

PATENT SPECIFICATION

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(54) METHOD FOR BUILDING SHIPS

(71) We, MITSUI SHIPBUILDING AND ENGINEERING CO. LTD., a corporation organised under Japanese Law, of 6-4, 5-chome, Tsukiji, Chuoku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention has reference to the building of ships by the system which consists in fabricating ship sections, transferring each fabricated section to a dock in which the ship is being built and joining each section when so transferred to other sections in the dock, further ship sections being fabricated, transferred to the dock and joined to other sections until a floatable ship is constructed. Such system is the so-called block system and will be hereinafter referred to as such and the fabricated sections will hereinafter be referred to as blocks.

It has heretofore been proposed to build ships by this system in a dry dock having rails extending longitudinally of the dock and having vehicles which run on the rails, each fabricated block being mounted on a vehicle and transferred thereby to a site on which the ship is being constructed, each block being secured to other blocks on the site to form a floatable structure or ship which can be removed from the dock when the latter is floated and the structure or ship water borne.

The present invention consists in the method of building ships by the block system as herein defined comprising the steps of fabricating each block in a rotatable frame rotating the frame to bring the block fabricated therein into a position for transfer, transferring the block on runners to the dock in which the ship is being constructed, supporting and rotating the block over the dock, depositing it on conveying means on the dock bottom, transferring the block to be joined to other blocks assembled in the dock and thereafter fabricating further blocks, transferring them to the dock and then to the ship being built in like manner until a floatable ship is constructed.

The invention will be understood from the following description and the accompanying drawings in which:—

Figure 1 is a perspective view illustrating an embodiment of the present invention;

Figure 2 is a schematic front view showing a condition in which the ship building is being practised in a dock, according to the present invention;

Figure 3 is a perspective view showing means for transfer or conveyance in the dock;

Figure 4 is a perspective view showing the transferring means in operation;

Figure 5 is a side view showing another embodiment of the block rotating means; and

Figures 6 to 8 are front views showing a manner of rotation or turn effected by said block rotating means.

Referring now to Figure 1, 1 is a block making frame and rotating means thereof, which comprises a pair of rotary wheels 2 and 2a connected to each other by means of connecting members 3. Each of said wheels 2 and 2a is constructed by four arcuate members and is rotatably supported by suitable supporting means not shown. One of the arcuated members of each rotary wheel is removable from the wheels. Each rotary wheel is hollowed to provide a square or rectangular frame for a block assemblage. The principal parts constituting a block 4 are prepared separately and joined together into a block within the rotating means. If necessary, the top arcuate member of the rotary wheel is removed to allow insertion therethrough of the component elements of the block. For convenience of its assembling, the block 4 illustrated in Figure 1 is assembled in the attitude shown in the figure. However, since this attitude is inconvenient for transfer, the rotary wheels 2 and 2a are turned to let the block take an attitude as indicated by 4a.

Although the block 4a is shown side by side with the original one 4 for the convenience of illustration, it will be understood that the rotary wheel and the block 4a shown on one side are identical with the original ones.

Then, the block 4 is taken out from the rotating means 1 on to a transforming means comprising a plurality of rollers 5 and transferred by rotation of the rollers to slide plates 6 provided at an end of a dock 11. The block thus placed on said side plates is securely held at the opposite sides by holding bars 8 of a rotating means 7. The holding bars 8 are provided two on each side of the block and are engaged with rotary shaft 10 so as to be slidable only in the axial direction. Thus, it will be appreciated that the block, securely held by said holding bars, is moved along the slide plates toward the dock 11 until it reaches an inner position of the dock, whereafter the rotary shaft 10 is turned in the direction of the arrow to allow the block to descend into the dock while rotating.

At the bottom of the dock are laid a suitable number of longitudinally extending parallel lines of transfer platforms 12 on each of which are rotatably embedded a plurality of small balls as shown in Figure 3, and on each of said platforms are placed a plurality of travelling pallets 13. As will also be seen, a buffer plate 14 is placed on each travelling pallet. The buffer plate is arranged so as to be movable either vertically or laterally by a hydraulic means and a block is placed on the buffer plates. Then the block is carried by the travelling pallet 13 in the dock to a location where it is assembled into a ship, as shown in Figures 2 and 4. At this location, the buffer plates 14 are moved vertically and/or laterally so as to correctly position the block for joining to the other blocks. The same process is repeated continuously for assembling and transferring the succeeding blocks, thereby gradually building up a ship.

