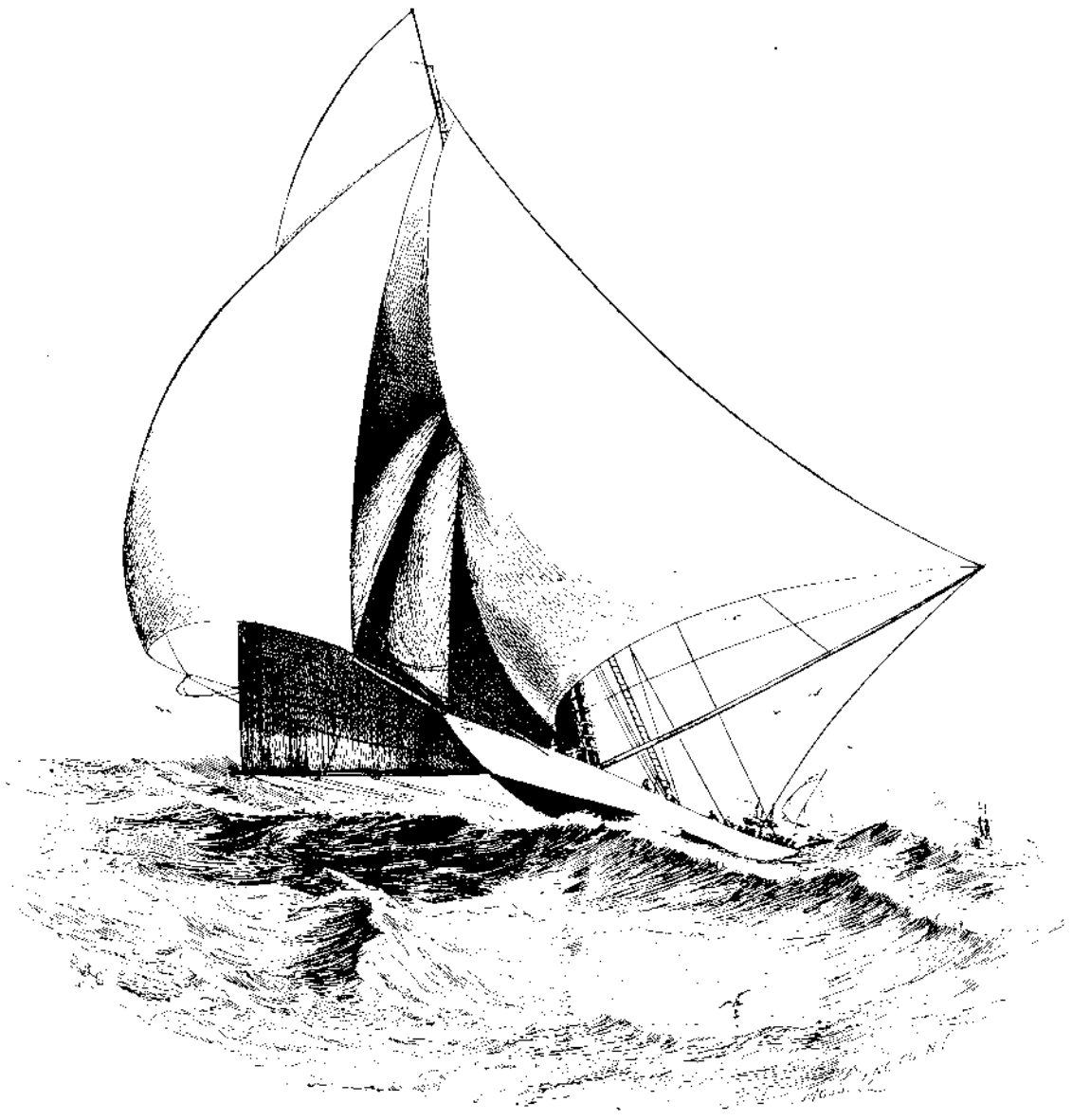
Two Wonderful War Ships.

