Nov. 13, 1923.

E. McL. LONG

SECTIONAL FLOATING DRY DOCK

Filed Jan. 17, 1919 3 Sheets-Sheet 2

Fig. 3.

Fig. 4.

Inventor
Eugene McLean Long

By his Attorney
Jas. H. Griffin
Nov. 13, 1923.

E. McL. LONG

SECTIONAL FLOATING DRY DOCK

Filed Jan. 17, 1919

3 Sheets-Sheet 3

Inventor
Eugene McLean Long

By his Attorney

Jas. W. Griffin
To all whom it may concern:

Be it known that I, EUGENE McLEAN Long, a citizen of the United States, residing in the city of New York, borough of Manhattan, county and State of New York, have invented a certain new and useful Sectional Floating Dry Dock, of which the following is a specification:

This invention pertains to the construction of sectional, floating dry docks, composed of concrete, or other similar material, wherein one or more of the pontoons, or one or more of the wings, may be temporarily removed for repair or other purposes, independently of the removal or retention of any other portion or portions of the structure.

The invention relates to the structure, as a whole, and, also, to various specific parts thereof. One of the salient features of the invention consists of a chambered pontoon of such construction that certain of the chambers can be filled and certain other chambers remain free of water so as to produce a non-sinkable type of pontoon composed of material heavier than the liquid in which it floats.

Among the other features of the invention, though not the exclusive ones, may be mentioned the following; a dry dock provided with pontoons and wings which are attachable and detachable from each other; a dry dock embodying a plurality of polygonal tubes, preferably octagonal; a pontoon for dry docks provided with controllable air and water inlets and outlets; a pontoon provided with cross bulkheads; a pontoon provided with a central, imperforate bulkhead, whereby water may be admitted to either end of the pontoon, independently of the other; novel means for unwatering pontoons, and a cantilever support cooperating with the pontoons, for holding the wings of a dry dock.

Features of the invention, other than those referred to, will appear from the hereinafter detailed description, taken in conjunction with the accompanying drawings.

The accompanying drawings illustrate the preferred, practical embodiment of the invention, but the construction shown therein is to be considered as typical, and not exclusive of the various forms in which the invention may be embodied.

Figure 1 is an exterior side elevation of the dry dock;
Figure 2 is a plan view;
Figure 3 is a section on line 3–3 of Figure 1;
Figure 4 is a section on line 4–4 of Figure 2;
Figure 5 is an exterior elevation of the juncture of the pontoons and wings;
Figure 6 is a section on line 6–6 of Figure 5;
Figure 7 is an enlarged plan of the cantilever support;
Figure 8 is a section on line 8–8 of Figure 7;
Figure 9 is a transverse section of one of the pontoons;
Figure 10 is a section on line 10–10 of Figure 11;
Figure 11 is a section on line 11–11 of Figure 10;
Figure 12 is a side elevation of a connecting pin for uniting the pontoons, cantilever supports and wings;
Figure 13 is an end view of the connecting pin.

Referring to the drawings, 1 is a pontoon composed of polygonal, closed chambers 2, across which extend bulkheads 3. A central, imperforate bulkhead 4 is also employed. Bulkheads 3 are provided with openings 5 and 6 for drainage purposes, the lower one 5 being positioned at the bottom of the chamber, whereby all the water may be drained therefrom. The walls separating the several chambers are provided with openings 7, whereby the side chambers may be drained into the central chamber. The heads of the chambers are provided with openings 8, having valves 9, operated, through a valve stem 10, by means of a motor 11, for the purpose of admitting and regulating the flow of water into the chambers. In practice, a plurality of valves would probably be employed as giving greater capacity as well as better regulation of the inflow of water into several chambers.

In the operation of the pontoon for the purpose of sinking it below the surface level, so that it may receive and dock a vessel, the valves 9 are opened by operating the mechanism just described, whereupon water begins to flow into the central chamber, rising therein until it finally reaches and flows...
through opening 7 into the side chambers, thereby filling said side chambers to the point at which the pressure of the confined air in the upper part of the chambers will equal the hydrostatic head of the water exterior to the chamber. If no means were provided for the escape of this entrained compressed air, no more water would enter the pontoon and it would not be possible to sink it below a certain definite depth. Air escape pipes 12 provided in the upper portion of said chambers lead through riser pipes 15 to the upper deck of the wings for the escape and regulation of the entrained air within said chambers. It is not deemed necessary to illustrate the valves or other operating mechanism by means of which the flow of this entrained air is regulated. These air pipes permit of the withdrawal of the entire or any other portion of the air within the chamber and serve as means for the regulation of the depth and speed of immersion of the pontoons and the connected portions of the structure.

