#25

INSPECTOR'S OFFICE,
TORPEDO BOATS Nos. 6 AND 7,
HERRESHOFF Mfg. Co.

Bristol, R. I.,

May 23rd 1897.

Reference No.
1513

Sir:

1. By your endorsement, letter No. 3857 from the Bureau of Construction & Repair, dated May 6th, 1897, is referred to me as General Inspector of the Torpedo Boat "Porter" for consideration and report, and I respectfully submit the following:--

2. This letter informs the Department in effect that in the opinion of the Bureau of Construction & Repair, the report of the Board of Inspection & Survey upon the trial of the Torpedo Boat "Porter", is in no degree satisfactory as regards the completion of the vessel, and in consequence a recommendation is made that a new Board be ordered to make a more thorough examination.

3. This opinion of the Bureau of Construction & Repair, and its recommendation, is founded upon the five statements made in paragraph 2 of its letter. In order to have a clear understanding of the meaning conveyed in these five statements, and for the purpose of more readily discussing their import, they are here briefly summarized as follows:--

1st. The conclusions of the Board of Inspection & Survey are somewhat remarkable because it accepted the statement of the General Inspector of the "Porter" as to the conformity of the vessel to plans, specifications, and authorized changes.

2nd. The conclusions of the Board that "the Porter is a remarkable product of the highest skill in hull and engine design and construction", is not justifiable because the report of the Naval Constructor of the Board showed her to be "materially out of trim", and because she was not tested in a seaway.

3rd. The Board should have docked the vessel for an examination of her bottom because numerous defects have since been discovered in docking the vessel at the New York Navy Yard.

4th. The boat should not have been permitted to be completed as far as a preliminary trial without all bulkheads having been fully tested.

5th. The General Inspector did not have, and was unable to furnish, plans of the vessel which were required to be furnished under the terms of the specifications before the material was ordered, or the work

commenced. Moreover, the Bureau believes that in many important particulars, there were serious departures from the plans and specifications.

4. An analysis of these five charges of the Bureau of Construction & Repair reveals the fact that three of them, the 1st, 4th, and 5th, contain no statement relative to the defects of the "Porter", or reflecting upon the efficiency of the vessel. They relate simply to the methods pursued by the General Inspector in the performance of his duty, and to the evidence accepted by the Inspection Board in forming its conclusion. The latter part of the 5th statement conveys the opinion that defects may exist, but no fact is given and no evidence is produced to support this suspicion.

5. Of the two remaining statements, the 2nd makes the distinct charge that the vessel was "materially out of trim", while the 3rd states that numerous defects were discovered in her bottom while in the New York Yard.

6. While much of the matter in this letter from the Bureau of Construction & Repair refers more especially to the Board of Inspection & Survey, it is my desire to give the Department the fullest detailed information

upon all the questions therein referred to, and I will, therefore, answer, seriatum, each of the five statements referred to in paragraph 2.

7. The Board of Inspection & Survey reported that the "Porter" conformed with the contract, the plans, specifications, and duly authorized changes, accepting as satisfactory evidence my written statements to that effect, together with the written statements of the Naval Constructor and Naval Engineer Members of the Board, and the Board's own observation of the vessel as to strength and character of work. It appears that this evidence is not satisfactory to the Bureau of Construction & Repair.

The vessel was built in accordance with general plans duly approved by the Secretary of the Navy, and in accordance with the specifications, as far as applicable thereto. Prints of these plans, all detail drawings made in accordance therewith, as well as the contract and specifications furnished me, and authority for changes and departure from original plans, were either in my possession or available for examination by the

