No. 815,866. PATENTED MAR. 20, 1906.

E. M. SCOFIELD.

RETAINING WALL OR THE LIKE.

APPLICATION FILED FEB. 20, 1905.

2 SHEETS—SHEET 1.

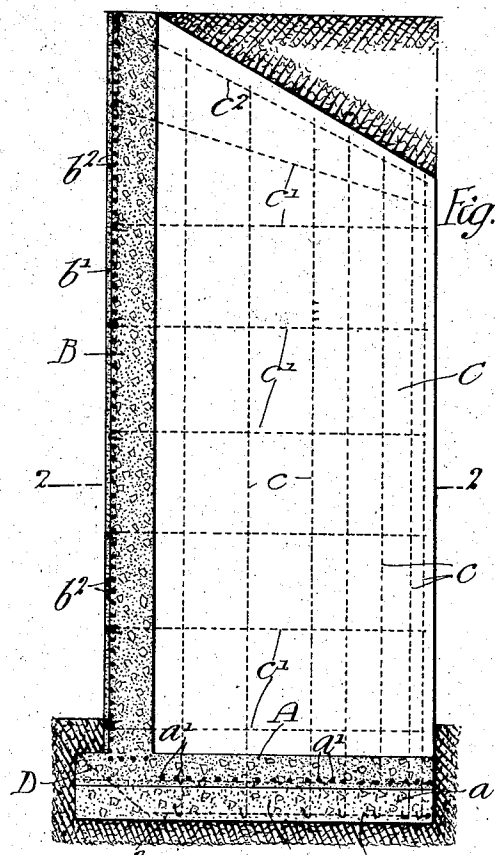


Fig. 1.

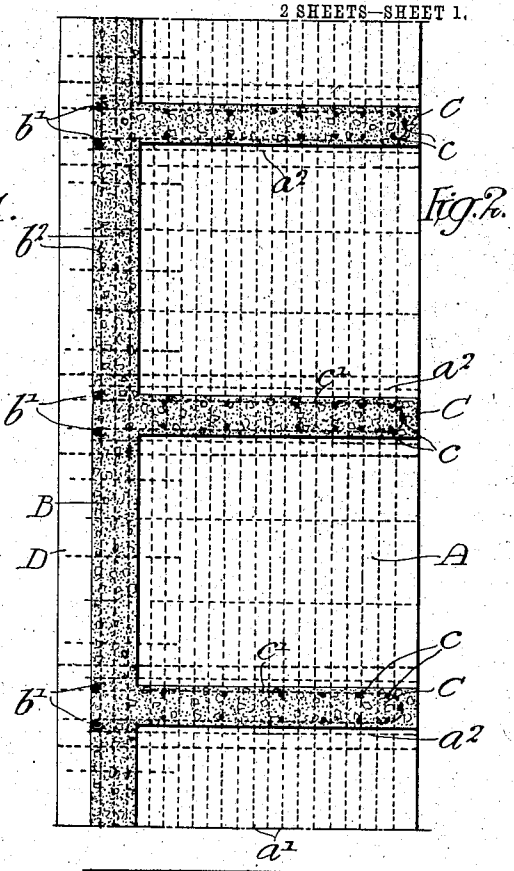


Fig. 2.

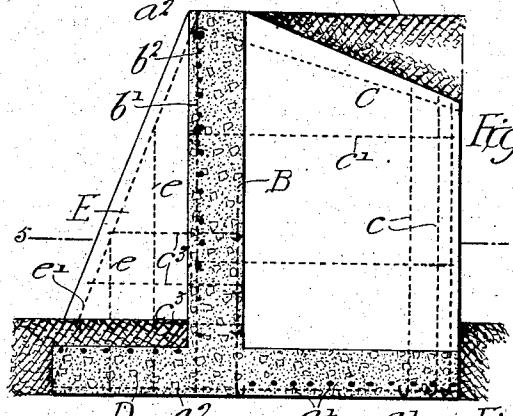


Fig. 3.

