

C. WEBER.
CONCRETE STRUCTURE AND METHOD OF CONSTRUCTING THE SAME.
APPLICATION FILED MAY 19, 1917.

1,307,224.

Patented June 17, 1919.

3 SHEETS—SHEET 1.

Fig. 1.

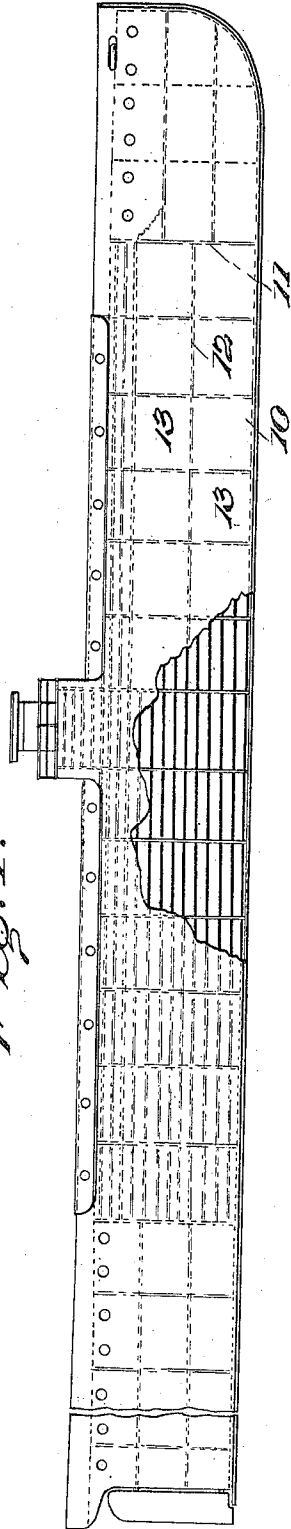


Fig. 2.

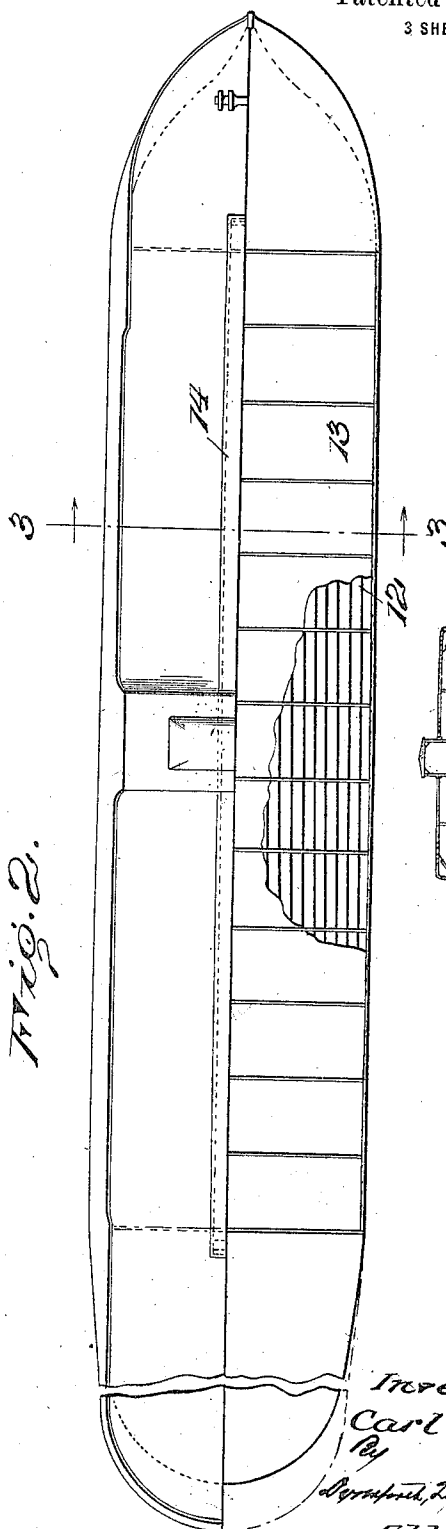
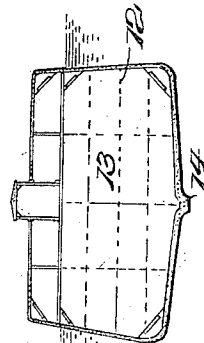


Fig. 3.



