G. E. KASTENGREN.

REINFORCED CONCRETE SHIP MOLD.

APPLICATION FILED APR. 17, 1918.

1,345,013.

Patented June 29, 1920.

2 SHEETS—SHEET 1.

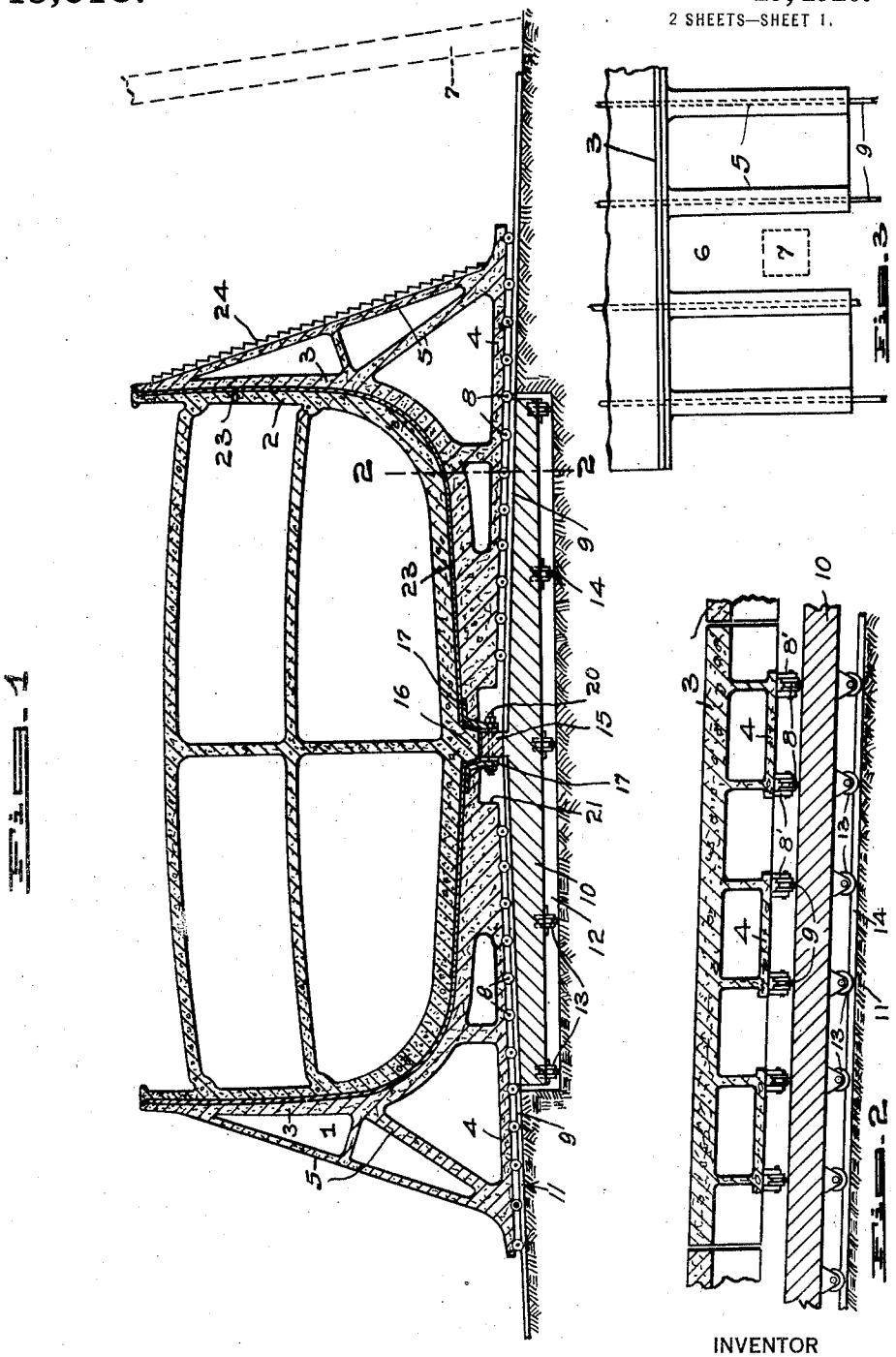


Fig. 1

Fig. 3

Fig. 2

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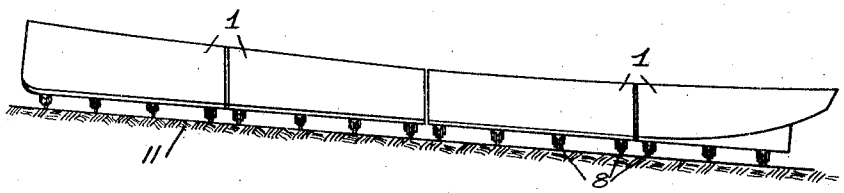


Fig. 4

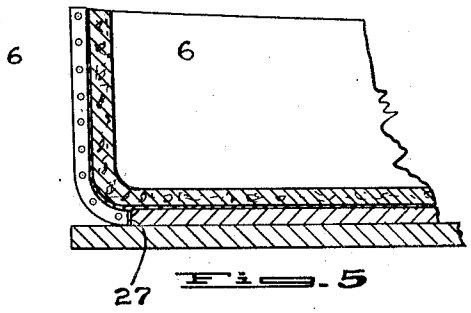


Fig. 5

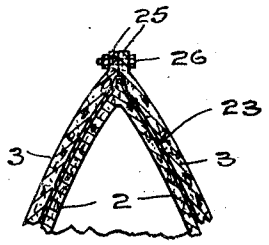


Fig. 6

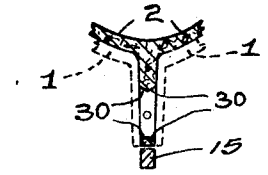
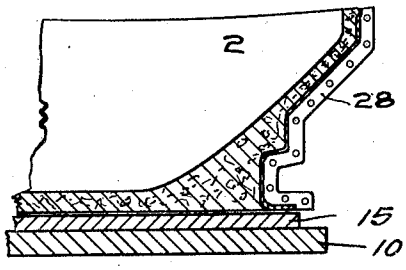


Fig. 8

Fig. 7



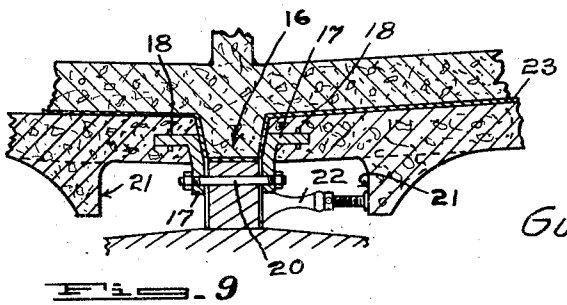


Fig. 9

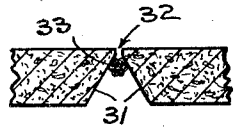


Fig. 10

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UNITED STATES PATENT OFFICE.

GUSTAVUS E. KASTENGREN, OF SEATTLE, WASHINGTON, ASSIGNOR TO CONCRETE CRAFT CORPORATION, OF SEATTLE, WASHINGTON, A CORPORATION OF WASHINGTON.

REINFORCED-CONCRETE-SHIP MOLD.

1,345,013. Specification of Letters Patent. **Patented June 29, 1920.**

Application filed April 17, 1918. Serial No. 229,022.

To all whom it may concern:

Be it known that I, GUSTAVUS E. KASTENGREN, a citizen of the United States, and resident of Seattle, in the county of King and State of Washington, have invented a new and useful Improvement in Reinforced-Concrete-Ship Molds, of which the following is a clear and exact specification.

This invention relates to improvements in apparatus for facilitating the construction and launching of re-inforced concrete ships and the object of this improvement is to provide a permanent sectional exterior mold, in connection with a ships' ways, that may be temporarily withdrawn after a ship's hull is completed to permit the ship to be launched, and is adapted to be easily and quickly moved back into place after the ship has been launched so that work on another ship may begin immediately.

