April 1, 1952 H. A. WILSON 2,591,225

OFFSHORE PLATFORM

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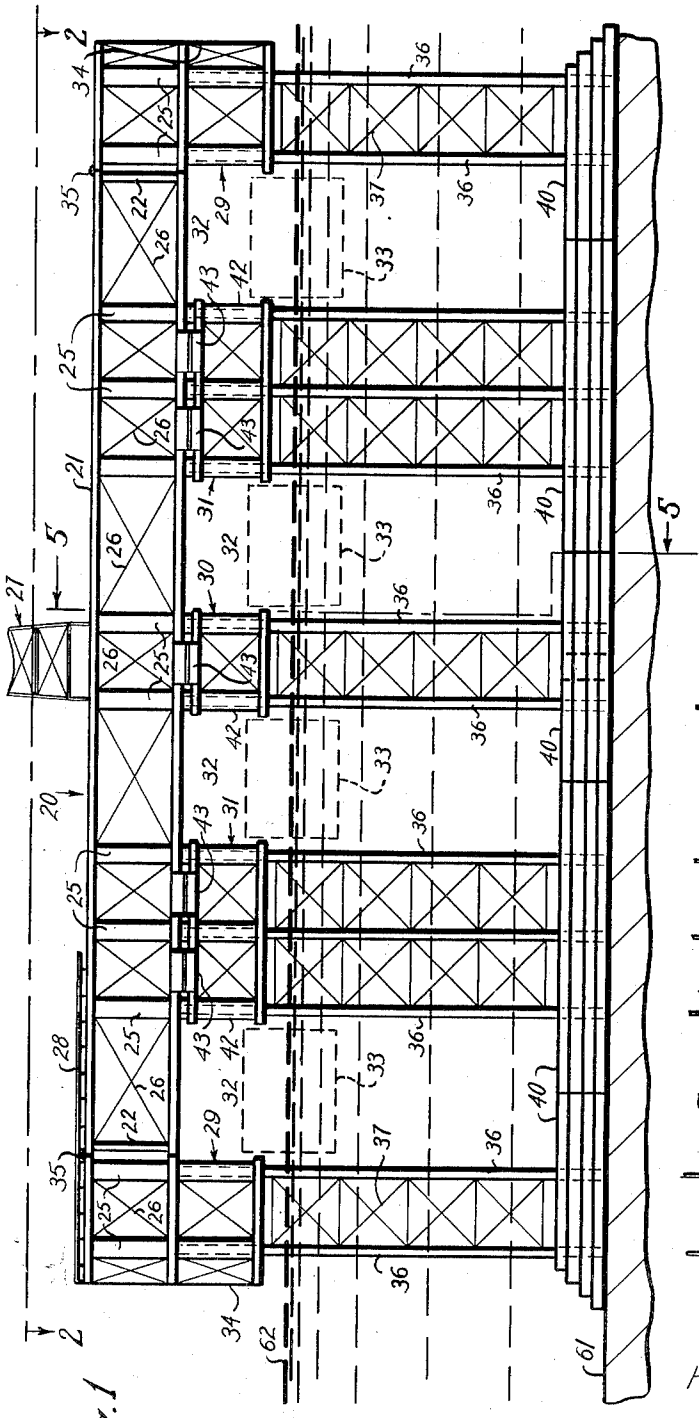

