No. 875,699.

PATENTED JAN. 7, 1908.

P. T. C. DUMAIS.

REINFORCED COMPOSITE STRUCTURE.

APPLICATION FILED JUNE 20, 1907.

3 SHEETS—SHEET 1.

Fig 2

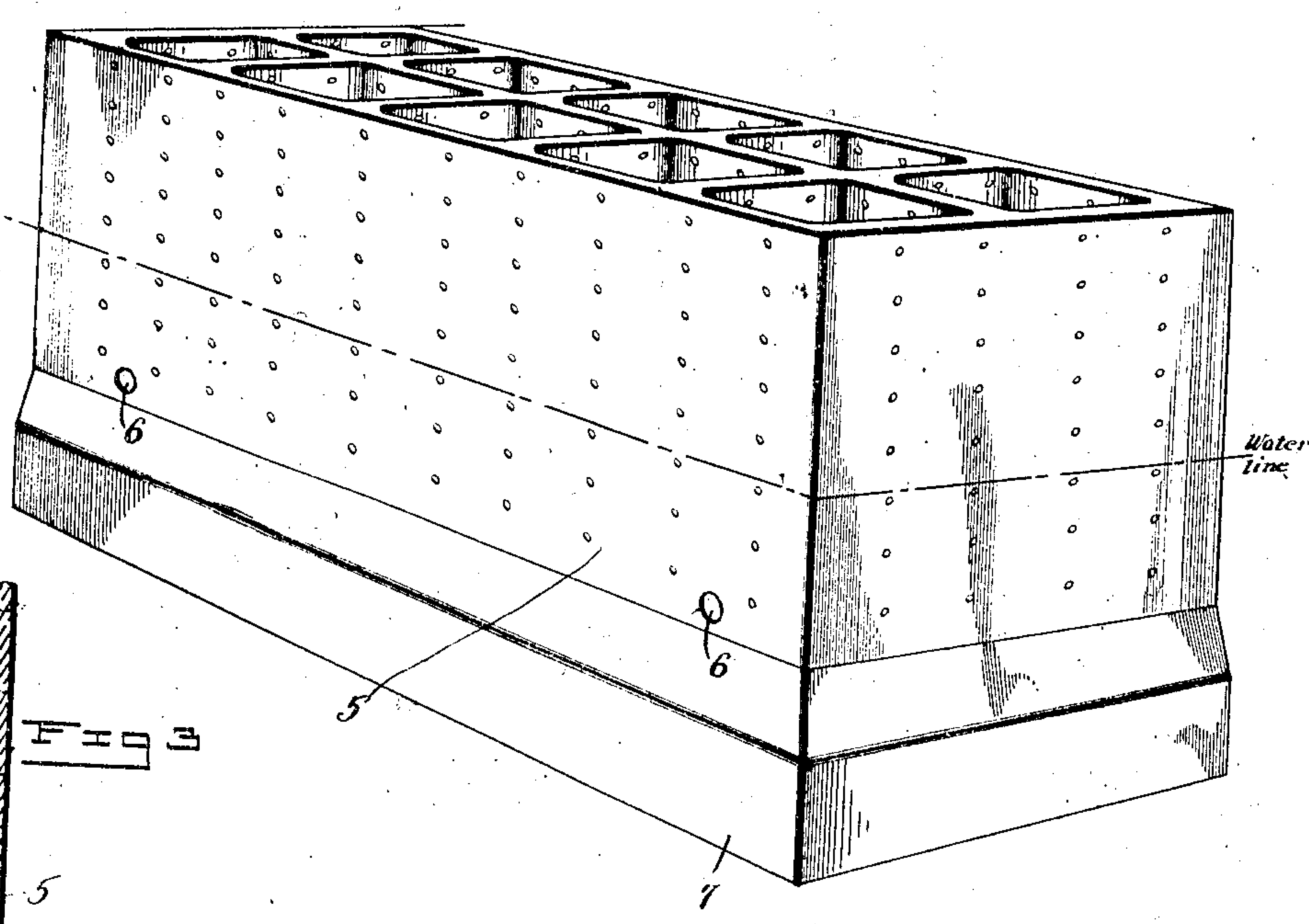
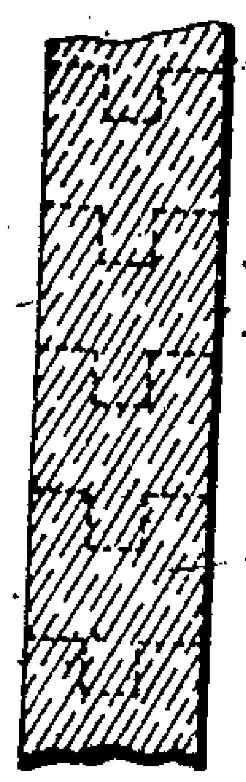