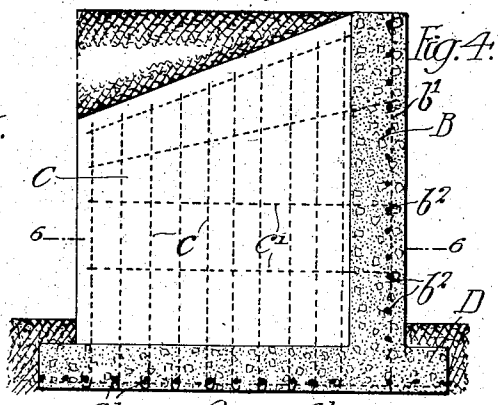


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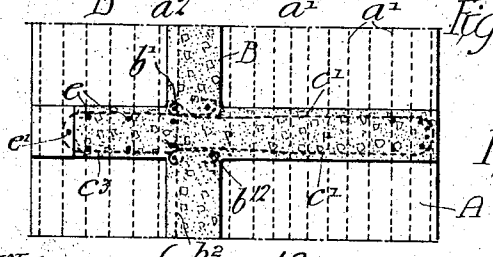


Fig. 5.

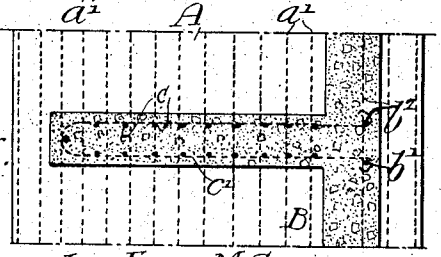


Fig. 6.

Witnesses: Titus H. Howe. Walter J. Pellinger

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2 SHEETS—SHEET 2.

Fig. 7.

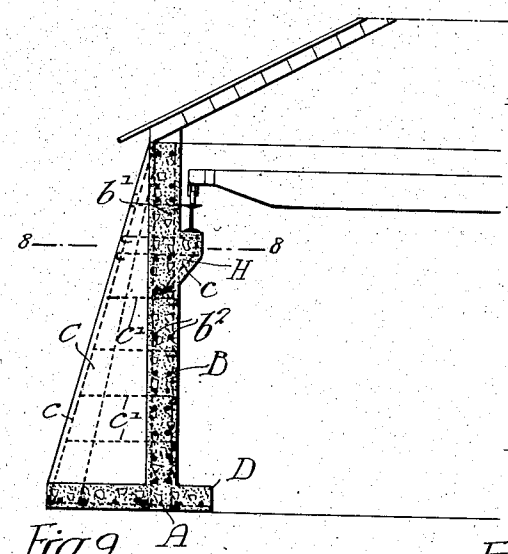


Fig. 10.

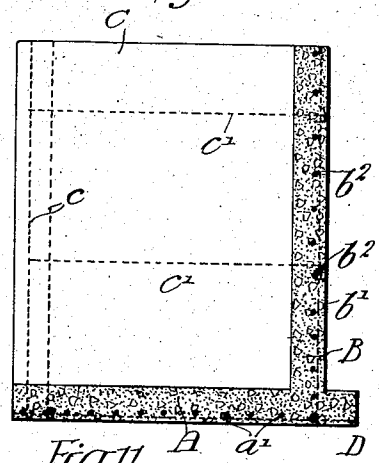


Fig. 9.

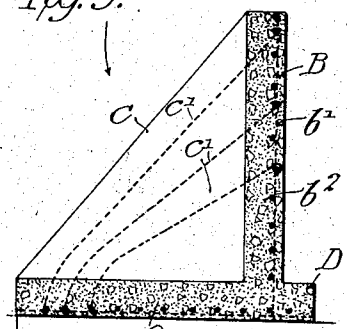


Fig. 12.

