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ART OF BEACH PROTECTION

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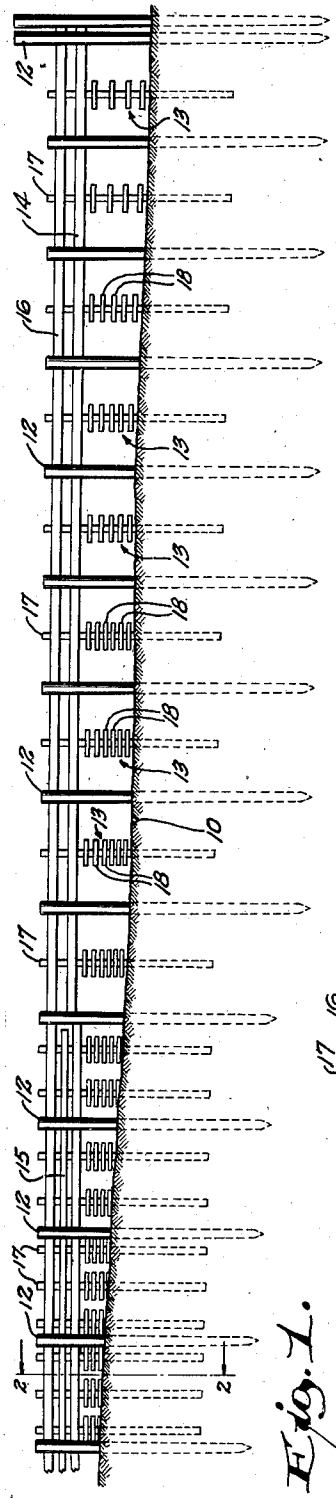


Fig. 1.

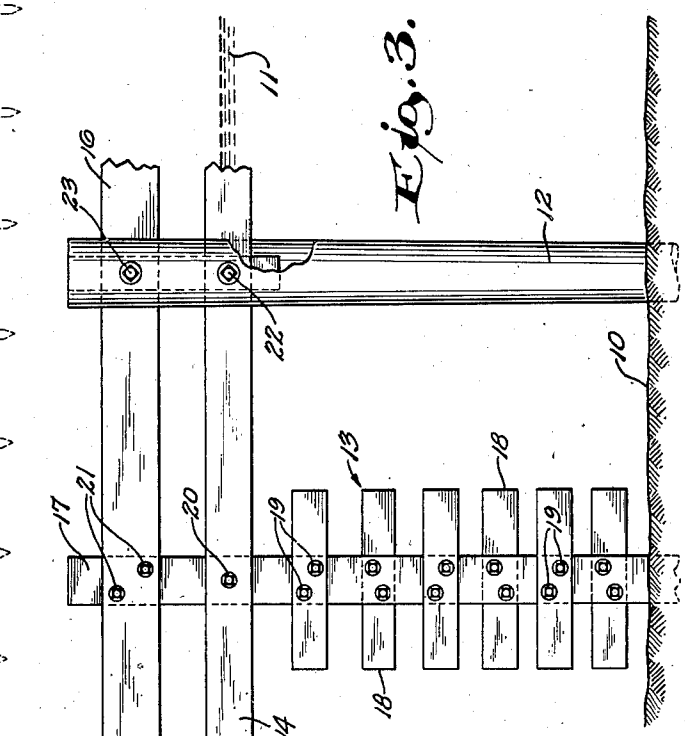


Fig. 3.

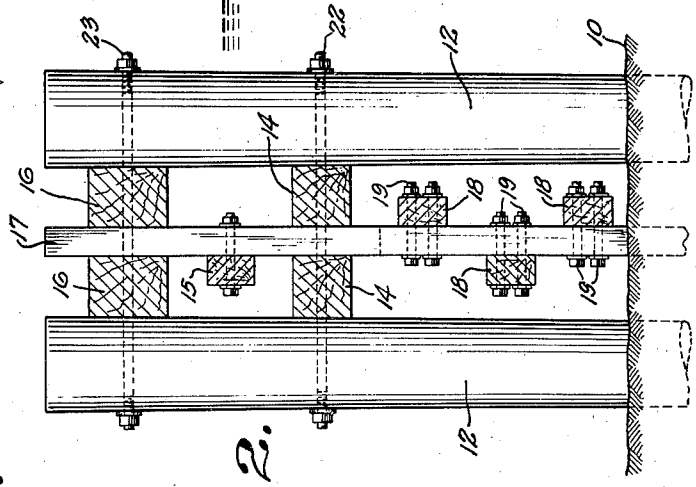


Fig. 2.

