

L. M. HAUPT.
 BEACH RECLAMATION WORKS.
 APPLICATION FILED AUG. 17, 1910.

1,010,139.

Patented Nov. 28, 1911.

5 SHEETS—SHEET 1.

Fig. 1.

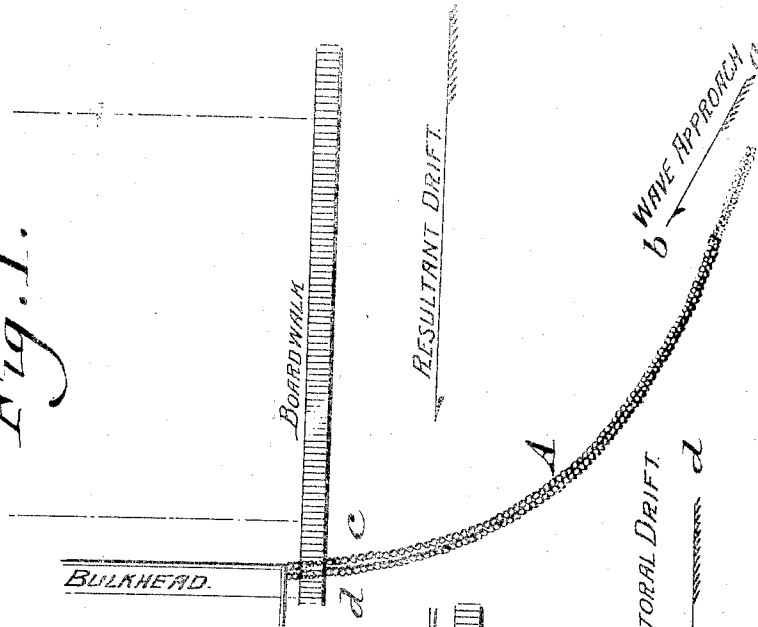
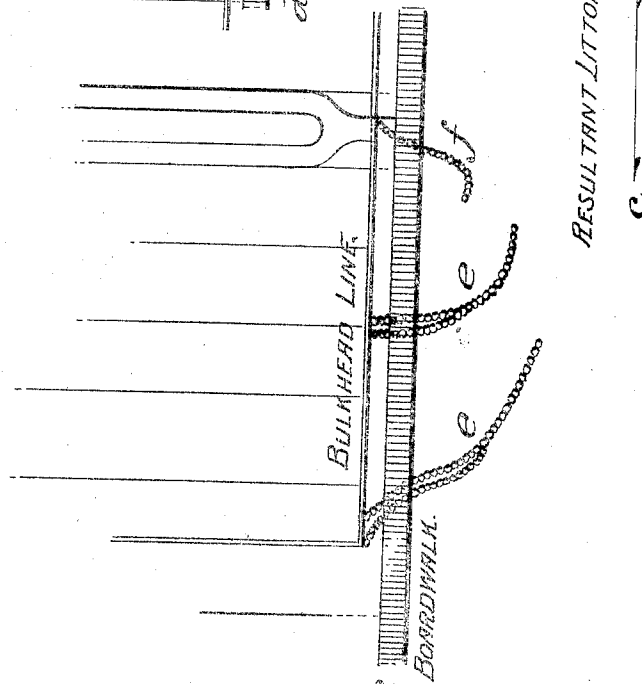


Fig. 2.



