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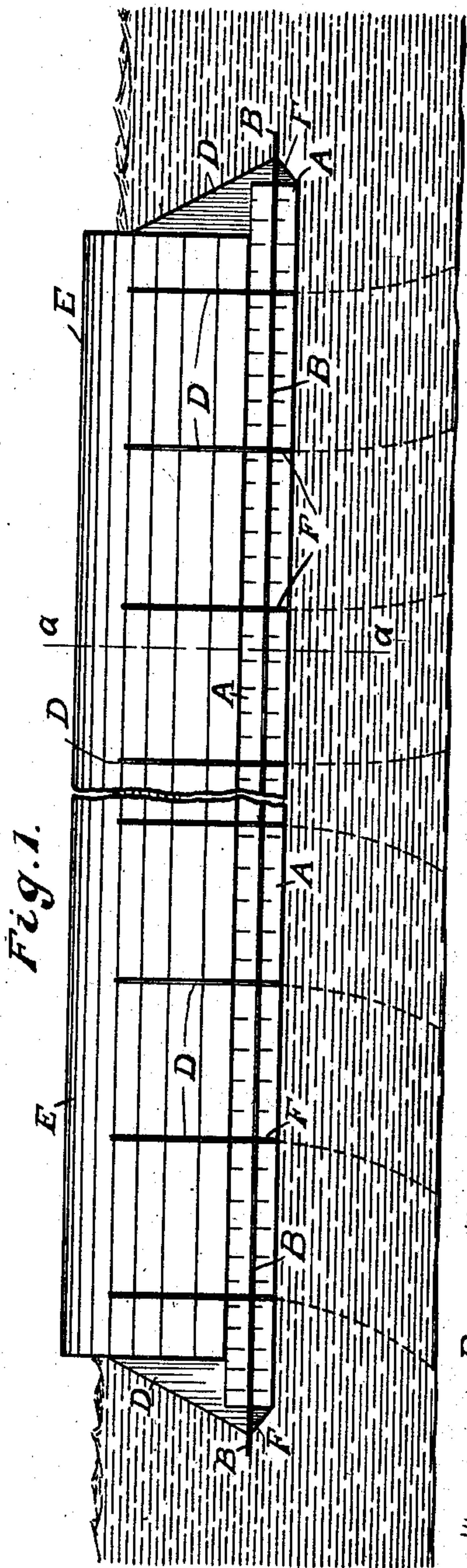
W. E. MURRAY.

PATENTED JUNE 2, 1908.

STEADY FLOATING STRUCTURE.

APPLICATION FILED AUG. 13, 1906. RENEWED OCT. 30, 1907.

5 SHEETS—SHEET 1.



Witnesses:  
H. H. Hunt.  
Ida M. Daskau.

