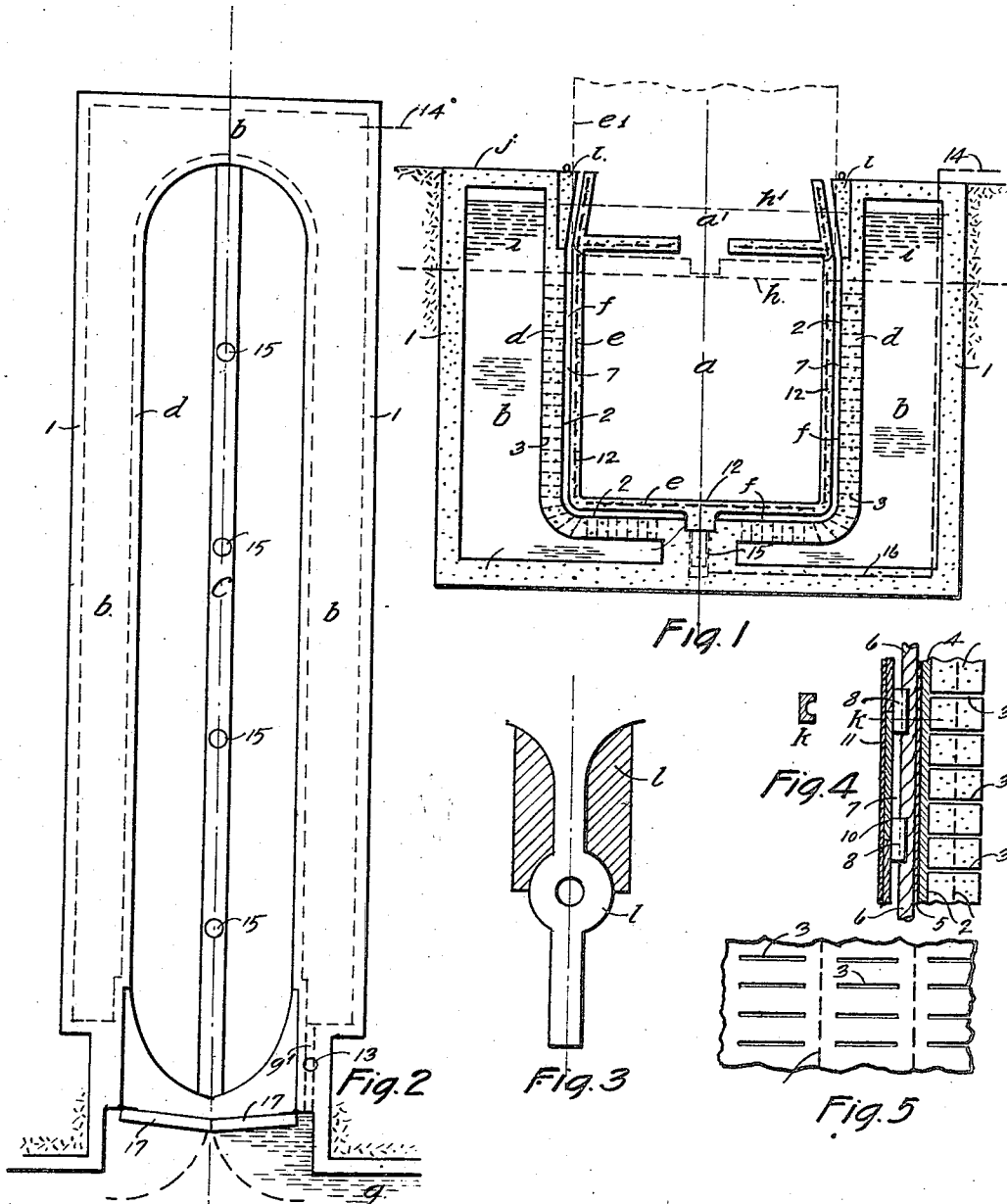


E. A. LARSEN.
MOLD FOR CASTING CONCRETE HULLS.
APPLICATION FILED APR. 1, 1918.

1,416,844.

Patented May 23, 1922.



WITNESS:

Ferdinand Butterfield,
J. Bauer

INVENTOR.

Edward A. Larsen

UNITED STATES PATENT OFFICE.

EDWARD A. LARSEN, OF LARKSPUR, CALIFORNIA, ASSIGNOR TO HIMSELF, JAMES D. WHALEN, AUGUSTUS J. BOWIE, AND E. N. RICHARDSON, TRUSTEES, ALL OF SAN FRANCISCO, CALIFORNIA.

