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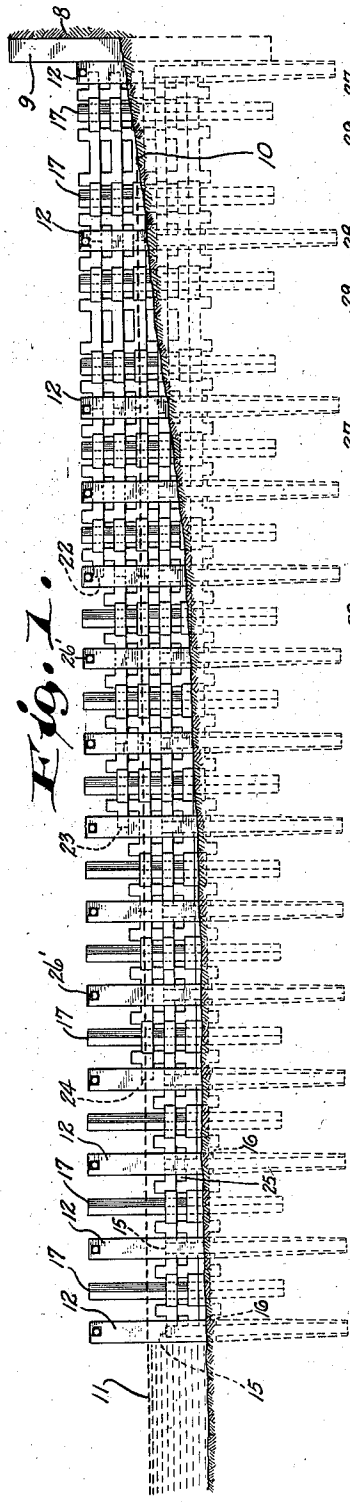


Fig. 1.

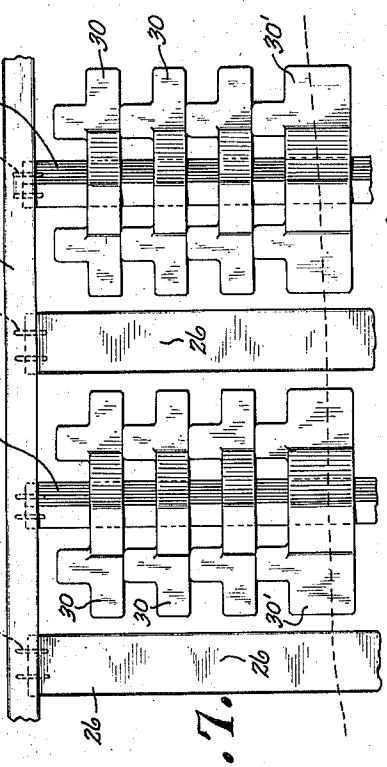


Fig. 7.

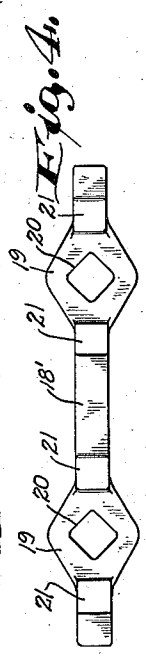


Fig. 4.

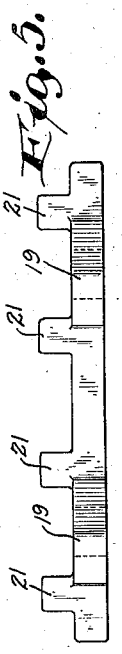


Fig. 5.



Fig. 6.



Fig. 3.

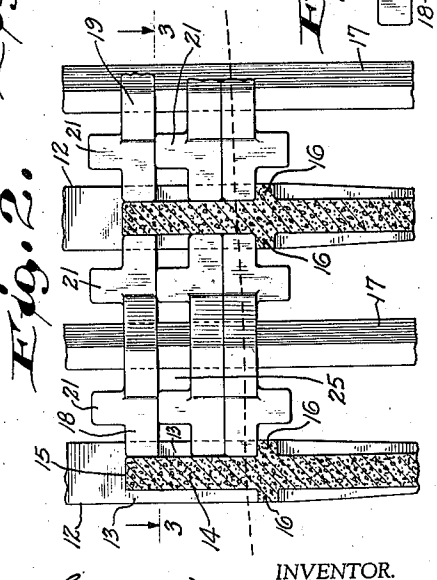


Fig. 2.

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5 Claims. (Cl. 61—4)

This invention relates to improvements in jetties.

The problem of protecting water front property is one which has presented enumerable difficulties particularly along the shores of the Great Lakes and the shore of the ocean where great property destruction has occurred. 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.

