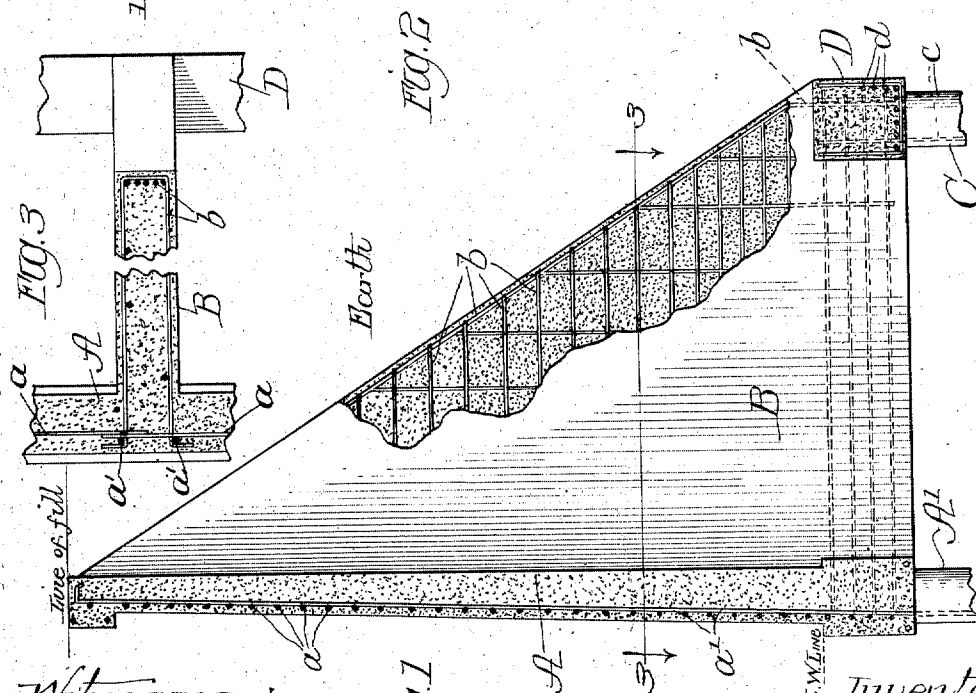


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RETAINING-WALL.

982,698.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, MAXWELL M. UPSON, a citizen of the United States, residing at New York, county of New York, and State of New York, have invented certain new and useful Improvements in Retaining-Walls; of which the following is a specification.

My invention relates to retaining walls and the like which are used for dock purposes, railroad embankments, etc., where fluids, soils or deposits of any character are to be held in a vertical plane, and the object thereof is to provide a novel and efficient construction of wall of this character having features of advantage and utility which will be apparent from the description hereinafter given.

According to the present embodiment of my invention, my retaining wall consists of a vertical wall of concrete which is reinforced and is attached to and rigidly supported by a series of wing walls, extending at right angles thereto, the retaining part of the wall, as well as the wings, resting upon the piles and connected therewith, the buttresses formed by said wing walls and piles being connected by means of a beam which is adapted to take care of the overturning tendency of the wall and also acts as an anchor to keep the wall from traveling horizontally, such beam being buried in the ground and carrying the weight of an inverted triangle of earth. As a result of the employment of a retaining wall of the character stated I am enabled to provide an efficient wall at a considerably decreased expense as compared with that of the ordinary so-called gravity retaining wall, as well as a wall which will maintain its proper position and alinement under all conditions.

In the drawings, Figure 1 is a sectional elevation of my retaining wall taken on the line 1—1 of Fig. 2, showing a portion of one of the wing walls broken away to illustrate the composition thereof; Fig. 2 a plan view of my retaining wall; Fig. 3 a section on the line 3—3 of Fig. 1.

Referring to the embodiment of my invention illustrated in Figs. 1, 2 and 3, the retaining wall proper marked A is formed of concrete or the like and is supported by a series of concrete piles A¹ which practically constitute a part of the wall, such piles being formed or sunk into the soil in any suitable manner. The retaining wall is

preferably strengthened or reinforced by a series of horizontal metal bars *a* and also by a series of vertical bars *a*¹, which by preference extend into the concrete piles. The retaining wall is provided with a series of walls B which I term wing walls and which extend laterally at right angles thereto at suitable distances apart. By preference, each of these wing walls is triangular, as clearly illustrated in Fig. 1, and each is moreover supported by and anchored at its outer end to a pile C preferably of concrete. Moreover, by preference each wing wall is reinforced both vertically and horizontally by the series of strengthening bars *b*, which are anchored not only to the retaining wall but also to the supporting piles C, as illustrated in Figs. 2 and 3, with the result that the wing walls and the retaining walls are rigidly held together and with the further result that said piles C not only form a fixed foundation to secure a vertical alinement with the wall, but also afford a resistance to the vertical pull which the horizontal thrust against the retaining wall exerts. As shown in Fig. 3 and by preference, said strengthening bars *b* interlock with each other and also with the vertical bars *a*¹ of the retaining wall as well as with strengthening bars *c* in the piles C as seen in Fig. 1.

