THE NEW AMERICAN WAR SHIP OLYMPIA.

The cruiser Olympia, built at the Union Iron Works, San Francisco, Cal., has recently been completed, and in her trial trips has proved herself one of the noblest and fastest ships in the navy. The speed, as contracted for, was to be 20 knots. Her construction was authorized by the act of September 7, 1888. This act called for a cruiser of about 5,300 tons displacement. The speed of 20 knots had then been attained by the Spanish ship Reina Regente, the fastest war ship then afloat, a vessel which will be remembered by many of our readers as having participated in the naval parade at New York last spring. Bids for the Olympia were called for on April 10, 1890, and two months later were opened and the contract awarded to the Union Iron Works, of San Francisco, which proposed to construct the vessel on its own plans for $1,760,000, or on the department's plans for $1,796,000. The limit set by the act of Congress was $1,800,000. The contract called for the completion of the vessel on April 1, 1893. A speed premium was offered.

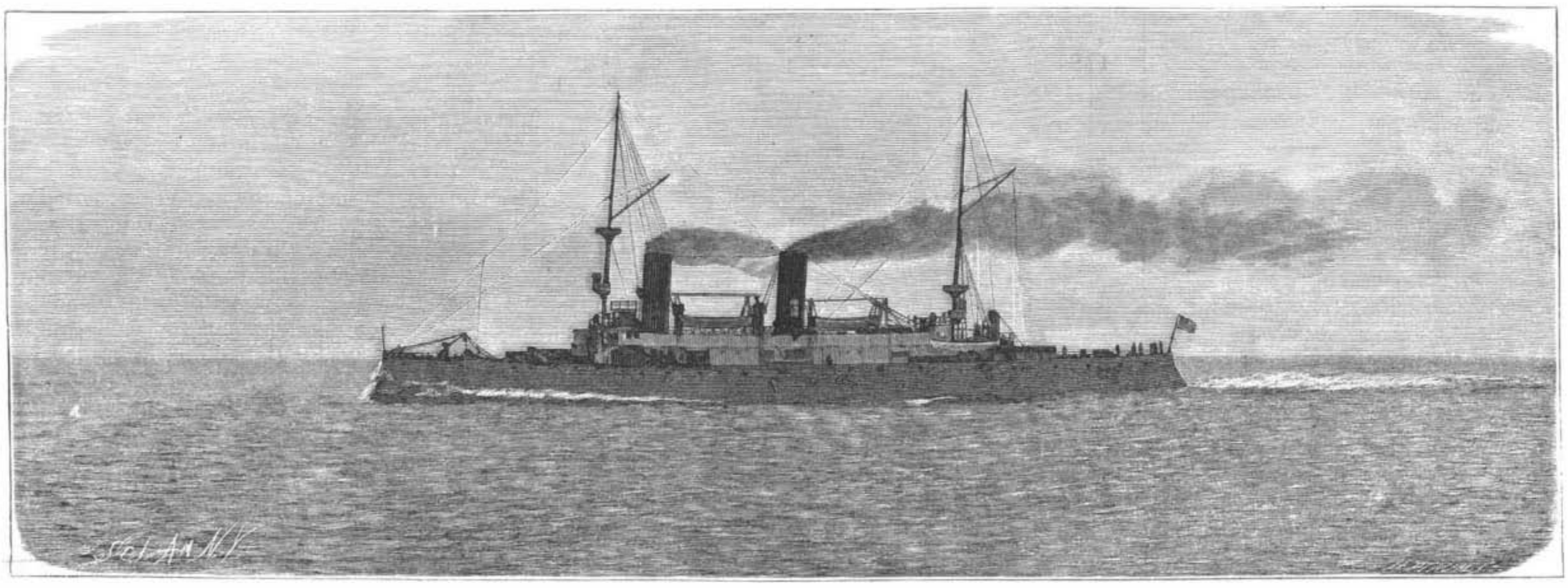
To secure more space in the fire room the contractors, at their own expense, lengthened the hull 10 feet. The ship is 340 feet long on the load line, 53 feet beam, 33½ feet deep, and draws 21½ feet of water. Her displacement is between 5,500 and 5,600 tons. She has three complete decks; one of which is a protective deck, and is virtually a substitute for side armor, none of which she carries. This protective deck joins the hull beneath the water line at an angle of 30°. It is 4¾ inches thick on the slopes amidships. On the forward and aft slopes it is 3 inches thick. Its flat central portion is 2 inches thick. Above the protective deck a belt of water-excluding material is carried up the sides, 2¾ inches thick and rising 4 feet above the water line. She has a cast steel ram in the bow. Her two masts are provided with military tops for Gatling guns and search lights.