Heretofore, 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 breach 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 #19,786, dated December 10, 1935, one type of jetty for forming a protective beach is shown and described. This type of jetty is particularly adapted for use along the shore of a lake such as one of the Great Lakes. The present invention contemplates a jetty more particularly adapted for use along the shores of an ocean. While my prior Patent No. 2,000,312 also discloses a jetty particularly adapted for ocean work, the present invention contemplates improvements which result in greater permeability and which materially facilitate installation.

It is a particular object of the present invention to provide a jetty composed of upright members and horizontal members wherein the horizontal members so cooperate with certain of the upright members as to eliminate the necessity of employing additional securing means to maintain the horizontal members in position.

A more specific object of the invention is to provide a jetty as above described wherein the horizontal members are formed with loops through which the upright members are adapted to extend in order to anchor the horizontal members in position.

A further specific object of the invention is to provide a structure as above described wherein the loops are preferably formed in intermediate portions of the horizontal members for cooperation with certain of the uprights and wherein the ends of said horizontal members cooperate in a different way with other uprights.

Other objects of the invention are as follows: to provide a jetty wherein the upright members may be provided with lugs to afford permeability;

to provide a jetty wherein the necessity of employing waling is eliminated; to provide a structure which is sufficiently substantial to withstand the forces of the ocean; to provide a jetty formed of elements which may be cast from concrete wherein a minimum number of molds is necessary; and to provide a construction which is sufficiently flexible in its possibilities to meet various requirements.

With the above and other objects in view, the invention consists of the improved jetty and all its parts and combinations as set forth in the claims and all equivalents thereof.

In the accompanying drawing illustrating preferred forms 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 a fragmentary enlarged elevational view of the jetty, certain of the uprights being shown in longitudinal section;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a plan view of one of the horizontal members alone;

Fig. 5 is a side view of one of the horizontal members;

Fig. 6 is a fragmentary side view of a horizontal member showing a lug of less height; and

Fig. 7 is a fragmentary side elevational view of a modified form of jetty.

Referring more particularly to the drawing, the numeral 8 designates a hillside bordering an ocean or other body of water, and the numeral 9 designates an artificial barrier such as a retaining wall paralleling the hillside. The numeral 10 designates a sand beach, and the numeral 11 the water level.

The jetty is preferably formed of a plurality of Portland cement elements which have been cast in suitable molds. Other materials such as creosoted yellow pine may, however, be employed. The main upright members or piles designated by the numeral 12 are preferably I-shaped in cross section as indicated in Fig. 3 to provide a channel-shaped recess 13 on each side. The webbing 14 of each pile preferably terminates short of the top of the pile as at 15, and it is preferred to provide sills 16 in the channels 13 as shown in Fig. 2.

Other upright members 17 are preferably substantially square in cross section and somewhat shorter than the main upright members 12.

The horizontal members may be furnished in a plurality of lengths. In Figs. 2 and 3 a single length horizontal member is indicated, and these members each comprise an elongated body portion 18 having a substantially diamond-shaped intermediate portion or loop 19 formed with a diamond-shaped aperture 20 extending therethrough, which aperture is of proper size and shape to slidably receive one of the upright members 17. Said intermediate portions 19 of the horizontal members may of course be shaped differently than shown, the diamond shape, however, being preferred. In addition the aperture 20 may be of any shape to properly cooperate with the shape of the upright member 17 which is used. The horizontal members 18 are also provided with upwardly extending integral lugs 21, which lugs are positioned on each side of the aperture 20.

For most work it is desirable to have a number of horizontal members 18' which are of double length as indicated in Figs. 4 and 5. That is, each one of these double length horizontal members includes two of the loops 19 and two sets of lugs 21, so that it is locked against sway by two uprights.

In making a jetty of this type one of the upright members 12 is driven in adjacent the front of the retaining wall 9, or closely adjacent to the natural bank if there is no retaining wall, and a second upright member 12 which is spaced toward the water from the first upright member is also driven into position. Next two of the upright members 17, suitably spaced with respect to the apertures of the horizontal members to be used, are driven into position as shown in Fig. 1. One of the double length horizontal members 18' shown in Fig. 4 is then dropped into position with the upright members 17 extending through the apertures 20. The ends of the horizontal members are slid downwardly in the channels 13 of the upright members 12 until said ends strike the sills 16. Then other horizontal members are assembled in superimposed position with respect to one another to build up a wall structure of desired height. It is preferred to lay the first two horizontal members back to back as indicated in Fig. 1 so as to provide somewhat less permeability near the bottom of the jetty. The other horizontal members, however, are all preferably supported on the upwardly extending lugs 21 of the horizontal member there-below.

As the work on the jetty progresses outwardly, the upright members 12 are preferably driven closer together so that the space there-between can be bridged by a single length horizontal member, and the lower portion of the jetty therefore contains only single length horizontal members. However, for portions of the jetty above the upper ends of the webbing 15, double length horizontal members may again be employed. As the jetty progresses outwardly into the water it is preferred that the rows of horizontal members be stepped downwardly as at 22, 23 and 24, to provide a jetty of outwardly decreasing height. It is apparent that this outwardly decreasing height may be either gradual or abrupt depending upon the particular requirements.

