Oct. 31, 1950 A. C. W. SIECKE ET AL 2,528,089

SUBMERSIBLE FLOATING STRUCTURE

Filed July 31, 1947 2 Sheets-Sheet 1

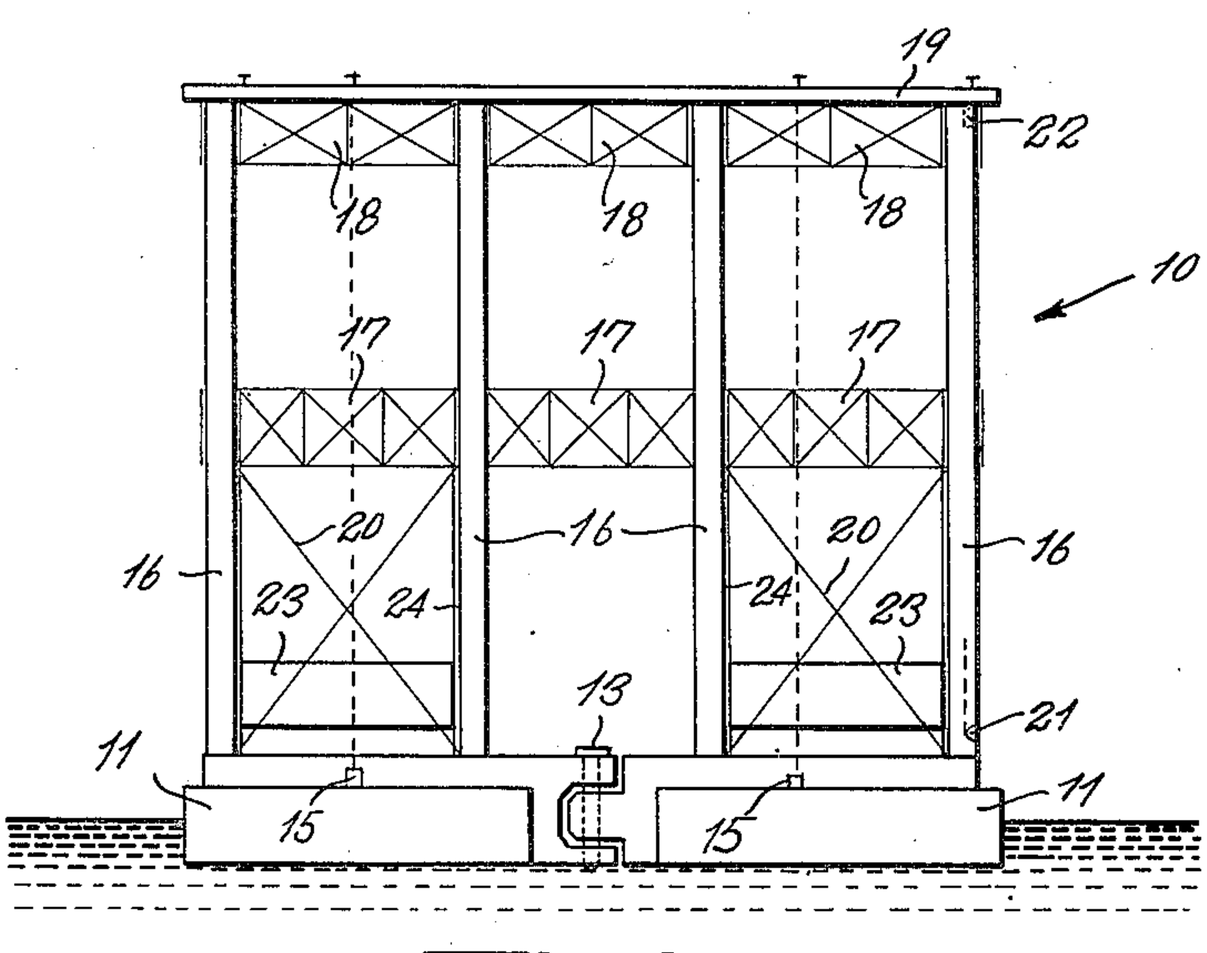

Fig. 1.

