Aug. 21, 1951 R. M. HAMILTON 2,565,369

SECTIONAL ARTICULATED FLOATING PLATFORM

Filed Oct. 26, 1945 6 Sheets-Sheet 1

Fig. 1.

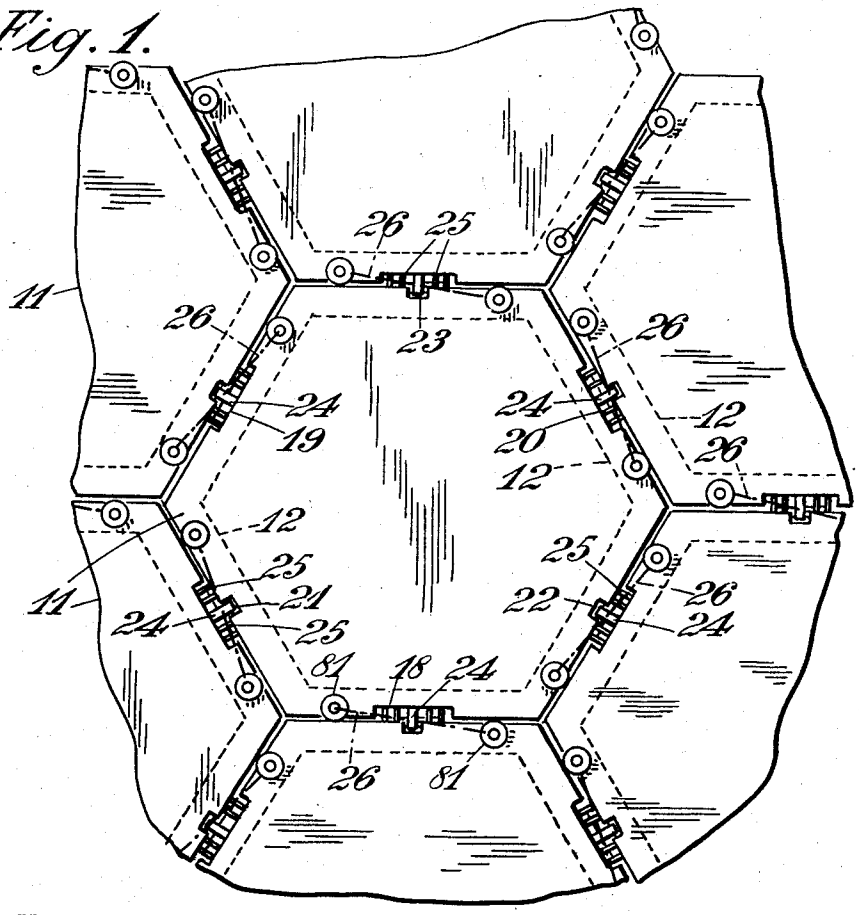
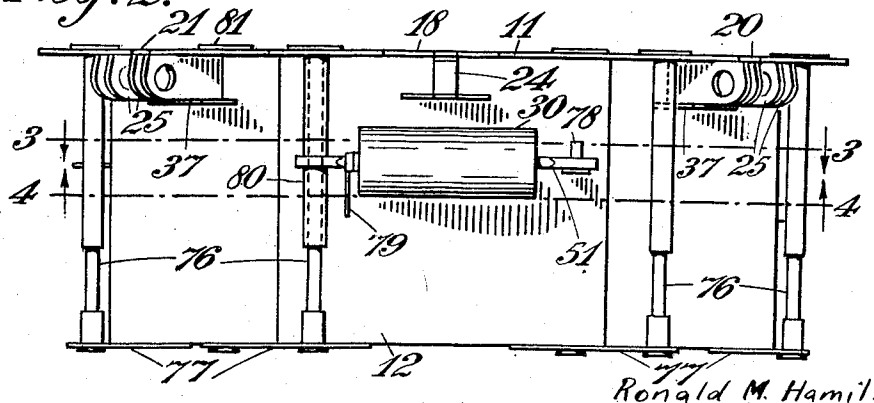


Fig. 2.



Ronald M. Hamilton
Inventor

by his attorneys
Stebbins, Blenko & Webb

Aug. 21, 1951 R. M. HAMILTON 2,565,369

SECTIONAL ARTICULATED FLOATING PLATFORM

Filed Oct. 26, 1945 6 Sheets-Sheet 2

Fig. 3.