Fig. 1

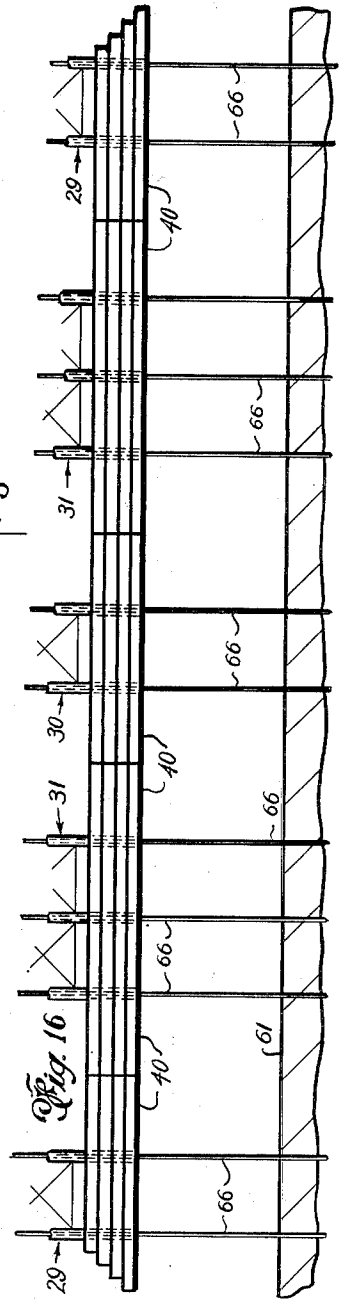

Fig. 16

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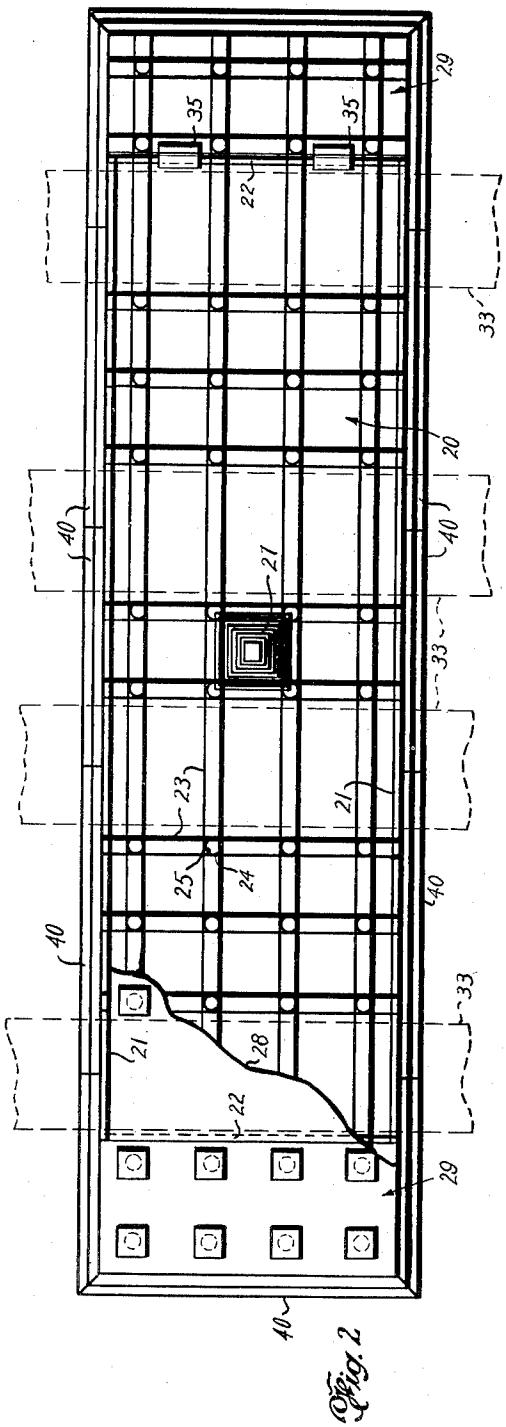

Fig. 2

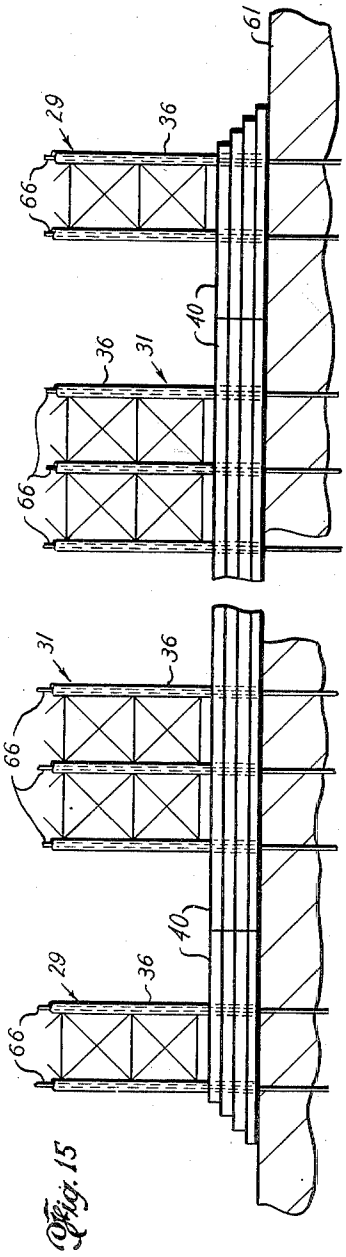

Fig. 15

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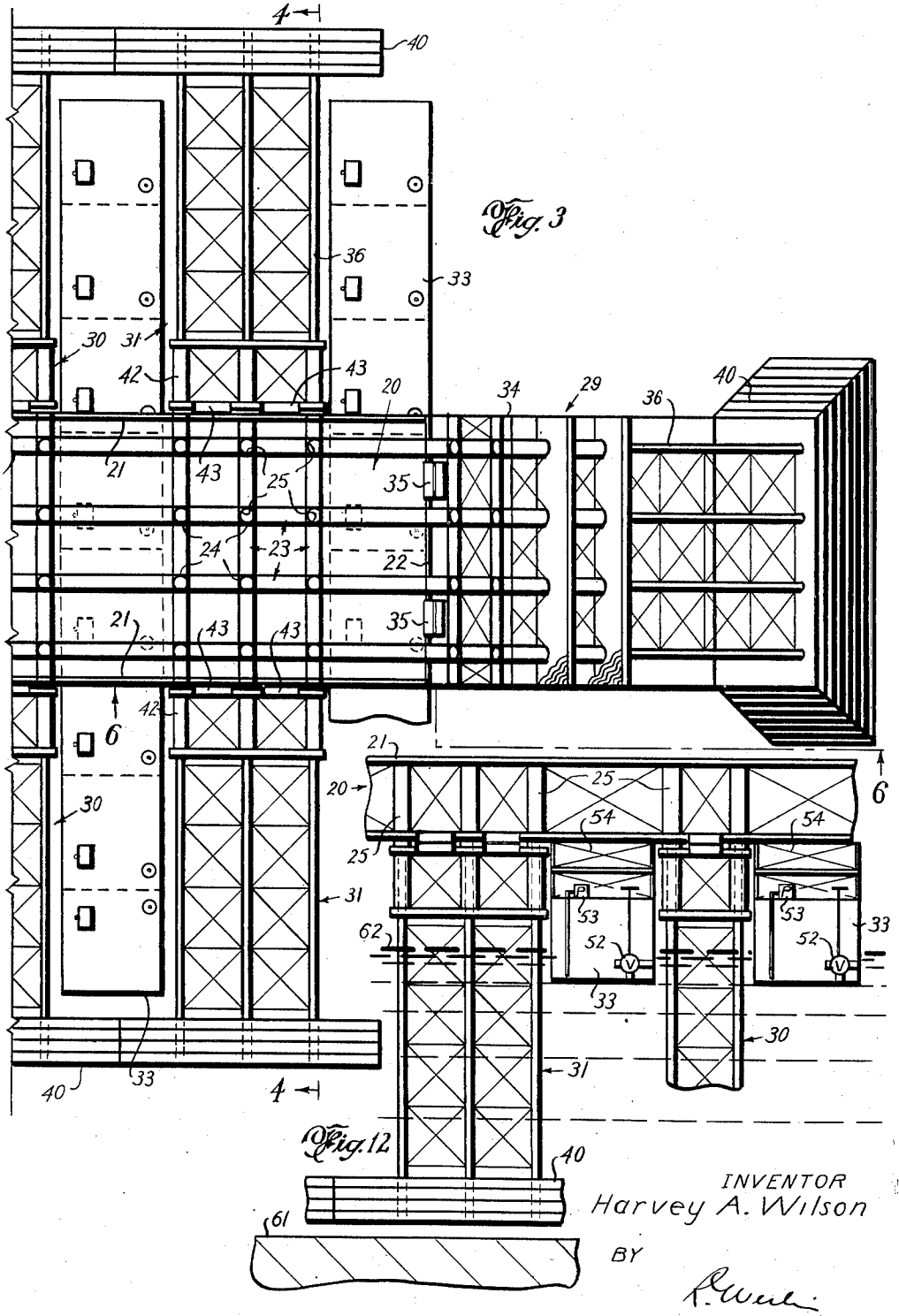

