June 27, 1944. R. L. CARRUTHERS 2,352,370

DERRICK SUPPORT FOR UNDER WATER DRILLING

Filed Dec. 6, 1940 2 Sheets-Sheet 1

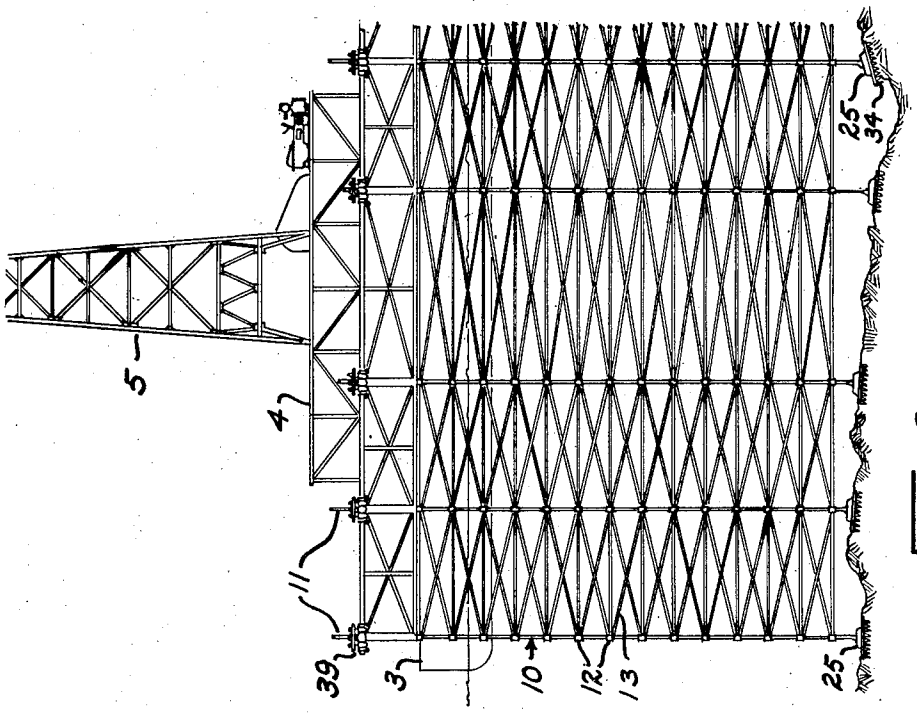

Fig. 2.