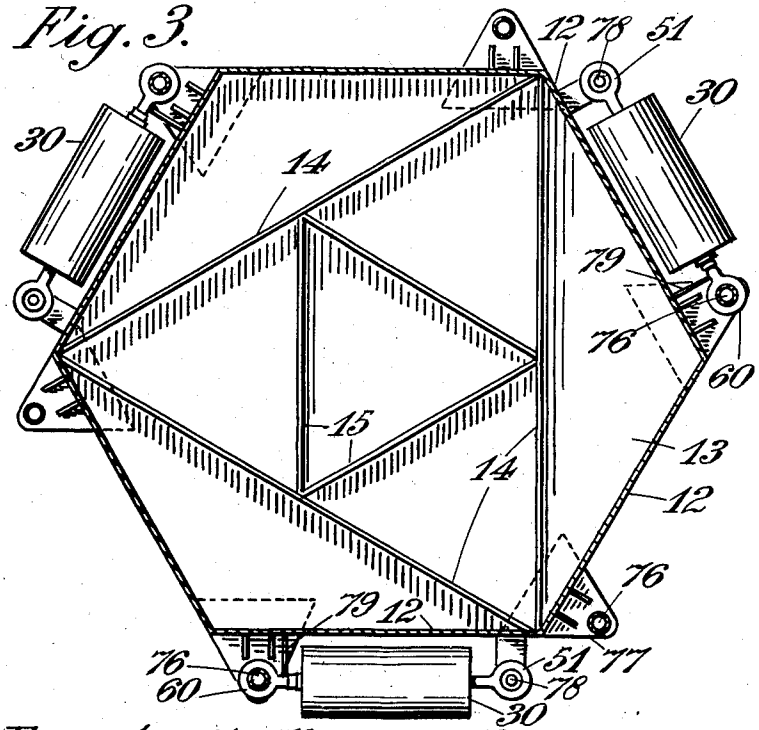
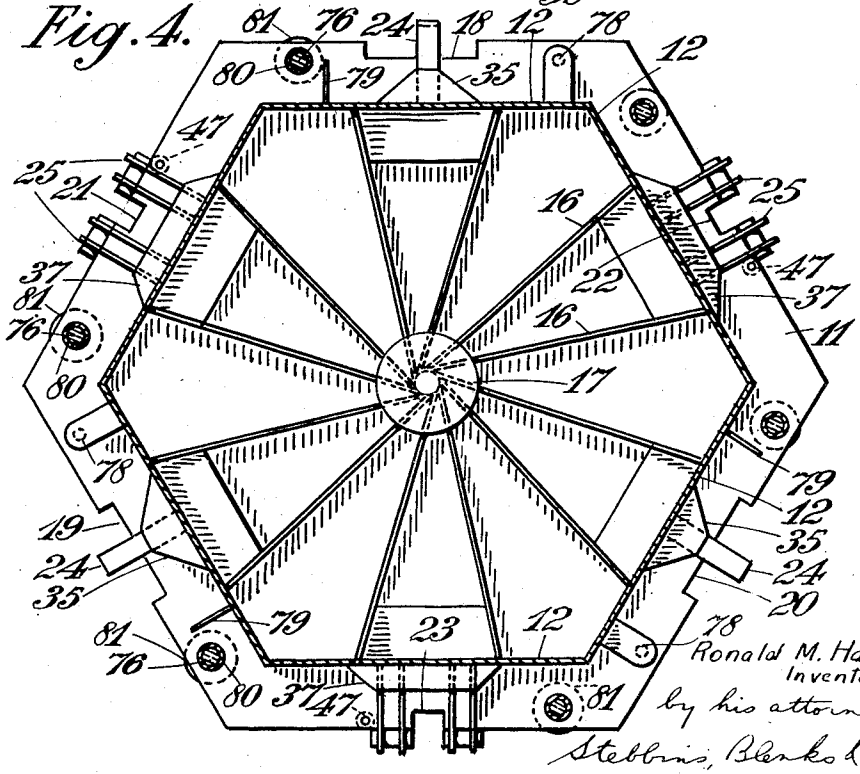


Fig. 4.



Ronald M. Hamilton
Inventor
by his attorneys
Stebbins, Blenko & Webb

Aug. 21, 1951 R. M. HAMILTON 2,565,369

SECTIONAL ARTICULATED FLOATING PLATFORM

Filed Oct. 26, 1945 6 Sheets-Sheet 3

Fig. 5.

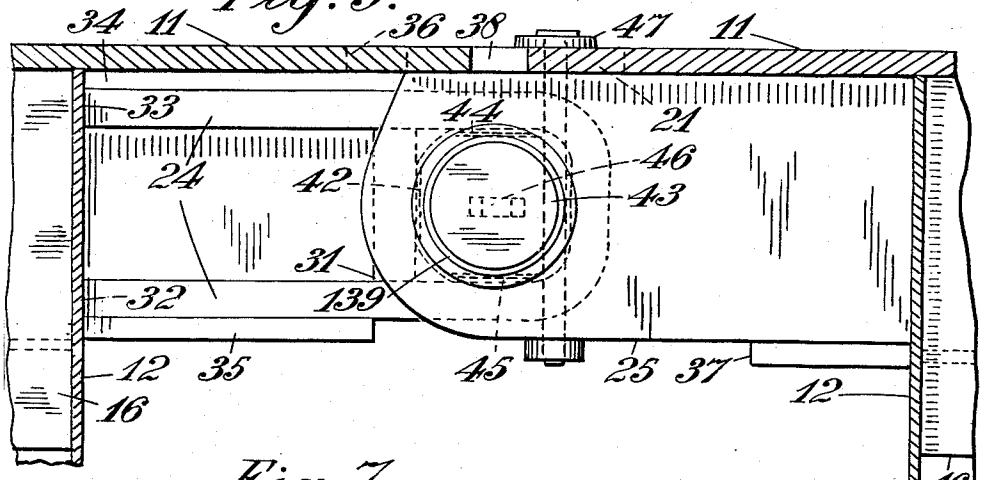
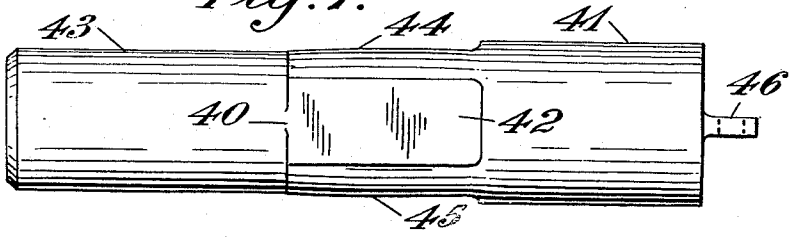


Fig. 7.



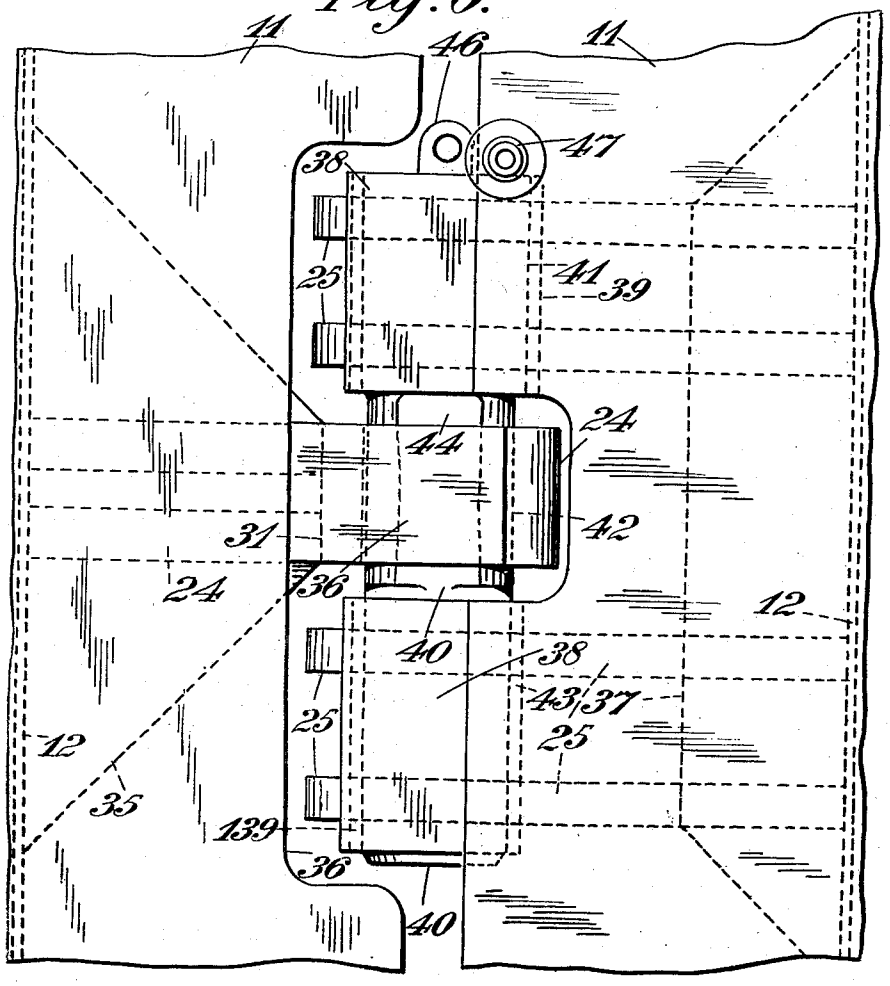
Ronald M. Hamilton
Inventor
by his attorneys
Stebbins, Blenko & Webb

