May 7, 1935. S. M. WOOD ET AL 2,000,311

JETTY

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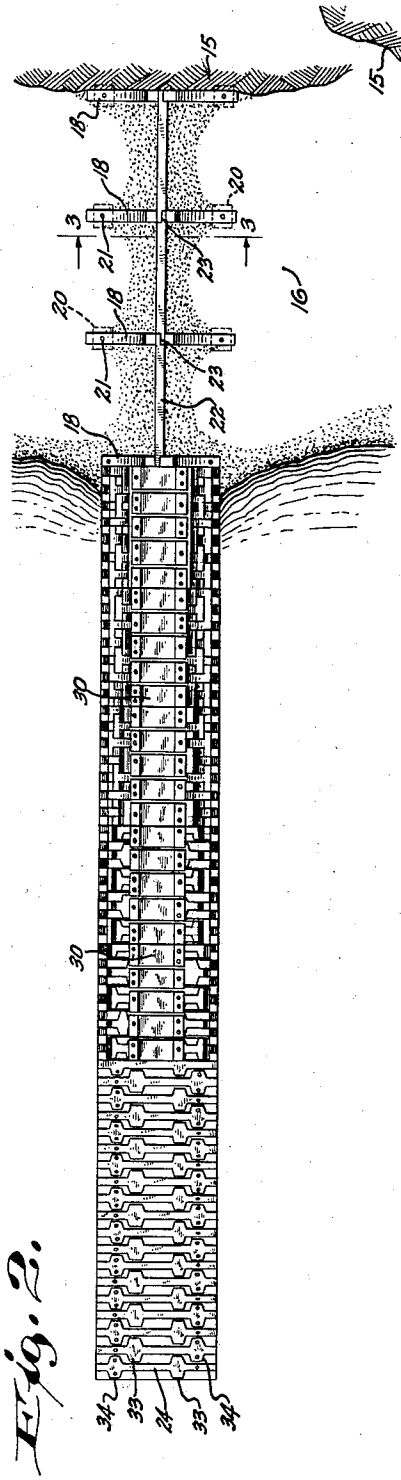

Fig. 2.

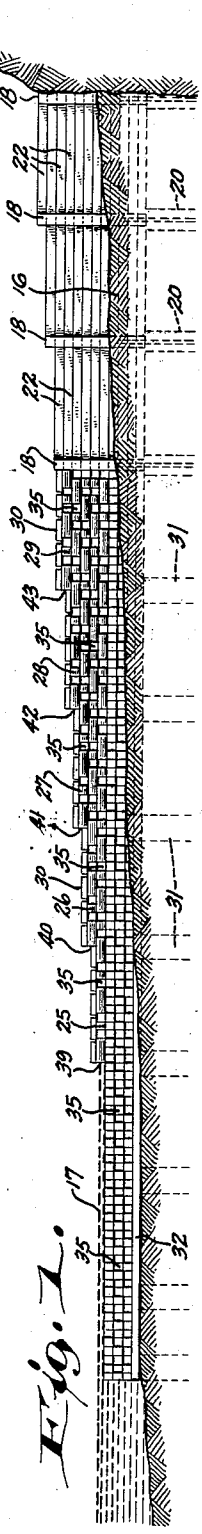

Fig. 1.

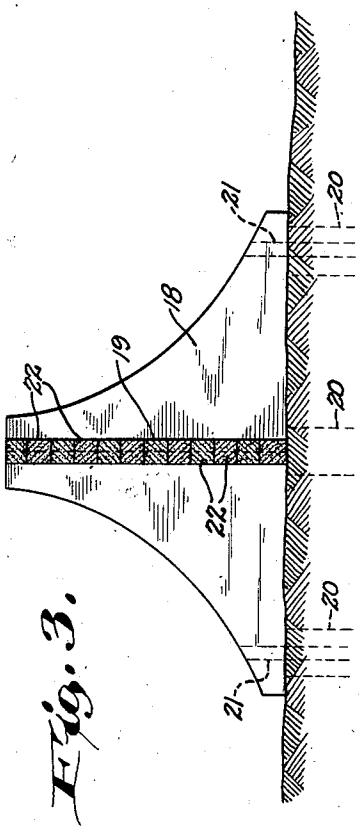

Fig. 3.

INVENTORS
Sydney M. Wood
Harry A. Schmitt
BY
Worrell Luther & Worrell
ATTORNEYS.

