(No Model.) 3 Sheets—Sheet 1.

J. F. C. FARQUHAR.

STEADYING FLOATING VESSELS.

No. 283,091. Patented Aug. 14, 1883.

Fig. 1.

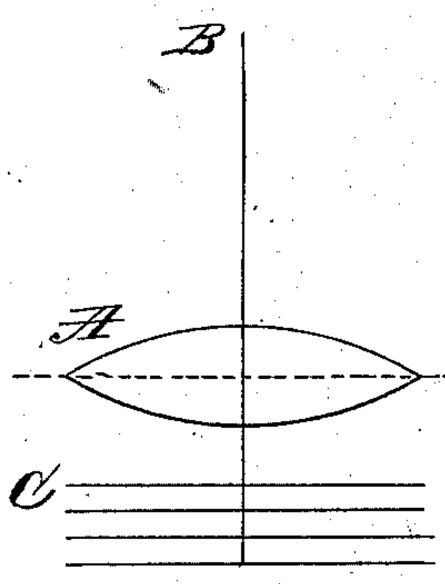


Fig. 2.

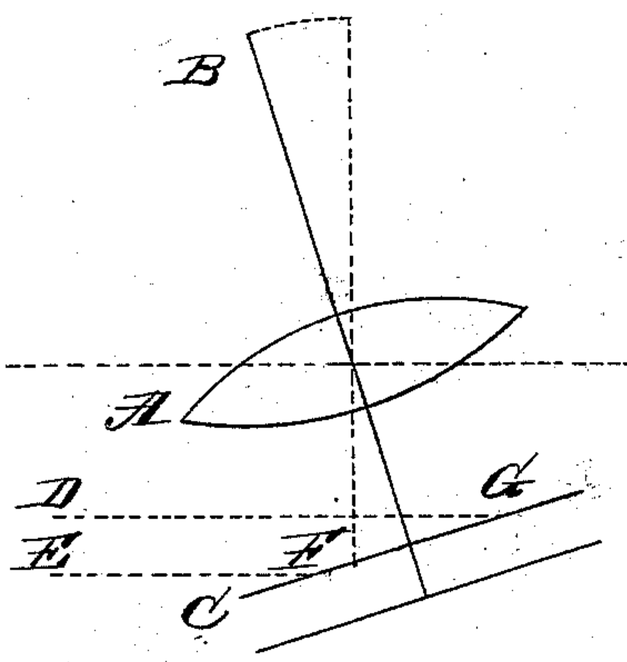


Fig. 3.

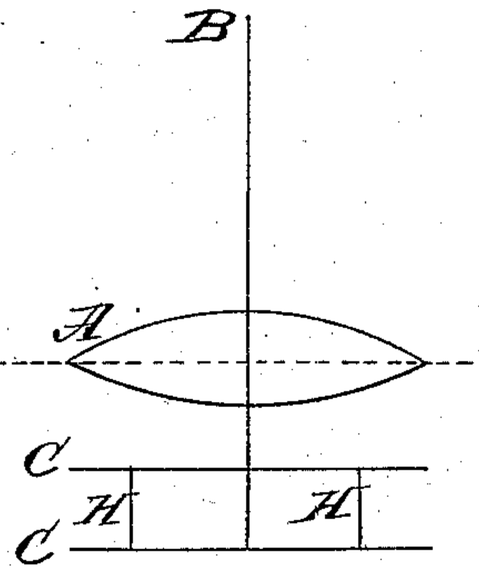


Fig. 1*

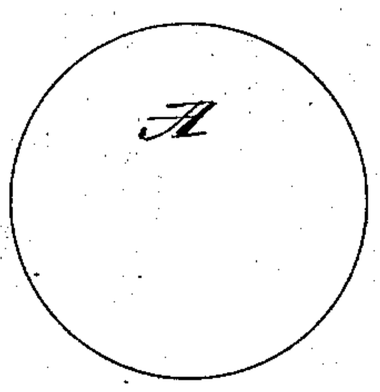
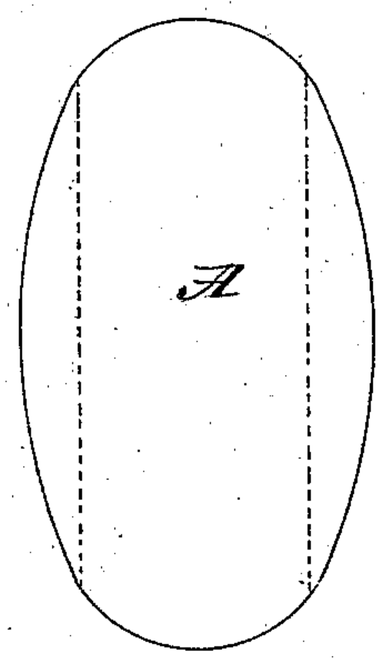


Fig. 3*



WITNESSES:

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(No Model.) 3 Sheets—Sheet 2.