Aug. 21, 1951 R. M. HAMILTON 2,565,369

SECTIONAL ARTICULATED FLOATING PLATFORM

Filed Oct. 26, 1945 6 Sheets-Sheet 4

Fig. 6.



Ronald M. Hamilton
Inventor
by his attorneys
Stebbins, Blenko & Webb

Aug. 21, 1951 R. M. HAMILTON 2,565,369

SECTIONAL ARTICULATED FLOATING PLATFORM

Filed Oct. 26, 1945 6 Sheets-Sheet 5

Fig. 8.

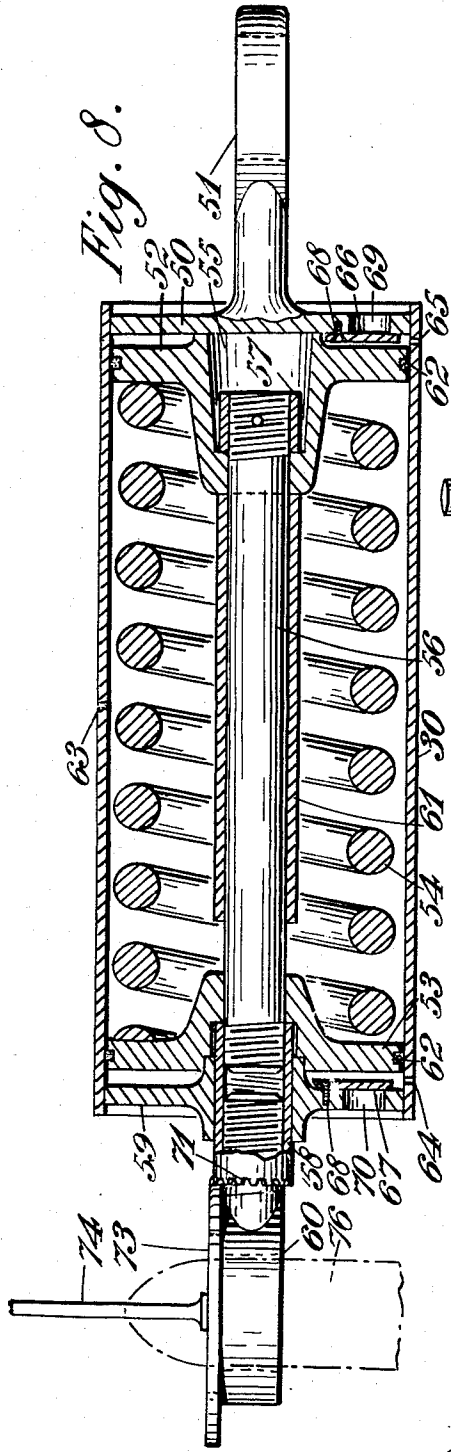


Fig. 10.

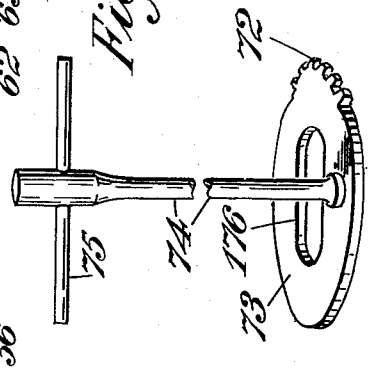
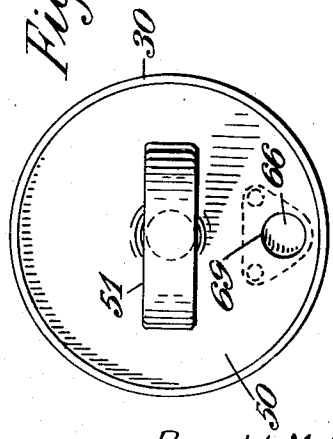


Fig. 9.



Ronald M. Hamilton
Inventor
by his attorneys
Stebbins, Blenko & Webb

Aug. 21, 1951 R. M. HAMILTON 2,565,369

SECTIONAL ARTICULATED FLOATING PLATFORM

Filed Oct. 26, 1945 6 Sheets-Sheet 6

Fig. 11.

