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Crain

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[54] MOORING STRUCTURE AND METHOD

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[52] **U.S. Cl.** **61/46,** 61/48, 52/654, 114/230

[51] **Int. Cl.**.....**E02d 13/00,** E02b 3/06

[58] **Field of Search**.....61/46, 46.5, 50, 52, 53.5, 61/48; 114/230; 52/654

[56] **References Cited**

UNITED STATES PATENTS

2,979,910	4/1961	Crake	61/46
2,927,435	3/1960	Upson	61/46

FOREIGN PATENTS OR APPLICATIONS

671,866	5/1952	Great Britain	61/46
1,018,801	10/1957	Germany	61/46
1,087,984	8/1960	Germany	61/46

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[57] **ABSTRACT**

This invention relates to a mooring structure and method of construction thereof, comprising a triangular template or diaphragm having vertical sleeves at the corners through which tubular legs or piles are driven in telescoping arrangement while the template is supported by beams whose ends are held on two barges straddling the structure. The sleeves are welded to the legs. A prefabricated triangular tripod is welded to the top of the legs. Concrete is then poured into the legs. One or more diaphragms may be used with each structure at a selected height above or below the water level.

5 Claims, 5 Drawing Figures

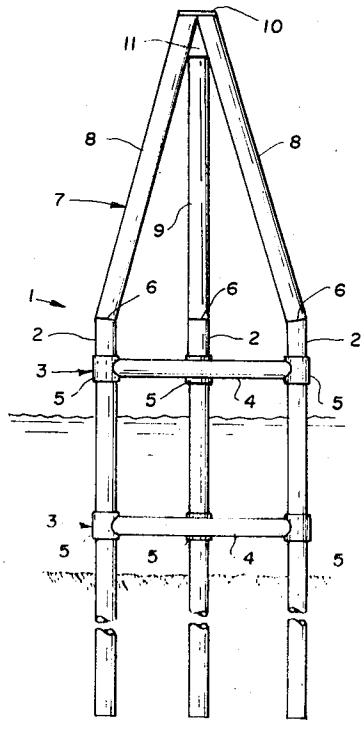


Fig.1.

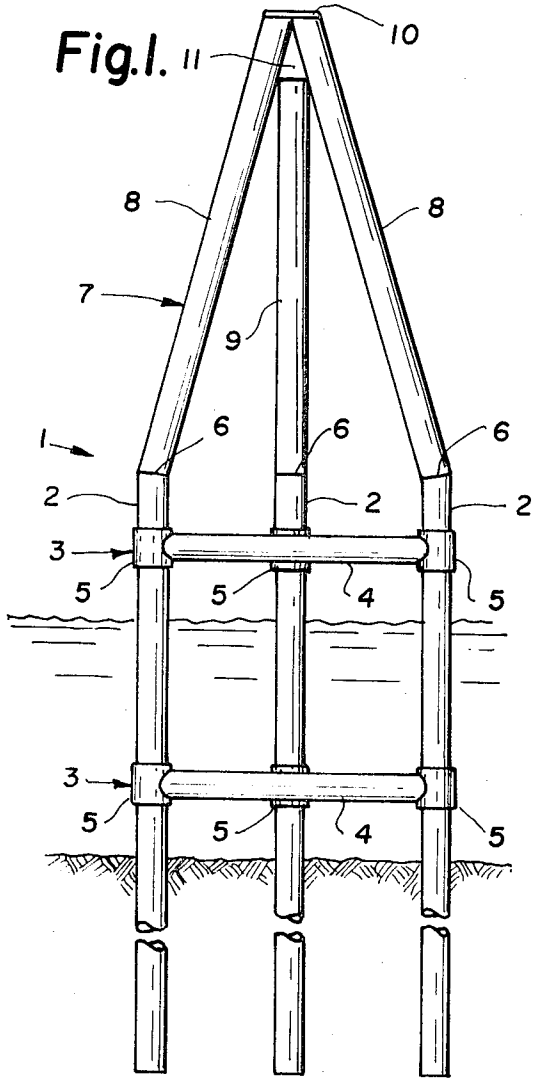


Fig.2.