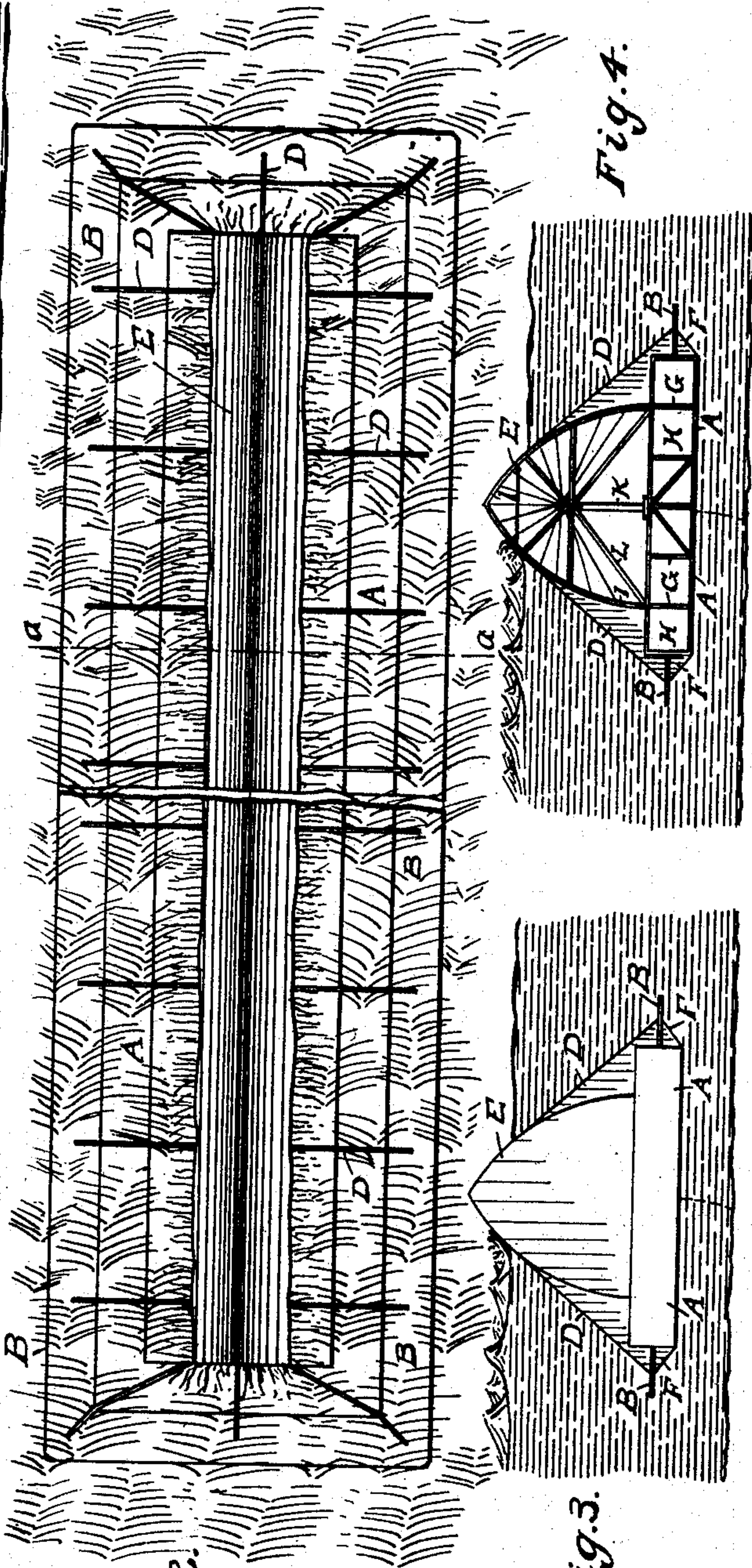


Fig. 2.  
By William E. Murray  
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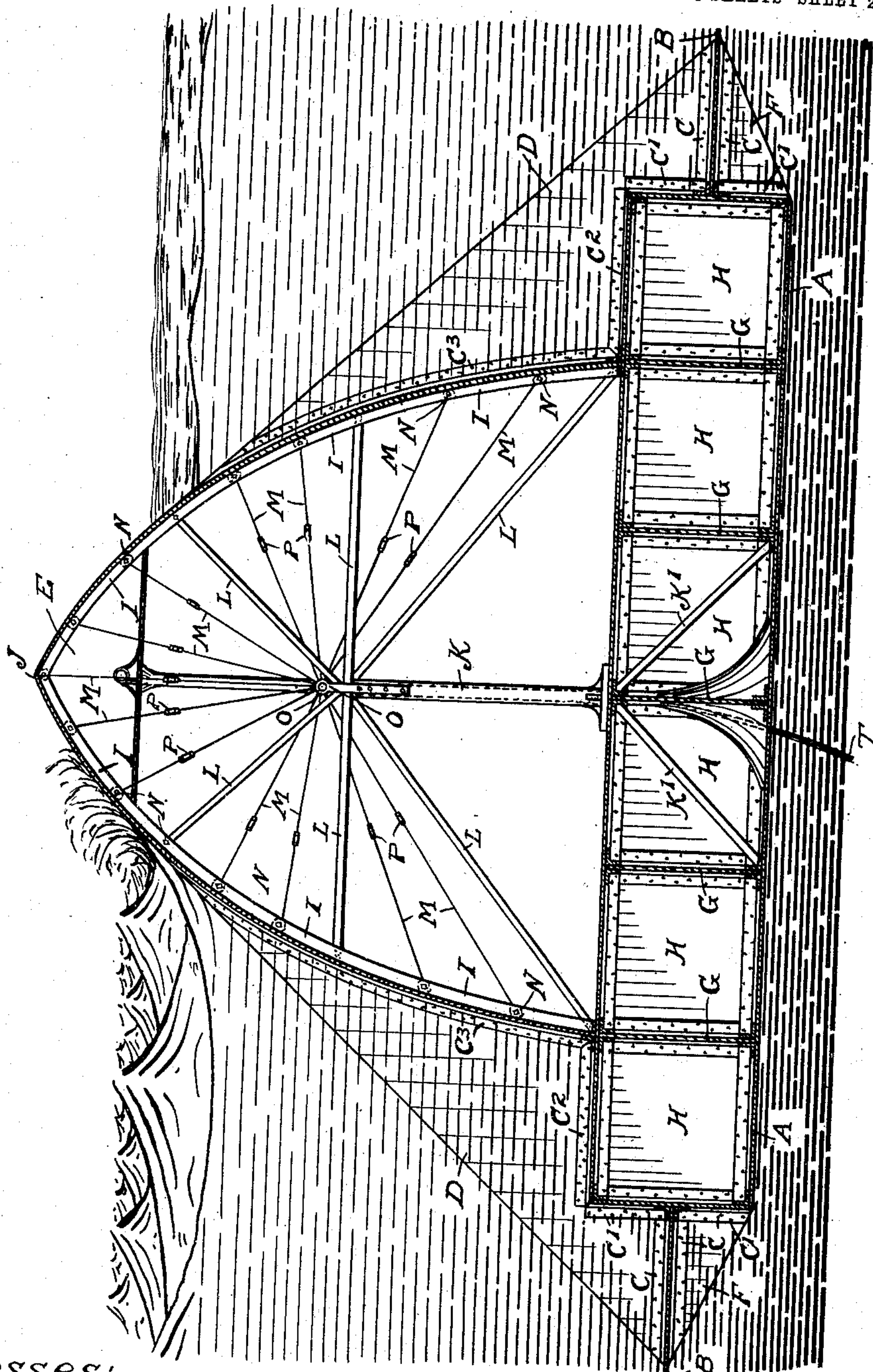
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6 SHEETS—SHEET 2.

