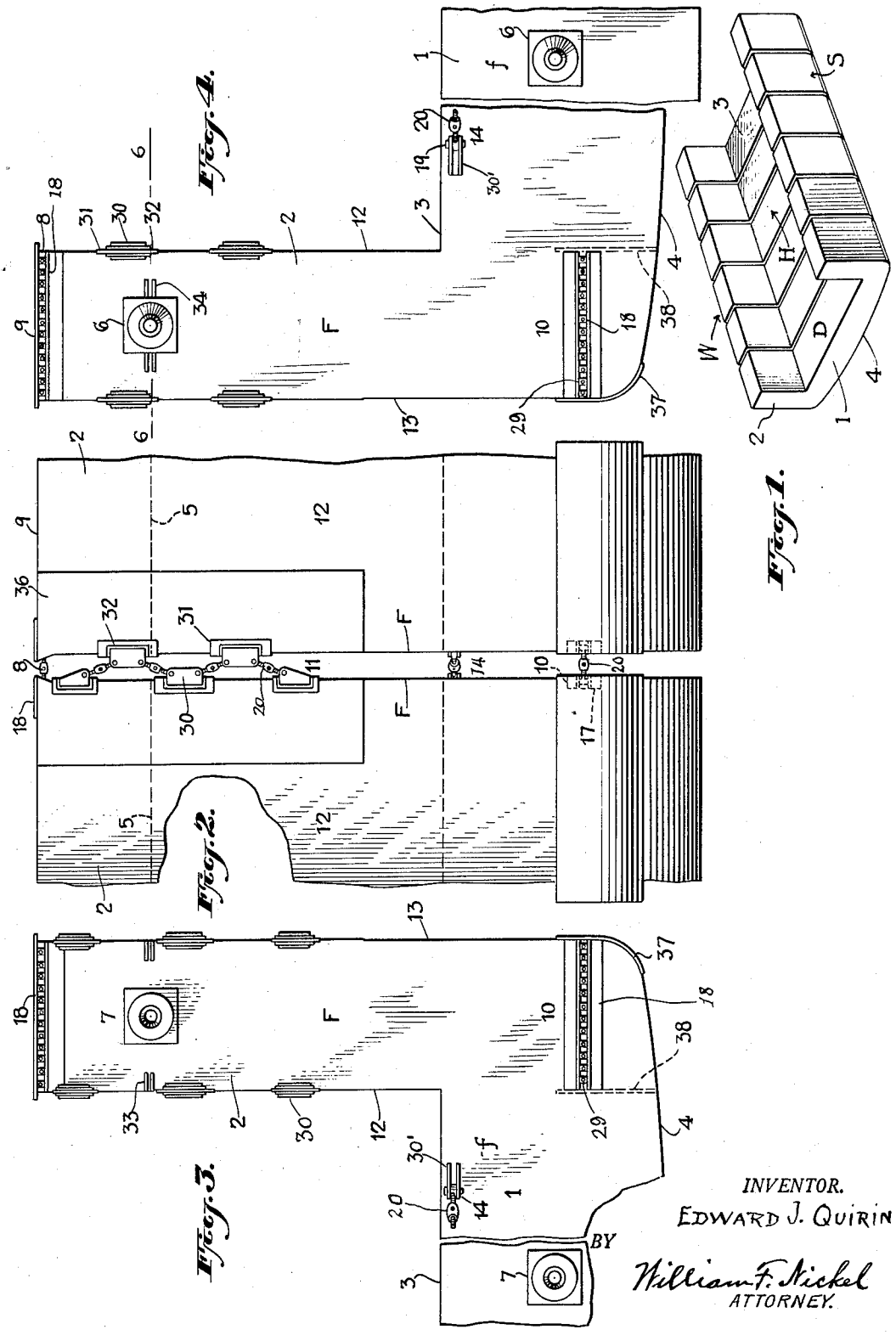
Jan. 31, 1956 E. J. QUIRIN 2,732,818

SECTIONAL FLOATING DRY DOCK AND COUPLING MEANS THEREFOR

Filed Sept. 8, 1953 3 Sheets-Sheet 1




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SECTIONAL FLOATING DRY DOCK AND COUPLING MEANS THEREFOR

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Fig. 8.