Provision having been made in the British navy estimates for 1893–94 for the construction of two powerful first-class cruisers, to be named the Powerful and Terrible, *The Engineer* says it has been decided to invite tenders for the construction of the former as soon as the designs have been completed, leaving that of her sister ship until the next financial year. As these ships will be the largest and most powerful cruisers of their class ever built, the following particulars of them, which are open to modification, will be interesting to our nautical readers. The contemplated principal dimensions are as follows: Length, 500 ft.; breadth, 70 ft.; displacement at mean draught of 27 ft., 14,000 tons. The vessels are to be constructed of steel throughout, but as they are intended to keep the sea for lengthened periods, they will be sheathed and coppered. The proposed continuous sea speed in smooth water is to be twenty knots, but on the eight hours' natural draught trial the expected speed is twenty-two knots an hour. To secure the former each vessel will be fitted with engines and boilers capable of developing a power fully sufficient for actual requirements. For the protection of the vital parts of the ship, which include the engines, boilers, magazines, etc., they will be covered by a strong turtle-back deck of steel, having a maximum thickness of 4 in. amidships, reduced toward the extremities. Between this and the main deck, for the whole length of the engine and boiler space, these vessels will, like all the other first-class cruisers in the navy, be subdivided into numerous coal bunkers. At the normal displacement and draught of the ship—14,000 tons and 27 ft.—about 1,500 tons of coal will be carried, but provision will be made for a bunker capacity of 3,000 tons. The vessels will be propelled by twin—in preference to triple—screws, their efficiency within the limits of the proposed power and draught having been established by previous experience in our largest cruisers, as well as in the large twin-screw vessels of the mercantile marine. The armament of the vessels will comprise two 9·2 in. breech-loading guns, mounted at bow and stern as chasers, twelve 6 in., eighteen 12-pounders, twelve 3-pounder quick-firing guns, and several machine guns. The 9·2 in. and 6 in. guns will have armored protection, and the 12-pounder guns will be fitted with strong shields, revolving with the guns. Special study has been given to the protection of the guns and their crews and the transport of ammunition from the magazines to the guns. For the protection of the commanding officer in action an armored conning tower is to be erected at the break of the forecastle. To enable the bow and stern chase guns to be fought in heavy weather and to maintain speed at sea, an unusual height of freeboard at the poop and forecastle, upon which these guns are carried, is provided. In addition to the guns carried by these vessels they will be supplemented by four torpedo dischargers, which will be submerged and placed in separate rooms.



THE AMERICAN YACHT VIGILANT.

Railway Schools in Russia.

There are in Russia special institutions called technical railway schools, for the special education of people for the railway service, viz., engine drivers, engineers, their assistants, road masters, etc.

At the present time there are twenty-eight technical railway schools, of which twenty-five belong to the government, and three which, although remaining private, are also under the inspection of the Ministry of Communication.

The pecuniary fund, which covers the expenses for maintaining the schools of the government, consists especially of sums which are paid to the Ministry of Communication by the majority of railways, to the amount of 15 rubles per verst of the railway lines open for traffic.

To this main source of income are added the annual payment of 10 rubles from every pupil, the sums realized by the sale of pupils' handiwork, useless property and materials, etc.

This fund, under the name of general school fund, consists at the present time of a capital of nearly 1,500,000 rubles and an income amounting to 500,000 rubles per year.

The annual maintenance of the twenty-five government schools costs more than 400,000 rubles.

At the root of the whole internal economy of these schools there is a strict discipline, as the employment for which the pupils are prepared demands, beyond a definite circle of knowledge and practical understanding, a particular punctuality in the execution of their service and a perfect subordination to discipline.

The whole course of instruction of the technical railway schools lasts five years, three years of which are for study in school and two years for practice on railways. During the three years of study in school there is taught: *a*, religion; *b*, elementary mathematics, with the fundamental knowledge of bookkeeping and land surveying; *c*, general knowledge of physics and practical knowledge of telegraphy; *d*, a short course of general and applied mechanics (descriptive); *e*, a short course in working wood and metal; *f*, elementary knowledge of architecture; *g*, practice of railway business; *h*, elementary and special drawing by hand and with the aid of instruments, as well as calligraphy; and *i*, handicrafts, as locksmiths', blacksmiths' and joiners' work. Besides this there are introduced into the school singing and gymnastics.

Considerable attention is apportioned to practical training in handicrafts and drawing. The training in handicrafts is conducted by experienced teachers with special technical education in special teaching workshops.

After having finished the three years of study in class the pupils are sent off for two years' practical training on railways, where they work in workshops, in repairs of the line, on locomotives, partly on the telegraph, etc.

The annual number of pupils instructed in the railway schools amounts to above 1,500, and this number has increased of late.