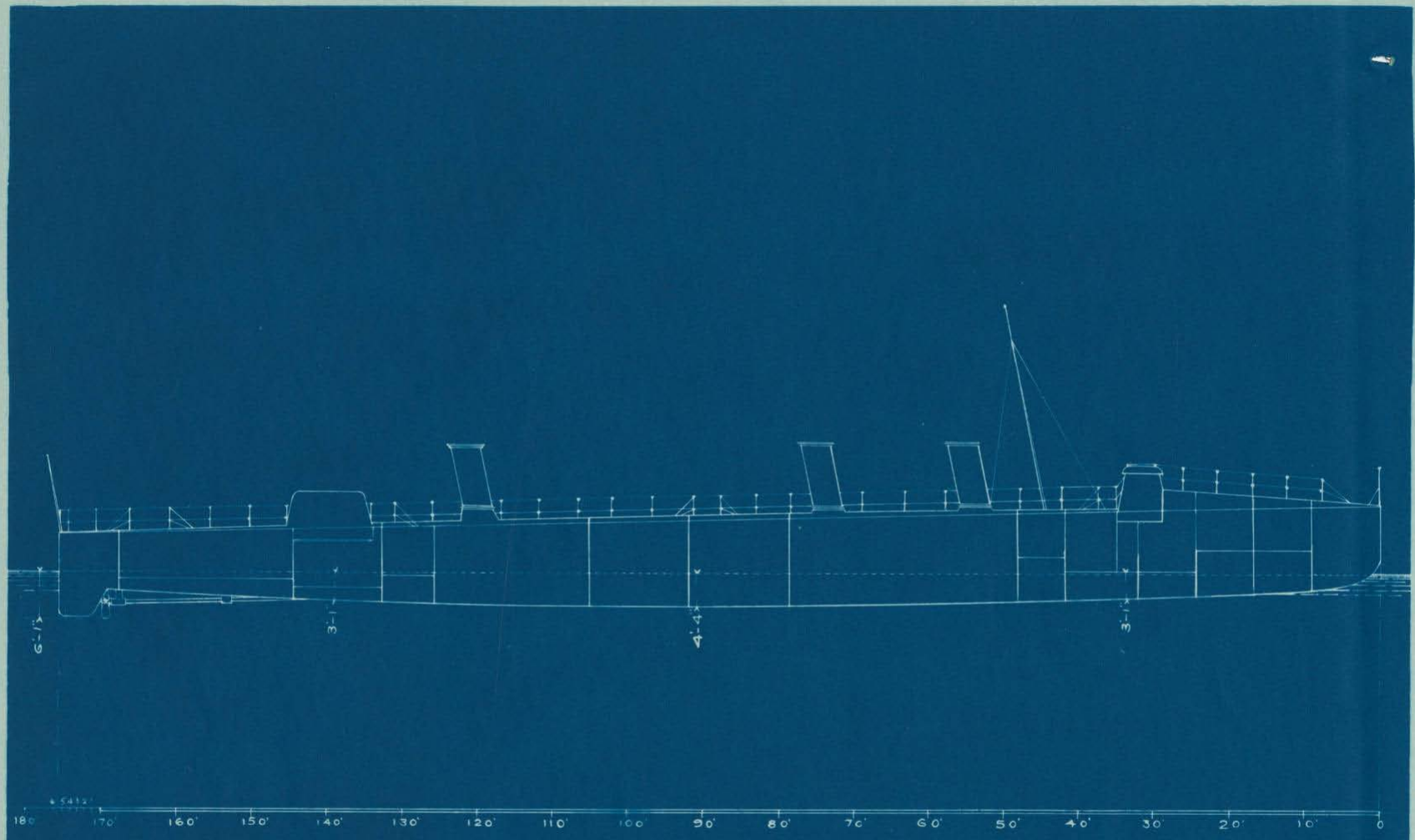
Board when it assembled at Bristol. The Board made such examinations and called for such information as to satisfy itself upon all points effecting the efficiency of the vessel, or acceptance by the Government, and I see no reason to doubt that their conclusions were fully warranted by the facts presented to them.

8. The 2nd statement of the Bureau of Construction & Repair asserts that the "Porter" is "materially out of trim". This means that the weights used in her construction, machinery, armament, or equipment, have been so erroneously distributed, or such errors have been made in her calculations, that the vessel does not float on an "even keel" as intended, or upon the lines calculated by her designers.

I venture to state that few boats have ever been built which have floated more closely to the lines contemplated in their designs than does the "Porter".

The accompanying print is a longitudinal section showing the position of the water-line when already for the trial, and at the time her "draft" was recorded by the Naval Constructor on the Board.

The amount of water the hull of the "Porter" draws in this position, lying still in smooth water, is marked



TORPEDO BOAT "PORTER"
SHOWING
TRIM AT TRIAL.

MAY 22nd-1897

on the print at several points along her entire length. It will be seen that from the fore-foot the depth of the keel below the water line gradually increases, being 3' 1" at a point under the forward conning tower until it reaches a maximum of 4' 4" about midway. From this point running aft it again decreases, and at a point under the after conning tower corresponding to a similar position at the forward conning tower, the depth is about the same, 3' 1". A glance at the figures and the print will show that the after body of the vessel is very similar in depth, contour, etc., to the forward body.

It is customary in the Naval Service to paint upon all vessels a "water-line", which line is parallel to the water when the ship is on what is known as an "even keel, that is, floating upon the lines intended in her design. In this condition she is known to be "in trim", being neither down by the stern nor by the head. When the weights of a vessel are so distributed that she does not float with her "water-line" parallel to the water, or the lines upon which she was designed, she is then known to be "out of trim", and will be down neither by the head or the stern.

