

SPECIFICATIONS

FOR THE

Construction of a Steel Twin-screw Sea-going Torpedo-boat of about 100 tons displacement.

TORPEDO-BOAT No. 1.

Hull.—Dimensions: Length over all, one hundred and thirty-eight (138) feet; length on deck, one hundred and thirty-four (134) feet. Depth: Keel to sheer amidships, 7 feet 6 inches; extreme depth, keel to crown of deck amidships, 10 feet.

Keel.—To be flat-plate worked to form, and width to suit, $\frac{1}{4}$ inch thick.

Keelson.—To be of I-beam steel 6 inches by $3\frac{1}{2}$ inches, 13 $\frac{1}{2}$ pounds, tapered out forward with 5 inches by $2\frac{3}{4}$ inches, 10 pounds, and 4 inches by $2\frac{1}{2}$ inches, 8 pounds; and aft with 5 inches by $2\frac{3}{4}$ inches, 10 pounds, 3 inches by $3\frac{1}{2}$ inches, 10 pounds, Tee. Sections to be securely connected together and riveted to reverse angle on, and also to short angle on other side of floor plates.

Stem.—To be forged of steel to required size (average about $\frac{3}{4}$ -inch by $3\frac{1}{2}$ inches), and to extend from spar-deck to 8 feet along keel from spur of ram.

Stern Post.—To be of forged steel of about same general dimensions as stem, but to be properly formed with eye to receive rudder stock.

Frames.—To be of steel angles, 18 inches apart from center to center, of sizes from $1\frac{1}{2}$ inches by $1\frac{1}{2}$ inches by $\frac{1}{16}$ inch to 2 inches by 2 inches by $\frac{1}{4}$ inch, to suit. There are to be double frames at each bulkhead.

Floor Plates.—To be of steel plates $\frac{1}{4}$ inch thick forward and aft of machinery, and $\frac{3}{16}$ inch and $\frac{1}{4}$ inch in the wake of machinery, rudder and screws. Reversed bars of steel angles, sizes $1\frac{1}{4}$ inches by $1\frac{1}{4}$ inches by $\frac{5}{16}$ inch to $1\frac{3}{4}$ inches by $1\frac{3}{4}$ inches by $\frac{3}{16}$ inch, as required, will be riveted to top of every floor plate, and to extend at least 6 inches beyond end of floor plates, but those abreast of engines and boilers to extend to deck.

Deck Beams.—To be of steel angle bars $1\frac{1}{4}$ inches by $1\frac{1}{4}$ inches by $\frac{5}{32}$ inch and $1\frac{1}{2}$ inches by $1\frac{1}{2}$ inches by $\frac{5}{16}$ inch, to be placed at every frame and riveted to them by bracket plates $\frac{1}{4}$ inch thick.

Stringer Angles.—To bind sheer strake to stringer plate, of steel, and formed to make a neat finish, and also to give strength to gun-wales.

Foundations of Machinery and Boiler.—To be of steel plates and angles of the requisite sizes firmly secured to the hull of boat by steel angles.

Coal Bunker Fronts.—To be of steel plates $\frac{1}{8}$ inch to $\frac{1}{16}$ inch thick, which will extend nearly 60 feet forward and aft in a continuous line, and will be secured to hull of boat in a manner to give proper longitudinal strength.

Skin Plating.—To be of steel plates $\frac{3}{16}$ inch to $\frac{1}{4}$ inch thick and carefully moulded to form of hull, and hammered into shape cold. The middle half length to be plated $\frac{3}{16}$ inch thick, and the ends $\frac{1}{8}$ inch thick, but properly thickened near the ram and stern-bearing brackets.

Deck Plates.—To be of steel plates $\frac{1}{8}$ inch to $\frac{5}{16}$ inch thick, and worked in the same manner as skin plating.

Water-tight Bulkheads.—To be of $\frac{1}{8}$ inch and $\frac{3}{32}$ inch steel plates and stiffened as required with angle and Tee-bars.