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Fig 5.

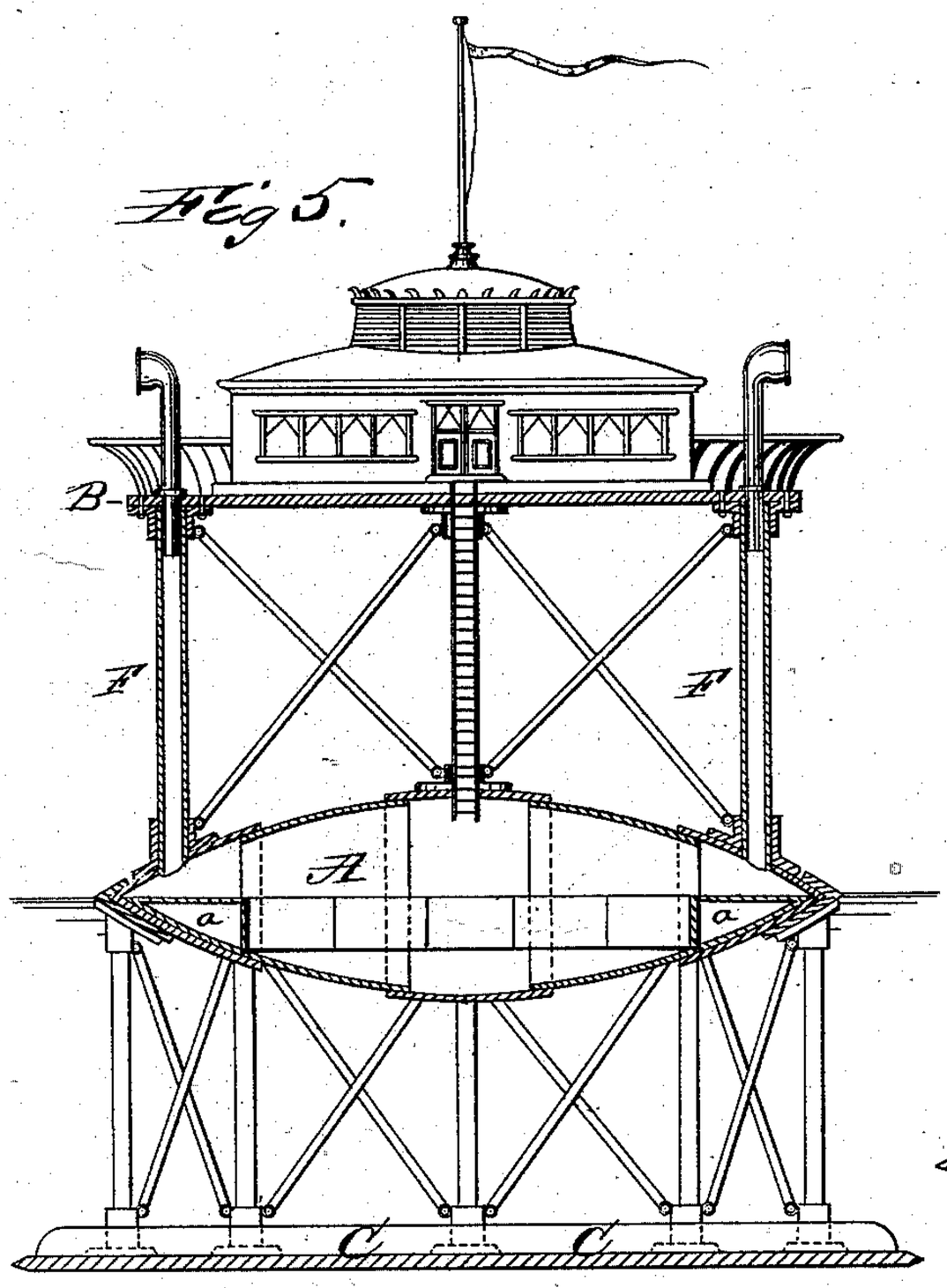


Fig. 4.

