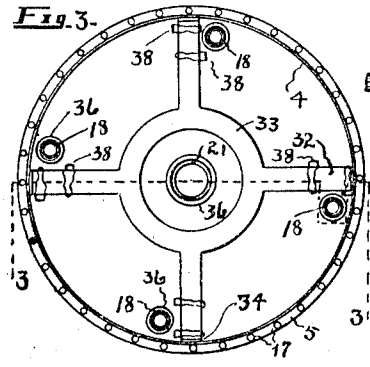
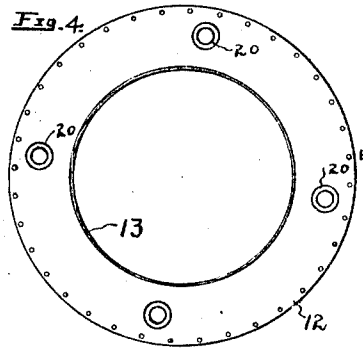
E. BIGNELL.

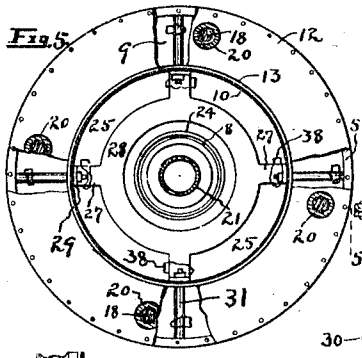
CAISSON CONSTRUCTION.

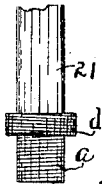
APPLICATION FILED SEPT. 6, 1912.

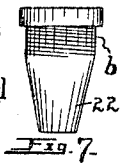
1,066,984. Patented July 8, 1913.