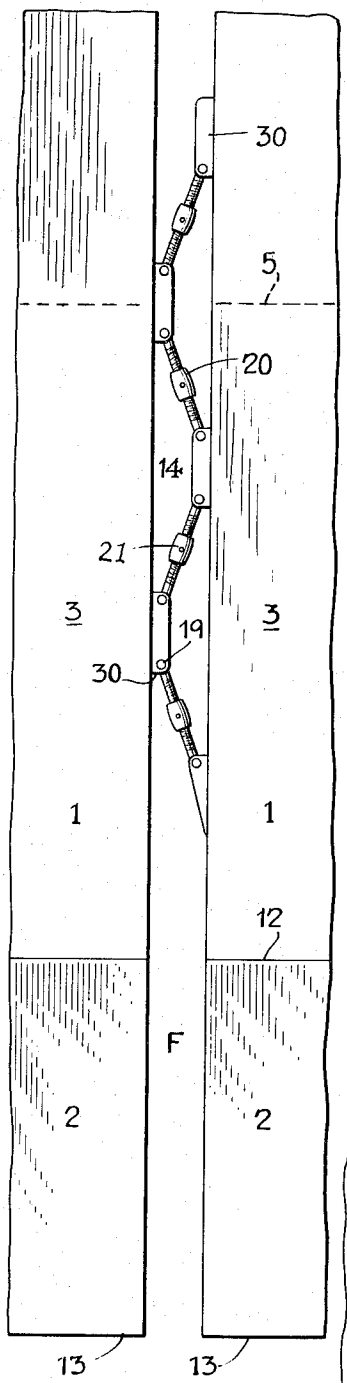



Fig. 5.

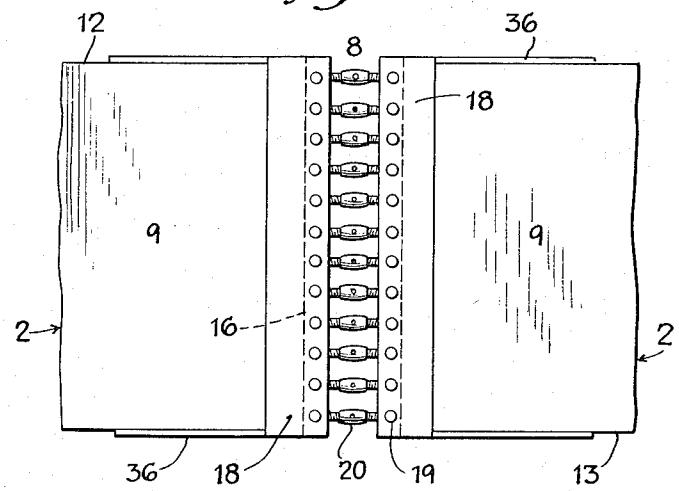



Fig. 6.

