Aug. 3, 1943. F. R. HARRIS 2,325,607

FLOATING DRY DOCK

Filed Aug. 21, 1940

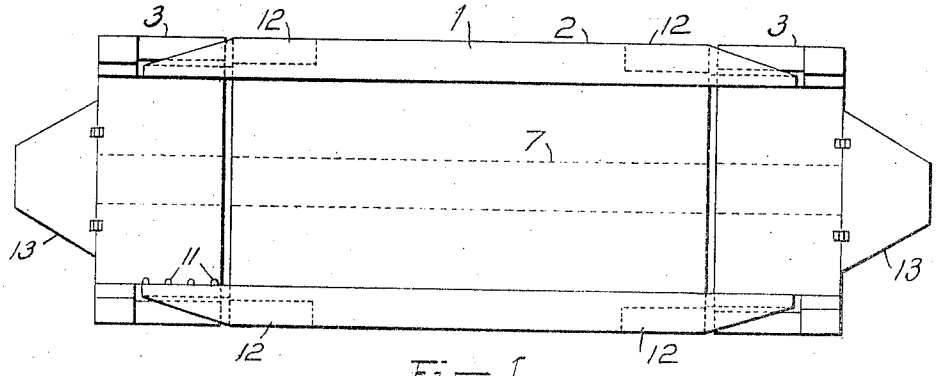


Fig. 1.

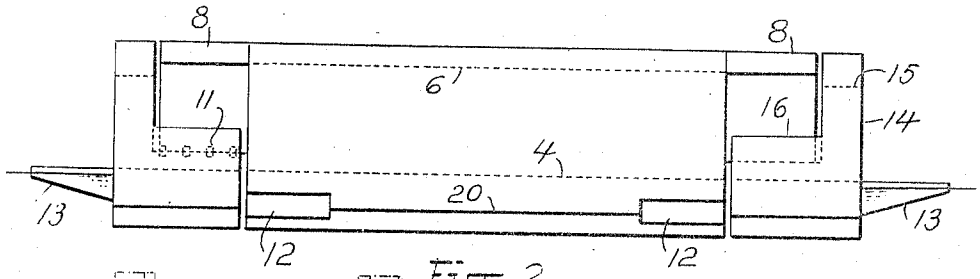


Fig. 2.

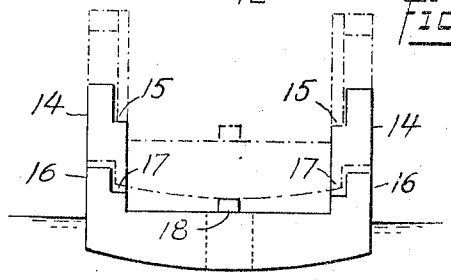


Fig. 3.

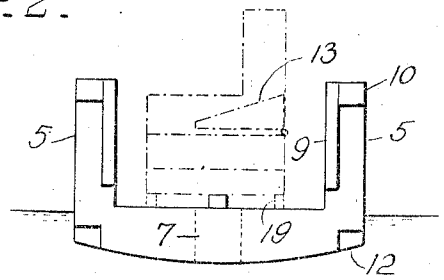


Fig. 4.

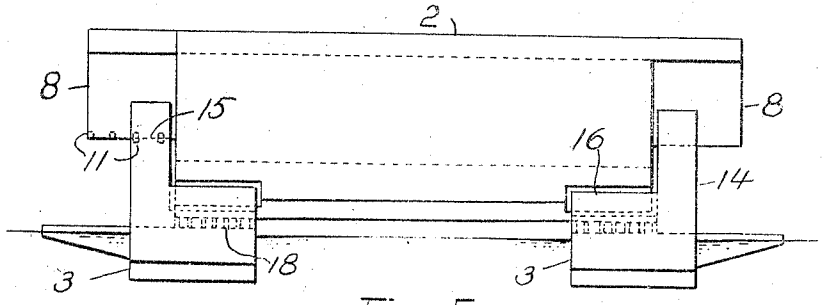


Fig. 5.

WITNESSES

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FLOATING DRY DOCK

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5 Claims. (Cl. 114—46)

My invention refers to a self-docking floating dry dock and provides means whereby examinations, cleaning and repair may be safely and expeditiously undertaken at the underside thereof.

