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CAISSON

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Fig. 1

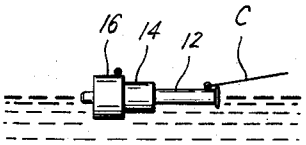


Fig. 2

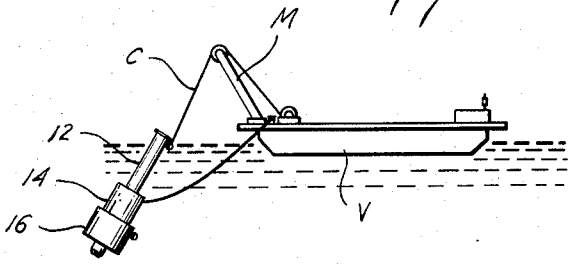


Fig. 3

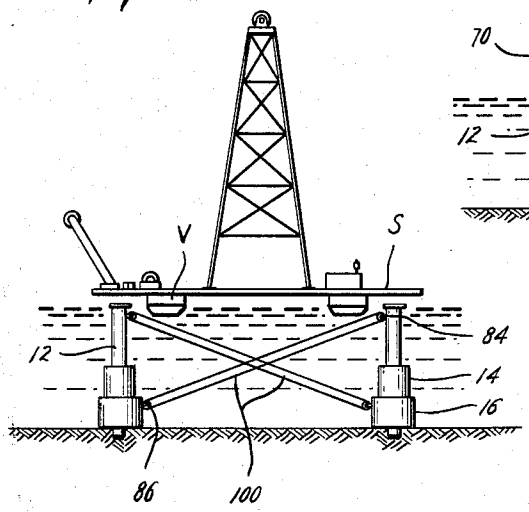
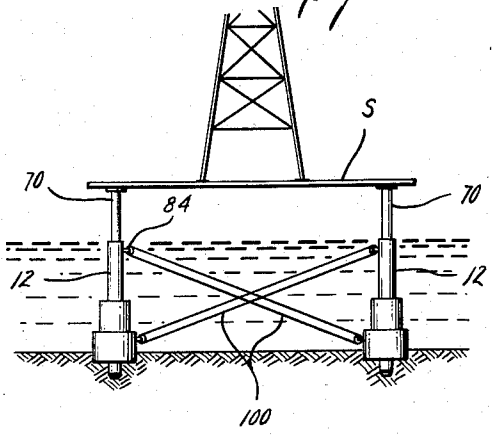