Inventor
Carl Weber.

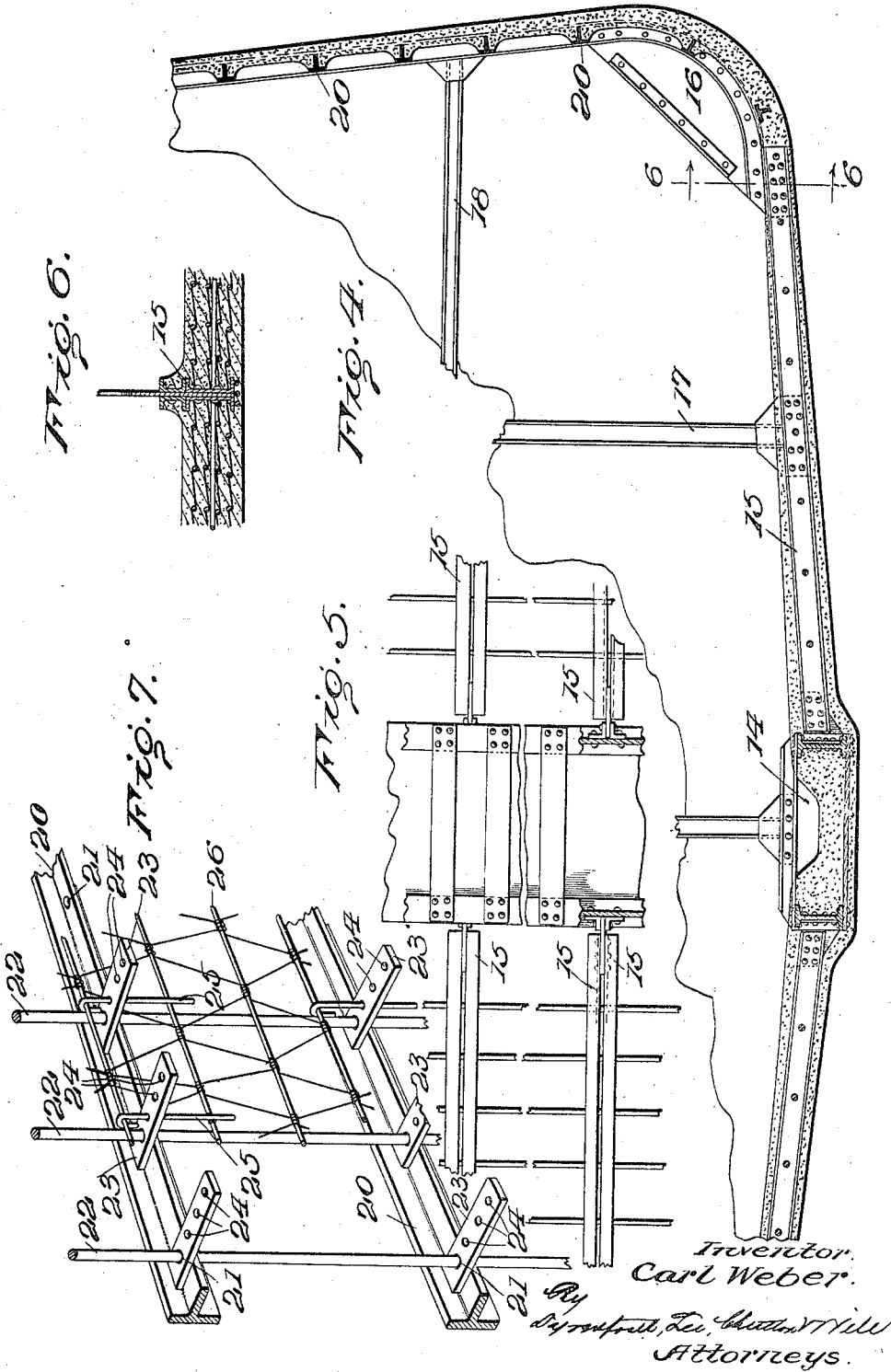
By
Symonds, Lee, & Smith, Attorneys.

