COPY.

Bristol, Rhode Island,

July 10th, 1886.

Honorable

W. C. Whitney,

Secretary of the Navy,

Navy Department, Washington, D.C.

Sir:--

In obedience to your order of June 29th, 1886, directing us to assemble at Bristol, Rhode Island, on July 2nd, 1886, and to be present at all the trials which the Herreshoff Manufacturing Co. might desire to make with the torpedo boat "Stiletto", on the completion of these trials to make a report to the Navy Department of the result of the examinations and to express our opinion as to whether this boat embodies the qualities which a modern torpedo boat should possess, we beg to report as follows:-

General Description.

The "Stiletto" is a high pressure, single screw, wooden vessel of the following dimensions:-

Length between perpendiculars .....90 feet.

Length over all.....94 feet.

Beam.....11 feet.

Draught L. W. L. (forward and aft).....3 feet.

Displacement to L. W. L.....35.65 tons.

The keel of white oak is in two lengths secured together by a hook scarph 6 feet long, bolted through with 3-8" copper bolts.

The garboards of white oak 2 1-2" at rabbett and 10" wide are side-bolted to the keel.

The frames of white oak are 1 7-8" x 2", steamed and bent, and are spaced 15". They extend from gunwale to keel to which and the garboards they are securely bolted, there being also plank floors, extending across the keel, ~~3-8~~ 3" x 2 3-8", bolted to keel and frames. There is a thick strake of oak about 2 feet above the L. W. L., 5" x 2 3-4" thick. The top strake is of oak 6" x 2" and the gutter strake lapping over this and on to the deck beams is 8" x 2¼". Stem and stern are both of white oak 5" siding.

The hull is strapped diagonally with iron straps 3-16" thick, varying in width from 2½" to 6". On each side there are two diagonal straps crossing in opposite directions under the engine room, each 6" wide, and a similar arrangement under the fireroom, 4" wide, the remainder of the straps being 2" 1-2 wide. These are outside the frames and inside the planking and are intended to guard against twisting and working.

The planking between the garboard and the thick strakes on side is in two thicknesses the inner of white pine 5-8" thick and about 5" wide, butts on the frames; the outer of yellow pine 3-4" thick with seams along the middle of the inner planks and screwed to the frames and along the seams. The seams are not calked but a layer of white lead is placed between the two thicknesses. The bottom is painted with copper paint instead of being coppered. The planking above the thick strake is in two thicknesses of ½" white pine.

The deck beams of oak (rounded 1 3-4" in 9 feet), are fastened to the frames by galvanized malleable iron knees, about 15" x 15", lightened by holes and secured to frames and beams by 3 bolts in each. The deck planking is in two thicknesses of ½" white pine with white lead between.

The first collision bulkhead is about 7 feet 6" abaft the forward perpendicular; the chain stowing in the compartment forward of this bulkhead.

Next abaft is the officer's stateroom 12 feet long with two berths, chest of drawers and other furniture; at the after end of this space is the water closet fitted with Sand's marine pump arrangement and wash bowl. Abaft this is the cabin, 8 feet x 10 feet long, fitted with table and two settees which can be pulled out to form berths. This space is roomy and well lighted.

Next is the boiler room, 18 feet 6" long , and then the engine room 11 feet long. Abaft the engine room are two staterooms 6 feet long, two bunks in each. Next abaft is the galley 6 feet long with sink and bench for spirit stove. Abaft this are the quarters for crew, 12 feet 6" long, fitted with five folding bunks. The after collision bulkhead is about 5 feet from the after perpendicular. The above divisions form six water tight compartments extending to the upper deck. The forward and after bulkheads are of No. 14 iron plates braced by vertical angle-iron stiffeners.

The forward stateroom and cabin are entered by a hatch at the rear of pilot house. The fire room hatch is fitted with two covers which may be thrown back like the top of a landau or shut down on a low coaming 4½" above the deck. It can be opened from above or below and egress is easy in case of an emergency.

There is a raised skylight and a hatch with coaming and cover, to the engine room. The after crew space and galley are reached through a small hatch with a coaming 4½" high.

There are 15 dead-lights on each side with glasses about 9" diameter, hinged at the top and made to close water tight by screwing down with butter-fly bolts on a rubber ring.

Two anchors can be carried forward though storage for only one chain is provided. A pivoted davit forward can be used for

either bower. There is a capstan just abaft this worked by brakes. There are six galvanized chocks and cleats on each side. Small galvanized malleable metal stanchions about 2 feet 9" high carry the monkey rail and netting.

The conning tower rises 2 feet 9" above the deck. There is a platform at such a distance below that a man standing on it has his head and shoulders projecting up into the tower. The tower is circular, about 4 feet in diameter, fitted with steering arms which control either hand or steam steering. It has lights for all-round view, with a compass and means for signaling to engine room and blowing whistle.

