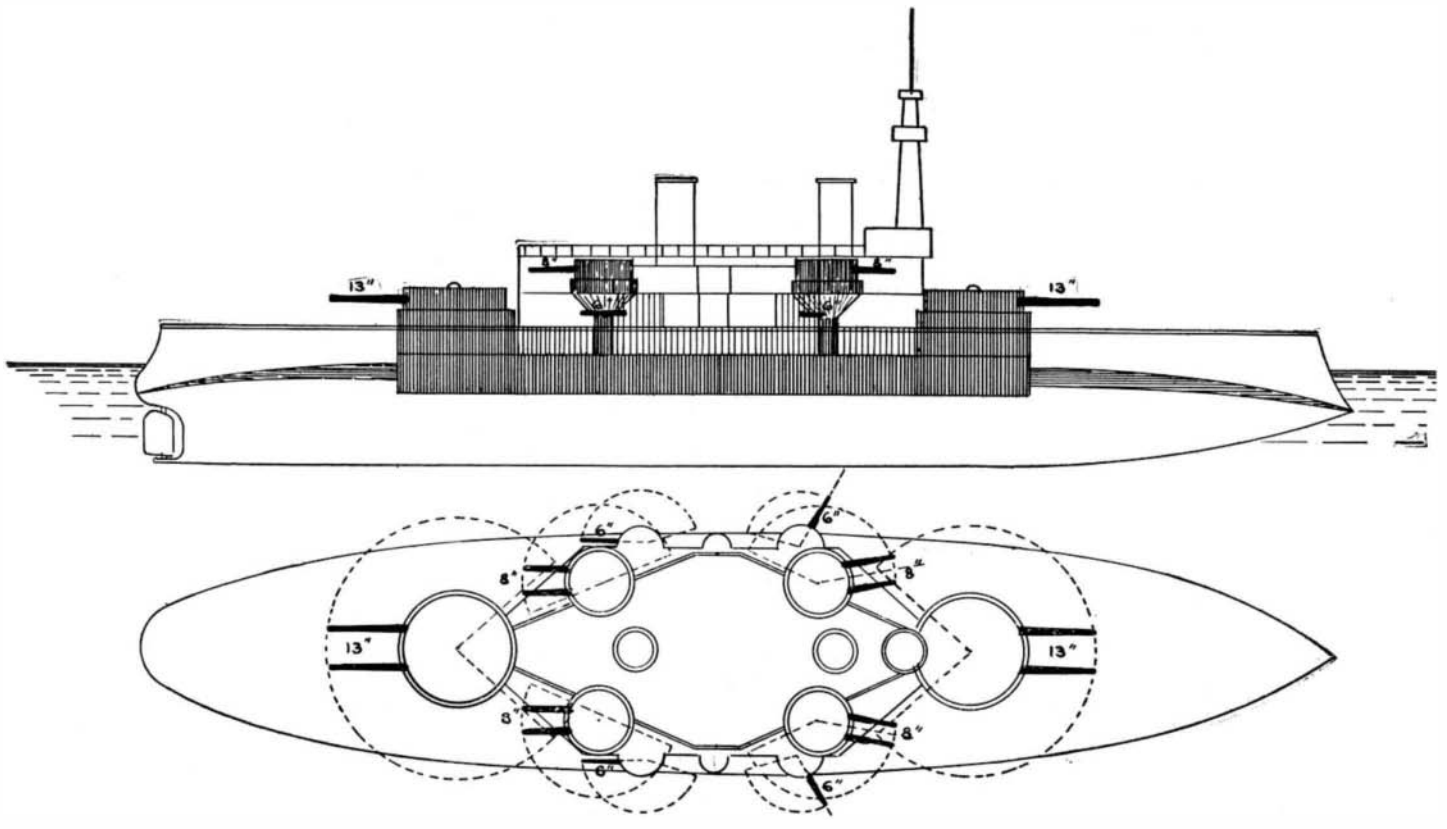
THE SPEED TRIAL OF THE UNITED STATES BATTLESHIP MASSACHUSETTS.

On Saturday, April 25, the first-class battleship Massachusetts, a sister ship to the Indiana and Oregon, underwent her full speed trial over the thirty knot course off Cape Ann. As the course was covered twice in succession, the total distance run by the ship was sixty knots, and the boilers and engines were being pushed to their fullest capacity the whole of that distance.