It is also customary to paint figures upon the stem and stern post of vessel's to indicate their "draft". The "draft" as thus marked is measured from a horizontal base line through the lowest point of the vessel, and the distance above this line is marked on both the stem and stern. These figures do not necessarily indicate what amount of water the vessel actually draws, forward or aft, but refers only to their distance above the base line. When they read the same at the water, both forward and aft, you may then know that the vessel is floating "in trim". By means of them you may also know how much water the ship draws for purposes of navigation, or her displacement at any time.

In illustration of this system, the "Ericsson" with only 12 tons of coal on board, now at the Torpedo Station and recently painted at the New York Navy Yard, shows by these marks on her bow, a "draft" of 4' 11", yet the actual amount of water drawn at this point is only 3' 6 1/2". The marks aft show her "draft" to be 5' 5 1/2", yet the actual amount of water she draws at the propeller tips is in reality 6' 2 1/2". These marks simply indicate their distance above her base line.

which, in this case, is drawn through the lowest point of the hull 9" above the tips of her propeller blades as shown on Construction Drawing No. 2049, New York Navy Yard, March 15th, 1897. Thus these marks inform us that her "trim" is 6 1/2" down by the stern, that she draws 9" more water than actually shown by her "draft", and that she draws 2' 8" more water aft than forward.

An inspection of the Tug "Leyden" (marked at the Navy Yard, Portsmouth, N. H.), and of Torpedo Launch "No.1" (marked at the Navy Yard, New York), would indicate that there is some diversity of custom practiced in marking the "draft" of Naval vessels.

In the case of the "Porter", her base line is drawn through the lowest tip of her propeller blade, and her "draft" also indicates the exact amount of water she draws.

Referring again to the print of the "Porter", it will be observed that at the time of her trial, when lying alongside the dock, her true "water-line" was, as reported by the Naval Constructor on the Board, 6' 1" above her base line. She was on an "even keel", and, as above explained, her "draft", as respecting "trim",

was the same both forward and aft. She was thus exactly "in trim", floating exactly on the lines upon which she was designed, and was neither down by the head nor down by the stern.

The "draft" forward of 3' 1", given in the report of the Naval Constructor on the Board, may refer to the amount of water the "Porter" draws forward. If so, his figures are correct. His deductions, however, that she was down by the stern is erroneous.

Regarding the assertion that the "Porter" is "materially out of trim", and the suggestion that better results would be obtained if she were loaded to "trim" less by the stern, and in view of the great publicity which has been given these opinions through the press, it is deemed advisable to make the following statement of facts from which the Department may draw its own conclusions.

In 1875 I was detailed as the Inspector of the Torpedo Boat "Lightning", which the Navy Department had ordered to be built by the Herreshoff Mfg. Co. Prior to commencing the construction of the boat, Mr. N. G. Herreshoff made a series of experiments with models, towing

them under conditions which would demonstrate the power required for propulsion, the form of hull best suited for speed, and determine other qualities which the boat should possess. These experiments were, at that time, complete and satisfactory; and the "Lightning", built on the model then selected, developed a speed of more than one statute mile in excess of the requirements;-- and a speed which, up to the present time, has never been equaled by a boat of the same "water-line" length.

During the year 1880, similar but much more exhaustive experiments were made, and in accordance with the data then obtained the "stiletto" was built; and that boat (the displacement according to the Navy Register being only 31 tons) with the unusually large trial weight of 9 1/4 tons on board, maintained for three hours a speed of 18.23 knots which was greatly in excess of that attained abroad, at that time, by boats of comparative size under like conditions.

In 1888 when the "Cushing" (of which I was also the Inspector) was contracted for by the same firm, models were again made the subject of experimentand study with a view of determining the form best adapted to speed.

and which should, at the same time, possess the greatest manoeuvering and sea-going qualities. From the calculations then made, and the deductions drawn, a vessel was built which exceeded the contract requirements as regards speed, and which has, during the seven years she has been the property of the Government, frequently demonstrated her ability to maintain that speed; and whose manoeuvering powers have been the subject of frequent admiration; and whose sea-going qualities have been fully proved.

In November, 1895, subsequent to executing the contract for Torpedo Boats Nos. 6 and 7, Mr. N. G. Herreshoff conducted another elaborate series of experiments with towing models, which was witnessed by both Lieut. Wood and myself. Three models were tried at this time and the one finally adopted was given an exhaustive series of tests to determine the difference of resistence due to shifting of weights.