The main battery consists of four 8 inch and ten 5 inch breech-loading rifles. The 8 inch guns are mounted on the main deck, forward and aft, in elevated steel barbettes, 4 inches thick, covered with conical roofs. These are about 10 feet above the deck, giving the guns a very extended training capacity. The ammunition tube leading to the barbettes is of steel and is 3 inches thick. The 5 inch guns are mounted in the central superstructure. They are protected by segmental shields, also 4 inches thick. Four can fire directly ahead, four astern, or five can fire abeam on either side. The secondary battery contains fourteen 6 pounder rapid-firing guns, protected by 2 inch shields, six 1 pounder rapid-firing guns, and four Gatlings. There are six torpedo tubes, one in the bow, one in the stern, and two on each side. The tubes are of the Howell type.

The ship is driven by twin screws, actuated by triple expansion engines of 13,500 horse power, calculated at 160 pounds pressure and 128 revolutions per minute. The high pressure, intermediate, and low pressure cylinders are of 42 inches, 59 inches, and 92 inches diameter respectively, and of 42 inches stroke. The main valves are of the piston type, worked by the Stevenson link motion. Bronze bed plates are used throughout. The main journals are lined with Parson's white metal put in under a hydraulic pressure of 15 tons per square inch. There are six boilers; four double-enders, 15 feet 3 inches diameter and 21 feet 3 inches long. Two are single-enders, of the same diameter and 11 feet long. All can be worked under forced draught on the air tight fire room system. The total grate surface is 824 square feet, and the heating surface is 28,300 feet. She is fitted out as a flag ship, having admiral's quarters, and is designed to carry a crew of 466 men.

Official trials were made November 25, but not completed. The trials are to be soon resumed. On the first trials a maximum speed of 22·3 knots was attained and an average of 22·15 knots, reduced by tidal corrections to 21·85 knots.

We are indebted to Mr. P. E. Law, of Santa Barbara, Cal., for the photographs from which our engravings were prepared. These were instantaneous photographs taken from the deck of the U. S. S. Patterson.



THE NEW WAR SHIP OLYMPIA RUNNING AT 22 KNOTS.

THE STATE DAM, MOHAWK RIVER, AT COHOES, N. Y.

This work is known as the "State dam," in contradistinction from the dam of the Cohoes Water Power Company, located about a mile above the falls, and by its means and a bridge the boats on the Champlain or Northern Canal are enabled to cross the river, which at this point is 1,700 feet wide. Several previous dams built here have been carried away.

Fig. 1 shows the method of constructing the apron. Strong ribs grooved on their inner edges are secured by braces to the masonry of the dam and then sheets of iron are introduced between the ribs, as shown in our engraving. The lower half of the apron is first built and the space between the iron plates and masonry filled in solid with concrete cement, then the upper half is made in the same manner and the cement carried up behind the iron plates to the top.

The top of the dam is finished, as seen in Fig. 2, by laying strong girders, which are firmly anchored to the masonry coping, and upon the girders iron plates are attached, the interstices between the girders and covering plates being solidly filled with hydraulic cement or concrete. The whole work is of the strongest and most substantial nature.

The dam is built by Messrs. Cunningham & Morety, under contract with the State, the price to be paid being $90,000. For the photographs from which our illustrations are made we are indebted to Mr. Chas. McGovern, of Cohoes, N. Y.