A further object is to provide a movable launching table that coöperates in supporting the mold while the ship is being constructed and that serves as a movable launching platform on which the ship may be carried into the water.

Further and more specific objects reside in the details of construction of the various parts of the mold which are combined to produce an operative and efficient structure of the nature described.

The invention consists in the novel construction of a sectional mold for use in reinforced concrete ship construction and in the adaptation and combination of such mold with a launching table as will be more clearly hereinafter described and claimed.

In the accompanying drawings Figure 1 is a view in cross section of a mold and launching table constructed in accordance with this invention as they might appear when supporting a finished ship; Fig. 2 is an enlarged fragmentary view in vertical cross section on broken line 2—2 of Fig. 1; Fig. 3 is a plan view of a portion of one section of a mold constructed in accordance with the invention; Fig. 4 is a view in elevation on a small scale of a complete mold of this type that is formed in four sections; Fig. 5 is a view in vertical mid-section of the bow of the mold showing the ship therein; Fig. 6 is a sectional view on broken line 6—6 of Fig. 5; Fig. 7 is a view in vertical mid-section illustrating the stem of the mold in its relation to the ship; Fig. 8 is a fragmentary sectional view substantially on broken line 8—8 of Fig. 7; the position of the mold being indicated by broken lines; Fig. 9 is a view in vertical section illustrating one method that may be used for separating the mold sections from the finished ship and Fig. 10 is a fragmentary sectional view illustrating the manner of forming a cement tight joint between two adjacent sections of the mold.

In a general way this invention comprises a mold having an interior form that corresponds to the exterior shape of the ship that is to be built and that is formed of a plurality of sections, the lines of division between said sections being on a medial plane extending lengthwise of the mold and on a plurality of spaced vertical planes extending crosswise of the mold so that after a ship is completed the mold sections may be successively removed and the ship blocked up one section at a time to make ready for launching.

In reinforced concrete construction it is customary to form temporary molds that are torn down when the concrete has hardened or set. This invention provides a permanent mold that may be used repeatedly without necessitating the loss of time incident to the tearing down and rebuilding of the mold between the construction of successive ships.

Referring to the drawings, throughout which like reference numerals designate like parts the numeral 1 designates a mold that is formed of a plurality of coöperative sections having a combined interior configuration that corresponds to the exterior configuration of a ship 2 that is to be built.

Owing to the symmetrical form of construction of the hull of a ship it is necessary in the construction of a permanent mold to divide the sections of which the mold is constructed on substantially the medial plane or keel line of the ship so that when the ship is ready to be launched one half of the mold sections may be moved away from the ship in one direction and the other half of such mold sections may be moved away from the ship in the opposite direction thus leaving the ship free to slide into the water.

It is also necessary where the mold is of a permanent form of construction, to divide the mold into separate sections crosswise of its length so that the sections can be moved

outwardly from the ship one at a time and the ship blocked up for launching.

The mold sections 1 are preferably each formed of a wall 3 that corresponds in shape to the desired configuration of the exterior of that particular part of the ship opposite which it is located and with a base portion 4 that is rigidly connected with the wall 3 by truss members 5.

If desired the mold sections may be constructed of reinforced concrete as indicated in the drawings, but this invention also contemplates the use of wood, iron, or other suitable material for the construction of these molds.

The base portion 4 of each of the mold sections projects outwardly as shown in Fig. 3 and is provided with a plurality of cut away or slotted portions 6, so that when the mold sections are moved outwardly the cut away portions may straddle posts 7 that may be used to support a shed above the ship's way, the cut away portions making it possible to locate the posts 7 nearer to the ship than would otherwise be possible and still obtain the necessary sidewise movement of the mold to permit launching.

The base portions 4 of the mold sections 1 are each provided with a plurality of grooved wheels or rollers 8 that are mounted in U-shaped bearing brackets 8′ and are adapted to run on tracks 9 and 9′ as more clearly shown in Figs. 1 and 3.