Fig. 5.



Witnesses:

Ida M. Daskam.

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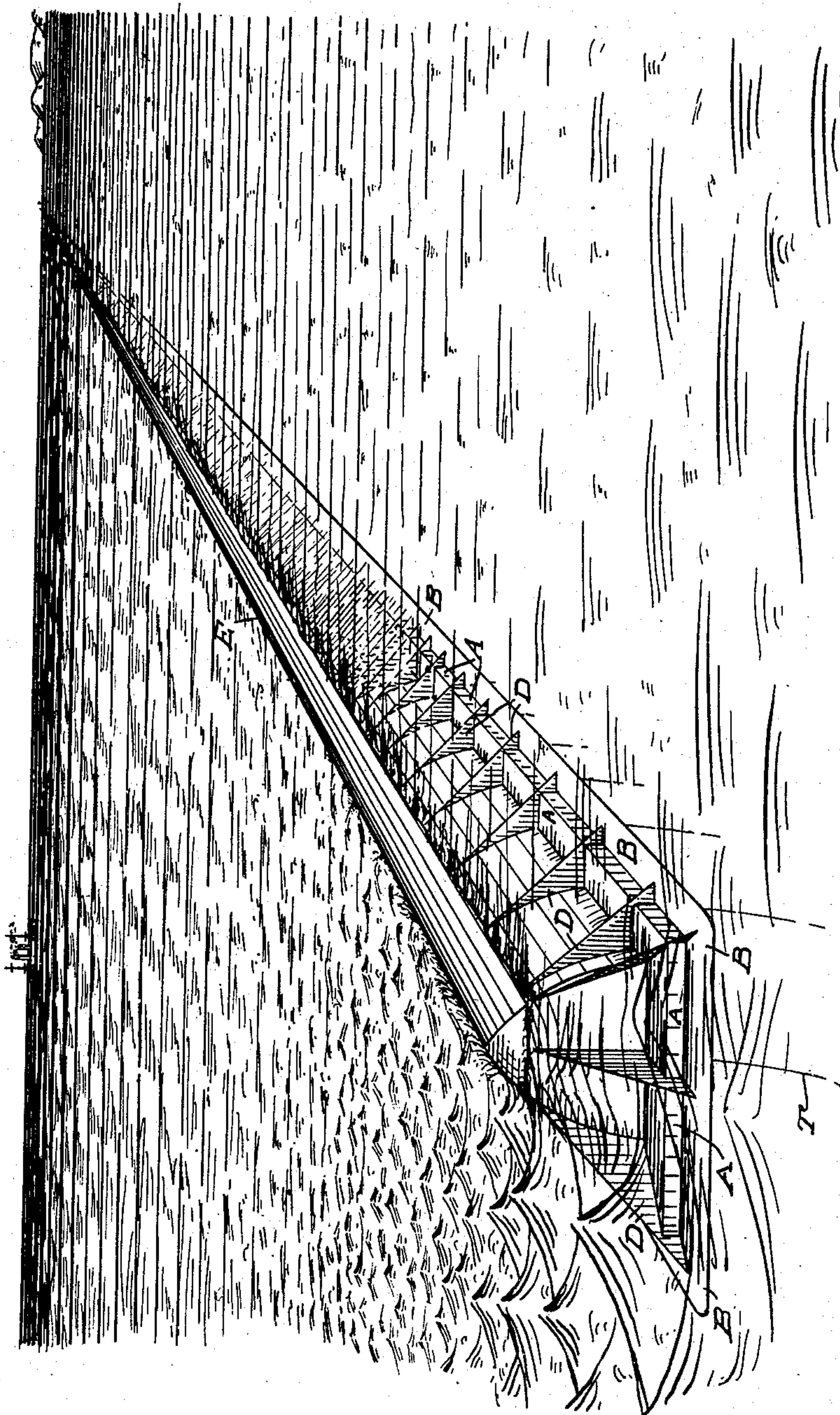
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5 SHEETS—SHEET 3.