There is a steam steering cylinder on the starboard side of the fire room with a stroke of 24". This connects on the after side directly to the rudder by a steel wire rope and on the forward side passes around wheels at sides in wake of the conning tower, crosses the vessel and leads aft to the rudder on the port side.

Chain is used instead of rope leading around the wheels, the chain making fast to a transverse rack which also can be traversed by a hand moved cog. To the head of the rudder arcs of malleable iron are secured, the ends of the rope being made fast to them so that there is no slip, and as the ropes on each side are kept taut there is no back-lash, while the lead is excellent. The rudder head is protected by a light wood cover. The rudder is a balanced

one, the axis of the stock being 5" abaft the forward edge. It is of bronze 36" long, 33½" deep, upper edge 6" below the L.W.L. 7-8" thick in a middle vertical line tapering to one half inch on the axis of the stock and 5-16" at the ends, with rounded edges and corners. The rudder is enlarged at the upper forward corner to 6¼" by 11". A cast piece is bolted to the ship where the rudder passes into the vessel and there is a bearing at the head of the stock. The stock tapers from 4½" diameter at the rudder to 3¼" at the top. The stock is hollow, diameter of hole 1 3-4". Special strength is provided at the after end of the hull.

BOILER.

The boiler is 66" square to the outside. There are ten flats of pipes 58" square.

1st two flats of pipes.....3½" diameter.

2nd two flats of pipe.....3" diameter.

3rd two flats of pipes.....2½" diameter.

4th two flats of pipes.....2" diameter.

5th two flats of pipes.....1½" diameter.

Giving a heating surface of 552 sq. feet on the inside of the pipes.

There is only one grate 55" square, giving a grate surface of 21 sq. feet; bars 2½" deep. There are two furnace doors 12" x 14" and two ash-pit doors 20" x 8". From the bottom of ash-pit to top

of grate is 12½", top of grate to under side of pipes 15½". Weight of boiler 10,343 lbs. Diameter of smoke stack 24", height above deck 8 feet 6", above top of grate 14 ft. 6". The separator just abaft the boiler is 6 feet long and 18" diameter. It is made of wrought iron with cast iron heads. Abaft the boiler and in the same compartment is a metal screen forming a bunker with two doors at the bottom; this will hold about 7 tons of coal. There is a fresh water tank underthe boiler and ~~firing~~ flat holding about 300 gallons. A steam injector leads to this and also a No. 1½ Blake steam pump. For pumping out the water tight compartments there is a system of 2" copper pipes leading to an ejector on the port side of the fireroom; on blowing steam through this water may be drawn from all the compartments but the end ones. There is no provision for drawing from the end compartments. pressure of air in fire-room is kept up by a centrifugal fan, diameter 3 feet 6", run by a simple engine 3½" x 6" stroke. Air is supplied through a brass ventilator extending above the deck to a cowl and is also drawn from the engine room, this fan is placed in the after, upper port corner on the bulkhead, between the fire and engine rooms. The ashes pass out by a chute through the bottom. This chute is a pipe 5" diameter widened at the top.

ENGINES.

The engines are direct acting vertical compound engines with two cylinders acting on cranks at 90 degrees.

High pressure cylinder 12" diameter.

Low pressure cylinder 21" diameter.

Stroke.....12".

Weight of engines.....4275 lbs.

The engine bed is formed of a steel plate ½" thick 54" long and 32" wide. It is cut for the cranks and has lightening holes in the niddle. The thrust and engine bearings are attached to this bed, thickening plates being worked under the bearings 5-8" thick.

The engine is not otherwise secured to the hull, so that even if the frames of the boat were pushed in the engine would not be deranged. The cylinders are jacketed. Around the tops and bottoms are lines of ports controlled by ring valves, the valves at top and bottom being connected by rods and the whole worked by the usual excentrics. These valves are balanced, doing away with loss by friction, and there is but little clearance, and as steam is admitted all around the cylinder at once there is but little wire drawing. Babbitt's metal is put in all bearings. The condenser is of copper containing 684 tubes 5-8" outside diameter and 9-10" from centre to centre. A centrifugal pump is used for the circulating water making about 740 revolutions at full speed. There are six (6) pumps made fast to the engine bed.

Two Feed Pumps from Hotwell to Boiler.

Two Force Pumps from Separator to Boiler.

Two Air Pumps from Condenser to Hotwell.

SHAFT AND PROPELLER.

The shaft is of mild steel 3 3-8" diameter, made in two lengths; forward length 15 ft. 11".

After length, 18 ft. 5"., connected by a cast iron half coupling and keys. The thrust bearings made fast to the engine bed plate. The shaft collers are 4 3-4" in diam., 3-8" thick and 3-4" between. The after end of the shaft turns in a log fitted in two halves containing bearings and forming part of the after keel. Weight of shaft 1000 lbs.