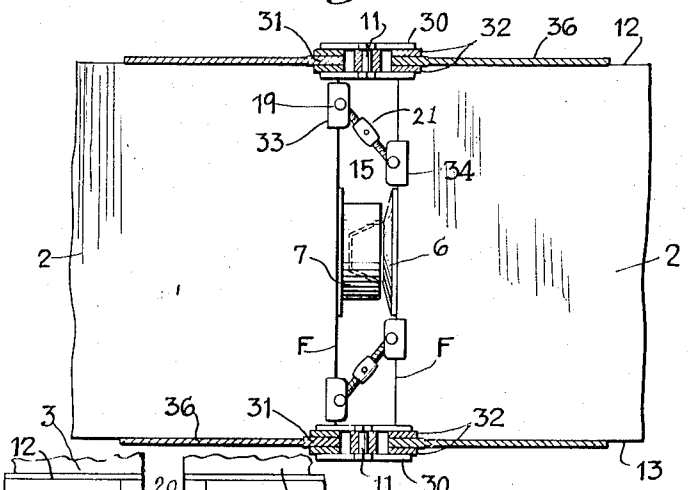
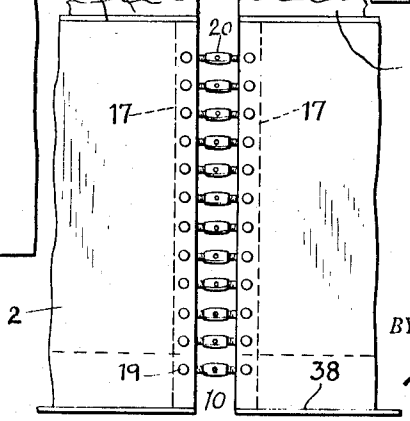



Fig. 7.




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Fig. 9.

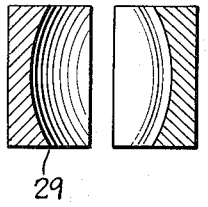



Fig. 10.

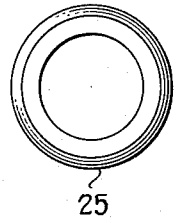



Fig. 11.

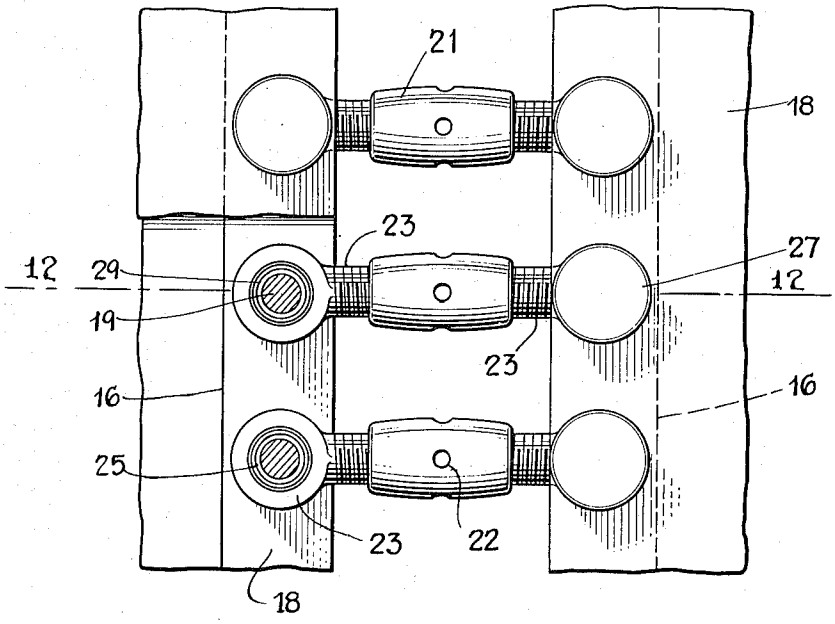
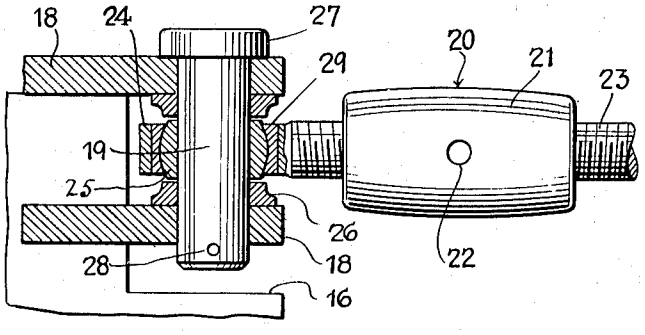



Fig. 12.