Fig. 6.



Witnesses:

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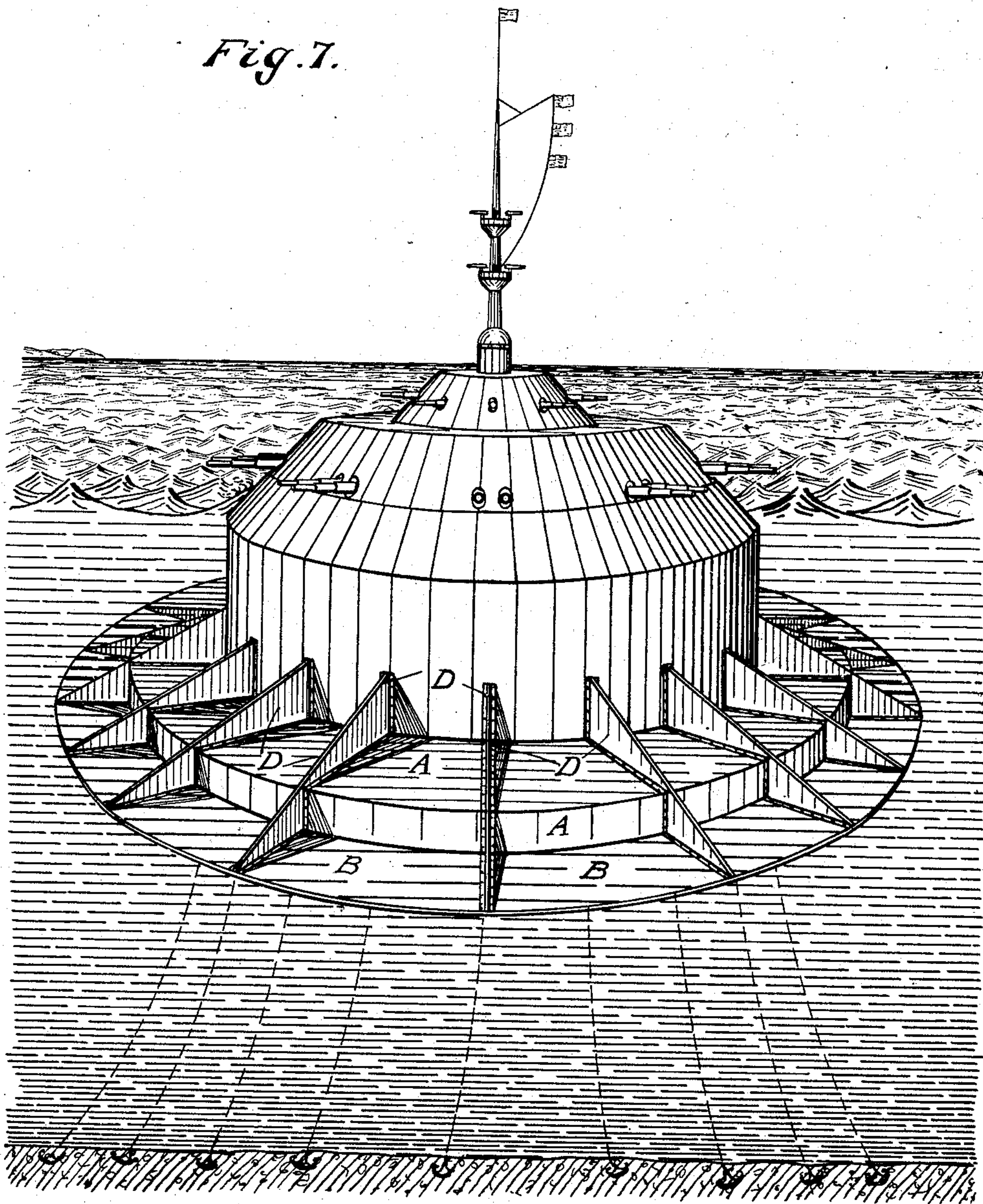
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5 SHEETS—SHEET 4.

Fig. 7.



