction of Damp-Proof and Water-Tight Cellars and Basements, as well as the strengthening of walls and floors of buildings; and I declare the following to be a full, clear, and exact description thereof, sufficient to enable any person skilled in the art to which my invention belongs to make and use the same.

My invention relates to building, basement, cellar, and vault constructions.

The object is to increase the stiffness and strength of walls or floors of buildings without increasing their thickness, so that a structure will remain integral or as originally constructed even after great lapse of time, will resist tensile strain, remain erect under the weakening effects of fire, and may even be able to withstand earthquake shocks and oscillations; furthermore, to construct basements, cellars, vaults, or the like in such manner that the inside thereof will be entirely free from dampness; furthermore, to construct foundation-walls or the walls of basements or cellars on soft bottoms in such manner that they will be capable of sustaining the buildings above them without the employment of piles or other ordinary means for upholding foundations on soft bottoms, and, finally, to prevent the tops and bottoms of stiffened walls from being pushed inward when subjected to pressure from without.

With these objects in view the invention consists in a wall, floor, or the like, having upon its top surface supporting-walls and comprising in its structure, along with surface masses of concrete or the like to resist compression, metallic ties or beams embedded slightly beneath the interior or upper surface for the purpose of resisting tensile strain from transverse pressure inward or upward; furthermore, in a wall, floor, or the like, composed of two portions, an outer and an inner, the outer portion capable of resisting compressive force and the inner portion capable of withstanding tensile strain, the two portions united by a stratum of asphaltum, tar, pitch, or any equivalent water-resisting substance extending along the neutral axis of the wall or floor, whereby the cellar is rendered damp-proof, and by exclusion of moisture the metallic parts near the interior surface of the wall are preserved in a constantly dry and non-oxidizable condition, and any relaxation of the adhesion of the cement thereto is prevented; furthermore, in a wall or floor consisting of an outer and an inner portion united along its neutral axis by a stratum of damp-proof material, the outer portion constructed of cement, artificial stone, or the like, and the inner portion composed of similar material and provided with metallic ties or small beams embedded in it, whereby tensile strain may be successfully withstood and the floor or wall be prevented from bursting inward; furthermore, in a wall or floor composed of two portions united along the neutral axis by a stratum of damp-proof material, the outer portion made of cement, artificial stone, or similar material capable of resisting compressive force, and the inner portion constructed of like substance and consisting of inverted arches having metallic ties or small metallic beams embedded in the foot of the arches for the purpose of withstanding the tensile strain; furthermore, in the combination with the walls having embedded metallic beams, of beams and blocking pieces to resist pressure above or below, or both above and below, and, finally, in various novel details of construction, described and shown, whereby the objects of the invention are attained.

In the accompanying drawings, forming part of this specification, and in which like letters of reference indicate corresponding parts in all the figures, Figure 1 is a perspective view of a water-tight cellar, basement, or other compartment, of hydraulic cement concrete, showing two sides and the floor thereof and exhibiting one form of embodiment of my invention with means additional for sustaining the walls above against pressure from within. Fig. 2 is a vertical longitudinal section of a cellar of stone or brick and artificial stone, showing one of the walls and a portion of the floor, exhibiting another form of embodiment. Fig. 3 is a view of a water-tight cellar or vault of brick, stone, or concrete, showing two sides and the floor, exhibiting

another form of embodiment, the structure being built with arches additionally to resist pressure from without.

By my invention walls and floors may be constructed in an exceedingly staunch manner, buildings may be made to resist lateral pressure to sustain the compression from the weight above and to exclude dampness, and structures may readily be erected on soft or marshy ground.

Referring to the drawings, A designates the floor of a cellar or basement, and B and C indicate two of the walls, these being shown as divided into an outer and an inner portion, the inner portions being marked, respectively, B′ and C′ and the outer B^2 and C^2. The floor and sides are built of hydraulic-cement concrete, or of brick, stone, or like materials cemented together, and metallic ties *a b c d e i* are embedded slightly beneath the inner or upper surface for the purpose of resisting tensile strain caused by transverse pressure inward or upward.