THE launch Daimler, built by the Daimler Motor Co., of 111 East 14th Street, New York City, has distinguished itself in the way of valuable practical service, besides affording one of the attractions of the Exposition. Six men sailing in a small yawl, about half a mile out in the lake, were capsized by a sudden gust of wind, and some of them, at least, would have been drowned, had it not been for the rapidity with which the launch reached and rescued them. On another occasion the launch had the honor of going out and towing in the Viking ship, when the latter was unable to make port on account of head winds.

The Chocolate Tree in Trinidad.

We learn that Mr. J. H. Hart, Curator of the Royal Botanic Gardens, Trinidad, has recently returned from a visit to Central America, after having successfully transported thither no less than twenty-five thousand plants of Trinidad cocoa. In return, he has conveyed to Trinidad two highly desirable varieties of the *Theobroma cacao*, and two species new to that colony, and already numerous plants of each are thriving well. One of the varieties is a purely white-seeded one, producing large pods and splendid beans, which require only forty-eight honrs' fermentation instead of the ten days usual in Trinidad. The second variety, known in Nicaragua as "alligator cacao," is peculiar from the soft covering of its pod and the raised instead of indented sectional ribs. The new species are *Theobroma bicolor* and *Theobroma sp.*, the latter known as "cacao meco," "cacao mono," or "monkey cocoa."

THE YACHTS CONTENDING FOR THE INTERNATIONAL CHAMPIONSHIP.

The series of races in which the Valkyrie, as the British champion, in competition with the American yacht Vigilant, is endeavoring to win back the prize cup originally won in England by the yacht America, has attracted more attention than any other competition of the kind which ever engaged the attention of the yachting world. It has also excited to a remarkable degree feelings of international rivalry, happily of an altogether friendly and amicable nature. Our illustrations represent the rival yachts under sail, one of the views also showing the Valkyrie out of water in drydock, bringing out her full lines.

As announced by the official measurer of the New York Yacht Club, the dimensions of the two yachts are as follows:

Vigilant—Length on load water line, 86·19 feet; from end of boom to forward side of mast, 99·37 feet; from fore side of mast to end of jib stay, 73·80 feet; from fore side of mast to jibtopsail stay, 75·90 feet; from fore side of mast to forward point of measurement, 74·85 feet; from fore side of mast to outer end of spinnaker boom, 74·62 feet; deck to upper side of main boom, 3·08 feet; deck to topsail halyard block, 125·96 feet; deck to hounds, 69·08 feet; length of topmast, 56·88 feet; length of gaff, 54·76 feet.

Valkyrie—Length on load water line, 85·50 feet; end of boom to forward side of mast, 92·60 feet; forward side of mast to jib stay, 66·16 feet; fore side of mast to jibtopsail stay, 66·16 feet; fore side of mast to forward point of measurement, 66·16 feet; fore side of mast to outer end of spinnaker boom, 72 feet; deck to upper side of boom, 3·03 feet; deck to upper side of topsail halyard block, 114·86 feet; deck to hounds, 63·30 feet; length of topmast, 51·56 feet; length of gaff, 55·57 feet.

Figured from the above, their measurements are reduced to the following:

	Vigilant. Feet.	Valkyrie. Feet.
Sail area	11,272	10,042
Ordinary racing measurement	96·18	.....
International racing measurement	96·78	93·11

Vigilant allows Valkyrie 1 minute 48 seconds in a race over a thirty mile course.

A technical expert, Mr. Irving Cox, makes the following comparison of the two boats, which we condense from the New York *Sun*:

The two vessels represent very different principles in yacht designing. The Vigilant depends for her speed on moderate displacement, extremely easy lines, great stability, due to excessive beam, and light weights aloft; the Valkyrie on narrow beam, fine entrance, and stability, obtained by a powerful bilge, very low lead, and light hull. The Vigilant for holding on to windward depends on good draught, a perpendicular keel, and a centerboard. The Valkyrie expects to accomplish the same object by means of excessive draught, a great deal of vertical keel, and by the form of the vessel's side when keeled. The Vigilant has a centerboard weighing 3 tons, 20 feet

long, which drops 10 feet, making her draught 24 feet. The draught of the Valkyrie is 18 feet. The masts of both vessels are of Oregon pine, that of the Valkyrie being 21½ inches in diameter, and that of the Vigilant 20 inches. The bottom of the Vigilant is covered with Tobin bronze and that of the Valkyrie with copper.

Submarine Photography.

BY JOHN HUMPHREY.