Fig. 3

Fig. 12

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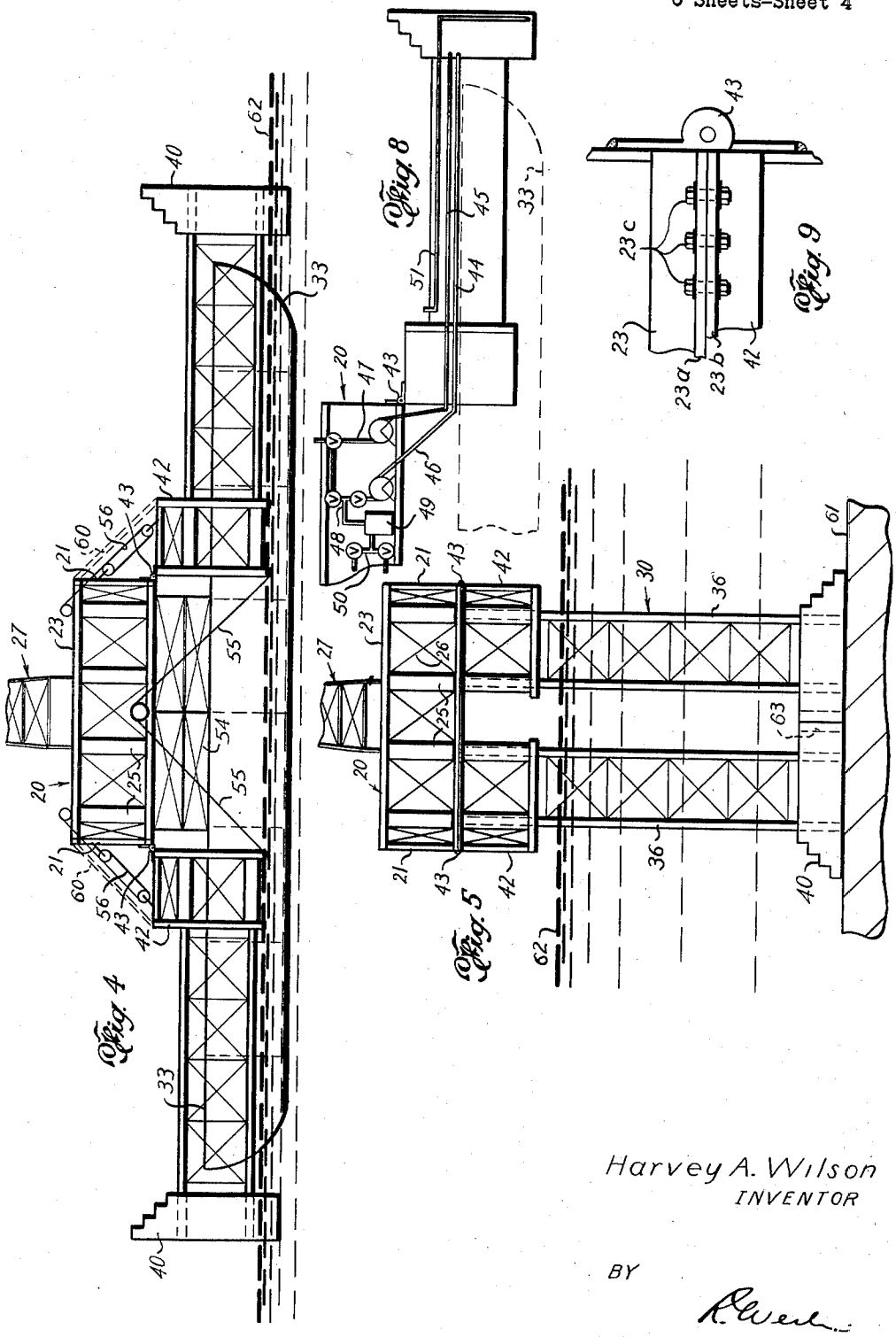

Fig. 4

Fig. 5

Fig. 8

Fig. 9

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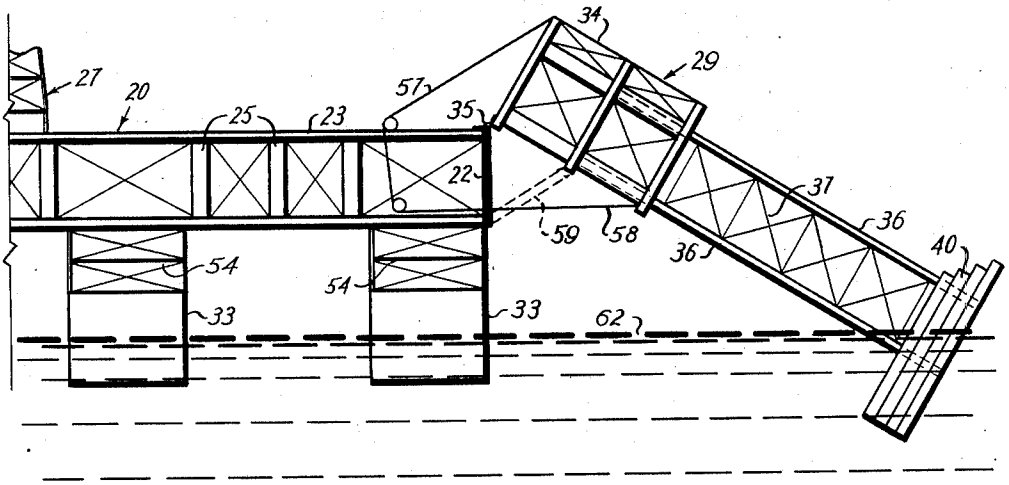