Fig. 4



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Fig. 5

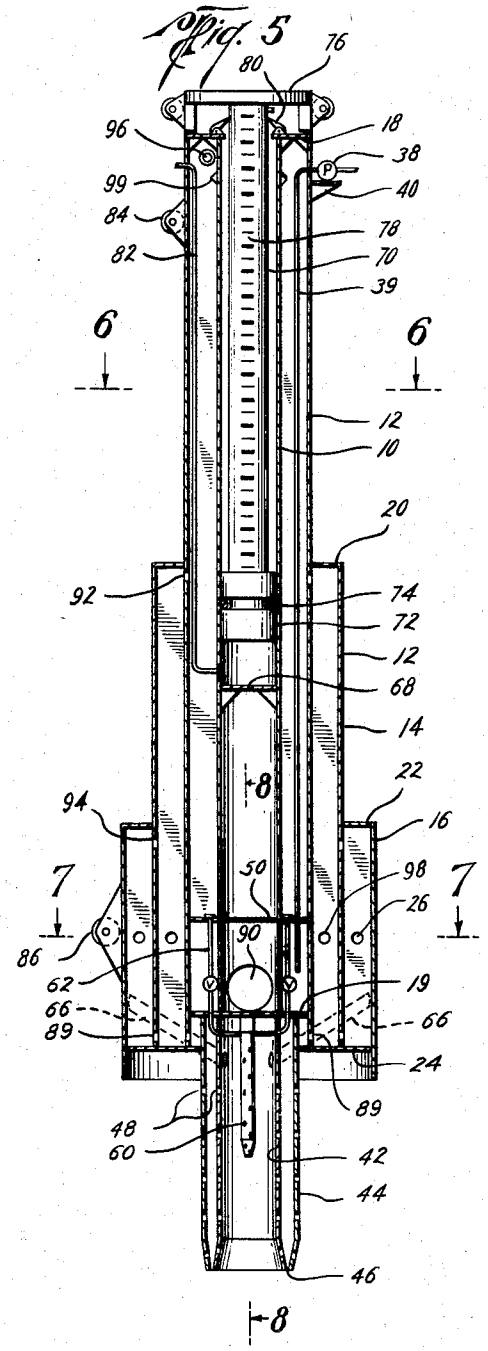


Fig. 6

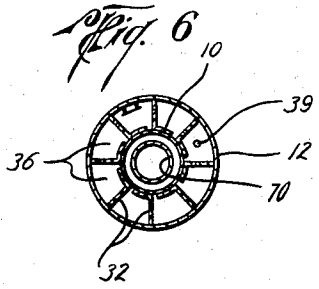
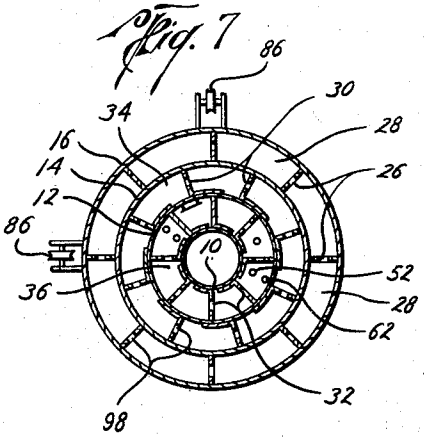


Fig. 7



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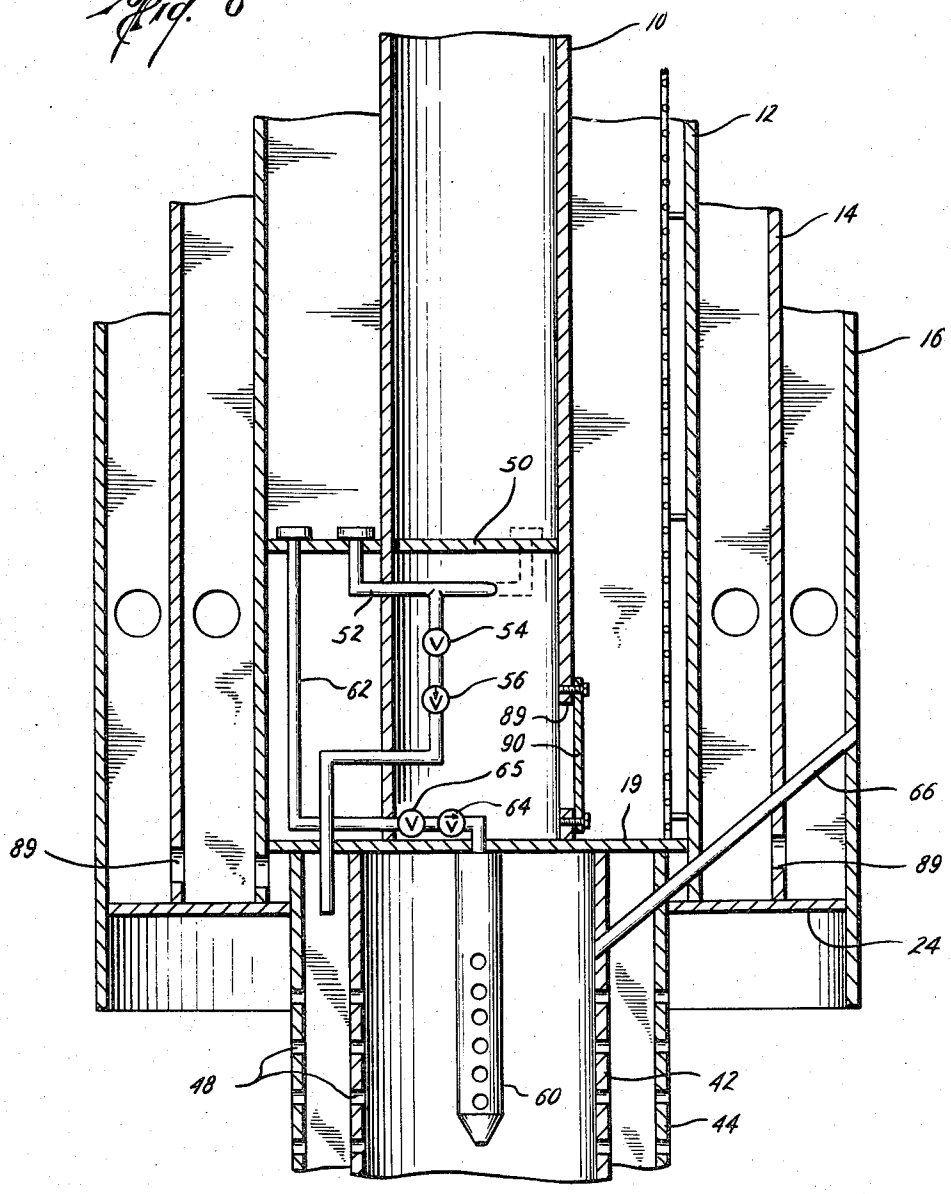
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Fig. 8