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ART OF BEACH PROTECTION

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8 Claims. (Cl. 61—4)

This invention relates to improvements in the art of beach protection.

The problem of protecting water front property is one which has presented innumerable difficulties. An important factor in causing a receding shore line is the erosive action of the water's forces. Necessarily, this erosive action is most damaging during a period when the water level is high, and in view of the fact that statistics show that high levels occur in regular cycles on the Great Lakes, there is always a period of transition between a low level and a high level during which most property owners are inadequately protected.

It has been attempted to check this erosive action by building retaining walls which parallel the edge of the hillside. There is, however, no wall strong enough to permanently withstand the action of the water's forces, and this type of protection is therefore efficacious for a short time only. A long, gradually sloping beach well supplied with sand and gravel, is the best protection against erosive action, as it has the ability to rob a storm of its destructive power, and it is to the formation of a beach of this type that this invention particularly relates.

The principal forces causing erosion on a shore line are contributed to by the air and by the water itself, and the two movements set up by the air are wave action and littoral currents. With a wind blowing directly at right angles to the shore, denudation of the beach takes place, as there is a surface drift shoreward and an undertow lakeward, which, assisted by the fact that the waves stir up sediment, is able to convey material from the shore out to deeper water.

The most common condition is when the wind is blowing at an oblique angle to the shore, and when this is the case the sand and other particles held in suspension in the water are caused to travel along the shore line. With this fact in mind, it may be seen that the particles can be accumulated by the construction of an obstacle across their path, that is, by the construction of a jetty or groin extending into the water at right angles to the bank. The formation of a suitable type of protective beach by this method, however, cannot be accomplished with the ordinary type of groin, as it is found that while deposits may form on the storm side of the jetty, they will tend to concentrate to provide a relatively steep slope adjacent the jetty on this side, and on the lee side objectionable scouring will take place. It is also found that with most types of jetties, scouring will take place at the outer end of the jetty due to the accelerated velocity of the littoral currents around said end.

It is, therefore, one of the objects of the present invention to provide an improved jetty which results in the formation of a long, gradually sloping beach on both sides of the jetty, and in the elimination of scouring action at the outer end.

Other objects of the invention are to provide a jetty which greatly accelerates the deposit of beach building material, which nullifies the wave action and reduces the energy of littoral currents, and which causes the deposit of a greater percentage of fine sand.

A further object of the invention is to provide a jetty adapted to produce a beach which is advantageous, not only in that it protects the shore line, but also in that it renders the shore unusually suitable for bathing purposes.

In my Reissue patent No. 19,786, dated December 10, 1935, and in my Patents No. 2,000,312 dated May 7, 1935 and No. 2,099,249 dated November 16, 1937, several types of jetties for forming protective beaches are shown and described. The present invention contemplates improvements which result in greater control over permeability and which materially facilitate and lessen the expense of installation.

It is a particular object of the present invention to provide a jetty composed, throughout the major portion of the height of the jetty, of upright members and short horizontal members, wherein the short horizontal members are permanently connected to certain of the upright members so as to facilitate installation.

A further object of the invention is to provide a construction as above described wherein the permeability of the jetty may be varied and controlled by varying the spacing between those upright members which carry the short horizontals and by varying the vertical spacing between said horizontal members.

A further object of the invention is to provide a jetty as above described wherein the horizontal members are of such a nature that they may be conveniently assembled on the vertical members prior to installation of the jetty, to provide preassembled units, and wherein only the upper portions of the verticals are connected to each other after the verticals are jetted into the sand. The said connection between the verticals is accomplished by the use of continuous horizontal members positioned near or above the water level. Thus the necessity for under-water work is eliminated, installation is speeded up and the cost of installation is materially reduced.