Fig. 6

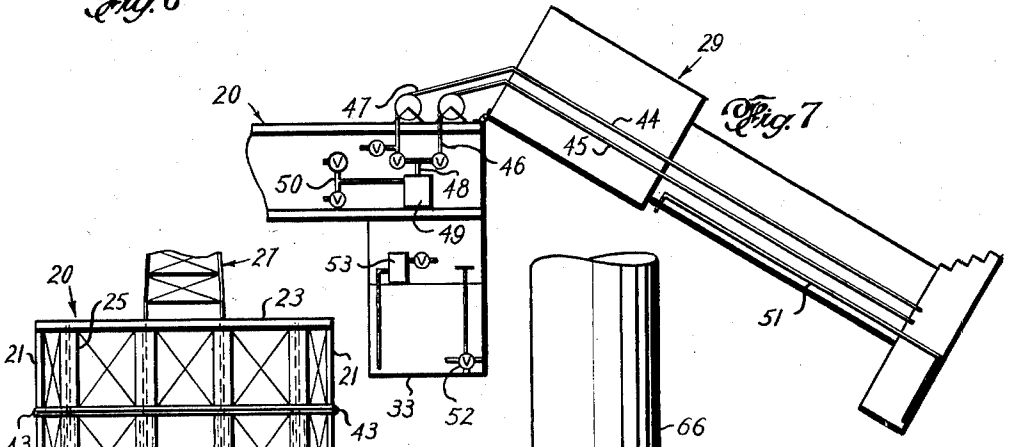

Fig. 7

Fig. 18

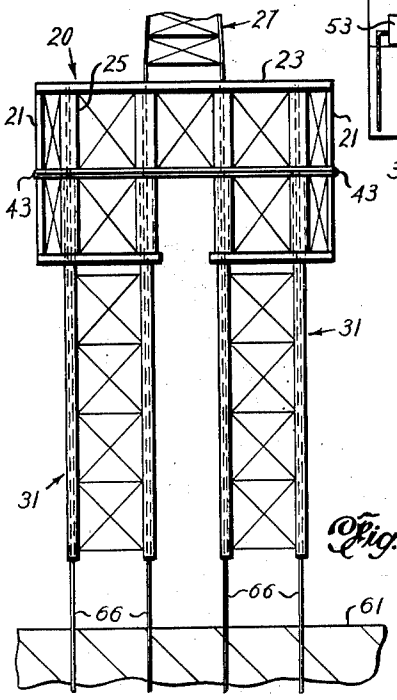

Fig. 17

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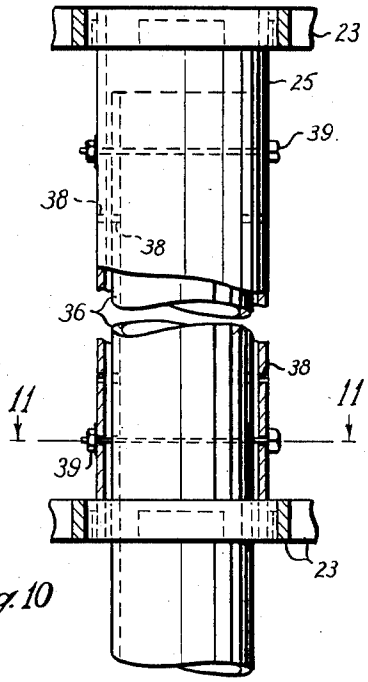


Fig. 10

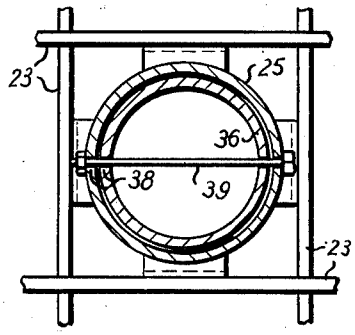


Fig. 11

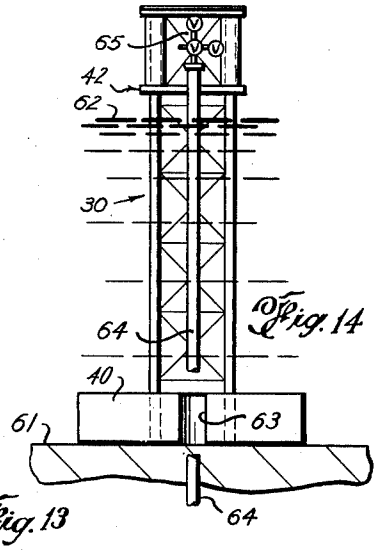
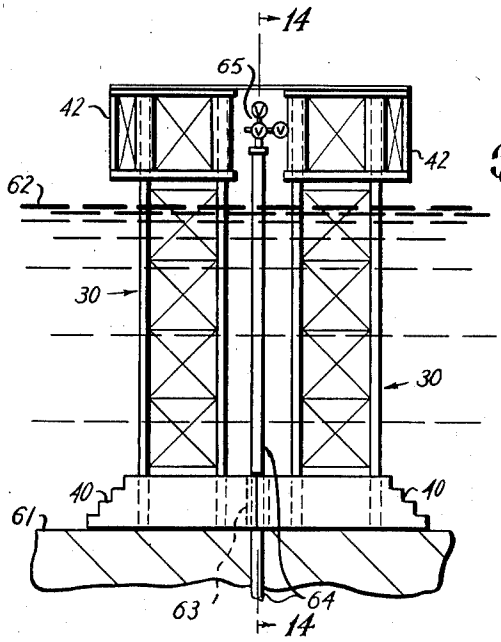


Fig. 14

Fig. 13



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Patented Apr. 1, 1952

2,591,225

UNITED STATES PATENT OFFICE

2,591,225

OFFSHORE PLATFORM

Harvey Ashton Wilson, Brazoria, Tex.