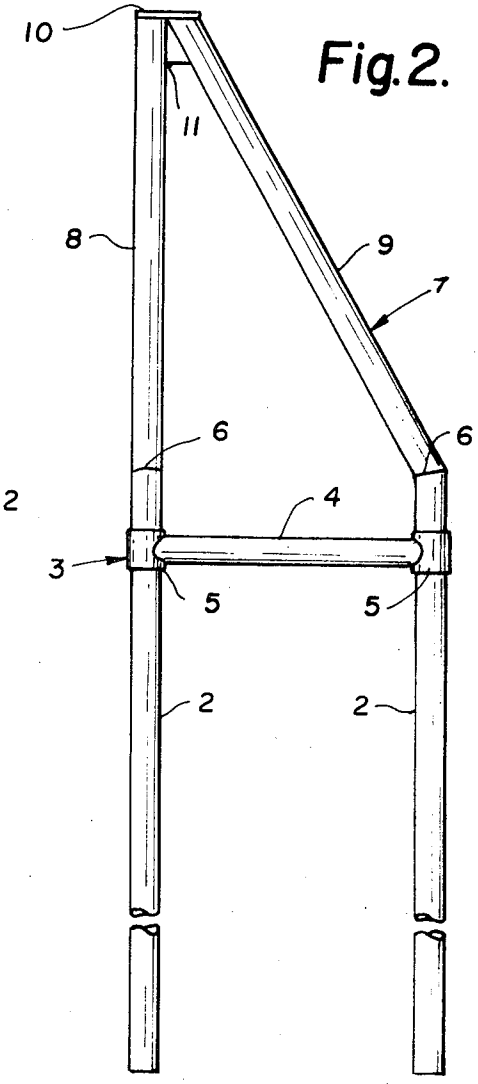


Fig.3.

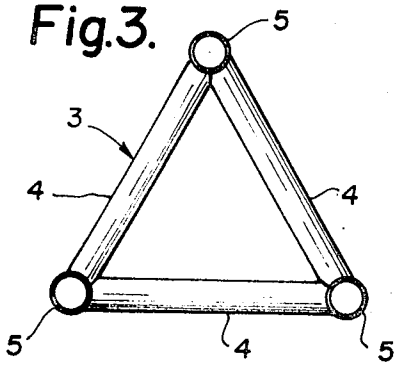


Fig.4.

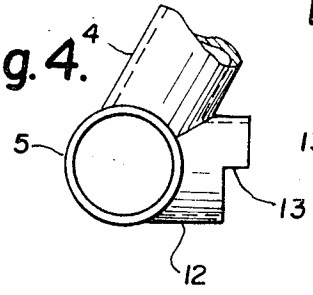
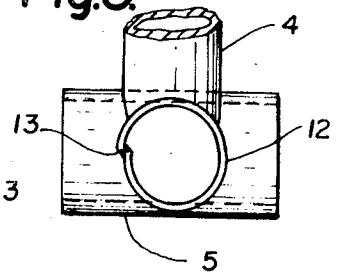


Fig.5.



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MOORING STRUCTURE AND METHOD

This invention relates to a mooring structure and to the method of erecting such structure.

In the past, mooring structures have been generally erected by driving wooden poles into the river bottom and tieing or bunching them together. These have not proved satisfactory since they require considerable time for erection at the river site and great difficulty is encountered in properly arranging or bunching the poles into the desired final shape for the assembly.

An object of the present invention is to provide a novel mooring structure and method of assembly which are devoid of the abovenamed disadvantages of prior structures and methods of assembly and which enable prefabrication of main parts of the assembly before transporting the assembly to the site, thereby saving considerable labor time and expense for erection and enabling construction of a more accurate and reliable assembly of reproducible design having much longer life than heretofore possible.

A more specific object of the invention is to provide a mooring structure and method of assembly enabling the hollow legs or piles to be driven through a triangular template or diaphragm while the template is being held, by barges or the like, a predetermined distance above the surface of the water, and finally welding the template to the legs and welding a tripod onto the top of said legs.

Other objects and advantages will become more apparent from a study of the following description taken with the accompanying drawing wherein:

FIG. 1 is an elevational view of a mooring structure embodying the present invention;

FIG. 2 is a side view thereof as viewed from the right of FIG. 1;

FIG. 3 is a top view of the template 3 with the tripod 7 removed;

FIG. 4 is an enlarged, top view of one of the corners of the diaphragm or template 3 shown in FIG. 3; and,

FIG. 5 is a side view of the corner portion shown in FIG. 4.

