navy. She is of steel, 252 feet in length and 929 tons displacement, and has a speed of 21.5 knots. In the forward part of the ship are placed three pneumatic guns that form her armament. These are built into the ship. Their muzzles are carried forward and project above the deck near the bow at an elevation of 18 degrees. They are 15 inches in diameter, 54 feet long, and are made of thin cast iron. The rear end of these guns, or tubes, extend down to the bottom of the ship. The dynamite shells for the guns are 14¾ inches in diameter and about 7 feet long. The submarine explosion of a shell from the Vesuvius would probably destroy a ship 20 or more feet distant. The dynamite projectiles are hurled from the tubes by means of compressed air, 1,000 pounds pressure. Ten projectiles are provided for each gun. This is the full armament of the ship so far as torpedoes are concerned. In firing, the guns have a fixed elevation. Their range is varied by admitting more or less compressed air in the tubes. The guns are trained by action of the helm of the vessel. The hull of the Vesuvius is actually a floating gun carriage with three pneumatic tubes built rigidly into her construction. Besides the dynamite guns the vessel carries three 3-pounder rapid-fire guns. The cost of constructing the Vesuvius was $350,000.

The armored ram Katahdin is designed especially for harbor defense—for ramming an enemy. She has a small armament of four 6-pounder rapid-fire guns, and is protected by 6 inches of steel on her sides and the slopes of her deck and 2 inches on the flat. She is 250 feet in length and has a displacement of 2,155 tons. Her speed, however, is only 16 knots, which is a serious fault, as speed and rapidity of action are essential for a ram.

The Dolphin was originally intended for the dispatch boat of the navy, but her speed, only 15.5 knots at the best is insufficient. She is constructed of steel, and has no armor or protection. The armament of this vessel is two 4-inch rapid-fire guns, two 6-pounder rapid-fire guns, and four machine guns.

PROTECTED CRUISERS. A protected cruiser is a cruising vessel, the engines, boilers, magazines, steering gear and other vital parts of which are protected by a turtle-back of steel armor which reaches below the water-line on either side, and fore and aft the entire length of the ship. This turtle-back, or protective deck as it is called, is from 2 to 4 inches in thickness on the slopes and from 1 to 2 inches on the flat. The idea in constructing a cruiser is to keep her as light as possible, that she may attain high speed and also be quickly handled. The design of the protective deck is to deflect projectiles coming into the ship in the vicinity of water line, and thus prevent damage being done to the vital parts of the vessel. This is the only protection which the hull of a protected cruiser has against the fire of an enemy. But sometimes the guns of this class of vessel are protected by a light shield of steel or thin armor. The battleships and armored cruisers also have protective decks. A cruiser does not, except in rare cases, carry as heavy guns as a battleship, and then she only carries one or two of them, as in the case of the Spanish cruiser Vizcaya.

All of the following ships are protected cruisers:

NAME.	Displacement. (Tons.)	Speed. Knots.	Coal Capacity Tons.	NO. GUNS. Main Battery.	NO. GUNS. Secondary battery
Atlanta	3,000	15.60	490	8	13
Baltimore	4,413	20.10	1,144	10	15
Boston	3,000	15.60	496	8	12
Charleston	3,750	18.20	758	8	15
Chicago	4,500	18.00	832	18	12
Cincinnati	3,213	19.00	460	11	13
Columbia	7,375	22.80	1,670	11	19
Minneapolis	7,375	23.07	1,891	11	19
Newark	4,098	19.00	809	12	17
Olympia	5,870	21.69	1,170	14	26
Philadelphia	4,324	19.68	1,086	12	18
Raleigh	3,213	19.00	460	11	15
San Francisco	4,098	19.53	628	12	18

UNPROTECTED CRUISERS. The Detroit, Marblehead and Montgomery are unprotected cruisers of a displacement each of a little over 2,000 tons. Each has a coal capacity of 340 tons and a maximum speed of about 19 knots. In each is a thin water-tight deck of steel which is similar to the protective decks of the other cruisers, but in thickness is only 7-16 inches on the slopes and 5-16 on the flat. These vessels are light, draw only 16½ feet of water, and can be handled readily. These vessels, exclusive of armament, cost the government about $620,000 each. Unprotected cruisers rely for protection against serious injury solely upon coal and a very minute sub-division of the compartments in the region of and below the load line. This is further secured by cofferdams worked in the vicinity of the machinery spaces and filled with cellulose or other water-excluding material, to prevent the water, in case of injury, from finding its way to the larger compartments in the center of the vessel.

The armament of each of these vessels consists of ten 5-inch, six 6-pounder, two 1-pounder all rapid-fire, and two Gatlings, except the Marblehead, which has two Colt automatic guns in place of the Gatlings. Each vessel also has one field gun.

MONITORS. The Amphitrite, Miantonomoh, Monadnock, Monterey, Puritan and Terror are low freeboard double turreted coast-defense monitors. Each has a belt of steel armor along and above the water line, and the turrets are also heavily armored. Each has also a flat protective deck of about 2 inches of steel. These vessels are not designed for cruisers, or chasing an enemy, but for defensive purposes. They lie very low in the water, almost submerged, and are sluggish in maneuvering. Their speed is but 10 or 12 knots, which, however, is sufficient for the purpose for which they are intended. The main batteries of the double turreted monitors consist of 10-inch and 12-inch breech-loading rifles. These vessels cost the government abont $1,800,000 each.

The thirteen low freeboard single turreted iron monitors were built in 1862, and still are on the navy list, loaned to the naval militia of the various states. They are as follows;

Ajax, Jason, Montauk,
Comanche, Lehigh, Nahant,
Canonicus, Mahopac, Nantucket,
Catskill, Manhattan, Passaic,
Wyandotte.

Each of these single turreted monitors has a pair of XV-inch smooth-bore guns in her turret. The original cost of these monitors was about $500,000 each.

STEEL GUNBOATS. During the past ten years ten unarmored steel gunboats have been added to the navy:

Bancroft, Bennington, Castine,
Concord, Helena, Machias,
Nashville, Petrel, Wilmington,
Yorktown.

These gunboats are similar in construction to the unprotected cruisers, but are somewhat smaller. Their displacements vary from 839 tons, in the case of the Bancroft, to 1777 tons, in the case of the Machias.

COMPOSITE GUNBOATS. Since 1897 six unarmored composite gunboats have been added:

Annapolis, Marietta, Newport,
Princeton, Vicksburg, Wheeling.

A composite vessel is built with steel frames and is plated with steel above and with planking below the water line, the planking being coppered as in a wooden sailing vessel. When greater strength is required the vessel is built with a complete steel shell and the under-water planking is wood-sheathed and coppered. By reason of this a composite vessel can remain away from a dry dock for a considerable time, while a vessel with her steel bottom exposed to the action of the salt water must dock every few months and scrape and paint. The hull and machinery of this class of vessel cost about $225,000.

TORPEDO-BOATS. The torpedo-boat is built for the sole purpose of carrying and firing torpedoes.

The requisites are high speed, the power to suddenly stop dead in the water, or to back, or to turn quickly. Besides she must be down low in the water so as to present as little target as possible to the enemy. Then she must be noiseless or she could not creep up to her prey under cover of darkness, fog or smoke without making her presence known. Invisibility and the swiftest movement are essential to a successful