Nov. 13, 1928. 1,691,335

H. V. CAMPBELL

SEA WALL, JETTY, AND SIMILAR STRUCTURE

Filed Oct. 20, 1926 3 Sheets-Sheet 1

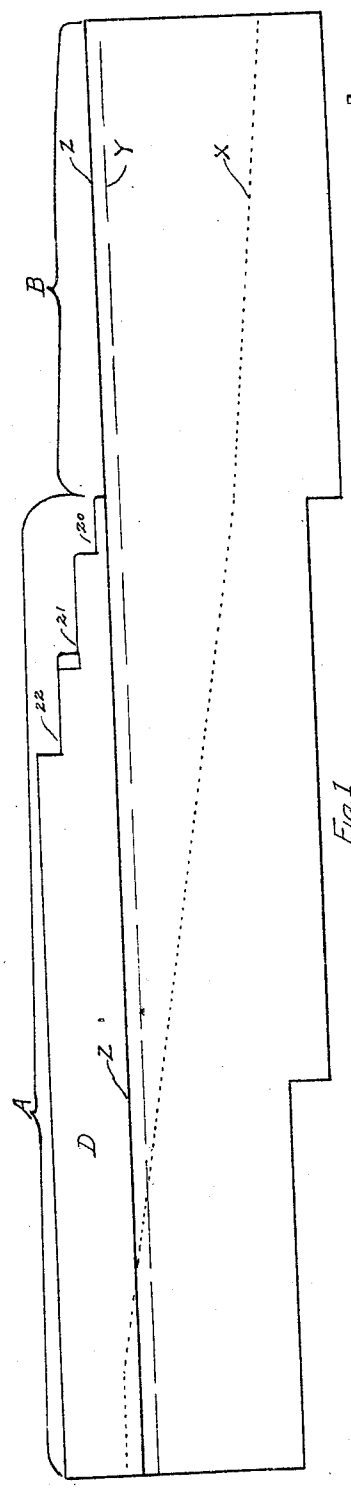


Fig. 1

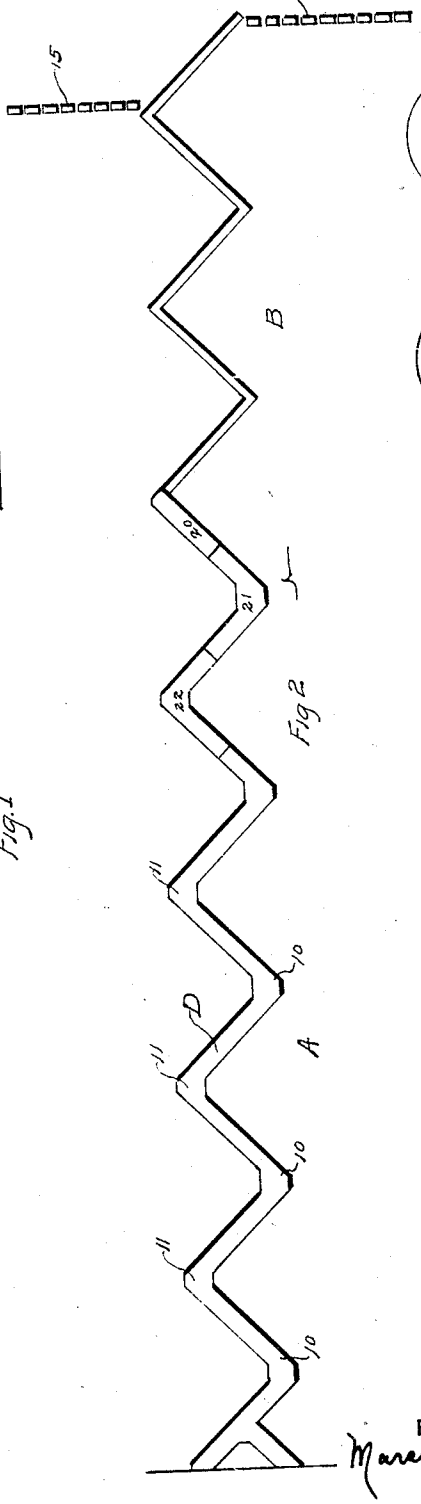


Fig. 2

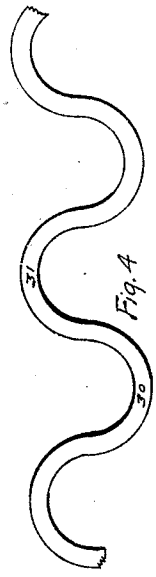


Fig. 4

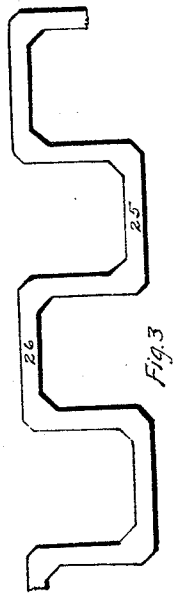


Fig. 3

INVENTOR
H.V. Campbell
BY
Marshall & Hawley
ATTORNEYS.