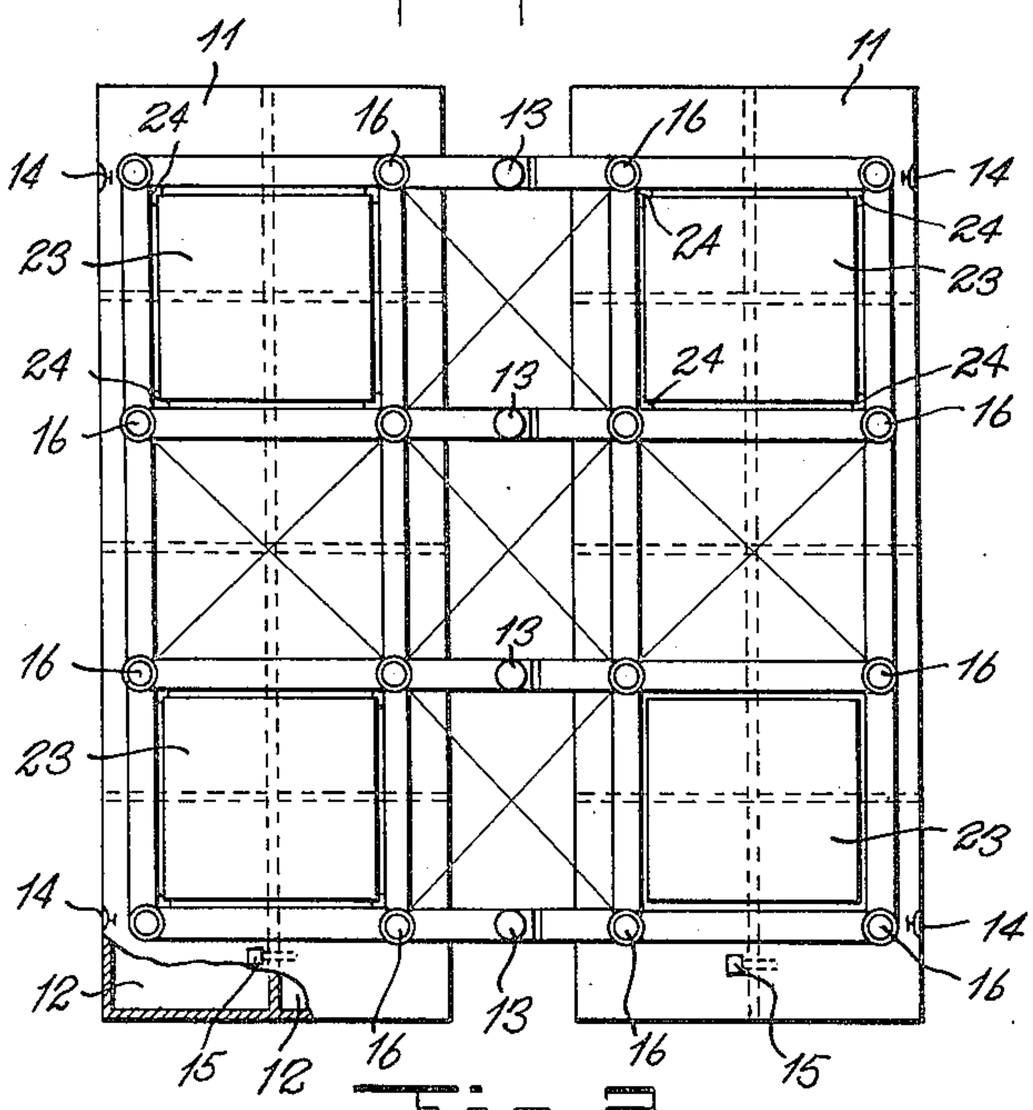

Fig. 2.