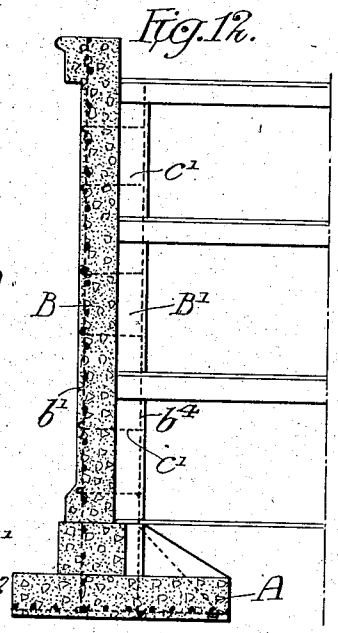


Fig. 11.

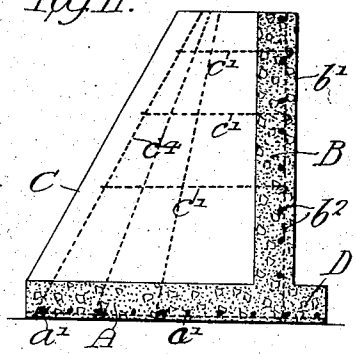


Fig. 18.

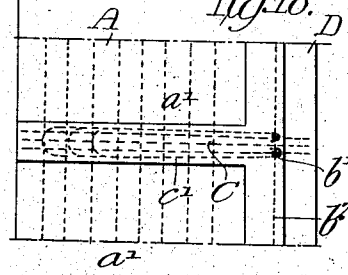


Fig. 8.

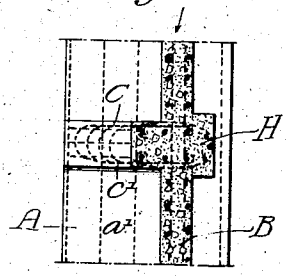


Fig. 14.

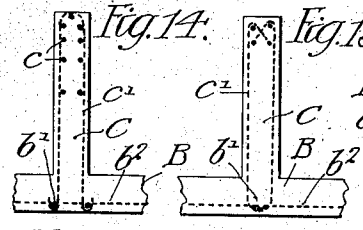


Fig. 15.

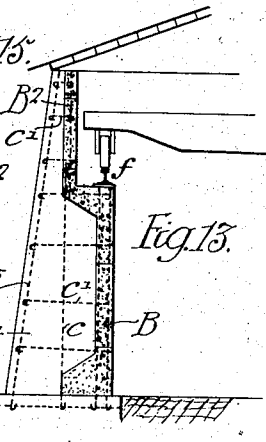


Fig. 13.

Fig. 16.

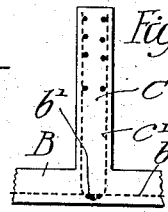
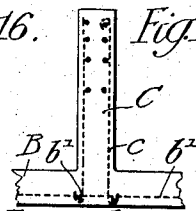


Fig. 17.



Witnesses:
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Walter F. Bullinger

Inventor
Edson M. Scofield.
by his Attorneys,
Howson & Howson

UNITED STATES PATENT OFFICE.

EDSON M. SCOFIELD, OF PHILADELPHIA, PENNSYLVANIA.

RETAINING-WALL OR THE LIKE.

No. 815,866. Specification of Letters Patent. Patented March 20, 1906.

Application filed February 20, 1905. Serial No. 246,530.

To all whom it may concern:

Be it known that I, EDSON M. SCOFIELD, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Retaining-Walls or the Like, of which the following is a specification.

One object of my invention is to provide a novel form of concrete-wall construction particularly designed for use in such structures as sea-walls, reservoirs, retaining-walls of various forms, and walls of buildings, by means of which the possibility of the failure of such structures shall be materially diminished.