Galvanizing.—All plates and angles to be galvanized.

Riveting.—Skin plating: All vertical seams to be butted, strapped and treble-riveted amidships, double-riveted forward and aft. All longitudinal seams to be lapped and double-riveted.

Deck and Coal Bunker Fronts.—Thwartship and vertical seams to be butted, strapped and double-riveted. Longitudinal seams to be lapped and double-riveted. The plates over boilers and engines to be riveted in such a way that they may be easily detached.

Butt Straps.—All butt straps to be of the thickness of the thicker plate of the two which they join and the fiber to run in the same direction. Butts will be at least two frames and two strakes apart.

Conning-towers.—To be of steel plates $\frac{1}{4}$ inch thick, with the tops to raise by screws 4 inches if required.

Stanchions.—To be of steel, 2 feet 9 inches high, with iron wire ridge rope. Hand-rails to be fitted over the whale-back.

Compartments.—There will be eleven (11) compartments, separated by water-tight bulkheads, placed and described as follows: First bulkhead, on No. 4 frame, $\frac{1}{8}$ inch thick, with manhole; second bulkhead, on No. 10 frame, $\frac{3}{32}$ inch thick, with manhole; third bulkhead, on No. 23 frame, $\frac{3}{32}$ inch thick, to extend as high as sheer line of boat; fourth bulkhead, on No. 28 frame, $\frac{1}{8}$ inch thick,

to be pierced by properly arranged openings, to ventilate the fore-castle and galley into the boiler space (there will be a light airtight partition separating the boiler space from the fire-room); fifth bulkhead, on No. 41 frame, $\frac{3}{8}$ inch thick, to be pierced by a hole for blower inlet, passage door (arranged to be closed on deck), two spy-holes fitted with glass and a manhole in each coal bunker; sixth bulkhead, on No. 54 frame, described same as fifth bulkhead; seventh bulkhead, on No. 67 frame, described same as fourth bulkhead; eighth bulkhead, on No. 74 frame, $\frac{3}{8}$ inch thick, to extend as high as sheer line of boat; ninth bulkhead, on No. 83 frame, $\frac{3}{8}$ inch thick, with high sill door; tenth bulkhead, on No. 88 frame, $\frac{1}{2}$ inch thick, with manhole.

Entrances, Hatchways, &c.—There is to be one entrance into each conning-tower, one skylight and ten (10) hatchways through the deck, as shown on the drawings.

Lighting.—To be five (5) suitable windows in each conning-tower, and the various compartments are to be lighted by about fifty-four (54) deck-lights, arranged as shown on drawings.

Ventilators.—To be arranged as shown on drawings (about twenty (20) in number) and arranged to be closed in bad weather. Ventilation will be induced by connecting with the boiler spaces before mentioned and using the outer jacket of smoke-stacks.

Machinery.—To consist of two (2) sets of quadruple expansion engines, connected directly to propeller-shafts, with cylinders to each engine, as follows: High pressure, $11\frac{1}{4}$ inches diameter; first intermediate, 16 inches diameter; second intermediate, $22\frac{1}{2}$ inches diameter; low pressure, two (2), $22\frac{1}{2}$ inches diameter each. Stroke of all pistons, 15 inches, and working on five (5) cranks, placed relatively to each other to give the least vibration to the hull. Engine valves to be of the balanced piston type, and worked from a counter-shaft. All parts to be carefully built of the most suitable metal for each particular place, and, as far as practicable, to be tested to pressures at least twice the estimated working pressures, or to a tensile strain of at least three times the estimated working strain. Engine to be practically noiseless and easily reversed by one man.

Pumping Engines.—The main feed pumps and air pumps to be worked by independent engines, one for each main engine. There will also be two (2) blowing-engines, one for each fire-room; one (1) engine to work a centrifugal circulating pump. Each of these engines to be of the compound type, carefully balanced and connected to exhaust into the main condenser.