The particular form of construction shown in the drawings is for an octagonal type of polygonal chamber, and while such type will be that probably most generally used, because of its special advantages, it is not intended to limit the construction to this particular type. In this form of construction, however, the form be octagonal, or of some other polygonal or circular section, angular floating chambers 14 will be provided between the interior chambers and the exterior walls of the pontoons, being the purpose of this form of construction, to provide a heavier than water structure the flotation of which is regulated through the provision, in cross section of the pontoons, of a portion into which the water of immersion cannot enter from the chambers except through specific appliances provided therefor. As it may be desirable, however, to utilize certain of these flotation areas in sinking the pontoon, air escape pipes 15 are provided, which connect with the riser pipes 13 for the escape of air from said chambers. Valves 9, in conjunction with the air pipes 12 and 15 and the water inlet pipes 16, enable the rise and fall of the pontoons and the depth of immersion thereof to be regulated and controlled to a nicety.

A pump 17 actuated by a shaft 18 connected to a motor 19 and supplied with water through a draft tube 20 and a foot valve 21 is used for unwatering the pontoon and portions of the connected structure. This draft tube with its foot valve extends nearly to the bottom of the pontoon, having its lower portion and its foot valve 21 immersed in a sump or pump well 21½ composed of the same material as that of the chamber. This pump draws only from the central chamber and is supplied by water from the side chambers through opening 7, in the partition walls between the chambers.

In order to preserve intact the walls of the flotation chambers 14, it is not possible to completely drain the side chambers into the central chamber directly through openings 7 or otherwise, and for the purpose of removing the water in the side chambers to a point practically at the bottom of the chambers, siphons 22 are provided for the purpose of conveying the water below the bottom of openings 7 in the side chambers into the central chamber. Priming pipes 23 reaching from the top of the siphon to and beyond the top of the wings are provided for priming and exhausting the siphons. It is clear that in a structure built of impervious concrete or similar material, practically air tight, that the operation of the pump would be hampered as the water is reduced in the pontoons by the fact that a vacuum more or less complete would be created in the upper portions of the pontoons as the same are unwatered. To provide such a condition, the air pipes 12 and riser pipes 15 are used for admitting air to the pontoon during unwatering so as to preserve normal atmospheric pressure therein at such time, as well as for removing entrained air during the period of immersion.

The priming pipes 23 are connected by by-pass pipes 24 to the discharge pipe 25 of the pump 17 in order that water may pass from the discharge pipe into the priming pipes 24 for the purpose of priming the siphons 22. The discharge pipe 25 rises to a point just below the top of the wings so that it may discharge water above the face of the pontoons into the deck at all stages of immersion. This discharge pipe 25 has a side outlet pipe 26 provided with a valve 27 operated by a stem 28 from a stand 29 or other operating mechanism. A valve 30 operated by a stem 31 through a stand 32 or otherwise, is placed upon the upper arm of the discharge pipe, the purpose of these pipes being as follows. For the purpose of expediting the sinking of the pontoons, valve 9 is opened, allowing water to enter the pontoons. When pump 17 is operated, it discharges through the open valve 27 into the wings, thereby adding to the amount of water which can be flooded into the dry deck at any particular period. Under certain conditions, it might be desirable to flood the wings without flooding the pontoons beyond a certain limit, and this may be accomplished by regulating the valve 9 so as to permit the pump 17 to raise such an amount of water and discharge it through side outlet 26 and valve 27 as would be sufficient to flood the chamber of the wings to the extent desired.

During the unwatering of the pontoon,
the valve 27 is closed and the valve 30 opened, allowing the water within the pontoon to be discharged overboard through the upper portion of the discharge pipe. For the purpose of unwatering the chamber of the wings, a drain pipe 33 extending through the bottom of the wings through the top of the pontoon, has a valve 34 operated by a stem 35 and a stand 36 or otherwise, by means of which valve and its operative mechanism, the chambers of the wings may be connected to or disconnected from the chambers of the pontoons. Wings 37 are superimposed open either end of the pontoons and disconnected therefrom, thereby permitting of the introduction or withdrawal of either pontoons or wings independently of each other, and also of any other pontoon or wing forming part of the dry dock. These wings are of the chambered variety, having a lower chamber 38 and an upper chamber 39. The lower chamber is braced by diagonal braces 40 which have openings 41 therein for the purpose of flooding or drainage alternately, as may be desired.

For the purpose of registering the wings and pontoons approximately, and without injury to the structural material of which the wings and pontoons are composed, buffer beams 42 attached to the wings abut upon other buffer beams 43 attached to the pontoons of a resilient material, such as wood. These buffer beams serve the further purpose of taking up shocks as between two partially disassociated structures. Locking bars 44 are employed to hold and adjust the pontoons relatively to each other, and other locking bars 45 are employed for the adjusting and holding of the wings relative to each other, the type of construction of both bars being similar. The said locking bars, either of timber beam shape or otherwise, are slidably insertible within yokes 46 which pass through enlarged holes 47 in buffer beams 48 and are fastened by means of nuts 49 to the structural material of the pontoons or of the wings; this method of uniting being for the purpose of introducing a resilient material between the locking bar 44 and the structure of the pontoon or wings as the case may be. Pins 49 passing through holes in the locking bar 44 and buffer beam 43, are used for the purpose of locating and holding the pontoons laterally with reference to each other. In the form of construction illustrated, the length of the wings is approximately the same as the width of the pontoons immediately beneath, and for the purpose of holding said wings in position in case of the removal of a pontoon without the removal of its attendant wings, cantilever supports 50, having a serrated lower abutting plate 51 which registers in the correspondingly depressed bearing plates 52 on the edges of the adjacent pontoons, are employed. Straps 53 are securely fastened to the cantilever support 50 by means of bolts 54 and plates 55 and extend outwardly from the cantilever supports. They are provided with openings 56 registering with sockets 57 in the pontoons and registering holes 58 in the bottom of the wings for the insertion of removal pins 59 for the temporary attachment of the wings and pontoons separately or together to the cantilever supporting plate. It is evident that with this construction, on the withdrawal of pins 59, the pontoons or wings may be removed and reinserted independently of each other.