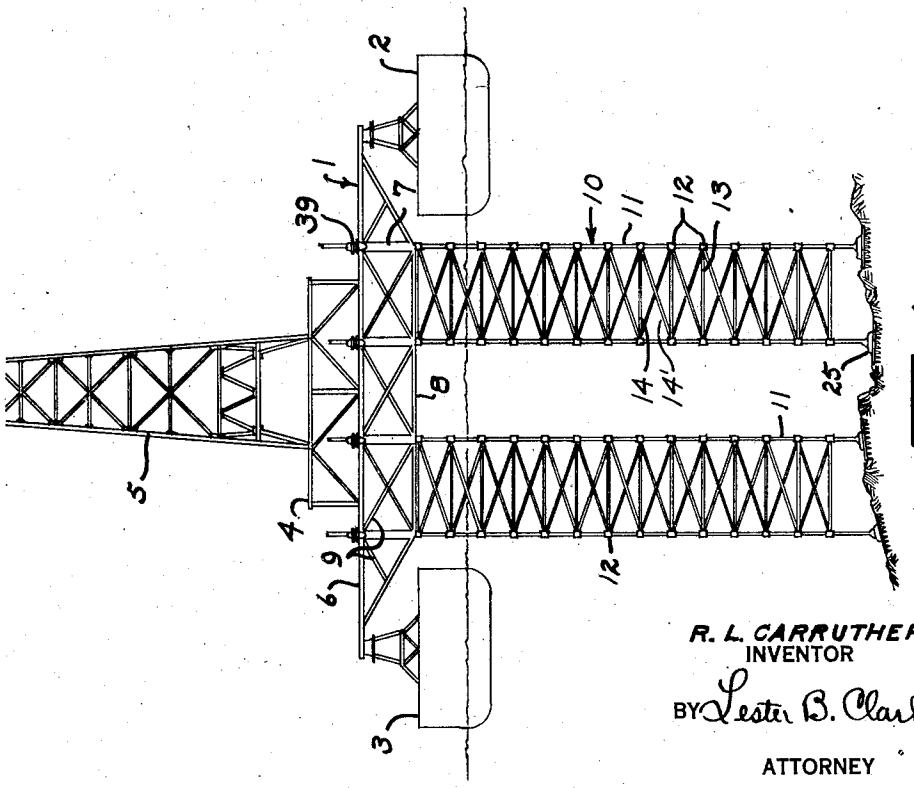

Fig. 1.

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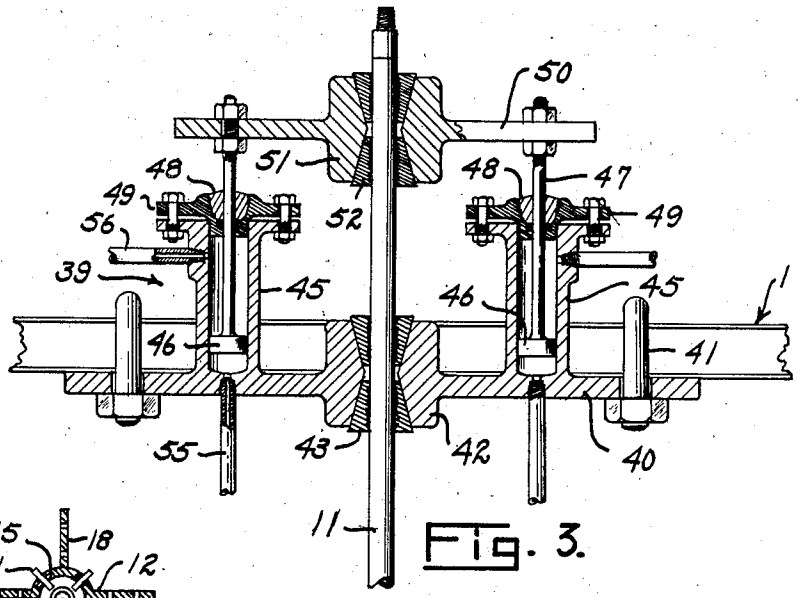

Fig. 3.

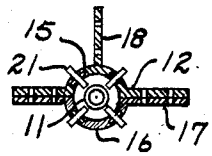

Fig. 5.

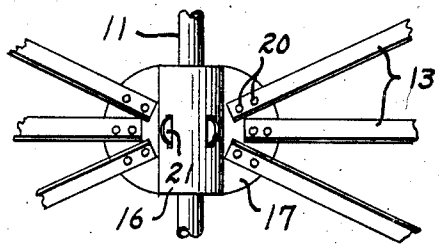

Fig. 4.

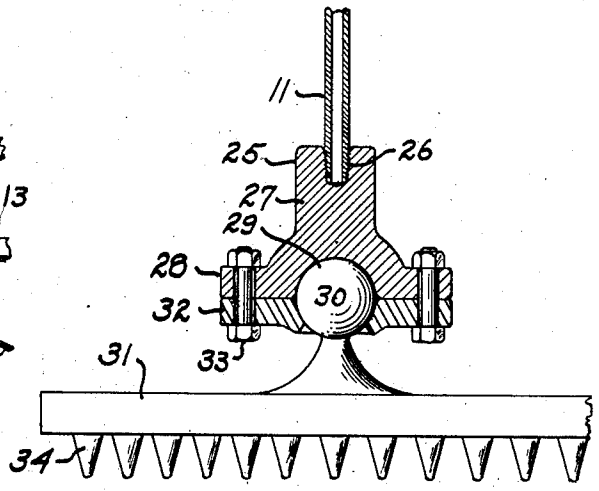

Fig. 6.

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DERRICK SUPPORT FOR UNDERWATER DRILLING

Robert L. Carruthers, New Iberia, La.

Application December 6, 1940, Serial No. 368,757

4 Claims. (Cl. 61—46)

This invention relates to a submarine foundation or support and the method of construction thereof. More particularly the invention relates to a supporting structure for use in drilling operations for subsurface deposits beneath water covered areas.