Application October 11, 1948, Serial No. 53,895

7 Claims. (Cl. 61—46)

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This invention relates to marine foundation structure and particularly to off-shore working and drilling platforms for oil wells.

This invention is a continuation-in-part of my co-pending application Serial No. 34,639, filed June 23, 1948. In said co-pending application there was disclosed a structure which comprised a platform section removably mounted on a float or barge, and a pair of pier members hingedly connected at opposite sides of the platform. The pier members were provided with buoyancy chambers at their outer ends and served to stabilize the structure while in transit to an off-shore location, and when sunk to the bottom by swinging about their hinged connections to the platform, served as spread footings for the piers to support the platform from the land bottom and to then permit removal of the main transporting barge.

The primary object of this invention is to provide improvements in the basic platform structure disclosed in the earlier application by which the greater degree of flexibility may be imparted to the structure to meet a wide range of conditions likely to be encountered in off-shore locations.

More specific objects include the use of a plurality of hinged pier sections about all four sides of the main platform section; spacing of the pier sections to permit employment of a plurality of barge hulls which are insertable in and removable from the space between the pier sections; employing controlled buoyancy of the pier floats to support at least a portion of the platform load; and means for adjusting the elevation of the platform section relative to the pier sections.

These and other objects and advantages of this invention will become apparent from the following detailed description when read in conjunction with the accompanying drawings which illustrate several useful embodiments in accordance with this invention.

In the drawings:

Fig. 1 is a side elevation of the platform structure in accordance with one embodiment of this invention, showing the pier section lowered and the structure fully erected on the land bottom, the original position of the supporting barges being indicated by the broken lines;

Fig. 2 is a plan view of the erected structure taken generally along line 2—2 of Fig. 1;

Fig. 3 is a partial plan view of the structure showing some of the hinged pier sections extended in the towing position;

Fig. 4 is a transverse elevation taken generally along line 4—4 of Fig. 3;

Fig. 5 is an elevational view taken generally along line 5—5 of Fig. 1;

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Fig. 6 is a partial side elevation taken generally along line 6—6 of Fig. 3;

Fig. 7 is a schematic view illustrating apparatus for regulating the buoyancy of the side pier sections and support barges;

Fig. 8 is a view similar to Fig. 7 illustrating the means for regulating the buoyancy of the end pier sections;

Fig. 9 is a detail illustrating means for connecting the pier sections to the platform section;

Fig. 10 is an elevational view, partly in section, of an enlargement of the upper end of one of the pier section columns showing means for vertically adjusting the length of the pier sections;

Fig. 11 is a cross-section along line 11—11 of Fig. 10;

Fig. 12 is a fragmentary side elevation of the structure illustrating an intermediate stage during the erection thereof;

Figs. 13 and 14 are respective end and side elevational views of the central pier sections of the structure showing the position of the head of a well therein after removal of the main platform structure from about these sections;

Figs. 15, 16 and 17 are fragmentary views of other embodiments of footing and supporting arrangements for the structure; and

Fig. 18 is an enlarged detail of an anchoring pile employed with some of the embodiments of the structure.

Referring to the drawings, the foundation structure in accordance with one embodiment of this invention comprises a generally rectangular platform section, indicated generally by the numeral 20.

In accordance with the illustrative embodiment, platform section 20 is substantially longer than it is wide but it will be understood that these relative dimensions may be varied as desired. Platform section 20 is formed by marginal openwork structural steel trusses of substantial height which are set on edge forming a deep box-like frame composed of side trusses 21—21 connected across their ends by end trusses 22—22. A plurality of spaced parallel double-beam trusses 23, of the same height as trusses 21 and 22 extend longitudinally through the interior of the frame, and are suitably fastened at ther ends to end trusses 22—22. A series of similar trusses 23 extend transversely of the frame intersecting the longitudinal trusses at a plurality of spaced points and connecting at their ends to the side trusses 21. The trusses are also rigidly joined together at their several intersections. The several intersections of the longitudinal and transverse trusses 23 form a corresponding plurality of square openings 24 through which extend tubular columns 25 which form connecting spacers between the

upper and lower truss beams and are rigidly connected thereto. Suitable structural cross-bracing 26 extends between adjacent pairs of the columns to thereby rigidly lace together the several members of the platform structure. The platform section, constructed in this manner, constitutes a rigid structure adapted to support heavy loads, such as a heavy drilling derrick, indicated by the numeral 27, and its usual appurtenances (not shown). Suitable decking, indicated by the numeral 28 (see Fig. 1) may be laid across the upper and lower beams of the platform trusses to form vertically spaced working platforms. The depth of platform section 20 will normally be such that when the structure is fully erected, as will be described hereinafter, the upper deck will be well above the crests of any waves which may move across the surface of the water body in which the structure is located, the open-work construction of the platform section allowing such waves to roll through without serious resistance.

Arranged at the opposite ends of the platform section is a pair of elongated end pier members, designated generally by the numerals 29—29. A plurality of matching pairs of elongated side pier members are arranged on opposite sides of the platform section and at spaced intervals along the sides. In the illustrative embodiment, one pair of the side pier sections, designated generally by the numerals 30—30, are disposed centrally of the length of the platform section on opposite sides of the derrick 27. Two additional pairs of the side pier sections, designated generally by the numerals 31—31, are symmetrically spaced on opposite sides of the center piers 30—30 and are disposed inwardly from the outer ends of platform section 20. The described arrangement of the side pier sections provides a series of spaces or bays 32 below platform sections 20 between adjacent side pier sections and below the outer ends of the platform section. These bays extend transversely of the platform section and provide alley-ways through which a series of removable barges 33, adapted to buoyantly support the structure may be installed.