The engine performance during this severe trial was admirable. There were no heated journals, nor was there a leaky joint, tube or rivet in the boilers. On the first run over the course the average speed was 16·03 knots, and the second thirty-one knots was covered at average speed of 16·21 knots, making an average speed for the whole sixty knots of 16·15 knots an hour. This is 1·15 knots faster than the speed called for by the contract, according to which the builders were to receive $25,000 for every quarter of a knot above 15. She thus earns a bonus of $100,000 for her builders, the Cramps Ship Building Company, of Philadelphia. The highest speed obtained on the trial was 17·03 knots, which was maintained continuously for six miles.

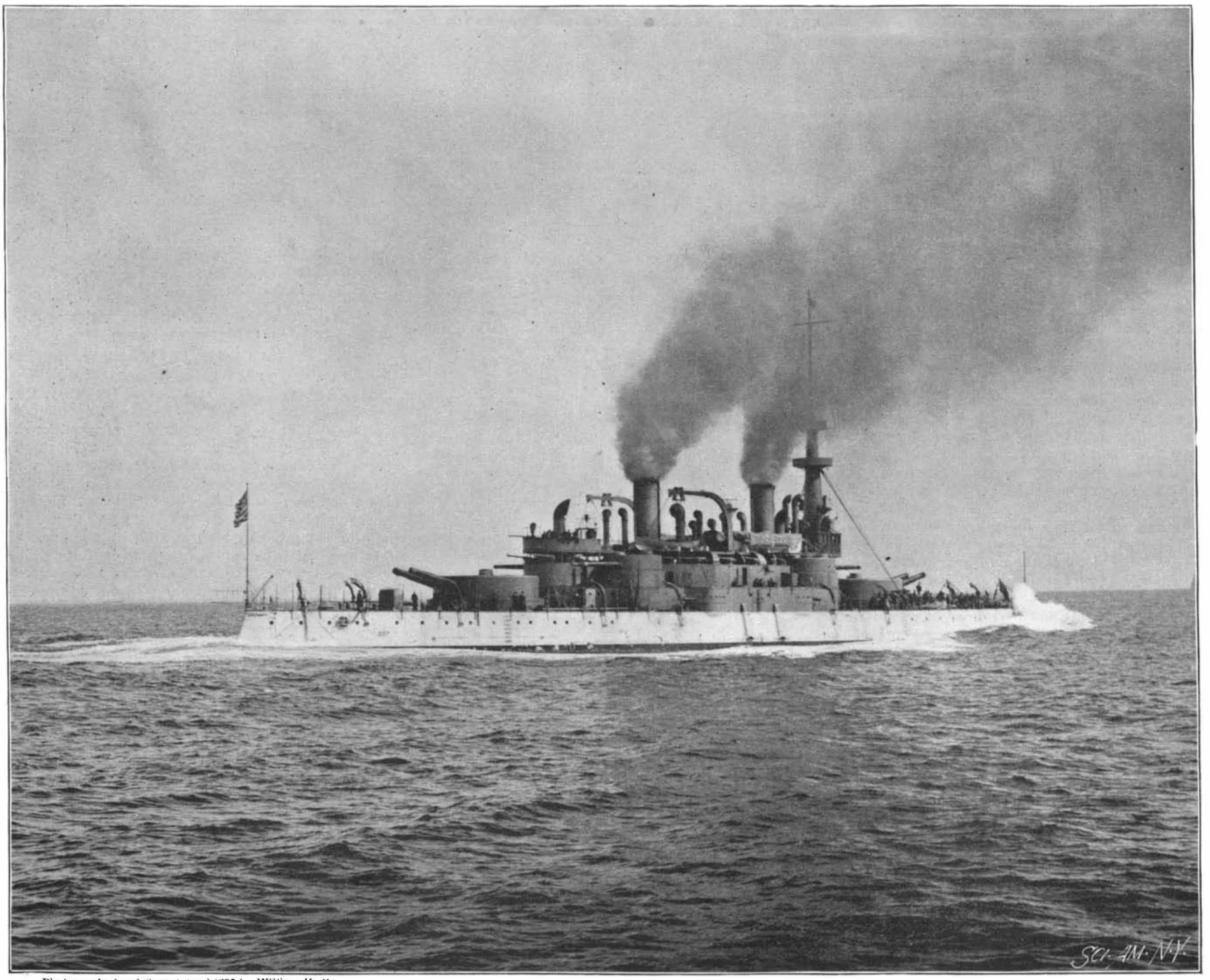
The ease with which the Massachusetts reached and maintained this high rate of speed is the more remarkable because speed was not one of the objects aimed at by her designers, her displacement being mainly devoted to guns and armor, in which she is probably the most formidable battleship afloat today. The possession of this extra knot of speed adds considerably to her fighting efficiency. Superior speed in a duel between two modern battleships will be as valuable as was the possession of the weather gage in the days of the sailing ship. The faster ship can give or decline battle; can determine the range at which the battle shall be fought, and will be better able to use or avoid the ram than her slower opponent.