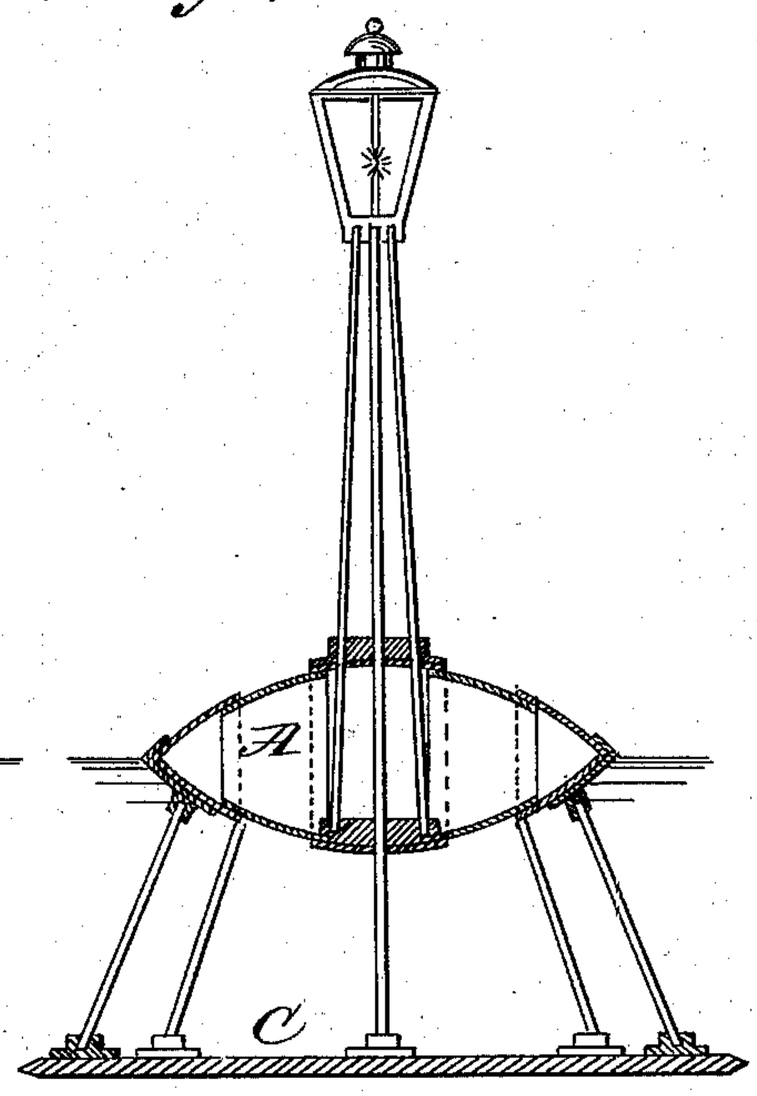


Fig. 5.*

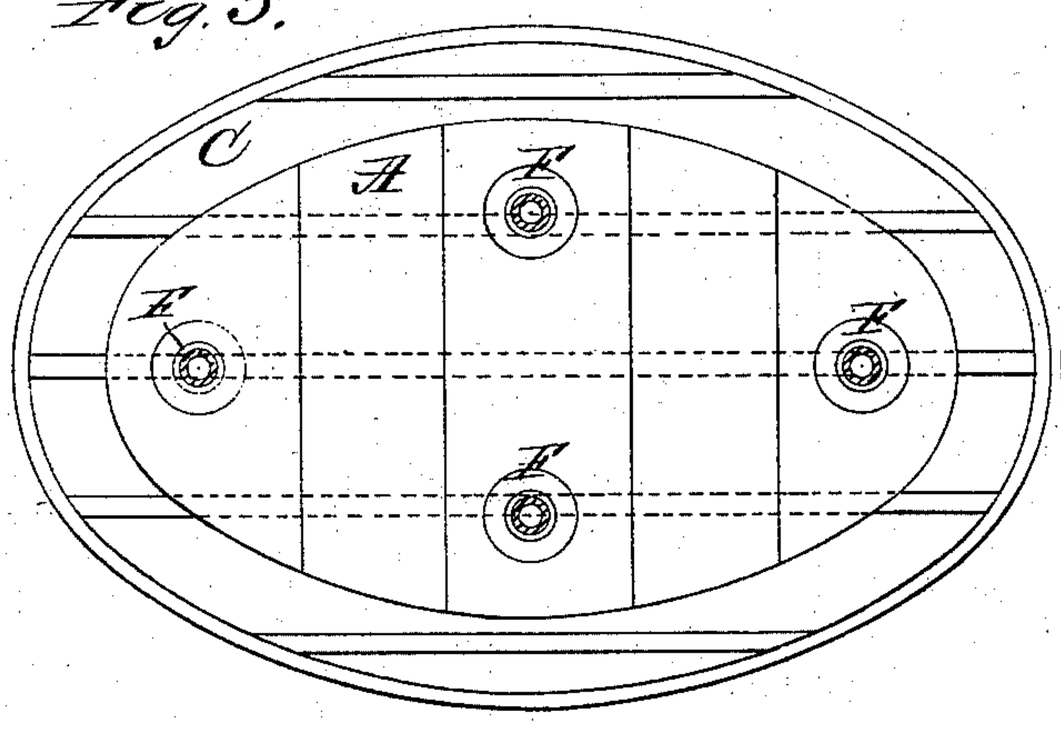