Melted asphaltum or any other water-resistant substance or material may be run in or be placed between the thicknesses of the walls and floor to prevent dampness from penetrating to the interior and at the same time to form a bond of strength between the sections. A′ indicates this layer of asphaltum, which is preferably at or near the neutral axis of the wall or floor, where the structure is least subject to strain.

In laying the floor I proceed as follows: The bottom section (marked A^2 Fig. 1) is made of any thickness required for strength—say ten inches—and is composed of concrete made of hydraulic cement and agglomerates of sand, gravel, pieces of broken rock, or the like, mixed with water. After being properly made and dry or hard on its top melted asphaltum or any equivalent water-resisting material is run on the top surface to about the thickness of three-fourths of an inch, and while this is still soft brick, stone, or similar absorbent material is pressed into it. The brick A^3 shown is preferred, as being more absorbent, and, if the asphaltum be properly prepared, the brick will part within itself before it will separate from it. The bricks of the course A^3 are preferably about three-eighths of an inch apart. They are pressed into the melted asphaltum and will strongly adhere to it when it has become cold. The course of bricks is an intermediate bond of union between the asphaltum and the superimposed concrete, as concrete of itself will not adhere very well to asphaltum. On top of the bricks is sprinkled Portland cement and water mixed to the consistency of thick cream. This fills the spaces and covers the top of the bricks. When this layer of cement is hard, concrete is rammed upon it. I prefer to use a concrete composed of one volume of hydraulic cement to five volumes of sand, gravel, and small pieces of broken rock mixed with a small quantity of water. When the concrete thus made is of a predetermined thickness, metal ties or small metallic beams are embedded in it, having been coated with pure cement and water mixed to the consistency of thick cream, and upon the top of these is rammed the material forming the floor-surface. If the floor is to be of artificial stone, this upper layer will be made of equal volumes of cement and sharp sand, having the surface slicked. The bottom section A^2 should be of material quite as good as that described for the top section.

The metallic ties are cemented to the surrounding material and may be of the kind indicated in the drawings, as *a a*, threaded on cross-bars *b b*, (see Fig. 1,) though these ties form no part of my invention. This arrangement is preferable, as it connects the concrete in a cross direction as well as lengthwise. The ties or beams may be, however, of any approved construction, either the kind shown at *c* and *d*, with roughened surfaces, or like those shown at *e* and *i*, having flanges single or double. T and I shaped metallic beams have a large surface, to which the cement may adhere, and a vertical and horizontal surface, thus resisting forces in two directions. The said beams are much stronger in resistance to bending than the same quantity of metal in other shapes. As shown in the drawings, these metallic beams and ties extend from the walls and floor into each other, thus giving additional strength to the structure. The beams may be flat bars with small rods for ties passing through them the entire height and extent, thus binding the inside of the walls or floor entire.

Metallic anchor-pieces, designated by *j*, may be used to connect the two sections or parts of the walls or floors extending through the asphaltum.

In building the walls I proceed as follows: If the walls are to be of concrete, I set the ties about an inch and a half from the proposed inside surface of the walls and with their lower ends embedded in the floor and coat them with liquid cement of the consistency of thick cream. The inner sections of the walls are built to their entire height, with anchors, if necessary, extending outward. When this inner section is dry and hard, a long tapering board is placed upon its outside surface with the thin edge down, so that it may easily be withdrawn, and another board of equal width is placed beyond this for the purpose of making a space in which to ram the concrete. When the concrete placed between the two boards has become hard, the board separating the two sections of the wall is withdrawn and melted asphaltum poured into the space thus left. It is important that the asphaltum in the floor and that in the walls should meet and form a close union, as shown in Figs. 1, 2, and 3, in order to exclude all dampness. When these steps have been completed, the top of the outer section thus made is scraped

and liquid cement, of the consistency of thick cream, poured upon it and the building continued to the entire height of the section in the manner just described.

The invention will be still clearer by following the figures of the drawings in sequence.