BATTLESHIP MASSACHUSETTS—SIDE ELEVATION AND DECK PLAN.

Although this speed is not up to the performance of some of the later European battleships, it must be remembered that the records of 17 and 18 knots, credited to the latter, were often made over measured mile courses and at the cost of badly leaking boilers; indeed, it has been a common experience for the trial trip of a European battleship to be suddenly cut short by leaking or priming in boilers or overheating of the engines.

In view of the high average speed of the Indiana type, it has been suggested that the six new battleships should be supplied with sufficient horse power to give them at least an equal speed. The Kearsarge



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THE BATTLESHIP MASSACHUSETTS PHOTOGRAPHED AT HER FASTEST SPEED.

and her mate are of 1,237 tons more displacement than the Indiana, and yet, as at present designed, the horse power is to be only ten thousand, which is the amount that was indicated by the Massachusetts during her recent trial. The estimated speed corresponding to the ten thousand horse power of the Kearsarge is fifteen knots. It would be a wise policy to make the fifteen and a half to sixteen knot speed of the Indiana type the lowest allowable rate of speed for the battleships of the new navy. When a fleet goes into action, its speed will be limited to the speed of the slowest ship, and a wise policy would suggest that the new battleships should be as least as fast, if not a little faster than, their predecessors, even if this should involve the addition of another thousand horse power to their boiler capacity.

The Massachusetts and her sister ships are designed specially for coast defense, as distinct from the Iowa, which is a seagoing battleship. They sit low in the water, their freeboard being about 12 feet, and consequently they will form a more difficult target to hit than the lofty ships of some foreign navies which have a freeboard of over 20 feet.

Their sphere of action will lie off the coasts and in the harbors and roadsteads, although it should be understood that, if called to do so, they could make the transatlantic trip with ease. As they will operate within easy reach of the home ports, they do not require to carry a large supply of coal and ammunition. The weight which is ordinarily devoted to these in the seagoing ship has been devoted in the Massachusetts to guns and armor, with the result that she could deliver heavier blows and stand more hammering than any other battleship afloat.

Protection.—The "vitals," that is the engines, boilers, and magazines, are protected by a continuous vertical wall of 18 inch armor at the water line, 7½ feet high, which is roofed in by a flat steel deck 2¾ inches thick. At each end of this armored wall a circular barbette of 17 inch armor is built up to a height of 15 feet above the water line. Within this revolves a turret of 15 inch steel, in which is placed a pair of 13 inch guns. It will thus be seen that from the water line up to the guns there is a continuous wall of steel 17 and 18 inches thick to protect the turret machinery, the powder and shell, and the gun crew.

The eight 8 inch guns, which are carried at the great height of 26 feet above the water line, are similarly protected. A stout ammunition tube of 5 inch steel protects the ammunition in its passage from below the armored deck to the base of the barbettes. The barbettes are protected by 8 inches and the turrets above them with 6 inches of steel. The 6 inch guns are protected by 6 inches of steel, and shells are prevented from entering and bursting below them by a belt of 5 inch steel, which rises above the 18 inch belt armor. A conning tower situated at the base of the military mast, and protected with 10 inches of steel, will shelter the commander when he takes the ship into action.

Now, when it is remembered that the 18 inch armor is barely penetrable by the heaviest artillery under ideal conditions at the proving ground, and that the

VANITY FAIR AT OLYMPIA—SCREENING THE LADY.

6 and 8 inch armor is equally proof against the shells of the heavier class of rapid firing guns, it is safe to say that the Massachusetts could carry her guns unharmed through a long protracted naval fight.