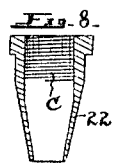


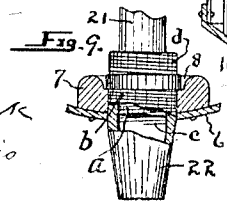


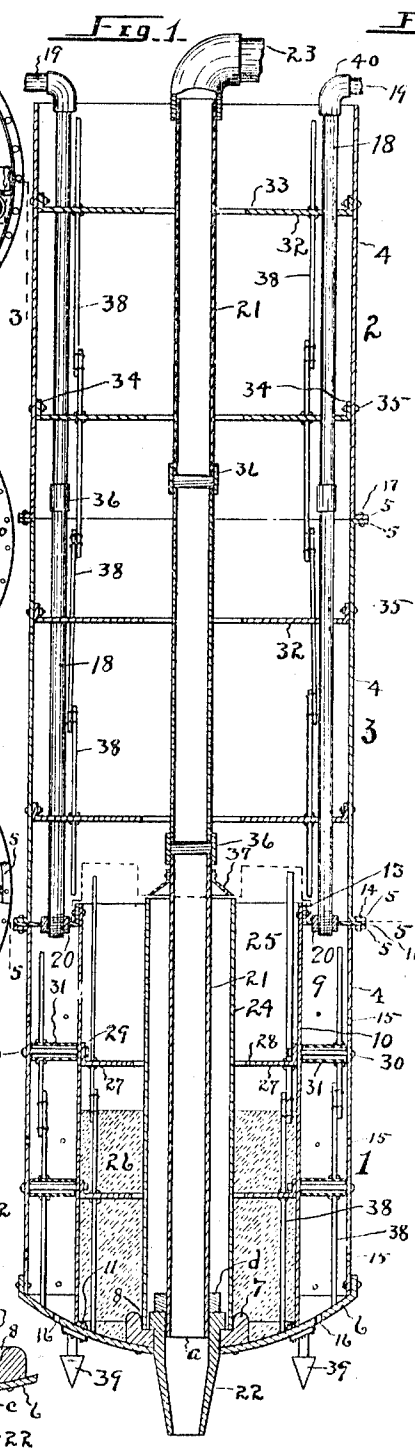


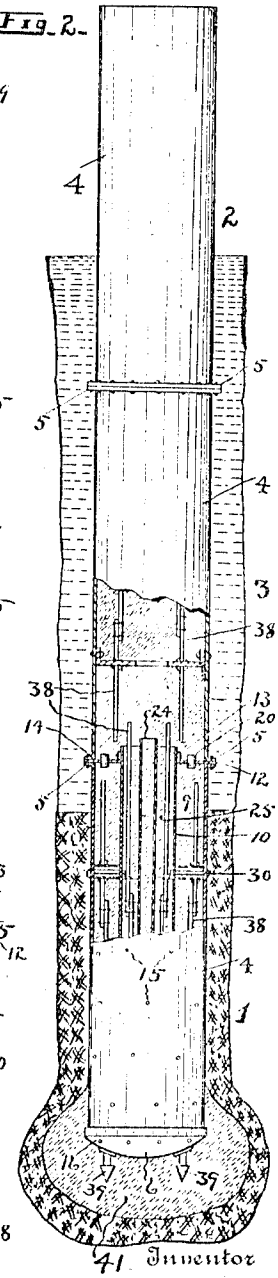












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CAISSON CONSTRUCTION.

1,066,984. Specification of Letters Patent. Patented July 8, 1913.

Application filed September 6, 1912. Serial No. 718,887.

To all whom it may concern:

Be it known that I, EDWARD BIGNELL, a citizen of the United States, residing at Lincoln, in the county of Lancaster and State of Nebraska, have invented certain new and useful Improvements in Caisson Construction, of which the following is a specification.

This invention relates to an improvement in caisson construction, and broadly includes certain novel means by use of which caissons may be built of reinforced concrete in the position where they are to remain, and by use of which they may be conveniently handled and sunk to a comparatively great depth in any location where required, and particularly in harbors or river beds for the support of wharves, piers or bridges.

The invention consists of the novel construction, combination and arrangement of parts as described herein and claimed, and as illustrated in the drawing, wherein,—

Figure 1 is a view in longitudinal section of a caisson illustrating one embodiment of my invention, the section being on the irregular line 3 3 of Fig. 3. Fig. 2 is a view partly broken and in section, being a side elevation of the same caisson shown in Fig. 1, the scale being somewhat reduced, the nozzle and conducting pipes being removed and the casings filled with concrete, said view also showing a concrete foundation formed below the caisson, a water line, and a part of the river bed or ground in which the caisson has been sunk. Fig. 3 is a plan view of the upper section of the caisson, the supply pipes and their couplings at their upper terminals, being removed. Fig. 4 is a plan view of the partition or upper wall of the water receptacle. Fig. 5 is a transverse section, partly broken, taken above the inner compartment and above the water receptacle, as on the irregular line 5 5 of Fig. 1, to show a plan of the lower section. Figs. 6, 7, 8 and 9 are detail views to clearly show the construction and mounting of the central or main conducting pipe and nozzle. Fig. 6 is a view of the lower part of the main conducting pipe and collar. Figs. 7 and 8 show the nozzle, respectively, in side elevation and longitudinal section. Fig. 9 is a view partly broken and in section, showing the nozzle threaded in the supporting-block, the main conducting pipe being threaded in the nozzle.

Referring now to the drawing for a more particular description, the caisson consists, in part, of the lower section 1, the upper section 2 and intermediate section 3, all preferably being of the same diameter and each consisting, in part, of a metallic, cylindrical casing 4 of any suitable length or diameter, provided with continuous, transverse, outwardly-projecting, terminal flanges 5. While I have shown only one intermediate section 3, any desired number may be used, depending upon the required length of the caisson and also depending upon its diameter; and in some instances the lower section alone may be used.