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# SECTIONAL FLOATING DRY DOCK AND COUPLING MEANS THEREFOR

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Application September 8, 1953, Serial No. 378,770

2 Claims. (Cl. 114—46)

This invention is an improved floating dry dock, particularly a floating dry dock made of transverse sections having pontoon hulls and side walls secured together end to end to produce a complete floating dry dock for receiving and raising large ships.

An important object of my invention is to provide connecting devices by which the component sections of a floating dry dock can be readily united to one another to form a finished dock rigid throughout and fully capable of practical use; and of being quickly and easily taken apart for removal to another location and there reassembled for continued service.

A further object is to provide a floating dry dock built of sections that carry coupling members extending across opposing end faces of the side walls thereof; along vertical lines adjacent the inboard and outboard faces of the side walls of the sections; and crosswise on the adjacent end faces of the sections near the pontoon deck of each; said members being adjustable so that the sections can be tightly joined together for effectively resisting all stresses and bending movements in both horizontal and vertical directions.

Another object is to provide a floating dry dock made of assembled sections with stout and durable coupling members that can be easily manipulated with ordinary tools to connect the sections or disconnect one or more when inspection or repair is needed, or for transshipment of the dock from one place to another.

Other objects of the invention and the advantages and an embodiment thereof are fully and clearly set forth herein and the characteristics are pointed out in the claims. The drawings illustrate a preferred construction of my improved dock, but variations may be adopted in many respects without deviation from the essential arrangement or material change in the combination of parts by which my invention is distinguished.

On the drawings:

Figure 1 is an isometric view of a dock comprising assembled sections.

Figure 2 is a side elevation showing a pair of sections completely coupled.

Figure 3 is an elevation of part of the end of the section at the right of Figure 1 showing coupling members in position thereon, seen from the left of Figure 2.

Figure 4 is a similar elevation of part of the end of the section at the left in Figure 2, showing coupling members affixed thereto, seen from the right of Figure 2.

Figure 5 is a top plan view showing the arrangement of coupling members at the upper ends of the walls of adjacent sections.

Figure 6 indicates in top plan parts of two connected sections showing coupling members, between the end faces of the side walls thereof and below the tops, at about the level of the line 6—6 in Figure 4.

Figure 7 shows in top plan the horizontal coupling members running from the walls towards the middle, and disposed below the main deck of the dock.

Figure 8 is a side elevation on an enlarged scale of



the arrangement of vertical coupling members between the end walls of adjacent sections.

Figures 9 and 10 are respectively a section and a top view of a universal joint for the ends of the coupling members.

Figure 11 is a top plan showing how the couplings are mounted and made fast between the sections of the dock; and

Figure 12 is an end view of the parts illustrated in Figure 11, partly in section on line 12—12 in Figure 4.

As illustrated in Figure 1, the dock has the usual configuration with pontoon hull bearing the main or pontoon deck and side or wing walls along the sides of the hull. The sections, each indicated by the letter S, when assembled lie in transverse positions; each having a hull 1 and side walls 2. The sections are placed end to end so that the hulls thereof form the pontoon hull H of the whole dock extending along the full length thereof, and the walls 2 of the several sections are all in alignment and form the wing walls W along the full length of the sides of the dock. See Figure 1.

Each section has a hull with a main deck 3 and a bottom 4, the decks 3 being all at the same level to form the main or pontoons deck D of the dock when the sections are joined together. In the walls 2 of each section the level of the safety decks near the tops supporting the machinery for the section is indicated at 5, and in the hull 1 and walls 2 of each section below the decks 5 are bulkheads (not shown) for dividing the interior into flooding and buoyancy compartments. Each section has its own pumps, conduits and valves for admitting and expelling water when the dock is to be sunk and raised. The equipment and arrangement of bulkheads are not part of the invention.