An object of the invention is to provide a novel method of erecting a platform or support in water covered areas where it is desired to perform drilling operations to tap subterranean deposits beneath such areas.

Another object is to provide a stable support which may be readily removed for subsequent use when drilling operations are completed.

Still another object is to provide a structure of the class described without the necessity of providing pilings or other support structure secured in the submerged surface formation.

Still another object is to construct a support by floating a platform into desired position and thereafter assembling a structure which extends downwardly and supportingly engages the submerged surfaces to support the platform.

Another object is to construct a structural framework for the platform in which supporting pillars or columns for the composite structure are movable relative to the remainder of the structure so that the supporting stresses are equalized among such columns.

A further object is to provide a novel mechanism for effecting relative movement between the supporting pillars and the remainder of the structure to equalize the supporting stresses.

In accordance with the invention a platform is prefabricated and is floated to a position where the complete structure is to be erected. The column is provided with pillar or column receiving and guiding members through which the support columns are slidable. Hydraulic equalizing jacks are provided in conjunction with certain of such members so that the supporting columns are urged downwardly relative to the platform and the weight of the entire structure is uniformly distributed upon the supporting columns. A structural steel framework is progressively fabricated and lowered beneath the prefabricated platform and such framework is secured to the columns in a manner that the latter may be moved relative to the former whereby the columns engage the submerged surface and support the structure.

The foregoing objects are primary objects and will together with other objects become more fully apparent from the following description taken in connection with the accompanying drawings in which:

Fig. 1 is an end elevational view of a completed structure embodying the invention;

Fig. 2 is a side elevational view of the construction shown in Fig. 1;

Fig. 3 is a sectional view through one of the hydraulic jacks or equalizing units constituting an element of the invention;

Fig. 4 is an elevational view of the framework connector with structural steel members attached thereto;

Fig. 5 is a horizontal sectional view through one of the framework connectors;

Fig. 6 is an elevation of one of the footing assemblies, parts being shown in section to more clearly illustrate the construction.

Referring to Figs. 1 and 2 of the drawings, a platform 1 is constructed upon land and is transferred to the barges 2 and 3 or is initially constructed upon such barges. This platform includes a raised working platform 4 and drilling derrick 5. It is obvious that such working platform and derrick may be constructed upon the platform 1 either before or after the main platform is floated to and fixed in operating position.

The main platform 1 includes the floor 6 from which members 7 extend downwardly and are interconnected by means of cord members 8 and web members 9 so that such structure possesses adequate stiffness to serve the purpose for which it is designed.

The platform 1 is supported upon a structure generally referred to as 10 and comprising the columns 11, connectors 12 and structural steel framework 13 which is secured to the platform 1 and extends downwardly therefrom. Such structure is so designed as to withstand the weight of the platform 1 and the equipment mounted thereon and also the side thrust produced upon the structure by wind, waves and thrusts produced by normal drilling operations.

The connectors 12 are of particular construction as illustrated in Figs. 4 and 5. As best seen in Fig. 5 each of these members comprises semi-cylindrical portions 15 and 16 having outwardly extending projections or ears 17 and 18 whereby the connector may be positioned about the column 11 and fastened together and to the structural members 13 by means of bolts 20.

Each of the connectors is provided with longitudinal slots within which rollers 21 are pivotally mounted, such construction permitting free movement of the column 11 longitudinally of the connector.

A support assembly 25 is attached to the column 11 in any suitable manner as by means of the threaded connection 26. This assembly comprises a head member 27 having a flange 28 thereon and provided with a socket 29 to receive the ball 30 on the footing member 31. These parts are held in assembled relation by means of the ring 32 and bolts 33, the ring being recessed centrally to complete a socket joint for the ball 30. By means of this support assembly the footing member 31 is adapted to desirably rest upon the submerged surface even though such surface be of irregular contour as shown in Figs. 1 and 2. The projections 34 on the footing member 31 overcome the tendency of the assembly to slip sidewardly upon the supporting surface.