The lower section is provided, preferably, with a convexed or bowl-shaped bottom 6, and secured upon the inner side and at the middle of said bottom is the interiorly threaded supporting-block 7, formed with a circular groove 8 opening upon its upper end. To provide an annular receptacle or water compartment 9 in the lower section, I employ the cylindrical casing 10 having a length equal to or greater than the length, and a diameter less than that of said section. It has a lower terminal flange 11 suitably secured upon the bottom 6; and by means of the annular plate 12 having an upset flange 13 suitably secured to the upper end of casing 10, a transverse partition or containing wall is provided for the upper end of said water compartment, the outer part of said partition or wall 12 being secured by suitable keepers 14 between flanges 5 of the respective lower and intermediate sections; and by means of said flanges and keepers, these two sections may be rigidly connected end to end.

The importance of providing the caissons in sections is very great, and when constructed in accordance with the herein description, they will be comparatively inexpensive and may be conveniently handled, and will adequately resist lateral stresses.

At 15 are indicated numerous perforations formed in staggered relation in the outer wall of the water receptacle 9, as best shown in Fig. 2; and perforations 16 are also formed in the bottom 6, these comparatively small apertures providing discharge passageways for the water which may be contained in receptacle 9.

The upper section may be secured upon the intermediate section, their flanges 5 registering and secured by keepers 17. At 18 are indicated tubular members or conduct-

ing pipes, each being provided at its upper end with a supply pipe 19, and water under pressure may pass within receptacle 9 and be discharged through perforations 15 and 16, said pipes having threaded connections at their lower ends with couplings or sleeves 20, said sleeves being suitably secured to and traversing the wall or partition 12. While I have shown only four pipes 18, a greater or lesser number may be employed, as may be required.

At 21 is indicated a tubular member or main conducting pipe disposed centrally of the caisson. It is provided at its lower end with a discharge member or nozzle 22, its upper end having a supply pipe 23. By referring to Fig. 8 it will be seen that the nozzle is interiorly threaded so that it may be conveniently mounted upon or removed from the threaded terminal *a* of pipe 21. Also the nozzle is exteriorly threaded as indicated at *b* (Fig. 7), said exterior threads *b* being inclined reversely to threads on *a;* and in practice, before the caisson is sunk, the nozzle is generally secured to project beyond or outwardly of the bottom of the caisson, by means of its threaded connection with the supporting-block 7.

At 24 is indicated a sleeve disposed to surround the conducting pipe 21. Its lower end may be mounted in groove 8, and it preferably has a length as great as that of the lower section, and therefore an annular compartment 25 is formed, with an imperforate bottom, between the wall of the sleeve 24 and wall 10 of water receptacle 9, and as will be seen, this compartment during the operation of sinking the caisson, is employed for containing heavy material, and preferably the concrete 26, to cause the caisson to sink vertically.

At 28 are indicated spiders or annular plates having radially disposed arms connected with wall 10. They provide braces which may be conveniently formed. As best shown in Fig. 5, their terminals are formed with upset flanges 29. Bolts 30 may transversely traverse receptacle 9 and walls 4 and 10 of the lower section, and may be suitably secured to flanges 29, said bolts being provided with spacing members, braces or sleeves 31, and by reason of this arrangement, lateral stresses directed against and radially of the lower section may be effectively resisted. In Fig. 5 only four of the arms 27 and sleeves 31 are shown, and as illustrated in Fig. 1, only two of these spiders are provided, but the number of these members may be greater or less, depending obviously upon the diameter of the caisson and the depth to which it is to be sunk.

At 32, best shown in Fig. 3, are indicated radially disposed arms which connect the annular plates 33 with the walls 4 of the upper and intermediate sections, said arms 32 having transverse flanges 34 adapted to bear upon said walls 4, and secured by keepers 35. These spiders or plates with their radially disposed arms provide effective braces, and they may be arranged in the sections in any suitable numbers sufficient to withstand lateral stresses directed against the sides of the sections. Also in this connection it may be stated that the continuous flanges 5 and transverse partition 12 tend to resist stresses directed against or radially of the cylindrical caisson, and this is one of their functions.