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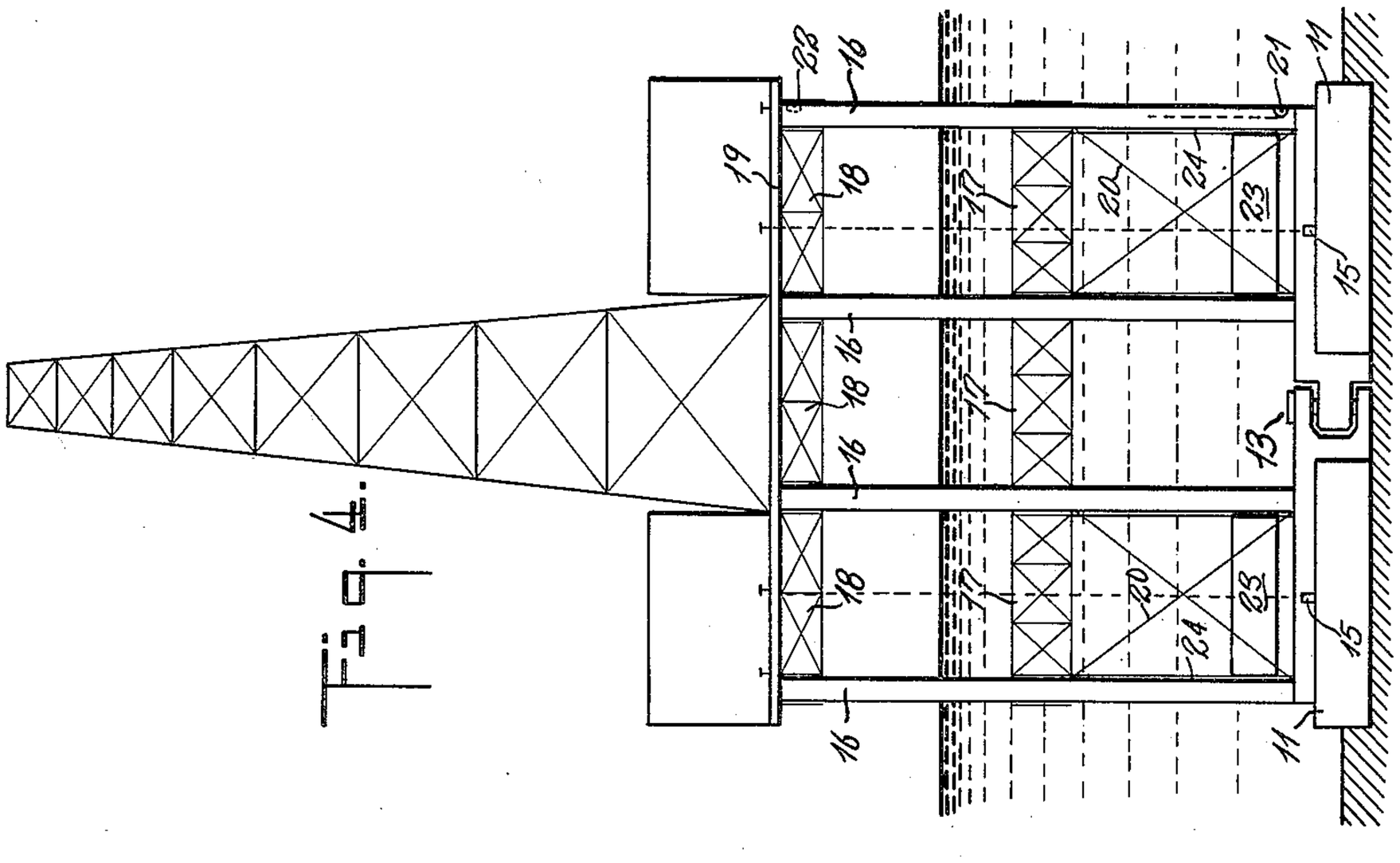
Filed July 31, 1947 2 Sheets-Sheet 2

Fig. 4.