It is generally recognized that a self-docking dry dock should provide a structure of great continuity in docking operations, i. e., have the smallest number of divisions possible; joints dry and accessible and at the greatest possible distance from points of greatest strain; simplicity of pump control; a constant dock width throughout; minimum liability to accident in self-docking; great stability at self-docking and at ship docking operations; and quickness of self-docking and re-assembly, so that frequent self-dockings may be inexpensively undertaken.

While the object of floating dry dock investigations, discussions and design for many years has centered on the securing of a suitable self-docking type, all solutions of this problem have entailed sacrifices of some of the advantages of the solid one-section trough dock.

In some types, bolt or pin plates are provided for locking together the different sections, but such locking limits the self-docking operation to absolutely calm weather as it requires great care to perfectly align the sections.

Other types use protruding pontoon shelves at the ends or sides of the sections so that any section may be dry docked on the shelves of any two of the remaining ones.

Still another three section dry dock type provides overhanging wing ends on the center section which locks the two end sections thereto, when the dock is assembled for ship use, while the end sections are provided with laterally protruding and relatively low wing walls, between which the center section may be slid when the two end section pontoons are slipped under the center section. This ingenious device, however, requires an auxiliary pumping plant for self-docking and obviously a considerable slip width to accommodate the laterally protruding side walls.

Now, however, I have discovered and therein resides an important part of my invention, that all the advantages of the aforesaid three-section type may be retained without employing unduly enlarged side walls.

I accomplish my purpose by recessing the four lower corners of the main pontoon body so that a relatively low portion of the wing walls of the end sections may be slid therein while the main part of the end pontoons are slipped under the center section; or by otherwise shaping the side walls of the center and end sections in such a manner that the end sections are most effectively engaged by the center section and steadied thereby; thus increasing the stability of the dock and enhancing its capacity to withstand all the stresses imposed under working conditions.

Also by retaining the full height of the dry dock wings for a short distance at the outrigger ends of the dock, I provide over-water support for a pumping plant of the end section, and the same pumping plant is used for ship docking as well as self-docking purposes.

It is also to be noted that hinged outriggers, preferably adapted to be swung out of the way back on the deck of the pontoon, are also an important part of my invention, as this arrangement enables me to use relatively short end sections, the length of which is increased in effect.

In the drawing—

Figure 1 shows my preferred arrangement of parts and shows three dry dock sections locked together by means of wing extensions on the long center section.

Figure 2 is a side elevation of my preferred arrangement.

Figure 3 is an end elevation of the end sections, and shows an outline of the center section when docked thereon.

Figure 4 is an end elevation of the center section and shows an outline of an end section placed therein.

Figure 5 is a side elevation of my preferred dry dock structure and shows the main center section docked on and between the end sections.

In the drawing where like reference characters designate corresponding parts, 1 denotes my preferred sectional dry dock which comprises a relatively long center section 2 and two end sections 3.

The center section comprises a pontoon part 4 and two side wing walls 5 which together form a solid trough dock section. At the upper part of the wing walls a safety deck 6 is provided which keeps the dock from being entirely submerged. The pontoon bodies of the sections are preferably provided with rounded bottoms and a center buoyancy chamber 7 which divides the sections laterally into two pumping compartments with relatively shallow taper ends. This chamber will be of proper size, length or width.

Each end of the side walls 5 is preferably provided with an overhanging projecting portion, which may be the extremities of a plate girder 8, having the web section 9 and the flange section

10, which preferably forms a continuation of the safety deck 6 and the wing wall proper. The webs 9 are in the planes of the inner faces of the walls 5.

I prefer to make the ends of the web sections of the plate girders at all times open or exposed to the sea in order not to complicate the pump control, and suitable connections 11, a few of which are shown in the drawing, are provided merely to lock together the different sections of the dock.

At each of the four lower corners of the center pontoon part 4 is a shallow recess 12 provided.

The end sections 3 are solid trough dock sections of the same general transverse contour and construction as the center section.

A hinged outrigger end 13 or work platform is preferably attached to each end section, and at the outrigger end of the sections the side walls form wing towers 14, sufficient in height, length and width to accommodate pump motors and valve operating stands, not shown in the drawing.