C. WEBER.
 CONCRETE STRUCTURE AND METHOD OF CONSTRUCTING THE SAME.
 APPLICATION FILED MAY 19, 1917.

1,307,224

Patented June 17, 1919.

3 SHEETS—SHEET 2.



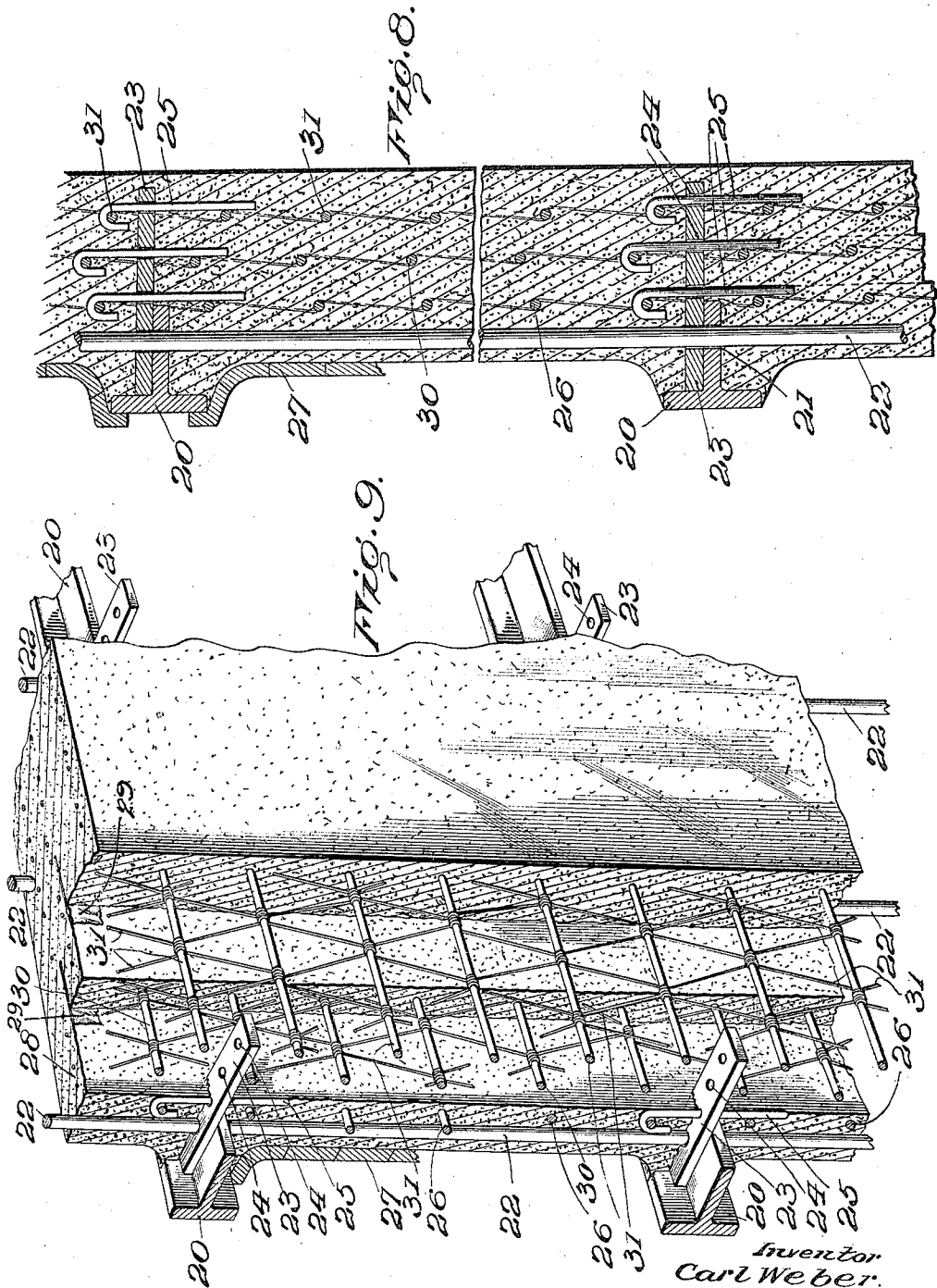
Inventor:
 Carl Weber.