In Fig. 1, in the inner part of the walls and the top of the floor are the small metallic beams, which resist the tensile strain in conjunction with that part of the walls and floor in which they are cemented, the outer part of the walls and the extreme bottom of the floor from their neutral axis resisting the compressive force. Melted asphaltum or any similar water-resisting substance or material is run in or placed between the thicknesses of walls and floor to prevent dampness penetrating the interior and at the same time forming a bond of strength between the sections. Beams D D, which may rest against or be built into the walls of the cellar, have blocking-pieces E $E^{\times}$ between them. This construction, which is readier and stronger than one of solid beams, aids the walls in resisting pressure inward upon the upper part of the cellar. Sometimes in addition to this timbers F F are secured to the under side of the beams and blocking-pieces D E $E^{\times}$; or if the beams D are of iron, or if it be deemed preferable, angle-irons may be used in the place of the timbers F. The pieces $E^{\times}$ with the beams D form a continuous brace for the wall C.

In Fig. 2, again, pressure from without against the walls or floor causes them to be tensilely strained on the inside and compressed on the outside in the manner as the forces are exerted on a beam subjected to cross-strain. To resist this tensile strain on the inside, the metallic beams *a a* are built in near the inside surface of the floor and walls and cemented to them, so that they act together in resisting the tensile strain. Brick, stone, and the like have a much greater capacity to resist compression than tension, and with Portland-cement concrete, composed in volumes of one of cement to five of sand and water, nine months old, the ratio of the crushing to the tensile strength is generally found to be as large as thirty-five to one. The black line between the thicknesses of the bottom and the wall represents the stratum of asphaltum, or, may be, pitch, tar, brimstone and tar, or any like material, between the sections to prevent moisture from penetrating the interior.

In Fig. 3 is shown an embodiment of my invention in which the inner sections of walls and floor are built in the form of inverted arches of brick and cement, metallic ties or beams *a*, *b*, *c*, *d*, *h h*, r^2, and s^2 being embedded in the bases of the arches, the ties or beams built in and cemented at the foot of the arches resisting the tensile strain, the outside of the walls resisting the compressive force. The walls and floors may be of any of the materials before described, and, as in Fig. 1, without being arches and with arched floor or the reverse, the black line in the bottom and in the walls showing the stratum of asphaltum or equivalent to prevent moisture penetrating.

The layer of asphaltum or its equivalent, by excluding moisture, preserves the metallic parts near the interior surface in a constantly dry and non-oxidizable condition and prevents any relaxation of the adhesion of the cement thereto.

As described and shown, the metallic ties or beams are placed about an inch and a half from the outer surface of the section of the wall or floor to which they belong; but this may be varied as circumstances demand.

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

1. A wall or floor liable to be subjected to inward or upward transverse strain, comprising masses of concrete or analogous material to resist compressive force and with metallic rods, bars, or equivalent having depressions or elevated portions, or both, on their surfaces and over their lengths and embedded beneath the interior or upper surfaces and inside of or above the neutral line of the concrete or analogous material for the purpose of resisting tensile strain uniformly over its length independent of end resistance, caused by transverse pressure from without or below, substantially as herein described.

2. In building or similar constructions, a floor consisting of two surfaces, the bottom surface resting upon a foundation of earth or equivalent material and the top surface supporting walls, the space between the walls near the top surface being provided with metallic ties or small beams by which the floor is stiffened and tensile strain resisted on its top surface, substantially as described.

3. In buildings, cellars, basements, vaults, or the like, walls or floors, or both, composed of two portions, one portion capable of resisting compressive force and the other provided with means for withstanding tensile strain, the two portions united together by anchors and by a stratum of asphaltum, tar, pitch, or equivalent water-resisting substance, substantially as described.

4. In buildings, cellars, basements, vaults, or the like, walls or floors, or both, consisting of an outer and an inner portion united together along the neutral axis by a stratum of damp-proof material, the outer portion constructed of cement, artificial stone, or like material capable of resisting the compressive force and the inner portion similarly constructed and provided with metallic ties or small beams embedded in it, whereby the tensile strain may be successfully withstood, substantially as described and shown.

5. In buildings, cellars, basements, vaults, or the like, walls or floors, or both, composed of two portions united together along the neu-

tral axis by a stratum of damp-proof material, the outer portion composed of artificial stone or the like and the inner portion made of similar material and constructed of inverted arches having metallic ties or small metallic beams embedded, substantially as described.

6. The combination, with the walls strengthened by the small metallic beams, of the beams D D, and blocking-pieces E E×, substantially as and for the purpose described.

PETER H. JACKSON.

Witnesses:
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HENRY HAUSTEIN.