A. A. GUERINI.

CONSTRUCTION OF CONCRETE SHIPS.

APPLICATION FILED MAY 28, 1918.

1,356,064. Patented Oct. 19, 1920.

Fig. 1.

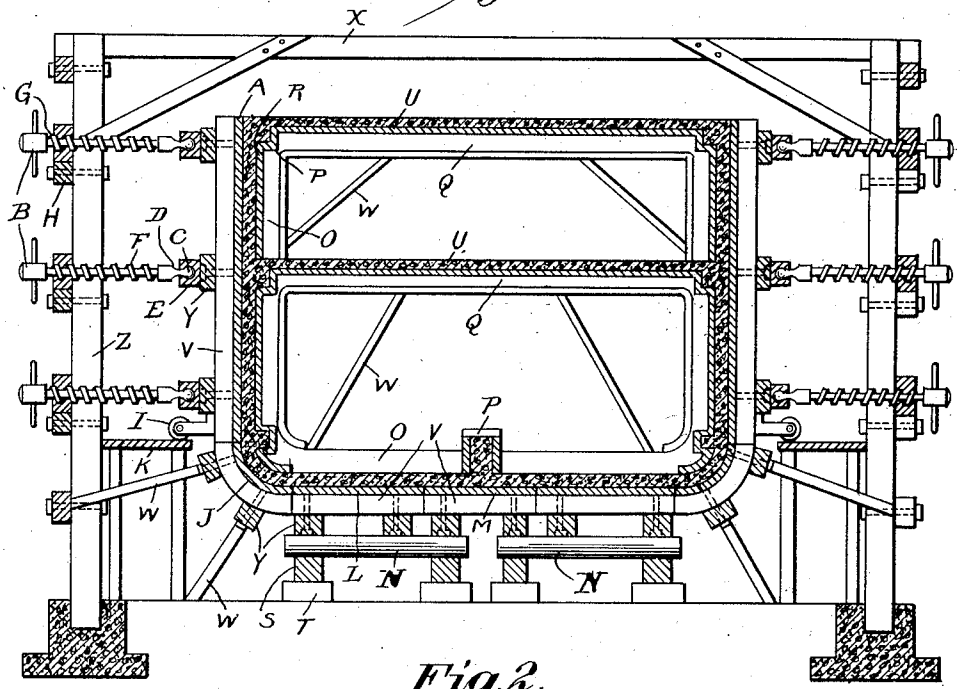
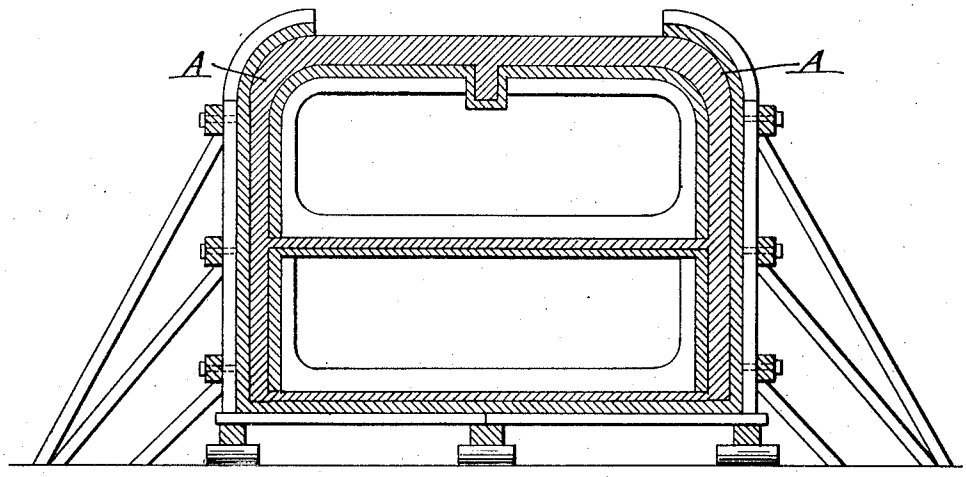


Fig. 2.



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CONSTRUCTION OF CONCRETE SHIPS.

1,356,064. Specification of Letters Patent. Patented Oct. 19, 1920.

Application filed May 28, 1918. Serial No. 237,076.

To all whom it may concern:

Be it known that I, ANNIBALE A. GUERINI, a citizen of the United States, residing at Middleboro, county of Plymouth, and State of Massachusetts, have invented and discovered certain new and useful Improvements in Construction of Concrete Ships, of which the following is a specification.

The object of the present application is an improvement for the construction of ships on which the material employed is reinforced cement—or reinforced concrete, composed of the aggregate, as sand and stone, or are made with reinforced cement and asbestos fibers.

My improvement relates to how to avoid the dangerous consequences caused by the shrinkage of the cement in its setting.

For this purpose, I build first, an outside mold for the bottom and walls of the ship. This mold can be sectional or monolithic, and an inside mold for the walls—ribs—beams—decks and partitions required.

Drawings.

Figure 1, transverse section of the molds with the supporting frame work and with the concrete poured in.

Fig. 2, transverse section of the molds as they are prepared at the present with the concrete poured in, showing the setting cracks.

The same letters and numbers in the drawing refer to the same letters and numbers in the specifications.

AA is the outside mold of the walls of the ships which are kept in position by the braces B, each brace at one end terminating in spherical head C., with a collar D. at its base, working in the box E., bolted to the frame of the mold.

The other end of the brace terminating with a screw F., working on the female member G., bolted to the horizontal beams H. of the frame.

I are the wheels or casters, running on the platform K. These wheels are to facilitate the traveling of the mold.

J are the molds for the curved portions of the ship.