Each of the end pier members 29 comprises a generally rectangular head frame 34, composed of open-work trusses of the same general form and construction as those employed in the main platform section, including intersecting double-beam trusses 23 and hollow columns 25. Frames 34 are of about twice the height of the platform trusses so that when swung downwardly to the vertical position alongside the ends of the platform section (see Fig. 1), the frames 34 extend well below the lower end of the platform section, generally a distance equal to the depth of the platform section. A series of hinges 35 are connected between upper beams of end trusses 22 and the adjacent upper inner edges of frames 34, so that the end pier members may be swung in a vertical plane about the ends of the platform section between a generally horizontal position and a position alongside the ends of platform 20, as illustrated particularly in Figs. 1 and 6. The upper surface of frames 34 may thus form extensions of the platform section. End pier members 29 are of generally rectangular form of approximately the same width as platform section 20 and of any desirable length extending longitudinally relative to the platform section. In the embodiment illustrated, the longitudinal dimension of each end pier member is about one-third its transverse dimensions. Each

of the frames 34 is provided with an elongated extension composed of parallel rows of tubular columns 36 inter-laced by suitable cross-bracing 37 to form a unitary structure of the same general configuration as frame 34. The upper ends of columns 36 are telescopically slidable in the columns 25 of frame 34, so that each extension is longitudinally adjustable relative to its frame 34. Figs. 10 and 11 illustrate a typical connection between one of the columns 25 and the inserted end of one of the columns 36. As there shown, the columns are provided with matching series of spaced holes 38 through which pairs of locking bolts 39 extend transversely. Removal of the bolts permits columns 36 to be adjusted axially relative to columns 25, after which the bolts may be re-inserted to hold the columns in the adjusted positions. The lower ends of columns 36 of each of the groups forming one of the pier extensions extend through and are rigidly connected to a hollow chamber 40 of generally rectangular form adapted to form a spread footing for the pier member when resting on a supporting surface.

Each of the side pier members 30 and 31, comprises a generally rectangular head frame 42 substantially identical in construction to head frames 34 but of a height substantially equal to that of the portions of head frames 34 which extend below platform section 20 when in the erected position as illustrated in Fig. 1. Series of hinges 43 are connected between the lower beams of side trusses 21 and the upper outer edges of frames 42, so that the side pier members may be swung in a vertical plane about the sides of the platform section between a laterally extending generally horizontal position and a position beneath the adjacent sides of the platform section as illustrated particularly in Figs. 4 and 5. Like end piers 29, the side piers 30 and 31 are provided with elongated extensions composed of parallel rows of tubular columns 36 interlaced by suitable cross-bracing 37, the upper ends of the extension columns being adjustable in the frame columns in the same manner as previously described for frames 34. The lower ends of columns 36 forming the side pier extensions likewise extend through hollow spread footings 40. The areal dimensions of the several spread footings 40 are so selected that when all of the pier members are in the down position, as illustrated particularly in Fig. 1, the footings will adjoin one another to form a substantially solid rectangular spread footing of somewhat larger area than platform section 20 which will rest on the land bottom and support the load of the entire structure.

The buoyancy of hollow footings 40 may be controlled by ballasting with water by any conventional means. Figs. 7 and 8 illustrate schematically suitable means for performing this operation. A pair of pipes 44 and 45 for supplying water and air, respectively, to the footings, are connected by flexible pipes 46 and 47, respectively, to a suitably valved header 48 which is connected to a pump 49 adapted to draw air or water through a suction header 50 leading to appropriate sources of supply (not shown). A vent riser pipe 51 leads from the lowermost point in the interior of the footing to a point which will be above the level of the water in which the structure is erected. With this arrangement, water for ballast may be introduced into the footing through pipe 44, displacing air therefrom through pipe 45. When the water is to be re-

moved to increase the buoyancy of the footing, air will be introduced through pipe 45 and the pressure thereof on the water in footing 40 will force the water through riser pipe 51 and discharge it above the surface of the immersing water body.

Barges 33 are suitably compartmented and provided with sea cocks 52 and suction pumps 53 for filling and emptying, respectively, the barge compartments to vary their buoyancy. (See Figs. 7 and 12.) The decks of barges 33 are provided with structural cradles 54 by which platform section 20 may be spaced vertically above the barge decks and which are adapted to be detachably connected to the platform section by any suitable and conventional fastening means (not shown). Winch lines 55 leading from platform section 20 to the side pier members 30 and 31 may be employed to assist in drawing the side pier members snugly up under the platform section, when the pier members are lowered, while winch lines 56 may be employed in raising the side pier members relative to the platform section (see Fig. 4 particularly). Similar winch lines 57 and 58 (see Fig. 6) may be employed in the raising and lowering of end pier members 29. Temporary braces 59 and 60 may be installed between the platform structure and end and side pier members, respectively, to increase the rigidity of the structure when the pier members are in the raised positions, as illustrated particularly in Figs. 4 and 6. It will be understood that these braces will be removed when the pier members are to be lowered to their vertical positions. Fig. 9 is a detail showing a typical releasable connection between one of the side pier members and the platform section when the pier member has been swung to the vertical position beneath the platform section. From this detail it will be seen that the lower beam of a truss 23 is provided with a laterally extending flange 23a which mates with a flange 23b formed on the upper beam of one of the transverse trusses forming frame 42. Bolts 23c are extended through these mating flanges for rigidly locking these parts of the structure together. It will be understood that a similar type of connection may be employed to fasten the ends of platform section 20 to the adjacent faces of end pier members 29.

The above-described structure may be transported to an off-shore location and erected in the following manner:

Platform section 20 will be pre-fabricated and installed on the suitably spaced barges 33 with the platform section securely bolted to cradles 54. Pier members 29, 30 and 31 will then be suitably connected by means of hinges 35 and 43 to their proper places about the margins of the platform structure, as illustrated. Footings 40 on the outer ends of the pier members will be rendered sufficiently buoyant so as to floatingly support the outer ends of the pier members in the extended positions, as illustrated particularly in Fig. 3. Temporary braces 59 and 60 will be put in place so that the entire structure will become a relatively rigid unitary structure during transit to the off-shore location. The barge supported structure, as thus arranged, will then be towed in any suitable manner to a selected drilling location. During transit over the water, the outwardly extended pier members, having their outer ends supported on buoyant footings 40 and rigidly connected to platform section 20 by means of temporary braces 59 and 60, will serve as outriggers which will effectively balance and stabilize the barge and the platform structure and render the transit to the location relatively safe and easy. Furthermore, it will be evident that by this arrangement the entire platform structure may be pre-fabricated in its entirety in safe harbor areas and brought to the location as a single unit, thereby eliminating the need for transporting massive erecting equipment to the location, and for operating such bulky equipment often far out at sea where frequently the prevailing wind and wave conditions make it impracticable and often impossible to employ such erecting equipment.