In Figures 5 to 8 there is shown a modified rotating means. A suitable number of struts 15 are provided in the dock 11, and on the struts 15 are supported rotary platforms 16 arranged rotatable in the longitudinal direction of the dock by means of shafts 17. Connecting between the rotary platform 16 and each strut 15 are the links 18, 19 which are coupled to each other, and connecting between said both links are a hydraulic cylinder 20 and its piston rod 21, with their ends being connected to the suitable parts of the respective links. It will also be noted that a plurality of rollers 22 are arranged in juxtaposition on each rotary platform 16.

As shown in Figure 5, the block 4 is transferred on to the rollers 22 on the rotary platforms 16, and then the platforms 16 are revolved by actuation of the hydraulic cylinder 20 as shown in Figure 7. It is to be noted that a piston 23 is projected from the block bottom by a hydraulic mechanism to support and prevent the block from falling

down. The piston 23 is then gradually moved down synchronized with rotation of the rotary platforms until finally the block is rested on the dock bottom as shown in Figure 8.

While the mechanisms shown and described herein are of the preferred embodiments, various other modifications in the structure will easily suggest themselves to those skilled in the art.

As obvious from the foregoing, the present invention eliminates any need of hoisting up the blocks, thus making it possible to dispense with a large-sized crane as necessitated in the conventional practice and to rapidly and easily build up a ship.

WHAT WE CLAIM IS:—

1. The method of building ships by the block system as herein defined comprising the steps of fabricating each block in a rotatable frame, rotating the frame to bring the block fabricated therein into a position for transfer, transferring the block on runners to the dock in which the ship is being constructed, supporting and rotating the block over the dock, depositing it on conveying means on the dock bottom, transferring the block to be joined to other blocks assembled in the dock and thereafter fabricating further blocks, transferring them to the dock and then to the ship being built in like manner until a floatable ship is constructed.

2. The method in ship building by the block system as claimed in claim 1 which consists in clamping the block being transferred to the dock between side bars, rotating the side bars with the block over the dock and then depositing the block on the conveying means.

3. The method of ship building as claimed in claim 2 which consists in transferring the block transferred to the dock to a platform rotatable about a horizontal axis, rotating the platform with block thereon so that the block is deposited on the conveying means in the form of runners or the like on the dock bottom and then transferring the block to be joined to others assembled in the dock.

4. Means for use in ship building as claimed in claim 1 comprising a rotatable frame in which each block is prefabricated and by which the fabricated block can be turned to a suitable attitude for transference to the dock, runners on which the block is conveyed to the dock, clamping means by which the block is gripped, means by which the clamped block is rotated and simultaneously lowered to be deposited on conveying means on the dock bottom, the conveying means being such that the block can be transferred to join with others already assembled in the dock.

5. Means for use in ship building by

Then, the block 4 is taken out from the rotating means 1 on to a transforming means comprising a plurality of rollers 5 and transferred by rotation of the rollers to slide plates 6 provided at an end of a dock 11. The block thus placed on said side plates is securely held at the opposite sides by holding bars 8 of a rotating means 7. The holding bars 8 are provided two on each side of the block and are engaged with rotary shaft 10 so as to be slidable only in the axial direction. Thus, it will be appreciated that the block, securely held by said holding bars, is moved along the slide plates toward the dock 11 until it reaches an inner position of the dock, whereafter the rotary shaft 10 is turned in the direction of the arrow to allow the block to descend into the dock while rotating.

At the bottom of the dock are laid a suitable number of longitudinally extending parallel lines of transfer platforms 12 on each of which are rotatably embedded a plurality of small balls as shown in Figure 3, and on each of said platforms are placed a plurality of travelling pallets 13. As will also be seen, a buffer plate 14 is placed on each travelling pallet. The buffer plate is arranged so as to be movable either vertically or laterally by a hydraulic means and a block is placed on the buffer plates. Then the block is carried by the travelling pallet 13 in the dock to a location where it is assembled into a ship, as shown in Figures 2 and 4. At this location, the buffer plates 14 are moved vertically and/or laterally so as to correctly position the block for joining to the other blocks. The same process is repeated continuously for assembling and transferring the succeeding blocks, thereby gradually building up a ship.