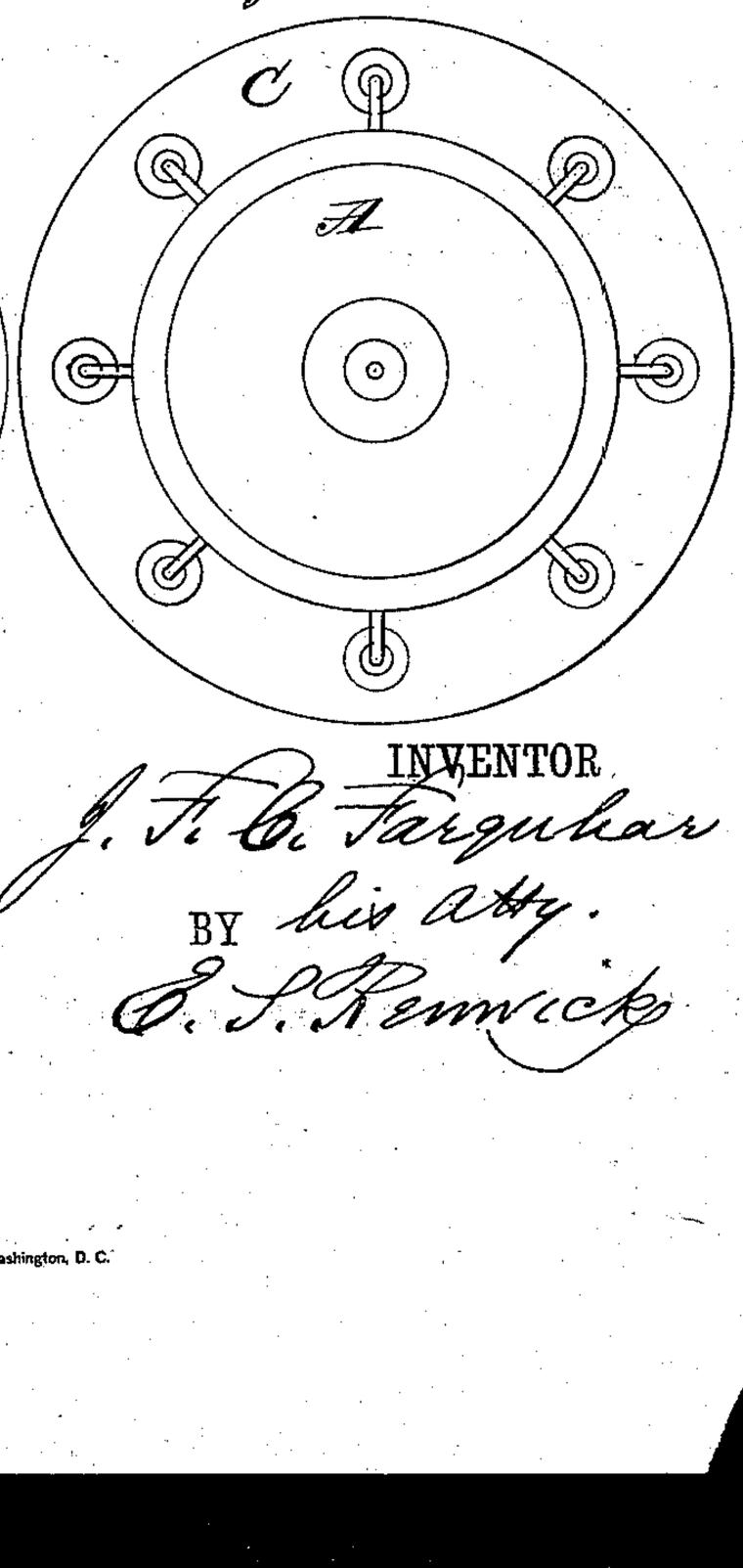


Fig 4.*



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3 Sheets—Sheet 3.