Nov. 13, 1928.

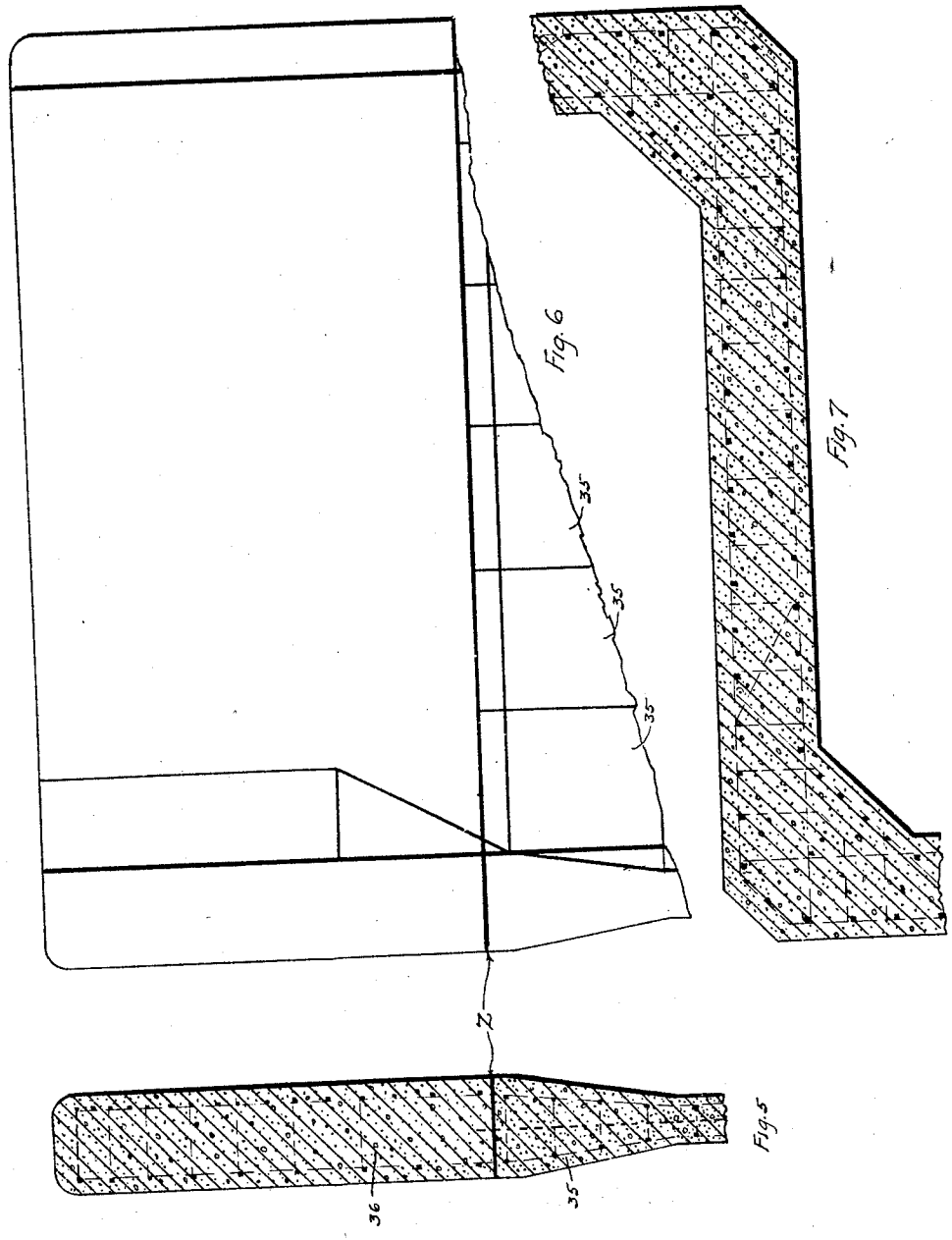
1,691,335

H. V. CAMPBELL

SEA WALL, JETTY, AND SIMILAR STRUCTURE

Filed Oct. 20, 1926

3 Sheets-Sheet 2



INVENTOR
H.V. Campbell

BY
Marshall & Hamley
ATTORNEYS.