Donkey Pumps.—There is to be a donkey pump in each fire-room, connected to draw either from condenser, supply tank, the

sea, or bilge suction pipe, and to discharge into boiler, on deck, fire-room, or overboard.

Condenser.—To be one condenser of copper, tinned on the inside; tubes of copper, tinned inside and out; tube-sheets of brass, tinned on the inside. To be of sufficient capacity to condense all the steam the boilers will generate. All engines are to exhaust into condenser, and provision will be made so that main engines can exhaust into the atmosphere in case of accident to the condenser.

Engine-room.—To be fitted with all tanks, pipes, and other appliances for the necessary operation of the machinery.

BOILERS AND FITTINGS.

Boilers.—There are to be two (2) boilers, each complete in itself and so arranged as to work in connection with one engine on, or so that either may be used to work both engines in cases of emergency. The boilers to be of the "Herreshoff Improved," square type, and also to embody any approved of improvements which may be made by the "Herreshoff Manufacturing Company" up to the time of building the boilers, and will be designed for a working pressure of 200 pounds per square inch, and to be tested to a hydrostatic pressure of 400 pounds per square inch. To be reasonably economical in the consumption of coal, but of sufficient size to burn all the fuel necessary for the required performance of the boat.

Fittings.—The requisite pipes, cocks, valves, gauges, whistle, &c., are to be provided, and are to be of the best type. All out-board connections below the water-line are to be provided with sea-cocks.

Safety Valves.—There will be two (2) safety valves to each boiler, one to blow into the condenser, and the other (set at a higher pressure) to blow into the atmosphere.

Forced Draft.—Each fire-room will be arranged to close nearly air-tight, and to be provided with an efficient fan-blower to force air into it to support the combustion of fuel necessary.

BILGE PUMPS.

Bilge Suction Pipes.—There is to be a main pipe or chest in engine-room with valves and pipes leading into the bilge in compartments Nos. 4, 5, 6, 7, and 8, and this main pipe or chest is to be connected with the main injection pipe and also with each donkey pump.

Ejectors.—There are also to be bilge ejectors of nominal sizes in compartments, as follows:

	Tons.
Compartment No. 2	20
Compartment No. 3	40
Compartment No. 4	40
Compartment No. 5	40
Compartment No. 6	40
Compartment No. 7	40
Compartment No. 8	40
Compartment No. 9	20
Ejectors, total	280
Estimated capacity of centrifugal pump	550
Estimated capacity of donkey pumps	40
Total per hour	870

or 100 tons in 7 minutes.

Propellers.—To be of forged steel or aluminum bronze 50 inches diameter, 8 feet 4 inches pitch, four blades each, or other sizes that experiment may prove to give the best results.

Propeller Shafts.—To be of steel, 5 inches diameter, and to be suitably supported and connected.

STEERING GEAR.

Rudder.—There is to be one rudder arranged under the after part of hull, as shown in the drawing, and of such size and so arranged to give the boat the maximum maneuvering qualities, either going ahead or astern.

Steering Wheels.—To be placed in each conning-tower and connected by steel-wire ropes and chains to the rudder, the connections being such that the disabling of one wheel will not interfere with the working of the other.

Steam Steering Engine.—To be located in the forward conning-tower, and will be simple, compact and reliable, so arranged as to be quickly and easily brought into action and thrown out at the will of the helmsman; to work from the forward wheel.

QUARTERS OF OFFICERS AND CREW.

Cabin.—To be plainly finished in hard wood, to contain 4 berths, transoms, lockers, table, &c., as shown on drawings. Pantry to be in the compartment aft of and lavatory in the compartment forward of cabin.

Machinists' Room.—To be located in compartment No. 7, and will be fitted with 3 berths, transoms, locker, table, &c.; also, lavatory for the accommodation of the machinists.