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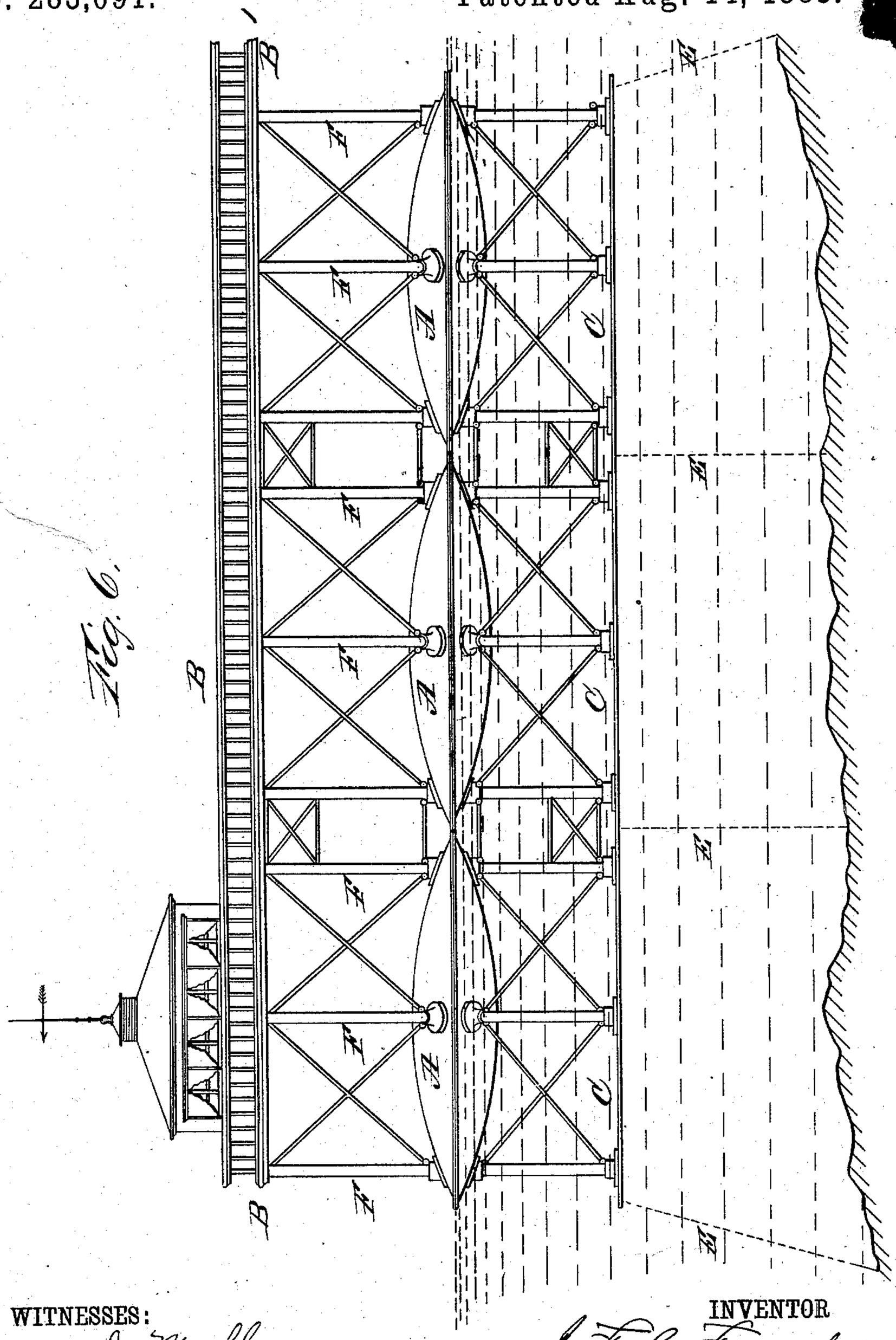

Fig. 1.

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UNITED STATES PATENT OFFICE.

JOHN F. C. FARQUHAR, OF LONG ACRE, COUNTY OF MIDDLESEX, ENGLAND.

STEADYING FLOATING VESSELS.

SPECIFICATION forming part of Letters Patent No. 283,091, dated August 14, 1883.

Application filed May 16, 1883. (No model.) Patented in England August 12, 1881, No. 3,508, and in France November 14, 1881.