Several of the difficulties experienced in endeavors to ascertain the natural relations of objects existing at considerable depths under water have been overcome by M. Louis Boutan, in a remarkably ingenious manner, and the contrivances he adopted are described in a recent communication to the Paris Academy of Sciences.

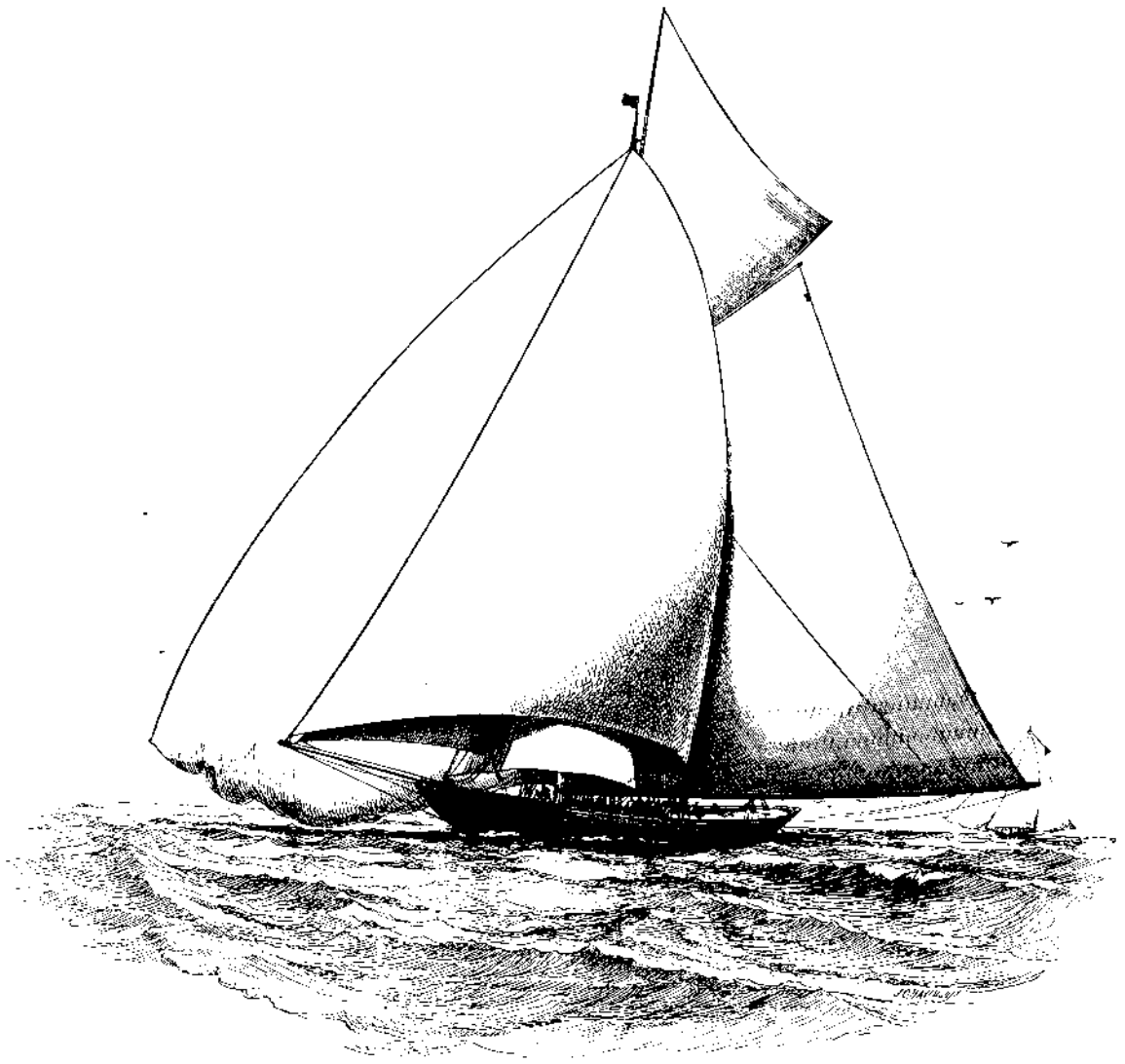
He prefers to use a small camera in which several plates can be exposed consecutively, and incloses this in a rectangular, water-tight metal box, into the sides of which plates of glass are inserted to serve as windows. The camera can be so disposed that the lens may face all the windows in turn, if desired, and exposures are regulated from outside the metal case. To avoid any ill effects that might be caused by differences in the internal and external pressure when the apparatus is sunk in deep water, a kind of balloon filled with air is connected with it. As the pressure increases, in descending, the balloon is compressed, extra air is thus forced into the box, and the pressure on its walls equalized. A stout foot to support the apparatus and weights to sink it complete it for practical purposes.