In Figures 5 to 8 there is shown a modified rotating means. A suitable number of struts 15 are provided in the dock 11, and on the struts 15 are supported rotary platforms 16 arranged rotatable in the longitudinal direction of the dock by means of shafts 17. Connecting between the rotary platform 16 and each strut 15 are the links 18, 19 which are coupled to each other, and connecting between said both links are a hydraulic cylinder 20 and its piston rod 21, with their ends being connected to the suitable parts of the respective links. It will also be noted that a plurality of rollers 22 are arranged in juxtaposition on each rotary platform 16.

As shown in Figure 5, the block 4 is transferred on to the rollers 22 on the rotary platforms 16, and then the platforms 16 are revolved by actuation of the hydraulic cylinder 20 as shown in Figure 7. It is to be noted that a piston 23 is projected from the block bottom by a hydraulic mechanism to support and prevent the block from falling

down. The piston 23 is then gradually moved down synchronized with rotation of the rotary platforms until finally the block is rested on the dock bottom as shown in Figure 8.

While the mechanisms shown and described herein are of the preferred embodiments, various other modifications in the structure will easily suggest themselves to those skilled in the art.

As obvious from the foregoing, the present invention eliminates any need of hoisting up the blocks, thus making it possible to dispense with a large-sized crane as necessitated in the conventional practice and to rapidly and easily build up a ship.

WHAT WE CLAIM IS:—

1. The method of building ships by the block system as herein defined comprising the steps of fabricating each block in a rotatable frame, rotating the frame to bring the block fabricated therein into a position for transfer, transferring the block on runners to the dock in which the ship is being constructed, supporting and rotating the block over the dock, depositing it on conveying means on the dock bottom, transferring the block to be joined to other blocks assembled in the dock and thereafter fabricating further blocks, transferring them to the dock and then to the ship being built in like manner until a floatable ship is constructed.

2. The method in ship building by the block system as claimed in claim 1 which consists in clamping the block being transferred to the dock between side bars, rotating the side bars with the block over the dock and then depositing the block on the conveying means.

3. The method of ship building as claimed in claim 2 which consists in transferring the block transferred to the dock to a platform rotatable about a horizontal axis, rotating the platform with block thereon so that the block is deposited on the conveying means in the form of runners or the like on the dock bottom and then transferring the block to be joined to others assembled in the dock.

4. Means for use in ship building as claimed in claim 1 comprising a rotatable frame in which each block is prefabricated and by which the fabricated block can be turned to a suitable attitude for transference to the dock, runners on which the block is conveyed to the dock, clamping means by which the block is gripped, means by which the clamped block is rotated and simultaneously lowered to be deposited on conveying means on the dock bottom, the conveying means being such that the block can be transferred to join with others already assembled in the dock.

5. Means for use in ship building by



the block system as claimed in claim 3 comprising a rotatable frame in which each block is fabricated, runners by which the fabricated block is conveyed to the dock, a platform on which the block is deposited, means by which the platform with block thereon is rotated about a horizontal axis, means by which the block is retained on the platform when the platform is being rotated about a horizontal axis and conveying means in the dock by which the block is conveyed to be joined to other assembled blocks in the dock.

6. Means for use in ship building as claimed in claim 4 or 5 wherein the conveying means in the dock comprises a transfer platform, pallets slidable on the platform and buffer plates on the pallets to receive the block, the buffer plates being adjustable to bring the block thereon into register with the block to which it is to be secured.

7. The method of ship building by the block system wherein each block is fabricated and conveyed to the dock to be joined

to an assembly of blocks in the dock substantially as described with reference to Figures 1 to 4 of the accompanying drawings.

8. The method of ship building by the block system wherein each block is fabricated and conveyed to the dock to be joined to an assembly of blocks in the dock substantially as described with reference to Figures 5 to 8 of the accompanying drawings.

9. Means for use in the construction of ships by the method claimed in any of the claims 1, 2 and 3 substantially as herein described with reference to Figures 1 to 4 of the accompanying drawings.

10. Means for use in the construction of ships by the method claimed in any of the claims 1, 2 and 3 substantially as herein described with reference to Figures 5 to 8 of the accompanying drawings.

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