SCIENCE

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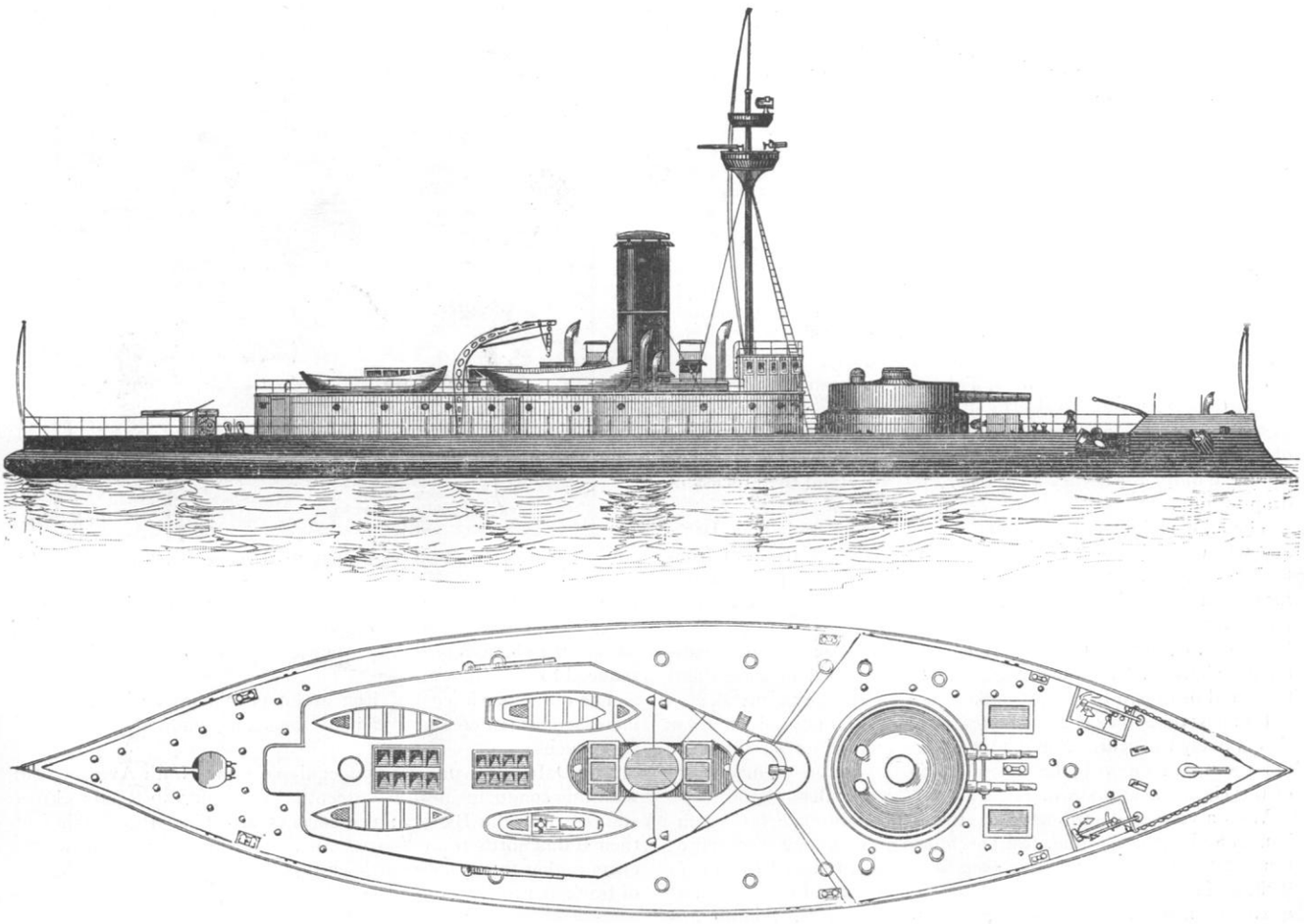
THE SUBMERGING MONITOR CRUISER.