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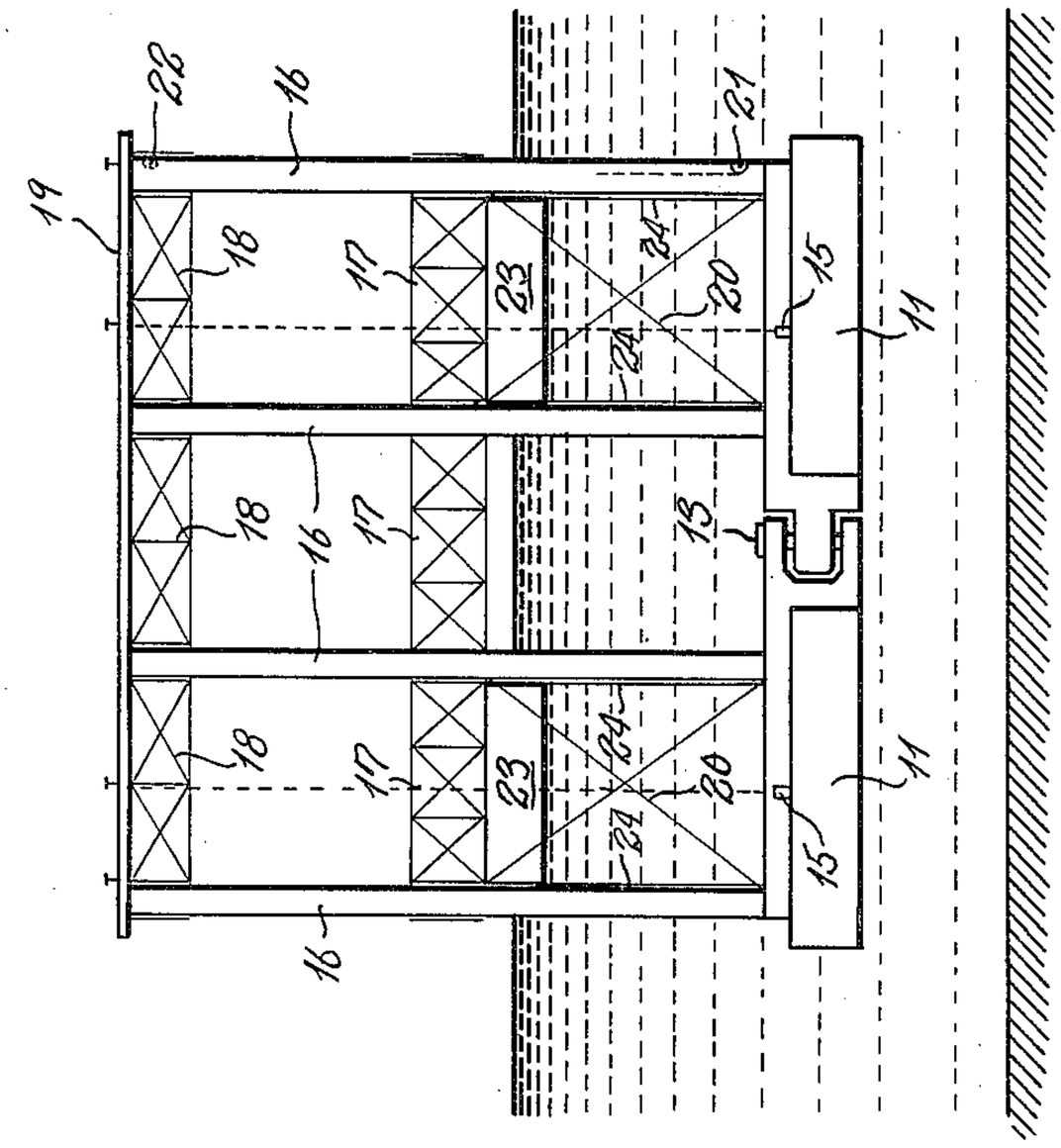

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SUBMERSIBLE FLOATING STRUCTURE

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5 Claims. (Cl. 61—46)

1

This invention relates to submersible floating structures.

An object of this invention is a floating structure which can be sunk in deep open waters subject to hurricane winds and tides and heavy wave action and which, when in sunken position, will afford a firm, stable base on soils of varying bearing capacities for use in various marine operations and which can be used directly while in such sunken position for operations conducted from its superstructure for the drilling of oil or other wells, driving of piles, building permanent structures adjacent to it or in conducting other operations in which a stable working platform over waters of great depths is required or desired and which can be refloated and transported from one location to another in various depths of water and various widths of channels and streams.