WITNESSES

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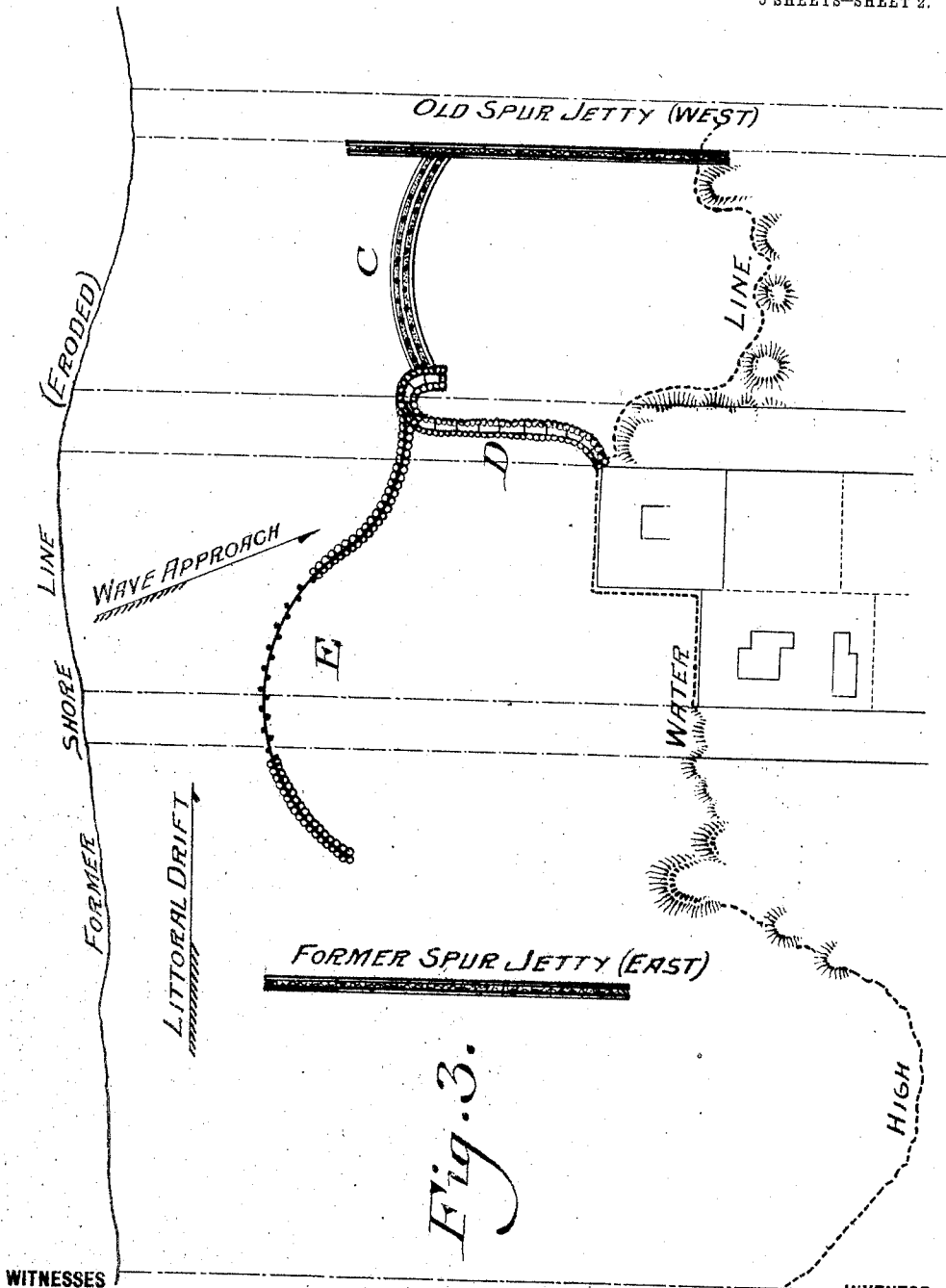
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5 SHEETS—SHEET 2.