Fig 3



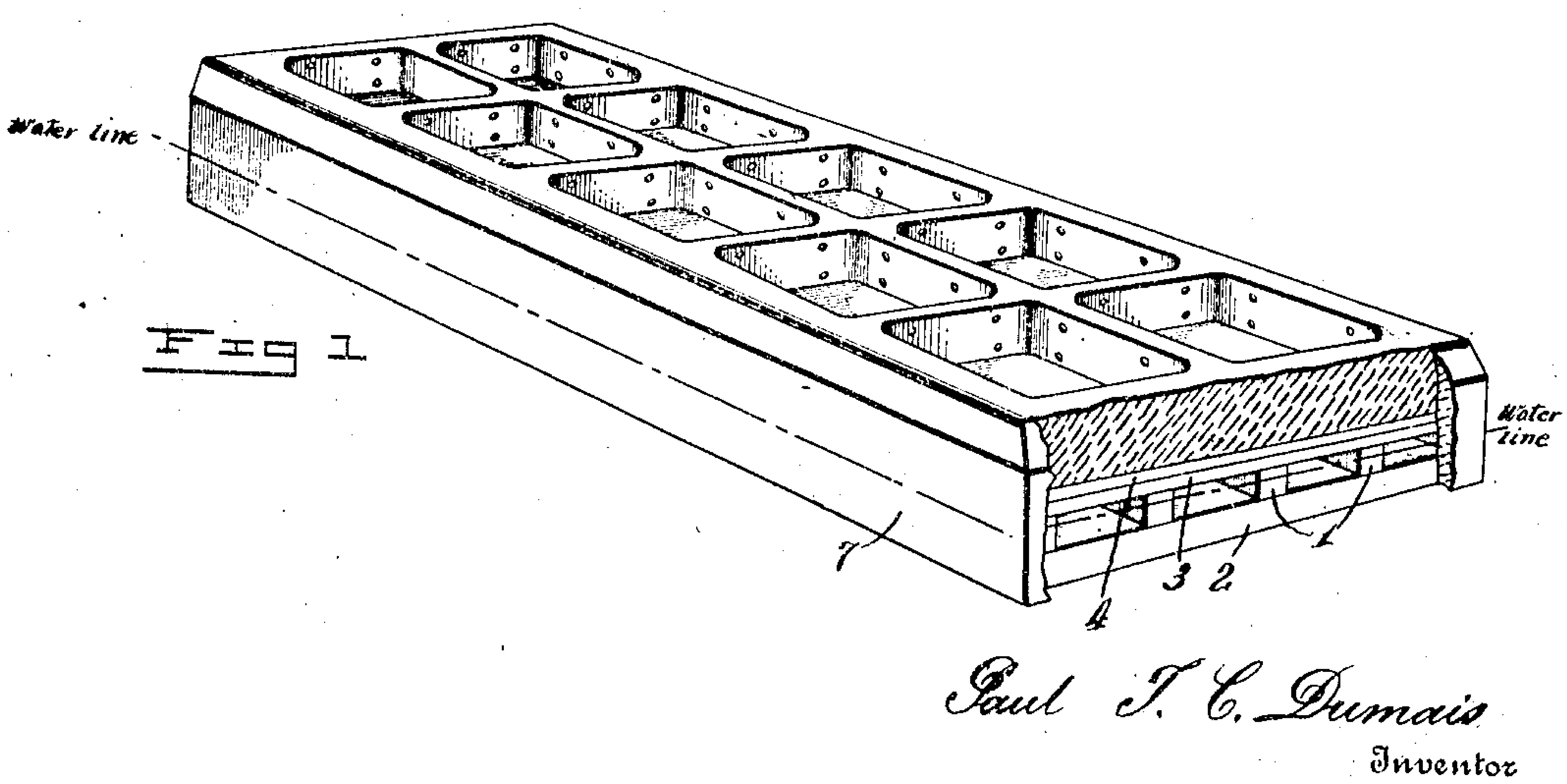


Fig 1

Paul T. C. Dumais
Inventor

Witnesses
E. M. Sliney
C. Cousins

By Marion & Marion

Attorneys

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3 SHEETS—SHEET 2.