Nov. 13, 1928. 1,691,335

H. V. CAMPBELL

SEA WALL, JETTY, AND SIMILAR STRUCTURE

Filed Oct. 20, 1926 3 Sheets-Sheet 3

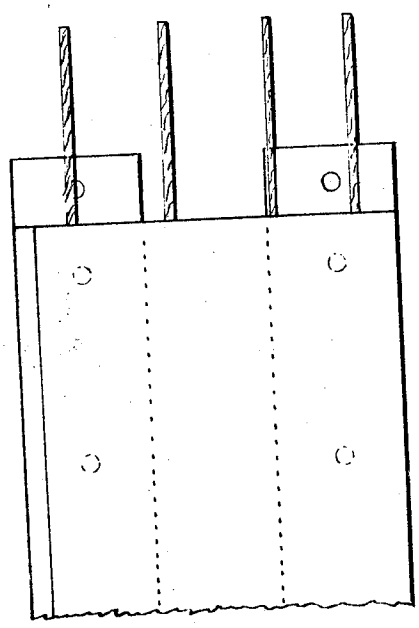


Fig. 8

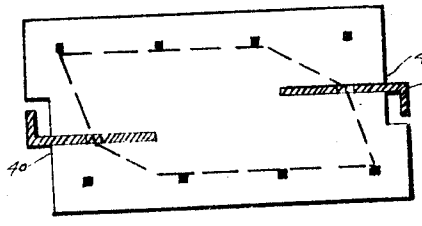


Fig. 9

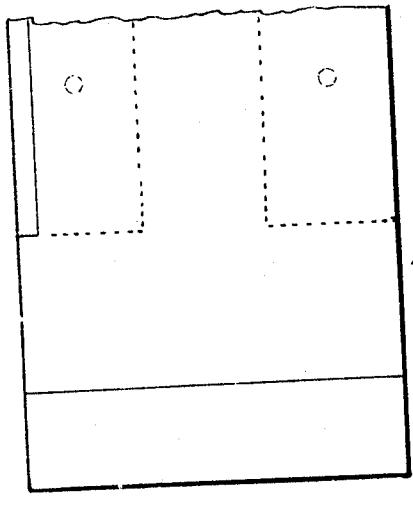


Fig. 8a

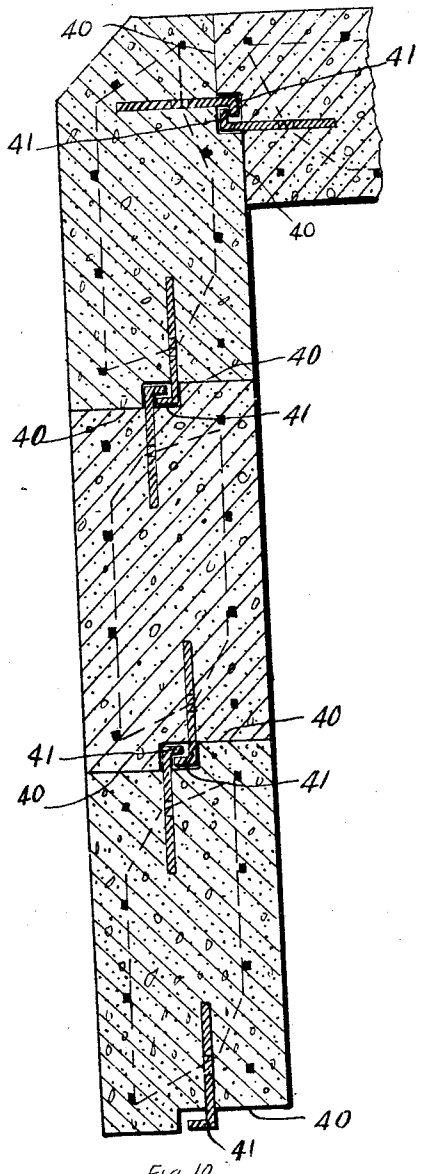


Fig. 10

INVENTOR
H.V. Campbell

BY
Marshall & Hawley
ATTORNEYS

Patented Nov. 13, 1928. 1,691,335

UNITED STATES PATENT OFFICE.