A further object of the invention is to provide a novel method of building jetties wherein a substantial part of the assembly work, which is normally performed with difficulty under the water, is taken care of prior to installation.

Other objects of the invention are to provide a jetty which permits accurate observation of the degree of penetration from above the water level; to provide a jetty which has a desirable effect upon wave action and water currents; to provide a jetty which eliminates the usual difficulties present when working in muddy water; and to provide a jetty which is formed of units and members that are easy to handle and install.

With the above and other objects in view the invention consists of the improvements in the art of beach protection and all its parts and combinations as set forth in the claims and all equivalents thereof.

In the accompanying drawing illustrating one complete embodiment of the preferred form of the invention, in which the same reference numerals designate the same parts in all of the views;

Fig. 1 is a side elevational view of the improved jetty as installed;

Fig. 2 is an enlarged sectional view taken approximately on the line 2—2 of Fig. 1; and

Fig. 3 is an enlarged fragmentary side elevational view.

Referring more particularly to the drawing, the jetty, as illustrated, is formed of wood. It may, however, be formed of steel, non-ferrous metals or concrete. The numeral 10 designates the bottom of the lake or other body of water in which the jetty is to be installed, and the jetty is installed in a direction to extend out into the water from the beach so that the jetty is at approximately right angles to the shore line. In Fig. 1 the left-hand side of the illustration is the portion of the jetty nearest to the shore line, and the right-hand portion of the illustration is the end of the jetty which is positioned a substantial distance out in the water. An approximate water level is indicated at 11 in Fig. 3. This water lever, however, will vary somewhat from year to year and also will vary during the year.

The jetty consists of a plurality of piles 12, vertically disposed units 13, and elongated horizontal members or walers 14, 15 and 16. The units 13 are an important feature of the present invention and comprise vertical members 17, which are preferably of less length than the piles 12, having short horizontal members 18 secured thereto in vertically spaced relation.

In the improved method of building the jetty a plurality of the units 13 are assembled on the shore. It is preferred to have the short horizontal members 18 alternate in position on opposite sides of the verticals 17, as is clearly illustrated in Figs. 2 and 3. The short horizontals 18 are preferably connected to the verticals by means of bolts 19. The members 18 are so arranged that the bottom-most one is spaced from the lower end of the vertical member 17 a distance sufficient to allow for proper penetration of the vertical into the ground or sand. This distance should be sufficient to bring the bottom-most horizontal member 18 substantially at or slightly above the ground line 10. For the units 13 which are to be installed nearest the shore, a lesser number of short horizontals are used and the vertical spacing is closer together. The uppermost horizontal member 18 should be so arranged that it will be below but somewhat near the water level 11 when the unit is installed in its proper position. As illustrated in Figs. 1 and 3, it is preferred to have the vertical spacing between the horizontal members 18 increase upwardly. This provides for an increase in permeability of the jetty from the bottom up. It is also preferred to utilize a greater spacing between the short horizontal members 18 as the units approach the outer end of the jetty. This can be accomplished by lessening the number of short horizontals 18 toward the outer end of the structure. Thus an outwardly increasing permeability is effected. In addition the permeability may be controlled by varying the spacing between the units 13. In Fig. 1 it is apparent that near the shore line the units 13 are quite close together and that they are spaced farther apart as the jetty progresses outwardly. After the units 13 have all been assembled in a proper manner to obtain a desired effect, the jetty is installed by jetting the main piles 12 and the vertical units into the sand in the manner illustrated in Fig. 1. By making a suitable mark on each of the units 13, the degree of penetration can be observed as the unit is being driven into position. It is preferred to utilize the main piles 12 in pairs as illustrated in Fig. 2. After the piles 12 and vertical units 13 have been driven into position the walers 14, 15 and 16 may be connected to the structure. These walers provide substantially continuous horizontal members and may be spliced at intervals as is required. The walers 14 and 16 are preferably used in pairs, one on each side of the vertical members 17, as is clear from Fig. 2. The walers 14 are connected to the verticals 17 by means of bolts 20 and the walers 16 are connected to the verticals 17 by means of bolts 21. The extra walers 15 which are used near the shore line may be employed on one side only of the verticals 17, as is illustrated in Fig. 2. The walers 14 are connected to the main piles 12 by means of bolts 22 and the walers 16 are similarly connected by means of bolts 23. Inasmuch as the lowermost wales 14 are positioned near or above the water level 11, the installation of the walers involves no under-water work. The fact that the short horizontal members 18 have been assembled before installation of the units 13 eliminates all necessity for under-water work.