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Fig. 9

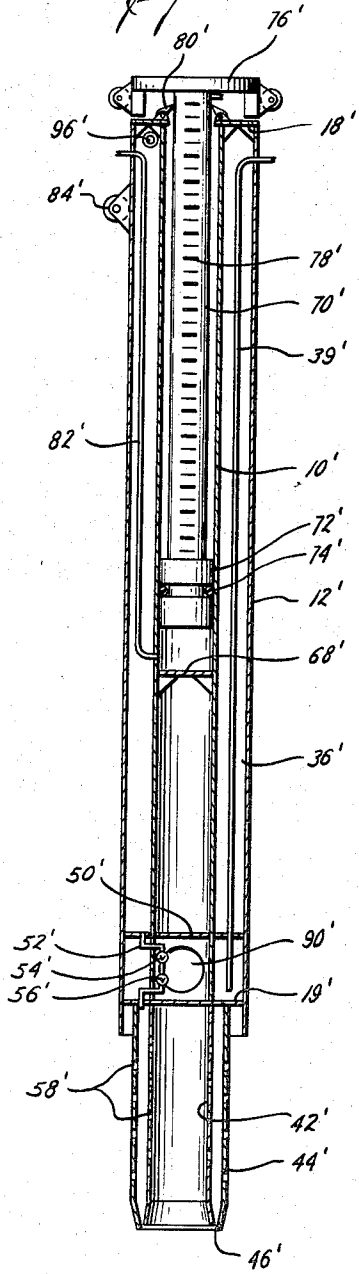
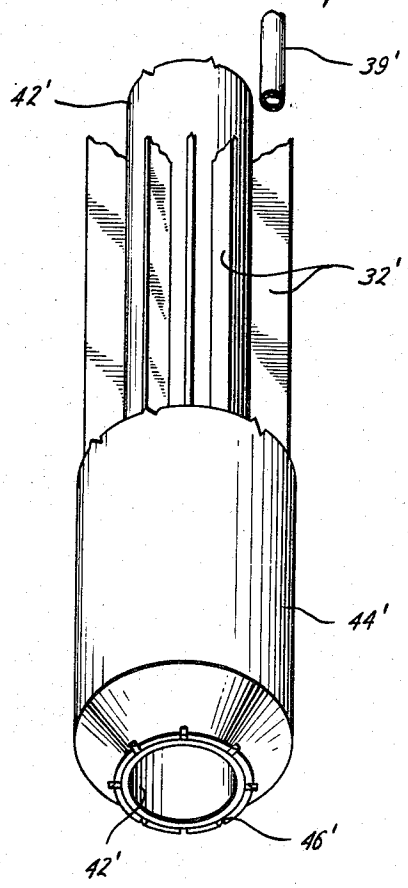


Fig. 10



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2,924,947

CAISSON

Ole Peterson, Many, La.

Application January 7, 1955, Serial No. 480,319

2 Claims. (Cl. 61—46.5)

This invention relates to a caisson, and more particularly to a caisson which is constructed for use in the supporting and anchoring of well drilling equipment in the conducting of well drilling operations in locations which are under water, such as in off-shore drilling operations.

The invention finds particular application in the construction and use of off-shore drilling platforms in the drilling of oil and gas wells in areas which are located under water. In the construction of off-shore drilling platforms it is necessary to provide supports which must be very securely anchored in the earth beneath the water and upon which the platform may be supported in a position well above the water level at high tide.

Heretofore, numerous methods and means have been proposed for this purpose, such as the driving of pilings which project above the water level and upon which the platform may be erected. Various devices have also been provided whereby the height of the platform above the water could be adjusted, such as by the sinking of barges to form a substantial footing upon which uprights, such as tubular piles, could be erected, and with which means is associated for extending the piles upwardly to the desired height.