It will be understood that the lower section, which is first sunk, may at that time be wholly separated from the other sections, and this is a desirable feature. It will be noted that the use of flanges 5 and their keepers permit this separation, and provide a convenient means for connecting the sections end to end. Also to facilitate the separate handling of the sections in the provision of caissons of unusual length, pipe 21 and pipes 18 are formed in sections, to be connected by pipe couplings 36, said connections being adjacent to flanges 5.

In operation, the conducting pipes 18 and 21 are mounted within the caisson, the main conducting pipe 21 being disposed to traverse the annular plates or central apertures of the spiders, and conducting pipes 18 being disposed between arms 32 thereof. Threads *a* at the lower end of pipe 21 will register with threads *c* of the nozzle, and water under pressure, as above described, may be discharged below the caisson through perforations 16 and nozzle 22, the force of the water excavating and moving the ground to such an extent that the caisson will sink by gravity. In order that the caisson may be directed vertically at the time it sinks, a quantity of cement or concrete 26 is deposited in compartment 25. Also water will move outwardly from perforations 15 to prevent any ground or similar substance from adhering to the side of the caisson.

At 37 is indicated a hood of inverted funnel shape. It may be mounted upon pipe 21 and may overhang the upper, open end of sleeve 24 to prevent the cement or concrete from passing within the sleeve and adhering to pipe 21, for it will be understood that this pipe, after the caisson has been sunk, may be removed.

During operation, all of the work may be directed and performed without descending below the level of the ground or water, regardless of the number of sections employed. Any excess in the buoyancy of the caisson may be overcome by increasing the supply of concrete or cement 26.

At 38 are indicated numerous, connected reinforcing strips disposed within and longitudinally of the caisson, and when the

caisson is filled with concrete, as shown in Fig. 2, this reinforcing material, preferably of metal, will be embedded in the concrete for the purpose of resisting any force tending to bend the caisson.

Any desired number of reinforcing strips may be employed, and they may be supported by any suitable means while the sections are being filled, as upon arms or braces 27 and 32 and upon sleeves 31, any suitable strands being employed, as shown in the drawings, for securing the strips thereon. In arranging the strips, care should be exercised so that they will be disposed, for the most part, near the circumference of the caissons and in the plane of the connected flanges 5, so that each strip will provide an integral portion projecting inwardly of the ends of the connected sections, and to the end that the caisson may be fully reinforced at the connected terminals of the sections when the filler of concrete is finally deposited therein.

After the caisson has been sunk to a desired depth, a foundation 41 of concrete may be formed below its bottom, if desired. To provide this footing or foundation, the nozzle 22 is first removed. Since the inclination of the threads *b* of the nozzle is reverse to the inclination of threads *a* of pipe 21, it is obvious that a rotation of this pipe in one direction may cause a release of the nozzle from supporting-block 7; and after pipe 21 with its nozzle 22 has been withdrawn from the caisson, the nozzle may be removed from said pipe.

Pipe 21, as shown in Fig. 6, is provided with an exteriorly threaded collar or boss *d;* and when said pipe is again lowered in the caisson, minus the nozzle, it may be mounted in and supported by block 7. Cement or concrete in a plastic condition may then be disposed in said pipe, and pipe 23 may be employed as a conduit for compressed air; and by means of the air pressure thus employed, the concrete or cement or other analogous mixture may be forced through pipe 21 to be discharged below bottom 6, and to form the foundation 41.

At 39 are indicated holders or anchor-pins mounted upon and projecting below the bottom of the caisson. Any suitable number of these members may be employed, and after the concrete has become hardened they will operate to bind or connect the foundation 41 with the bottom of the caisson.