HARRY V. CAMPBELL, OF FREEHOLD, NEW JERSEY.

SEA WALL, JETTY, AND SIMILAR STRUCTURE.

Application filed October 20, 1926. Serial No. 142,855.

This invention relates to breakwaters, jetties, sea-walls or dykes for the purpose of protecting shores and harbors, rivers, lakes and seas from wave action or currents.

Sea-walls, breakwaters and similar structures have been used for many years to break up the force of currents and waves but such structures as usually constructed have been built of rock or rip-rap and have been gradually demolished by the action of the waves or currents. Other structures have been built of piles strongly reinforced and such constructions are very expensive. Structures of this type depend for their stability upon the weight and width of the base and the penetration of piles into the ground or bed.

This invention has for its salient object to provide a sea-wall, dyke, jetty or similar structure that will have great stability and will effectively break up or neutralize the force of currents or waves.

Another object of the invention is to provide a sea-wall or similar structure so constructed and arranged that it will inherently resist forces tending to overturn it and will not be primarily dependent for its stability on the depth or penetration of the supporting piles or other structure on which it is mounted.

Another object of the invention is to provide a rigid and stable structure of the character specified so constructed that it can be erected at a minimum expense.

Further objects of the invention will appear from the following specification taken in connection with the drawings, which form a part of this application, and in which

Fig. 1 is an elevation of a sea-wall or jetty constructed in accordance with the invention;

Fig. 2 is a top plan view of one type of sea-wall embodying the invention;

Figs. 3 and 4 are top plan views of other types of sea-wall embodying the invention;

Fig. 5 is a sectional elevation taken through the monolith or wall and the supporting pile on which it is mounted;

Fig. 6 is an elevational view of a portion of the sea-wall;

Fig. 7 is a longitudinal sectional elevation through the monolith or wall;

Figs. 8 and 8A are elevational views of one form of pile that may be used to support the sea-wall or monolith;

Fig. 9 is a transverse sectional elevation through the pile shown in Fig. 8; and

Fig. 10 is a transverse sectional elevation through a plurality of adjoining and interconnected piles showing one form of pile construction adapted for use with a monolith of the type shown in Fig. 7.

The invention briefly described consists of a sea-wall comprising a monolithic, reinforced concrete construction supported on piles arranged to conform to the contour of the wall or monolith. The wall is zig-zag in construction and has alternately arranged, interconnected portions extending in opposite directions from a longitudinal mean or center line of the structure. By reason of the zig-zag or alternately arranged portions, the structure will present a maximum resistance to the force of the waves or currents and will inherently resist such forces as tend to overturn or upset the wall. Furthermore, the zig-zag structure will break up and largely neutralize the force of the waves or currents. Further details of the invention will appear from the following description.

The general scheme of erecting a wall or break-water of the type under consideration is illustrated in Fig. 1. In this figure, the wall comprises what may be termed an inshore portion A and an offshore portion B. The dotted line X represents the bed of the stream or ocean and the dash line Y represents the mean water level.

The sea-wall is built by driving a plurality of piles preferably of reinforced concrete construction, into the bed of the ocean or stream and the line Z on Fig. 1 represents the upper ends of the piles. A monolithic structure D is mounted on the inshore portion of the pile structure.

The main feature of the invention consists of forming the wall in such a manner that it will be inherently stable and will present great resistance to wave forces. The wall may be made in various shapes or contours. In Fig. 2 a wall is shown having alternately arranged, oppositely extending portions 10 and 11. The inshore portion A consists of a reinforced, monolithic concrete structure D mounted on the upper ends of the piles. The offshore portion B consists of a plurality of interconnected or interlocking piles arranged in the manner of the monolithic wall or in zig-zag relation. At the outer end of the offshore portion are shown at 15 and 16 two sets or two rows of reinforced pile. The wall at the junction of the inshore portion A

and offshore portion B is shown at 20, 21 and 22 as stepped.

Fig. 3 shows another contour of sea-wall comprising alternately arranged, oppositely extending rectangular portions 25 and 26.

In Fig. 4 the oppositely extending portions 30 and 31 are curved in contour.

Fig. 5 illustrates in section a pile 35 and a portion 36 of the monolithic wall mounted on the top of the pile. The piles 35 are arranged as shown in Fig. 6 side by side and abutting and they are preferably interlocked in any suitable manner as in the manner illustrated in Figs. 8 to 10 inclusive and hereinafter described.