More especially the object of the invention is to provide a novel arrangement of reinforcing-bars in structures of the general type noted above for the purpose of increasing their resistance to the strains to which they are subjected when in use.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation of a sea-wall constructed according to my invention. Fig. 2 is a sectional plan view of the structure shown in Fig. 1, the same being taken on the line 2 2. Figs. 3 and 4 are sectional elevations of special forms of retaining-walls constructed according to my invention. Figs. 5 and 6 are respectively sectional plan views of the structures shown in Figs. 3 and 4, taken on the lines 5 5 6 6 of said figures. Fig. 7 illustrates a portion of the wall of a building constructed according to my invention, the same being shown as provided with a portion for the support of a crane-rail. Fig. 8 is a sectional plan view taken on the line 8 8, Fig. 7. Figs. 9, 10, and 11 are sectional elevations of various forms of retaining-walls constructed according to my invention. Figs. 12 and 13 are transverse sectional elevations of two forms of factory-walls, showing my invention as applied to strengthen the same; and Fig. 14 to 18, inclusive, are sectional plan views, to some extent diagrammatic, illustrating buttressed walls in which various arrangements of reinforcing and tying bars are employed in the manner characterizing my invention.

Referring first to Figs. 1 and 2 of the above drawings, A represents the base of the concrete structure, which in these figures is more particularly designed for use as a sea-wall. Adjacent to one edge of said base is erected the wall proper, B, and this is reinforced at intervals by a series of rearwardly-extending buttresses or wing-walls C, which in the present instance diminish in height as they recede from the wall. Under each of the buttresses C there is provided a footing a of concrete, which, with the base A, is extended in front of the wall B to form a toe D.

In order to properly reinforce the above-noted bodies of concrete, I provide in the wall B vertical reinforcing-bars b' and longitudinal reinforcing-bars b^2. In the buttresses C, I provide a series of vertically-extending reinforcing-bars c, in addition to which there are horizontally-extending bars or rods c', by which said buttresses are tied to the reinforcing system of the wall B. For the purpose of illustrating the construction I have shown these bars c' as provided with hooked ends by which they are connected to other reinforcing-bars; but it will be understood that in actual practice the hooked portions more nearly lie in horizontal planes. The said bars c' are preferably made in a form not unlike an elongated letter **U**, and while I preferably extend them around the outside of the vertical bars c this is not necessarily done, since they may be on the inside of the verticals and connected to them by any desired form of tie or clamp.

It will be seen that the base A is reinforced by a number of longitudinally-extending bars a', while the footing portions a have extending through them reinforcing-rods a^2, the forward ends of which may, if desired, extend upwardly at an angle, so as to be embedded in the upper part of the toe portion D. The tie-rods c' for the buttresses are preferably inclined upwardly near the top portion thereof, as shown at c^2 in Fig. 1, so that this is properly reinforced and tied to the wall B. In order to secure the tying action of the bars c' to the greatest possible extent, I bend or hook their ends around the vertical bars b', as above noted, so that it will be seen that whatever strains act upon the wall B to tear it away from its reinforcing-buttress will be transferred to and resisted by the bars c', with the result that the buttresses become trusses, in effect, with their reinforcing-bars in tension and certain portions of the concrete structure between said bars in compression.

If desired, buttresses, as E, may be provided in front of the wall B and in addition to the buttress C, as shown in Fig. 3. In this case the vertical reinforcing-bars *e* and also the inclined bar *e'* of the front buttresses may be tied to each other and to the body of the wall B by means of U-shaped bars c^3. The ends of said tie-bars may be permitted to extend into the body of the wall B, as shown in Fig. 5, and hooked to verticals b^{12}, while the ends of the bars *c'* may, as before, be bent around or hooked to the vertical reinforcing-bars *b'* in said main wall.

Figs. 4 and 6 illustrate my invention as applied to a relatively low retaining-wall having in its buttresses a relatively large number of vertical reinforcing-bars *c*, all of which are tied to the vertical reinforcing-bars *b'* in the wall B by means of the U-shaped tie-bars *c'*.