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Fig. 5.

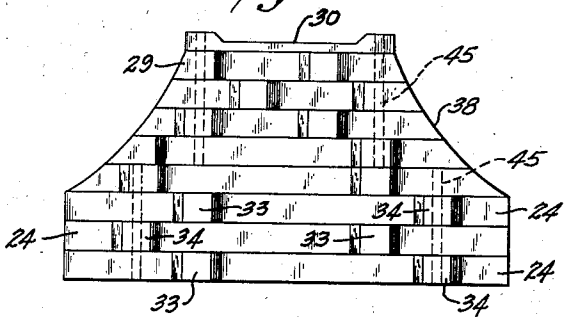


Fig. 4.

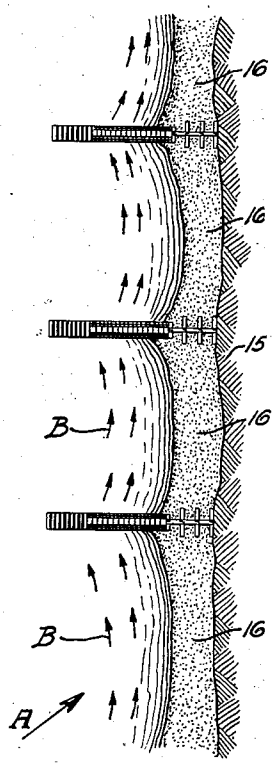


Fig. 7.

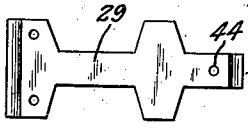


Fig. 8.

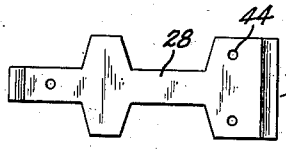


Fig. 9.

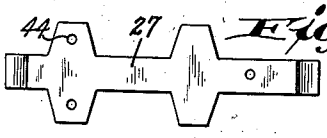


Fig. 10.

Fig. 11.

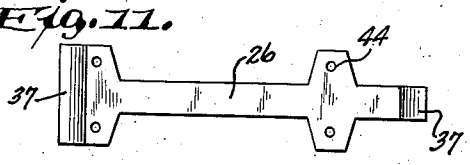


Fig. 12.

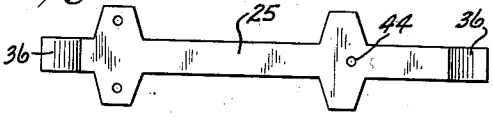


Fig. 13.

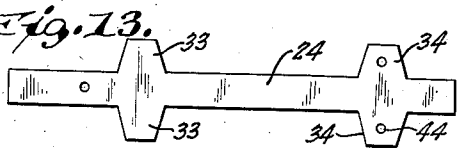
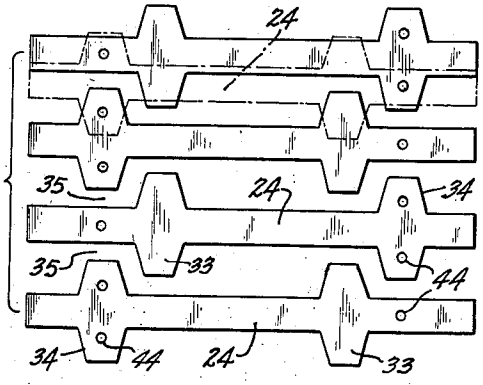


Fig. 6.



INVENTORS.
Sydney M. Wood
Harry C. Schmitt
BY
Morsell Luber & Morsell
ATTORNEYS.

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UNITED STATES PATENT OFFICE

2,000,311

JETTY

Sydney M. Wood, Lake Bluff, Ill., and Harry A. Schmitt, Milwaukee, Wis.

Application January 6, 1934, Serial No. 705,494

12 Claims. (Cl. 61—4)

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

The problem of protecting lake front property is one which has presented innumerable difficulties particularly along the shores of the Great Lakes where great property destruction has occurred. An important factor in causing a receding shore line is the erosive action of the lake's forces. Necessarily, this erosive action is most damaging during a period when the lake level is high, and in view of the fact that statistics show that high levels occur in regular cycles, 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 lake'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 lake shore 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 lake 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 Wood Patent #1,928,473, dated September 26, 1933, one type of jetty for forming a protective beach is shown and described. The present invention relates to a jetty of a particular shape wherein permeability is utilized in connection therewith for accomplishing the desired object. In the patent above referred to this permeability is accomplished by the use of rock laid in relatively loose formation. However, rock is not always easy to obtain and it is always difficult to transport it to the lake shore.