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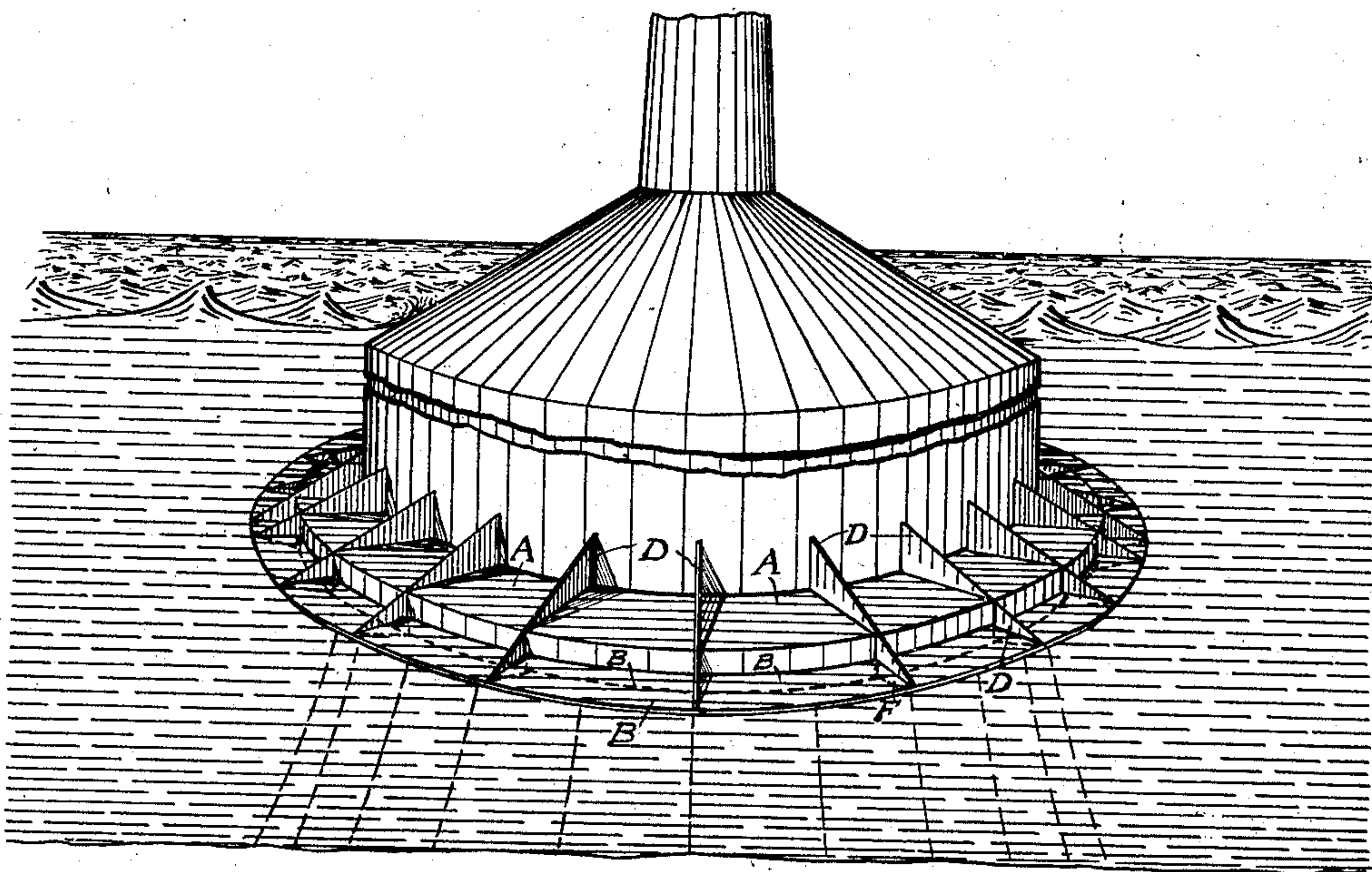
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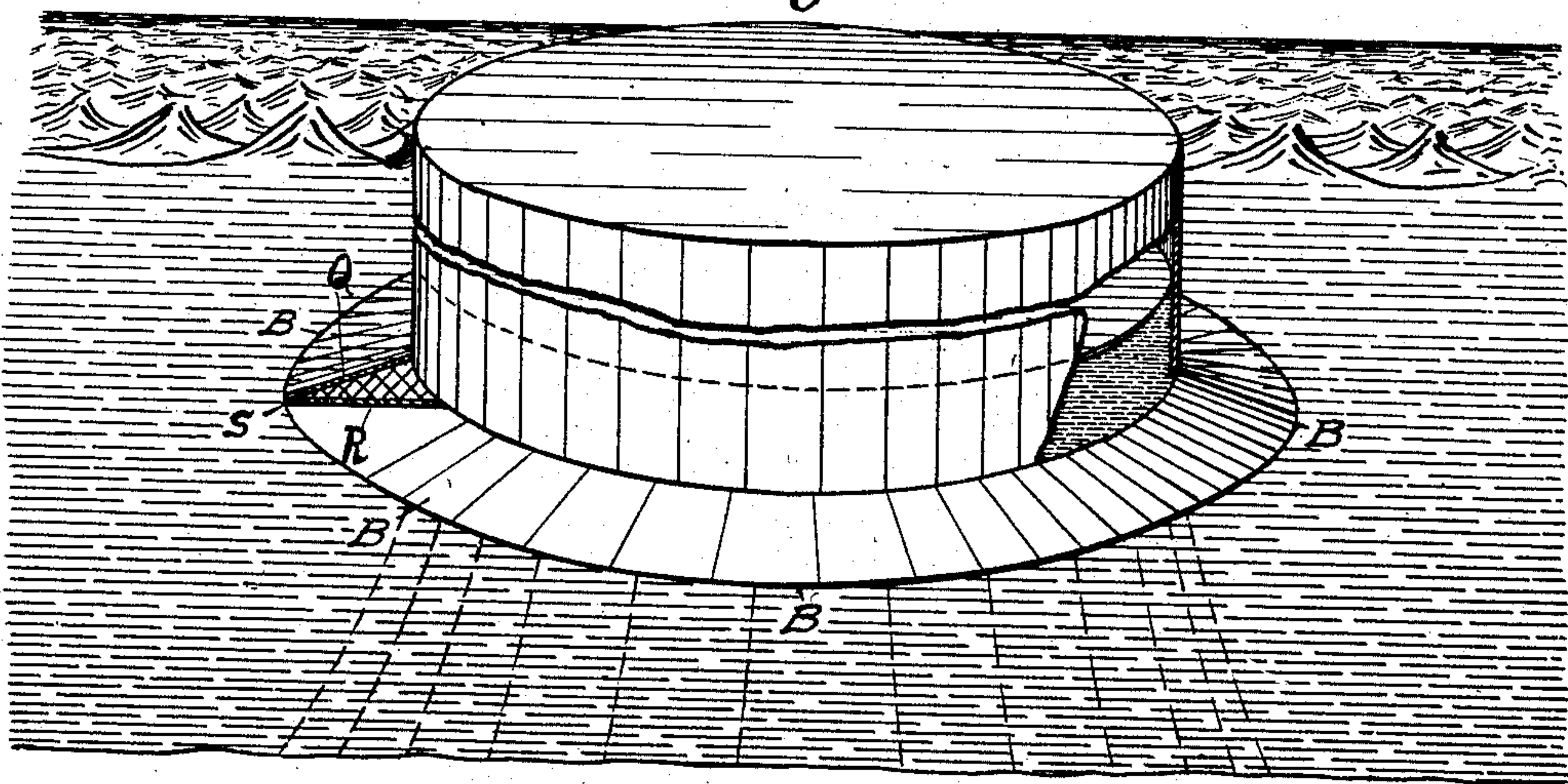
APPLICATION FILED AUG. 13, 1906. RENEWED OCT. 30, 1907.

