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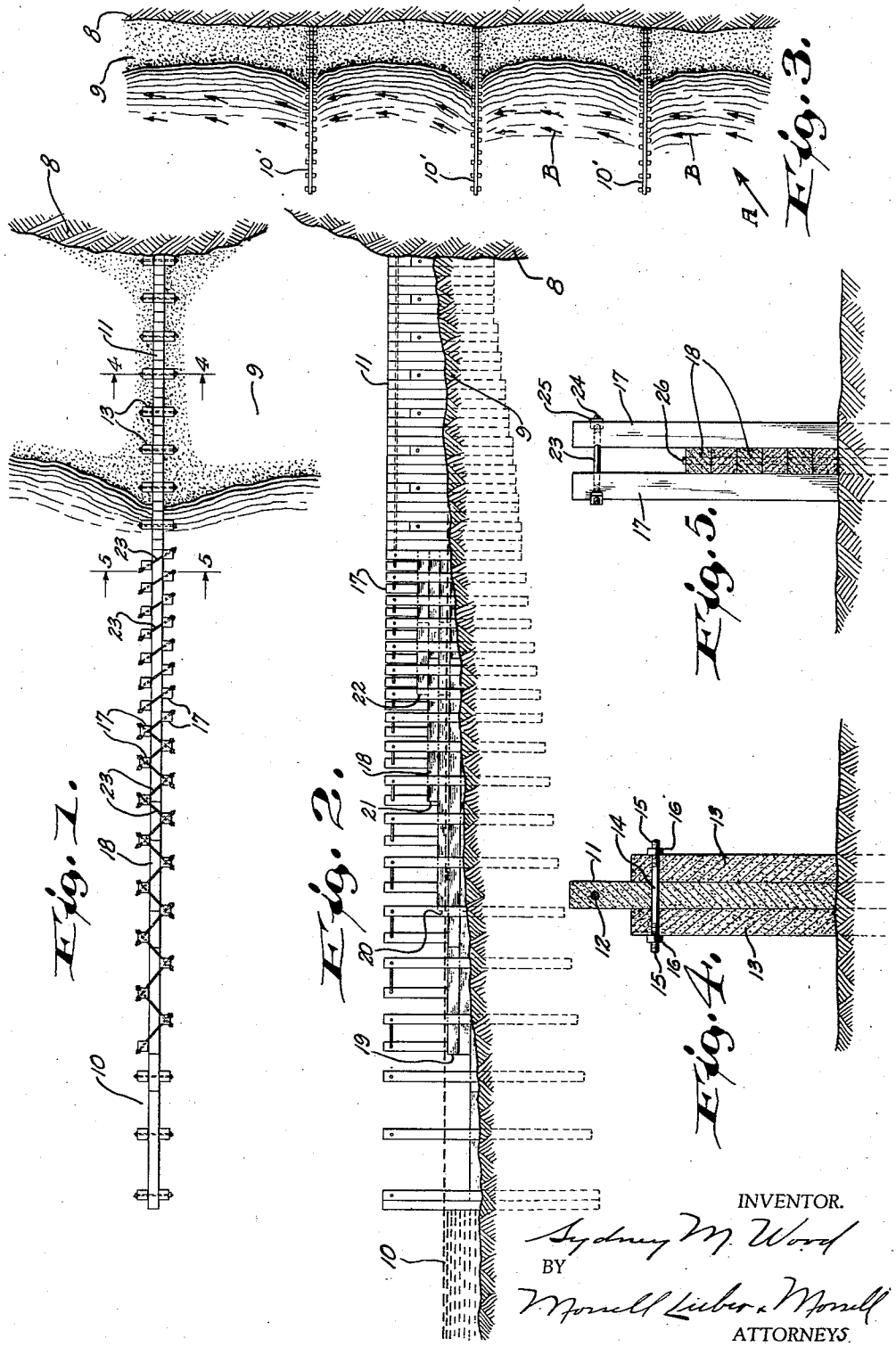

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

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6 Claims. (Cl. 61—4)

This invention relates to improvements in the art of forming protective beaches.

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 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 method of forming protective beaches 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.

A further object of the invention is to provide an improved jetty for effecting commercial exploitation of the above method.