To all whom it may concern:

Be it known that I, JOHN FREDERICK COOKE FARQUHAR, of Long Acre, in the county of Middlesex and Kingdom of Great Britain, have made an invention of certain new and useful Improvements in Steady-Floating Vessels; and I do hereby declare that the following, in connection with the accompanying drawings, is a full, clear, and exact description and specification of the same.

This invention has for its object to reduce the extent to which floating bodies or vessels are rendered unsteady by the action of the waves, and the improvements are applicable to steam or sailing vessels, floating fortresses, light-ships, telegraph-station vessels, beacons, buoys, floating pontons, piers, and such like. To obtain this end I fix below the bottom of the vessel, out of reach of the action of the waves, two or more horizontal plates—one above the other and at a distance apart—so that water may enter and pass freely in lateral directions between them, but is confined above and beneath. The sizes of these plates are governed by the dimensions of the floating body and the extent of the rigidity and steadiness required. When great rigidity is required several of these plates should be used, and they should equal or exceed the largest horizontal dimensions of the floating body. Where less rigidity is required, a less number of plates can be used and of smaller dimensions. The result of this arrangement is that when the floating body is acted upon by a wave it is impossible for it to rise quickly, as the horizontal plate or plates underneath cannot be moved upward without carrying with them a large body of water. This applies also in the contrary sense, for when the wave leaves the floating body it will not be able to fall quickly into the trough of the wave. The tendency of the floating body to roll in a heavy sea is also greatly diminished, as before it can do so the horizontal plates have to put into movement an enormous weight of water. In order to lessen the force of the waves on the floating body, I prefer to construct it in such a form as will in my opinion offer the least resistance to the waves and will allow them to pass over it in any direction. I therefore construct the floating body in such a form as would be represented by two slightly-hollowed circles or ovals joined together at their edges, so that when floating horizontally in the water it will always present a fine edge in every direction to meet the waves, which will readily pass the floating body. In cases where the floating body is to be propelled or drawn through the water—such as in the case of steamships—one or more vertical plates can be fixed to the under side of the floating body and to and between the horizontal plates. The lengths of these vertical plates will be determined by the length of the floating body, and they will be placed lengthwise in the line of propulsion. Sufficient space should be left between them to allow a free passage for the water. The object of these vertical plates is to still further diminish the tendency of the floating body to roll and to give strength to the bottom plate, and as the edges of these plates, as also of the horizontal plates, will be fine, they will impede as little as practicable the passage of the floating body through the water. At a suitable height above the top surface of the floating body a platform, deck, or staging can be formed for passengers. This will be supported by suitable columns and rods fixed to the floating body or vessel. As the waves will break over the floating body, these columns should be made so as to offer the least resistance possible to the waves consistent with the requisite strength.

The floating body or vessel may contain the engines, boilers, and stores necessary for its propulsion, and can be rendered habitable by means of ventilation through the columns and funnels, &c., the air being admitted from above the upper deck. The propeller may be fixed above or between the horizontal plates at any suitable depth. It can also be worked in the center or in any other part of the construction. In cases where the floating body or vessel is not required to be propelled—such as for buoys, light-vessels, floating fortresses, &c.—the horizontal plates may be made slightly conical or dish-shaped in form, so that they shall retain a still greater hold on the water.

In order that my said invention may be fully understood, I have represented in the accompanying drawings and I will proceed to describe, several modes in which I have contemplated the application of my invention for

practical use, it being understood that the mode of application may be greatly varied without ceasing to embody my invention.

The accompanying diagram drawings, Figures 1, 2, and 3, explain clearly the improvements above described.

Figs. 1 and 1* show the application of the principle to a stationary floating vessel—such as a floating beacon, a light-ship, or a buoy—for which great stability is required. A is the floating vessel, made circular in plan, as shown by the plan view below. B is the center line of a column rising up from it. C are horizontal plates. The plates may be secured to and suspended from the lower part of the central column, and may also be secured by rods or stays to the under side of the floating vessel, near its circumference. The plates may be made slightly concave or with a coned rim, to give them a greater hold on the water.

Fig. 2 represents a floating vessel, A, having two horizontal plates, C. The floating vessel is in this figure represented in a position inclined to the horizontal, with the object of showing that, if it were ever brought into such a position, any movement of the water along the line E F acting to submerge it would be counterbalanced by the movement of the water along the line D G. Consequently, in addition to the great force required to move the floating vessel from a horizontal position, (resulting from, first, the great displacement of water which would be occasioned by any oblique movement of the horizontal plates, and, second, the force necessary to overcome its equilibrium,) the force of the current of water passing above and below and between the plates will, by itself, have an important influence to insure the stability of the floating body.