Each wing tower is preferably provided with a relatively high receiving place in the form of a shoulder or shelf 15, preferably provided with the lock attachments 11 for the locking in place of the center section at self-docking, all as illustrated in Figure 5 of the drawing. These attachments may be devices of any kind which can be readily engaged or disengaged to serve the desired purpose.

The remainders of the wing walls of the end sections are relatively low wing portions 16, and I prefer to provide each low wing portion with a low shelf or shoulder 17, adapted to receive and seat the extending wing girders 8 along the lower edges of their extremities when the sections are locked together for ship use as illustrated in Figure 1.

All sections are provided with regular keel blocks 18 and bilge blocks 19, some of which are shown in the drawing and on which ships as well as the different sections are docked.

The self-docking operation for the main center section is as follows:

The dry dock is pumped as light as possible so that the pontoon knuckle line 20 is well out of the water, whereupon the connections 11 are disengaged and the end pontoons 3 are sunk low enough for the top of their wing wall portions 16 to slide into the corner recesses 12, whereupon the two end sections 3 are slipped under the bottom of the center section and locked in place by means of the connections 11, with which the high shelves 15 are provided. This arrangement allows for a substantial portion of an end section to be slid under the center section with the entire wing wall length thereof still above water, and sufficient stability is attained without increasing the width of its wings.

The end sections are now pumped out and the center section is raised out of the water, supported by the keel blocks and balanced upon the shelves 15.

The self-docking operation completed, the bottom of the center section is open to inspection from boats or other suitable working floats.

When an end section is to be docked, it is first detached from the structure, its hinged outrigger 13 is swung back on the pontoon deck, and the main section is sunk down, and the end section turned crosswise is docked in the position indicated in Figure 4 of the drawing.

It is to be noted that in my preferred device the full width of the side walls is maintained throughout the entire dock for a height well above the top of the keel blocks and therefore maximum stability is at all times insured during the several docking operations, and only one transverse bulkhead is required for the end section, the pump control of which becomes the simplest hitherto devised, as all other types require two transverse bulk heads in each end section.

The presence at the ends of the section 2, adjacent to the junction of the sides and bottom, of the notches or recesses 12, adapted to receive the low or reduced portions 16 of the side walls of the sections 3 in the self-docking operation, permits the latter sections to have the same width as the center section and the movement of the dock into a slip is greatly facilitated. Thus a considerable saving in both weight and material is gained. Likewise the position of the webs 9 of the girders 8 in the planes of the inside faces of the side walls 5 and the provision of the high shoulders 15 and low shoulders 17 also on the inner faces of the side walls of the sections 3, in cooperation with the recesses 12, enable the sections 3 to be always used with the best effect. Obviously, when the end sections are under the center section (as shown in Fig. 5) the latter is most advantageously supported by the end sections, with the extremities of webs 9 resting on the high shoulders 15; and with the portions 16 of the walls 14 in the recesses 12, the weight and stresses are evenly distributed, the buoyant or lifting effect of the end sections is greatest and the stability of the entire structure at this time is assured. The tops of the recesses 12 can then either rest directly on the tops of the portions 16 and the shoulders 17 engage immediately with the bottom of the section 2, at the recesses 12, or blocks or wedges driven in between these surfaces to make secure engagement. The keel blocks 18 and other means may also be employed for this purpose. During self-docking the recesses 12 are above the water line. In the position of the sections for docking a ship as shown in Fig. 2 the webs 9 are received between the side wall portions of reduced height of the end sections and the lower edges of the webs 9 rest securely on the low shoulders 17 over some length; the end sections are thus steadied and the full added lifting effect of the end sections can efficiently be imparted to the center section 2. The sections 3 then lend support to both the main section and the vessel in the dock. The overhanging ends of the side walls 8 of the main section thus keep the end sections 3 steady. The weight of the ship and the other stresses are well distributed and maximum stability is obtained.