5 SHEETS—SHEET 5.

*Fig. 8.*



*Fig. 9.*



Witnesses:

H. H. Hunt.

Ida M. Daskam

By

Inventor:

William E. Murray

St. John Day.  
Attorney.



# UNITED STATES PATENT OFFICE.

WILLIAM EDWARD MURRAY, OF LOS ANGELES, CALIFORNIA.

## STEADY-FLOATING STRUCTURE.

No. 889,801.

Specification of Letters Patent.

Patented June 2, 1908.

Application filed August 13, 1906, Serial No. 330,478. Renewed October 30, 1907. Serial No. 399,944.

*To all whom it may concern:*

Be it known that I, WILLIAM EDWARD MURRAY, of the city of Edinburgh, in the county of Midlothian, North Britain, a subject of the King of the United Kingdom of Great Britain and Ireland and Emperor of India, at present residing in the city of Los Angeles, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Steady-Floating Structures, of which the following is a full, clear, and exact description or specification, reference being had to the annexed drawings and to the letters and figures marked thereon.

This invention which relates to certain improvements in steady floating structures, has for its object to render more steady the foundations for such structures which are described in the specification and shown by the drawings of Letters Patent, issued to me, the said William Edward Murray, on the 3rd day of July 1906, No. 825,149, as well as to render correspondingly steady the superstructure carried thereon.

Under my present improvements I increase the steadiness of such floating foundations and of the structures carried thereon by applying an additional flange of iron or steel plate which projects outwards horizontally external to the hollow flanged foundation filled with water or with material heavier than water, as in my aforesaid specification and drawings fully set forth.

The additional flange which I use under my present improvements is an attachment to the flange loaded with water or other material according to the invention described in the specification of my aforesaid Letters Patent, and this additional flange is supported by being attached to the loaded flange of my aforesaid invention, and by being further connected and supported by gussets or equivalent ties to the said flange and when necessary connected to the superstructure carried thereon. By means of this additional flange I am enabled to reduce the cubical capacity of the loaded flange comprised under my aforesaid Letters Patent, and thereby to reduce the quantity of material in the construction of the loaded flange, and in some kinds of steady floating structures I am by means of this additional flange, of stiffly supported iron or steel plate, enabled to reduce the width or diameter of the loaded

body to about the same diameter or width as that of the superstructure carried thereon.

