

M. M. UPSON.
RETAINING WALL.
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Patented Oct. 26, 1909.

938,091.

Fig. 1

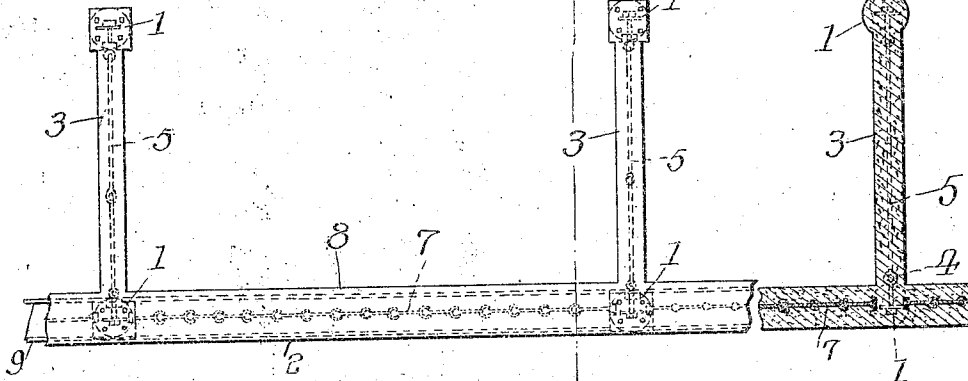


Fig. 2

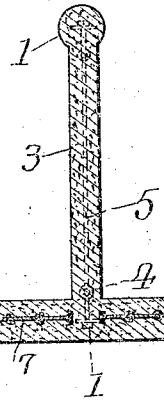


Fig. 3

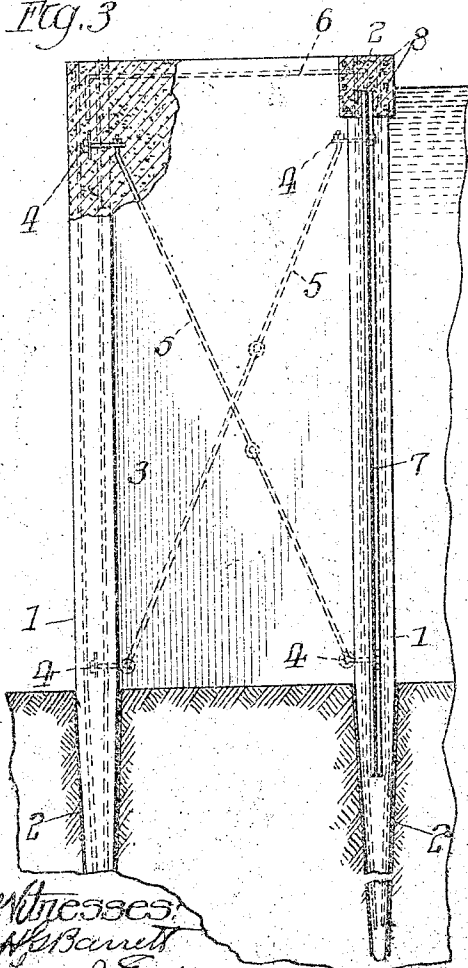
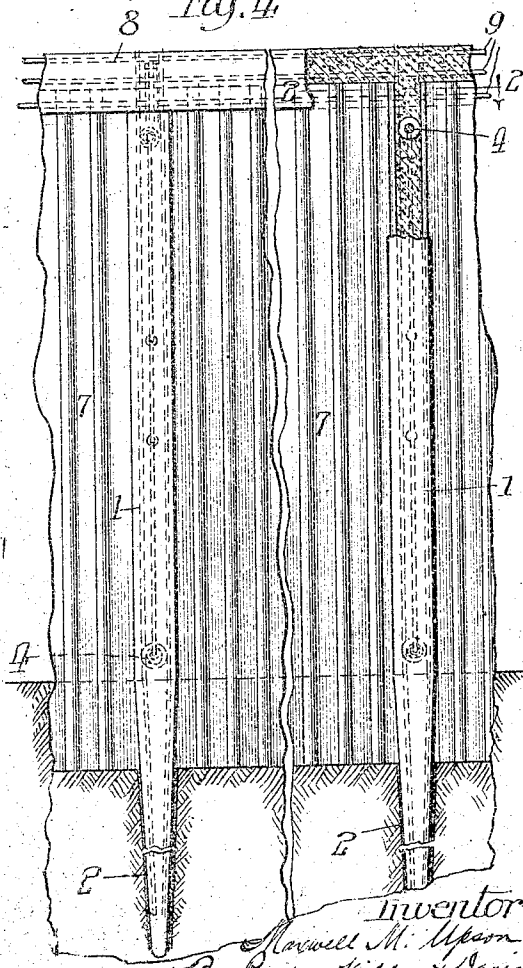