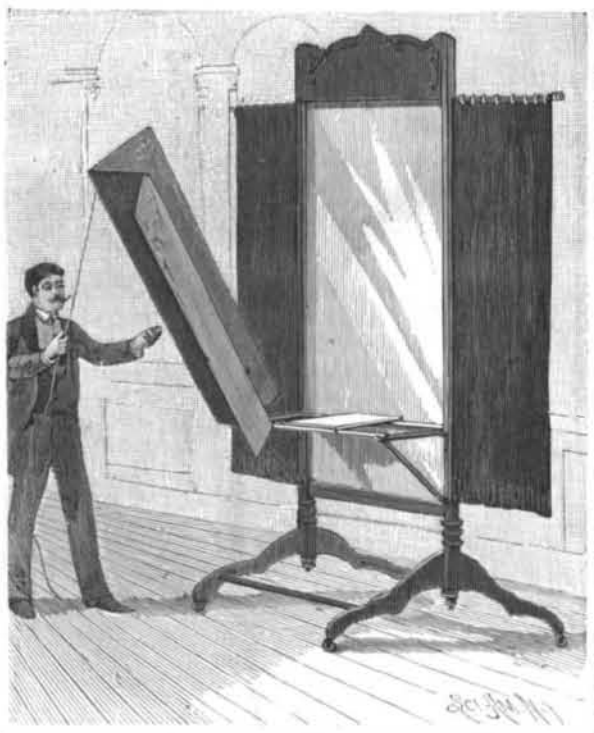
Armament.—The great offensive power of the Massachusetts is shown in the accompanying table.

No.	Caliber Inches.	Weight of shot Pounds.	Muzzle velocity Feet.	Muzzle energy Tons.	Muzzle penetration of iron Inches.
4	13	1,100	2,100	36,627	34·6
8	8	250	2,150	8,011	21·6
4	6	100	2,150	3,204	15·6
20	6-pounder rapid firing guns.				
6	1-pounder " "				
6	Torpedo tubes.				

It is the battery of 8 inch guns which gives this type of vessel its superior power of attack as compared with other ships; and in a naval duel it would probably decide the issue in its favor.

THE ILLUSION VANITY FAIR AT THE OLYMPIA.

We illustrate a very clever illusion which has recently mystified thousands of people who patronize



VANITY FAIR AT OLYMPIA—THE LADY HAS VANISHED.

the Olympia in this city. It presents the disappearance of a lady, apparently through a solid looking glass. The method used is remarkably ingenious.

A large pier glass in an ornamental frame is wheeled upon the stage. The glass reaches down within about two feet of the floor, so that every one can see under it. The only peculiarities which a skilled observer would be apt to notice are a wide panel extending across the top of the frame and a bar crossing the glass some four feet from the floor. The first is ostensibly for artistic effect—it really is essential to the illusion. The horizontal piece purports to be used in connection with a pair of brackets to support a glass shelf on which the lady stands—it also is essential to the illusion.

Brackets are attached to the frame, one on each side, at the level of the transverse piece, and a couple of curtains are carried by curtain poles or rods extending outward from the sides of the frame. Across the ends of the brackets a rod or bar is placed and a plate of glass rests as a shelf with one end on the rod and the other on the horizontal piece, thus impressing upon the audience the utility of the crosspiece. Its real function is not revealed.

A lady steps upon the shelf, using a step ladder to reach it. She at once turns to the glass and begins inspecting her reflection. The exhibitor turns her with her face to the audience and she agains turns back. This gives some byplay, and it also leaves her with her back to the audience, which is desirable for the performance of the deception. A screen is now placed around her. The screen is so narrow that a considerable portion of the mirror shows on each side of it. All is quiet for a moment, and then the screen is taken down and the lady has disappeared. The mystification is completed by the removal of the portable mirror, it being thus made evident that the performer is not hidden behind it.

Two of our cuts illustrate the performance as seen by the audience, the third explains the illusion. The mirror is really in two sections, the apparently innocent crossbar concealing the top of the lower one. The large upper section is placed just back of the lower piece, so that its lower end slides down behind it. upper section moves up and down in the frame window sash, and to make this possible without the audience discerning it the wide panel across the top of the frame is provided. When the glass is pushed up, its upper portion goes back of the panel, so that its upper edge is concealed.