The use of driven piling as a support for off-shore drilling platforms presents the disadvantages that such piling is very difficult to place in a vertical position, especially when it is used in locations where the water is relatively deep, and it is also difficult to remove the piling when the drilling operations have been completed. The use of sunken barges as supports has the disadvantage that the placement of such barges is difficult, particularly where the bottom is irregular or sloping, and the barges are also expensive to construct and not easily anchored against shifting.

The present invention has for its chief object the over coming of the above and other disadvantages of off-shore platform supporting devices as heretofore commonly constructed, the provision of a caisson of hollow construction, which may be floated in an empty condition to the desired location and thereafter filled with water to sink the same into a position to support a platform or super-structure above the water level.

A further object of the invention is the provision of a caisson which may be easily withdrawn from the earth after use and recovered or transported to another location for reuse.

Another object of the invention is to provide a caisson of type referred to embodying vertically adjustable means adapted to project above the water when the caisson is in anchored position, and upon which a platform or superstructure may be supported at any desired elevation.

A further object of the invention is the provision of a hollow caisson of tubular design and cellular construction having inner and outer tubular sections, which are connected by longitudinally extending bracing and reenforcing webs or flanges, and having jet means at the lower end of the caisson whereby the earth may be

washed away in front of the same to permit the caisson to penetrate the earth as it is lowered without the use of any driving means to force the caisson into the bottom.

A still further object of the invention is to provide a caisson of the kind mentioned, which is of simple design, economical construction and great strength, capable of long withstanding the heavy loads and extreme conditions of exposure to which structures of this type are customarily subjected.

The above and other important objects and advantages of the invention may best be understood from the following detailed description, constituting a specification of the same, when considered in conjunction with the annexed drawings, wherein—

Figures 1 to 4 are side elevational views, on a somewhat reduced scale, illustrating the manner in which the invention is employed in the erection of an off-shore drilling platform; Figure 1 showing the caisson of the invention in an empty position during the floating of the same to the location at which the platform is to be erected, Figure 2 showing the caisson in a partially filled condition as the same is being lowered to the bottom, Figure 3 showing a number of the caissons of the invention in anchored position with a platform supported thereon, and Figure 4 showing the platform supported in an elevated position on the caissons;

Figure 5 is a vertical central cross-sectional view of a preferred form of the invention;

Figure 6 is a cross-sectional view, taken along the line 6—6 of Fig. 5, looking in the direction indicated by the arrows;

Figure 7 is a cross-sectional view, taken along the line 7—7 of Figure 5, looking in the direction indicated by the arrows;

Figure 8 is a fragmentary, vertical, central, cross-sectional view, of the lower end portion of the caisson of the invention, as illustrated in Figure 5, illustrating details of construction of the same;

Figure 9 is a view similar to that of Figure 5, illustrating a somewhat modified form of the invention; and

Figure 10 is a fragmentary perspective view partly broken away, on a somewhat enlarged scale, of the lower end portion of the invention as illustrated in Figure 8, showing details of construction of the same.

Referring now to the drawings in greater detail, the invention as illustrated in particularity in Figures 5 to 8, takes the form of a hollow cellular body constructed of a number of concentrically arranged tubular sections, such as those shown at **10**, **12**, **14** and **16**, which may conveniently be of circular cross-section, and are of different diameters to provide annular spaces between the sections. The section **10** has an upper end wall **18** and a lower end wall **19** to close the annular space between the sections **10** and **12**. The sections **14** and **16** are similarly provided with upper end walls **20** and **22**, respectively, and are also provided at their lower ends with an end wall **24** to close the annular spaces between the sections **12** and **14** and **14** and **16**.

Longitudinally extending internal flanges or dividers **26** extend throughout the length of the section **16** and between the sections **14** and **16** to form elongated cells **28** within the section **16**, as best seen in Figure 7. Similar dividers **30** and **32** are also provided between the sections **12** and **14** and between the sections **10** and **12** to form elongated cells **34** within section **14** and cells **36** within section **12**.

A pump **38** is mounted on a bracket **40** suitably attached to the exterior of the section **12** near its upper end, which pump may be of any convenient type and operated from any suitable power source. The pump is adapted to pump water into the interior of the section **12**, suitable means such as a flexible hose, not shown,

being connected at one end to the inlet of the pump, and whose other end may be lowered into the water, and the outlet of the pump leading into the inside of the section 12 through a pipe 39 extending downwardly to a point near the bottom of the section 12.

