TORPEDO BOAT DESTROYERS.*

FOR SEA SERVICE, WITH SPECIAL REFERENCE TO THE CONDITIONS THAT PREVAIL ON THE PACIFIC COAST.

By G. W. DICKIE, Esq.

IMPORTANT naval events are occurring in such rapid succession, modifying opinions that we have maintained as perfectly sound, and forcing others to be abandoned that we had considered as firmly established, that any attempt to produce a paper on the subject I have been requested to write upon may fail to express the opinions of the author when it comes to be presented before the society. In fact, this is the third attempt (begun on the first of August) to put in presentable shape the conclusions arrived at in regard to the chief characteristics required in a design of a torpedo boat destroyer that would meet all the conditions of service on the Pacific coast.

On the first page of a paper that I have just laid aside as not expressing the opinions I now hold, I find the following, that expresses the difficulty of presenting this subject:

"I feel at the present date (April 25, 1898) that I am running some risk of losing any little reputation that I may now possess by the expression of opinions that the stern facts of actual service in any war may prove to be entirely wrong. Still, I desire, if possible, to complete this paper before anything happens that would in any way modify the opinions I now hold in regard to the utility of the latest developments in the construction of the type of vessel known as the torpedo boat destroyer."

More events have taken place since the above was written than usually occur in three months of naval history. In fact, these three months have provided material enough for naval architects, marine engineers, and ordnance experts to form opinions from year to year to come. It takes time, however, to form opinions, and more time to give them anything like practical form, and still more time to test the material forms into which these opinions finally shape themselves. The opinions expressed in this paper have not been entirely formed from the naval events of the past three months, although some of them have been modified by these events.

The conditions of service are not altogether those that war produce. A seaworthy vessel must possess many and varied qualities apart from those belonging to the special service in which the vessel is engaged. A vessel built with the special object in view of carrying large cargoes at a low rate of speed and a low rate of freight must have, besides the capacity to carry, the ability to safely meet the storm conditions of the ocean on which she and her cargo are borne. A fast passenger steamship, built with the special object in view of obtaining the greatest possible speed within the paying limits of the service, must still conform to the stern requirements that the ocean imposes on all those who "go down to the sea in ships and do business in the great waters."

A torpedo boat destroyer must possess other qualities than those necessary for the destruction of torpedo boats. In fact, the destroyer must be a seagoing vessel, able to remain at sea with the fleet to which she is attached or to make independent voyages.

The torpedo boat is intended, if the writer understands the purpose for which such craft are designed, as a part of harbor or coast defense, to be kept under shelter until a chance occurs for her to dart out, under cover of night or fog, and attempt to sink a hostile vessel or vessels. Her work is, therefore, short and sharp, requiring a supreme effort, well directed, and of short duration.

The work of the torpedo boat destroyer is to prevent the torpedo boat attack, and is, therefore, performed in open water. She must keep the sea with the attacking fleet, watching every place of refuge for a torpedo boat. She must, therefore, possess speed equal to that of the torpedo boat; a battery powerful enough to destroy her; seagoing qualities to enable her to keep a watch in spite of weather. She should be able to cover long distances at a high rate of speed, and in stormy weather. The fleet to which she is attached should not be delayed and hampered by guarding her from harm; she ought, instead, to be able in all kinds of weather to act as a scout in advance of the fleet, keeping the larger vessels informed as to the whereabouts of a possible enemy. Such would be an ideal torpedo boat destroyer.

It cannot be said that the present type of torpedo boat destroyer comes near meeting these requirements. Quite a large number of destroyers now meet the requirements, in the matter of speed, if required for a short time only, in smooth water, and if she is in good order; but the one quality of speed has been made paramount to all other qualities to such an extent that full speed can only be reached when the conditions are such that the seagoing qualities can be neglected.

It is because we think that the most important qualities required in a sea-going vessel are deliberately neglected in the fastest torpedo boat destroyers, and which we feel renders such vessels entirely unfitted for service on the Pacific coast, that we have mustered courage enough to state, as plainly as we can in words, the deliberate opinions we have formed on this subject.

While the conditions of service for such a vessel on the Pacific coast are not different in kind from those that prevail on the Atlantic seaboard of this country, the adverse conditions are far greater on the Pacific.

The great distance between harbors on the Pacific coast and the almost universal condition of rough water along the coast from Point Conception in the south to Cape Flattery on the north, with only one place of refuge, renders it necessary that any vessel for practical service outside the harbor of San Francisco or the smooth waters of Puget Sound must have good sea-going qualities and be able to remain outside in all conditions of weather.

The qualities necessary for this service are not possessed in any degree by the present type of torpedo boat destroyer. While they have made voyages of considerable length at sea, they have done so usually under the care of a larger vessel. They have needed

extra care, both in watching the weather, taking advantage of every shelter that lies in the way, and if the destination is reached without mishap, it is something to be proud of, as being entirely outside of the service for which the vessel is fitted.