Each of the pillars or columns 11 passes upwardly through the members 7 and is adapted to move axially relative to such members. Some or all of the members 7 are provided with a hydraulic jack mechanism 39 such as that shown in Fig. 3. This mechanism comprises a base member 40 which is attached to the platform 1 as by means of the U-bolts 41. The column 11 passes through a hollow boss 42 having a bore which tapers outwardly at its opposite ends to receive slips 43 from either above or below to engage the pillar or column 11 and serve a purpose that will more fully appear.

Cylinders 45 adjacent the boss 42 are integral with the base member 40 and extend upwardly therefrom. Pistons 46 are movable within the cylinders 45 to move the piston rods 47 which pass through a packing gland 48 in the cylinder head 49.

The outer ends of the piston rods 47 are attached to a spider 50 provided with a central boss 51 similar to the boss 42 in the base 40. The boss 51 likewise is provided with an outwardly converging bore to receive slips 52 which engage the pillar 11.

Fluid pressure pipes 55 and 56 are connected to each of the cylinders 45 above and below the pistons 46. These pipes are in turn connected to a source of fluid pressure (not shown) whereby it is possible to reciprocate the pistons 46 and associated assembly. Such reciprocation in conjunction with suitable use of the slips 43 and 52 enable relative movement between the hydraulic jack or equalizing unit and the column 11.

It is believed that the steps in construction of the submarine foundation are apparent from the foregoing description. By way of clarification it will be pointed out that the columns 11 are made up of sections which are lowered through the members 7 with the support assemblies 25 attached thereto. As these columns are assembled and lowered, connectors 12 are placed thereabout and interconnecting structural steel members such as cord members 14 and web members 14' are attached thereto as by means of bolts 20. Successive sections of this structural steel framework are added until such framework extends downwardly a sufficient distance to provide adequate strength for the structure. It is not necessary that this framework extend the entire distance from the platform 1 to the submerged surface upon which the structure is to rest. It is intended, however, that such framework will extend to a point in proximity to such surface and the upper section of the framework is then secured to the bottom of the platform 1.

Pressure fluid is then admitted to the cylinders 45 and the slips 43 and 52 are manipulated in such manner that a lifting effort is imparted to the composite structure comprising the platform 1 and the framework 10. Such manipulation of the hydraulic jacks 39 brings the support assemblies 25 into engagement with the submerged surface in such manner that the entire weight of the structure is distributed upon the respective support members 25.

Continued operation of the hydraulic jacks effects a lifting of the composite framework structure whereby such structure is lifted from the pontoons 2 and 3 and such pontoons may then be removed. Alternately the pontoons 2 and 3 may be retained in place if desired to serve as storage space or for slush pits and at the same time to effect desired lifting force upon the structure.

Broadly the invention comprehends a novel method of erecting a submarine foundation or support for drilling operations and the resulting structure.

What is claimed is:

1. A marine foundation comprising a platform, a framework attached thereto including vertically alined connectors, said framework extending downwardly to a point proximate a surface upon which the structure is to be supported, pillars movably passing through said connectors, a footing member on the lower end of each pillar, and means for adjusting the relative position of the platform and pillars to distribute the load upon the pillars.

2. A marine foundation comprising a platform having a framework attached to and extending downwardly therefrom to a point proximate a submerged supporting surface, members in said platform and framework having alined openings therein, support pillars passing through said alined openings, footing members on the lower ends of said pillars, and means for adjustably moving each of said pillars relative to the platform so that the weight of the assembly is distributed among the pillars.

3. The method of erecting a platform over a body of water and above a predetermined area submerged thereby comprising the steps of supporting the platform upon supports in the body of water, slidably lowering support columns from spaced points on the platform, progressively applying a framework slidable upon and supported by said columns, continuing said steps until the framework extends a predetermined distance beneath the platform, securing the upper end of the framework to the platform, and thereafter moving the respective columns relative to the platform and framework whereby the weight of the structure is distributed among the columns.

4. The method of erecting a platform over a body of water and above a predetermined area submerged thereby comprising the steps of supporting the platform upon supports in the body of water, slidably lowering support columns from spaced points on the platform, progressively applying a framework slidable upon and supported by said columns, continuing said steps until the framework extends a predetermined distance beneath the platform, securing the upper end of the framework to the platform, moving the respective columns relative to the platform and framework whereby the weight of the structure is distributed among the columns, and thereafter removing the supports.

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