SCIENTIFIC AMERICAN

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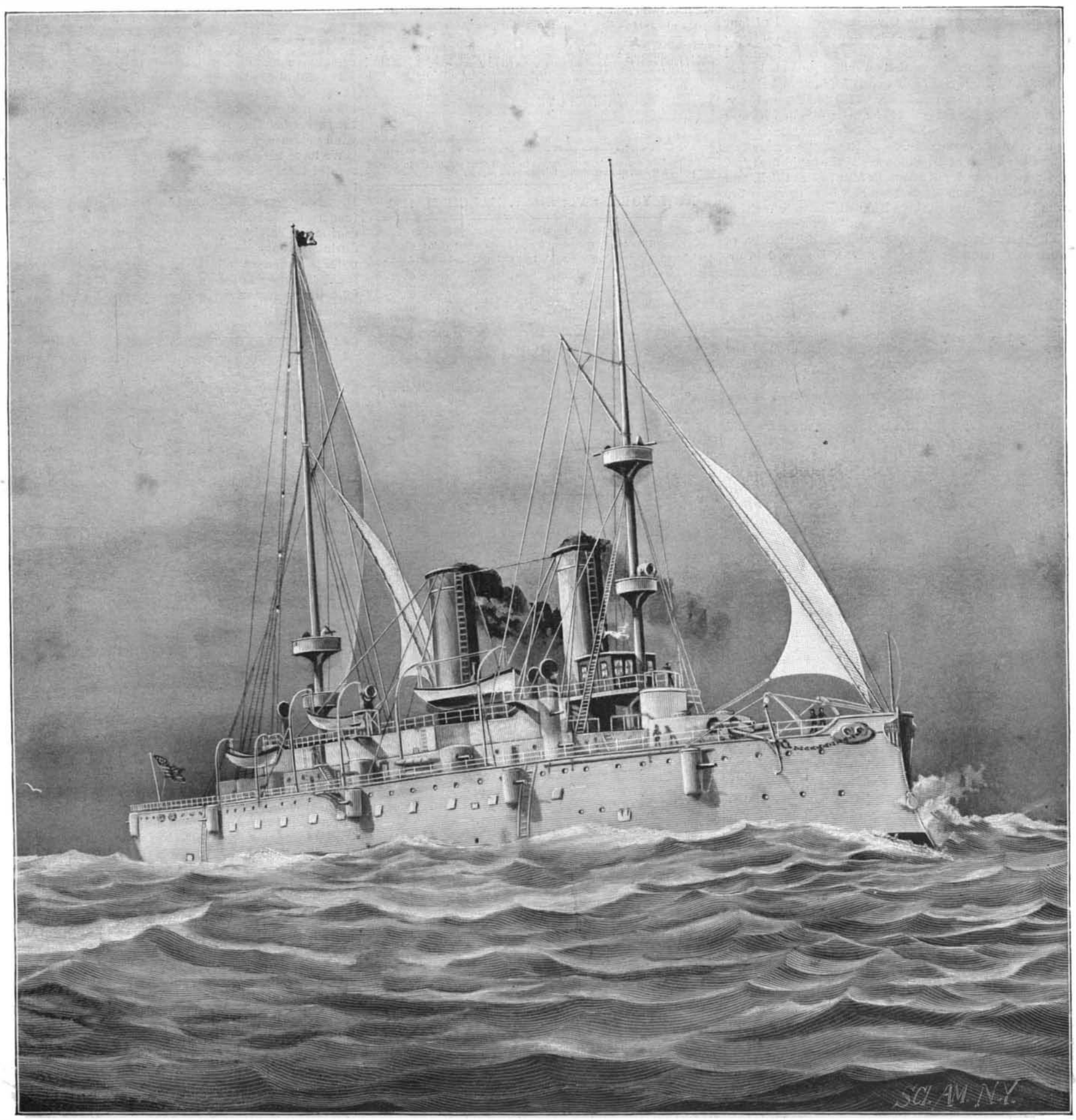
THE UNITED STATES PROTECTED CRUISER OLYMPIA.

There is a certain respect in which the Olympia can easily challenge comparison with any other protected cruiser either in our own or in any other navy of the world. There is no other ship which can show on a given displacement so high a development of the various qualities which go to make up the efficiency of this type of warship.

The science of warship design, as has been frequently pointed out in the SCIENTIFIC AMERICAN, is largely a matter of compromise. When the naval designer sits down at his board to plan a new ship, there is one quantity—the displacement—which is written down before all others; and within the limits of this quantity he makes his distribution of weights. He allots so much to hull, so much to machinery, so much to guns, armor, stores, and all the minor fittings which will sink the completed ship to her designed load line.