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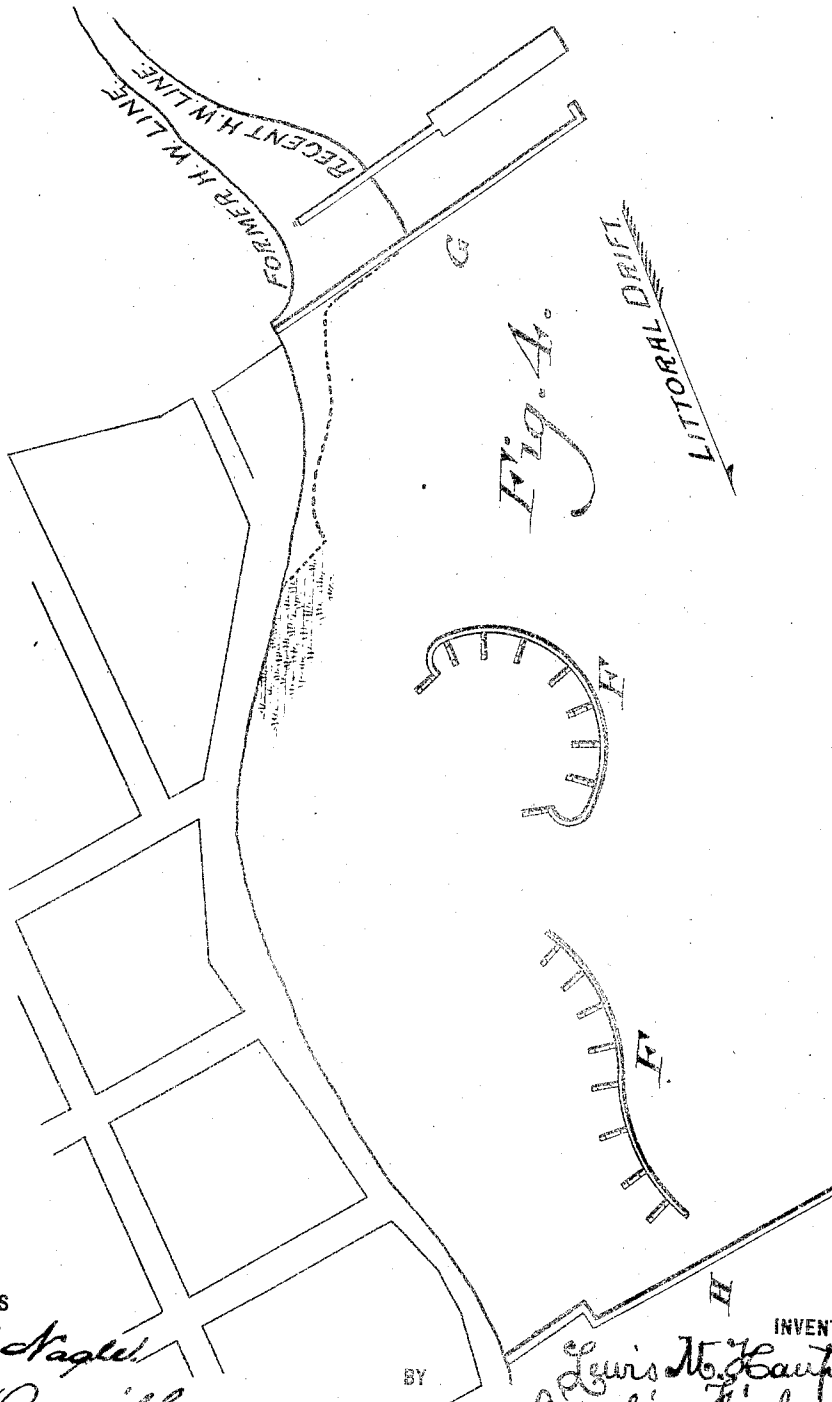
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5 SHEETS—SHEET 3.