It was then found that at high speeds (upwards of 24 knots) there was a decided tendency to lift the forefoot, and that by distributing the weights so as to prevent this, the towing resistance was greatly increased,

and that much greater power would be required for the propulsion of the boat so ballasted.

After the model had been selected, and the most favorable disposition of weights had been decided upon, Mr. N. G. Herreshoff stated that the boat constructed upon these lines would, at a speed of 27 1/2 knots, expose some three or four feet of her fore-foot, and that prophesy was literally fulfilled in the case of the "Porter" on her trial trip.

The feature of lifting the bow at high speeds led me to investigate the subject and I noted the authentic photographs of the "Chevalier" and "Mosquetaire" (built by M. Normand) showed, when going at high speeds, a most marked similarity to the behavior of the model selected (and as finally trimmed) when towed.

It will thus be seen that the speed obtained by the "Porter" was not due to accident, or to the unexpected "trim" of the vessel, but is to be attributed solely to the results obtained from the progressive series of experiments extending over a period of upwards of twenty years; and that these experiments have been progressive is evident from the fact that the boats built in

accordance with the principles demonstrated, have, in every case, equaled or exceeded all expectations as is shown in the following table:--

Date	Vessel	Speed		
		Contract	Actual	Excess
1875	"Lightning"	19 miles	20.25 miles	1.25 miles
1886	"Stiletto"	17.50 kns.	18.23 kns.	.73 kns.
1890	"Cushing"	22.00 "	22.53 "	.53 "
1897	"Porter"	27.50 "	28.62 "	1.12 "
1897	"Dupont"	27.50 "	? "	?. "

The suggestion of the Naval Constructor, as to the improvement in "trim" of the "Porter", could not have been founded upon the same careful consideration, and scientific investigation which was given this subject by the designer.

As to the tendency of the "Porter" to "squat", and to materially increase her "trim" by the stern at high speed, mentioned in the report of the Naval Constructor, I refer you to the three photographs taken upon the trial while running at high speed. These photographs.

develop the interesting fact that abaft the bow wave, which occurs in the vicinity of the forward conning tower, the "Porter" floats at high speed on practically the same lines as when lying still in smooth water.

In this connection it is perhaps well to call attention to misleading statements which have been made in regard to the displacement of the vessel. In the report of the Bureau Chiefs (Construction & Repair and Steam Engineering) regarding the proposal submitted by the Herreshoff Mfg. Co. for these boats, occurs the following:--

" They (the Herreshoff Mfg. Co.) also offer to
" guarantee a speed of 27 1/2 knots per hour, for
" two hours. This speed is, however, to be obtain-
" ed, as shown by the plans, at a lighter displace-
" ment than that contemplated by the Department's
" plans and specifications:-- the Herreshoff boats
" having to make 27 1/2 knots at a displacement of
" 164 tons, as against a speed of 26 knots at 182
" tons displacement required for the Department's
" boats. The Department's requirements are equiv-
" a lent to a speed of 27 knots at 164 tons so there

" is only a net promised increase of 1/2 knot in the " Herreshoff boats".

From this statement it appears that the boat, for which the proposal was originally submitted, was to have a trial displacement of 164 tons. The displacement of the boat at the time of trial calculated by Mr. N. G. Herreshoff the designer, and from the "draft" of water as reported by the Naval Constructor of the Board, was 163.7 tons;-- and as calculated by Lieut. Wood from the weight of material which entered into construction, the stores, trial weights, etc., etc., (all of which were most carefully tabulated) it was found to be 165 tons. The close approximation of these figures is not to be attributed to a mere coincidence, but is the result of accurate computations.

Regarding the "draft" of the vessel, the plans prepared by the Navy Department for Torpedo Boats Nos. 6 7 and 8 show the water-line at 6' 6 1/2" above the tip of the lower propeller blade. The plan submitted by the Herreshoff Mfg. Co. with their proposal has the "water-line" 6' 7 1/2" above this point; and the plan submitted by the Herreshoff Mfg. Co. after the trials of

the models above referred to, and which was approved by the Secretary of the Navy on the 29th day of January 1896, has the "water-line" at 6' 7" above this point.

The "water-line" as shown is assumed to represent the "draft" of the boat at "normal" load, or with her sea stores and one half of her coal on board. The Naval Constructor Member of the Board reports that the "draft" of the "Porter" aft at the time of trial was 6' 1". The boat had at this time all of her stores, or weights representing the same, and 12 tons of coal,-- or 26 tons less than her "normal" amount -- (her full capacity of coal being 76 tons). The calculated increase of displacement at trial "draft" is 1" for each 4.53 tons, which would be an increase of less than 5 3/4" for 26 tons. In other words, with the "normal" amount of coal on board, the "Porter's" "draft" of water would be 6' 7" as calculated, within very narrow limits.