Fig. 4



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UNITED STATES PATENT OFFICE.

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RETAINING-WALL.

938,091.

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 in the city of New York, county 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 the formation of walls adapted for dock work, sea-wall work and the like, although as will be understood such walls may have many other useful applications.

The object of my invention is to provide a wall consisting of a combination of concrete piling and curtain walls of sheet piling formed of wood, concrete or any other suitable material.

For the purpose of a clear description of my invention I have illustrated the same as a sea-wall or dock retaining wall, although as will be understood my invention is not limited thereto.

In the accompanying drawing Figure 1 is a plan view of my retaining wall; Fig. 2 a section on the line 2 of Fig. 4; Fig. 3 an end elevation of the wall with portions thereof in section and Fig. 4 a front elevation of the wall with a portion in section.

Referring to the present embodiment of my invention as illustrated in the drawings, the retaining wall therein shown is a combination of concrete piling and sheet piling. The concrete piling consists of a series of concrete piles 1 in pairs, one member of each pair being at the line of the wall and the other member being in the rear thereof, or in other words the piles are arranged in two parallel rows, the front row being in the line of the wall and the other row being to the rear thereof. These piles are preferably cast on land with suitable reinforcement and placed in position within steel incased holes driven in the ground below the surface of the water by means of the usual collapsible form or core used in the so-called Raymond system and illustrated in Raymond patent No. 845,120. As is well known, after the form or core is driven into the ground together with the shell and such form or core is withdrawn, the shell 2 remains in the ground. After the piles are thus placed in the relative positions shown, that is the pairs of piles being at right angles to the face of the wall, a concrete wall 3 of any suitable depth but preferably extending from the surface of the

ground to the top of the pile is cast in position. This construction forms a buttress adapted to take the thrust against the retaining wall. As clearly shown in Fig. 3 the piles are provided with eye-bolts 4 to which are connected tie rods 5 running diagonally from the lower end of one of the piles to near the upper end of its companion pile. These tie rods are placed in position before the concrete wall 3 is formed, with the result that the tie rods are imbedded within said wall when the buttress is completed. By preference the members of each pair of piles are tied together by horizontal reinforcing rods 6.

The retaining wall proper is arranged between the buttresses described and as a material for said wall sheet piling 7 of any suitable material, preferably steel, may be employed, the same being driven into the ground with a penetration sufficient to take care of the horizontal thrust at the base of the piling. This sheet piling may either rest at its ends in a recess in the sides of the concrete piling or the first section of the sheet piling may be cast with the concrete piling, either method making a tight joint which would prevent the passage of either water or material from one face of the wall to the other. The penetration of this sheet piling should be of sufficient depth to avoid all possibility of the action of the water carrying material underneath the surface of the ground from one side of the wall to the other. In order to resist the horizontal thrust at the top of the wall I preferably provide a concrete horizontal beam 8 bridging from buttress to buttress, which beam also serves to protect the sheet piling and insure maximum length of life. It will be understood that this curtain wall or retaining wall proper may be made of concrete extending between the buttresses from the ground to the top, in which event it would not be necessary to have such surmounting beam except as the same may be desirable to take the horizontal thrust at the top of the wall. If desired this beam may be reinforced by means of rods 9.