Upon the annexed drawings Figure 1 is a side elevation of my improved steady floating foundation shown as adapted for carrying a breakwater as the superstructure. Fig. 2, is a plan corresponding to Fig. 1. In both Figs. 1 and 2, the central parts of the foundation and breakwater are shown as broken away, it being explained that an entire section of breakwater of which the two end portions only are shown in Figs. 1, and 2, cannot be shown in a sheet of drawings of the dimensions prescribed by the Rules of Practice of the Patent Office. Fig. 3, is an end elevation of the steady foundation and breakwater superstructure shown at Figs. 1, and 2. Fig. 4, is a transverse section of the improved steady floating foundation and breakwater superstructure on the line *a, a*, Figs. 1, and 2. Fig. 5, is an enlarged transverse section of the steady floating foundation and breakwater shown at Figs. 1, 2, 3, and 4; this enlarged view being necessary in order to show some of the details or features of construction of the steady floating foundation and breakwater which cannot be shown in drawings of the dimensions of Figs. 1, 2, 3, and 4. Fig. 6, is a perspective view of my improved steady foundation carrying a breakwater superstructure of the kind illustrated at Figs. 1, and 5; this view illustrating the relationship of the entire foundation and the superstructure to the water in which it is immersed and steadily floats. Fig. 7, is a perspective view of a circular steady floating foundation with my additional projecting flange and gussets connecting it to the loaded flange of my aforesaid invention and fastened to the sides of the superstructure carried thereon; the superstructure in this case being a fortress of the kind described in the specification and shown in the drawings of Letters Patent, issued to me on the 17th day of July 1906, No. 826,183. Fig. 8, is a perspective view of a circular steady floating foundation with my additional flange applied thereto, carrying a cylindrical superstructure having a conical top shown immersed in the water in which the structure floats, and as adapted for carrying a lighthouse at the center of the conical top, the central portion of the superstructure being shown broken away; it being here explained that the height or depth of the central portion of the structure is variable



according to the height and weight of the lighthouse carried thereon. Fig. 9, is an elevation of my steady floating foundation showing the flange of iron or steel plate as directly fastened to the bottom of the loaded superstructure. In this figure the flange is carried by latticed work or equivalent stiffening structure as shown in section at the left-hand side of Fig. 9, and by constructing and applying the flange in the manner shown at Fig. 9, I am enabled to dispense with a floating foundation of larger diameter or width than the diameter or width of the superstructure; I am, indeed, enabled to reduce the loaded part of the steady floating foundation to the diameter or width of the base of the superstructure by placing in the base of the superstructure a depth of water or other loading material heavier than water within the base of the superstructure so as to sink the entire structure to the depth requisite for steadiness of flotation.

In Figs. 1, to 6, of the drawings, the loaded steady floating foundation which is similar to that shown in my aforesaid Letters Patent Number 825,149, dated July 3rd, 1906 is marked A, and at the sides and ends of the loaded steady foundation A, the horizontally projecting flange B, is shown. This flange B, is connected about midway in the vertical height or depth of the steady floating foundation A, all around the said foundation and to the vertical sides thereof as shown more especially at Fig. 5, by angle irons C, riveted to the flange and gussets D, and by other angle irons C', to the vertical sides of the loaded steady floating foundation A. The gussets D, are also riveted or equivalently fastened to the upper flat part of the loaded steady foundation A, by angle irons C<sup>2</sup>, and the gussets D, are further supported by being connected by angle irons C<sup>3</sup>, also riveted or equivalently attached to them, and to the curved sides of the breakwater superstructure E. An additional support to the horizontal flange B, is provided below the said flange by the bottom gussets F, connected by the bottom angle irons C, and C', attached by rivets or equivalently attached to the gussets F, and to the lower part of the vertical sides of the steady floating foundation A, and to the under faces of the flange B.

In the enlarged section Fig. 5, it is shown that the steady floating foundation A, is divided into compartments by cross partitions G, connected by angle irons and rivets to the top and bottom plates of the steady floating foundation A; these partitions G, being again connected transversely by bulkheads or transverse partitions H.

By reason of the longitudinal and transverse partitions G, and H, respectively, being connected by angle irons and rivets or equivalent attachments to the top and bottom, sides and ends of the steady floating

foundation, not only is great stiffness of structure obtained, but the quantity of water to be admitted into the steady floating foundation for the purpose of immersing it to the requisite depth is regulated, either by filling the whole of the water tight compartments thus produced, or by filling part only of them by admitting water through valves or by loading the outer chambers of the foundation A, with gravel, pig iron or other material heavier than water, all as set forth in the specification and shown in the drawings of my aforesaid Letters Patent, issued to me the 3rd day of July 1906, No. 825,149.