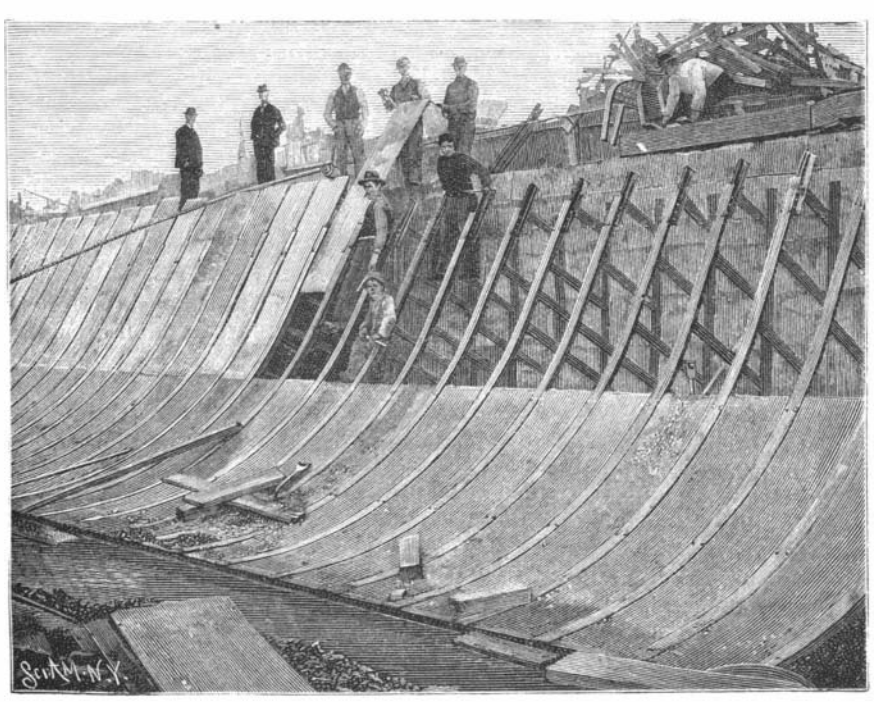


Fig. 1.—THE NEW STATE DAM, COHOES, N. Y.—THE IRON APRON.

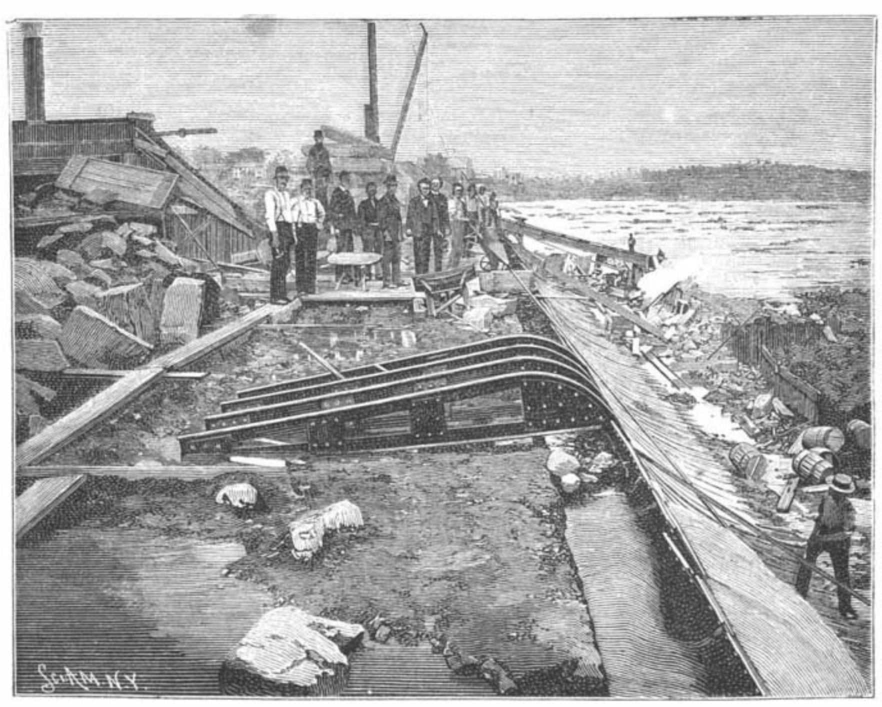


Fig. 2.—THE NEW STATE DAM, COHOES, N. Y.—SHOWING THE TOP FRAME.

Liquid Chlorine.

Chlorine in liquid form is now being manufactured by Messrs. Pechiney & Co., of Salindres, in France, and at the Rheinania Works, at Rheinan, near Mannheim, in Germany. The gas is liquefied by subjecting it to a pressure of 50 atmospheres (750 lb.) to the square inch and stored in strong iron vessels holding 120 lb. each. It is delivered from these vessels either in the liquid or gaseous form, and can be used in bleaching. It is said to be as economical in use as bleaching powder, while it has some advantages over that product. It is said, however, that the railway companies consider the liquid highly dangerous, and make difficulties as to carriage.

AT the late meeting of the Zoological Society of London a most remarkable instance of evolution in the adaptation of animal organisms to their environments was demonstrated. Mr. Tegetmeier said that the English rabbits imported into Australia were gradually changing their habits and becoming tree climbers, the available food for them there being largely the bark and leaves of trees. In evidence of his assertions he showed the feet of some Australian rabbits, which showed that they are slighter than those of their English progenitors, and their claws are longer and sharper.

Crystallized Sunshine.