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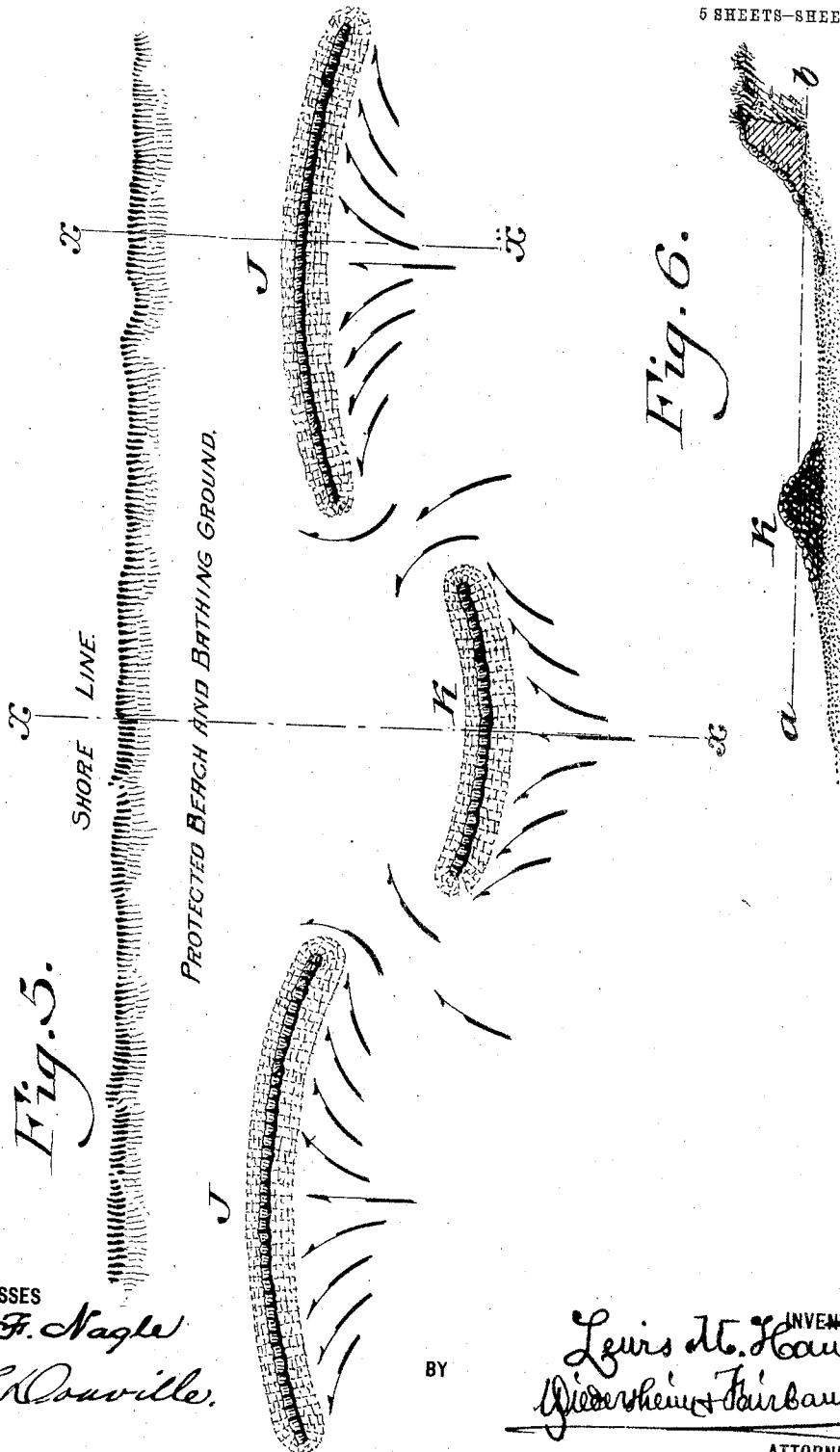
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5 SHEETS—SHEET 4.



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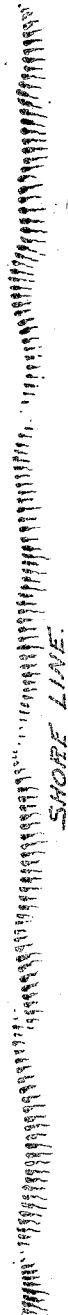
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5 SHEETS—SHEET 5.



SHORE LINE.

Fig. 7.

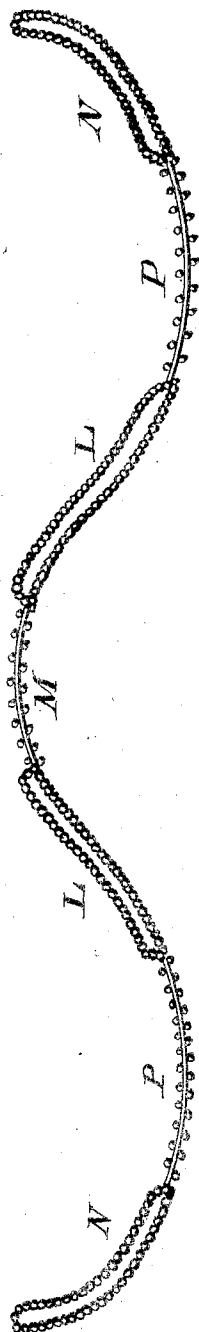
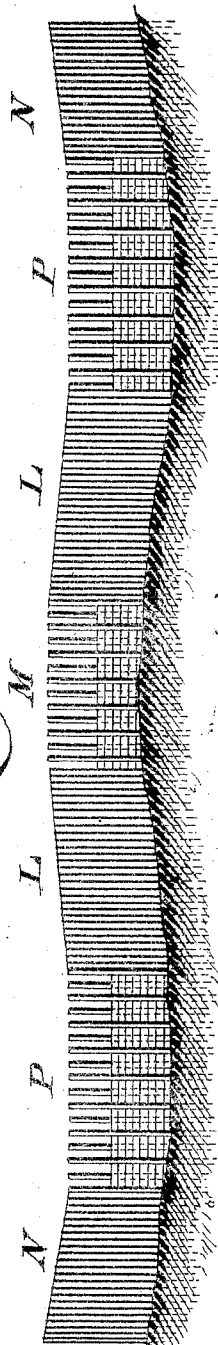


Fig. 8.