The monolithic concrete portion of the sea-wall is preferably constructed in some such manner as that shown in Fig. 7, the concrete being reinforced by steel tie rods and other suitable reinforcing structure.

The piles 36 may be formed in any suitable manner and one construction of pile is illustrated in Figs. 8 to 10. From these illustrations it will be seen that each pile has a portion 40 at each longitudinal edge thereof cut away and forming an angular recess and has embedded therein at each edge thereof a longitudinally extending angle or L-shaped bar 41. The piles are driven into the bed with the L-shaped bars interlocking as shown in Fig. 10 and after being set, grout may be poured into the unfilled portions of the recesses entirely filling the interlocking joints. The form of pile just described affords an inexpensive construction and it will be noted that the piles are interchangeable and need not be arranged in any regular sequence as is the case with most of the forms of interlocking piles. The piles as above explained are so driven that they will conform to the zigzag or angular contour of the sea-wall.

From the above description it will be clear that the angular or curved shape or contour of the sea-wall will in addition to its weight and the pile penetration cause each of the oppositely extending portions or panels to be supported and stabilized by the adjacent portion or panel. This form of construction provides great resistance against overturning due to wave impact.

The inshore portion A affords an absolute resistance to wave blows or forces, protects the beach on the lee side and tends to break up the wave surge and currents accelerated by straight jetties as they approach the beach. This portion of the sea-wall also holds the beach on the windward side. The whole structure affords a protection for the beach both above and below the water and induces accretion by retarding the littoral sand drift and inshore current.

Although one specific embodiment of the invention has been particularly shown and described, it will be understood that the invention is capable of modification and that changes in the construction and in the arrangement of the various cooperating parts may be made without departing from the spirit or scope of the invention, as expressed in the following claims.

What I claim is:

1. A self-sustaining sea wall consisting of a rigid elongated structure extending substantially perpendicular to the shore line and having a series of alternately arranged interconnected portions extending on opposite sides of a longitudinal or mean center line of the structure.

2. A self-sustaining sea wall consisting of a rigid elongated structure extending substantially perpendicular to the shoreline and having a series of staggered interconnected portions extending on opposite sides of a longitudinal or mean center line of the structure.

3. A self-sustaining sea wall consisting of a rigid elongated structure extending substantially perpendicular to the shore line and having a series of alternately disposed interconnected portions arranged in zigzag shape.

4. A self-sustaining sea wall consisting of a rigid elongated structure extending substantially perpendicular to the shore line and having a series of staggered portions extending on opposite sides of a longitudinal or mean center line of the structure.

5. A self sustaining sea-wall consisting of a rigid, elongated structure extending substantially perpendicular to the shore line and having a series of interconnected portions extending substantially equal distances on opposite sides of a longitudinal or mean center line of the structure.

6. A sea-wall or jetty comprising a plurality of interconnected piles and a monolithic wall mounted on said piles, said pile structure and said monolithic structure having a series of alternately arranged, interconnected portions extending on opposite sides of a longitudinal or mean center line of the sea wall.

7. A pile structure composed of piles each having oppositely extending, angular recesses at the two side edges thereof and oppositely extending, longitudinal angle bars embedded in the pile structure, the outer edges of said bars being disposed in said recesses, the several piles providing in combination a structure having a series of staggered portions extending on opposite sides of a longitudinal or mean center line of the structure.

8. A self sustaining sea-wall, consisting of a rigid, elongated structure extending substantially at right angles to the shore line and having a series of interconnected portions extending on opposite sides of a longitudinal or mean center line of the structure, said structure comprising piling having a reinforced monolithic concrete cap mounted on its inshore portions.

9. A sea-wall consisting of an elongated structure having a series of interconnected portions extending on opposite sides of the mean center line of the structure, said portions having substantially vertical walls, piling for supporting said portions, the cross sectional area of which no more than equals that of the portions.

10. A self sustaining sea-wall consisting of a rigid, elongated structure extending substantially at right angles to the shore line and having a series of interconnected, alternately arranged portions extending on opposite sides of a longitudinal or mean center line of the structure, said portions being designed to withstand water forces from either side of the structure, said portions having substantially vertical walls, piling for supporting said structure, the thickness of which no more than equals that of the structure.

11. A sea-wall consisting of a rigid, elongated structure having a series of alternately arranged, interconnected portions extending on opposite sides of a longitudinal or mean center line of the structure, said wall being of substantially the same thickness from top to bottom.

In witness whereof, I have hereunto set my hand this 18th day of October, 1926.

HARRY V. CAMPBELL.