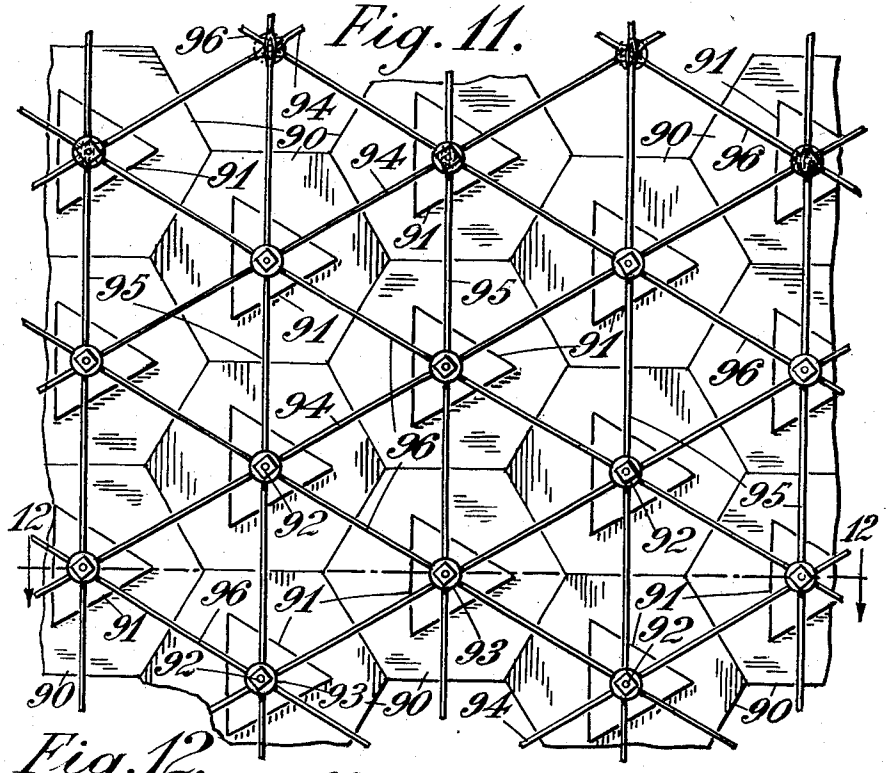


Fig. 12.

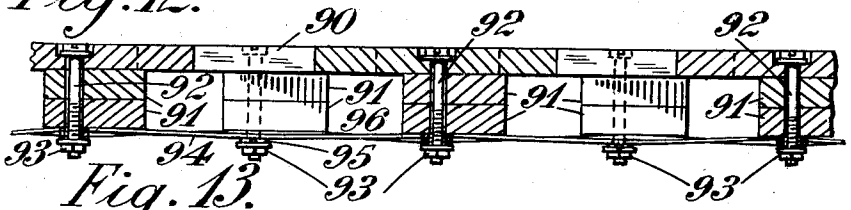


Fig. 13.

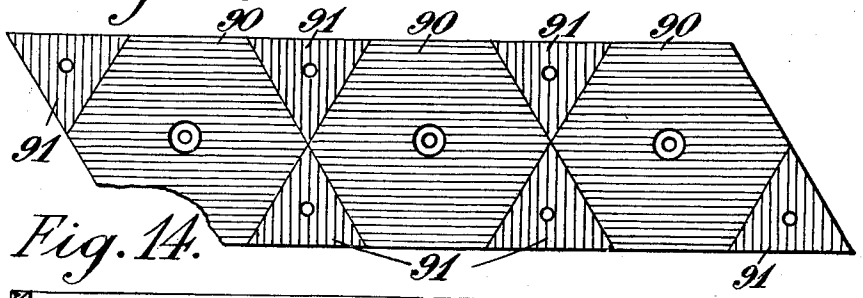


Fig. 14.

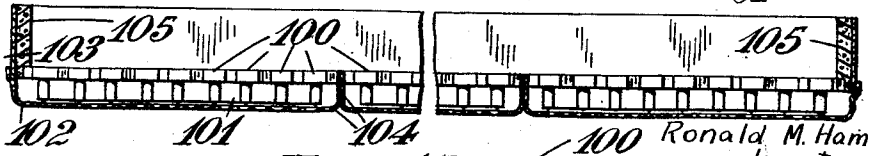


Fig. 15.

Ronald M. Hamilton
Inventor
by his attorneys
Stebbins, Blenko & Webb

Patented Aug. 21, 1951

2,565,369

UNITED STATES PATENT OFFICE

2,565,369

SECTIONAL ARTICULATED FLOATING PLATFORM

Ronald Marsden Hamilton, Farnham, England, assignor to Hamilton's Lilyflex Surfaces Limited, London, England, a British company

Application October 26, 1945, Serial No. 624,662
In Great Britain May 28, 1941

8 Claims. (Cl. 114—0.5)

1

This invention comprises improvements in or relating to floating airfields, runways, bridges and the like, and is in part a continuation of my application Serial No. 476,462, filed February 19, 1943 which has, since the filing of this application matured into Patent No. 2,527,995. It is an object of this invention to provide an improved floating platform which can be used as a runway for aircraft or a floating bridge or other analogous purpose. The invention comprises a floating airfield consisting of blocks of polygonal formation which are fitted together so as to form a mosaic floor capable of floating on the surface of water and able to yield under the weight of aircraft or other vehicles located upon it so as to spread the load, to enable the structure to ride easily over large waves and to afford a "dynamic buoyancy" to vehicles upon it when they are in motion over its surface. By dynamic buoyancy is meant that the progressive displacement of the water, caused by displacement of the depression in the surface of the structure when a vehicle rides forward over it, produces an upward force on the structure due to the inertia of the water which prevents the depression from being so deep as it would need to be if the vehicle were at rest.

The present invention further comprises a mosaic floating structure wherein the mosaic elements are united to one another by hinge connections disposed around each mosaic element in positions where it adjoins its neighbours in such manner that the hinge-lines of the hinges extend in a plurality of intersecting directions.

Preferably the hinge-lines of the various sections are such that they form a zig-zag pattern in every direction across the structure. The object of this is that there should be no direction in which the structure as a whole is capable of bending in a straight line about its hinges because if such is the case the bending will be easier about such a line than about other lines and the structure may be liable to take up a sharply bent or furrowed formation when waves come upon it from a direction at right angles to the line along which it bends most easily. For example the elements of the structure may be composed of regular hexagons so that the hinge-lines extend across the structure in a series of zig-zag tracks the successive sections of which lie at angles of 120° to one another.

Such hexagonal or like structure, across which the hinge-lines form zig-zag patterns, although all the elements are hinged to one another, does not yield to a load upon it by bending about one

2

axis or into a merely cylindrical shape. The load tends to cause a depression like a very flat inverted dome, but as the area of the surface of the depression is necessarily greater than the area of a flat surface of equal size as viewed in plan, the tendency is to pull the units of the mosaic which are near the periphery inwards to supply the extra area. As the units are very rigid this can only take place to a slight extent and therefore the depression is very flat and the load which is located in the centre of, and is the cause of, the depression is supported by a reaction spread over a large area of water. Even although the hinge joints may run, as above described, along zig-zag lines, the structure as a whole is capable of bending into a more or less cylindrical or sinusoidal shape of large radius under the influence of large waves. If the hinge-lines run in straight lines across the structure and the direction of movement of the waves is at right angles to the hinge-lines of course the sinusoidal configuration is easily obtained and may become too sharp under these conditions but with the preferred construction in which the hinge-lines do not extend in straight lines but in zig-zag lines, a sinusoidal configuration of large radius may be acquired by the structure on account of slight play in the hinge joints which is inevitable in manufacture, or which can be assured if necessary by special design. In the case of the zig-zag pattern the advantage is gained that the readiness to assume a sinusoidal configuration on the part of the structure is equal, or more or less equal, for waves coming from every direction.