We use it daily in a myriad of forms and combinations. It is a chief and important article of food which we call sugar. The sparkling cubes which we buy for a nickel per pound are lumps of crystallized sunshine, or, if you please, concentrated energy. The growing cane absorbs carbonic acid gas from the air, throws off oxygen and deposits carbon in the plant. The carbon combines with hydrogen and oxygen given up from the water absorbed by roots and from the atmosphere. From a single pound of sugar cane we may obtain 2,800 grains of carbon. In these bodies of ours, often called human furnaces, we burn sugar, and so great is its heat-giving power that ten grains of cut-loaf sugar, when consumed in the body, will produce sufficient heat to raise 8·61 pounds of water one degree F., which is equal to lifting 6·649 pounds one foot high. (Edward Smith.)

Some chemists call this force potential energy. It is stored up in different sorts of food in varying volume. There is as much or more in starch than sugar, but in the case of starch it must first be converted into sugar, which the system does as soon as it enters the mouth. Sugar is the very best example of respiratory food, because its action in the system is rapid, and, as a general rule the sugar is fully decomposed or destroyed—burnt up, which is not the case with foods consisting largely of albumen. One ounce of sugar burnt up in the system gives four times more of energy than one ounce of Bass' ale, 25 per cent more than one ounce of cooked beefsteak, nearly four times as much as can be obtained from a like quantity of potatoes.

Crystallized sunshine, as it is turned out in sparkling cubes, or as a granulated mass from the huge, smoke-begrimed brick structures that are such conspicuous objects along the river front of New York, Philadelphia and the bay of San Francisco, plays a very important part in our dietary. And until recently it had a very important part in Uncle Sam's economy, for we find that during the past twenty-five years (1866-1891) sugar placed over $1,000,000 in the national treasury in the shape of a duty or a tax on the energy-building power of the people. It is not any wonder, then, that sugar plays a very prominent part in the political world. It is a splendid source of financial strength to many governments, as it is a physical strength to those who are its consumers.

Chemically considered, there are several sorts of sugar, but using the term in its general sense, we may say that it can be obtained from linen rags and sawdust, as well as from beets and other roots, maize, sorghum, the palm and the cane. The chemical production of fruit sugar, grape sugar or glucose, which will not crystallize, is very different from that of cane or beet sugar. If one atom of water could be eliminated from a molecule of glucose, we would have a chemical formula identical with cane sugar. Will it be the same, if the change is ever brought about? Some chemists claim it will, but nature, in her laboratory, makes different things from the same chemical formula, and has tricks of combination that defy our power of research and investigation.—*American Grocer*.

Amalgam Cement for Porcelain.

A very stable and lasting cement for articles of porcelain that do not have to be submitted to a very great degree of heat is made, according to the *Farben Zeitung*, as follows: First prepare a fine powder of metallic copper, by shaking a solution of copper sulphate with granulated tin. Wash the powder well after precipitation. The proportion of this powder will vary according to the desired hardness of the cement (which is, in fact, an amalgam), and may run from 20 to 36 parts, the rule being the more copper, the harder the cement. Place the desired quantity in a porcelain vessel and add to it sufficient sulphuric acid of 1·85 s. g. to make a pasty mass. Add at once 70 parts of metallic mercury and stir constantly until a homogeneous amalgam is obtained. Wash with plenty of warm water until all the sulphuric acid is removed. To use this amalgam it must be heated until it becomes likes wax. The edges of the article to be united should also be heated to about 375° C. (about 706° F.) When applied to the heated amalgam a portion of the latter will attach itself to the edges, which may then be joined. As soon as it is cool the article is ready for use. It will then stand heat up to 500° F. without any danger.

Vesuvius.

Professor Palmieri writes: "Vesuvius, the activity of which was rather increased last full moon, and then decreased during the last few days, has again commenced to show signs that we may expect new eruptions and flows of lava. From the principal crater much smoke issues, and detonations are heard and redhot stones are thrown out. The eruptive cone in the Atrio del Cavallo emits smoke from its summit with a certain force, while from its base the lava flows more rapidly. A smaller cone in the same place is not quite so active. For many days the seismic instruments have maintained a constant movement which tends to increase."

THE PHOTORET.

This is the name given to a complete little photographic camera, an American invention, which eclipses for compactness and novelty anything of the kind that has come under our notice. It resembles in outward appearance a nickel-plated watch, and is readily operated with one hand. The lens is rather minute and of fixed focus, but still makes a sharp, small picture which can be subsequently enlarged four or five diameters to advantage. What appears to be the ring and stem of the watch is the releasing pin for the shutter and for revolving the lens, bringing it into a new position for the next picture, and at the same time winding up the shutter spring. There are also numbers stamped on the periphery of the lens holder which indicate the number of pictures that have been taken; these numbers show as the outer case is rotated. On the front is a small pin-hole called "time stop." If a common pin is inserted here and the stem of the watch be pressed as shown, the lens will remain open as long as the pressure is maintained, and a time exposure may thus be made.

