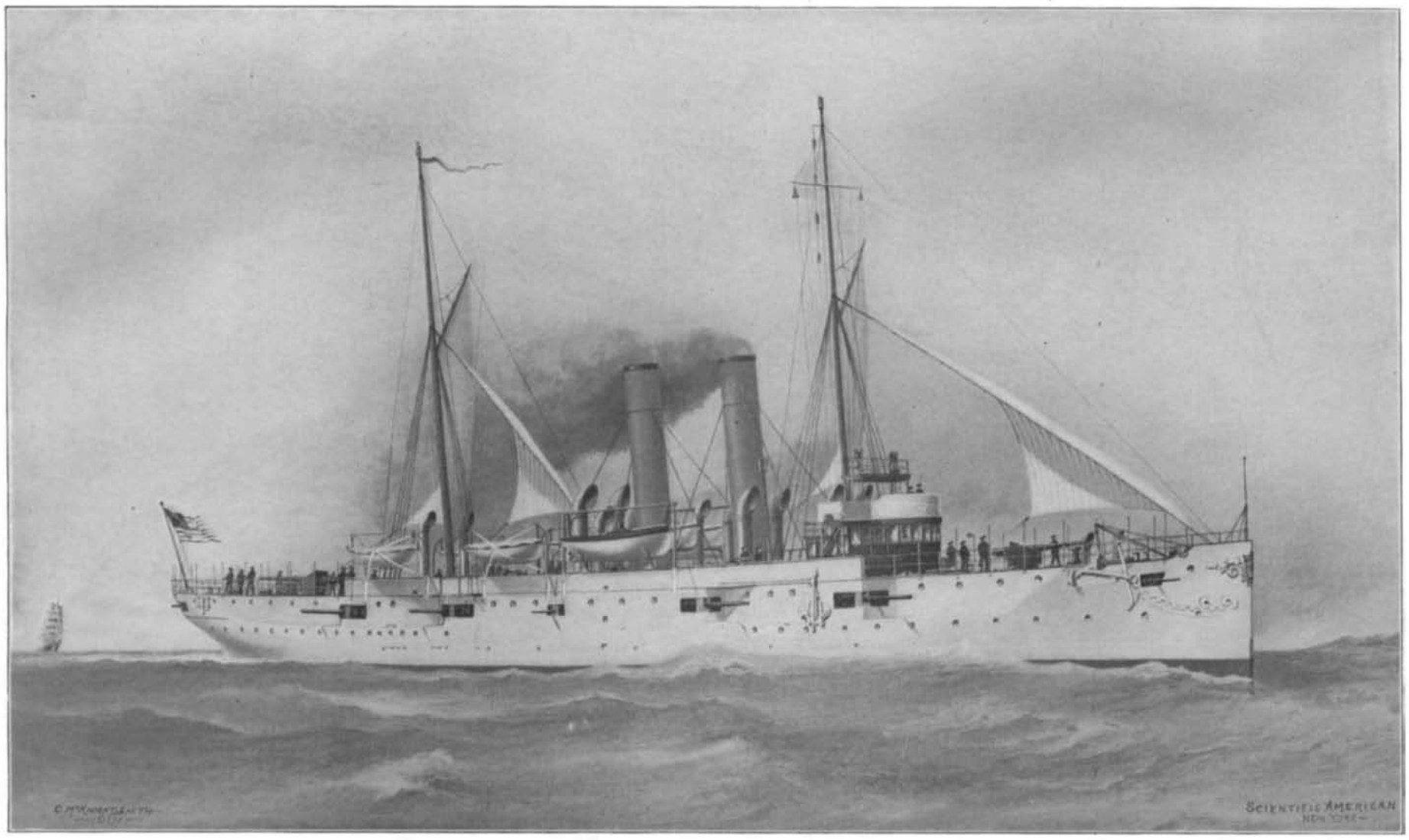
for long voyages and foreign service, liberal berthing accommodation had been made for the crew and more spacious staterooms for the officers. It was further shown that there was no open waist amidships, as in the "Raleigh," the upper deck being carried flush throughout the vessel, and thus giving more deck room and a higher freeboard; and, lastly, that, though the waterline protection is exceedingly light, consisting merely of an inner sloping deck 1 and 2 inches in thickness, considerable protection is afforded by a cofferdam 27 inches in width by 4 feet in depth, filled with waterproof corn-pith cellulose; while back of the cofferdam, in the wake of the engines and boilers, will be coal bunkers presenting a horizontal protection of from 8 to 10 feet of coal when the bunkers are full.