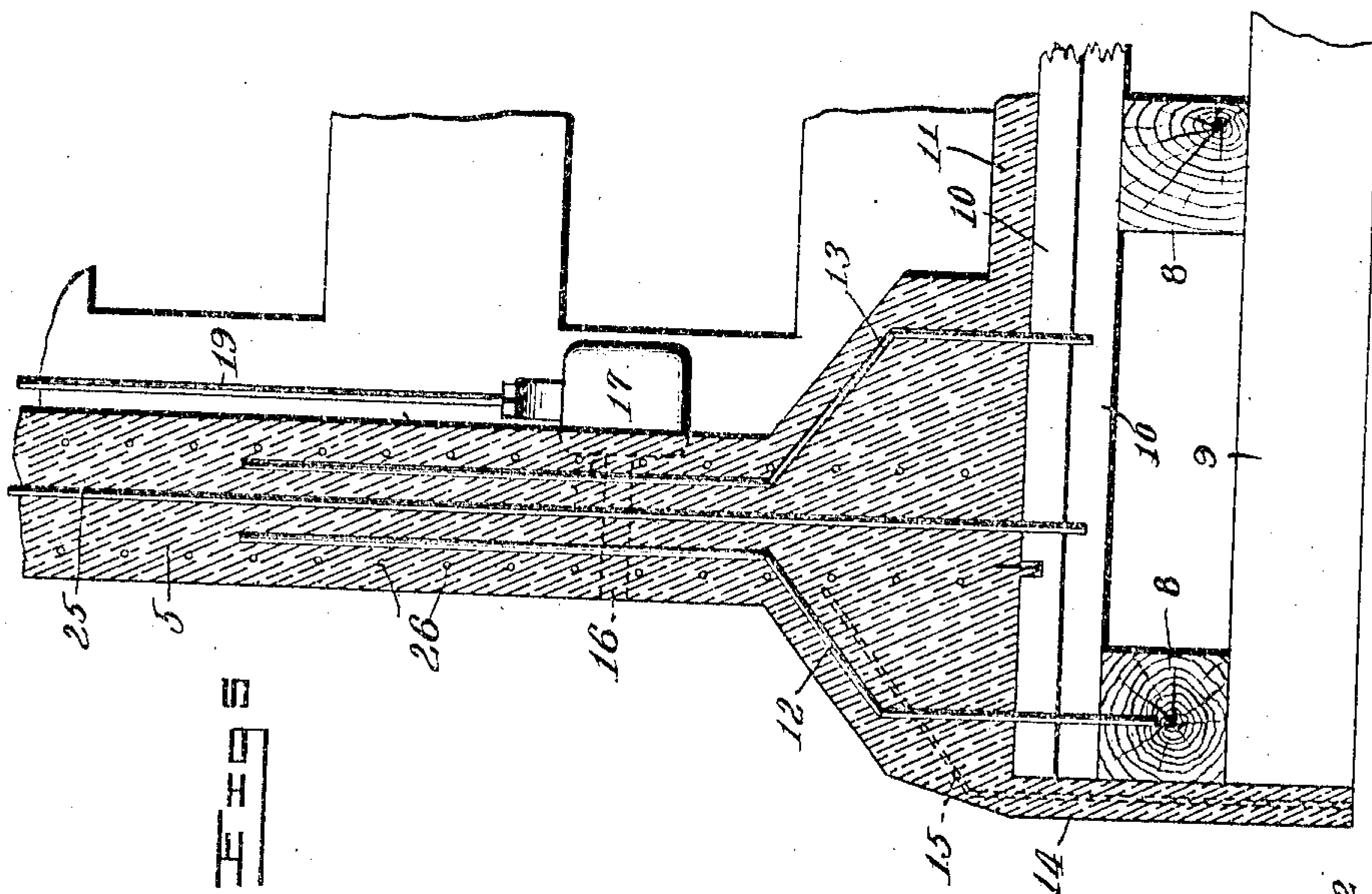

Fig. 5

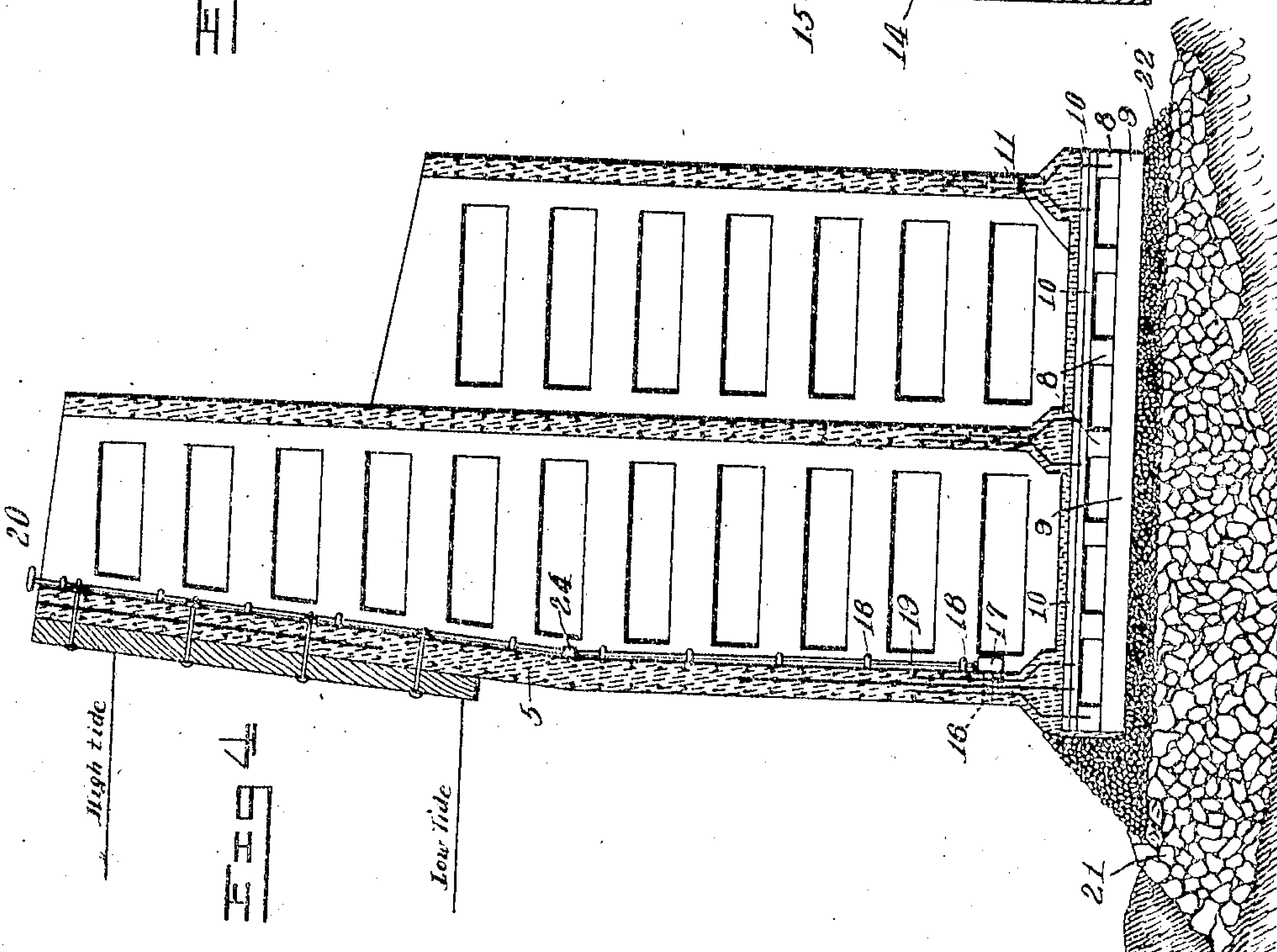

Fig. 4

Paul T. C. Dumais
Inventor

Witnesses
E. M. Sliney
C. C. Cousins

By Marion & Marion
Attorneys

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3 SHEETS—SHEET 3.