While, as hereinafter explained in reference to the modified form of retaining wall, the wall thus far described is efficient and practical, yet in practice I find that its efficiency is considerably increased by the provision of a beam D which is buried in the ground and connects the buttresses which are formed by the wing walls and their piles. This beam is also preferably strengthened by means of the strengthening bars *d*. The function of this beam is to take care of the overturning tendency of the wall, it being understood that the same carries the weight of an inverted triangle of earth. Such beam also acts as an anchor to keep the wall from traveling horizontally.

The retaining wall structure above described may be constructed according to any suitable method but according to the method practiced by me the piles, which are preferably of concrete or reinforced concrete, are first driven or formed, in which operation the concrete is placed in a shell which has been preliminarily driven by means of

a core. Where reinforced concrete piles are used, the reinforcement, that is the bars, etc., hereinbefore referred to, extends above the top of the piles so that the reinforced parts of the wall may be substantially attached to the reinforcement in the piles. After the piles are thus formed, the wall reinforcement and wall forms are put into place and the concrete then poured into the forms. This method permits of a substantial tie between the pile and the concrete proper in addition to the tie afforded by the interlocking or interlaced reinforcement.

The retaining walls illustrated in the drawings are of the type intended to hold earth on one side without there being any pressure on the other side except air pressure, and in Fig. 1 I have so indicated these facts by using the words "earth" and "air" respectively. However, while as stated the retaining wall may be employed to hold back the earth which is located on the buttress side of the wall, yet such wall may be employed to hold back water on the smooth side of the wall.

Retaining walls constructed according to my invention embody numerous improvements over the ordinary gravity retaining wall in that the cost is considerably decreased and a better retaining wall produced. Moreover, footings of large area, which are commonly required, are dispensed with and a retaining wall is formed which cannot settle or be forced out of alinement, for the provision of the wing walls and their fixed foundations or supports takes care of the horizontal thrust against the retaining wall, such foundations or concrete piles taking care both of the lifting components of the wing walls and the settling components thereof. Also, by means of the reinforcement through the piles of the retaining wall a stiffening action is obtained, due to the pressure of the earth exerted against the piles beneath the ground. Again, by the employment of the cross beam connecting the ends of the buttresses I provide against the overturning tendency of the wall and also prevent such wall from traveling horizontally. Furthermore, by the use of my invention, the usual foundations or so-called slabs below the wing walls may be dispensed with, so that the weight of the earth does not need to be carried on the structure while my beam which takes care of the overturning movement is placed at a position most advantageous for its purposes. Thus I avoid the necessity of other retaining wall constructions of providing most substantial foundations.

I claim:

1. A retaining wall comprising a vertical wall, wing walls connected therewith, piles to which the wing walls are secured, and means associated with said wing walls for

resisting the tendency of the vertical wall to overturn or travel horizontally.

2. A retaining wall comprising a front vertical wall, a rearwardly-extending wall connected therewith, piles to which said rearwardly-extending wall is connected, and means associated with said rearwardly-extending wall for resisting the tendency of the front wall to overturn or travel horizontally.

3. A retaining wall comprising a vertical wall, wing walls connected therewith, piles to which the wing walls are secured, and means for tying together the rear ends of said wing walls.

4. A retaining wall comprising a vertical wall, wing walls connected therewith, piles to which the wing walls are secured, and cross beams connecting said wing walls.

5. A retaining wall comprising a vertical wall, wing walls connected therewith, piles to which the wing walls are secured, and cross beams connecting between the outer ends of the wing walls at a point adjacent said piles.

6. A retaining wall comprising a vertical wall, a series of piles on which such wall is supported and to which it is connected, wing walls connected with the vertical wall, piles to which the outer ends of the wing walls are secured, and cross beams adapted to be located below the ground and to connect the wing walls at their outer ends.

7. A retaining wall comprising a vertical wall, a series of piles supporting such wall and forming a part thereof, a series of triangular shaped wing walls connected with the vertical wall, a series of piles connected with the outer ends of such wing walls and supported thereby, and cross beams connecting between said last mentioned series of piles and the wing walls.

8. A retaining wall comprising a vertical wall, a series of piles supporting such wall and forming part thereof, wing walls connected with the vertical wall, a series of piles connected with the outer ends of such wing walls for supporting and holding the latter walls, and reinforcing bars extending through the wing walls and anchored at their ends in both sets of piles.

9. A retaining wall comprising a vertical wall, a series of piles supporting such wall and forming part thereof, wing walls connected with the vertical wall, a series of piles connected with the outer ends of such wing walls for supporting and holding the latter walls, cross-beams connecting the outer ends of the wing walls, and interlocking reinforcing bars located in the wing walls and the cross-beams.

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Witnesses:

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