Now, such a vessel in commission on the Pacific coast cannot go from San Francisco Harbor to any other harbor without making an ocean voyage of several hundred miles, with a probability of encountering rough weather.

The disastrous results of many late attempts to steam or tow light craft to Alaskan waters, most of them better able to stand rough water than the fastest type of torpedo boat destroyers, show the necessity of substantial sea-going vessels for service on this coast.

The 420-ton destroyers lately ordered by our government are a decided improvement in this class of vessel, but we do not think they are fitted even yet to meet the special conditions of service on the Pacific.

The annexation of the Hawaiian Islands requires a much greater radius of action for such a vessel, and, we think, a different treatment. In fact, we maintain that if 30 knots or over is aimed at as the supreme speed, a sufficiently staunch sea-going vessel cannot be produced in the present state of the art, and that the present so-called 30-knot torpedo boat destroyers have not, in fact, the speed with which they are credited as being available when required.

The supreme efforts required, under expert management and with special trial trip crews, to reach the contract requirements are seldom or never repeated in the life of the boats.

If these boats and their machinery were made more substantial, so that their full power could be exerted at any time and without risk, and the hull stand a moderate sea without danger, the 30-knot boat, by reason of the extra displacement, would drop to about 27 knots; yet we venture to assert that such a boat, ordered to reach a point at sea, say one hundred miles distant, in the shortest possible time, would reach the objective point in less time than the regulation 30-knot boat that is said to get a horse power in 50 pounds weight of machinery. A large proportion of naval vessels rated at high speeds, especially those over 20 knots, have obtained such speeds under conditions that cannot be reproduced when the speed is most needed, and a good, reliable, heavy engined, 16 or 17-knot boat may outstrip them in a fight.

Whatever speed a fighting ship has ought to be produced when ordered from the bridge. An Atlantic liner would not be considered a success if in ordinary weather she could not cross the ocean at very near her trial speed, and if the machinery of a naval ship were as substantially built, she could do the same, if necessary, as long as her coal held out. Merchant ships are now making the longest possible sea voyages with a steady and continuous production of steam greater than that produced per foot of grate in naval vessels in three, four, or six hours forced draught trials that are said to be so destructive to boilers.

In the merchant service machinery is built for full power as a normal condition. In the navy full power is only to be resorted to under great necessity, and maintained at a terrible risk; hence the difference.

Returning to the subject proper of this paper, we would propose for a torpedo boat destroyer adapted for service on the Pacific coast the following general characteristics as necessary to meet the conditions of the varied service required, the outline drawings accompanying this paper being illustrations of how we would embody these qualities in a sea-going vessel:

Length on normal water line.....	250 ft.
Extreme width.....	25 "
Depth moulded.....	15 "
Draught of water on trial.....	8 "
Draught of water loaded.....	9 " 5 in.
Displacement on trial.....	640 tons.
Total load displacement.....	800 "
Indicated horse power on trial.....	7,000 "
Speed on trial.....	25 knots.
Radius of action, 12 knots.....	3,200 "
Best speed from San Francisco to Honolulu.....	15 "
Best speed from San Francisco to Puget Sound	
Naval Station, or San Diego, good weather.....	20 "

The weights provided for are as follows:

Ordnance.....	36 tons.
Machinery, including water in pipes and boilers, evaporating plant, tools, spare parts, water in water tanks, etc.....	230 "
Hull, complete, and fittings.....	300 "
Crew and effects, including portable furniture.....	14 "
Coal at normal trim.....	60 "
Making the normal displacement.....	640 "
Coefficient at 8 feet draught.....	0.448

With bunkers full of coal there would be 160 tons added, the full coal capacity being 200 tons.

As will be observed by the outboard profile, we have designed this vessel to have a full fore-castle, extending to the foreward fireroom, and a half poop extending to the engine room. Between the poop and fore-castle a hammock berthing extends the full length.

The 6-pounder guns, of which there are six, would be carried on rail mounts above the hammock berthing. This arrangement would give very good quarters, both for officers and crew.

Casings around the two smokepipes are carried up high enough to carry the inner ends of the boat skid beams. This enables four boats to be carried, while the casings furnish room for the galleys on deck.

We propose to carry two 4-inch rapid-fire guns, one on the fore-castle deck and one on the poop.

The conning tower is of 1-inch nickel steel.

There is a chart house aft of the conning tower and a bridge above. There is also an after steering house on the poop. This covers the stairs to the officers' quarters and carries the searchlight above. This light would be controlled from the forward bridge.

The machinists would occupy a space at the forward end of the poop, entering from the landing leading to the engine room, aft of which would be the ward room and officers' state rooms. The total complement of officers and crew would be seventy-five.