THE calls for models and designs of battle-ships and other war-vessels issued at various times by the Navy Department have resulted in the collection of many valuable plans and much data that will tend toward the construction of a navy of which the country may justly feel proud. Among the designs submitted that possess some novel features is that of Hon. J. R. Thomas, United States Representative from Illinois. It is intended in this vessel to combine large powers of offence and defence on as small an amount of displacement as is possible, recognizing that the efficiency of an armored vessel intended for ocean or coast purposes is to be measured by the disposition and character of her armament, the ability to use it in all reasonable weather, the protection afforded by the armor, the rate of speed both going ahead and turning, her cruising capacity without recoaling, and her habitability.

This cruiser is 235 feet in length, with a beam of 55 feet. She displaces 3,030 tons on a draught of 14½ feet. One great point to be observed by war-vessels intended for service on our coast is that of keeping the draught as small as possible, in order to insure the entry of these vessels into our ports on the south-eastern seaboard and the Gulf coast, many of which are so shallow that the heavy class of armored vessels at present afloat cannot enter. In this vessel the trouble has been overcome in a very great measure by keeping her draught inside of 15 feet. Her 7,500 horse-power promises a speed of 17 knots, which may quite possibly be increased before the final plans are approved. The main battery consists of two 10-inch breech-loading rifles mounted in a turret, armored with 10 inches of steel plating. There is, in addition, a 15-inch Zalinski dynamite gun capable of throwing 800 pounds of high explosive at any distance within a range of two miles. There are two under-water bow torpedo-tubes, and a 6-inch rapid-fire gun on



THE SUBMERGING MONITOR CRUISER.

the after deck. To these are added several rapid-fire guns of the smaller calibers, placed at the most commanding positions about the vessel. Her single military mast, in addition to the armored top, carries a powerful search-light mounted on an upper platform.

To give as great an armor protection as possible on a very limited displacement, the armor has been disposed in the form of an arc of a circle, turning downwards at the sides to four feet below the fighting-line. The armor on the crown is three inches in thickness, increasing to five inches at the sides. In order that the target presented to an enemy may be as small as possible; ballast-tanks have been provided capable of holding enough water to lessen the cruising freeboard three feet; so that the hull target exposed, in still water, will be represented by a segment of a circle, rising from zero at the water-line to four feet above at the centre of the vessel.

Particular attention has been paid to the subject of water-tight compartments, and the appliances for readily freeing them from water, both in case of accident and for restoring her to the normal line of floatation.

The ram bow with which this vessel is fitted, the speed that she is calculated to attain, and her handiness, all combine to render her a formidable and valuable addition to our seacoast defences, while her coal capacity, and ability to remain at sea at a 10-knot speed for over a month without recoaling, make her of the highest service as a cruiser.

Great care has been bestowed on the subject of light and ventilation below. A complete electric plant, comprising lights, fans, and blowers for ventilating, with all modern improvements, will undoubtedly do away with many of the ills that prevailed aboard former types of low-freeboard ironclads.

TOBIN BRONZE.

THIS alloy, manufactured by the Ansonia Brass and Copper Company, New York and Chicago, is attracting attention on account of its high elastic limit, tensile strength, toughness, and uniform texture. When rolled hot, the tensile strength of the bronze has been found to be greater than that of mild steel, certain tests showing for the bronze an average tensile strength of 79,600 pounds per square inch, and for steel 65,630 pounds; the elastic limits being 54,257 pounds and 36,510 pounds respectively.

Further, at a dead red heat, Tobin bronze can be forged and stamped as readily as steel. It is maintained by those who have experimented with and tested different kinds of metals with a view of determining their utility for forgings, that they find Tobin bronze to be the only bronze they have tried that will stand the process of drop-forging.

The alloy is lighter than copper, can be worked well in a lathe, and when finished has a bright golden color. Its freedom from blow-holes, durability, and anti-frictional properties adapt the bronze for use on all bearing surfaces; while its lightness, in addition to its great tensile strength, and resistance to the corrosive action of sea-water, renders it a suitable metal for condenser-plates, steam-launch shafting, ship sheathing, etc. When rolled in sheets and tempered or drawn in wire, it makes an excellent spring metal.