Torpedo-room.—To be fitted for the accommodation of twelve (12) persons. Bunks to be made of galvanized iron, having wire bottoms, and are to be fitted to trice back against the side of boat when not in use. Transoms, lockers or drawers and a table to be provided.

Water-closets.—There is to be a water-closet in compartment No. 4 and one in each of the lavatories, and to be enclosed by water-tight bulkheads and doors.

Cooking Arrangements.—A suitable galley, with fixtures complete, is to be furnished, to be located in the after end of torpedo-room, and to be properly ventilated. Steam-cooking arrangements are also to be provided.

Coal-bunkers.—Will extend the full length of machinery compartments and will have a capacity of about thirty-three (33) tons.

MISCELLANEOUS FITTINGS.

Engine telegraph and speaking-tube from conning-towers to engine-room.

Speaking-tube and signal gear between conning-towers.

Whistle connection to each conning-tower.

Davits.—To be of steel, fitted with hand winch, and capable of raising 1,000 pounds; to have 4 steps where required.

Boat Davits.—Also, a pair of light boat davits with gear for row-boat.

Bits.—Cleats, chocks and fairleaders, well secured and located where required.

Reel.—For anchor-chain, fitted with brake, located in No. 2 compartment.

Anchors, Cables, &c.—Two anchors, one chain cable, one manilla cable, one hauling line, three mooring lines, two boat-hooks, two flag-staffs, one-half dozen buckets, one and one-half dozen cork life-preservers, two cork life-rings, one spirit compass and binnacle, anchor and running lights and ship-bell.

Row-boat.—To be of cedar build, 11 feet long.

Ladders.—The necessary ladders to give free access to all compartments that require them.

Gratings.—Light pine gratings will be laid over the deck where required.

Steam Winch.—On the forward part of the whale-back there is to be a steam winch of sufficient power to raise the anchors, and to be fitted to be worked by hand also.

Steam Heaters.—Are to be fitted in compartments 4, 5, 6, 7, 8 and 9, and arranged to take steam from the boat's boilers or from a pipe in shed when boat may be housed during cold weather; and

provision is to be made for delivering the condensed water from the heaters overboard.

Distilling.—Apparatus for supplying fresh water for drinking and cooking purposes placed in the engine-room and connected to water-tank of about 200 gallons in compartments No. 4 or No. 8.

Painting.—The hull generally to receive four (4) coats of red-lead paint; two (2) coats of French grey paint above the water-line, and a coat of anti-fouling composition below.

SPACES FOR EQUIPMENT, &C.

The after conning-tower will have a space around it sufficient to mount a pair of torpedo-guns as now practiced in some foreign boats.

Proposed positions are shown on the drawings for the mounting of quick-firing guns; also, for air compressors for torpedo, bow torpedo-tubes, dynamo engine, search-light, magazine, &c.

ESTIMATES OF WEIGHTS.

These are subject to refinement on more careful calculations, being within a preliminary nature:

Displacement.	Tons.
Hull, thirty-five (35) tons.....	35
Engines, eleven (11) tons.....	} 47
Boilers, twenty-six (26) tons.....	
Shafting and screws, four and one-half ($4\frac{1}{2}$) tons.....	
Piping, condenser, pumps, &c., five and one-half ($5\frac{1}{2}$) tons.....	
Equipment, seventeen (17) tons.....	17
Total.....	99

Power, Speed, &c.—At full speed the engines are estimated to develop 1600 indicated horse-power, and the coal consumption at 4,000 pounds per hour, or 174 pounds per knot at the rate of 23 knots, or about 370 knots on bunker capacity.

At 10 knots speed the consumption of coal is estimated at 220 pounds per hour, or 2,900 knots on bunker capacity.

HERRESHOFF M'FG CO.

JOHN B. HERRESHOFF,

Treasurer.

ADDITIONS TO SPECIFICATIONS SUBMITTED WITH DRAWINGS FEBRUARY 14, 1888.