The tracks 9 and 9′ are each disposed at a slight angle to the horizontal and slope downwardly from the central plane of the ship toward the outer ends thereof so that when the molds are moved outwardly they will also be lowered slightly and will clear the bottom portions of the ship more readily.

The inner track sections 9 may be supported on a launching table 10 while the outer track sections 9′ may be supported on a permanent foundation or floor 11 of the ships' ways, the track sections that are supported on the launching table 10 necessarily being separate from the track sections that are supported on the permanent floor 11 to permit the launching table to be moved.

The launching table 10 is positioned within a recess 12 in the floor 11 and is mounted on grooved rollers 13 that run on inclined tracks 14 that extend lengthwise of the ship's way and are so disposed that they will carry the ship into the water in which it is to be launched.

Extending lengthwise of the medial portion of the launching table 10 is a keel block 15 that serves as a bottom for the keel section 16 of the ship 2 and also serves as a means for securing the mold sections on opposite sides of the ship together.

The mold sections are each provided on their inner edges with angular metal plates 17 that may be solidly embedded within the concrete as more clearly shown in Fig. 9 and are provided with projecting lugs or pins 18 to prevent displacement thereof, the plates 17 being adapted to fit against the keel block 15 and be secured thereto by bolts 20.

The mold sections 1 are all provided adjacent their inner edges with shouldered portions 21 of the form shown in either Fig. 1 or Fig. 9 between which and the keel block 15 jack screws 22 may be interposed to start the movement of the mold sections away from the ship.

The mold sections are preferably provided with a lining 23 of material that will not adhere to the sides of the concrete ship. When concrete molds are used this lining may be simply a coating of soapy material to prevent the sides of the vessel from sticking to the mold or it may be a lining of sheet metal surfaced with a thin coating of greasy or soapy material.

The mold sections will preferably be provided at any desired number of points with steps 24 by which a person may ascend to the top thereof.

The bow of the mold will converge as shown in Figs. 5 and 6 to give the desired shape to the bow of the ship and opposite mold sections will be flanged as at 25 and secured together by bolts 26, the flanged portions 25 meeting the keel block 15 just below the front end of the ship as indicated by the numeral 27.

The keel portion of the mold will conform to the desired shape of the keel of the ship and will be flanged as at 28, Fig. 7, so that it may be bolted together.

The surfaces of parting between the ship and the mold will all be receding surfaces as the surfaces 30 of Fig. 8 so that the mold will part freely from the ship.

The edges of adjacent sections of the mold are made with receding or divergent surfaces 31 from inner to outer side thereof and the relatively narrow clearance space 32 that is necessarily left at the inner side between two adjacent molds is stopped by wedging a rope or piece of hemp 33 tightly between the divergent surfaces 30.

When in use all of the mold sections are secured to the keel block 15 as shown in Fig. 1, and the reinforced concrete ship 2 is constructed inside of the molds, it being necessary to use suitable interior molds, which are not herein described since they form no part of this invention.

When the ship is ready to be launched the nuts on the keel block bolts 20 are removed, jack screws 22 are inserted between the keel block 15 and the shouldered portions 21 and two oppositely disposed sections of the mold are moved outwardly until they are clear of the ship. Suitable blocking is then inserted

between the launching table and the bottom of that section of the ship from which the mold has been withdrawn to support the ship on the launching table and two more oppositely disposed sections of mold are moved outwardly clear of the ship to permit the insertion of more blocking. In this way the mold is removed in sections and the ship is blocked up on the launching table one section at a time so that when the last section of the mold has been removed the ship is supported on the launching table by blocks and may be carried on the launching table down the launching ways and into the water.

The provision of the launching table makes it easy to launch the ship without breaking or chipping the reinforced concrete of which the ship is constructed.

If desired the launching table may be dispensed with and the ship allowed to slide down the ways in the usual manner after the mold has been removed and the ship blocked up.