In water near the shore, not greatly exceeding one meter in depth, the apparatus can be conveniently fixed, without the operator needing to enter the water, and, by direct sunlight, good negatives can be obtained in ten minutes. When the water is deeper the operator must descend in diving costume to fix the case securely on its stand before commencing the actual work of photography. In calm, bright weather photographs can then be obtained by direct sunlight in from thirty to fifty minutes. Colored glasses, preferably blue, must be interposed between the objective and the water, in order to obtain sharp images.

By the use of artificial light to illuminate the surroundings, however, matters are still more simplified. To this end, M. Boutan has contrived a special magnesium lamp. A cask of two hundred liters capacity is filled with oxygen gas, and on its upper end is fixed a spirit lamp, which is covered by a bell glass. A vessel containing magnesium, in powder, is connected with this lamp in such a manner that the metal can be projected across the flame by the action of a rubber ball which serves as bellows. The oxygen gas, of course, is intended to assist combustion, and the lamp having been lighted and covered by its protecting globe, the cask simply requires weighting to sink it.

Good instantaneous negatives have thus been obtained by M. Boutan during a violent storm, when no day light could penetrate the depths. They are lacking as regards background, but this he attributes to imperfections in the apparatus, particularly the objective. He also found it necessary to place before the lens a diaphragm of very small aperture to secure a sufficient degree of sharpness. If a formula were calculated for an objective, the front of which might be exposed to sea water, he thinks these drawbacks might be remedied.

As it is, he has proved that photographs can be taken in a brief time under water, in calm weather, by direct sunlight, at depths up to six or seven meters; while, by the use of his special lamp, they can be taken, instantaneously, at any depth that can be conveniently reached by a diver, and the state of the weather is of no importance.