1. Statement giving the location of the frames and deck-beams of the different dimensions proposed in the specifications; also, thickness of floor-plates to be used in the different frames:

1. Frame angles, $1\frac{1}{4}$ inches by $1\frac{1}{4}$ inches by $\frac{7}{32}$ inch on No. 28, and forward 2 inches by 2 inches by $\frac{1}{4}$ inch on frames No. 29, No. 66 and all intermediate except Nos. 41 and 54, which are to be $1\frac{1}{4}$ inches by $1\frac{1}{4}$ inches by $\frac{7}{32}$ inch; Nos. 67 to 71, inclusive, to be $1\frac{1}{4}$ inches by $1\frac{1}{4}$ inches by $\frac{7}{32}$ inch; Nos. 72 to 83, inclusive, $1\frac{1}{2}$ inches by $1\frac{1}{2}$ inches by $\frac{3}{16}$ inch; Nos. 84 and 85, $1\frac{1}{4}$ inches by $1\frac{1}{4}$ inches by $\frac{7}{32}$ inch; Nos. 86, 87, 88, 89 and 90, 2 inches by 2 inches by $\frac{1}{4}$ inch; No. 91, $1\frac{1}{4}$ inches by $1\frac{1}{4}$ inches by $\frac{7}{32}$ inch.

Deck-beams, $1\frac{1}{4}$ inches by $1\frac{1}{4}$ inches by $\frac{5}{32}$ inch forward of No. 28 and aft of No. 67; $1\frac{1}{2}$ inches by $1\frac{1}{2}$ inches by $\frac{3}{16}$ inch between No. 28 and No. 67.

Thickness of floor-plates, as per specifications.

2. Under the heading "Floor-plates," in the specifications, is the term "machinery" intended to include the boilers? and are any floor-plates less than $\frac{3}{16}$ inch thick to be used within the space included between frames Nos. 28 and 67, inclusive?

Answer to first question: Yes.

Answer to second question: No.

3. Is it the intention to taper the stringer angles in thickness? If so, how much?

Answer: No; unless we can get the stock rolled tapering in thickness.

4. A general scheme of riveting must be submitted, giving diameter of rivets, spacing for single, double and treble riveting, and stating manner of making rivet-holes.

Diameter of rivets to be twice the thickness of plates they connect, and where the plates are of different thicknesses the thinnest is to rule; but no rivets to be used less than $\frac{1}{4}$ inch in diameter. In inside framing work (not water-tight), one size larger rivets may be used.

Spacing of rivets to be four diameters in water-tight work, and not more than eight diameters in other work.

The overlap in single riveting to be not less than $3\frac{1}{2}$ diameters; in chain riveting, not less than $5\frac{1}{2}$ diameters, with the rows 2 diameters apart to centers; in square riveting, a double row, the over-

lap to be $6\frac{1}{2}$ diameters, and in a treble row the overlap to be $9\frac{1}{2}$ diameters, with half as many rivets in outer row, rows of rivets to be 3 diameters apart.

Rivet-holes to be punched from the faying sides of sheets and angles and in outside plating, or, where necessary, to be counter-sunk for flush riveting; the large diameter of counter-sink to be $1\frac{1}{2}$ diameters and the depth $\frac{1}{2}$ diameter of rivet.

The smallest size of rivet-holes to be just large enough to receive hot rivets. Rivets of $\frac{3}{8}$ inch in diameter, or less, will be driven hot or cold, as may be deemed best by the Department.

HERRESHOFF M'FG CO.

By JOHN B. HERRESHOFF,

Treasurer.

WASHINGTON, D. C.,

February 27, 1888.

The specifications presented with the proposal of the Herreshoff Manufacturing Company for the construction of Torpedo-boat No. 1, together with the additions thereto dated February 14, 1888, and the seven sheets of plans for said vessel, prepared by that Company, are the plans and specifications attached to the contract for the construction of said vessel.

JOHN B. HERRESHOFF,

Treasurer Herreshoff Manufacturing Company.

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MRS. J. H. BROWN

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