Couplings 40 of pipes 18 may be removed, and cement or concrete in a plastic condition may be passed through said pipes so that receptacles 9 may be filled with that material, and supply pipes 19 may be employed as conduits for compressed air, so that said receptacle may be filled as described; and the remaining parts of the caisson may be filled with the usual mixture of concrete or cement, and when it becomes hardened the caisson will be complete.

In practice, before the several sections of the caisson are filled with the plastic concrete, pipes 18 and 21 are generally removed. Since the sleeve 24 prevents contact or adhesion of the supply of concrete or cement 26 with said pipe 21, all of the pipes may be removed if desired; or if the caisson is of unusual length, the pipes may remain therein as additional metallic reinforcement.

Having fully described the several parts and their uses, a further explanation relating to operation is not necessary.

What I claim as new and desire to secure by Letters Patent is,—

1. A caisson comprising a cylindrical casing formed with perforations and provided with a bottom having perforations and an imperforate part; a second cylindrical casing disposed within said perforated casing upon the imperforate part of said bottom to provide an inner container and an annular compartment in communication with said perforations; and a plurality of pipes adapted to conduct water under pressure to be discharged within the annular compartment and below said bottom.

2. A caisson comprising a cylindrical casing provided with perforations and provided with a bottom having perforations and an imperforate part; a second cylindrical casing disposed within said perforated casing upon the imperforate part of said bottom to provide an inner container and an annular compartment in communication with said perforations; a plurality of radially disposed braces traversing the container and annular compartment; and a plurality of pipes adapted to conduct water under pressure to be discharged within the annular compartment and below said bottom.

3. A caisson comprising a cylindrical casing formed with perforations and provided with a bottom having perforations and an imperforate part; a sleeve disposed longitudinally within said casing; a second cylindrical casing disposed within said perforated caising upon the imperforate part of said bottom and circumscribing the sleeve to provide an inner annular container and an outer annular compartment in communication with said perforations; a plurality of pipes in communication with and adapted to conduct water under pressure to be discharged within the outer annular compartment, and a main pipe traversing said sleeve adapted to conduct water under pressure to be discharged below said bottom.

4. A caisson comprising a perforated cylindrical casing provided with a bottom; a second cylindrical casing disposed within said perforated casing upon said bottom to provide, adjacent to said perforated casing,

an inner container and an annular compartment in communication with said perforations; an annular plate disposed transversely between and secured upon the upper ends of said casings to form a brace and providing an upper containing-wall for said annular compartment; an annular plate disposed transversely within and having radially arranged arms bearing upon said second cylindrical casing; and a main pipe traversing the aperture of said annular plate adapted to conduct water under pressure to be discharged below said bottom.

5. A caisson comprising a perforated cylindrical casing provided with a bottom; a second cylindrical casing disposed within said perforated casing upon said bottom to provide an inner container and an annular compartment in communication with said perforations; an interiorly threaded supporting-block formed with an annular groove and mounted upon said bottom; a sleeve seated in said groove and disposed longitudinally of the caisson; a nozzle engaging the interiorly threaded part of the supporting-block and projecting below said bottom; a plurality of pipes connected with and adapted to conduct water under pressure to be discharged within the annular compartment; and a main pipe connected with and adapted to conduct water under pressure to said nozzle.

6. A caisson comprising a cylindrical casing formed with perforations and provided with a bottom; a sleeve disposed longitudinally within said casing; a second cylindrical casing disposed within said perforated casing upon said bottom and circumscribing the sleeve to provide an inner, annular container and an outer annular compartment in communication with said perforations; braces disposed between the cylindrical perforated casing and said second cylindrical casing; a plurality of pipes in communication with and adapted to conduct water under pressure to be discharged within the outer annular compartment; a main pipe traversing said sleeve and adapted to conduct water under pressure to be discharged below said bottom; and a plurality of annular plates provided with radially disposed arms having bearings of their terminals upon said second cylindrical casing.