Fig 8

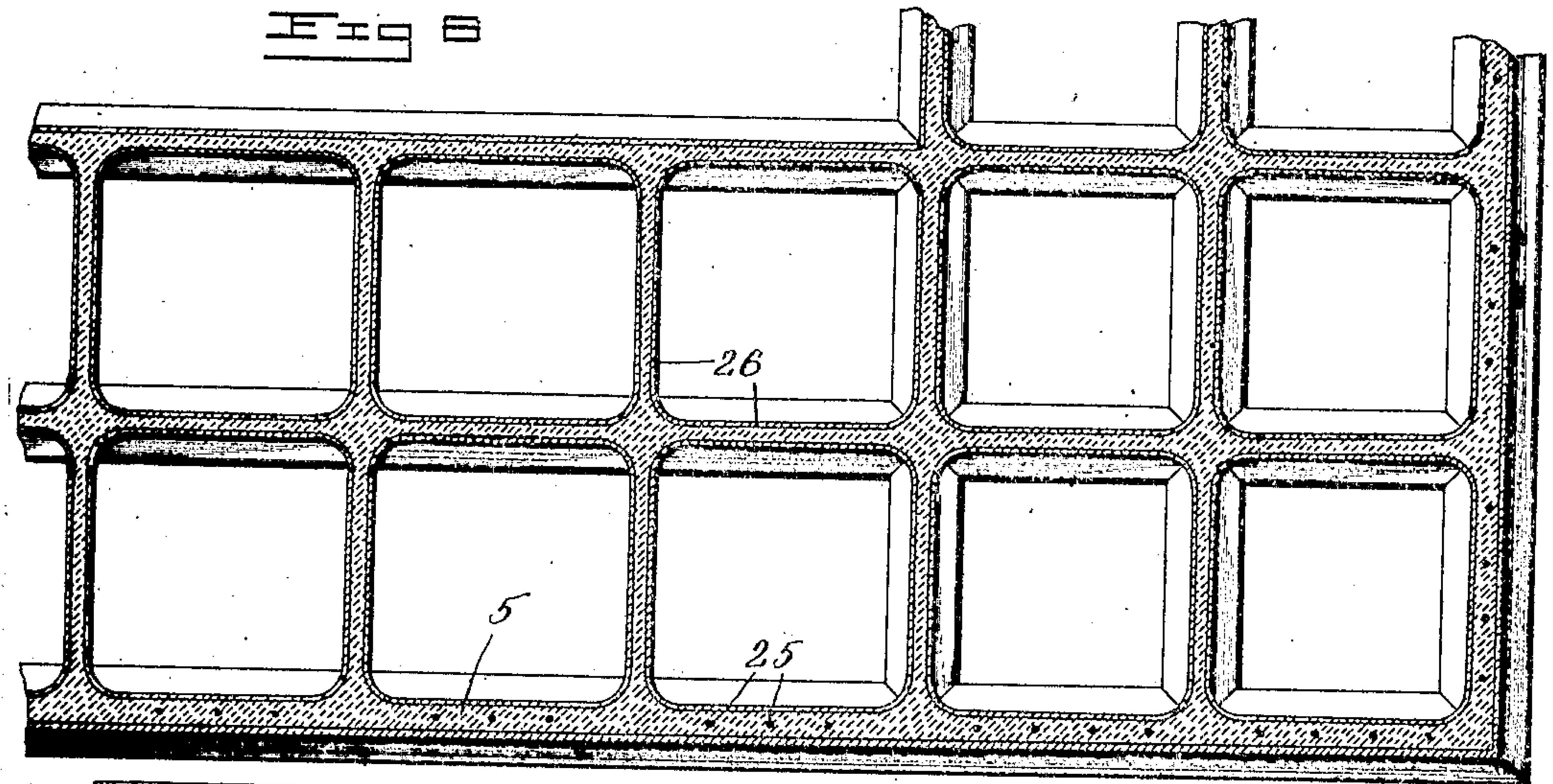
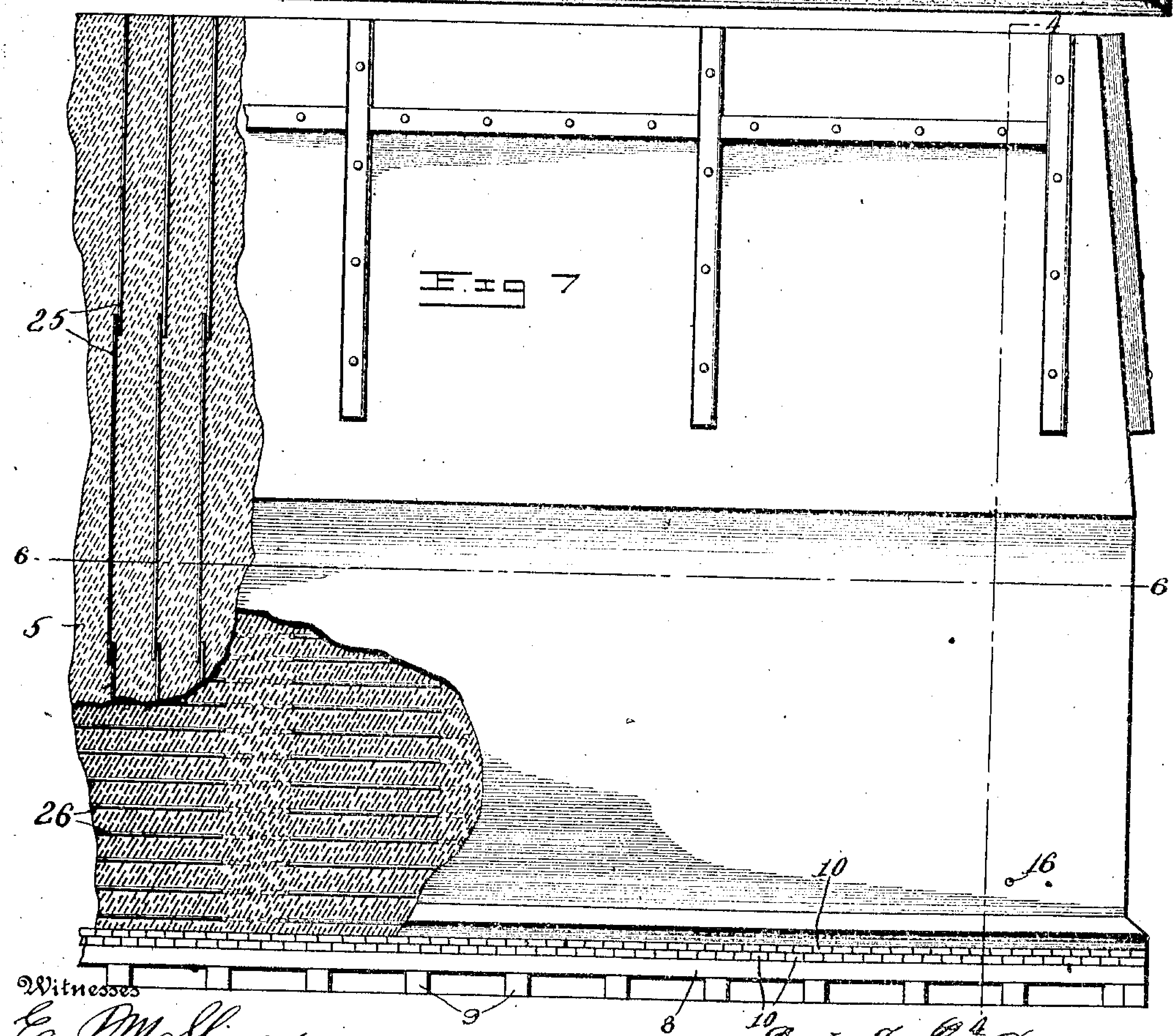