A submersible floating structure embodying this invention may consist of a single unit or a plurality of interjoined units. Each unit is composed of a sealed buoyant barge on which is mounted a rigidly framed buoyant superstructure. Each unit is so designed as to float separately with its normal superstructure above water level and when sunk have its superstructure constitute a safe support for any superimposed load such, for example, as equipment, machinery or the like. Means are provided for interconnecting any number of units to form a multiple unit integral structure. Preferably, the design of the superstructure attached to each barge is such that separately used, it can be used as a working platform or the superstructures of several units can be combined to form a complete working platform utilizable in a multiple of marine operations. The construction is such that for reasons of stability when operating in waters exposed to heavy wave action, the base will be sufficiently bulky and of sufficient weight that the working platform of the superstructure can be placed at sufficient distance above the mean low water level as to be above the crest of waves of full gale or hurricane force and such superstructure is so designed that it offers minimum resistance to such wave action. Each barge may be equipped with one or more pontoons which can be used during the sinking or raising of the barge to aid in the control of its buoyancy and stability and each pontoon may be mounted on the barge at whatever location is deemed most desirable for the use to which the floating structure is to be put and may be either in fixed or movable relation to the barge.

A further object of this invention is to provide by means of barges containing, within themselves as integral parts thereof, a means of submerging and raising themselves (described herein) to provide a multiple unit submersible foundation in waters of various depths for a working platform from which can be conducted operations in well drilling, pumping, pile driving, construction of permanent marine structures or foundations, or other uses requiring a stable base over waters for their operation, so constructed that each unit thereof may be towed or navigated through narrow or shallow bodies of water and being provided with a buoyant superstructure so that the entire structure will maintain stability during sinking and yet be sufficiently stable when set on bottom in an open body of water that it will safely withstand great forces of wave and wind pressure.

2

Other objects, novel features and advantages of this invention will become apparent from the following specification and accompanying drawings, wherein:

Fig. 1 is a front view of a structure embodying the invention in floating position in a body of water;

Fig. 2 is a plan view partially broken away of Fig. 1;

Fig. 3 is a front view of the structure in partially submerged position, and

Fig. 4 is a front view of the structure at rest on bottom in the body of water with a superimposed load applied.

The submersible floating structure specifically disclosed herein and designated generally by 10 is made up of two units suitably connected together but it is to be understood that any desired number of units may be similarly combined to make up the submersible floating structure. Each unit consists of a buoyant barge 11 divided by partitions into several water-tight compartments 12. Suitable means 13 are provided for interjoining each barge to another. At least one compartment 12 of each barge is provided with a sea cock 14 and the remaining compartments are provided with valves 15 by proper operation of which all the compartments may be put in communication with the sea cock 14 and with each other. Means, not shown, but of standard construction are provided for introducing air into the various compartments 12 and for permitting the escape of air therefrom.

Each barge is equipped with a plurality of vertical posts 16 of suitable height and of sufficient strength to transmit to the barge all the vertical and horizontal loads to which it may be subjected. The posts 16 may be either hollow and buoyant as shown or may be non-buoyant. Horizontal struts 17 are framed to the posts 16 (at a point below the trough of the largest wave reasonably contemplated to be encountered at any location of the structure) and additional horizontal struts or trusses 18 are framed to the posts 16 (in such position that the bottom thereof is at a safe distance above the crest of any wave reasonably to be expected at the location). A

platform 19 is supported by the upper end of the posts 16. Preferably, vertical bracing 20 is provided below the struts 17 to make a rigid structure capable of transferring all loads to the posts 16 and barges 11 in a uniform predetermined manner.

Each hollow post 16 is provided at its lower end with a sea cock 21 and at its upper end with a relieving valve 22. Suitable means accessible from the platform 19 are provided for operating the various sea cocks and valves.