We have no doubt whatever that the prediction of the late Chief Constructor that the vessels will be exceedingly comfortable and will become, on that account, popular with officers and crew, will be fulfilled, at least in peace times; and no doubt the vessels will find a useful sphere of work in representing this government at foreign stations. We cannot help asking the question, however, as to what would be the fate of one of these slow, poorly-protected vessels should she fall in with an armored, or even a protected, cruiser of 20 knots speed or over, that was capable of overhauling her and overmatching her with the power of her armament. The type is one that is too slow to run away and too poorly protected to stand up and fight a modern cruiser with any great likelihood of success. What, for instance, would happen to the ½-inch protective (*sic*) deck if high-explosive shells, even of small caliber, were bursting above it?



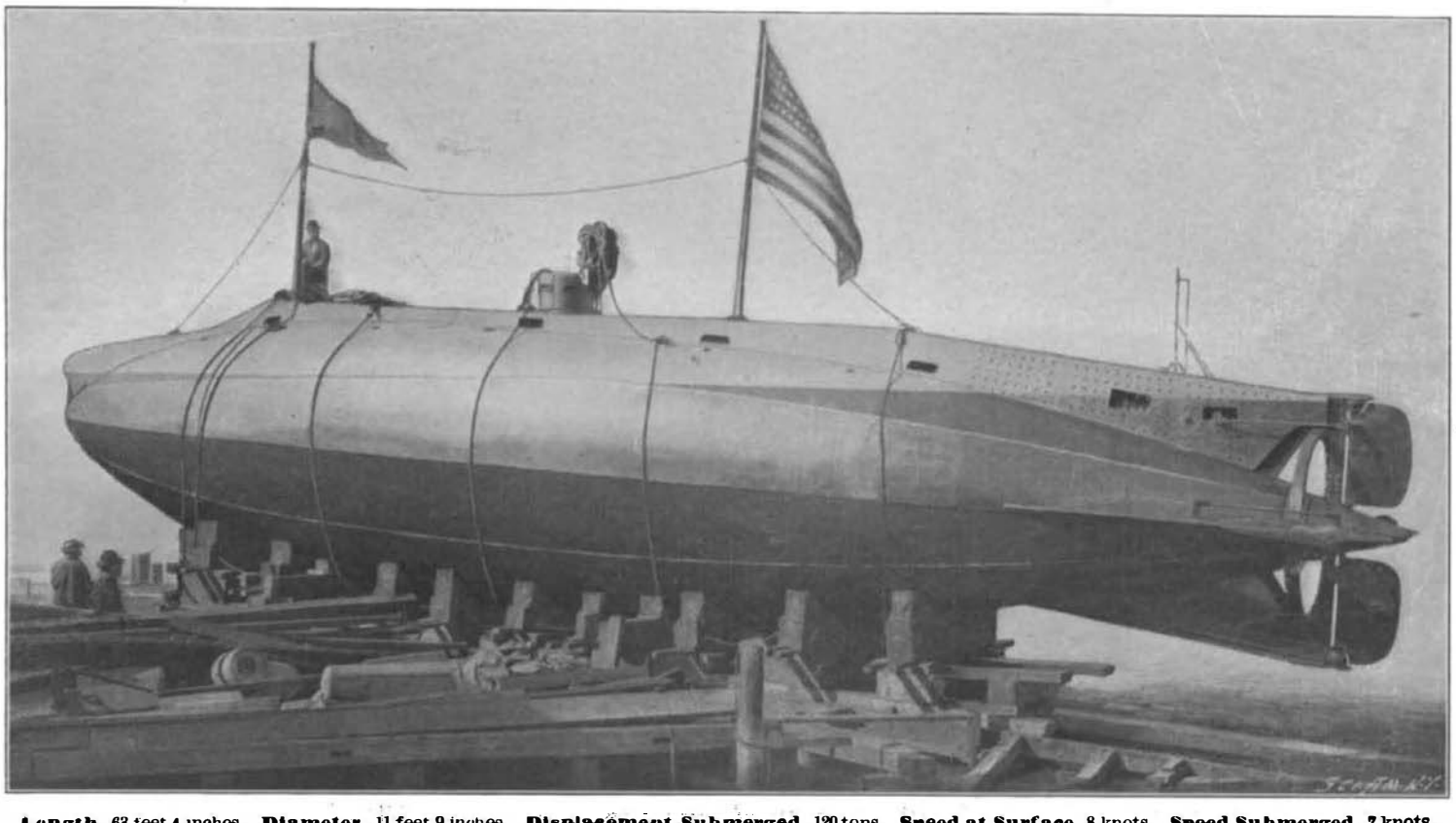
Displacement, 8,200 tons. **Speed,** 16½ knots. **Bunker Capacity,** 700 tons. **Armor:** Deck, ½ inch on flat, 1 inch to 2 inches on slopes. **Armament:** Ten 5-inch R. F.; eight 6-pounders; two 1-pounders four Colts; one 3-inch field gun. **Complement,** 293.