Fig 7



Witnesses

E. M. Sliney

C. J. Cousins

By Paul T. C. Dumais, Inventor

Marion & Marion, Attorney

UNITED STATES PATENT OFFICE.

PAUL THOMAS CONCORD DUMAIS, OF HULL, QUEBEC, CANADA.

REINFORCED COMPOSITE STRUCTURE.

No. 875,699. Specification of Letters Patent. Patented Jan. 7, 1908.

Application filed June 20, 1907. Serial No. 379,841.

To all whom it may concern:

Be it known that I, PAUL THOMAS CONCORD DUMAIS, a subject of the King of Great Britain, residing at Hull, county of Ottawa, in the Province of Quebec, Canada, have invented certain new and useful Improvements in Reinforced Composite Structures; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in reinforced composite structures, and it consists in the constructions, combinations and arrangements herein described and claimed.

My invention is primarily intended for the construction of wharves, breakwaters, coffer-dams, and all structures which are more or less immersed and subjected to the action of water.

My invention is especially adapted for floating crib works which are sunk to position on proper foundations after being completed.

In the accompanying drawings forming a part of this application and in which similar reference symbols indicate corresponding parts in the several views—

Figure 1 is a perspective view, partly broken away, illustrating a partially completed floating crib employed in the construction of a bridge pier; Fig. 2 shows the floating crib completed to constitute the finished pier, and ready for sinking on to its foundation; Fig. 3 is a detail sectional view through one of the composite walls of the crib work; Fig. 4 is a vertical sectional view, on the line 4—4 of Fig. 7, illustrating the retaining wall of a wharf constructed according to my invention; Fig. 5 is a detail sectional view on a larger scale, of the bottom of the outer wall shown in Fig. 4; Fig. 6 is a sectional view on the line 6—6 of Fig. 7; and Fig. 7 is a front elevation of a wharf construction shown in Figs. 4, 5 and 6.

Figs. 1 to 3 of the drawings show a buoyant platform comprising a series of longitudinal timbers 1, which are strongly secured on transverse beams 2 and provided with a water tight flooring of boards 3 and 4. The flooring can be formed water tight in any usual manner but I have found it advantageous to employ a double flooring with interposed impervious material, such as tarred paper. In such construction, I secure both layers of the double flooring with their boards parallel and extending transversely across the longitudinal timbers 1, with tarred paper interposed and the boards of the upper layer breaking joint with those of the lower layer. This insures a water tight construction, and has proven greatly superior in practice to the old forms of double flooring in which the boards of the respective layers are laid angularly, so that the joints of each layer cross those of the other.