In Figs. 7 and 8 I have shown my U-shaped tie-bar as applied to the strengthening of a building-wall having outside buttresses and provided with a series of projecting portions H for the support of a crane rail or girder. In this instance the U-shaped pieces *c'* may be hooked or bent around the vertical reinforcing-rods *b'* in the same manner as above described, or may be permitted to extend into the girder-supporting portions, as shown, these latter portions being made with or without vertical reinforcing-bars, as desired, though in any case being strongly tied to the main wall B.

Figs. 9 to 11, inclusive, and Fig. 18 illustrate various forms of retaining-walls to which my invention may be applied, the structure shown in Figs. 9 and 18 being one in which the rods *c'*, while, as before, hooked or bent around the vertical reinforcing-bars *b'* of the wall proper, are inclined downwardly from the points of their engagement with said vertical bars and then bent so as to tie the latter to the lower rear portion of the base A. In the construction shown in Fig. 10 a relatively small number of vertical bars are employed in the back part of the buttress, being tied to the reinforcing system of the main wall by the two horizontal bars *c'*, according to my invention. In Fig. 11 the rear vertical reinforcing-bar in the buttress has been replaced by inclined bars c^4, extending within the loops *c'*, as before described.

In the case of the wall shown in Fig. 12 I have provided a vertically-extending strengthening-rib or buttress B', having a vertical reinforcing bar or bars b^4 tied to the reinforcing-bars *b'* in the wall B by means of horizontal U-shaped bars *c'*, as heretofore described.

Another form of wall is illustrated in Fig. 13, in which external buttresses C', having vertical bars b^5 tied to the main wall, are provided. A crane-rail *f* is carried upon the top of said main wall, while an offset wall B^2, supported by the buttresses and main wall, is made to carry the roof structure. This offset wall is also preferably tied to the buttresses, as before described.

Various ways of arranging the tie bars *c'* are illustrated in Figs. 14 to 17, inclusive, the first of these figures showing a case in which the free ends of the bar are hooked around verticals in the main-wall structure, while verticals in the buttress are operatively engaged by the body and curved end of said bar. Fig. 17 is a somewhat similar form of the device in which two bars, each hooked at one end to the main wall vertical bars, are extended into the buttress, it being understood that like all reinforcing-bars commonly used they are provided with series of projections or openings whereby they are tied into a body of concrete in the manner well known in the art. In Fig. 15 the curved end of the bar *c'* is extended into the main-wall structure, where it embraces the vertical reinforcing-bars, while its free ends are hooked around vertical bars extending through the rear portion of the buttress. A similar arrangement is shown in Fig. 16, except that the free ends of the bar *c'* are not hooked nor tied to other bars.

I claim as my invention—

1. A concrete wall including a main vertical portion, a base portion, and a buttress for the main portion resting upon said base portion, longitudinal and vertical reinforcing-bars in the main portion and in the base portion, vertically-extending bars in the buttress, with a series of U-shaped bars extending in the buttress and entering the main portion of the wall, said latter bars being placed to transmit strain from said vertical bars in the buttress to the main vertical portion of the wall, substantially as described.

2. A concrete-wall construction including a main vertical portion, buttresses extending from both faces of said wall, upwardly-extending reinforcing-bars in said buttresses, and series of U-shaped bars operatively connected to said vertical bars and extending into the main-wall structure, substantially as described.

3. A concrete-wall structure including a main vertical portion, a buttress therefor, substantially U-shaped reinforcing-bars extending through the buttress and into said main-wall structure, the free ends of said reinforcing-bars being hooked, and vertical reinforcing-bars engaged by said hooked portions of the U-shaped bars, substantially as described.

4. A concrete-wall structure including a main vertical portion, a base, a buttress or buttresses for said vertical portion, reinforcing-bars extending horizontally through the

base, vertical reinforcing-bars extending in the main-wall structure, and substantially U-shaped bars in the buttress hooked to engage the vertical bars, said vertical bars being hooked to engage the bars in the base portion, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDSON M. SCOFIELD.

Witnesses:
E. S. RUE,
J. C. MCALPINE.