It will be understood that the number and size of the barges 33 employed in each case will be determined by the dimensions of platform section 20 and the total load to be supported when afloat. It will also be understood that when employed as a drilling foundation, the drilling derrick and other machinery and supplies may be installed on the structure before moving out to sea, so that everything required will be moved en masse and will be in place on location during erection of the structure.

When the drilling location has been reached, temporary braces 59 and 60 will be removed and footings 40 ballasted with water to reduce their buoyancy and allow the outer ends of the pier members to sink of their own weight in the water and swing inwardly toward the platform section about hinges 35 and 43. All of the pier members may thus be lowered at the same time or successively or in any other convenient order. Winch lines 56 and 57 may be employed to restrain the swinging movement of the several pier members although this may be effectively controlled solely by regulating the buoyancy of footings 40 by proper regulation of the ballasting operation. Ordinarily the ballasting of barges 33 will have been regulated to maintain the platform section at a sufficient height so that, as the pier members swing downwardly to their respective vertical positions along the ends and beneath the sides of the platform section, the bottoms of the footings 40 will clear the land bottom 61 and allow the pier members to freely assume the desired vertical positions while suspended somewhat above the land bottom. Alternatively, the lengths of the pier members may be predetermined relative to the depth of the water and the desired elevation of the platform section above the mean water level 62, so that when the barges are at normal draft, the footings will clear the land bottom. Or the pier members may be initially telescoped sufficiently within their respective head frames to allow them to swing freely into position and then extended, as by means of the adjusting arrangement described above.

When the pier members are thus in their vertical positions, winch lines 58 and 59 may be employed, if necessary, to draw them snugly into position against the platform section, and connecting bolts, such as bolts 23c, inserted to lock them firmly to the platform structure. Thereafter the buoyancy of barges 33 may be reduced to sink the entire structure a distance sufficient to place the footings firmly in place on the land bottom. Or the slidable connections between the pier columns and their head frames may be adjusted to extend the pier members to bring the footings firmly to rest on the land bottom. With the structure thus in place, cradles 54 will be disconnected from platform section 20 and the buoyancy of the barges will be reduced sufficiently to allow the barges to be withdrawn from bays

32 and the structure thus becomes fully erected and self-supporting. It will be understood that should the land bottom not be level, suitable adjustments may be made in the lengths of the individual pier members to suitably level the platform section. In any case where columns 36 are extended relative to the head frames, additional cross-bracing 26 may be installed between the thus exposed columns to further strengthen the extended structure.

Normally the dimensions of the structure will be selected so that when erected on a particular water location the platform section and the head frames of the pier members will be above the mean water level 62 at that location and preferably such that the crests of the highest waves which will normally be anticipated at that location, will pass below the upper deck of the platform section. The open-work structure will permit free passage of such waves thus avoiding the battering effect of such waves particularly under rough water conditions. The outer faces of footings 40 may be provided with the step-like construction illustrated in the drawings to reduce the battering effect thereon of strong underwater currents.

Drilling operations may now be conducted from the platform by conventional methods until completion of the well. An aperture 63 (see Fig. 5) will be provided in the center of the abutting faces of the footings 40 at the lower ends of central pier members 30 to permit passage therethrough of the usual conductor pipe 64 (Fig. 13) through which drilling operations will be conducted. The space between the head frames of central pier members 30 directly below derrick 27 may be employed as the so-called "cellar" and after completion of a well the well head fittings or "Christmas tree" 65 (Fig. 13) may be located in this space.

When drilling operations have been completed, the structure may be refloated by reversing the previously described operations. Barges 33 will be re-inserted in bays 32 and cradles 54 connected to the bottom of the platform section. The buoyancy of the barges will then be increased sufficiently to take the entire load of the structure and to raise the structure bodily for a sufficient distance to allow footings 40 to clear the land bottom (see Fig. 12). The connections between the head frames of the pier members and the platform section will then be released and air blown into the footings to displace the ballast therefrom and render the footings buoyant once again. This will cause the lower ends of the pier members to rise and swing outwardly about their hinged connections to the platform section until the outer ends of the pier members have risen to the surface and assumed their original outwardly extended positions. The buoyancy may be suitably regulated to prevent uncontrolled rise of the pier ends. Winch lines 55—56 and 57—58 may be employed to assist in the raising of the pier members. When the latter are once more afloat in their original positions, temporary braces 59 and 60 may be reinstalled and the structure is now ready for removal to another location.

In the event a well has been completed, it will normally be desirable to provide a protective structure and a working platform about the well head. In such a case the central pier members 30 may be left in place while the remainder of the structure is removed. This may be done by severing all the connections including hinges 43, between the head frames 42 of these pier members and the platform, then raising the other pier members in the manner previously described. The buoyancy of barges 33 may be increased sufficiently to lift the platform structure to a height which will clear the tops of the head frames of pier members 30 while the remainder of the structure is floated away, leaving pier members 30 about the well head (see Fig. 13). Suitable decking and cross bracing may then be arranged between the pier members 30 to provide the enclosing platform and protective structure for the well head.

Fig. 15 illustrates another useful embodiment in accordance with this invention. In this embodiment, piles 66 may be driven through the registering hollow columns 25 and 36 into the land bottom to assure additional firm anchorage of the structure to the land bottom. Platform section 29 may, if desired, be connected to the tops of the piles in order to place some or all of the load directly on the piles. When necessary to remove the structure, the piles will be withdrawn or removed in any conventional manner and the refloating operations will be the same as previously described.