In the construction of the composite superstructure, the buoyant platform is floated to convenient location for operation, and a bed of concrete laid on the water tight flooring. The monolithic walls of the crib work are progressively built up on the concrete bed; a preferred means for progressively constructing the walls is disclosed and claimed in an application for Letters Patent filed by me simultaneously with this application. The crib work may be secured to the platform by suitable bolts extending through the bed of concrete; or the bed of concrete may be omitted and the walls of the crib work secured directly on the floating platform. The crib work is constructed with water tight outer walls 5 provided with inlets 6, which are controlled by valves in a manner similar to that shown in Fig. 5.

As the superstructure is progressively built up, the weight thereof will act to further and further increase the depth of submergence of the platform and superstructure, as shown by the position of the water line indicated in Figs. 1 and 2.

After the superstructure has been completed to the desired extent, the entire structure is floated or towed to position and the valved inlet 6 opened to admit the water of flotation for sinking the structure on to a suitable foundation which can have been previously prepared. Under certain conditions, the entire superstructure can be completed, as shown in Fig. 2, before towing the floating structure to its desired position; in other cases, the available depth of water of flotation, and other conditions, may make it advisable to tow the floating structure to position before it is fully completed.

After the structure has been sunk to position on its foundation, the valves are closed and the interior of the crib work filled with any suitable material, such as crushed stone or loose rock filling. I have found in practice that a filling of earth or sand insures greater weight and stability than crushed stone. A cubic foot of solid limestone weighs approximately 168 lbs., and a cubic foot of crushed limestone weighs approximately 89 lbs., while a cubic foot of earth will average about 110 lbs.; that is an excess weight of 21 lbs. per cubic foot in favor of the earth filling. The earth or sand employed for filling can usually be dredged in the immediate vicinity of the structure, and can always be obtained at a much less expense than the cost of crushed rock. In the existing forms of timber crib work, earth or sand has not been available as a filling, since it would rapidly wash out through the joints and interstices.

As shown in the drawings, I provide the structure with a sheathing, or apron, 7 of concrete or cement for protecting the sides of the buoyant platform wherever the latter would be subjected to attacks of toredo, or other destructive agencies. This sheathing is formed directly on the sides of the platform, and is integral with the concrete walls of the superstructure, to which it can be strongly secured by reinforcing tie members embedded therein, as shown especially in Fig. 5. In practice, it has proven very advantageous to fill the crib work by the usual form of suction dredge. The discharge pipe of the dredge is arranged to discharge in the top of the crib work; the dredging material settling to the bottom by its greater weight and the water intermixed with said material finally overflowing from the top of the crib work.

Figs. 4 to 7 illustrate the application of my invention to the retaining wall of a wharf, or similar structure. A timber platform, comprising beams 8 and 9 and a double flooring 10, similar to that previously described, is shown with a thin bed of rigid cement 11 laid on said flooring and integral with the progressively built up walls of the reinforcing concrete superstructure. Reinforcing tie rods 12 and 13 are shown embedded in the concrete walls and secured, respectively, to the timbers and floorings of the platform; thereby securely anchoring said walls in position. A concrete, or cement, sheathing 14 is provided for the walls of the timber platform which are exposed to the water. The sheathing 14 is formed integral with the walls of the superstructure, and is firmly secured in position by reinforcing tie rods embedded in the sheathing and extending within said walls. Inlet openings 16 are formed in the lower portion of the outer walls of the superstructure during the progressive building up of the latter, and are provided with any suitable form of valves 17 at their inner ends. As the walls are progressively built up, guiding and retaining staples 18 are embedded therein for receiving the elongated stem 19 of the valve 17; such elongated stem being conveniently formed by successively adding additional lengths thereto as the wall increases in height. A hand wheel 20, secured to the upper end of the valve stem, provides convenient means for actuating the valve 17 to control the inlets 16 after the structure is in place on its foundation. Free rotation of the valve stem is provided for by universal joints 24 placed in said stem at any points in which its direction changes. I have shown a foundation comprising a bed of rock 21 with a surface of crushed stone 22; loose stone being piled on the water side of the retaining walls to embed the shields 14 and protect the timber platform. The above described retaining walls are preferably constructed, placed in position, and filled in a manner similar to that previously described in reference to the pier construction.