After the ship has been launched the launching table may be moved back into place so that the ends of the tracks 9 register properly, the mold sections may be moved inwardly and bolted to the keel block and to each other and the apparatus quickly made ready for the construction of another ship.

It is obvious that numerous changes in the form of construction of this apparatus may be resorted to within the scope of the claims.

What I claim and desire to protect by Letters Patent is—

1. A permanent external mold for concrete ships comprising a plurality of mold sections adapted to be releasably secured in fixed positions on each side of the vertical medial plane of a ship and movable at right angle to said plane.

2. An external mold for the construction of reinforced concrete ships comprising a longitudinally extending keel block, and a plurality of mold sections arranged side by side on each side of said keel block and adapted to be secured thereto said mold sections being movable toward and away from said keel block.

3. An external mold for the construction of reinforced concrete ships comprising a longitudinally extending keel block, a plurality of mold sections arranged side by side on each side of said keel block and adapted to be secured thereto said mold sections being movable toward and away from said keel block, and shoulders on the lower side of each of said mold sections adjacent said keel block whereby means may be inserted between said shoulders and said keel block to move said sections outwardly.

4. An external mold for concrete ships comprising a plurality of mold sections adapted to be releasably secured in fixed positions on each side of the vertical medial plane of a ship, trackways extending outwardly from both sides of said medial plane on a downward incline and rollers supporting said mold sections for movement on said trackways.

5. A mold of the class described comprising a plurality of mold sections having a combined interior shape that conforms to a desired exterior configuration of a ship, a keel block extending lengthwise in the medial plane of said sections, releasable means for securing said mold sections to said keel block, trackways extending outwardly in downwardly inclined relation from said keel block and rollers supporting said mold sections for movement on said trackways toward and away from said keel block.

6. The combination with a ship's way, of a launching table movable on inclined trackways lengthwise thereof, a keel block adapted to extend lengthwise of said launching table, trackways extending transversely of said launching table in downwardly inclined relation from the center to the side edges thereof, other transverse inclined trackways located on the floor of the ships' way and adapted to register with the trackways on said launching table, mold sections, releasable means for securing the inner edges of said mold sections to said keel block and rollers supporting said mold sections for movement on said transverse trackways whereby said mold sections may be moved outwardly crosswise of said ship's way to clear said launching table and permit said launching table to be moved lengthwise of said ship's way.

7. The combination with a ship's way, of a launching table movable on inclined trackways lengthwise thereof, a keel block adapted to extend lengthwise of said launching table, trackways extending transversely of said launching table in downwardly inclined relation from the center to the side edges thereof, other transverse inclined trackways located on the floor of the ship's way and adapted to register with the trackways on said launching table, a mold divided into a plurality of sections the lines of division being on a longitudinal medial plane and on a plurality of transverse vertical planes, an angular plate rigidly secured to the inner edge of each of said mold sections, releasable means for fastening said angular plate to said keel block, abrupt shoulders on the bottoms of said mold sections adjacent said keel block, whereby means for exerting an outward pressure on said mold sections may be inserted between said abrupt shoulders and said keel block and rollers supporting said mold sections for movement on said transverse trackways whereby said mold sections may be moved outwardly crosswise of

said ships' ways to clear said launching table and permit said launching table to be moved lengthwise of said ship's way.

8. A device of the class described comprising a mold formed of a plurality of sections the lines of division between said sections being on a longitudinal medial plane and on a plurality of transverse vertical planes, releasable means for securing said sections together on said medial plane of division and means supporting each of said sections for independent movement toward and away from said medial plane.

9. An apparatus for constructing reinforced concrete hulls, comprising a plurality of parallel trackways, a hull mold section on each trackway, said sections being adapted to be brought together to form a mold for the hull, and means for securing said sections together.

10. An apparatus for constructing reinforced concrete hulls comprising a plurality of opposed parallel trackways sloping downward from a center line, and a hull mold section on each trackway, said mold sections being adapted to be brought together to form a mold for the hull.

Signed at Seattle, Washington, this 5th day of April, 1918.

GUSTAVUS E. KASTENGREN.