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UNITED STATES PATENT OFFICE.

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BEACH-RECLAMATION WORKS.

1,010,139.

Specification of Letters Patent. Patented Nov. 28, 1911.

Application filed August 17, 1910. Serial No. 577,673.

To all whom it may concern:

Be it known that I, LEWIS M. HAUPT, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Beach-Reclamation Works, of which the following is a specification.

My invention relates to beach or shore reclamation works, and consists of means for aiding nature in the deposition of littoral drift carried by waves, winds, tides and currents along a coast, and to cause the dynamic action of the tides and breakers to cast said drift ashore or to impound it in artificially created neutral areas on the strand, in such manner as to defend the coast or foreshore from the erosive action of said forces, or, in other words, to convert their destructive elements into those of conservation, causing accretion instead of detrusion. The means employed will be hereinafter described, attention being directed to the accompanying drawings, as embodiments thereof, whereby these forces are utilized for the desired ends.

Figure 1 represents a plan view of a beach or shore-reclamation-work embodying my invention. Figs. 2, 3, 4, 5 and 7 represent plan views respectively of other forms thereof. Fig. 6 represents a section on line $x-x$ of Fig. 5. Fig. 8 represents an elevation of Fig. 7.

Similar letters of reference indicate corresponding parts in the figures.

Referring to the drawings:—A, Fig. 1 represents a "reclamation jetty" which extends seaward from a point at or near the high water line flexing in such manner as to meet and divide the prevailing angular wave movement and entrain the inner portion of it shoreward while its outer portion swings around the convex face of the work and expands into the groin formed by the jetty and the beach to leeward. The efficiency of this jetty as a tool to convey the littoral drift shoreward, will depend on the prevailing direction of the angular wave movement with reference to the contour of the shore line. Thus in Fig. 1, if the waves approach generally in the direction $a-b$ and the littoral drift is also along shore, as indicated,

then the best results will be obtained by flexing or bending the jetty in the manner indicated, so as to part the breakers and form a protecting barrier extending seaward, the groins of which c, d will rapidly fill up causing the beach to move seaward even beyond the outer limits of the work, which does not happen with the normal straight jetties so generally in use. The grade, alignment and length of the structure must be varied to conform to local conditions of exposure, "fetch" of sea, contour of coast, slope of foreshore, prevailing littoral drift, winds, material, etc.

Fig. 2 represents a combination of the basic "reclamation jetty" arranged in series of two or more, as at e, e , in such manner as to form expanding pockets with narrow apertures or inlets, and suitable cover, to retard and decompose the incoming breakers charged with sand, causing them to expand with loss of velocity and to deposit their silt in the basin thus formed. This series may be protected at its windward end by a hooked jetty flexed in the opposite direction as indicated at f . The alinement, in plan, may be of simple, compound or reversed curves, or broken lines, as may be found most suitable for the site in question. By these devices the forces of the sea are utilized for the automatic reclamation of the foreshores and the protection of the bulkheads, in consequence of the deposits created and maintained within the embayed areas.