The stern bearing is a brass casting.

The propeller hub is 8" long for'd diam. 3 3-8". tapering 1" in 12". The screw is a four (4) bladed bronze screw.

Diameter of screw.....48".

Pitch of screw.....80".

Weight of screw.....250 lbs.

The displacement of the "Stiletto" is 35.65 tons to the L.W.L., light with only water aboard it is 26.45. This leaves 9.2 tons for weights to be carried. A crew of 8 men and two officers, fresh water, boat & gear etc. would require 1 ton.

Two firing tubes or corresponding arrangement for firing torpedoes for'd and three torpedoes would weigh 3½ tons.

A 37mm Hotchkiss revolving cannon with 600 rounds weighs with all equipments 62 ~~tons~~ hundred, which would leave 4 tons of coal to the L.W.L.; she could of course be loaded more deeply if it is necessary as three additional tons would sink the boat only 2" deeper. Seven tons will carry the vessel at 19 knots about 300 miles and much farther at a lower speed. In considering tha availability of this vessel for torpedo service, the following points have been considered.

SPEED.

The speed is satisfactory, being very great and well sustained.

NOISELESSNESS.

With hatches closed there is nothing to be heard from the fans, but the buzzing of the screw can be heard half a mile in still weather when running at high speed, but as will probably be necessary to throw off all concealment when within half a mile of an enemy and take all chances, the above is not considered an objection.

NON-VISIBILITY.

The vessel has a freeboard of 5 ft. and can be easily seen, especially will this be so at night for when firing, flames issue from the stack.

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STEERING.

The vessel has both hand and steam steering and answers her helm readily while the heel is not great when turning at high speeds.

LEAKS.

The vessel can be forced free from water by means of an ejector, but when going at full speed water would not run in machine gun shot holes.

ECONOMY.

The economy of coal is great, as will be seen from the results of the three hours trial; 3,115 pounds of coal were burnt in three hours while going in all 59 sea miles, a very good showing indeed with forced draft.

HEAT BELOW.

This vessel being built of wood is not heated up by the steam to such an intense degree as the steel boats. The temperature in the closed fire room with a pressure of 2½" of water was only 92 degrees F.

ESCAPE for FIREMEN.

The firemen can easily escape from the closed stoke-hole. If the catches are pulled and there is any pressure the hatches fly open themselves.

WATERTIGHT COMPARTMENTS.

There are six (6) of these formed by bulkheads extending to the

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upper deck.

ROLLING.

The vessel does not roll excessively, being about the same as well built boats of her size. She has no bilge keels.

CLOSETS.

There are two (2) water-closets, one forward between the officer's stateroom and cabin, and one in the engine room.

GALLEY.

The cooking will be done by an alcohol lamp.

PROTECTION.

There is no effort made at protection.

BOILERS.

The type of boiler is a good one for torpedo service; as the amount of steam to escape, if penetrated, is small, while it can be forced to any extent.

STRENGTH.

The vessel is strong and well built and her timbers are all sound.

One serious difficulty encountered during the trial of this boat when the steam pressure exceeded 140 pounds, was the difficulty in making the auxiliary feed pump work. This defect should be remedied by the substitution of another kind of pump.

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It is our opinion that a boat of this class should have feed pumps independent of the main engine. With the single exception of the boiler feed at very high pressures (no difficulty occurs when running at 20 knots), the boat appears in all respects quite equal to any foreign built torpedo boat of her size. Although built of wood she shows no signs of weakness after considerable hard steaming.

It is necessary to mention that on July 9th, the "Stiletto" met with an accident which temporarily and completely disabled her engines. While out with a pleasure party one of the bolts in a crank pin brass broke and the low pressure piston was driven through its cylinder. As it will require a month or more to make a new cylinder and have the boat ready for further trial, it was deemed best by the Board to submit this report without waiting to make turning trials and to take indicator cards as was intended.

The results of the trials are subjoined in tabular form.

In conclusion we have to say that, in our opinion, this boat embodies the qualities which a modern torpedo boat should possess. But we are also of the opinion that the defect in the present boiler feeding arrangements should be corrected and in future such boats should have independent feed pumps. It is our opinion that the type of boiler used in this boat is well adapted to a torpedo boat. Although great care and skill is used in the construction of the hull of Mr. Herreshoff's boats, and although they have

shown strength and lightness combined, we are of the opinion that steel would prove a better material than wood, if the comparison were extended over a considerable number of years.

STEAM TRIALS.

July 2nd, 1886. Four (4) runs were made over the measured knot. There were thirteen (13) men on board and about a ton of coal. Displacement about 28 tons. The wind was fresh and the water rough. The auxiliary pump did not work well.

