R. B. WILLARD.

SEA WALL.

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1,332,655.

Patented Mar. 2, 1920.

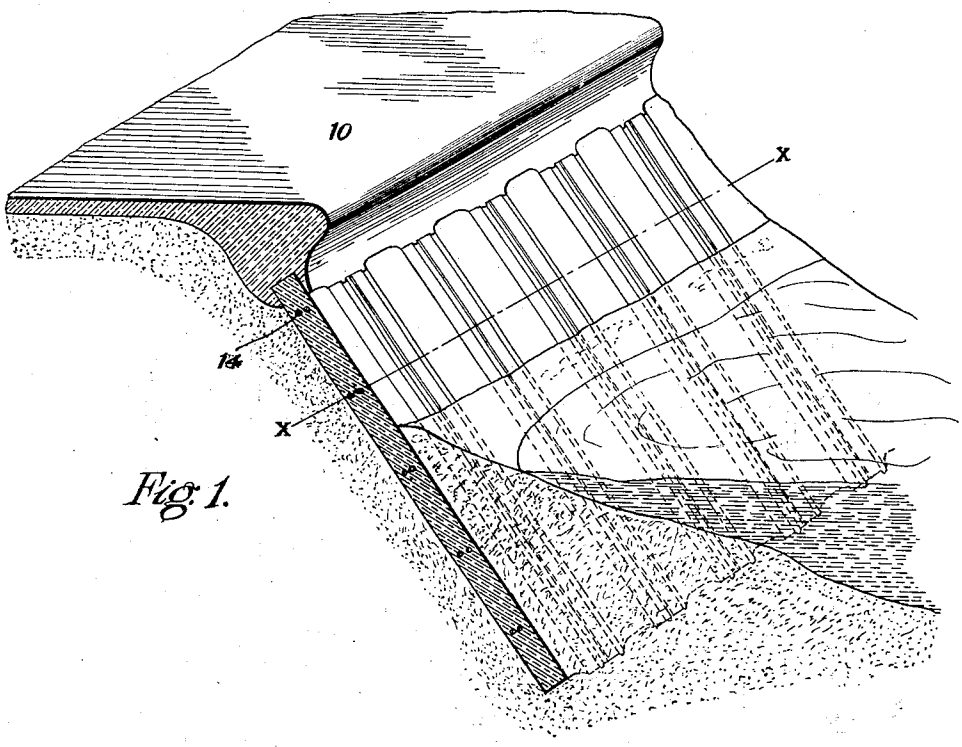
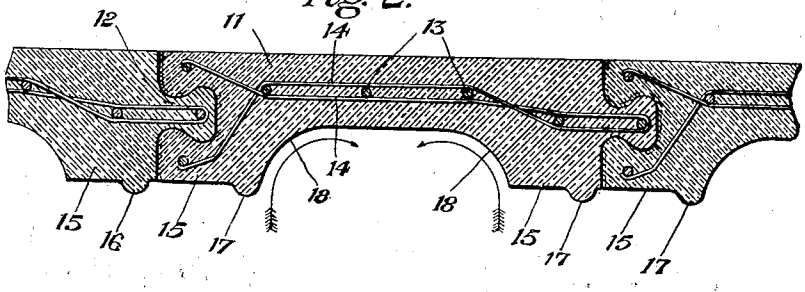


Fig. 1.

Fig. 2.



WITNESS
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SEA-WALL.

1,332,655. Specification of Letters Patent. Patented Mar. 2, 1920.

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To all whom it may concern:

Be it known that I, RUFUS B. WILLARD, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Sea-Walls, of which the following is a specification.

My invention relates to that class of sea walls ordinarily made of reinforced concrete panels and used to prevent the action of waves and tides from washing away the sand or other shiftable material comprising the shore.

My object is to provide a sea wall of the class described of simple durable and inexpensive construction, so shaped and arranged that the crushing impact of huge waves will not be delivered direct upon the sea wall, but on the contrary will be divided and a portion only of such crushing impact will first strike upon the projecting portions of the thickest and strongest parts of the panels, and of the remainder a part will strike glancing blows upon the inclined curved portions which tend to divide the waves and direct strong currents inwardly toward the central portions of the panels and to thereby create counter currents or waves to meet and counteract the remaining portions of the incoming wave and to thereby greatly minimize the total crushing impact of a wave upon the sea wall and also to divide the impact as to time whereby a part only of a wave exerts its crushing impact upon the wall at one time and then other parts strike upon the sea wall at a later time, with the result that I may employ a relatively thin and inexpensive sea wall and obtain as great strength as to wave resistance as may be obtained by a much thicker and more expensive sea wall of the ordinary concrete panel construction.