A hexagonal formation has been referred to as preferable, and this is particularly so because all the units of the mosaic may then be alike. However, mosaics built up of sections of a plurality of shapes, such as octagons interspersed with squares set diagonally, can be adopted with success, but they involve greater trouble in manufacture.

Preferably each of the mosaic elements is designed to have a freeboard greater when it is floating unloaded than the depth of the depression produced in the structure, under normal conditions of use, by the load of the vehicles to be used thereon. If this is done it is unnecessary to make the joints between the individual elements of the mosaic watertight.

The hinge connections between the sides of each mosaic element and its neighbours may be such as to permit twisting of the element out of the plane of its neighbour, if desired, such

twisting being limited by shock absorbing devices.

The shock absorbing devices may take the form of stops with means to cushion the shock before the stops come into play.

Notwithstanding the quality of the structure explained above which limits the curvature of bends due to the hinge lines running in zig-zag formation across the structure, it is desirable for structures which are to be used in choppy seas to provide means which further limit the curving of the surface under the influence of waves and to do this without unduly stressing the structure or losing the advantages derived from its flexibility and the provision of shock absorbing devices as just described is beneficial.

The invention includes, in a mosaic floating structure, the combination of a mosaic formed by interfitting floating elements, hinge connections disposed around each mosaic element in positions where it adjoins its neighbours to unite the elements together, the hinge-lines extending in a plurality of intersecting directions, and damping devices also interconnecting the mosaic elements to retard bending of the hinges under stress of wave forces. The damping devices may be of the hydraulic cylinder-and-piston type.

When the hinge-lines extend in zig-zag pattern in every direction across the structure, the damping devices may consist of hydraulic cylinder-and-piston damping elements each positioned beneath a hinge with its line of extension parallel, or almost parallel, with the line of the hinge.

It is possible for the damping devices to lie parallel, or almost parallel, to the lines of the hinges because flexing of the hexagonal structure necessarily involves not only hinging about the axes of the pins but a certain amount of transverse movement of the pins in their hinges and twisting of the elements relative to one another, since the pins, as above pointed out, do not anywhere extend across the structure in a straight line.

The following is a description by way of example of certain constructions of floating structure in accordance with the invention, reference being made to the accompanying drawings, in which:

Figure 1 is a plan of a part of the structure as assembled;

Figure 2 is a side elevation of one mosaic unit of the structure shown in Figure 1;

Figure 3 is a section upon the line 3—3 of Figure 2 looking downwards in the direction of the arrows;

Figure 4 is a section upon the line 4—4 of Figure 2 with parts omitted looking upwards in the direction of the arrows so that the underside of the deck is seen;

Figure 5 is a detail section through the joint between two mosaic elements showing the hinge connection in elevation;

Figure 6 is a plan of the same parts as are shown in Figure 5;

Figure 7 is a detail of the hinge pin;

Figure 8 is a longitudinal section through a shock absorbing unit;

Figure 9 is an end elevation of the same;

Figure 10 is a detail of an adjusting tool;

Figures 11 to 15 inclusive show an alternative construction originally shown in the aforesaid United States Patent Application Serial No: 476,462; in these figures:

Figure 11 is an underside plan view of a floating airfield structure;

Figure 12 is a section on the line 12—12 of Figure 11;

Figure 13 is a diagram showing the method of construction of the parts used in Figures 11 and 12;

Figure 14 is a section through a modified construction, and

Figure 15 is a detail of the construction illustrated in Figure 14.

Referring first to Figures 1–10, floating structure consists of a large number of hexagonal units each of which comprises a hexagonal deck plate 11. The deck plates are shown in the drawings as flat but they may be provided on their upper surface with some form of roughening or upstanding ribs or strakes not shown in the drawing, to prevent slipping of the wheels of vehicles using the surface. Alternatively the plates may be corrugated, which has the advantage of stiffening them as well as of providing a non-slipping surface.

To the underside of each of the plates 11 there is welded a hexagonal float chamber the walls of which are indicated in Figure 1 by the dotted lines 12. The walls 12 are shown in full lines in Figures 2, 3 and 4 and the chamber will be hereinafter referred to as the float chamber 12. The bottom of the float chamber is closed by a hexanogal plate 13 (Figure 3) and this plate is stiffened by ribs 14 which extend across it in a triangular formation and by a small triangle of ribs 15 uniting the ribs 14 together. The ribs 14, 15 are welded to the outer walls 12 of the float chamber and the walls 12 are also welded together at the corners as well as being welded to the deck plate 11. Each of the float chambers comprises stiffening ribs 16 beneath the deck plate which are seen in the underside section, Figure 4, and which extend radially, or nearly radially from points slightly offset from the centre, toward the side walls and are welded to each other at the centre, to the side walls at their ends and to the deck plate along their upper edges. Beneath the ribs 16 where they meet one another at the centre there is welded a circular plate 17 which unites them all more firmly together and transmits tension from each rib to the opposite one. This structure stiffens the deck plate sufficiently to bear the load.

It will be noted that the deck plate 11 overhangs the walls of the float chamber 12 all round and that the deck plates of the various elements of the structure fit together with only a slight space between them. The deck plates 11 may measure say about six or seven feet between opposite sides and the spaces between their edges may be say half an inch to an inch in width. The thickness of the plates is such that they normally float immersed to about one-third or half their depth, that is to say about eighteen inches or less in the water and they are therefore capable of sinking substantially under load before becoming flooded over the upper surface.