By *Wm. H. Smith, Jr., Mathew W. Hill*
 Attorneys.

C. WEBER.
 CONCRETE STRUCTURE AND METHOD OF CONSTRUCTING THE SAME.
 APPLICATION FILED MAY 19, 1917.

1,307,224.

Patented June 17, 1919.
 3 SHEETS—SHEET 3.



Inventor
 Carl Weber.

By *Dyrenford, Lee, Chubb & Mills*
 Attorneys.

UNITED STATES PATENT OFFICE.

CARL WEBER, OF CHICAGO, ILLINOIS, ASSIGNOR TO TORCRETE SHIPBUILDING CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

CONCRETE STRUCTURE AND METHOD OF CONSTRUCTING THE SAME.

1,307,224.

Specification of Letters Patent. Patented June 17, 1919.

Application filed May 19, 1917. Serial No. 169,648.

To all whom it may concern:

Be it known that I, CARL WEBER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Concrete Structures and Methods of Constructing the Same, of which the following is a specification.

This invention relates to improvements in concrete constructions adapted for walls, tunnels, silos, ships' hulls or the like, as well as the method whereby such structures are made.

One of the objects of the present invention is to provide an improved concrete structure impervious to moisture and of strong and durable construction adapted to withstand the heavy strains and stresses to which it may be subjected.

A further object of my invention, when the same is applied to the construction of the wall constituting the hull of a concrete vessel, is to build the same of relatively light weight and yet having a certain degree of elasticity.

A further object of my invention is to construct the wall, tunnel, silo, or the hull of a vessel of standardized parts so positioned and arranged as to permit the desired structure to be easily and quickly erected and with the minimum of expense.

Other objects will be in part obvious from the annexed drawings and in part indicated in connection therewith by the following analysis of this invention.

This invention accordingly consists in the features of construction, combination of parts and in the unique relations of the members, and in the relative proportioning and disposition thereof, all as more completely outlined herein.

In the accompanying drawings constituting a part of this disclosure I have illustrated my invention as applied to the making up of a wall of a concrete ship yet I do not wish to be understood as limiting my invention by such illustration, as the wall construction, and the method of erecting the same illustrated in said drawings and hereinafter described, is equally applicable to other purposes as in the building of concrete houses, the construction of walls for bulk heads, tunnels, silos, cisterns and numerous other uses, which need not be specifically enumerated.

In said drawings

Figure 1 is a side elevational view showing a complete vessel, certain parts being broken away or shown dotted in order that the structure may be more clearly seen;

Fig. 2 is a plan view of the boat shown in Fig. 1;

Fig. 3 is a transverse sectional view taken on the line 3—3, Fig. 2;

Fig. 4 is an enlarged detail transverse sectional view;

Fig. 5 is a detail plan view of a portion of the keel;

Fig. 6 is a sectional view taken on the line 6—6, Fig. 4;

Fig. 7 is a perspective view showing a portion of the side skeleton;

Fig. 8 is an enlarged transverse sectional view of a portion of the side wall;

Fig. 9 is a perspective view of the portion shown in Fig. 8, showing the layers of which the sides of the vessel are composed.

Referring to the drawings and particularly to Figs. 1, 2 and 3, 10 denotes the hull of a boat or vessel shown for illustrative purposes divided by one or more bulk heads 11, and also horizontally by decks 12 to divide the interior of the vessel into a plurality of separate compartments 13 of any desired dimensions.

The rear of the boat is shown partially broken away. It may of course be provided with the desired motor power, etc.