Figs. 3 and 3* show the application of my invention to a steamboat or such like floating vessel. A is an oval floating vessel, shown in cross-section and in plan; B, vertical center line; C C, two oval horizontal plates, of the same form and dimensions as the horizontal section of the floating vessel. H H are longitudinal vertical plates. In cases where it may be found necessary to allow the floating body to rise and fall more freely to the waves, the bottom plate may be made with a hole in its center, or with a number of holes, so that the resistance between the bottom plate and the water is lessened to the extent of the water which passes through the hole or holes. In all the above cases the mass of water confined in upward and downward directions between the horizontal plates must be raised and lowered bodily, in order that the vessel may rise and descend in the sea, and the inertia of the mass opposes rapid movement, so that the vessel is much less affected by the waves than it would be if a single horizontal plate should be used which does not confine the water. In cases in which a platform or raised deck is to be supported by the vessel above the waves, two or more horizontal plates suspended beneath the vessel are preferable to a single one; but, as this part of my invention is not restricted (as the preceding part is) to the combination of the vessel with two or more horizontal plates, I have represented in the drawings several applications of it with a single horizontal plate, it being understood that when the first part of my invention is to be used in connection with the other parts, at least two suspended horizontal plates separated by a space must be used.

Figs. 4 and 4* represent a buoy with one bottom plate of larger dimensions than the floating body or vessel. The top of the buoy is fitted with a lantern or light apparatus, which is supported above the floating vessel by stays or columns, which permit a practically free passage for the sea between the floating vessel and the bottom or platform of the lantern, and, owing to its freedom from pitching and rolling, and to the slight resistance offered to the waves by its supports, the light should at all times be visible in clear weather.

Figs. 5 and 5* represent a vessel for passengers and cargo. B is the platform forming an upper deck containing saloons, &c., and connected with the floating body A by the columns F and stays, as shown. These columns are hollow, to allow of the ventilation of the interior of the floating body, and one or more of these columns should be sufficiently large to permit a person to ascend from the floating body to the upper deck, B, by means of an internal ladder. C is the bottom plate, attached to and suspended from the floating vessel by rods and stays, as shown. The interior of the floating vessel may contain the engines and stores, &c. The propeller can be fixed in any position desired between the bottom of the floating vessel A and bottom plate, C. The top surface of the floating vessel A may be provided with one or more air-tight hatches for loading and unloading cargo.

When the floating body is to be propelled through the water, I sometimes substitute strong upright plates in place of columns, to connect the bottom plates with the floating body, such connecting-plates being set in the direction of the vessel's length, and such connecting-plates may either be continuous or may be constructed with openings. There may be two or more such plates arranged in parallel lines. Sometimes, also, I make the columns of lenticular section, with their edges set fore and aft, to diminish the resistance to propulsion.

In order to counteract the effect of the wind in heeling vessels to leeward, I sometimes construct my floating bodies with a series of water-tight compartments—such as *a*, Fig. 5—at their sides, and provide one or more pumps, connected with the same by suitable pipes and valves. This construction permits the windward side of the vessel to be ballasted with water, and enables the ballast to be shifted from one side of the vessel to the other when

the direction of the vessel to the wind is changed. This water ballast, being at a distance from the center of the vessel, is a powerful agency in counteracting the heeling effect of the wind.

Fig. 6 represents a pier supported by three floating bodies. B is the upper staging or platform, connected with the three floating bodies A A A by the columns F and stays, as shown. C C C are the three bottom plates, which are firmly secured to heavy sinkers by the mooring-chains E, to prevent the pier from drifting with the tide. The whole structure is well secured together in all its parts, so as to make one rigid and immovable pier.

If it should be desired to remove the pier in the winter season to a harbor of safety, the pier may be divided up into three parts by disconnecting the three floating bodies. Each part can then be easily towed into harbor.

In cases where the tides recede so low as to leave the fore shore exposed, it can be leveled with concrete or other means under the bottom plates, C, so that the pier, at low tide, would rest on the concrete in a level position, the bottom plates being of sufficiently large area to make a firm base to the pier above. In many places where shifting sands are to be found it is impossible to build an ordinary pier on piles. It would in such cases be of great advantage to use this floating pier.

In the three applications represented by Figs. 4 4*, 5 5*, and 6, two or more horizontal plates may be advantageously used instead of one, numerous trials and experiments having proved that an increase in the number of these plates gives more than a proportionate amount of steadiness to the floating vessel. It was also proved that there were two things necessary to obtain a practically-steady platform at sea, viz:

First. That the floating vessel should be made of such form as to offer the least resistance possible to the waves, and should allow them to pass freely over it. There should, therefore, be no broadsides, as in ordinary ships.