My invention provides a wall which is practically indestructible, while kept under water and which affords a maximum rigidity with a minimum amount of material. Furthermore a wall of this character may be constructed without the use of caissons.

or divers, thereby materially decreasing the cost. And on account of the possibility of using materials to their best advantage, the cost per lineal foot of this construction is 5 very much decreased from ordinary wall structures.

The chief purpose of my invention is to provide a suitable and efficient construction capable of taking care of horizontal pressures in dock and water work and consequently I do not limit my invention to any specific application thereof, for as will now be evident my invention may not only be applied as shown to a sea wall or retaining 10 wall but may be applied to dock construction where no earth pressures exist, in which case the walls or webs with the braces would be applied to adjacent piles in dock construction, the webs and tying referred to taking care of the pressure of steamers and 15 also staying the dock against the pressure of the current, etc.

I claim:

1. A retaining wall comprising pairs of 25 concrete piles and concrete walls between the members of each pair to form buttresses, and a retaining wall proper secured to the buttresses; substantially as described.

2. A retaining wall comprising a retaining wall proper and buttresses consisting of 30 pairs of concrete piles and concrete walls arranged between the members of each pair of piles and forming an integral structure with the piles; substantially as described.

3. A retaining wall comprising a retaining wall proper and buttresses consisting of 35 pairs of concrete piles, concrete walls arranged between the members of each pair of piles and forming an integral structure with the piles, and tie rods between the 40 members of the pairs of piles; substantially as described.

4. A retaining wall comprising a retaining wall proper and buttresses consisting of 45 pairs of concrete piles, concrete walls arranged between the members of each pair of piles and forming an integral structure with the piles, and diagonal tie rods extending between the lower end of one member 50 of a pair of piles to the upper end of the other member, and embedded in said concrete wall; substantially as described.

5. A retaining wall comprising a retaining wall proper and buttresses consisting of 55 pairs of concrete piles, concrete walls arranged between the members of each pair of piles and forming an integral structure with the piles, eye-bolts in the upper and lower ends of the piles, and diagonal tie 60 rods extending between the lower eye-bolt of one member of a pair of piles to the upper eye-bolt of the other member, said tie rods being embedded in said concrete wall; substantially as described.

65 6. A retaining wall comprising a retain-

ing wall proper and buttresses consisting of pairs of concrete piles, and tie rods between the tops of the two members of each pair of piles; substantially as described.

7. A retaining wall comprising buttresses 70 formed by a series of piles and interposed concrete walls, a retaining wall proper arranged between and secured to the buttresses and a cross beam bridging from buttress to buttress and surmounting such retaining wall; substantially as described. 75

8. A retaining wall comprising buttresses formed by a series of piles and interposed concrete walls, and a retaining wall proper arranged between and having its ends embedded in the piles which are in the line of the retaining wall; substantially as described. 80

9. A retaining wall comprising buttresses formed by a series of piles and interposed 85 concrete walls, and sheet piling arranged between the piles which are in the line of the retaining wall and extending into the ground; substantially as described.

10. A retaining wall comprising buttresses 90 formed by a series of piles and interposed concrete walls, and sheet piling arranged between the piles which are in the line of the retaining wall and having its ends secured to such piles; substantially as described. 95

11. A retaining wall comprising buttresses formed by a series of piles and interposed 100 concrete walls, and a retaining wall proper arranged between and secured to the buttresses, said buttresses being at right angles to the face of the retaining wall proper; substantially as described.

12. A retaining wall comprising a series of concrete piles arranged in pairs at right angles to the face of the wall, shells which 105 are positioned in the ground and extending below the water level and into which the piles are placed, concrete walls between the members of the pairs of piles, and a retaining wall proper secured to the front members of the pairs of piles; substantially as described. 110

13. The combination with a pair of concrete piles and a concrete wall arranged between and forming an integral structure 115 therewith, one of the piles being exposed to the pressures and the other being in the rear thereof; substantially as described.

14. The combination with a pair of concrete piles, one of which is exposed to the 120 pressures and the other being in the rear thereof, a concrete wall arranged between said piles, and tie rods extending between said piles and embedded in said wall; substantially as described.

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Witnesses:

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