MOLD FOR CASTING CONCRETE HULLS.

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Specification of Letters Patent. Patented May 23, 1922.

Application filed April 1, 1918. Serial No. 225,971.

To all whom it may concern:

Be it known that I, EDWARD A. LARSEN, a citizen of the United States, and residing at Larkspur, in the county of Marin and State of California, have invented a new and useful Improvement in Molds for Casting Concrete Hulls, of which the following is a specification.

This invention relates to the construction of concrete hulls for sea going vessels and apparatus therefor.

The principal object of my invention is the expeditious production of reinforced concrete hulls, and I accomplish this object by casting the hulls in a permanent mold and draw them from the mold by water pressure. Briefly stated, my invention may be described as a porous or perforated mold, built in a basin or drydock of the graving dock type, equipped with the usual sea gate, pumps, inlet valves and power equipment. The dock is covered by a work floor, except over the mold and the fairway leading to the seagate through which the cast hull may be floated to sea. The interior surfaces of the mold are formed to give shape to the exterior of the hull. When a hull is to be cast, the dock is freed from water, the inner surfaces of the mold coated with soft-soap or other dissolvable matter, after which the said surfaces are waterproofed by tarred paper or fabric. Then lubricated cables are hung on the sides of the mold from keel to deck at close intervals, and board lining is nailed to wood blocks against the said cables. This wood lining, covering the entire inner surfaces of the mold, is lastly covered by a second lining of water proofing as before described. The water proofing is intended to prevent the escape of the poured concrete through the porous walls of the mold, which is pierced by innumerable narrow slits. The steel reinforcement is next fabricated, and then sectional wood forms are built in the mold to give shape to the interior of the hull, deck and gunwale. The concrete is then poured, and, when set, the dock is flooded with water from the adjacent waterway or sea, controlled by valves, the said lubricated cables having been previously pulled from their places by power, thus leaving the cast hull free from contact with the mold except the keel portion. As the water

floods into the dock and surrounds the mold, hydrostatic pressure is exerted against the cast hull in the mold through the perforated walls, of said mold, the pressure increasing as the soft-soap coating dissolves and water area spreads on the exterior surface of the hull. Auxiliary hydraulic jacks are also provided in the keel section of the mold to facilitate the drawing of the hull and pumps operated to raise the water level in the dock to a higher elevation than that of the adjacent waters, thus increasing the static head in the dock. When the hull is fully floated, the seagate may be opened and the hull launched in the open. Another object of my invention is the building of hulls of less tonnage than the mold is designed for. This I accomplish by building wood forms, covered with wood lining and waterproofed, and set away from the mold dock walls a sufficient distance to give the required tonnage to the hull and to conform to the shape of the smaller hull desired. The mold may also be used for the drydocking of small vessels for repairs and painting. Those portions of the hull, such as the gunwale and stern post, which will not allow of a straight draft of the hull, are made so they can be removed before the hull is to be floated.

In the accompanying drawing, in which similar numerals refer to similar parts throughout the several views, Fig. 1 shows a cross section of the mold cast hull inside. Fig. 2 shows a plan view (with cast hull omitted) of the mold dock. Fig. 3 shows removable sections of mold in the stern post. Fig. 4 shows a section through the perforated walls of the mold showing the lubrication, board linings airspace, water-proofing and furring cables. Fig. 5 shows an elevation of the interior surface of the mold walls and floor showing the slits piercing same, through which the water from the outside of the mold walls is forced by hydrostatic pressure.

Referring to the drawings, *a* indicates the hold, *b* immersion waters, *c* keel mold, *d* perforated wall of mold, *e* cast concrete hull, *f* space between hull and mold containing lubrication, waterproofing, furring cables, airspace and wood lining, *g* tide waters, *h* waterline outside the dock, *i* water

level increased by pumps; *j* floor of the dock, *k* nailing block on cables.