For getting and holding the sections in proper position for coupling, interfitting guide members are mounted at the same level on the opposing end faces of the sections. These members each include projecting round members 6 or "pintles" and "gudgeons" or members 7 with round sockets to receive the pintles. The gudgeons are mounted on the end face of one section and the pintles on the opposing end face of a section next to it. With these members in engagement the walls 2 are kept in alignment and the decks 3 are maintained at the same level while the coupling operation is performed. Preferably the guide members are located one on each of the opposing end faces of the walls 2, at the level of the safety decks 5, and one on each of the opposing end faces of the hulls 1 at the middle thereof.

In the operation of assembling the dock, the sections are placed end to end. They extend transversely of the dock when finished and are moved so that the pintles 6 enter the gudgeons 7. They are joined together by horizontal rows of coupling members 8 extending between opposing ends near the top or upper decks 9 of the walls 2 and by horizontal rows of coupling members 10 of the same type between opposing ends and near the sides, below the level of the main or pontoon deck 3. Also the sections are joined by inclined coupling members 11 extending up and down and being approximately in the planes of the inboard faces 12 and outboard faces 13 of the walls 2 below the safety decks 5 and between the decks 5 and tops or upper decks 9. The opposing ends of the sections are also joined by horizontally disposed coupling members 14 at the level of the main deck, and by horizontal coupling members 15 at the level of the safety decks 5. All these coupling members include anchor pins and turn buckles extending in the required direction from one section to another. The arrangement is clearly shown on Figures 1 to 8 inclusive.

The coupling members 14 (Figures 3 and 4) uniting the sections below the main decks and between the in-

board faces of the walls 2 are particularly useful in helping to keep the hulls of the sections in proper alinement and preventing movement of said hulls in a direction transversely to the completely assembled dock; thus reducing stresses and strains across the side walls from the inboard to the outboard faces thereof. In my copending application Serial No. 281,727 filed April 11, 1952, a very similar sectional dock construction is shown with the horizontal rows 8 and 10 of coupling members at the top and bottom of the walls and vertically arranged coupling members at the inboard and outboard faces of the walls; but the dock construction disclosed in said accompanying application has no coupling members on the faces of the hulls below the decks and between the inboard faces of the walls 2.

Within the sections, the framing carrying the outer plating of the walls 2 is so formed at the tops that the opposing faces F at the ends of the walls 2 present shoulders 16 adjacent the edges of the upper decks 9. These shoulders run horizontally along the end faces F of both walls on all the sections except the sections at the extremities of the assembled dock; which are shown at the right and left on Figure 1; and the last-named sections have such shoulders along only the end faces that oppose the end faces of the sections next to them. The guide members also may be omitted at the extreme ends of the complete dock. The upper row of coupling members 8 is attached to the opposing end faces of each pair of adjacent sections along these shoulders.

Below the level of the deck 3 the end faces F of the sections have elongated horizontal recesses 17, one such recess being at each side of a section near the bottom 4; and the ends of the coupling members 10 in the lower rows are held in each pair of such opposing recesses 17. The separate coupling members 8 and 10 comprise turn buckles, each having a central sleeve for tightening. Thick horizontal holding or anchor and reinforcing plates 18 are affixed to the framing inside the sections and project out through the vertical portions of the opposing end faces F above the shoulders 16 and from the bottoms of the recesses 17, between the upper and lower edges thereof; and are perforated near their outer edges. These plates are in pairs, one above the other, and form bearing members for coupling pins 19 to attach the turn buckles 20 that connect the sections. The upper reinforcing plates 18 adjacent the shoulders 16 are preferably laid on the top decks 9 of the walls 2.