During the progressive building up of the structure, reinforcing rods are embedded in the walls therein, as shown in the drawings. The outer walls are reinforced throughout their height by overlapping series of metal rods 25 and by outer horizontally arranged metal rods 26. The interior of the structure is subdivided into a series of compartments by the inner partition walls 26 of reinforced concrete formed integral with the outer walls and progressively built up therewith. Metal rods, or bands, 26 embedded in the walls of the several compartments, constitute a very efficient and convenient form of reinforcement, and provide an excessively rigid construction.

In locations in which the beds for receiving the retaining walls are not submerged, it will be obvious that the timber platform and flooring can be dispensed with. In such constructions, the bed will be leveled off, or built up with concrete, to provide a suitable foundation, and the walls of the superstructure progressively built up to constitute a monolithic structure with said foundation having reinforcing tie rods extending within the foundation.

I have illustrated and described preferred and satisfactory constructions, but, obviously, changes could be made within the spirit and scope of my invention.

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

1. In composite crib work, the combination of a base, a monolithic superstructure comprising outer walls and inner connecting walls progressively built up from said base, and reinforcing rods embedded in said superstructure and extending in said base to constitute anchors for said walls, substantially as described.

2. In composite crib work, the combination of a base, a monolithic superstructure comprising outer walls and inner connecting walls progressively built up from said base,

and an overlapping series of reinforcing rods embedded in the walls of said superstructure, the rods of the lower series extending within the base to anchor the walls thereto, substantially as described.

3. In composite crib work, the combination of a base, a monolithic superstructure progressively built up from said base and comprising outer walls and inner connecting walls subdividing the interior of said superstructure into a series of compartments, metal reinforcing bands embedded in said superstructure and extending around the walls of said several compartments, and reinforcing rods embedded in the outer walls of said superstructure and extending in the base to anchor said walls thereto, substantially as described.

4. In composite crib work, the combination of a water tight base, a monolithic superstructure integral with said base and comprising water tight outer walls progressively built up from said base and provided with inlet openings in their lower portions, valves controlling said inlets, manually-operated means supported by said outer walls for actuating said valves, and means for extending said manually-operated means along said walls as the latter are progressively built up, substantially as described.

5. In composite crib work, the combination of a buoyant water-tight flooring, a monolithic superstructure secured to said flooring, said monolithic superstructure comprising water-tight outer walls progressively built up from said flooring, valved inlets extending through the lower portions of said outer walls, manually-operated means supported by said outer walls for controlling said valved inlets, and means for extending said manually operated means along said walls as the latter are progressively built up, substantially as described.

6. In composite crib work, the combination of a buoyant water-tight flooring, a monolithic superstructure secured to said flooring, said monolithic superstructure comprising water-tight outer walls progressively built up from said flooring and connecting inner walls formed integral with said outer walls during the progressive building up of the latter, valved inlets extending through the lower portions of said outer walls, manually operated means supported by said outer walls for controlling said valved inlets, and means for extending said manually operated means along said walls as the latter are progressively built up from the flooring, substantially as described.

7. In composite crib work, the combination of a water-tight flooring buoyant of itself, a monolithic superstructure comprising water-tight outer walls and connecting inner walls progressively built up from said flooring, substantially horizontal reinforcing members embedded in said outer and inner walls, substantially vertical reinforcing members extending through the progressively built up portions of said outer walls, and manually operated means for admitting water through the lower portions of said outer walls, substantially as described.

8. In composite crib work, the combination of a water-tight flooring, a monolithic superstructure comprising water-tight outer walls and connecting inner walls progressively built up from said flooring, substantially horizontal reinforcing members embedded in said outer and inner walls, substantially vertical reinforcing members extending through the progressively built up portions of said outer walls, valved inlets extending through the lower portions of said outer walls, manually-operated means supported by said outer walls for controlling said valved inlets, and means for extending said manually operated means along said walls as the latter are progressively built up from the flooring, substantially as described.

9. In composite crib work, the combination of a water-tight flooring, a monolithic superstructure comprising concrete walls progressively built up on said water-tight flooring, reinforcing members embedded in said concrete walls and anchored to said flooring, a sheathing of concrete on the edges of said water-tight flooring, and reinforcing members embedded in said concrete sheathing and extending within said concrete walls for firmly supporting said sheathing in place, substantially as described.

10. In composite crib work, the combination of a water-tight flooring, a monolithic superstructure comprising concrete walls progressively built up on said water-tight flooring, reinforcing members embedded in said concrete walls and anchored to said flooring, and a sheathing of concrete extending about the edges of said water-tight flooring and overlapping said monolithic walls for shielding said flooring when in position, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

PAUL THOMAS CONCORD DUMAIS.

Witnesses:

A. BRAY,

I. A. CHASSÉ.