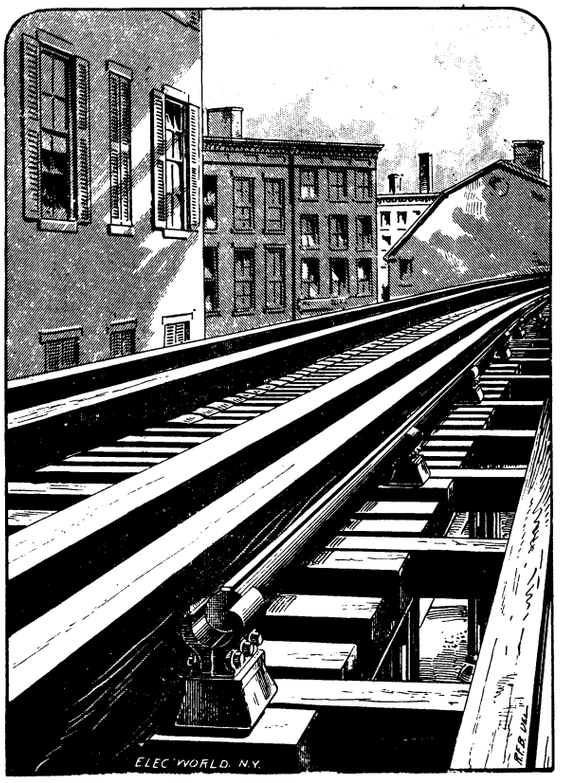
Its resistance to oxidation makes it a useful material wherever this is likely to occur. Some interesting experiments on this very point were made with the bronze by the inspectors of machinery of the United States steamers "Concord" and "Bennington."

With a view to determining its torsional endurance for steam-launch and yacht shafting, test specimens an inch long were cut at random from three-fourths-inch hot rolled rods, reduced to half an inch, and subjected to a torsional test in comparison with the best quality of machinery steel selected by Professor J. E. Denton, professor of experimental mechanics at Stevens' Institute, and tested by him on Thurston's autographic testing-machine. The results were as follows: average load at end of one-foot lever, which strained samples to elastic limit, for bronze 328 pounds, for steel 340 pounds; which ruptured samples, for bronze 633 pounds, for steel 711 pounds.

Another notable quality — its non-liability to give forth sparks — makes it invaluable for gunpowder machinery and gunpowder tools of every description.

A LARGE ELECTRIC-CURRENT CONDUCTOR.

A NEW departure in current conductors for electric-railway purposes has been taken by the Daft Company, who are now operating trains on a section of the Ninth Avenue Elevated Road in this city. The new kind of conductor is shown in the accompanying picture, which is a view on the road mentioned, looking south from Fourteenth Street. The conductor, which is supported by heavy insulated cast-iron brackets, runs along outside the outer guard-rail of each track. It is of round iron, three inches in diameter, and is surmounted by, and in perfect electrical contact with, a bar of phospor bronze three-eighths of an inch thick by one inch wide. This bar takes all the wear from the contact apparatus, and will retain a polished surface under all circumstances. The supporting bracket is made in two parts, as may be seen in the illustration, and has a grip sufficient to prevent all possibility of displacement



NEW DAFT CONDUCTOR, NEW YORK ELEVATED ROAD.

of the conductor. The conductor is elevated a considerable distance from the ties, and the supporting brackets are well insulated, so that the chances of loss of electric energy through leakage are reduced to a minimum.

The difference in cost of iron and copper admits of the greatly increased size of conductor, giving the same conductivity at much less expense.

The Daft Company are now equipping the Ninth Avenue road with this conductor from Fourteenth Street south to Rector Street station, near the Battery; the success attending the running of their trains north from Fourteenth Street during the past winter encouraging them to extend operations and equip a greater length of track as rapidly as possible.

A METEOROLOGICAL EXHIBITION.

SEVERAL months since, the New England Meteorological Society, following the annual custom of the Royal Meteorological Society of London, decided to hold a loan exhibition in Boston in connection with its fourteenth regular meeting. The exhibition was opened in the physical laboratory of the Massachusetts Institute of Technology, Jan. 15, and was continued seven days. Among those who sent apparatus were Mr. Rotch from his Blue