OF MACHINERY.

The Palace of Machinery, which we illustrate, measured ures with the annex $984 \times 1,393$ feet. After the Agricultural and Art buildings, the Machinery Hall is probably the most graceful structure on the grounds. The architects were Messrs. Peabody & Stearns, of Boston, and the design is taken from the best types of the Spanish Renaissance, and the details are all thoroughly classic. A covered loggia at the first story feet long, is one of the curiosities of Machinery Hall, ines are immensely popular as are also the exhibits gives a fine chance for a promenade in all weathers. as is also the electric rolling bridge which traverses of match-making machinery. The exhibit of machin-

furnish electricity enough to drive 10,000 lights. The belts are 72 inches wide. Engines are on every side driving dynamos, so that the scene at night is a very furnish electricity enough for 158,000 sixteen candle

THE WORLD'S COLUMBIAN EXPOSITION-THE PALACE German exhibit the first object of interest which would Hall, and the articles made find a ready sale among attract the visitor is the great Allis engine of 2,000 horse, the throngs of visitors who pass through the building power, which drives two huge dynamos that will each daily. Gloves, ribbons, badges, medals and candy seem to have the greatest sale.

A large tank near the center of the building affords an opportunity to display hydraulic machininteresting one. The Westinghouse dynamos alone ery. The printing exhibit is very attractive, and a newspaper, The Daily Columbian, is printed power lamps. The two-story marble switchboard, 78 here daily. The type-setting and type-casting mach-







THE WORLD'S COLUMBIAN EXPOSITION-THE PALACE OF MACHINERY.

bells which are rung at intervals. The center pavilion on the South Canal facade masks one of the huge arched roofs. Our illustration also shows the termination of the South Canal, the reproduction of the Egyptian obelisk now in Central Park, New York, and the classic colonnade which helps carry out the architectural scheme and at the same time serves as a screen to hide the intramural railway. The colonnade was designed by Mr. C. B. Atwood. Our plan shows the arrangement of the exhibits and the boiler house, etc

"heavy chores" connected with the exhibits. The boiler house is very clean, as oil is used for fuel, but it is not visited to any extent, on account of the heat. To the left of the boiler house and not shown in the plan are the pumping works, which have a daily capacity of 40,000,000 gallons. Beyond the boiler house and in the same line is a model machine shop fitted up with high grade machine tools; here any repairs to machinery or engines may be made at short notice. The classification is according to countries, Germany, as usual, making a large and very fine exhibit. There

The beautiful campaniles are filled with chimes of the building from time to time and does all of the ery at Chicago in Machinery Hall cannot be very well compared with the exhibit in Machinery Hall at the Centennial, as many of the exhibits now placed in the Electricity, Mines and Transportation buildings were in 1876 in Machinery Hall. Still, the exhibit on the whole is very creditable. Many of the prominent exhibits have been already illustrated in the SCIEN-TIFIC AMERICAN and others will appear in the later issues.

> IN mechanics, speed cannot be obtained except at the expense of power; nor power be obtained except

Entering at the northern portico in the center of the is considerable manufacturing going on in Machinery at the expense of speed.

Two Wonderful War Ships.

estimates for 1893-94 for the construction of two power- 1,500,000 rubles and an income amounting to 500,000 ful first-class cruisers, to be named the Powerful and rubles per year. 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 for which the pupils are prepared demands, beyond a cruisers of their class ever built, the following particulars of them, which are open to modification, will ing, a particular punctuality in the execution of their be interesting to our nautical readers. The contemplated principal dimensions are as follows: Length. 500 ft.; breadth, 70 ft.; displacement at mean draught way schools lasts five years, three years of which are of 27 ft., 14,000 tons. The vessels are to be constructed of steel throughout, but as they are intended to keep ways. During the three years of study in school there the sea for lengthened periods, they will be sheathed is taught: a, religion; b, elementary mathematics, with and coppered. The proposed continuous sea speed in the fundamental knowledge of bookkeeping and land smooth water is to be twenty knots, but on the eight surveying; c, general knowledge of physics and hours' natural draught trial the expected speed is practical knowledge of telegraphy; d, a short course twenty-two knots an hour. To secure the former each of general and applied mechanics (descriptive); e, a vessel will be fitted with engines and boilers capable short course in working wood and metal; f, elementary of developing a power fully sufficient for actual require- | knowledge of architecture: g, practice of railway busiments. For the protection of the vital parts of the | ness; h, elementary and special drawing by hand and

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 twinscrew 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

heavy weather and to maintain speed at sea, an un- the school singing and gymnastics. usual height of freeboard at the poop and forecastle, upon which these guns are carried, is provided. In training in handicrafts and drawing. The training in addition to the guns carried by these vessels they handicrafts is conducted by experienced teachers with will be supplemented by four torpedo dischargers, which will be submerged and placed in separate rooms. shops.

Railway Schools in Russi

This fund, under the name of general school fund, Provision having been made in the British navy consists at the present time of a capital of nearly

> 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 definite circle of knowledge and practical understandservice and a perfect subordination to discipline.

The whole course of instruction of the technical railfor study in school and two years for practice on rail-

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 ship, which include the engines, boilers, magazines, etc., with the aid of instruments, as well as calligraphy; cup originally won in England by the yacht America,

tion 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. 5688 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,

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:

e		
	Vigilant.	Valkyrie
	Feet.	Feet.
	11,272	10,042
racing measurement	96.18	••••••
	_	



THE AMERICAN YACHT VIGILANT.

enable the bow and stern chase guns to be fought in joiners' work. Besides this there are introduced into 3.03 feet; deck to upper side of topsail halyard block,

Considerable attention is apportioned to practical special technical education in special teaching work

After having finished the three years of study in class the pupils are sent off for two years' practical train There are in Russia special institutions called tech- ing on railways, where they work in workshops, in regraph. etc.

nical railway schools, for the special education of people pairs of the line, on locomotives, partly on the telefor 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 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 reperty and materials, etc.

The annual number of pupils instructed in the railway schools amounts to above 1,500, and this number ing comparison of the two boats, which we condense has increased of late.

guished itself in the way of valuable practical service, besides affording one of the attractions of the Exposiespecially of sums which are paid to the Ministry of tion. Six men sailing in a small yawl, about half a mile out in the lake, were capsized by a sudden gust to make port on account of head winds.

International racing measurement......

Sail area

Ordinary

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

A technical expert, Mr. Irving Cox, makes the followfrom the New York Sun:

The two vessels represent very different principles THE launch Daimler, built by the Daimler Motor in yacht designing. The Vigilant depends for her Co., of 111 East 14th Street, New York City, has distin- 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 holdof wind, and some of them, at least, would have been ing on to windward depends on good draught, a perdrowned, had it not been for the rapidity with which pendicular keel, and a centerboard. The Valkyrie the launch reached and rescued them. On another expects to accomplish the same object by means of occasion the launch had the honor of going out and excessive draught, a great deal of vertical keel, and alized by the sale of pupils' handiwork, useless pro- towing in the Viking ship, when the latter was unable by the form of the vessel's side when keeled. The Vigilant has a centerboard weighing 3 tons, 20 feet