Second, That some foundation must be made in the sea to prevent pitching and rolling, or even rising and falling too suddenly to the waves, and for this purpose the weight of the water beneath the floating body must be made to serve in the manner described by means of the bottom plates.

Some of the great advantages to be obtained by this system are as follows: Light-ships and buoys can be prevented from pitching and rolling, consequently more perfect light apparatus can be used on them, and the lights should be at all times visible in clear weather, whereas with the usual light-ships, in rough weather a great portion of the light is wasted by being directed to the sky or buried in the sea. Moreover, the tower above the floating vessel may be constructed on so large a scale that it will take the place of a light-house with the capacity of being moved out in the deep seas, where it would be quite impossible to obtain a foundation for an ordinary light-house. Telegraph-station vessels can be placed at long distances apart across the ocean, and connected together by means of a cable of telegraph-wire under the sea. The great importance of such a system of telegraph-stations across the ocean to maratime nations has been frequently discussed; but hitherto it has been found to be impracticable by reason of the rising, falling, and rolling of ordinary vessels injuring the cable, and the impracticability of living continuously in a vessel which has no upper works and is swept by the sea; but this objection is obviated by my invention, as vessels can be made on this system to barely rise or fall at all by increasing the area of the bottom plates, or increasing the number of them, while the platform, raised clear of the sea, affords opportunities for the exercise and airing of the keepers. Piers, also, can be constructed on this system and securely moored in position, thus saving the great expense of pile-driving, &c. Another great advantage will accrue from the fact that, if desired, during the winter or tempestuous seasons of the year, the piers can be towed into a harbor of safety until required for use again in the fine season. Many piers are entirely destroyed and nearly all suffer considerable damage in the stormy seasons. During these seasons many of the piers are not required at all, so that their removal into harbor would be no loss.

For naval purposes this system will provide in many ways the great desideratum of a practically-steady body at sea, either for war-vessels or floating fortresses on which the guns are raised above the action of the waves.

Passenger-ships made on this system will not only be relieved of the rolling and pitching motions of ordinary ships, but will also be entirely free from the sudden rising and falling motions of the waves, which are so productive of sea-sickness, and which no other system has yet been able to prevent. A passenger-ship on this new plan will have the appearance of a floating pier traveling through the sea, the waves passing between the floating vessel and the upper deck. The raised platform forming the floating vessel need draw but little water, and the total depth from floating vessel to the bottom plate need not exceed that of ordinary vessels.

For long sea passages, where heavy seas are encountered, the bottom plate or plates can be made so as to be raised or lowered, as desired. To effect this I attach the bottom plate or plates to columns fitted to slide endwise in the columns which connect the platform forming the upper deck and floating body together. By making the upper columns pass through the floating vessel, and by making the lower columns to work telescopically in the upper columns, the lower plate can be lowered to a

considerable depth below the floating body, and can also be raised up close to the floating vessel, when desired. By this means a vessel can be made to encounter the heaviest seas and to enter some of the shallowest harbors. Any diminution of speed which would arise from the skin-friction of the bottom plate would, in my opinion, be counterbalanced by the small resistance offered by the floating body to the waves, as compared with the great resistance offered by the broadside and bow of ordinary vessels. It is also a well-known fact that bodies of equal displacement can be propelled faster under water than on the surface, and the former would be the case with the floating body constructed upon my system. As the floating body will pass entirely through the waves instead of up and down the waves, as do ordinary vessels, a considerable saving of distance to be traveled would be effected, and consequently a saving of time, even supposing both vessels to travel at the same speed.

I am aware that a floating body or vessel has been combined with a horizontal plate suspended beneath it and secured to it for the purpose of steadying it in a seaway; hence I do not claim, broadly, that combination.

I claim as my invention—

1. The combination, substantially as before set forth, of the floating vessel with two horizontal plates secured beneath the same and adapted to hold a mass of water between them.

2. The combination, substantially as before set forth, of the vessel, the horizontal plate secured beneath the same, and the platform supported above the same by means of columns, leaving a space between said vessel and said platform for the passage of waves.

3. The combination, substantially as before set forth, of the vessel, the horizontal plate secured beneath the same, the platform above the same, and the hollow column, which combines said platform and vessel with the capacity of inclosed communication between the two.

In witness whereof I have hereunto set my hand.

JOHN F. C. FARQUHAR.

Witnesses:

W. L. BENNEM,

J. E. WARNER.