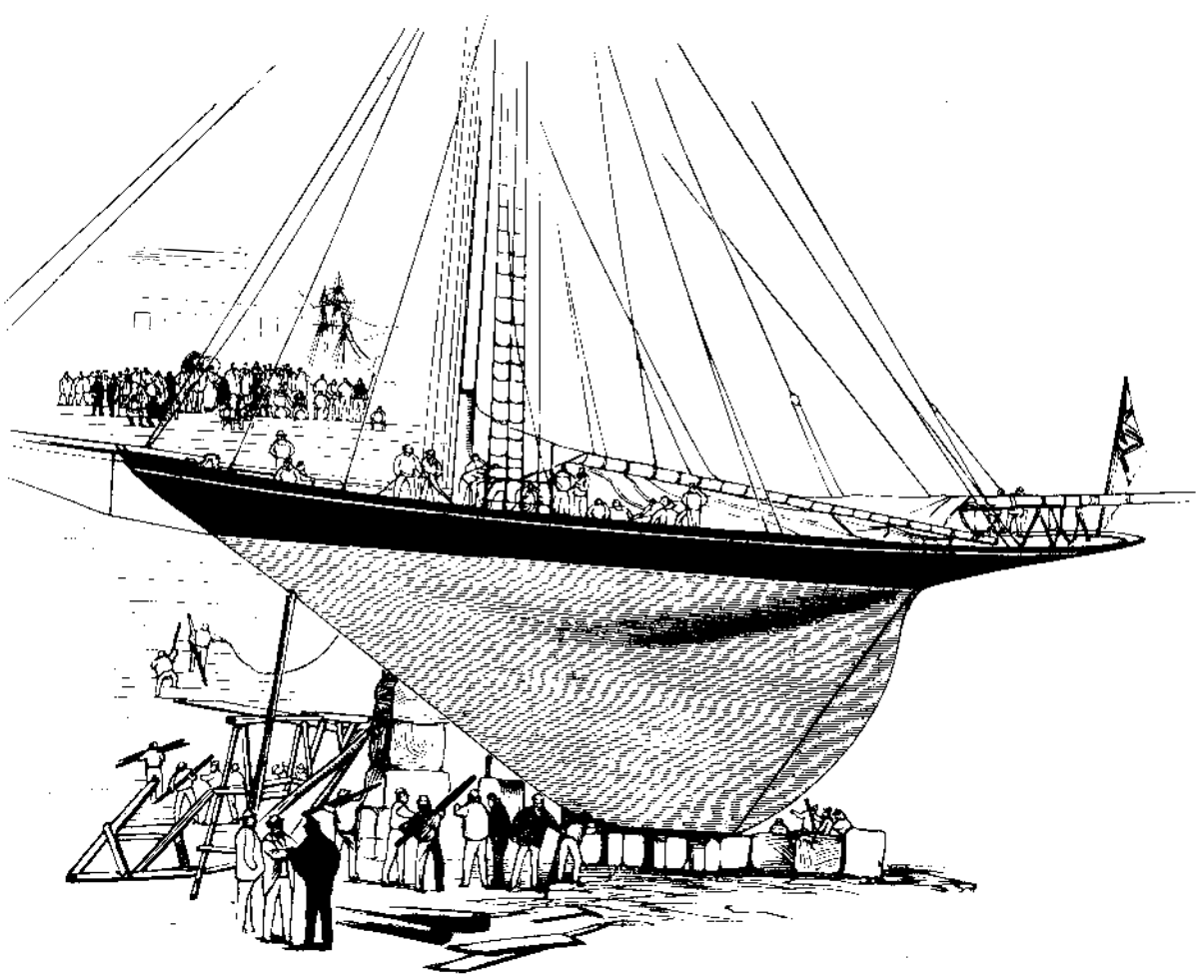


THE ENGLISH YACHT VALKYRIE.

The Trial Trip of the Castine.

The new gunboat Castine, or No. 6, as she was formerly called, had her speed test September 15, off New London. The result of the trial trip was a signal triumph for her builders, the Bath Iron Works, of Bath, Maine. The contract speed was 13 knots per hour; but on her speed test an average speed of 16 032 knots was sustained, after making the usual deductions for tide, etc., thus beating her sister ship the Machias. The bonus which the builders of the Castine will receive will amount to $60,000. The engines made 238 revolutions, with steam at 165 pounds, a large part of the distance. The course was 60 miles and her official time was 3 hours 39 minutes 12 seconds. The speed of the Castine was 16·4 knots, but some corrections had to be made, which brought the official speed down to 16·032 knots. The sea was more unfavorable than when the Machias made her trial trip. The government has again obtained in the Castine a better boat than was bargained for, and will doubtless be very willing to pay the extra allowance.

The Castine is a steel boat, 190 feet long, 32 feet beam, mean draught 12¾ feet, displacement 1,050 tons, aggregate horse power 1,600, speed 14 knots. Her engines are of the vertical, inverted, direct-acting, triple-expansion type, the cylinders being 15, 25, and 34 inches in diameter. She will carry 250 tons of coal, and her nominal cruising radius is 4,600 knots. The Castine has a protective deck, and her battery consists of eight 4-inch rapid-fire guns, two 47-millimeter and two 37-millimeter revolving cannon, as well as one 1-pounder and one Gatling gun.



THE ENGLISH YACHT VALKYRIE IN DRYDOCK.

Plated Silk Stockings.

Speaking of American imitation silk hosiery, *The American Silk Journal* recently said that the enterprise and skill of American silk hosiery manufacturers has, it is represented, very nearly driven the foreign lisle thread stocking out of the market. There are some cheap German lisle thread goods sold, but the bright lisle thread, such as are produced by the English manufacturers, and are among the most durable and dainty of hosiery fabrics, are no longer imported to any considerable extent. Even French lisle can seldom be found in the city marts where high-class goods are usually sold. A well qualified authority explains the cause for this notable transition in the market. The moment the manufacturers of the United States could produce a "plated" silk stocking (which is a cotton stocking with a silk face) at a lower price than that obtained for a brilliant lisle thread, there was, he says, no longer any call for lisle thread. The merchants of New York and elsewhere have long since discovered that the fabrics that create the highest exhibition of value, however specious their worth, have the best prospect of pecuniary success. The woman of fashion does not purchase her gossamer-like hosiery of pure silk for wear, but because they please her eye, and her less wealthy sisters usually imitate her. There are few stockings costing over a dollar a pair sold now, except those of silk and of American manufacture. Next in price to the silk-faced hosiery or "plated" silk stocking, which sells at from sixty cents to one dollar and twenty-five cents a pair, is the spun silk article. This is a durable fabric, but not so strong as one of bright silk, which can be purchased at the same figure, and it is not as popular.

THE preliminary surveys for the Pacific Railroad required four seasons, and cost over $1,000,000.