The vessel as shown in Fig. 4 is provided with a main keel 14 forming the usual backbone to the skeleton of the boat and to which the traverse ribs 15 are riveted or secured in any desired manner. These ribs which may be in the form of I-beams, channel irons, etc., as shown in Fig. 6, extend laterally and then upwardly, and at the bend a reinforcing plate or gusset 16 is interposed to insure strength and stability. Likewise posts 17 and transverse members 18 are secured as may be necessary, according to the type of vessel to be constructed. These ribs 15 are connected longitudinally by means of T-beams, or other suitable forms of structural steel, 20. In this manner the skeleton of the vessel is formed and provides a structure against which the reinforcing for the concrete may be placed. It is to be understood that I do not confine the invention to the use of a structural steel skeleton, for wood or concrete frames can be used to advantage, or

a combination of iron, wood and concrete in the forming of the skeleton of the vessel.

It is to be noted that T-beams 20 extending longitudinally of the vessel are provided at regular intervals with perforations 21 through which vertical tie members or stay-rods 22 may be threaded, as indicated in Fig. 7, and resting upon the horizontal portion of each T-beam are gage and shear posts 23 projecting laterally therefrom.

The posts are for the purpose of gaging the thickness of the wall. The length of the posts varies in the different parts of the hull in accordance with the desired thickness of the same. Another purpose of the posts is to firmly fasten the concrete to the frame in the same manner as a rivet fastens a steel plate to a girder or the like.

The posts also take up the shearing stresses between frame and hull and the shearing stresses developed in the wall itself.

The posts furthermore serve the purpose of supporting and properly spacing the reinforcement of the wall as shown in Figs. 7, 8 and 9, and as hereinafter more fully described.

In Fig. 7 a plain simple form of post is shown just to illustrate the method.

The posts may be fastened to the steel frame in any one of a number of different ways. In Fig. 7 a method is shown whereby the posts are held in place by reinforcing rods 22 threaded through holes in the longitudinal steel members and through corresponding holes in the ends of the posts.

These gage and shear posts are provided with a plurality of vertically disposed openings 24 through which anchor members 25 are passed. These anchor members are for the purpose of holding the wire fabric, expanded metal or other suitable reinforcing material 26, in spaced relation with respect to the members 20. They are hooked over the nearest main wire to hold them in place, and are of such length as shown in Fig. 7 to extend over at least two of the horizontal wires forming the netting, and thereby hold the same in proper spaced relation with respect to the framework.

After the parts above stated have been assembled to form the complete frame structure the concrete is applied thereto in layers, as shown in Fig. 9. A backing 27, which may be either permanent or temporary, is placed between the horizontally disposed T-beams 20, and concrete or mortar preferably formed of Portland cement and silicious sand, either with or without a suitable water-proofing ingredient, is sprayed by means of a compressed air device upon the first layer of netting until the ribs and T-beams and netting are completely inclosed or covered by the cement forming the first layer 28, as shown in Fig. 9. After completing one layer the backing 27, unless

the same forms a permanent part of the vessel as might be the case for an interior decoration, or as an insulating medium, is moved to another location, and the operation repeated until the complete hull is formed. The outer surface of this layer 28 may be covered with a membrane water-proofing material as indicated at 29 if so desired. A second reinforcement 30 of netting is then placed over this first layer of concrete and supported in spaced relation by means of anchors 25 passing through the holes 24, and the operation repeated, after which a third layer of netting 31 may be applied, or even more laminations in accordance with required thickness of the hull. The outer surface of the boat is then finished, and may be painted as desired.

The different laminations in the hull or wall as formed may be made of materials of different composition and different density, and membrane water-proofing or insulating may be placed between any two or more laminations. It may be advisable to make the outer layer of a hard dense concrete to protect the inner layers against abrasion, and use more elastic combinations for the inner laminations.

By applying the different coatings with the compressed air machine a perfect bond between the laminations is secured, and after completion the entire wall forms a monolithic, seamless structure which, owing to the multiple reinforcements shows a comparatively great elasticity.

It may be compared roughly to strong wire-glass, and if it should ever be cracked by a tremendous impact the parts remain bound together, and the wall may be easily repaired. It is obvious that such impact with a wharf or other vessel could not cause tearing away whole plate sections as frequently happens with steel boats.