In view of the above facts, I venture to assert that at the time of the trial the "draft" of the boat did not vary 1/2" from the original calculation; and that the displacement of the boat was within 2 tons of the original computation;-- and I do not believe that

any vessel ever built for the Government has more fully filled the intentions of the designer.

9. The 3rd statement of the Bureau of Construction & Repair criticises the action of the Board of Inspection in not making a personal examination of the bottom of the "Porter" instead of accepting my written report in relation thereto.

The whole subject concerning the bottom of the "Porter" is fully covered by correspondence in possession of the Department, and on this point I would respectfully refer to my communication No. 1361 of May 8th, 1897; to report of Board on Hull of "Porter", dated May 16th, 1897; and to my endorsement thereon.

10. The 4th statement criticises the time when the last three bulkheads were tested, claiming that the test should have been made during an earlier stage on construction and before the preliminary trial.

Circumstances rendered it inconvenient for me to test these three bulkheads before the official trial, but the prescribed tests were made as soon thereafter as practicable, and before I accepted the boat on behalf of the Government. It did not appear to me at the time

that the interests of the Government would in any way suffer were the tests postponed to any convenient time prior to the preliminary acceptance of the boat. Experience with the other bulkheads of a similar character and workmanship, warranted the belief that the remaining three were reasonably tight, and this fact was fully realized upon trial.

11. In the contract and specifications for the "Porter", it is provided that the vessel shall conform to certain plans and drawings. These plans and drawings are general in character, showing the principal dimensions of the boat and from them all detail plans are made during the progress of the work of construction. In order that the Government's interests may be thoroughly protected, it is provided that each drawing shall be approved by the General Inspector of the boat before the material is inspected or the work is commenced. In order to still further protect the interests of the Government, presumably in case of disputes as to agreement of work with drawings, it is provided that the General Inspector shall be furnished with a tracing of each of the drawings. In carrying out these provisions, it

was my custom to inspect the drawings in the drafting room of the Herreshoff Mfg. Co., during the progress of their development, frequently discussing the merits with the designer, and making such suggestions as to alterations or improvements as would tend to increase the efficiency of the boat, or make the work conform to the specifications as near as practicable. All drawings were approved by me before the material was inspected or the work commenced. Copies of all these drawings on tracing cloth have been furnished me by the Contractors, and the required blue prints are now being prepared. The interests of the Government have in no way suffered through the slight delay in the requirement of these tracings, and the work on the vessel and her early delivery were expedited by the methods I pursued.

As to there being serious departures from the plans and specifications, I know of none except what have been duly authorized. In questions of detail I have exercised my judgment, and the authority vested in me as General Inspector. I have always borne in mind that my first duty was to protect the interests of the Government in obtaining an efficient vessel, capable of

meeting all the requirements for which she was intended; but I recognized that in the execution of details it was desirable to take full advantage of the experience and genius of the designer, whose phenomenal success in the production of nearly 200 high speed steam vessels has attracted universal attention. To this end I availed myself of the clause which directs me to deal liberally with the Contractors in relation to changes in detail of construction, so long as the size, strength, and general character of the vessel remains substantially the same. In justification of this policy, and of the wisdom of the methods I have pursued in dealing with the Contractors, I would refer you to the records of the "Lightning", the "Stiletto", the "Cushing", and the "Porter".

12. In conclusion I think it is shown that the statements made in the letter of the Bureau of Construction & Repair, relative to the existence of defects in the "Porter", are not supported by facts.

It is recalled that in the circular for bids on Nos? 6, 7, and 8, the Bureau of Construction & Repair did not expect to realize a speed of more than 26 knots on boats of this class. By means of certain alterations

suggested by the Contractors of Nos. 6 and 7, and through the introduction of new and novel ideas by them, a speed of 26 knots was not only realized but it was exceeded by more than two and one half knots, a performance rarely equaled in the progressive development of Torpedo Boats, and an achievement which can be fully appreciated by those who are acquainted with the difficulties surrounding the problem.

It is believed that the report of the Board of Inspection & Survey that "the Porter is a remarkable product of the highest skill in hull and engine design and construction" will be fully verified, and that the Department possesses a boat whose superior in her class does not exist in the world.

This belief is still further supported by the evidence of the officers serving on board the "Porter", and by the opinion of all unprejudiced observers.

Respectfully,

Commander, U. S. N.,
General Inspector Torpedo Boats Nos. 6 and 7.

Assistant Secretary of the Navy,
Navy Department, Washington, D. C.