The present invention contemplates the formation of a jetty from units which may be cast of Portland cement or the like and this casting may be done on the beach so that hauling of the heavy units is eliminated.

A further object of the invention is to provide a novel form of shore structure for use in connection with a jetty of the type described, said shore structure being of a relatively inexpensive nature wherein repairs can be easily made and yet possessing great strength.

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 drawings 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;

Fig. 2 is a plan view thereof;

Fig. 3 is an enlarged cross-sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a plan view on a reduced scale, of a lake shore, showing a plurality of parallel jetties installed;

Fig. 5 is an enlarged cross-sectional view taken through the unit formed part of the jetty, none of the units of the jetty, however, being cut through;

Fig. 6 is a plan view showing the method of assembling a group of the units; and

Figs. 7 to 13 are plan views showing the different types of units which may be utilized in the structure.

Referring more particularly to the drawings, the numeral 15 designates a hillside leading down to a beach bordering a lake or other body of water. In cases where there is an artificial barrier such as a retaining wall paralleling a hillside the jetty may be laid in the same relation with respect thereto as it is with respect to the hillside 15. The numeral 16 designates the sand beach and the numeral 17 the water level of the lake.

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 jetties may be extended from the hillside or wall 15 outwardly into the lake 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 of the lake, 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 Fig. 2 and Fig. 3, a plurality of supporting wings 18 which may be molded from cement or the like, are positioned in pairs as shown, there being a space 19 between each pair of wings. In order to provide a foundation for these relatively heavy wings it is preferred to drive piles of wood or concrete into the sand as indicated by the numeral 20 and metal rods or the like 21 may be caused to project from the piles and to extend through apertures in the wings in order to firmly anchor the latter in position.

Elongated beams of concrete or any suitable material 22 may be laid in superimposed horizontal position in the spaces 19 between the wings, the ends of said beams being preferably dovetailed as at 23. These beams therefore form a durable wall structure which is resistant to turning movement or other forces because of the fact that the laterally extending wings form an effective brace therefor.

The jetty proper consists of a plurality of units of irregular shape which are cast from cement or the like and these various units used are designated by the numerals 24, 25, 26, 27, 28, 29 and 30, shown in Figs. 7 to 13 inclusive. Before the units are laid, piles 31 should be driven into the sand beneath the water to form a base structure and on these piles foundation slabs of cement or the like may be laid as at 32. Next a plurality of the longest units 24 are laid to form a row on top of the foundation 32. These units are formed with sets of projections 33 and 34 and it will be noted that the projections 33 are spaced a greater distance from one end than the projections 34 are spaced from the other end. This provides for laying of the units in the manner shown in Fig. 6 to produce a staggered formation and provide a baffled channel 35 between each pair of units. After approximately three layers of the units 24 have been laid, a new layer is begun, using the units 25 shown in Fig. 12. These units differ only in that their ends are of beveled formation as at 36. Next a row of the units shown in Fig. 11 is laid, these units 26 being somewhat shorter in length than the units 25 and also having beveled ends 37 for alinement with the beveled ends 36 of the units 25. Next a row is laid with each of the blocks 27, 28 and 29 shown in Figs. 10, 9 and 8, to thereby form the structure shown in Fig. 5 wherein the sides taper preferably on a slightly curved line 38 as illustrated on said figure. On top of the row of units 29 may be laid a row of the strips 30 to thereby form a structure on which a person can walk.

The first three rows, or any desired number for that matter to suit particular requirements, may extend the full length of the jetty. Subsequent rows, however, may be shorter to provide a structure of decreasing height outwardly. Accordingly, the row of units 25 may terminate at the point 39 as indicated. The next row of units 26 may terminate at the point 40, the row of units 27 at point 41, the row of units 28 at point 42, and the row of units 29 at point 43.

Each of the units is formed with apertures 44 therein and the various superimposed layers of units may therefore be connected together by running rods of metal or the like 45 through registering apertures 44 of the superimposed layers. The apertures may be plugged with cement in order to hold the rods in place. The method of laying units in a superimposed row is shown by dot and dash lines in Fig. 6. This figure also indicates the manner in which the apertures 44 aline.