Taking the deck plate 11, as seen in Figure 1, it will be observed that on three sides it is widely notched out, as shown at 18, 19, 20, and on the intervening sides it has narrower notches 21, 22, 23. There project from the element in the centre of the wide notches male hinge members 24 and on each side of the narrow notches there project hinge members 25 of the corresponding female parts. The female hinge members on one of the plates 11 are adapted to fit with the male

parts of hinge members on adjoining plates and by arranging the male and female parts alternately around the sides of the hexagon it will be found that all the hexagons will fit together and all be alike. The details of the hinges are hereinafter described.

In addition to the units being connected together by hinges, one in the centre of each side, as just described, they are further connected by hydraulic piston-and-cylinder damping mechanisms with stops, which mechanisms are located just above the plane of the bottoms of the float chambers. In Figure 1 the centre lines of the dampers are shown by the chain lines **26** and these dampers are constructed so that they resist both extension and compression as hereinafter explained. It will be noted that there is a damper connecting each side of each unit with its neighbour. Before the parts are assembled the dampers are stowed on the units, three to a unit, and occupy alternate sides. The neighbouring units supply the dampers to fill the sides which do not carry them before assembly. In the drawing, Figure 2, a damper **30** is shown in the stowed position on one of the sides **12** while the two neighbouring sides are shown without dampers. The damper **30** as stowed has been omitted from Figure 4 but the three dampers are shown in situ in Figure 3 in the stowed position.

Before describing the damping means it is preferable to describe the hinges in some further detail. As can be seen from Figure 2 and Figure 5 the male part **24** of the hinge is formed from a flat steel bar which is bent twice into a rectangular U-shape, the arms of the U being joined together by a cross-piece **31** so that a square opening is left between the cross-piece **31** and the bent part of the U-shaped bar. The cross-piece is welded to the sides of the U and the U-shaped member itself is turned over with the arms horizontal and welded at **32, 33** to the wall **12** of the float chamber. A packing piece **34** is inserted between the upper sides of the hinge **24** and the deck **11** and the U-shaped hinge member **24** is welded to the packing piece **34**, the packing being itself welded to the deck. A triangular plate **35** welded to the wall of the float chamber **12** underlies the lower arm of the hinge member and is welded thereto. A small packing piece **36** is welded to the top of the hinge member **24** to bring the upper surface up to the level of the deck.

On the female side the hinge comprises four upright plates **25** which underlie the overhanging edge of the deck **11** of the next unit and are welded thereto and to the wall **12**. The plates **25** lie two to one side and two to the other side of the male member **24** of the hinge and their attachment to the hexagonal unit is stiffened by means of a web plate **37** which underlies them and is welded to them and to the wall **12**. The outline of the plate **37** can be seen in dotted lines in Figure 6. Here it may be observed that in the drawings the fillets of the welds are not shown, to avoid cumbering the drawing but their existence will be obvious to an engineer. Where the plates **25** project beyond the edges of the deck plates **11** they are covered with packing pieces **38** to provide an upper surface level with the deck surface and prevent any undue break in the continuity thereof.

The plates **25** are pierced with openings to receive bushes **39, 139** which fit the end portions of a hinge pin **40** and the hinge pin **40** is made square in cross-section at its middle portion so as to fit the square in the centre of the male hinge member **24**. As can be seen from the detail, Figure 7, the pin comprises a large end **41** which fits the bush **39**, a squared central portion **42** to fit the male member of the hinge and a reduced circular portion **43** to fit the bush **139**. The central squared portion **42** has flat faces on its vertical sides but is slightly barrel-shaped on its upper and lower sides as indicated at **44, 45** in Figure 7, so that it can permit a slight canting of one-half of the hinge relatively to the other and thereby permit of any unit being twisted in its plane relative to the unit to which it is hinged. It will be noted that the squared portion is not a complete square but a square with rounded corners. On one end of the hinge pin there is an eye **46** for attachment to a chain by which it may be secured to the underside of the deck plate. The chain is not shown in the drawing but it serves to prevent the hinge pin from being withdrawn from the bush **39** and accidentally dropped in assembling the parts, because it would then fall into the sea and be lost, but the chain is long enough to permit the pin to be withdrawn so far as to permit introduction of the male hinge member **24** between the two bushes. A locking pin **47** is provided which can be dropped into a hole through the deck and fall in behind the head **41** of the pin **40** after it has been inserted in the hinge and thus prevent it from working out again.

One of the dampers **30** is shown in Figures 8 and 9. It comprises a metal tube which forms the cylinder and is closed at one end by a cover plate **50** welded to the cylinder and carrying an eye **51**. Within the cylinder are two pistons **52, 53** held apart by a strong buffer spring **54**. The piston **52** which lies nearer to the cover plate **50** has a central recess **55** and is bored centrally to pass a piston rod **56** which is capable of sliding through the piston **52** into the recess. Within the recess the rod **56** carries a screwed-on head **57**. At the other end of the cylinder the rod **56** passes through the piston **53** and is screwed into a sleeve **58**. The sleeve **58** is a sliding fit in a cover plate **59** which is welded in the cylinder after the other parts have been assembled. The sleeve **58** butts on the inside of a recess formed in the piston **53** and thus the spring **54** is held compressed between the sleeve **58** on the rod **56** at one end and the head **57** screwed on the rod at the other. An eye **60** is screwed into the sleeve **58** and thus tension or compression can be applied to the damper **30** by applying force to the eyes **51, 60**. If compression is applied the sleeve **58** is forced into the cylinder and presses the piston **53** to the right as viewed in the figure, the amount of the movement permissible being that which suffices to bring the head **57** against the cover plate **50** which acts as a stop. If tension is applied the rod **56** draws the piston **52** to the left, as viewed in the figure. This movement is limited by a tube **61** which is slid over the rod **56** and is long enough to butt at the end of the desired movement against the piston **53** and so act as a stop.