SEMI-PROTECTED CRUISER "DENVER." ALSO "CLEVELAND," "CHATTANOOGA," "DES MOINES," "GALVESTON," AND "TACOMA."

Submarine Torpedo Boats.

THE HOLLAND SUBMARINE TORPEDO BOAT CLASS.

The United States government has now no less than eight submarine boats constructed or under construction. These are of the Holland type, which has been adopted by our own and by the British navy. In the absence of any experience with the submarine under the hard conditions of actual warfare, it is difficult to assign to this novel craft its proper value as a fighting unit of the navy. Just now, its value varies from nothing to everything, according to the conservative judgment or over-sanguine temperament of the critic. The friends and promoters of the submarine have undoubtedly committed the old fault of claiming too much, and there will come, if there has not already begun, a protest on the part of practical naval men against the impossible qualities which have been ascribed to what is, at best, an untried device. The method of attack of the submarine is outlined somewhat as follows: The little craft will steam to within striking distance of a battleship, and before her conning tower can be detected, will sink beneath the surface, approaching, still unsuspected, until within view of the vessel's unprotected hull. She will then discharge her torpedo and stealing away under water, will come to the surface beyond range of the enemy's guns. All this is picturesque and, if practicable, would certainly be awe-inspiring. There is one difficulty, however, which would render an exploit of this kind exceedingly hazardous, and that is the impossibility of seeing under water with sufficient clearness for maneuvering. When the boat is submerged the navigator can see but dimly, if at all, and his course, as laid, is subject to errors in both a vertical and a horizontal plane. The chief value of the submarine will lie in its moral effect in keeping the enemy continuously on the move, particularly should he be engaged in blockading a harbor in which a few submarines were known to exist.



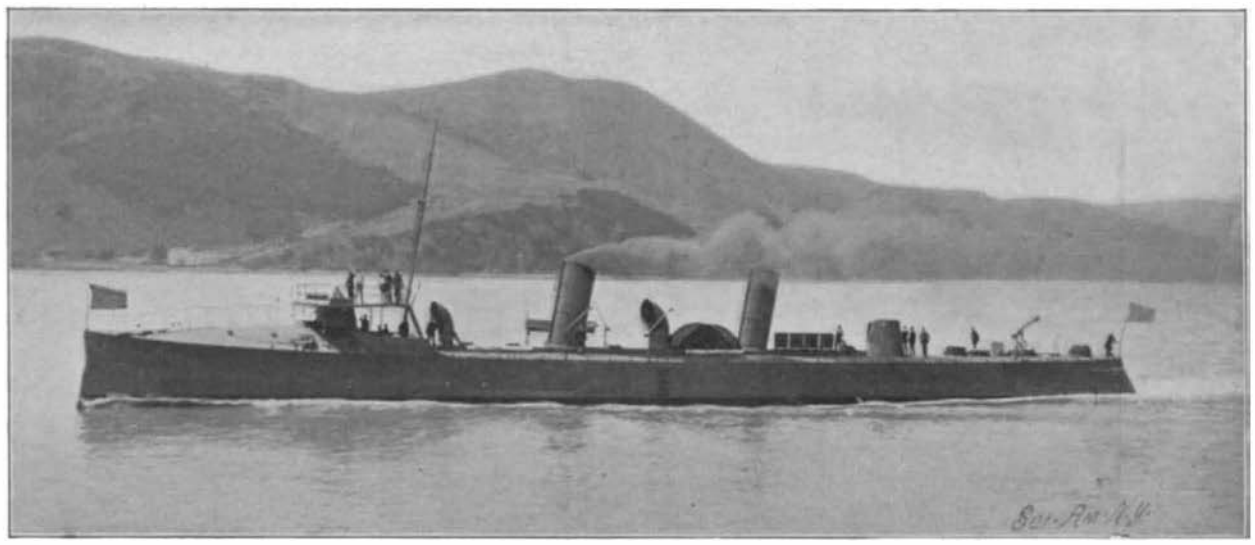
Length, 63 feet 4 inches. **Diameter,** 11 feet 9 inches. **Displacement Submerged,** 120 tons. **Speed at Surface,** 8 knots. **Speed Submerged,** 7 knots. **Gasoline Tank Capacity,** 850 gallons. **Armament:** One torpedo-expulsion tube; five 45 cm. by 11 feet 8 inches Whitehead torpedoes.