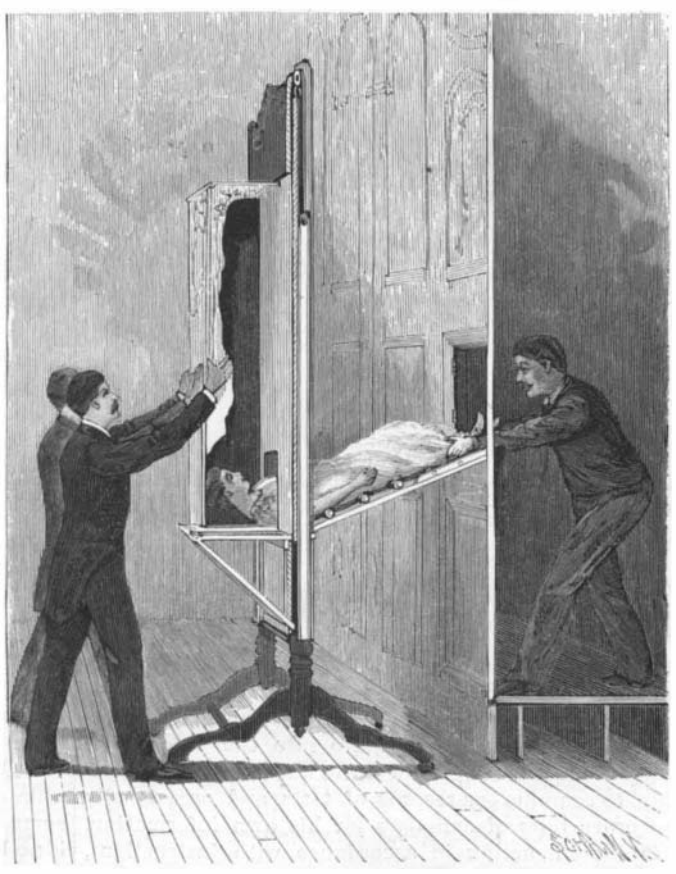
Out of the lower portion of the same mirror a piece is cut, leaving an opening large enough to admit of the passage of the person of the lady, The third cut, with this description, explains everything. The mirror as brought out on the stage has its large upper section in its lowest position. The notched portion lies behind the lower section, so that the notch is completely hidden from the audience. When the glass shelf is put in place, the performer steps upon it and is screened from view. The counterpoised glass is raised like a window sash, exposing the notch. The screen is just wide enough to conceal the notch, the fact that a margin of the mirror shows on each side of the screen still further masking the deception. From the scene piece back of the mirror an inclined platform is projected to the opening in the mirror. Through the opening the lady creeps and by the assistant is drawn away behind the scene; next the platform is removed, the glass is pushed down again, and, the screen being removed, there is no lady to be seen. The fact that some of the mirror was visible during the entire operation greatly increases the mystery. The lady passes through the notch feet foremost, and her position, facing the mirror, makes this the easier.

Lippman's Interference Color Photography.

In a lecture before the Royal Institution, of London, on April 17, M. Lippman, as reported in Photography, stated that the essentials of his interference method of photography in colors required an emulsion almost transparent, with no visible grain, the film to be in contact during exposure with a mirror, for which a sheet of platinum could be used, but mercury was better. The rapidity of light was stated to be 186,000 miles per second, but by means of the mirror it was induced to stand still and have its portrait taken. The formation of the stagnant waves was shown by a very pretty experiment with an India rubber tube suspended from the ceiling; and the explanation that at the nodal points there was no movement of light, and consequently no reduction of silver, led up to the explanation of the deposition of the silver in strata, of which there were about five hundred in the thickness of an ordinary sheet of note paper.

The reproduction of color by these negatives was explained from the analogy of the phonograph, which was able to set up vibrations similar to those which had caused the impression on the cylinder.

MIMICRY IN PLANTS.—While, in animals, color is greatly influenced by the need of protection from their numerous enemies, plants rarely need to be concealed, and obtain protection by their hardness, their spines, their hairy covering, or their poisonous secretions. There seem to exist, however, a few cases of true protective coloring, the most remarkable being that of the stone mesembryanthemum of the Cape of Good Hope, which in form and color closely resembles the stones among which it grows: and Dr. Burchell, who first discovered it, believes that the juicy little plant



VANITY FAIR AT OLYMPIA—THE DISAPPEARANCE EXPLAINED.

This thus generally escapes the notice of the cattle and wild herbivorous animals. Mr. J. P. M. Weale has also noticed that many plants growing in the stony Karoo have their tuberous roots above the soil, and these so perfectly resemble the stones among which they grow that, when not in leaf, it is almost impossible to distinguish them.