Each of the pistons **52, 53** is provided with a single split piston ring **62**. In the centre of the cylinder **30** at the upper side there is a bleed hole **63** and at each end on the underside are bleed holes **64, 65**. In addition there are inlet clack valves **66, 67**. The clack valves consist of triangular metal plates which are hung at their upper corners on screws **68**. The screws **68** have countersunk heads and the clack valves **66, 67**

have holes to receive the heads which are also countersunk but to a wider angle than the angle of the heads of the screws. The bottoms of the countersunk holes in the clack valves being made of slightly greater diameter than the screws, it is impossible for the screws to grip the valves tightly. The valves therefore hang against the insides of the cover plates 50, 59, the valve 66 serving to close an inlet port 69 and the valve 67 to close an inlet port 70. The effective length of the damper can be adjusted by rotating the sleeve 58 relatively to the eye 60 and in order to facilitate this adjustment when the damper is in situ, the end of the sleeve 58 is cut into gear teeth 71 which are adapted to mesh with teeth 72 on an adjusting tool which consists of a disc 73 and an operating rod 74. The tool is shown in perspective in Figure 10 and it will be seen that the rod 74 carries a cross handle 75 at the top. The disc 73 is pierced with an elongated hole 176 having parallel sides and rounded ends and the distance between the sides is made equal to the diameter of the pin 76 which enters the eye 60. Therefore the length can be adjusted by slipping the disc 73 over the pin 76 and meshing the teeth 72 with the teeth 71, after which by giving the disc a series of partial rotary movements alternated with lifting it off the teeth 71, moving it angularly back to its original position and remeshing, the sleeve 58 can be adjusted a few teeth at a time until the correct length is reached.

These dampers are fitted over upstanding pins 76 which are supported by bracket plates 77 standing out from the underside of the float chamber 12, as can be seen in Figure 3. There is a bracket and an upstanding pin 76 from each corner of the float chamber but prior to assembly there are dampers secured on three only of the pins 76. As can be seen from Figures 2 and 3 the other ends of these dampers are temporarily supported on bracketed pins 78 close below the male portions 24 of the hinges. In order to prevent the eyes 60 from sliding down the pin 76 the shank of the eye is supported on a short vertical plate bracket 79.

When two of the hexagonal elements are brought together, after the hinge has been pinned up, a hook is lowered through the space between the edges of the deck plates 11 and the eye 51 is lifted off the pin 78 and transferred to the pin 76 of the next element, which will be found to be in position to receive it. This will swing the damper from the position shown in Figure 3 where its axis is parallel to the side wall 12 of the float chamber into the position indicated in chain lines in Figure 1 where its axis lies at an inclination to the axis of the hinge although running more or less parallel therewith. The slight swinging movement thus imparted to the damper serves to carry the shank of the eye 60 clear of the bracket 79 and as a result the damper can slide down the two pins 76, the one on one of the hexagonal elements and the other on the other element until it rests on the plates 77 at the bottom of the pins.

If in assembling it is found that the length of the dampers does not quite fit, this can be adjusted by the tool shown in Figure 10, and the dampers can moreover, after having been assembled and brought to the bottom of the pins 76, be further adjusted should this be found necessary, so that they are all more or less equally loaded when the structure is flat.

The pins 76 stand up considerably away from the brackets 77 which carry them and therefore are liable to become bent if they are given an accidental blow in transit or in assembly. To guard against this tubes 80 having flanged heads 81 are dropped through holes in the deck plates 11 so that they slide telescopically over the upper ends of the pins 76. In assemblying the elements the tubes 80 need to be lifted off those pins on to which the eyes 51 are to be dropped, and after the dampers have sunk into place the tubes 80 are replaced.

It will be apprehended that the dampers 30 are stowed, when in the position shown in Figure 5, somewhat above the water level. When, in the course of assembling, which is done afloat, the dampers have been transferred at the eyes 51 on to the pin 76 and begun to sink toward the bottom of the pins, they do so quite slowly and gently as they more or less float down through the water and during this time they fill with water through the inlet valves 66, 67. Air bubbles out through the bleed holes 63 and in a short time the damper will be found to be full of water, in which condition it is ready for work.

The rate of leakage of water past the pistons and through the bleed holes is settled by the size of the bleed holes and by the clearance between the ends of the split piston ring 62 and this, in conjunction with the force exerted by the spring 54, gives a maximum total force which the damper will exert. This force must be arranged to be within the strength of the hinges and the walls of the floating hexagonal elements and as a result the elements are held with their decks nearly level against all forces exerted by the waves up to that predetermined by the spring 54 and they are permitted by the damper to flex slowly against forces in excess of this figure. Thus the structure can never be overstrained and always keeps itself as flat as its strength will permit.

In the event of a heavy storm it may be that sections of the structure cannot flex sufficiently fast to prevent the structure from being lifted by the waves so that a portion of it will bridge between the crests of adjacent waves. In such a case the dampers when they rise above the surface of the sea will rapidly empty themselves and their damping action will therefore be automatically eliminated, at all events temporarily, so that the structure will be more easily accommodate itself to rough waves. As a floating aerodrome or pier of this kind cannot be used in a storm it is a distinct advantage that under such conditions it accommodates itself to the waves more easily and is less stressed than when it is riding fully awash in calm weather. The structure will maintain a surface flat enough for aircraft to alight upon in all weathers up to a certain degree of violence of the waves, above which it will not be usable but will, if properly constructed, be able to ride out the storm.

The cylinders empty partly through the clack valves, which hang rather loosely at those ends of the cylinders where there is no pressure, and so emptying is more rapid than filling, which latter is limited by the rate of escape of air through the single small hole at the middle of the upper side. Therefore it will be appreciated that in stormy weather there will be a general tendency to keep a certain amount of air in the damping cylinders which reduces the stiffness of the structure but as the weather moderates the stiffness will automatically return.

Referring now to Figures 11 to 13 these show a construction of floating floor for an aerodrome.

Only a section of the floor is shown. It consists of a large number of hexagonal pieces of wood **90**. These may be about two inches thick and they each carry beneath them a stem-portion **91** made of two triangular blocks of wood of similar thickness secured to the head **90** by means of a bolt **92** and nut **93**. These hexagonal units are all held together by a mesh of wires **94, 95, 96** on their underside, which mesh is constituted by three parallel sets of wires crossing one another at angles of 60 degrees and united at each crossing point by the bolts and nuts **92, 93**. The wires are all stranded wire and are partly unstranded and eyeletted where they pass over the bolts. Such a construction can be extended as far as desired in any direction and the wires **94, 95, 96** can be made up in lengths which cover a certain number of sections, with an eye at each end and then commence again if necessary. Such a structure being mainly constructed of wood, will float of itself and as the hexagonal sections fit closely together and are prevented from moving apart by the wire mesh beneath them, it will only bend downwards, when a weight is placed upon it, with a somewhat slight radius of curvature. In other words the structure is stiffened sufficiently to spread the load although it remains flexible. Therefore aircraft can be launched across the surface and the weight of the aircraft is distributed over a large area of water, the whole forming a flexible mat. Water-tightness between the sections can be assisted, if desired, by rubber joints, but it is not positively essential because the weight of an aircraft when alighting or arising rests on any particular part of the floor for a short period of time only. Around the edges of the aerodrome thus created there would preferably be erected a barrier or fence of canvas of a height sufficient to prevent the surface from being swamped by waves.