THE HOLLAND SUBMARINE TORPEDO-BOAT CLASS—"HOLLAND," "ADDER," "GRAMPUS," "MOCCASIN," "PIKE," "PORPOISE," AND "SHARK."

The first of our torpedo boats, the "Holland," is 53 feet 11 inches long, 10 feet 3 inches diameter and 74 tons displacement, and is driven by a 50-horse power engine. She carries one torpedo tube and one dynamite gun as her armament. The six vessels author-

ized June 7, 1900, are 63 feet 4 inches in length, 11 feet 9 inches in diameter and have a displacement, submerged, of 120 tons. When on the surface, they are driven by a single-screw, four-cylinder, Otto gasoline engine of 160 horse power. They are provided with a generator of 70 horse power, which may be either driven by the gasoline engine for charging the batteries, or, when the boat is submerged, the generator can be thrown onto the batteries and used as a motor for driving the propeller.

These six submarines are built with a double bottom and with three watertight compartments. In the forward compartment are the gasoline tank, the expulsion tube, and the air flasks for the discharge of the torpedoes. The amidship compartment contains the main ballast tanks, which are located in the double bottom, and above them are the storage batteries, the torpedoes, and the air flasks in which fresh air for the crew is stored at 2,000 pounds pressure. In the third compartment at the stern are the gasoline engine, the motor, the clutches and the steering gear. Submersion is achieved by trimming tanks assisted by a pair of horizontal diving rudders at the stern. The vessel is controlled from a conning tower protected with four inches of armor. Considerable experience has been gained with the "Holland," which has served as a school of instruction in which crews and officers are enabled to familiarize themselves with this type of craft. The most interesting experiment thus far was the recent sinking of one of the "Hollands" to the bottom of Peconic Bay, where she remained for fifteen hours without coming to the surface. The officers and crew experienced no inconvenience whatever from vitiated atmosphere. Whether the same immunity would be realized were the batteries and motor power in operation is, of course, an open question which could only be solved by an actual trial.



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Length, 213 feet. **Beam,** 20 feet 7¾ inches. **Mean Draft,** 6 feet. **Displacement,** 279 tons. **Speed,** 30.1 knots. **Bunker Capacity,** 95 tons. **Armament:** Two 18-inch Whitehead torpedoes; four 6-pounder R. F. guns. **Complement,** 66.

TORPEDO-BOAT "FARRAGUT."

Torpedo-Boats and Destroyers.

TORPEDO-BOAT "FARRAGUT."