At its lower end the body has a discharge nozzle of cylindrical shape, having inner and outer, radially spaced walls 42 and 44, respectively, which converge toward their lower ends to form an annular discharge opening 46, and may also be provided with suitably spaced openings, such as those indicated at 48 in the walls 42 and 44. The discharge nozzle is attached at its upper end to the lower end wall 19, and above the wall 19 the annular space between the sections 10 and 12 is closed by a wall 50. The discharge nozzle is in communication at its upper end with the annular space between the sections 10 and 12 by means of one or more pipes, such as the pipe 52, having a manually operable valve 54 and a downwardly opening check valve 56 therein, whereby the flow of water from within the section 12 downwardly into the discharge nozzle may be controlled and water is prevented from flowing upwardly through the discharge nozzle into the section 12.

An agitator nozzle 60 is positioned inside of the wall 42 of the discharge nozzle, in position to discharge water therein at a point above the lower end of the discharge nozzle, and this agitator nozzle is connected in communication with the annular space between the sections 10 and 12 by means of a pipe 62, which has a check valve 64 therein which opens to permit the discharge of water through the agitator nozzle, but which prevents the return of water from the agitator nozzle into the interior of the body. A manually operable valve 65 is also provided in the pipe 62, located in a position to be opened and closed from within the section 10 beneath the wall 50 therein.

In order to permit the escape of water, sand and other material from within the wall 42 of the discharge nozzle, outlet pipes 66, shown in dotted lines in Figure 5, lead from within the wall 42 to the exterior of the section 16.

The section 10 is closed by an interior wall 68 located meditate its ends, and above this wall a tubular stem 70 extends into the section 10, having a piston 72 at its lower end. Suitable packing, such as that shown at 74 is disposed between the piston and the interior of the section 10 to form a fluid tight seal. The stem 70 may be provided at its upper end with a head member 76 positioned for engagement with any desired superstructure or platform to be supported on the caisson. The stem is also provided with one or more longitudinally extending, toothed racks 78, which are cooperable with pawls 80 pivotally carried by the upper end wall 18 to hold the stem in any desired position of elevation.

A pressure fluid supply pipe 82 leads from the exterior of the body to the interior of the section 10 at a point above the internal wall 68 and beneath the piston 72, whereby fluid under pressure may be admitted to or discharged from the section 10 to operate the piston.

The body may also be provided with upper and lower sheaves 84 and 86, attached to the exterior of the sections 12 and 16, respectively, for a purpose to be explained more fully hereinafter.

The longitudinally extending flanges or dividers 26, 30 and 32 may have openings therethrough as indicated at 88, and the sections 12 and 14 may be provided with similar openings 89 whereby water may enter the cells 28, 34 and 36 when the pump 38 is operated to pump water into the interior of the section 12. One of the cells 28 is, however, closed against the entrance of water therein and the section 10 is provided with an opening 89 in communication with this cell and which opens into the interior of the section 10, beneath the wall 68, whereby the section 10 may be entered to operate the manually operable valves. A closure 90 may be provided for the opening 89.

The sections 12 and 14 are provided with openings 92 and 94, located near the upper end walls 20 and 22, respectively, through which air may escape into the section 12 from sections 14 and 16 as the water rises within the latter sections. An opening 96 is also provided in the section 10 near its upper end through which air may be permitted to escape, or through which air under pressure may be introduced to force water within the caisson out through the pipe 39 when it is desired to refill the caisson with air.

In order to permit water and air to pass freely from one cell to another of the caisson openings, such as those indicated at 98 are provided in the longitudinal dividers 26, 30 and 32, as best seen in Figure 7, and the dividers 32 within the section 12 may also be notched, as seen at 99 in Figure 5 to permit the free passage of air and water therethrough.

In making use of the caisson of the invention, constructed as described above, the caisson may be floated in an empty condition and towed to the desired location in the manner illustrated in Figure 1. When the desired location is reached, the caisson may be suitably connected, as by means of a cable C, to any convenient type of lifting mechanism M, mounted on a barge, or other suitable vessel V, as shown in Figure 2, whereupon the pump 38 may be operated to pump water into the interior of the section 12, whence it will flow into the cells to fill the same, and cause the caisson to sink into a substantially vertical position, with the lower end of the caisson resting on the bottom.