We have, in this vessel, purposely omitted all deck torpedo launching tubes, believing that they should form no part of the armament of a sea-going torpedo boat destroyer, as such a vessel must be prepared to go into action along with the fleet of which it forms a part. Superior speed would enable her to choose the kind of vessel with which she would engage. The deck tubes would, in such a case, if there was any intention to use it, contain a charged torpedo that would, in such an exposed position, be a constant

source of dread to those on board. We have, therefore, arranged for two special submerged torpedo tubes in a protected compartment aft of the engine room. Owing to the limited width of the vessel, these tubes would be designed to open on top instead of at the inner end. We believe that there is no mechanical difficulty in designing the discharging tube and the impeller that carries the torpedo clear of the skin of the vessel before release, so as to admit of the torpedo being placed in the tube from the top side.

The sloping sides of the torpedo room would be of 1-inch nickel steel. We have also provided 1-inch nickel steel protection extending the whole length of the engine and boiler compartments, so as to give a moderate amount of protection when the coal bunkers are empty.

We have shown four Thornycroft boilers in our design and four cylinder, triple expansion engines of 7,000 horse power. We have allowed thirty tons extra weight for the machinery above that allowed for the same horse power in the usual types of torpedo boat destroyer, so as to have a fair margin of safety in all main parts of the engines and boilers.

In this design our aim has been to produce a sea-going torpedo boat destroyer that can go to sea and remain at sea without any special risk, and at sea can maintain a speed of 25 knots for a few hours when such a speed is required; that can make extended voyages, thus serving the purpose of a scout or dispatch boat, whenever or wherever such service is required; that carries a battery that makes her a torpedo boat destroyer in fact.

This boat would show better speed under regular service conditions than any of the so-called 30-knot torpedo boat destroyers, and for seaworthiness, habitability, or fighting capacity far outranks them.

DESIGNS OF THE NEW VESSELS FOR THE UNITED STATES NAVY.*†

By Chief Constructor PHILIP HICHBORN, United States Navy.

THE proceedings of this society form so convenient and—if I may be allowed to say it—so valuable a reference in regard to the general design of the various types of vessels comprising our naval force, that I felt I could not consistently refuse to contribute a paper at the present meeting, notwithstanding the fact that I had hardly time to do proper justice to the subject.

Since our last meeting, practically every type of vessel the government possesses has been put to the test in engagements with the enemy. There is no record, so far as I know, of the failure of any vessel to fulfill all expectations. The wonderful success attending these naval engagements has impressed the country at large with the value of, and the necessity for, an efficient navy. Congress responded to this sentiment promptly and liberally, and within the past six weeks contracts have been made for three additional battleships, four coast defense monitors, sixteen torpedo boat destroyers and twelve torpedo boats. A full ship-rigged sailing vessel was also authorized as a practice ship for the Naval Academy, and is already under way. There are a few features connected with each to which I wish to invite your attention. At the present stage I am able to give only approximate data regarding the battleships, being the result of preliminary calculations in connection with one design.

Particulars regarding each design are arranged as conveniently as possible in the form of an appendix, and fairly complete plans—upon which the paper depends principally for its value—are attached.

BATTLESHIPS.

Believing that the "Alabama" class represented an efficient type, the Department in issuing circulars and plans for the three vessels appropriated for concluded practically to duplicate that class as regards size, speed, armament, etc. It was decided, however, to invite bidders to submit their own designs, offering preference—other things being equal—to bids guaranteeing the highest rate of speed and greatest coal endurance, without exceeding the total weight of engines, boilers, and coal, or the space allowed therefor, as provided in the Department's plans and specifications.

The result was highly satisfactory. The designs submitted, after some revision, provided in effect an 18-knot vessel 20 feet longer and of 1,000 tons greater displacement, but in other respects conforming to the original plans and specifications, excepting, of course, the changes in design of boilers and engines to meet the additional requirements of power on the weight allowed.

The preliminary acceptance of these propositions had to be followed by a revision of plans and specifications before any contract could be drawn. At the time of preparing my paper, this work was still in hands of the builders, and I regret having been therefore unable to obtain plans and particulars as complete as I should have liked. General plans of the "Maine," intended to accompany the contract, were received in time to allow their utilization in illustrating the paper, and will be found appended. While there will probably be some variation from these plans in the other vessels, as regards the type of boilers and engines, they may be considered as fairly representing the class, and an examination will show that, in general, the vessels will be enlarged and speedier types of the "Alabama."

General dimensions and particulars of this design are tabulated in Appendix I. As remarked in the introduction, however, very little of this information can be considered as absolutely accurate or fixed, as a great deal of it is the result of only the preliminary design and calculations.

The machinery details, it must be remembered, are for one of the three designs only.

A clause in the contracts provides suitably for the making of certain changes in armor and armament, within six months, such changes being suggested by recent developments in the manufacture of armor and guns. It is believed, for instance, that a reduction of at least 25 per cent. in the thickness of heavy armor can be made when treated by the Krupp process without lowering its efficiency in resisting penetration.

* Read at the sixth general meeting of the Society of Naval Architects and Marine Engineers, held in New York, November 10 and 11, 1898.

† In the current issue of the SCIENTIFIC AMERICAN will be found illustrations and diagrams, with a detailed description, of the amended designs for the ships of the "Maine" class.

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