The genius of the designer will be shown in the manner in which he distributes his weights; and the most successful ship will be that which secures a high all-around efficiency without the sacrifice of any one essential feature. It would be an easy matter, comparatively, to build a ship which should be at once the fastest, best protected, most heavily armed, and have the greatest coal endurance of any ship in the world—provided there were no limit upon displacement. The Columbia can steam 23 knots against the Olympia's $21\frac{68}{100}$ knots; but to get this 1½ knots of extra speed she has had to sacrifice her offensive power to such an extent that she would be an easy prey to the smaller ship in a naval duel. Judged by the ships which have lately been produced, the United States designers are considerably ahead of those of foreign navies in their ability to turn out ships with an all-around efficiency. There is only one firm, the famous Armstrong Company, of Newcastle, England, that equals them in this respect. A comparison of the Olympia with the new Eclipse class of British cruiser,



THE UNITED STATES PROTECTED CRUISER OLYMPIA.

and with the Blanco Encalada, built by Armstrong & Company, will show this very clearly.

	Displacement.	Horse power.	Speed.	Protective deck.	Normal coal carried.	Armament.
	Tons.			Inches.		
Olympia	5,800	17,363	21·68	4¼ to 2	400	Four 8 in., ten 5 in. quick fire, fourteen 6 pounders, ten light guns.
Eclipse	5,600	9,600	19·5	2½	550	Five 6 in. quick fire, six 4·7 in. quick fire, eight 3 in. quick fire, six light guns.
Blanco Encalada	4,400	14,500	22·78	4 to 1¼	900	Two 8 in., ten 6 in. quick fire, twelve 3 in. quick fire, twelve light guns.

The great superiority of the Olympia over the Eclipse on every point of comparison cannot be attributed to the extra 200 tons displacement of the former; and the comparison is even yet more puzzling when we substitute the Armstrong cruiser for the Olympia. On 1,200 tons less displacement than the Eclipse, the Blanco Encalada carries a heavier armament at three knots higher speed.

The main battery of the Olympia, composed of four 8 inch and ten 5 inch breech loading rifles, is entirely on the main deck. The four 8 inch guns are mounted in pairs in two turrets of Harveyized steel 3½ inches thick, revolving within barbettes of 4 inch nickel steel armor. Firing through an arc of 280 degrees and having an axial height of 22 feet, these guns have a great range of action, besides being unusually well protected from return fire.

The ten 5 inch guns, which are of the rapid fire type, are housed in armored sponsons four inches thick, and are so placed that they give a direct bow or stern fire from four guns and a broadside discharge on either side from five.

The secondary battery, composed principally of fourteen 6 pounder rapid fire guns, is stowed in armored sponsons on the berth deck and along the hammock berthing above the 5 inch guns, affording the greatest convenient range and command. The disposition of the 6 pounders on the berth deck is such that, while free from the flash of the main battery above, they may maintain a complete belt of fire around the ship. The six 1 pounders and the four Gatling guns, which constitute a minor phase of the secondary battery, are distributed in the fighting tops and at advantageous points on the bridges. There are five torpedo discharges; one at the bow, one at the stern, and two on each broadside.

From a commanding position just abaft and above the forward turret, the commanding officer, incased by five inches of nickel steel, will bring his ship into action; and the most modern means of communication bring every important point within immediate touch.

The principal dimensions are:

Length on water line	340 feet.
Beam, extreme	53 "
Draught, mean	21 " 6 inches.
Displacement, normal	5,800 tons.
Coal supply, normal	400 "
Coal supply, bunker capacity	1,093 "

The vessel has twin screws, each shaft being driven by its own vertical, triple-expansion engine. While not admitting strictly of comparison, the Olympia and the Minneapolis have engines individually alike, one having two sets and the other three. On trial, the Minneapolis developed 21,000 horse power, a proportion of 7,000 for each engine, and the Olympia developed 17,313; over sixteen hundred horse power more in each engine than was realized by the larger craft.

The contract called for only 13,500; and the difference between that and the trial result is indicative of the wide margin of safety reserved by the government and upon which the contractors, at their own risk, are willing to encroach when a premium of $50,000 is placed upon every quarter knot of speed in excess of contract requirements.

Miscellaneous Notes.

It has been suggested that the boards of health of large cities require the wheels of all milk wagons to be equipped with rubber tires.