Each turnbuckle has a central sleeve 21, threaded inside, and a transverse hole therethrough 22 to be engaged by a tool. This sleeve receives the threaded shanks of bolts 23 having loops or apertures 24 at their outer ends. These apertures each receive a spherical head 25, that has a bore through it for the passage of the retaining pin 19. Shims 26 carried by the pins 19 adjacent the plates 18 prevent vertical motion of the turnbuckles. These pins have heads 27 at their upper ends and apertures 28 in their lower ends for cotters or other devices to prevent displacement. See Figures 11 and 12. The sleeves 21 can be turned to make the couplings taut. The turnbuckles coupling the sections between the shoulders 16 and between the recesses 17, because of the heads 25, which constitute ball joints at the pins or journals 19, can be easily attached and when the sleeves are tightened they adjust themselves as the sections are pulled close to one another.

To assemble the bolts 19 and heads 25, each head is seated in a ring 29, made in two semicircular halves that fit around the head 25. The inner faces of the halves are concave spherical surfaces to fit the head, and the outer faces are cylindrical and fit into the loops 24 snugly. Hence the two halves of the ring 29 are simply fitted on the head and then an assembled head and ring are inserted into the loops 24 at each end of each turnbuckle. When the pins 19 are now passed through plates 18 and the heads 25, the ends of each turnbuckle with its heads 25 and rings 29 are held securely.



Above and below the level of the safety decks 5, the coupling members 11 extend up and down at a slight incline between opposing ends of the assembled sections. To enable the sections to be united further by the coupling members 11, the sections of the dock have pairs of parallel plates 30 with each pair affixed to opposite sides of a stout lug or plate support 31. Reinforcing plates 32 may be affixed to the lugs 31 under the plates 30. These plates and lugs on the side walls are vertical and mounted on all the opposing ends of adjacent sections, some at the inboard faces 12 of the walls 2 and some at the outward faces 13 thereof. For example, six pairs of such plates 30 are affixed in vertical groups of three each to one sections, and four pairs in vertical groups of two each are fixed to the opposing end of the other section. On the one section, the middle pairs are just below the level of the deck 5, and on the other section, the upper two pairs are above and the other two below said deck 5. The upper, middle and lower plates on the one section are respectively in horizontal alinement, and so are the upper and lower plates on the other section. But the plates 30 on the ends of said sections are not at the same level, instead said pairs of plates in the groups of two each on said other section, are in line with the spaces between the pairs of plates on the first section, and thus a staggered arrangement of said plates is presented. The spaces between the plates 30 on said sections are just large enough to be bridged by the coupling members 11. The two lower pairs of plates 30 at each side on the opposing ends of adjacent sections are all joined by coupling members 11 inclined in one direction and all the upper pairs of plates 30 are joined by coupling members 11 inclined in the opposite direction; while the middle pairs of plates 30 on the one section are connected to both the upper and lower pairs of plates 30 on the other section by coupling members 11. Eight coupling members, four at the inboard faces 12 and four at the outboard faces 13, in the form of turn-buckles as above described are thus employed; and each group of four runs in a zigzag vertical line between the two sections connected by them. Each pair of plates 30 has apertures to receive the bolts or pins 19 and anchor the members to the adjacent sections of the dock. The lugs 31 are affixed to reinforcing plates 36 secured to the inboard and outboard faces of the walls 2.

Horizontal coupling members 14 are utilized to connect opposing faces of the sections between the walls 2 on each section, just below the level of the main decks 3. These members 14 are located on both sides of the longitudinal center line of the dock in a group of four each, but the number may of course be varied. The members of each group make a transverse zigzag line, beginning near the walls 2 and extending towards the middle of the dock. These members are anchored to adjacent sections by means of horizontal plates 30', like the plates 30, in pairs, one above the other in each pair, affixed to the framework of the section. These plates 30' are so located that the plates on one section are horizontally offset from the plates on the other section, just as the plates 30 are offset vertically on the end faces of the walls 2, so as to give the line of members 14 its zigzag shape. These horizontal plates 30 also have apertures therein to receive the attaching or coupling pins 19.