Openings 60 either temporary in character or if permanent, closed by some tight fitting plug or stopper, are left above the upper flotation spaces 14 for the purpose of introducing ballast in the form of concrete, sand or other permanent or removable material to secure uniformity of immersion and to regulate the trim of the pontoons. Openings 61 are left at the bottom of the interior chamber walls of the wings for filling and draining the adjacent chambers and for inspection. Outriggers 60 having chambered polygonal spaces 61 and a central slot 62 are shown at either end of the dry dock.

The pumps 17 on either side of each of the pontoons 1 and wings 37, are for the purpose of unwatering either side of the pontoon, the solid bulkheads 4 preventing these pumps being operative on the reverse side of the solid bulkhead 4. Occasion may arise, however, in which, due to injury or other cause, one of these pumps may not be able to unwater its side of the pontoon, and a pipe 65 with valves 66 operated through a stem 67 by means of a stand 68 or otherwise, is introduced, passing through the bulkhead 4, but in such manner as not to interfere with the water tightness of the said bulkhead 4, and in the event of the inability of one pump to unwater its side of the pontoon, by opening the valve 66 water can flow from the side of the pontoon in which the pump is inoperative and be lifted by the pump on the other side of the pontoon.

It will be understood that changes may be made in the specific structure described, such as the substitution of equivalents, and that parts of the structure may be used separately, or in other environments, without departing from the spirit or substance of the invention, the scope of which is commensurate with the appended claims. Having thus described the invention, what I claim as new, and desire to secure by Letters Patent, is:

1. A pontoon for dry docks having a plurality of parallel buoyancy chambers of polygonal cross section, adjacent chambers of which are formed with a common wall,
and a plurality of distinct flotation chambers positioned between successive buoyancy chambers and at the top and bottom of the common walls, said flotation chambers being provided with air and water inlet and exhaust pipes, whereby the flotation chambers may be controlled independently of the buoyancy chambers.

2. A pontoon for dry docks having a plurality of parallel buoyancy chambers of polygonal cross section, adjacent chambers of which are formed with a common wall, and a plurality of distinct flotation chambers positioned between successive buoyancy chambers and at the top and bottom of the common walls, said flotation chambers being provided with air and water inlet and exhaust pipe, whereby the flotation chambers may be controlled independently of the buoyancy chambers, and the common walls between successive buoyancy chambers being provided with openings whereby said chambers communicate with one another.

3. A pontoon for dry docks composed of a plurality of parallel polygonal tubes having a common wall dividing adjacent tubes, with flotation chambers at the top and bottom of said common wall and between adjacent tubes, and siphons connecting adjacent parallel tubes.

4. A dry dock embodying pontoons, wings superimposed upon said pontoons, said wings and pontoons being normally sealed with respect to one another, discharge pipes leading from the interior of the pontoons and through which pipes the pontoons may be discharged, and a valved outlet included in each pipe and leading to the interior of the corresponding wing, whereby the wings may be flooded by water discharged from the pontoons.

5. A dry dock pontoon embodying a plurality of parallel polygonal tubes having a common wall between each two adjacent tubes, with flotation chambers at the top and bottom of said walls, means for drawing off water from one of the tubes, and siphonic tubes connecting the two adjacent tubes with the tube in which is located the means for drawing off the water.

6. A dry dock embodying a plurality of pontoons and wings superimposed thereon, in combination with a plurality of resilient buffers for positioning the wings on the pontoons and locking bars associated with the resilient buffers for securing adjacent pontoons together.

7. A sectional dry dock embodying chambered wings superimposed upon pontoons composed of parallel polygonal tubes having a common wall between adjacent tubes, and flotation chambers at the top and bottom of said common wall, locking means comprising resilient buffer beams spanning the opening between adjacent pontoons, and means for anchoring the buffer beams to adjacent pontoons to preclude the separation of said pontoons.

8. A sectional dry dock embodying a plurality of pontoons, wings positioned along each lateral margin of each pontoon, and means for securing the adjacent pontoons together, said means underlying the joints between the superimposed wings.

9. A sectional dry dock embodying a plurality of pontoons, wings positioned along each lateral margin of each pontoon, and means underlying the joints between the ends of adjacent wings for securing the subjacent pontoons together, whereby an intermediate wing section of the dry dock may be supported by said means in the event that its corresponding pontoon is removed.

In testimony whereof, I have signed my name to this specification.

EUGENE McLEAN LONG.