L and M are the bottom parts of the mold. I have divided these parts into three molds, in order to be easy to remove. These parts are set on top of rollers N, and the rollers are set on top of the skids S, which are supported by the blocks T.

As soon as the outside mold is in position and rigidly braced in all parts, the reinforcements for the plate are laid over the mold, and the distance from the mold is specified by the constructing engineer (the plate is the bottom and the outside walls of the ship).

The next operation will be to set the molds for the transverse and longitudinal ribs O and P—the tie beams Q—the deck beams—the molds for the masts or for the hollow blocks for the masts, (if this is to be inserted after, and made from other material than that used for the ship), also needs to be set in position, the metallic perforated block for the propeller shaft, and the metallic sleeves for the pipes. If the ship is to have cement decks, a proper platform U will be erected between beams for the concrete.

The molds for the transversal and longitudinal ribs O and P must be set at a distance from the exterior mold equal to the thickness of the walls of the ship.

At the point where the exterior mold turns up, the spaces between the transverse ribs, will be furred to the top, so to make the inside mold R for the walls. The furring for the inside mold will be the distance from the outside mold equal to that of the thickness of the walls of the ship.

Having set in position all the above molds, the reinforcement and stirrups will be laid in, well secured, so as not to lose their position in pouring the concrete.

The final operation is to pour the concrete, and this is done by beginning from the bottom and continuing this operation without stopping to the top, and all molds must be filled successively, in order to insure a perfect monolithic mass.

The other important parts of the mold are the studs V, the longitudinal beams Y. The bracing and supports W will be used wherever they are needed. The supporting frame is composed of the upright Z and the cross tie X.

As soon as the concrete is well set and hard, the interior molds are removed and numerated, and by working the screw of the braces B, the outside molds AA are laterally separated from the concrete walls, far enough to insure the free passing to the ships in its travel to the water.

The ship now will be ready for the launching, and as soon as the ship is in the

water, the bottom mold will be removed and set again in its original position. The motion of the ship in running over the rollers will cause the bottom mold to separate from the concrete.

To commence again the construction of the ship, first, set in position the exterior molds L and M, and on top of this set the molds J. Next by working the screw of the braces B, have the molds AA take the required positions, lay the plate reinforcements, set the other molds.

In the above specifications, I have described the exterior mold, divided into seven parts, but these parts can be cut in many sections, so these sections can be easily handled.

From the foregoing description it can be seen that by casting a ship with the keel down, there is nothing to interfere with the contraction of the concrete in its setting.

The present method for constructing the concrete ship is to build, first, the inside mold with the keel up, and after, the outside molds for the walls (Fig. 2), lay the reinforcements and pour the concrete for the walls and bottom. This method is dangerous. The cement when set out from the water shrinks about one sixteenth of one inch to a foot. Admitting this fact, the consequence is that when a concrete ship is cast with the keel up, the concrete in setting, will develop a quantity of setting cracks at the curve where the walls meet the keel. (See Fig. 2, at AA.) The setting cracks must not be confounded with the air cracks. The air cracks are superficial and the setting cracks following a serpentine line go through the mass of concrete. These cracks cannot be prevented because they come from the natural law of the setting. The concrete in setting shrinks from top down, but the concrete of the keel cannot follow the shrinkage of the walls because it is supported by the molds. In some instances, these cracks hardly can be seen with naked eyes, especially if the concrete is poor in cement. But if after the concrete is hard, a cross section cut is made at the point above mentioned, the cracks will be seen in the inside of the concrete. In general, the cracks on the surface of the concrete are made to disappear by troweling the surface of the concrete, but by this operation, the cracks are only hidden to the eyes.

As I have above demonstrated, the present method of constructing concrete ships is dangerous, first, because the ship is weak at the point, which ought to be the strongest; second, from the cracks stated, the water in time will find its way in the ship; third, the water by entering through the cracks, will come in contact with the steel reinforcements on the concrete and will corrode the reinforcements, and the consequence will be the destruction of the ship.

As far as I know, I believe that the builders of the concrete ships are all following the method of casting the ship with the keel up, and I believe that I am the first to have found the way to avoid the setting cracks, so I beg you to allow me a Letter of Patent for the following claims:

1. In a sectional mold a stand, mold sections provided with casters carried by said stand, a supporting frame, uprights for said supporting frame, and adjustable braces secured to said mold sections and having threaded engagement with said uprights.

2. A hull-molding apparatus comprising, a stationary, permanent, exterior supporting frame; a removable, interior, sectional mold-wall; outer mold-wall sections permanently carried by the frame and means to move the outer mold-wall sections relative to the frame.

3. A hull-molding apparatus comprising, a stationary, permanent, exterior, supporting frame; a removable, interior, sectional mold-wall; outer mold-wall sections permanently carried by the frame and means carried by the frame to maintain the outer mold-wall sections in fixed spaced relation to the interior mold-wall and move them away from the completed hull.

4. A hull-molding apparatus comprising, a stationary, permanent, exterior, supporting frame; an interior mold-wall; outer mold-wall sections permanently carried by the frame and means to move the outer mold-wall sections relative to the frame.

5. A hull-molding apparatus comprising, a stationary, permanent, exterior, supporting frame; an interior mold-wall; outer mold-wall sections permanently carried by the frame and means carried by the frame to maintain the outer mold-wall sections in fixed spaced relation to the interior mold-wall and move them away from the completed hull.

6. A hull-molding apparatus comprising, a stationary, permanent, exterior, supporting frame; a removable, interior, sectional, mold-wall; outer mold-wall sections adjustably carried by the frame and means to move the outer mold-wall sections relative to the frame.

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Witnesses:
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