The results were as follows:--

No. of Runs	Pressure in Boiler	Intermediate Pressure	Vacuum in Inches	Air Pressure in Inches of Water	Revolutions		Observed Time	Speed Due to Time	First Mean	Second Mean	
					Per Mile	Per Minute					
1	140	32	22		1107	405	$2^m 44^s$	21.951			
2	147	30	21½		1152	421	$2^m 44^s$	21.951	21.951	22.01675	
3	149	32	22	2	1119	414	$2^m 42^s$	22.222	22.0865	22.22375	
4	151	32	20	2	1129	423	$2^m 40^s$	22.500	22.361		
Mean	146¾	31.5	21.375	2	1126¾	415¾	$2^m 42.5^s$		Mean	Mean	22.12125

July 3rd, 1886. In the forenoon six (6) runs were made over the measured knot. There were twelve (12) men aboard and about a ton of coal at the beginning of the trials.

The results were as follows:--

No of Runs.	Press. in Boiler	Intermediate Press.	Vacuum Inches	Air Press. in Fireroom in Inches of Water	Revolutions		Observed Time	Speed due to Time in Knots	
					Per Mile	Per Minute			
1	155.5	34	21.25	4.5	1147	418	2m 44.5s	21.871	22.4745
2	168	38	21.00	3.0	1121	431	2m 36s	23.078	23.0780 22.7762
3	168.5	38.5	20.0	3.5	1123	432	2m 36s	23.078	22.9310 23.0045
4	170.0	36.5	21.0	4.0	1130	429	2m 38s	22.784	22.9870 22.9590
5	164.5	36.5	19.0	3.5	1101	425	2m 35.2s	23.190	22.0500 22.5185
6	150	31.5	21.0	4.0	1152	401	2m 52.2s	20.910	Mean 22.7041 22.8146
Mean	162.5	35.83	20.54	3.75	1129	422.7	2m 40.3s		True Mean 22.898

The Horse power required for this speed is about 560. This is estimated as no indicators were fitted to the engines.

July 3rd., 1886:- In the afternoon the three (3) hours run at full power was made. The water was smooth and there was little wind. The course was in Narragnsett Bay, from the Dumplings to Sand Point Light. The whole distance run was 59 sea miles. The speed over the measured knot was taken twice during the run, no notice being given tothe engineers or firemen, nor any attempt made to spurt the boat.

Time of running down the knot 3m 9.4s 19.007 knots.

" " " up " " 2m 58s 20.225 "

Giving a mean speed of 19.616 knots.

Horse power for the speed is estimated to be 380.

Coal consumed during the three hours - 3,115 lbs.

Average temperature in fireroom - 92 degrees F.

Average number of revolutions per minute - 388.

Made six (6) half circles in turning, as follows:-

Off the Dumplings - starboard helm - half turn in 40s.

Off Sand Point Light - port helm - half turn in 50s.

Off the Dumplings - starboard helm - half turn in 43s.

Off Sand Point Light - port helm - half turn in 45s.

Off the Dumplings - staboard helm - half turn in 40s.

Off Sand Point Light - port helm- half turn in 46s.

Observations were made every fifteen (15) minutes, as follows:-

No. of Observations	Pressure in Boiler	Intermediate Pressure	Vacuum in Inches	Air Press in Eng-room Inches of Water	Revolutions per Minute
1	125	28	16	—	368
2	130	28	21	1.75	379
3	125	28	17	1.0	381
4	120	25	19.5	3.0	376
5	130	28	19.0	3.50	381
6	125	27	20.5	2.75	381
7	125	26	21	2.0	381
8	123	25	21	2.25	379
9	125	25	21.5	2.50	379
10	125	26	21	3.0	381
11	125	26	21.5	2.00	383
12	128	27	21.5	2.25	386
13	128	27	22.0	2.50	384
Mean	125.7	26.6	20.2	2.23	379.9

Wednesday July 7th., 1886:- Ran from Newport to Block Island and returned in a rough sea. This trial was intended to test the sea-going qualities and strength of the boat. At the entrance to Newport Harbor two (2) teeth were broken in the cast iron cog which controlled the steering engine (steam) and the vessel was thrown into the trough of the sea. The rolling was not excessive while in this position. When running into the wind no seas were shipped only spray coming on board. No trouble was experienced in using the hand steering gear, but the cast iron cog should be replaced by a steel one. The speed was good and well sustained, the time out to Block Island, distance 20 7-12 sea miles, being 1hr. 22m. 15s. (without allowance for time off course, 10 minutes), and back, 1hr. 10m. 26s.

Very respectfully submitted,

W. T. Sampson
Commander, U.S.N., President of Board.

B. H. McCalla
Commander, U.S.N., Member of Board.

George A. Converse

Lieut. Commander, U.S.N. Member of Board.

Lewis Nixon.
Ass't. Naval Constructor, U.S N.
Member of Board.