Referring more particularly to the drawing, numeral 1 generally denotes a mooring structure or assembly embodying the present invention and comprising, essentially, a triangular shaped template or diaphragm 3 which comprises hollow tubes or pipes 4 of steel or other suitable metal having integrally secured thereto, at the three corners such as by welding or unitary casting, three vertically extending sleeves 5 through which the telescoping legs 2 of hollow tubular construction are driven by a pile driver while the diaphragm 3 is held at a predetermined distance above the surface of the water. This is best done by supporting the diaphragm on two or more beams, the ends of which beams are supported on barges located on opposite sides of the diaphragm (not shown). Legs 2 are pile driven until their lower ends are sunk into the river bottom or bed. Ether a single diaphragm may be used, as shown in FIG. 2, or, if desired, one or more additional diaphragms may be used, either underneath the water surface or above the water surface, to provide greater reinforcement and a more assured vertical disposition of the legs. After the legs have been firmly driven into the river bottom, concrete may be poured into the top open ends of the legs 2 so as to fill them and provide greater strength. However, it is faster to pour concrete after tripod 7 is affixed to legs 2.

At the factory site, the tripod 7 may be manufactured in the form shown in FIGS. 1 and 2, comprising two angularly disposed tubes or pipes 8 located in the same vertical plane and an angularly disposed pipe 9, which pipes 8 and 9 are interconnected by gussets 11 welded to the top portions of the pipes. After the bottom ends 6 of the pipes have been welded to the top ends of legs 2 concrete may be poured into pipes 8 and 9 to fill also pipes 2. Finally a cap 10 is welded to form a top closure to pipes 8 and 9, forming a tripod.

It will be noted that the right side of the mooring structure, as viewed in FIG. 2, is adjacent the shore, whereas the left side thereof, comprising pipes 8 located in the same vertical plane, will face the sea or other body of water. Mooring lines will be tied to pipes 8 of the tripod.

FIGS. 4 and 5 show one of the corners of the diaphragm for finally completing diaphragm assembly, comprising a leg portion 12 having an offset end 13, as illustrated in FIGS. 4 and 5, to form a joint. Were it not for such offset, located at the bottom of the casting, the last leg would be difficult or impossible to join to the sleeve of the diaphragm.

Thus it will be seen that I have provided an efficient mooring structure and method of assembly thereof which enables the major component parts of the structure to be prefabricated at the factory so that they may be easily and quickly assembled at the mooring site even under very adverse weather conditions, and at very minimum expense; furthermore, I have provided mooring structure of reproducible design having considerably greater strength, and reliability and longer life than heretofore possible, as well as greater flexibility as to the number of reinforcing diaphragms that may be used.

While I have illustrated and described a single specific embodiment of my invention, it will be understood that this is by way of illustration only and that various changes and modifications may be contemplated within the scope of the following claims.

I claim:

1. The method of erecting a mooring structure comprising, supporting, in a horizontal plane, by a pair of barges, a hollow tubular triangular template having vertical sleeves at its corners, driving piles in the form of pipes telescopically through said sleeves, while the template is being held by the barges, until they sink into the river bed, welding said template to said pipes, welding a hollow tripod onto the tops of said pipes, and finally filling said hollow tripod and pipes with concrete.

2. A mooring structure comprising a triangular template adapted to be horizontally mounted several feet above the water surface, a vertically extending sleeve at each corner of said template, vertical pipes telescopically fitted to and attached to said sleeves, and a tripod comprised of three angularly disposed pipes attached to the tops of said vertical pipes, two of said pipes being in the same vertical plane and the third pipe, adapted to be closest to the shore, being inclined relative to said plane.

3. A mooring structure as recited in claim 2 wherein said first mentioned vertical pipes are filled with concrete.

4. A mooring structure as recited in claim 2 wherein both said vertical pipes and said tripod are filled with concrete and wherein a cap is welded to cover the top of said pipes forming said tripod.

5. A mooring structure as recited in claim 2 wherein said hollow tubular triangular template is notched to provide an offset on one of its legend portions adjacent a corner of the triangle to facilitate attachment of the leg portion thereto.

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