Fig. 3 illustrates a structure near to and connected with the shore line, and in which C D designate respectively a hurdle and a hooked jetty extending from said shore line outwardly beyond said line or bulkhead, so as to cause deposition of sand and its segregation and impounding within closely confined limits, thus protecting and covering the footing of said bulkhead, and causing rapid filling within the inclosure. This structure is designed to meet cases where the littoral drift has been previously intercepted by obstructing spur jetties built on either or both flanks of the property as shown, and where, in consequence, it is necessary to gather material from the immediate strand through the dynamic forces of the breakers, gener-

ated by an opposing barrier C, E and to cause it to be carried over a hurdle or hurdles of suitable crest height and be impounded by a tight inclosing wall from whence it may not escape seaward. For this case, I employ in connection with the parts C and E, the supplemental hooked jetty D, this being built out on the property line or other suitable location to serve as an abutment for the hurdle and also to furnish a *point d'appui* for a second wing E to defend the adjacent properties from serious erosion by the sea. By the combination of the curves and grades placed off shore, the forces of the breakers are greatly reduced before reaching the upland dunes, and deposits are created in place of erosion. The curves also decompose the waves causing lateral components, interference and reduced velocities which facilitate upbuilding and permanence by submergence of the works from the accumulation of the drift.

In Fig. 4, I show an embodiment where it becomes necessary to dispense entirely with the jetty D, Fig. 3, extending out from the shore and still form a sufficient shelter from prevailing storms to arrest the deterioration of the bluffs and create smooth and safe beaches by means of suitably designed barriers F, so placed as to create an artificial lee within and behind which the seas may deposit and build up peninsular formations reaching ultimately to the strand as the deposits accumulate. The forms of these barriers may be circular arcs, elliptical, oval, or polygonal, and be composed of compound or reverse curves of variable radii, oriented with reference to exposure, depth, drift and other factors to give the best results available at the site in question. Here, as in the former case, Fig. 3, the littoral drift has been arrested mainly by the long spur jetty G, as shown by the advance of the shore line on the adjacent property. H, is merely a light foot way extending to a sufficient depth for motor boats at low water.

Fig. 5 represents a modification of Fig. 4, in which the barriers may be arranged in series, alternately concave and convex, as shown at J—K—J; the traverse at K being advanced seaward of the barriers J to decompose the waves and cause lateral movements toward the gaps as indicated by the arrows. Thus the alluvial bluffs and properties are defended by a rip-rap or other line of defense removed to a safe distance from the toe of the slope creating a comparatively slack-water basin within, as shown in the cross-section on a—b, Fig. 6.

Fig. 7 represents another simple form of off-shore barrier or "flying buttress" constructed of timber or other suitable mate-

rial which possesses the advantage of cheapness combined with beauty and stability. This flying buttress is composed of a central concave section L with a hurdle M combined with outlying convex flanks N, to the right and left also containing hurdles P for the ready admission of the silt gathered from the outer ramps by the breakers and thrown over the weirs to be impounded in the inclosed areas; thus operating to recover and protect eroded beaches by the automatic action of the maritime forces.

I am aware that numerous jetties, seawalls, breakwaters, bulkheads, groins and other devices have been built to recover and protect alluvial coasts from abrasion, but believe it will be found that these structures have been confined to the immediate foreshore and have been placed directly on the natural face of the slope to be protected, or they have extended normally in a straight line, or nearly so, across the strand to or beyond the low water contour.

This point-blank resistance has involved enormous expense for massive structures which are frequently undermined or overtopped by breakers, and do not add to their stability by accretions due to deposits caused by the dynamic action of the maritime forces, as obtains in the forms and positions as proposed above. In this invention it is designed to transfer the line of battle some distance seaward, reducing the forces by decomposition, providing cover, and causing depositions; thus driving the shore-contours seaward and protecting the works automatically by their own accretions. Unlike my former Letters Patent, these designs are not intended to create channels by the utilization of natural agencies, but to cause deposits where they will resist the encroachments of the sea, and protect life and property from its destructive elements, by their novel form and position, as already set forth.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A beach-reclamation work composed of a resisting structure having its upper grade at or above the plane of low water, the same being adapted as to utilize the maritime forces prevailing on alluvial coasts, in such manner as to cause said forces to impel the material with which the breakers may become automatically charged; shoreward, and to cast it upon the strand, to be impounded, *in situ*, by the said works.

2. A beach-reclamation work composed of a plurality of resisting barriers, the same having their upper grade at or above the plane of low water and so placed with reference to the maritime forces as to decom-

pose the said forces and create a lee, or impounding basin for the deposition of silt and the formation of bars or shoals.

3. A beach-reclamation work composed of a plurality of barriers of curved form or forms, the same having their upper grade at or above the plane of low water.

4. A beach-reclamation work composed of a barrier of curved form, and a hook or hooks on the terminal thereof.

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Witnesses:

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