As a result of this structure it will be seen that the water can pass through the sides of the jetty at any point but that its passage is retarded due to the fact that the projections 33 and 34 form baffles around which the water must travel. Thus, the force of the littoral currents will be considerably checked to cause the deposit of particles of sand in proper formation to provide a long, gradually sloping beach.

By referring to Fig. 1 it will be seen that the major portion of the length of the jetty 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. 4.

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 permeable, 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 35 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. 4, it will be seen that with applicants' type of jetty, that when the wind is travelling 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 16 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, and that the sloped sides of the jetty shown in the cross-sections tends to nullify wave action and to reduce the energy of the littoral currents.

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 we claim is:

1. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of transversely laid spaced apart units, some of said units having lateral projections spaced from portions of an adjacent unit to provide a baffle for water passing between said unit and an adjacent one.

2. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of similar transversely laid units, each unit being formed with lateral projections, the units being laid in spaced apart relation with the projections of one unit staggered with respect to the projections of an adjacent unit to provide a circuitous path for water.

3. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of superimposed layers of similar transversely laid units, each unit being formed with lateral projections, the units being laid in spaced apart relation with the projections of one unit staggered with respect to the projections of an adjacent unit to provide a circuitous path for water.

4. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of superimposed layers of similar transversely laid units, each unit being formed with lateral projections, the units being laid in spaced apart relation with the projections of one unit staggered with respect to the projections of an adjacent unit to provide a circuitous path for water, upper layers being of less width than layers therebelow to provide tapered sides.

5. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of superimposed layers of similar transversely laid units, each unit being formed with lateral projections, the units being laid in spaced apart relation with the projections of one unit staggered with respect to the projections of an adjacent unit to provide a circuitous path for water, upper layers being of less width than layers therebelow to provide tapered sides and being of less length to provide for an outwardly decreasing height for the jetty.

6. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of superimposed layers of similar transversely laid units, each unit being formed with lateral projections, the units being laid in spaced apart relation with the projections of one unit staggered with respect to the projections of an adjacent unit to provide a circuitous path for water, the units of each layer being offset with respect to the units of an adjacent layer.

7. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of similar transversely laid units, each unit being formed with a lateral projection near each end, one of the projections being nearer its end than the other whereby like adjacent units may be laid in reversely extending position to cause staggering of the projections thereon and thereby provide a circuitous path for water.

8. A jetty comprising an elongated wall extend-

ing outwardly at an angle to the shore, said wall being formed of similar transversely laid units, each unit being formed with a pair of oppositely extending projections near each end, one of said pairs of projections being nearer its end than the other whereby like adjacent units may be laid in reversely extending position to cause staggering of the projections thereon and thereby provide a circuitous path for water.

9. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of superimposed layers of similar transversely laid units, each unit being formed with a lateral projection near each end, one of the projections being nearer its end than the other whereby like adjacent units may be laid in reversely extending position to cause staggering of the projections thereon and thereby provide a circuitous path for water, the units of each layer being offset with respect to the units of a layer below and the projections on the units of the adjacent layers cooperating to form support for the units of each layer in said offset relation.

10. A jetty comprising an elongated wall extending outwardly at an angle to the shore, said wall being formed of superimposed layers of similar transversely laid units, each unit being formed with a lateral projection near each end, one of the projections being nearer its end than the other whereby like adjacent units may be laid in reversely extending position to cause staggering of the projections thereon and thereby provide a circuitous path for water, the units of each layer being offset with respect to the units of a layer below and the projections on the units of the adjacent layers cooperating to form support for the units of each layer in said offset relation, and connecting means extending through overlapping parts of a plurality of layers of the units.

11. A unit for forming a permeable jetty comprising an elongated body portion having a pair of oppositely extending projections near one end, and having a pair of oppositely extending projections spaced a greater distance from the other end than said first pair of projections is spaced from its end.

12. A unit for forming a permeable jetty comprising an elongated body portion having a pair of oppositely extending projections near one end, and having a pair of oppositely extending projections spaced from the other end a distance greater than the spacing of the first pair of projections from its end by at least the width of one of the projections, there being an aperture in each projection of the first pair and an aperture in the body portion of the unit between the other pair of projections and the adjacent end.

SYDNEY M. WOOD.
HARRY A. SCHMITT.