If it is desired to form a jetty having apertures 25 of less size, then horizontal members having shorter lugs 21' as shown in Fig. 6 may be used, or if it is desired to increase the size of the apertures, the horizontal members may be made with lugs which are of greater length than the lugs 21.

After the jetty is completed, it is preferred to utilize bolts 26' to tie the spaced upper ends of the upright members 12 together.

It is to be noted that in order to provide firm foundation for the structure, that the uprights 12 are driven into the sand a distance approximately equal to the length of the portion projecting above the sand.

As a result of this structure it will be seen that water can pass through the sides of the jetty by way of the openings 25 between lugs, but that its passage is retarded by both the upright members and by the horizontal members and lugs. By referring to Figure 1 it will be seen that the major portion of the length of the rows of horizontal members projects above the water line, but that the outer end is submerged. This is for the purpose of allowing the shore currents to pass at reduced speeds through and over the submerged end to cause the retardation of currents passing inwardly or outwardly along the sides to prevent scouring at said ends and along said sides.

It has been found that the character of the beach may be still further improved by utilizing more than one jetty, the jetties being laid in parallel relationship to one another and spaced apart a substantial distance.

Due to the permeable nature of the wall, the water can flow through the spaces **25** so that there is no tendency for the currents to move in a direction parallel to the jetty and travel around the outer end with accelerated velocity such as is the case with a jetty of the impermeable type. Thus scouring at the outer end is eliminated. Furthermore, due to the fact that the currents are slowed down in a uniform manner by the permeable jetty and can trickle there-through, an even deposit of fine material is encouraged on both sides of the jetty, and this deposit will gradually build up, not only directly adjacent the sides, but for a substantial distance laterally therefrom to cause the formation of a long gradually sloping beach composed of fine particles of sand. With the impermeable type of jetty the littoral currents would rush around the outer end and cause scouring, and would then move inwardly toward the shore on the other side of the jetty and cause scouring on the lee side.

In Figure 7 a modified form of jetty is illustrated, said jetty being more particularly adapted for lake work as distinguished from ocean work. This jetty comprises upright members **26** and other upright members **27**, the upper ends of which are joined by a deck **28**, the deck being suitably tied to the upper ends of the uprights by rods **29** or the like. Horizontal members **30** which may be identical to the horizontal members **18** of the principal form of the invention and which are similarly formed with apertures corresponding in shape to the shape of the uprights **27**, are held in position by said upright members **27** which extend through the apertures. The ends of the horizontal members preferably terminate short of the upright members **26**. Due to the fact that the upright members **27** are square in cross section and extend through square apertures, the horizontal members are fixed against turning movement notwithstanding the fact that the ends are free. If desired, the lowermost horizontal member may be of increased thickness as at **30'**.

While in both forms of the invention the horizontal members have been shown as formed with lugs **21**, nevertheless, for certain forms of work it may be desirable to have less permeability or no permeability at all. In this case the horizontal members may be formed without lugs to provide a substantially solid wall, and the present invention contemplates the use of horizontal members either with or without lugs as long as other features of the invention are employed, such as the cooperation of the upright members with loops or apertures in the horizontal members.

Various other 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 an elongated wall extending outwardly at an angle to the shore, said wall comprising spaced upright members and superimposed horizontal members, said horizontal members being formed with interior apertures, and at least some of the upright members being of slightly less size than said apertures to extend through said apertures so that the horizontal members may be dropped into assembled position over said uprights, the cooperating upright members and apertures having at least one cooperating straight side, said cooperating straight sides fitting sufficiently close to one another to prevent turning movement of the horizontal members.

2. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall comprising spaced upright members and superimposed horizontal members, said horizontal members being formed with apertures, and at least some of the upright members being of a size to extend through said apertures so that the horizontal members may be dropped into assembled position over said uprights, and lugs on said horizontal members for vertically spacing the horizontal members from one another.

3. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall comprising spaced upright members, horizontal members laid in superimposed position between said upright members and having registering interior apertures formed with at least one straight side, and other upright members between said first upright members and extending through the apertures of said horizontal members said other upright members being of the same cross-sectional shape as said apertures and of a cross-sectional size nearly as great to serve as guides for and to anchor said horizontal members in position and against turning movement.

4. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall comprising spaced upright members, horizontal members laid in superimposed position between said upright members and having registering aperatures, and other upright members between said first upright members and extending through the apertures of said horizontal members, said first upright members being I-shaped in cross section to provide channels for slidably receiving the ends of the horizontal members, there being sills in said channels for supporting the ends of the lowermost horizontal members.

5. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall comprising spaced upright members, horizontal members laid in superimposed position between said upright members and having registering apertures, and other upright members between said first upright members and extending through the apertures of said horizontal members, and lugs on said horizontal members for vertically spacing the horizontal members from one another.

SYDNEY M. WOOD.