Each unit 11 may be provided with at least one pontoon or tank 23 suitably attached thereto at the location best suited for the use to which the floating structure is put and in Fig. 2 each barge is shown as equipped with two symmetrically arranged pontoons. Preferably, each pontoon is attached to the unit for vertical movement between guides 24. Suitable means (not shown) are provided for adjusting the position of each tank 23 relative to the barge 11 and retaining it in its adjusted position. Also, means are provided for admitting water to and expelling water from each tank.

When the floating structure is equipped with buoyant posts 16 and with the structure in the position shown in Fig. 1, submergence of the structure is effected by admitting water to the barges 11 until the buoyancy of the tanks 23 and the posts 16 becomes operative. The tanks 23 are then held at the water level and the structure is gradually further submerged relative to the tanks until the buoyancy of the posts 16 prevents further submergence. Water is then gradually admitted to the posts 16 by operation of the sea cocks 21 and relieving valves 22 and further submergence of the structure is continued as previously described until the barges rest on the bottom. Water is then admitted to a predetermined height such that the maximum bearing on the soil does not exceed a predetermined value. The tanks 23 are then filled with water and if desired may be lowered to the top of the barges. When the base is firmly set on the bottom, the various equipment and machinery to be operated are assembled on the platform 19. When the floating structure is equipped with non-buoyant posts 16 the structure is submerged by the admission of water into the barges and pontoons according to the procedure above set forth.

For any given depth of water, the struts 17 are arranged below the trough of the largest wave reasonably to be encountered and the horizontal struts 18 are arranged so that the bottom thereof is at a safe distance above the crest of any wave reasonably to be expected at the location. The actual height of these trusses above the barges is determined by the particular location at which the structure is put into use.

To refloat the structure, the suction between the ground and the barge bottoms is broken in any well known manner. The structure is then raised in the reverse manner to that described for lowering.

It is, of course, understood that various modifications may be made in the structure above described without in any way departing from the spirit of the invention as defined in the appended claims.

We claim:

1. A structure of the character described comprising a plurality of units, each unit comprising a sealed buoyant barge having means cooperating with the remaining units for interjoining them into an integral structure, a plurality of hollow posts extending upwardly from the top of each barge, a platform supported by said posts, means for admitting water into each barge and post, and means for removing water from each barge and post.

2. A structure of the character described according to claim 1 characterized by one or more pontoons supported by each barge, and means for admitting water to and removing water from each pontoon.

3. A structure of the character described according to claim 1 characterized by one or more pontoons supported by each barge for movement between said barge and said platform, and means for admitting water to and removing water from each pontoon.

4. The method of controlled submerging of substantially all but the platform of a submersible floating structure having a buoyant barge and a platform spaced therefrom and supported thereon by buoyant posts and a pontoon supported by said barge and movable between said platform and barge comprising the steps of controllably admitting water into said buoyant barge until it loses its buoyancy while maintaining said pontoon floating due to its buoyancy and primarily supporting the structure therefrom, thereafter controllably admitting water into said buoyant posts until they lose their buoyancy while maintaining said pontoon floating due to its buoyancy, and then controllably admitting water into said pontoon until it loses its buoyancy, whereby said pontoon steadies said structure during the submerging of said barge and said posts but is thereafter itself submerged to prevent undesired wave action thereon.

5. The method of controlled submerging of substantially all but the platform of a submersible floating structure having a buoyant barge and a platform spaced therefrom and supported thereon by buoyant posts and a pontoon supported by said barge and movable between said platform and barge comprising the steps of controllably admitting water into said buoyant barge until it loses its buoyancy while maintaining said pontoon floating due to its buoyancy and primarily supporting the structure therefrom, thereafter controllably admitting water into said buoyant posts until they lose their buoyancy while maintaining said pontoon floating due to its buoyancy, lowering said structure until it is seated on the bed of the body of water by moving said pontoon away from the top surface of said barge while maintaining said pontoon floating, and then controllably admitting water into said pontoon until it loses its buoyancy, whereby said pontoon steadies said structure during the submerging of said barge and said posts but is thereafter itself submerged to prevent undesired wave action thereon.

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