The horizontal members 18 are so short that they do not add enough to the weight of the verticals 17 to interfere with ease of handling. Furthermore, by utiliizing the short horizontals the bottom-most horizontal members may even be driven below the prevailing sand level, should this be desired.

It is apparent that installation of the improved jetty can be performed very quickly due to the fact that under-water work is eliminated. It is also apparent that the permeability of the structure may be controlled and varied by varying the spacing between the vertical members 17, by varying the number of members 17 utilized, by varying the vertical spacing between the short horizontals 18, and by varying the number of short horizontals which are installed on a single vertical member 17. Thus any desired effect may be produced. In the jetty illustrated in Fig. 1 there is outwardly increasing permeability and the permeability increases from the bottom upwardly.

Not only is the improved jetty easier to install but the use of the short horizontal members under the water has a very advantageous effect on the passing currents and produces results which

could not be accomplished by the use of continuous submerged horizontal members.

Various changes and modifications may be made without departing from the spirit of the invention and all of such changes are contemplated as may come within the scope of the claims.

What I claim is:

1. A jetty comprising a row of pre-assembled vertically disposed units, each unit including a vertical member having its lower portion extending into the ground and having a plurality of short horizontal members connected thereto in vertically spaced relationship, said short horizontal members being grouped on that portion of each vertical member which is normally below the water level and extending from adjacent the bottom upwardly, some of said units having the short horizontal members vertically spaced progressively farther apart from the bottom upwardly, and means connecting the upper portions of the vertical members to each other.

2. A jetty comprising a row of piles arranged in transverse pairs with transverse spacing between the piles of each pair the pairs of piles being spaced longitudinally of the jetty from each other, pre-assembled vertically disposed units interposed in said row between said longitudinally spaced pairs of piles, each of said units including a vertical member having its lower portion extending into the ground and having a plurality of short horizontal water baffling members connected thereto one above another, said short horizontal members being grouped on that portion of each vertical member which is normally below the water level, and horizontal walers secured to both sides of said vertical members and extending between the upper portions of the piles of each transverse pair and secured thereto.

3. A jetty comprising a row of pre-assembled vertically disposed units, each unit including a vertical member having its lower portion extending into the ground and each unit having a plurality of short horizontal members connected thereto in superimposed spaced relationship, said short horizontal members being grouped on that portion of each vertical member which is normally below the water level and extending from adjacent the bottom upwardly, some of the horizontal members on some of the units being vertically spaced with the horizontal members closer together near the bottom than near the surface, and means connecting the upper portions of the vertical members to each other.

4. A jetty comprising a row of pre-assembled vertically disposed units, each unit including a vertical member having its lower portion extending into the ground and each unit having a plurality of short horizontal members connected thereto in superimposed spaced relationship, said short horizontal members being grouped on that portion of each vertical member which is normally below the water level and extending from adjacent the bottom upwardly to adjacent the surface, at least some of the units having the short horizontal members so positioned with respect to adjacent horizontal members as to provide for less permeability near the bottom than near the surface, and means connecting the upper portions of the vertical members to each other.

5. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall including superimposed elements positioned under the water and extending from adjacent the bottom upwardly to near the surface of the water, said elements being positioned to provide underwater spaces through the wall which are of less size near the bottom than near the surface of the water.

6. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall including superimposed elements positioned under the water and extending from adjacent the bottom upwardly to near the surface of the water, said elements being positioned to provide underwater spaces through the wall which are of progressively less size near the bottom than near the surface of the water.

7. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall including vertically spaced superimposed horizontal members positioned under the water and extending from adjacent the bottom upwardly to near the surface of the water, the spaces between members being of a size to allow less permeability near the bottom than near the surface of the water.

8. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall including superimposed horizontal elements positioned under the water and extending from adjacent the bottom upwardly to near the surface of the water, said elements being vertically spaced progressively farther apart from the bottom upwardly.

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