Figure 13 shows how the hexagons **90** and the triangles **91** can be cut from a single plank by making criss-cross cuts at intervals. By manufacturing in this way waste of wood is avoided.

If it is important to save timber, a structure similar to that of Figures 11 to 13 can be manufactured of moulded material such as concrete by using hexagonal mushroom shaped elements **100**, as shown in Figures 14 and 15, each of which is made of concrete and is bolted to a wire mesh structure **101** beneath it, this structure being similar to that shown in Figure 1, (it will be borne in mind that Figure 11 is a view looking upwards from the underside). Below the wire mesh there is a layer of canvas **102**, the edges of which extend upwardly around the sides of the aerodrome, as shown at **103**. The canvas **102** is made in hexagonal sections and each section is bent up at the joints between the sections, as shown at **104**, so that the sections are self-contained. In this way an aerodrome is built up of a large number of floating hexagonal sections. The edges will be somewhat irregular as they will follow the hexagonal lines, but they can be filled in, if desired, by semi-hexagons. Around the edges is an upstanding concrete wall **105**.

It will be noted that one feature of the aerodrome surface described, is that the structure as a whole is not likely to be severely damaged by a bomb on any one part as the bomb will naturally pass through before exploding and the purely localised damage which would result, could be rapidly repaired by fresh sections.

I claim:

1. A floating structure comprising, in combination, a number of buoyant sections each having a deck, the decks fitting together as a mosaic and being of such shape that the joints between the several sections of the mosaic extend across the mosaic in zig-zag courses and nowhere proceed from between one pair of sections to between another pair in a straight line, hinges connecting the adjacent sides of the decks, said hinges having their axes parallel with the sides of the decks which they connect, means associated with each hinge afford limited relative angular movement of the sections at the hinge at right angles to the hinge axis, and means located below the deck level between the sections and interconnected from each section to its neighbors, to limit the angular movements of the sections relatively to one another.

2. A floating structure comprising in combination, a number of buoyant sections each having a hexagonal deck, the decks fitting together as a mosaic, hinges connecting the adjacent sides of the decks, the said hinges having their axes parallel with the sides of the decks which they connect, means associated with each hinge which afford limited relative angular movement of the sections at the hinge at right angles to the hinge axis, and means located below the deck level between the sections and interconnected from each section to its neighbors, to limit the angular movements of the sections relatively to one another.

3. A floating structure comprising, in combination, a number of buoyant sections each having a deck, the decks fitting together as a mosaic and being of such shape that the joints between the several sections of the mosaic extend across the mosaic in zig-zag courses and nowhere proceed from between one pair of sections to between another pair in a straight line, hinges at deck level connecting the adjacent sides of the decks and having hinge-axes parallel with the sides which they connect, means associated with each hinge which affords a limited relative angular movement of the sections at the hinge at right angles to the hinge axis, and hydraulic cylinder-and-piston type shock absorbing means each of which is jointed at one end to one section and at the other end to an adjacent section at a level below deck level such that they operate submerged, said shock absorbing means serving to limit the angular movement of the sections relatively to one another.

4. A floating structure as claimed in claim 3, wherein the line of extension of each shock absorbing element is substantially parallel with the line of the hinge located at deck level above it.

5. A floating structure comprising, in combination, a number of buoyant sections each having a hexagonal deck the decks fitting together as a mosaic, hinges at deck level connecting the adjacent sides of the decks and having hinge-axes parallel with the sides which they connect, means associated with each hinge which afford a limited relative angular movement of the sections at the hinge at right angles to the hinge axis, the hydraulic cylinder-and-piston type shock absorbing means each of which is jointed at one end to one section and at the other end to an adjacent section at a level below deck level such that they operate submerged, said shock absorbing means serving to limit the angular movement of the sections relatively to one another.

6. A floating structure as claimed in claim 5,

wherein the line of extension of each shock absorbing element is substantially parallel with the line of the hinge located at deck level above it.

7. A floating structure comprising, in combination, a number of buoyant sections each having a deck, the decks fitting together as a mosaic and being of such shape that the joints between the several sections of the mosaic extend across the mosaic in zig-zag courses and nowhere proceed from between one pair of sections to between another pair in a straight line, hinges connecting the adjacent sides of the decks said hinges having their axes parallel to the sides of the decks which they connect, means associated with each hinge which afford limited relative angular movement of the sections at the hinge at right angles to the hinge axis, and means to limit the angular movements of the sections relatively to one another comprising hydraulic damping elements, each consisting of a cylinder, two damping pistons therein with a spring located between them, a piston rod entering the cylinder from one end and extending slidably through both pistons which piston rod carries, on the side of each piston further from the spring, a shoulder to engage behind the piston, whereby the same spring acts to resist both extension and compression of the shock absorbing element, the cylinder being connected to one of the mosaic sections and the piston rod to an adjacent section.

8. A floating structure, comprising in combination, a number of buoyant sections each having a hexagonal deck, the decks fitting together as a mosaic, hinges connecting the adjacent sides of the decks said hinges having their axes parallel to the sides of the decks which they connect, means associated with each hinge which afford limited relative angular movement of the sections at the hinge at right angles to the hinge axis, and means to limit the angular movements of the sections relatively to one another comprising hydraulic damping elements, each consisting of a cylinder, two damping pistons therein with a spring located between them, a piston rod entering the cylinder from one end and extending slidably through both pistons which piston rod carries, on the side of each piston further from the spring, a shoulder to engage behind the piston, whereby the same spring acts to resist both extension and compression of the shock absorbing element, the cylinder being connected to one of the mosaic sections and the piston rod to an adjacent section.

RONALD MARSDEN HAMILTON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
438,196	Smith	Oct. 14, 1890
957,315	Duncanson	May 10, 1910
1,896,546	Kulik	Feb. 7, 1933

FOREIGN PATENTS

Number	Country	Date
5,242	Great Britain	Mar. 21, 1884
158,537	Great Britain	June 16, 1921
515,652	Germany	Jan. 10, 1931