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 Patent #1,928,473, dated September 26, 1933, 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. In my prior patent a construction is shown wherein outwardly increasing permeability is obtained by the use of loosely laid rock. Rock, however, is unsatisfactory as a general rule for ocean work because of the fact that there is no clay footing in the ocean and the rock is likely to be quickly undermined.

It is therefore a particular object of the present invention to provide a jetty construction which will afford outwardly increasing permeability wherein the jetty is constructed of means capable of withstanding the conditions to which it is subjected in ocean use.

A more specific object of the invention is to provide a jetty as above described comprising spaced upright members laid in two parallel rows with horizontal members supported between the uprights, both the horizontal members and the upright members cooperating to produce the desired outwardly increasing permeability.

With the above and other objects in view the invention consists of the art of forming protective beaches 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 plan view of the improved jetty;

Fig. 2 is a side elevational view thereof;

Fig. 3 is a plan view on a reduced scale showing a shore line with a plurality of jetties installed;

Fig. 4 is an enlarged vertical sectional view taken on line 4—4 of Fig. 1; and

Fig. 5 is a similar view taken on line 5—5 of Fig. 1.

Referring more particularly to the drawing, the numeral 8 designates a hillside leading down to a beach bordering an ocean or other body of water. In cases where there is an artificial barrier such as a retaining wall paralleling the hillside the jetty may be laid in the same relation with respect thereto as it is with respect to the hillside 8. The numeral 9 designates the sand beach and the numeral 10 the water level.

With the present invention in order to obstruct the littoral currents to cause the deposit of particles of sand in proper formation to provide a long, gradually sloping beach, one or more of the jetties, designated generally by the numeral 10', may be extended from the hillside or wall 8 outwardly into the water at approximately right angles to the hillside. In view of the fact that permeability is unimportant on the portion of the beach close to the hillside which is not ordinarily reached by the water, it is preferred to construct this portion of the jetty in a different manner from the portion which actually extends into the water.

As shown in Figs. 1, 2 and 4, a plurality of piles or posts 11, which are preferably constructed of Portland cement but which may also be formed of creosoted yellow pine or other suitable material, are driven into the beach in juxtaposition to one another to form a row extending from the hillside 8 to approximately the water's edge. The piles 11 may be reinforced and bound together by one or more metal rods 12 extending therethrough. At intervals other piles 13 may be driven alongside of the row of piles 11 as shown in Fig. 4 and rods 14 having threaded ends 15 for the reception of nuts 16 may be inserted transversely through each pair of piles 13 and through the row of piles 11 therebetween. The row of piles 11 is preferably larger than shown, and it is desirable to have it about 65% of the total length of the jetty.

At the end of the row of piles 11 similar piles 17 may be driven into the sand to form two rows as indicated in Fig. 1, the rows being spaced apart a distance approximately equal to the width of one of the piles. The piles 17 are spaced farther apart as they progress out into the water as may be seen from an examination of Fig. 2. Also, the majority of the piles of one row are staggered with respect to the piles of the other row.

Between the rows of piles 17 are laid in horizontal position a plurality of similar members 18, these members being laid in superimposed rows with upper rows terminating short of the lower ones as indicated at 19, 20, 21 and 22. Thus the height of the superimposed rows of members 18 decreases outwardly.

The upper ends of the piles 17 may be connected together in any suitable manner, but it is preferred to utilize obliquely extending rods 23 which are threaded at their ends at at 24 to receive nuts 25 in the manner shown in Fig. 5. Other rods 26 may be inserted vertically through the superimposed rows of members 18.

The piles 17 and members 18 may also be formed of Portland cement, creosoted yellow pine or other material capable of withstanding the elements.

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

As a result of this structure it will be seen that the water can pass through the sides of the jetty at any point outwardly of the row 11 but that its passage is retarded by both the upright piles 17 and the horizontal members 18 and that the amount of this retardation decreases outwardly due to the combination of the decreasing height of the horizontal members and the wider spacing of the upright members, this construction serving to form an outwardly increasing permeability.

By referring to Fig. 2 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 and to cause the retardation of currents passing inwardly or outwardly along the sides to prevent scouring at the ends and along the sides.

It is found that the character of the beach may be still further improved by laying a plurality of jetties of the type described in parallel relation to one another and spaced apart a substantial distance as indicated in Fig. 3.