The function of the recesses 12 is very important when the middle section is to be raised to self-docking position as shown in Figure 5. The lower edges of the overhanging portions of the side walls of the center section are then received by and seated upon the upper shelves 15; and the reduced portions 16 of the side walls of the sections 3 receive the adjacent portions of the sides of the section 2 along the recesses 12, to all intents and purposes, in telescoping engagement. That is to say, the tops of the lower portions 16 of the side walls of the end sections 3 slide into the recesses 12, which are formed at the junction lines of the bottom and sides of the main section 2. The end sections can thus be held steady and enabled to exert their maximum lifting effect; and the need of making the

end sections wider than the center section is eliminated.

It is to be noted that the corner recesses of the pontoon body of the middle section only reduce the lifting capacity of the dock approximately one per cent, but this small loss is more than offset by the accompanying reduction of some five per cent of the longitudinal docking stress for a maximum ship.

It is also of interest to note that besides serving as a means for locking the sections together, the overhanging wing girders 8 act as guides close under and around which the tower portions having shelves 15 may be slid to insure proper clearance and alignment of the underwater portions of the dry dock sections during self-docking operations.

It is also of interest to note that in military docks where extreme rigidity is required throughout, the undeveloped shear resistance of the shown web sections of the plate girder extensions may be fully utilized in conjunction with clamp connections adapted to resist direct tension and compression, and when such clamp connections are used I prefer to place them at the pontoon deck level where they are readily accessible.

I do not want to be understood as limiting my claims to the apparatus shown as it is manifest that alterations may be made in my device to meet different conditions without departing from the scope and spirit of my invention.

I claim:

1. A floating dry dock comprising three sections including a relatively long center section with side walls, with a deck between the side walls, and with recessed corners in its pontoon portion, said recessed corners being at least partially above the no-load water line of the center section but substantially below the level of said deck, end sections of the same general transverse contour as the center section and short enough to be docked inside of the center section, disengageable means for rigidly securing the sections together when docking a vessel, and side walls on each of the end sections, said side walls being of full height at the outer end of the end sections and being of reduced height for a substantial distance from the inner end of each end section for sliding into the recessed corners of the center section with the full length of the side walls above water to stabilize the end sections when a substantial portion of the side walls thereof is slid into said recessed corners and under the center section, prior to the raising of the center section out of the water on and between the two end sections.

2. A floating dry dock including a relatively long center section having side walls, two end sections shorter than the center section, and disengageable fastening means for rigidly securing one of said end sections to each end of the center section when docking a vessel, each of said end sections having a portion that extends under a part of the end of the center section for docking the center section between the end sections, and each of said end sections having at its end remote from the fastening means an extension portion that is hinged to the remainder of the end section for angular movement about a transverse axis into a position that shortens the length of the end section to a dimension small enough to fit between the side walls of the center section so that the end sections when turned sideways can be docked in the center section.

3. A floating dry dock comprising a center section, an end section for each end thereof, the center section having side walls with overhanging end extremities, the end sections having side walls with portions of reduced height, said portions each having a shoulder along each inner face spaced below the top to receive and seat said overhanging extremities when the end sections are in line with the center section, the remaining portions of the side walls of the end sections each having a shoulder along each inner face spaced below the top and higher than the first named shoulder to receive and seat said overhanging extremities when the end sections are under the center section.

4. A floating dry dock comprising a center section, an end section for each end thereof, the center section having side walls with overhanging end extremities, the end sections also having side walls with portions of reduced height, said portions each having a low shoulder along each inner face below the top, the remainder of the side walls of the end sections each having a shoulder along each inner face below the top and higher than the first named shoulder, the end sections, when in line with the center section, receiving and seating said extremities on said low shoulders, and when in position beneath the center section receiving and seating said overhanging extremities on said high shoulders, while the low shoulders engage with the ends of the center section along the bottom and adjacent to the sides thereof.

5. A floating dry dock comprising a center section, an end section for each end thereof, the over-all width of all said sections being the same, the center section having side walls with overhanging end extremities of reduced thickness, flush with the inner faces of the side walls, the end sections also having side walls each of which has a high shoulder along each inner face below the top for said overhanging extremities when the end sections are under the center section, said side walls also having portions of reduced height for simultaneously receiving between them the adjacent portions of the sides of the center section, said reduced portions also having interfitting engagement along their inner faces and below their tops with said overhanging extremities when the end sections are in line with the center section.

FREDERIC R. HARRIS.