A car load of redwood has been recently sent to Nuremberg, Germany, for use in making lead pencils. California redwood and cedar are about the only woods used in the manufacture of pencils, and the European forests, from which the pencil wood supply was formerly obtained, have become exhausted.

The Albert Levy prize, of the value of $10,000, has been awarded by the Academy of Medicine to Drs. Behring, of Berlin, and Roux, sub-director of the Pasteur Institute in Paris, for their discovery of the means of curing diphtheria.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1055.

For the Week Ending March 21, 1896.

Price 10 cents. For sale by all newsdealers.

STABILITY OF LOFTY BUILDINGS.

Although the exaggerated vertical proportions of the modern office building render it, architecturally speaking, somewhat grotesque, there is no doubt but that the steel "skeleton" system upon which it is built provides all the necessary rigidity and strength. The vast areas of towering wall which these buildings present to the wind naturally raise the question of their ability to withstand the accumulated pressure which must result when they are exposed to a gale of any strength.

The vibration of lofty buildings has ever been a favorite theme with those who write in the field of engineering romance.

The party who, not so long ago, gravely assured the public that the lantern at the top of the Eiffel Tower swept to and fro through an arc of ten feet, in response to the fiercer gusts of a storm, was shortly afterward followed by another writer, whose pen, more given to fluency than to fact, wrote down a detailed account of the vibrations of a certain well known office building, which were described as being so severe as to stop the clocks on any but the lowest stories! Factory chimneys, church steeples, lofty monuments, and in fact every structure that raises its head much higher than its fellows to the buffeting of the elements, are locally credited with feats of more or less impossible vibration.

That tall factory chimneys do sway to and fro in a high wind, and that a poorly constructed building will rock, can be proved by careful instrumental tests, and in extreme cases the motion can perhaps be detected by the eye, but the frequency and extent to which such movements occur has been vastly exaggerated.

It would be natural to suppose that the elasticity of the steel framework of a fire proof building would allow of a certain amount of "give" or spring, under the severe bending stresses to which it is subjected by wind pressure.

We have been favored with the result of an instrumental test, which was recently carried out on the twenty-first floor of the American Surety building, Broadway, New York, by the engineer and superintendent of the building, Mr. J. Turner. It was made during the height of the heavy storm which prevailed during January 4, when an official wind velocity of 82 miles per hour was registered in the neighboring station. The test failed to give the slightest evidence of vibration; a result which agrees with the testimony of the inmates that in a gale the topmost floors are as still as the first stories. The test was made with transit and level, and though it was not a test of the highest instrumental character, the result was remarkable, for both the plumb bob and the bubble remained perfectly still, even when the building was struck by the heavier gusts of wind.

We confess to some surprise at this practically absolute rigidity; for the absence of any building on the opposite side of Broadway, and, indeed, on that part of the whole block which lies immediately in front of the Surety building, makes it certain that practically the full height, from curb to coping, was exposed to the shock of the storm. Just how great was the bending strain set up within the building is a matter of easy calculation. The front exposed to the wind is 84 feet 8 inches wide by 314 feet high, giving a total of 26,585 square feet. The wind pressure corresponding to 82 miles per hour is somewhat problematical, for, although experimentalists have discredited Smeaton's formulæ, they have given us no substitute upon which they are well agreed among themselves. Smeaton gives 31 pounds per square foot as the pressure corresponding to 80 miles per hour. This is undoubtedly too high. Prof. Martin's formula, pressure $= 0{\cdot}004V^2$, works out at about 25 pounds to the square foot, which we will assume to have been maximum pressure on this occasion.

This gives a pressure on the whole front of 332 tons; and a bending or overturning moment of over 52,000 foot tons. These figures give us an impressive idea of the solidity of a construction which proves to be quite insensible to such powerful disturbing forces. It must be due to the combination of a thoroughly well riveted steel structure with the inertia and rigidity of massive walling, into which it is tied and built.

REPORT ON THE PLANS FOR NEW YORK RAPID TRANSIT.

The Supreme Court Commission, consisting of Frederic R. Coudert, George Sherman, and William H. Gelshenan, which was appointed to examine and pass upon the plans of the New York Rapid Transit Commission, has reported unequivocally in favor of the construction of the underground railroad on the lines proposed by Engineer Wm. B. Parsons.

It is evident, from the general tone of the report that they have judged the question as to whether the tunnel should or should not be built from the standpoint of general expediency, having in view the greatest good of the greatest number. The question which the commission set itself to answer was, whether the necessity for increased transit facilities existed and, if so, whether the proposed scheme would meet the necessity, and confer a public benefit upon the city