7. A caisson comprising cylindrical castings connected end to end, one of said sections being provided with discharge passageways; tubular members adapted to be connected end to end within and adjacent to the ends of the casings for conducting water under pressure to said discharge passageways; and metallic strips having integral portions projecting inwardly of the ends of the connected casings to provide reinforcements for a concrete filler to be deposited therein.

8. A caisson comprising cylindrical castings disposed end to end; metallic strips having integral portions projecting inwardly of the adjacent ends of the casings to provide reinforcements for a concrete filler to be deposited therein, and an arrangement of pipes for conducting water under pressure to be discharged at the bottom and sides of one of the casings.

9. A caisson comprising a first cylindrical casing provided with a nozzle projecting below its bottom; a second cylindrical casing adapted to be disposed end to end upon the first cylindrical casing; metallic strips having integral portions projecting inwardly of the adjacent ends of the casings to provide reinforcements for an adhesive filler to be deposited therein; and a tubular member communicating with and adapted to conduct water under pressure to said nozzle.

10. A caisson comprising a first cylindrical casing formed with perforations and provided with a nozzle projecting below its bottom; a second cylindrical casing disposed end to end upon the first cylindrical casing; metallic strips providing integral portions projecting inwardly of the adjacent ends of said casings to form reinforcements for a concrete filler therein; and a plurality of tubular members communicating with and adapted to conduct water under pressure to said perforations and to said nozzle.

11. A caisson comprising metallic cylindrical casings having outwardly projecting, terminal flanges, one of the casings being provided with discharge passageways, said casings being disposed end to end with their terminal flanges in register; keepers traversing said flanges; conducting pipes adapted to be connected end to end within and adjacent to the ends of the casings for the passage of water under pressure to the discharge passageways; and a plurality of metallic strips having integral portions projecting inwardly of the ends of the connected casings for providing reinforcements for an adhesive mixture to be deposited therein.

12. A caisson comprising a first cylindrical casing having a terminal flange and formed with a bottom having an outwardly-projecting nozzle; a second cylindrical casing provided with a terminal flange, said casings being disposed end to end with their flanges in register; keepers traversing said flanges; annular plates disposed centrally of and provided with radially disposed arms connected with the casings; a tubular member formed in sections, said sections being disposed with their terminals connected at points adjacent to the ends of the casings, said tubular member being in communication with and adapted to conduct water under pressure to said nozzle.

13. A caisson comprising a first cylindrical casing having discharge passageways and

formed with a terminal flange; a second cylindrical casing formed with a terminal flange, said casings being disposed end to end with their flanges in register; keepers traversing said flanges; annular plates disposed centrally of and provided with radially disposed arms connected with the casings; a tubular member formed in sections, said sections being disposed with their terminals connected at points adjacent to the connected ends of the casings, said tubular member traversing the annular plates for a communication with one of said discharge passageways for conducting water thereto under pressure; a plurality of tubular members traversing the casings and in communication with the other discharge passageways for conducting water under pressure thereto; and a plurality of elongated strips supported by the arms of said annular plates, said strips having integral portions projecting inwardly of the adjacent ends of said casings for providing reinforcements for an adhesive filler to be deposited therein.

14. A caisson, comprising a plurality of metallic casings provided with transverse terminal flanges and adapted to be disposed end to end with their flanges connected; a plurality of metallic strips each adapted to lie in a part of each of the adjacent connected caissons to provide a reinforcement for an adhesive mixture to be deposited therein.

15. A caisson, comprising a plurality of cylindrical, metallic casings provided with transverse, terminal flanges and adapted to be disposed end to end with their flanges connected; a plurality of annular plates disposed transversely within and having radially disposed arms bearing upon the casings; metallic strips lying in a part of each casing adjacent to said terminal flanges to provide reinforcements for an adhesive element to be deposited therein.

In testimony whereof I have affixed my signature in presence of two witnesses.

EDWARD BIGNELL.

Witnesses:

HENRY MARTIN GREENSLIT,

W. G. S. COOK.