Fig. 16 illustrates still another embodiment in which piles 66, provided with anchor tips 67 (see Fig. 18), are driven through the pier columns while footings 40 are supported above the land bottom. The upper ends of the piles will be connected to the platform to support a part of the load in compression. The balance of the platform load may be buoyantly supported by suitably regulating the buoyancy of footings 40.

Fig. 17 illustrates still another embodiment in which footings 40 are eliminated altogether. In this case, piles 66 will be driven into the land bottom through the hollow pier columns and the entire load supported on the piles. It will be understood, however, that in this embodiment, the outer ends of the pier members will be supported by suitable removable floats while in transit, the floats being removed preparatory to allowing the pier ends to sink while the structure is supported on the barges 33.

It will be understood that the number of pier members arranged about the perimeter of the platform section may be varied as desired. The spacing between the pier members may likewise be varied, as may be found desirable or most efficient for any particular case. In some instances, end pier members 29 may be dispensed with entirely, the support for the platform section being provided solely by the side pier members.

It will be evident also that, where it is desired to move the platform structure from one location to another, particularly to one in the near vicinity, it may be unnecessary to raise the pier members to the surface. In such cases, it will often be expedient merely to re-insert barges 33 under the platform section while the pier members are still in the pendent position, then increasing the buoyancy of the barges to lift the structure sufficiently to raise float members 40 clear of the bottom (illustrated in Fig. 12). The entire structure may now be towed to the new location and set down again, as by decreasing the buoyancy of the barges or by extending the pier sections in the manner previously described. The barges may then be removed and the structure thus prepared for use in the new location.

It will be understood that numerous additional changes and alterations may be made in the structural details of the several structural embodi-

ments and erection methods herein described within the scope of the appended claims without departing from the spirit of this invention.

What I claim and desire to secure by Letters Patent is:

1. An off-shore working platform, comprising, a pre-fabricated articulated structure including a main platform section, a plurality of elongated pier members arranged about the perimeter of said platform section, hinged connections between the upper portions of said pier members and said platform section constraining said pier members to swing downwardly and inwardly about said platform section to support the latter from the bottom underlying a water body of limited depth, and hollow footing members of controllable buoyancy carried by the outer ends of said pier members, said footing members being shaped and dimensioned to cooperate when in position on said bottom to form a substantially continuous spread footing throughout the area of said platform section.

2. An off-shore working platform, comprising, a pre-fabricated articulated structure including a main platform section, a plurality of elongated pier members arranged about the perimeter of said platform section, hinged connections between the upper portions of said pier members and said platform section constraining said pier members to swing downwardly and inwardly about said platform section to support the latter from the bottom underlying a water body of limited depth, each of said pier members having a telescopically adjustable section for varying its length, and hollow footing members of controllable buoyancy carried by the outer ends of said pier members, said footing members being shaped and dimensioned to cooperate when in position on said bottom to form a substantially continuous spread footing throughout the area of said platform section.

3. An off-shore working platform, comprising, a pre-fabricated articulated structure including a main platform section, a plurality of elongated pier members arranged about the perimeter of said platform section, hinged connections between said platform section and the inner end portions of said pier members, constraining said pier members to swing downwardly and inwardly about said platform section to support the latter from the bottom underlying a water body of limited depth, hollow footing members of controllable buoyancy carried by the outer ends of said pier members said footing members being shaped and dimensioned to cooperate when in position on said bottom to form a substantially continuous spread footing throughout the area of said platform section, and buoyant support members removably disposed beneath said platform section.

4. An off-shore working platform, comprising, a prefabricated articulated structure including a generally rectangular platform section and a plurality of elongated pier members arranged at the ends and opposite sides of said platform section, hinged connections between each of said pier members and said platform section to constrain each of said pier members to fold downwardly and inwardly relative to said platform section to a vertical platform-supporting position, one pair of said pier members on opposite sides of said platform section intermediate the ends thereof being in registration transversely of said platform section and detachably connected thereto, said pier members being of sufficient length to extend from said platform section to the underlying bottom of a body of water of limited depth, and hollow footing members of controllable buoyancy carried by the outer end of each of said pier members, said footing members being shaped and dimensioned to cooperate when in position on said bottom to form a substantially continuous spread footing throughout the area of said platform section.

5. An off-shore working platform, comprising, a prefabricated articulated structure including a generally rectangular platform section, a plurality of pier members arranged at the ends and along the opposite sides of said platform section, the pier members at said opposite sides being arranged in spaced-apart transversely registering pairs, hinged connections between each of said pier members and said platform section to constrain said pier members to fold inwardly relative to said platform section to a vertical platform-supporting position, said pier members being of sufficient length to extend from said platform section to the underlying bottom of a water body of limited depth, hollow footing members of controllable buoyancy carried by the outer ends of said pier members, said footing members being shaped and dimensioned to cooperate when in position on said bottom to form a substantially continuous spread footing throughout the area of said platform section, and buoyant supports removably disposed beneath said platform section in the spaces between said registering pairs of pier members.

6. An off-shore working platform, comprising, a pre-fabricated articulated structure including a main platform section of generally rectangular box-like construction, a plurality of elongated pier members of generally rectangular cross-section arranged about the perimeter of said platform section, the pier members at two opposite sides of the platform section having hinged connections between their upper inner edges and the adjacent upper edges of said platform section, the pier members at the other two opposite sides of said platform section having hinged connection between their upper outer edges and the adjacent lower edges of said platform section, all of said hinged connections being adapted to constrain their connected pier members to swing downwardly and inwardly to vertical positions relative to said platform whereby to support the latter from the bottom underlying a water body of limited depth.

7. In an off-shore working platform according to claim 6 a hollow footing member of controllable buoyancy carried by the outer end of each of said pier members, said footing members being shaped and dimensioned to cooperate when in position on said bottom to form a substantially continuous spread footing throughout the area of said platform section.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,358,951	Helmick	Nov. 16, 1920
1,681,533	Giliasso	Aug. 21, 1928
2,210,408	Henry	Aug. 6, 1940
2,327,118	McKnight	Aug. 17, 1943
2,398,351	Baker	Apr. 16, 1946