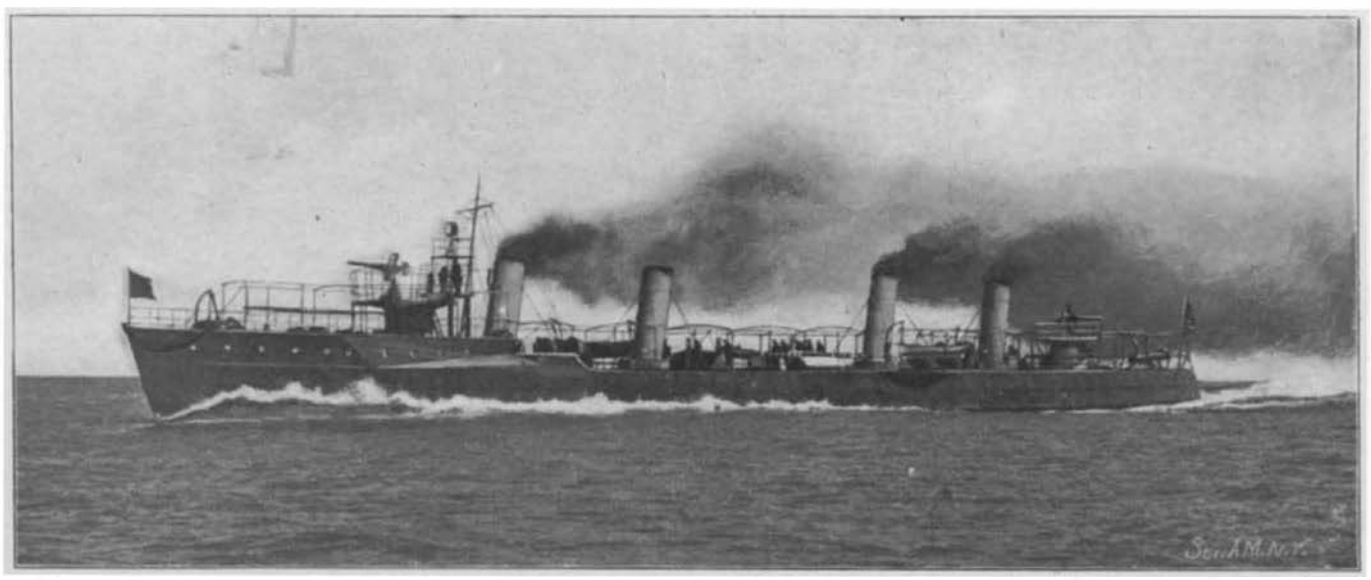
In the matter of torpedo-boats and torpedo-boat destroyers the United States navy has been content to pursue a conservative course, rather than rush into the wholesale construction of these craft with that precipitancy which has characterized some European navies. Up to the year 1890 we did not have a single torpedo-boat in commission, and at the present time we have but thirty-five of these little vessels, all told, on our naval list; whereas there are some navies which number them by the hundred. The value of the torpedo-boat is even to-day an unsettled question, and the complete loss of the destroyers "Cobra" and "Viper" during the past few months, together with the severe straining which has taken place in heavy weather of other craft of the torpedo-boat destroyer type, has reopened the question of the proper design, size and strength of torpedo craft to render them serviceable and safe upon the high seas. Hence, it is a matter of congratulation that, if we decide to increase our torpedo fleet, we have the advantage of experience gained in the maneuvers of foreign fleets; while, on the other hand, should the torpedo-boat pass out of fashion, we shall not have a large tonnage of worthless material on our hands. Our thirty-five torpedo-boats vary in size and speed from the "Gwin," of 46 tons and 21 knots speed, to the "Stringham," of 340 tons and 30 knots speed, and the "Bailey," "Goldsborough" and "Farragut," of 247 to 280 tons displacement and 30 knots speed. The last three craft were originally designed as torpedo-boat destroyers; but our Naval Constructors reached the conclusion that the destroyer, to be fully equal to its work, should be a larger and more powerful vessel, and consequently when the sixteen torpedo-boat destroyers of the "Bainbridge" type were designed the four vessels named above were relegated to the torpedo-boat class. As torpedo-boats they will be the largest in the world; indeed, they will exceed in size many of the destroyers in other navies. The "Farragut," which is herewith shown after her launch from the Union Iron Works, San Francisco, is typical of the larger torpedo-boats. She is 213 feet in length, 20 feet 7¾ inches in beam, and has a mean draft of 6 feet, at which draft she displaces 279 tons. She is driven by twin-screw, vertical, triple-expansion engines of 5,600 horse power, and she has made on trial a speed of 30.13 knots per hour. The bunkers have a capacity of 95 tons. The armament consists of two long 18-inch Whitehead torpedo tubes and four 6-pounder rapid-fire guns. She has a complement of 66 officers and men.