The outer surface of the entire vessel is perfectly smooth and the minimum of skin friction is obtained. It offers no projections to wharf edges, etc., and makes it less susceptible to marine growth.

The frame is built along the general lines of present practice. However, owing to the monolithic character of my concrete hull and the ease with which a hull is formed on and around the frame members a much greater freedom of design is possible. The rigidity of the concrete hull also reduces the buckling stresses in the incased steel members and therefore much lighter steel sections may be used. This results in great saving of cost of the frame. Another important factor is that the steel skeleton is practically entirely incased in concrete which protects the members against rust. Therefore no allowance needs to be made in the design for reduction of strength caused by deterioration.

After the first coating has sufficiently hardened the temporary backing is removed and may be used over again in a different place.

It is thus seen that the present invention provides a simple and practical method of constructing the walls constituting the hull of a concrete ship at comparatively low cost and in the minimum of time, and it is believed that this invention accomplishes, among others, all of the objects herein set forth.

As many changes could be made in the above construction and many apparently widely different embodiments of my invention could be made, without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

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

1. In a laminated wall, in combination, a frame-work, a plurality of successively applied layers of concrete applied to said frame-work, each layer being provided with metallic reinforcing each uniformly spaced from the preceding reinforcing, said layers of concrete being separated one from another by interposed layers of water-proofing material.

2. In a laminated wall, in combination, a frame-work consisting of horizontally and vertically disposed members, shear posts supported from said members, and a plurality of layers of metallic reinforcing supported from said posts in uniformly spaced relation, successively applied layers of concrete embedding said reinforcing, said layers of concrete being separated one from another by interposed layers of water-proofing material.

3. In a laminated wall, in combination, a frame-work consisting of horizontally and vertically disposed members, shear posts supported from said members, a plurality of layers of metallic reinforcing supported from said posts, and superposed layers of concrete separated by water-proofing or insulating material.

4. In a laminated wall, in combination, a skeleton frame having vertically and horizontally disposed members, stay-rods connecting said members, and shear posts projecting laterally from the sides of the skeleton, layers of reinforcing supported from said shear posts, successively applied layers of concrete embedding said reinforcing, a

permanent backing interposed between the members of the frame-work, said layers of concrete being separated one from another by interposed layers of water-proofing material.

5. In a laminated wall, in combination, a plurality of laterally and upwardly extending ribs, horizontally disposed beams connecting said ribs, vertically disposed stay-rods parallel with the ribs, shear posts secured on said stay-rods, a plurality of layers of metallic reinforcing supported from and anchored to said shear posts, a plurality of layers of concrete embedding said layers of reinforcing, said layers of concrete being separated one from another by interposed layers of water-proofing material.

6. In a laminated wall, in combination, a plurality of laterally and upwardly extending ribs, horizontally disposed beams connecting said ribs, vertically disposed stay-rods parallel with the ribs, shear posts secured on said stay-rods, a plurality of layers of metallic reinforcing supported from and anchored to said shear posts, a plurality of layers of concrete embedding said layers of reinforcing, said layers of concrete being separated one from another by interposed layers of water-proofing material.

7. The herein described method of constructing walls which consists in erecting a frame-work supporting a frame of metallic reinforcing from said frame-work and spraying said reinforcing with fluid concrete until the same is covered, adding another layer of reinforcing and spraying said second layer of reinforcing with fluid concrete until the same is covered, thereby to form a plurality of layers of reinforced concrete.

8. The herein described method of constructing walls which consists in erecting a frame-work, supporting a frame of metallic reinforcing from said frame-work, and spraying said reinforcing with fluid concrete until the same is covered, adding another layer of reinforcing and spraying said second layer of reinforcing with fluid concrete until the same is covered, thereby to form a plurality of layers of reinforced concrete, and interposing layers of water-proof or insulating material between said layers of concrete.

In testimony whereof I affix my signature in presence of two witnesses.

CARL WEBER.

Witnesses:

EMILY F. CAMP,
F. L. BROWNE.