The operation of the molding dock is as follows: The body of water *b* is pumped out from within the enclosing walls 1; the inner surfaces of mold walls 2, having perforations 3, are then coated with plastic lubricant 4, after which water proofing 5 is applied, then cables 6 are placed, forming space 7, then the nailing blocks 8 and wood lining 9 and finally waterproofing 10 and plastic lubricant 11. Steel reinforcement 12 is next fabricated, the forms for hold *a* and deck *a'*, are set and the concrete poured forming the hull *c*. When the concrete is set, the movable forms 7 are removed and the cables 6 are pulled, the sea valve 6 is opened and the adjacent waters *g* allowed to flow through inlet *g'* and flood area *b* to level *h*; also the hydraulic valve 14, operating the hydraulic jack 15 by supply pipe 16 is opened and the hull *c* raised from the mold to position shown as *c'*. The water body *i* with waterlevel *h'* is produced by pumping, to create the greater static head. The seagate is then opened and the hull launched in open waters.

The terms, "body", "vessel", "hull", or "ship" as used in the specification and hereinafter in the claims are intended to cover any form of floatable concrete construction, small boats, pontoons, caissons, barges, and the like.

What I claim is:

1. In a graving dock for molding the hulls of reinforced concrete hulls, forms in sections for giving shape to the interior of the hull and deck portions, hydraulic jacks along the keel line of the dock for auxiliary power in lifting the cast hull from the mold, openings through the walls of the dock to admit water for floating the vessel by forcing it through the perforations in the mold wall.

2. In a graving dock adapted to form a mold for the exterior surface of reinforced concrete hulls, a mold with perforations in the mold wall substantially as described to permit said hull to be floated.

3. In a graving dock, a mold for casting concrete ships, a sea gate closing mold from the sea, water reservoirs adjacent the mold communicating with the sea, valves controlling the inlet of water to same, perforations through walls and floors of mold communicating with said reservoirs, means for preventing the leakage of wet concrete in the mold though said perforations and lubricated cables for providing an air space between the cast hull and mold wall substantially as described.

4. In a graving dock adapted to form a mold for the exterior surface of reinforced concrete hulls, a mold with perforations in the mold wall to permit said hull to be float-

ed by hydrostatic pressure of flood waters around same, means for forming an air space between said hull and mold wall by a substance dissolvable by contact with water, enclosing walls around said mold forming a reservoir, valves and a seagate in said walls for controlling the inlet and outlet of water to said reservoir, substantially as described for the purpose specified.

5. In combination, a mold for the exterior surface of a concrete vessel, and means for applying water pressure between said vessel and mold to remove the vessel from the mold.

6. In combination, a mold for the exterior surface of a concrete vessel, said mold being hollow below sea level, and means for removing said vessel from said mold by hydrostatic pressure.

7. In combination, a mold for the exterior surface of a concrete vessel, means for removing the vessel from the mold by raising it by hydrostatic pressure, and a gate closing a passage from said mold to the sea, said passage permitting the vessel to be floated to the sea.

8. In the combination of claim 5, a soluble lining between said mold and vessel.

9. In the combination of claim 5, the mold consisting of exterior and interior portions having a space between them.

10. In the combination of claim 5, the mold comprising exterior and interior portions arranged to allow said interior portion to be moved away from the vessel.

11. In the combination of claim 10, removable spacing pieces between the exterior and interior of the mold.

12. In the combination of claim 11, the spacing pieces being of cable.

13. In the combination of claim 5, means for distributing the water pressure over the hull of the vessel.

14. A mold for casting concrete hull consisting of a matrix for forming a single or various types of hulls, and open at the top to allow of floating out the cast hull, means for preventing adhesion of the wet concrete forming the hull to the molding surfaces of said matrix.

15. A ship hull molding device comprising a mold of the shape of the hull of a ship and openings to admit liquid through the walls of the mold.

16. A ship hull molding apparatus comprising a fixed graving dock mold of the shape of the ship hull, openings to admit liquid through the walls of the mold and thence between the hull and mold to float the ship.

17. The process consisting in molding the hull of a ship in a fixed graving dock mold of the shape of the hull and floating said hull out of the mold by introducing liquid between the hull and mold.

18. The method of casting concrete hulls for vessels which consists in the separation of a ship hull from the mold in which it is formed by inundating the mold with water to a sufficient height or depth to cause the hull to leave the mold by floating out of the mold.

19. The method of casting concrete hulls for vessels which consists of the separation of a ship hull from the mold in which it is formed by raising the water level in which the two said bodies are immersed to a height

sufficient to cause the hull to float up out of the said mold in which it is formed.

20. The method of casting concrete hulls for vessels which consists of the separation of the hull from the mold in which it is shaped by means of water pressure applied to the hull and by which means the hull is floated out of the mold.

EDWARD A. LARSEN.

Witnesses:

FERDINAND BUTTERFIELD,
I. BAUER.