Of the total thirty-five torpedo-boats in our navy twenty-three have been commissioned or completed since the close of the Spanish war.

TORPEDO-BOAT DESTROYER "PERRY."

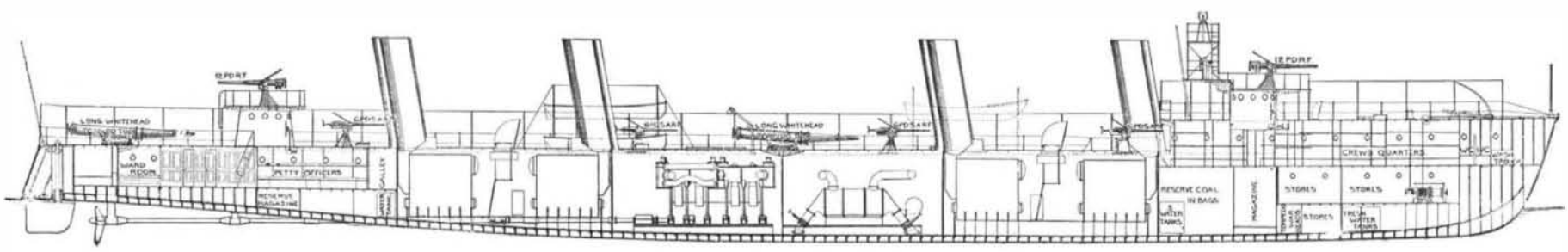
The torpedo-boat destroyer owes its existence to the theoretical prowess of the torpedo-boat. The torpedo-boat was one of those devices which periodically figure in the scare-head lines of the daily press as "annihilators," and the torpedo-boat destroyer is the annihilator of the annihilator. As soon as a few of the early torpedo-boats were built and began to maneuver with the fleets, it was found that they were altogether unseaworthy, at least so far as maintaining their speed in a jump of a sea was concerned. Hence, the idea of the torpedo-boat destroyer—a larger edition of the torpedo-boat, armed with heavier guns, and, by virtue of her greater speed and weight, able to run down the torpedo-boat and sink her. As the tendency in the construction of torpedo craft, whether of the torpedo-boat or destroyer type, has always been toward increase in size, our Naval Constructors when designing the sixteen torpedo destroyers, authorized May 4, 1898, very wisely made them considerably larger than the destroyers which were being built for foreign navies. We present an illustration of the "Perry," built by the Union Iron Works, at San Francisco, which was taken when she was making one of her trial runs at full speed. The cylinders of the "Perry" are 20½, 32, 38, and 38-inch diameter by 22-inch stroke. At 327 revolutions the horse power is about 8,000. The steam at the boilers is at 300 and at the engines 250 pounds pressure. There are four Thornycroft water-tube boilers, two forward of the engines and two aft.

Nine of the destroyers are of 420 tons displacement and are designed for speeds of 28 and 29 knots with 8,000 indicated horse power. They are known as the "Bainbridge," "Barry," "Chauncey," "Dale," "Decatur," "Paul Jones," "Perry," "Preble," and "Stewart," being named after heroes whose names are associated with the most brilliant episodes of our naval history. Each destroyer carries on the main deck two torpedo tubes for the discharge of the 18-inch Whitehead torpedo. The armament consists of two 12-pounder rapid-fire guns carried, one forward and one aft, above the conning towers and protected by shields. There are also five 6-pounders carried in broadside on the main deck. These vessels have a length of 245 feet, a beam of 23 feet 7¼ inches, and a draught of 6 feet



Length, 245 feet. **Breadth,** 23 feet 7¼ inches. **Draft,** 6 feet 6 inches. **Displacement,** 420 tons. **Contract Speed,** 29 knots. **Bunker Capacity,** 139 tons. **Armament:** Two long 18-inch Whitehead torpedo tubes; two 3-inch R. F. guns; five 6-pounders. **Complement,** 73.

TORPEDO-BOAT DESTROYER "PERRY"—"BAINBRIDGE" CLASS OF SIXTEEN VESSELS.



LONGITUDINAL SECTION, SHOWING INTERNAL ARRANGEMENTS OF TORPEDO-BOAT DESTROYERS.