The camera is loaded by unscrewing the back and inserting the sensitized thin film of celluloid face downward. On this film six small pictures may be made. Then in a dark room the film is removed and another inserted. These films are supplied with the camera in special boxes, each containing a compartment holding six fresh films and a vacant one for holding the exposed films.

Enough films are supplied with each camera watch to make thirty-six different pictures. There is also a small book of concise directions, which describe fully the method of operating the camera and of making the pictures. The price at which the camera is sold is very low, and it is certainly an article of no inconsiderable utility. Small as it is, it is useful, not only to the beginner in photography, but to those who are experienced in this beautiful art. There are many situations in which the taking of a photograph by means of a pocket camera like this becomes desirable and even important; situations, in fact, in which it would be impossible to use a large instrument. At all times and in all places it is useful. With it the owner may take snap shots of people, of animals, buildings, machinery and objects of nature. The student of science may use it in microscopical illustration. For the preparation of lantern slides it is especially convenient and yields excellent results.

Workers in almost every profession or trade may derive valuable assistance and be enabled to carry to their offices or work benches ideas and effects, many of which will repay a hundredfold the time and attention bestowed on them.

The design of a fabric, the draping of a garment or hanging, a striking effect in architecture, etc.—these, and, in fact, any and everything visible which would suggest itself as desirable to the operator, can be captured.

Independently of the greater uses, such as we have indicated, we welcome the advent of such contrivances as this, because they are of special interest to the young, and contain the elements for much harmless amusement and enjoyment. How much better it is for young folks to be occupied in picture taking than in learning cruel sports, such as bird shooting, pistol firing, etc. The boys and girls, as well as grown people, are likely to be delighted with this little invention.

We give a specimen of the portraiture produced by means of this camera. The small face is that made by the photoret, of which the larger face is an enlargement.

Further information may be obtained from the manufacturers, the Magic Introduction Company, 321 Broadway, New York City.

The Motions of the Diamond.

Sir R. Ball, who is fond of revealing the marvelous, has been studying the mysterious action of molecules; and what he has to say concerning the movements of the molecules of a diamond is as truly surprising as anything he has told us about the sun and the planets. Every body is composed of a multitude of extremely, but not infinitely, small molecules, and it might be thought, says Sir Robert (according to a contributor in the *Newcastle, Eng., Chronicle*), that in a solid, at all events, the little particles must be clustered together in a compact mass. But the truth is far more wonderful. Were the sensibility of our eyes increased so as to make them a few million times more powerful, it would be seen that the diamond atoms, which form the perfect gem when aggregated in sufficient myriads, are each in a condition of rapid movement of the most complex description. Each molecule would be seen swinging to and fro with the utmost violence among the neighboring molecules and quivering from the shocks it receives from the vehement encounters with other molecules, which occur millions of times in each second. The hardness and impenetrability so characteristic would at first sight seem to refute the supposition that it is no more than a cluster of rapidly moving particles; but the well known impenetrability of the gem arises from the fact that, when attempt is made to press a steel point into the stone, it fails because the rapidly moving molecules of the stone batter the metal with such extraordinary vehemence that they refuse to allow it to penetrate or even to mark the crystallized surface. When glass is cut with a diamond, the edge which seems so hard is really composed of rapidly moving atoms. The glass which is cut is also merely a mass of moving molecules, and what seems to happen is that, as the diamond is pressed forward, its several particles, by their superior vigor, drive the little particles of glass out of the way.

Gardening by Electricity.

By the use of electric light the Hon. W. W. Rawson, of Arlington, Mass., claims that he makes a gain of five days in each of his three crops of lettuce—that is, two weeks in a season—that the gain on one crop pays all the expenses of the electric lighting for the season, thus giving him the gain on the other two for extra profit. His attention was first called to the usefulness of the light by the advance made in the growth at the ends of his greenhouses next the street and in the glare of the electric light. This was so marked that he introduced the light through his lettuce and cucumber houses. Dr. Baily, of Cornell University, says, as the result of his own experiments, that the influence of the light is greatly modified by the interposition of a glass roof. Plants injured by a naked light were benefited by the protected light. Five hours' light per night at a distance of twelve feet hastened maturity a week or ten days, but proved injurious to young plants and those newly transplanted.

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At the end of every year a great many subscriptions to the various SCIENTIFIC AMERICAN publications expire.

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