The base piece is provided with two binding posts for receiving the battery wires. One of the binding posts is connected with the pointed standard, and the other communicates by a small wire with the mercury in the vulcanite cup.

The magnets and wheel, and all of the connected parts, are free to move in any direction on the point of the standard. When two large or four small Bunsen cells are connected with the gyroscope, the wheel revolves with enormous velocity, and upon letting go of the magnets (an operation that requires some dexterity), the wheel sustains not only itself, but also the magnets and other parts between it and the point of the standard, in opposition to gravity. The wheel, besides rotating rapidly on its axis, sets up a slow rotation about the pointed standard in the direction in which the *under side* of the wheel is moving.

By attaching the arm and counter balance shown in the engraving, so as to exactly balance the wheel and magnets on the pointed standard, the whole remains stationary. By *overbalancing* the wheel and magnets, the rotation of the apparatus around the standard is in an opposite direction, or in the direction in which the *top* of the wheel is turning.

This gyroscope illustrates the persistency of a rotating body in maintaining its plane of rotation against the force of gravitation. It also exhibits the result of the combined action of two forces tending to produce rotations about two separate axes lying in the same plane.

The rotation of the wheel upon its axis, produced in this instance by the electro-magnet, and the tendency of the wheel to fall, or rotate in a vertical plane parallel with its axis, result in the rotation of the entire instrument upon a new axis, which is coincident with the pointed standard.

THE SHAPING OF AN IRON SHIP.

In preparing to build an iron vessel it must be first decided what she is to do, where she is to go, and how she is to be moved. The character of the coast a ship is to visit determines her shape and capacity. If she is always to keep in deep waters and to follow the great commercial highways of the world, she must be built to sail in every sea; must be ready to encounter the dangers of every climate, hot monsoons of Indian seas or the freezing storms of the North Atlantic. If she is to visit our Southern ports and rivers, she must be flat-bottomed and of light draught, that she may creep over the shallow bars in safety. If she is to ascend swift and narrow rivers, she must be provided with ample means of ventilation and shaded decks. If her way leads to Northern ports, she must be ready to ride the tremendous seas and the furious gales of the North Atlantic. If her cargo is to be coal, she will assume one shape; if cotton, quite another. If she is to have paddles, she takes one form; if a screw, quite another.

Having decided all this; having settled upon her length, depth, width, and capacity, and fixed the cost, the next step is to make the model. A cabinet-maker carefully prepares a number of pieces of choice wood of exactly equal thickness, say from four to six inches wide and from a yard to one and a half yards long. At the same time he selects an equal number of pieces of veneer of the same size, choosing a veneer of a dark color or a color contrasting with the other wood. These boards are carefully laid one over the other, with the veneer between each, and the whole is then glued together to make a solid block. Out of this block the designer shapes the model of one half of the hull of the ship. He gives this block the exact shape the future ship is to assume when seen from the side. Only a half model is made, as the two sides of the ship will be simply duplicates of the model.

Every thing depends upon the skill of the designer. The ship's speed, capacity, draught and safety depend upon the shape he gives this wooden model. Men are not taught to make models; the good designer is born, not made. The imagination that can see the future ship in the block on wood, the sure eye that can draw the exquisite lines of bow and stern, the delicate hand that can realize these lines of beauty, come not by observation. They are gifts.

The architect making plans of houses and temples has comparatively an easy task. The drawing gives a clear idea of the appearance of the future building, and his work is perfectly plain and simple. The marine architect must combine science with beauty of form, or rather, science must be expressed in a beautiful form. The model must be an exact copy of the ship in little. He must be able to point out how deep the ship will sink in the water, how the bows will part the water in front, how the displaced water may sweep past the sides and under the stern. The model must show how deep the screw will be submerged, how far the ship may heel over under the influence of her sails or the waves in safety, and how she will be upborne from moment to moment on the ever-shifting waves. His art is the careful adjustment of forces, one against the other, the weight against the flotation or buoyancy, the resistance of the water against the power of her screw and engines, the force of the waves and wind against her own stability. The finished model is full of grace and beauty; but it comes not from the mere blending of sweeping curves and swelling lines, but from the balance of these forces. It is beautiful, because the repose of forces in equilibrium is always beautiful. Certainly, if the architect is called an artist, the model-maker is fully his equal.—*Harper's Magazine.*

RUSSIAN TORPEDO BOATS.

The engraving, which we copy from the London *Graphic*, represents the new model torpedo boat, one hundred of which were recently ordered by the Russian Government. Each boat is 75 feet in length by 10 in breadth, with a draught of 5 feet, and a speed of 22 miles an hour. They are built of steel, and divided into numerous watertight compartments, which serve the double purpose of increasing their strength and preserving their buoyancy in the event of any injury resulting from the enemy's fire. The vessel is armed with three torpedo poles of hollow steel, one at the bow, and one on each side of the boat, and the torpedoes consist of steel or copper cases containing from 40 to 50 pounds of dynamite, which would be exploded by electricity, and which is considered to be sufficient to sink any vessel afloat.

A MODE of equalizing the wear of the cylinders and pistons of horizontal engines, suggested by an English engineer, consists in making the piston-rod with a camber or upward bend, so that, when loaded with the weight of the piston and placed in the cylinder, it assumes a straight line, and transfers the weight to outside guides.

Of the corresponding members of the French Academy, Germany has 19; Great Britain, 16; Russia, 6; Italy, 2; Austria, 1; Denmark and Sweden, 4; Switzerland, 4; Belgium, 2; the United States, 3; Brazil, 1; and there are eleven vacancies to be filled.