In a sea wall of this class it is desirable and advantageous to employ locking tongue and grooved connections between the panels, but in such construction the weakest portions of the wall occur at the grooved edges, and in this connection it is one of my objects to protect this grooved edge in two ways—first by forming the forwardly projecting wave dividing portions of the panels at the tongue and grooved edge of the panels, and second by supplementing the same with reinforcing ribs arranged in pairs one near the tongued edge of one panel and the other spaced from the grooved edge of the mating panel whereby floating logs wreckage or debris carried by the waves against the sea wall will be prevented from striking against the outer surface of the grooved edge of a panel, and whereby all such impacts will be delivered against the thickest and strongest portion of the panels.

My invention consists in the construction arrangement and combination of the various parts of the sea wall whereby the objects contemplated are attained, as hereinafter more fully explained, pointed out in my claim and illustrated in the accompanying drawings in which:

Figure 1 shows a sectional perspective view of a sea wall embodying my invention and

Fig. 2 shows an enlarged detail sectional view on the line X—X of Fig. 1.

Referring to the accompanying drawing I have used the reference numeral 10 to indicate the cap member of the sea wall preferably having a flat horizontally arranged body portion and an outer edge curved from the body of the sea wall upwardly and outwardly to deflect spray. This portion is usually constructed after the sea wall proper has been placed in position and the upper ends of these panels are embedded in this cap portion so that any unevenness of the top ends of these panels is covered up and concealed by the cap.

Each panel is formed of reinforced concrete preferably in suitable molds and in the ordinary way. The body portion of the panel is indicated by the numeral 11. At one vertical edge there is a locking tongue 12 made "locking" by having its head slightly larger than its neck portion. At the opposite edge is a locking groove or channel shaped to fit around and to slightly receive the locking tongue. This locking tongue and groove arrangement is useful when the panels are being employed in the construction of a sea wall, after one panel is placed in position a second panel has its tongue inserted in the groove of the positioned panel and then as the sand or other material is removed from under said second panel (preferably by a water jet under pressure), the locking tongue and groove co-act in holding the second panel adjacent and parallel with the first as it drops by gravity to position.

The body of each panel is provided with

longitudinal reinforcing rods 13 and transverse reinforcing rods 14.

On the front or outer face of each panel I have provided adjacent to each edge a wave impact dividing member 15 projecting forwardly from the body of the panel, and on the front face of the member 15 at the tongue edge of the panel is a forwardly projecting rib 16 near the vertical edge, and at the thickest portion of the panel adjacent the groove edge is a corresponding projecting rib 17 spaced from the edge a distance greater than the depth of the groove so that this rib also is at the thickest part of the panel.

The edges of the members 15 adjacent the longitudinal center of the panel are inclined or curved at 18 in such manner that such portions of a wave as strike against the parts 18 are deflected inwardly parallel to the front face of the panel as shown by the arrows in Fig. 2, with the result that counter wave currents are thereby created which tend to cushion the impact of that portion of a wave striking upon the central portion of the panel.

In practical use and assuming that the sea wall has been placed in position in the ordinary manner as illustrated in Fig. 1 and that huge waves sometimes carrying logs and wreckage are striking upon it; it will be obvious that each wave instead of expending its entire force upon the wall in one crushing blow or impact as against a flat faced wall, will have its force divided, a portion only of the blow or impact being first delivered against the thickest and strongest parts of the panels and then after a perceptible interval of time the remainder of the blow or impact will be delivered upon the thinner portion of the panels. However that portion of the wave blow or impact that is delivered upon the thinner or weaker portions of the panels has its force materially lessened or cushioned by reason of the counter wave currents set up by the wave deflecting portions 18 so that at no time is the thinner or weaker portion of a panel subjected to such severe shocks as the thicker and stronger portions.

These ribs 16 and 17 serve not only to further divide the time of a wave impact and to create counter cushioning currents as before explained in connection with the parts 15 and 18, but in addition those ribs serve to receive the impact of any floating logs, wreckage, etc., and to prevent same from striking upon the grooved edge of a panel and by arranging these ribs as set forth such blows are always received upon the thickest and strongest portions of the panels, hence a relatively thin and inexpensive sea wall may be made as strong for the purpose intended as a much thicker and expensive sea wall made in the manner now in common use.

I claim as my invention—

A sea wall composed of reinforced concrete panels, each panel having a locking tongue at one edge and a co-acting locking groove at the other, there being at the front or outer face of the panel adjacent each edge an outwardly projecting wave impact dividing portion, and inclined portions between said wave impact dividing portions and the longitudinal center of the panel, and a rib on the front face near the tongue edge and a second rib on the front face spaced from the groove edge for the purposes stated.

Signed at Los Angeles, California, this 26th day of April, 1919.

RUFUS B. WILLARD.

Witnesses:

P. J. QUEALY,

B. W. MCMANUS.