When the caisson is thus positioned at the desired location, the empty cell in the section 12 may be entered through an opening, not shown, provided for that purpose at the upper end thereof, from whence the section 10 may be entered through the opening 89 to open the valves 54 and 65 to permit water to flow out through pipes 52 and 62 from the interior of the section 12 to be discharged through the discharge opening 46 to wash away the earth beneath the lower end of the caisson to permit the caisson to penetrate the earth. During the outflow of water through the discharge opening 46, water may also be discharged through the nozzle 60, to agitate and wash away through the pipes 66 any loosened material which might otherwise accumulate inside of the wall 42.

A number of the caissons may be securely anchored in an upright condition, as illustrated in Figure 3, and any desired type of platform or superstructure, such as that designated at S may be placed in position resting upon the head members 76 of the tubular stems 70, whereupon water under pressure from any suitable source may be allowed to enter the section 10 beneath the piston 72 therein, through pipe 82, to elevate the platform to the desired height above the water level. By setting the pawls 80 in contact with the teeth of the racks 78, the platform may then be securely held in elevation position.

The upper sheaves 84 on the section 12 of one caisson may be connected with the lower sheaves 86 of others of the caissons by endless cables, such as those indicated at 100, which pass about the sheaves and extend diagonally from one caisson to another to tie the caissons together, as seen in Figures 3 and 4.

Should it be desired to dismantle the equipment and remove the caissons, the platform may be removed, and the water forced out of the caisson by pumping air into the section 12 through the upper opening 96, whereupon the caissons may be withdrawn from the earth and floated. In the event that the caissons cannot be thus withdrawn, water under pressure may be forced out through the discharge outlet 46 and nozzle 60 through pipes 52 and 62 to cause a scouring action to loosen the earth about the lower end of the caisson to effect its release.

A somewhat modified form of the invention is illus-

trated in Figures 9 and 10 of the drawings, wherein the sections 10' and 12' are constructed and arranged in the same manner as the sections 10 and 12 previously described, but the sections 14 and 16 are left off. In this case the lower end portion of the section 10' forms the inner wall 42' of the discharge nozzle, which has the discharge opening 46'. The nozzle 60 is also eliminated in this form of the invention, as are the outlet pipes 66. In other respects this form of the invention is constructed and used in a manner similar to that described in connection with the form of the invention illustrated in Figures 5 to 8.

It will thus be seen that the invention provides a caisson which is of simple design and economical manufacture, and which is easily positioned and securely anchored at any desired location, but which may also be readily removed when desired without the use of complicated mechanism or inpury to the structure.

While the invention has been disclosed herein in connection with certain specific embodiments of the same, it will be understood that this is intended by way of illustration only, and that numerous changes can be made in the construction and arrangement of the various parts without departing from the spirit of the invention or the scope of the appended claims.

Having thus clearly shown and described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. A caisson for supporting a superstructure in an elevated position above the level of water over submerged ground, comprising a plurality of concentrically arranged tubular sections spaced radially from each other to form an elongated hollow body adapted to be floated in an empty condition, radially spaced tubular walls extending downwardly exteriorly of the lower end of the body forming a downwardly opening nozzle disposed in concentric relation to said sections and having a lower end discharge opening in communication with the interior of the nozzle between said walls and with the exterior of the nozzle means forming a discharge passageway leading from the space surrounded by the nozzle to the exterior of the body at a point remote from the lower end of the nozzle, means for introducing water into the body to cause the body to sink into an upright position with said nozzle in a position to penetrate the submerged ground, means for introducing water from the body into the nozzle to cause a downward flow of water from the lower end of the nozzle, and means for introducing water from the body into the space surrounded by the nozzle to cause an outward flow of water through said passageway.

2. A caisson for supporting a superstructure in an elevated position above the level of water over submerged ground, comprising a plurality of concentrically arranged tubular sections spaced radially from each other to form an elongated hollow body adapted to be floated in an empty condition, the lower end of said body being of larger diameter than the upper end thereof, inner and outer, radially spaced, cylindrical walls on the body extending downwardly from the lower end of the body in concentric relation to said sections and converging downwardly at their lower ends to form an outer nozzle, means for introducing water into the body to cause the body to sink into an upright position with said outer nozzle positioned to penetrate the submerged ground, means connected in communication with the interior of the body and said outer nozzle to cause a downward flow of water from the outer nozzle against the submerged ground beneath the body, an inner nozzle in and surrounded by said outer nozzle in position to project a stream of water downwardly toward the lower end of the outer nozzle, means for supplying water under pressure to said inner nozzle, and means forming a discharge passageway leading from the space surrounded by said outer nozzle to the exterior of the body.

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