Also at the level of the safety decks 5, some of the ends of the walls 2 of the sections carry pairs of additional horizontal upper and lower plates 33 having the same construction and mode of attachment as the plates 30. One pair is mounted near the inboard side and the other pair near the outboard side of the walls 2. In addition, upper and lower plates 34 in pairs are affixed to the faces of opposing ends of the walls 2 of adjacent sections, but more nearly at the middle of the ends of these walls. The guiding members 6 and 7 on the ends of the

walls 2 are also at the level of the decks 5, and the plates 33 and 34 flank these guiding members. The adjacent corners of all these horizontal plates 33 and 34 are perforated so that turnbuckles 20 can be mounted to join each pair of horizontal plates 33 to the central horizontal plates 34. These plates 33 and 34 and turnbuckles make up the coupling members 15, a pair of which is between each two opposing end faces of the walls 2; and the coupling members 15 of each pair extend diagonally in opposite horizontal directions, the better to hold the upper parts of the walls 2 in position and resist lateral displacement.

Reinforcing plates 37 are secured to the outside of the hull along the chine for the row of coupling members 10, and additional reinforcing plates 38 are put inside the hull extending from the bottom up to the inner ends of each row of said horizontal coupling members.

The turnbuckles in the rows 8 and 10 resist the bending movement of the dock, and the turnbuckles of the members 11 resist the vertical sheer stresses. The rows 14 and 15 prevent sidewise movement of the sections of the dock, and all sections are thus connected with the utmost strength and rigidity.

To align the sections and enable the turnbuckles to be mounted and secured by the pins 19, the pintles 6 and gudgeons 7 are utilized. These are located on the sections at the middle of the end faces *f* of the hulls, which are continuous with the end faces F of the walls 2, and on the end faces F of the walls 2 at the level of the decks 5. The sections at the extremities of the dock have such members only on the end faces opposing the next adjacent sections, while the other sections have these members on both end faces. One end face, may carry only the pintles, and the opposing face of the next section may carry the gudgeons, or the sections may carry both kinds. In any event, each pintle 6 must be in line with the proper complementary gudgeon or socket 7. When the sections are first assembled, the pintles will enter the gudgeons and the sections will all be held in horizontal alignment and at the same level while the tunbuckles are attached.

In Figures 2, 3, 4 and 6, the positions of all the coupling members and the interengaging guide members are indicated. These figures show the arrangement of the coupling and guide members and present the faces or sides of the dock without any reference to the interior



framework, which is not part of this invention. The pintles and gudgeons can be secured to the framework at the opposing ends of adjacent sections in any feasible way.

Figures 5 and 7 show only the arrangement of the upper and lower coupling members 8 and 10 respectively; the coupling members 11, pintles 6 and gudgeons 7 being omitted for the sake of clearness.

Having described my invention, what I believe to be new is:

1. A floating dry dock having pontoon hull, main deck and wing walls, comprising assembled sections extending transversely of the complete dock, each section having a hull, main deck and walls forming parts of the hull, main deck and wing walls of the dock, respectively, and coupling members on the opposing faces of said sections for uniting said sections, some of said members in horizontal rows between the walls of the sections near the tops, some in horizontal rows between the sections near the bottoms, some in vertical rows between said last-named walls, and some in horizontal rows between the hulls of the sections near the decks thereof, said sections also having reinforcing members adjacent the vertical rows of coupling members and additional reinforcing members adjacent the horizontal rows of coupling members near the tops, and further reinforcing members adjacent the horizontal rows of coupling members near the bottoms.

2. The floating dry dock according to claim 1, wherein the first-named reinforcing members comprise plates affixed adjacent the inboard and outboard faces of said walls, and the remaining reinforcing members comprise pairs of plates, one adjacent the inner end of each row of coupling members near the bottom and the other adjacent the opposite end, of said row on the outside of said section along the chine thereof.

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