The breakwater superstructure carried upon my improved steady floating foundation shown at Figs. 1, to 6, is of a shape best adapted for resisting the thrust of the waves with a minimum of resistance and for preventing the waves from disturbing the floating steadiness of the entire breakwater structure. This breakwater superstructure consists of a series of metallic frames I, curved after the manner shown in Figs. 3, 4, 5, and 6, more especially, the two halves of each curved frame meeting at the apex J, of the breakwater superstructure. These curved frames are each connected by vertical members K, to the steady floating foundation as shown more particularly in Figs. 4, and 5. Inclined ties K', K', again connecting the bottom of each vertical member K, the top of the steady floating foundation, and the bottom of the steady floating foundation, so that all tensile or compressive stresses upon the vertical members K, are distributed throughout the entire structure. Each pair of curved metallic frames I, is connected transversely by cross members L, L, while additional stiffness of the superstructure is obtained by the tie-rods M, connecting them by bolts N, N, to a central bolt O, at the upper parts of the vertical members K. The several tie-rods M, are provided with turn-buckles P, formed with right and left hand screws so as to operate upon the right and left hand screw ends of the tie-rods M, meeting in each turn-buckle P, which turn-buckles on being tightened or loosened produce the requisite stress for maintaining shape and stiffness of the superstructure by tension.

The curved metallic frames I, are spaced in regulated distances apart to insure stiffness with lightness of structure, and the spaces between each pair, or several of such curved tension frames may be divided by bulk-heads after the manner of the bulk-heads used in the construction of the hulls of iron or steel ships.

The improved steady floating foundation with its superstructure is moored to the bottom of any lake, ocean or other body of water wherein such steady floating foundation and superstructure is to be used, by hawsers T,



and anchors as shown at Figs. 1, and 6. The hawsers being sufficiently loose to allow of tidal rise and fall of the steady floating foundation and its superstructure, as well as to permit a moderate amount of horizontal movement which is sometimes caused by undertow and tidal or other currents, all as set forth in the specification of my aforesaid Letters Patent No. 825,149.

My additional flange B, of flat metallic plate is shown at Fig. 7, as applied to the bottom of the circular loaded flange A, on which a superstructure and floating fortress corresponding with my aforesaid Letters Patent No. 826,183, is shown. This additional flange B, is connected to the bottom edge of the loaded foundation A, by angle irons and rivets or equivalent connections, and it is further supported at intervals by the gussets D, which are also connected to the vertical side and top of the steady floating foundation and to the side of the superstructure by angle irons and rivets or their equivalents, after the manner already hereinbefore described with reference to the gussets D, Figs. 1, to 6.

In Fig. 8, the additional flange B, of flat iron or steel plate is attached to the steady floating foundation A, in the same manner as shown at Fig. 7, that is to say, by the gussets D, angle irons and rivets or equivalent connections, and therefore need not be herein further referred to.

In Fig. 9, the projection of the steady floating foundation A, as a loaded structure of larger diameter and projecting beyond the diameter of the superstructure carried thereon is dispensed with, and the loaded part of the steady floating foundation is of the same diameter or width as that of the superstructure. The loaded part of the steady floating foundation as shown at Fig. 9, may be of any depth sufficient to carry water or other heavy material capable of sinking the steady floating structure to the depth requisite for steady flotation, and the interior part of the base of the foundation so constructed is shown at the right hand side of Fig. 9, as loaded with water and having a floor extending completely across and constituting the top of the loaded part of the structure. The further or additional steady-

ness of this structure I obtain by the additional flange B, formed of iron or steel plate, and the upper and lower parts Q, and R, respectively, as shown at the righthand side of Fig. 9, are connected together and stiffened by latticed bars and rivets S. A steady floating structure of this character may be made of large area, and with a flat top as shown at Fig. 9, whereon there may be erected a variety of buildings or other structures, such for example as a hotel, hospital, sanitarium, or other structures adapted to constitute my steady floating structure as places either of utility or amusement.

I claim as my invention.

1. The steady floating structure, consisting of the combination of the hollow flat flange foundation, the flange of plate metal projecting outwardly beyond the hollow foundation, the gussets and attachments connecting the projecting flange to the steady hollow floating foundation and to the superstructure, and the superstructure, all constructed and operating connectedly substantially as hereinbefore described.

2. The steady floating structure consisting of the hollow flange, the flange of plate metal projecting outwardly beyond the hollow flange, said flange of plate metal being rendered rigid by gussets and attachments connecting the flange of plate metal to the hollow flange and to the super-structure, the gussets, the super-structure consisting of arched ribs, cross-members, ties, bulk-heads, and covering of metallic plate, substantially as hereinbefore described.

3. The steady floating structure consisting of the combination of the lower part thereof containing material for loading the foundation, the flange of metallic plate connected by latticed bars with the loaded bottom of the device from which the said flange projects, substantially as hereinbefore described.

In testimony whereof, I have hereunto set my hand and seal at the city of Los Angeles, aforesaid, in the presence of two subscribing witnesses.

WILLIAM EDWARD MURRAY. [L. s.]

Witnesses:

ST. JOHN DAY

IDA M. DASKAM.