Where a solid or impermeable jetty has been used, the littoral currents carrying the sand and other fine particles in suspension are obstructed by the sides of the jetty, but the velocity of the currents is accelerated to cause a rather abrupt turning of the flow of the littoral currents from a direction parallel to the shore line to a direction parallel to the sides of the jetty, the currents therefore flowing around the end of the jetty with accelerated velocity. When the littoral currents strike the sides of an impermeable jetty, there is likely to be a momentary and rather abrupt change in the direction of travel of the currents which causes a deposit in a rather abrupt manner close to the windward side of the jetty, and inasmuch as this deposit will be concentrated adjacent the jetty, any beach developed will have an abrupt slope and will not be desirable. Furthermore, due to the accelerated velocity of the littoral currents as they move around the end of the impermeable jetty, the fine sands are carried with the current, and the majority of the fill adjacent the jetty will be of coarser material. In addition, the action of the currents around the end of an impermeable jetty wherein the velocity is greatly accelerated will cause a marked scouring to take place at the outer end of the jetty, and thereby develop a deep water spot objectionable for bathing purposes.

With the present invention, it is to be noted that the major portion of the length of the jetty is increasingly permeable outwardly, and as a result, while the littoral currents are obstructed in a manner to cause the deposit of sand and other material held in suspension, nevertheless,

due to the permeable nature of the wall, the water can flow through the spaces so that there is not the 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 the 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 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 which rush around the outer end and there cause scouring and which then move inwardly toward the shore on the other side of the jetty, will cause a scouring on the lee side.

By referring to Fig. 3, it will be seen that with applicant's type of jetty, that when the wind is traveling in an oblique direction toward the shore, as indicated by the arrow A, that the littoral currents indicated by the arrows B will flow somewhat in the manner indicated, that is, approximately parallel to the shore. As said currents strike the permeable jetty, instead of changing direction and traveling at right angles to the sides of the jetty and around the outer end at accelerated velocity, they will pass through the permeable jetty and there will only be a slight tendency to direct the currents outwardly. The currents will then continue as indicated, passing approximately parallel to the shore between each pair of jetties and through the next successive jetty. The result will be a gradual slowing down of the littoral currents to cause a gradual deposit of sand and the formation of an ever widening beach composed of fine material, as indicated by the numeral 9 wherein the angle of the beach is relatively flat, and wherein the tendency for the beach to concentrate directly adjacent the sides of the jetty, is minimized.

It will further be seen that with the present invention, the area of new land formed will be much greater per foot of jetty than would occur with an ordinary type of construction.

Although only one form of the invention has been shown and described, it is to be understood that various changes and modifications may be made, and that 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 being formed of parallel rows of spaced upright members, and other members laid horizontally between said rows, the spacing of the upright members increasing outwardly to provide outwardly increasing permeability.

2. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of parallel rows of spaced upright members, and other members laid horizontally between said rows, the spacing of the upright members increasing outwardly, and the height of the portion formed by said horizontally laid members decreasing outwardly thereby providing in combination with the upright members a jetty of outwardly increasing permeability to partially obstruct littoral currents and cause a gradual decrease in the velocity of said currents and the deposit of beach building material.

3. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of parallel rows of spaced upright members and other elongated members laid horizontally therebetween in superimposed rows, the spacing of the upright members increasing outwardly, and the height of the portion formed by said horizontally laid members decreasing outwardly thereby providing a jetty of outwardly increasing permeability to partially obstruct littoral currents and cause a gradual decrease in the velocity of said currents and the deposit of beach building material.

4. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of parallel rows of spaced upright members and other elongated members laid horizontally therebetween in superimposed rows, the spacing of the upright members increasing outwardly, and upper rows of horizontally laid members being of less length than rows therebelow to provide for outwardly decreasing height which together with the increased spacing of the upright members forms a jetty of outwardly increasing permeability to partially obstruct littoral currents and thereby cause a gradual decrease in the velocity of said currents and the deposit of beach building material.

5. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of parallel rows of spaced upright members, and other members laid horizontally between said rows, the spacing of the upright members increasing outwardly to provide outwardly increasing permeability and upright members of one row being staggered with respect to upright members of the other row.

6. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of parallel rows of spaced upright members, and other members laid horizontally between said rows, the spacing of the upright members increasing outwardly to provide outwardly increasing permeability, and means connecting upright members of one row with adjacent upright members of the other row.

SYDNEY M. WOOD.