THE TIMBER DRY DOCKS AT THE BROOKLYN NAVY YARD.

As we go to press the last few yards of excavation are being taken out preparatory to opening the great timber dry dock at the Brooklyn Navy Yard, known as No. 3, to the river, and by the time this issue is in the hands of our readers the dock will be completed and ready for the entrance of warships. In its general construction it is similar to No. 2, a timber dock lying parallel with it which was opened a few years ago; but its capacity, as will be seen from the accompanying table, is considerably greater.

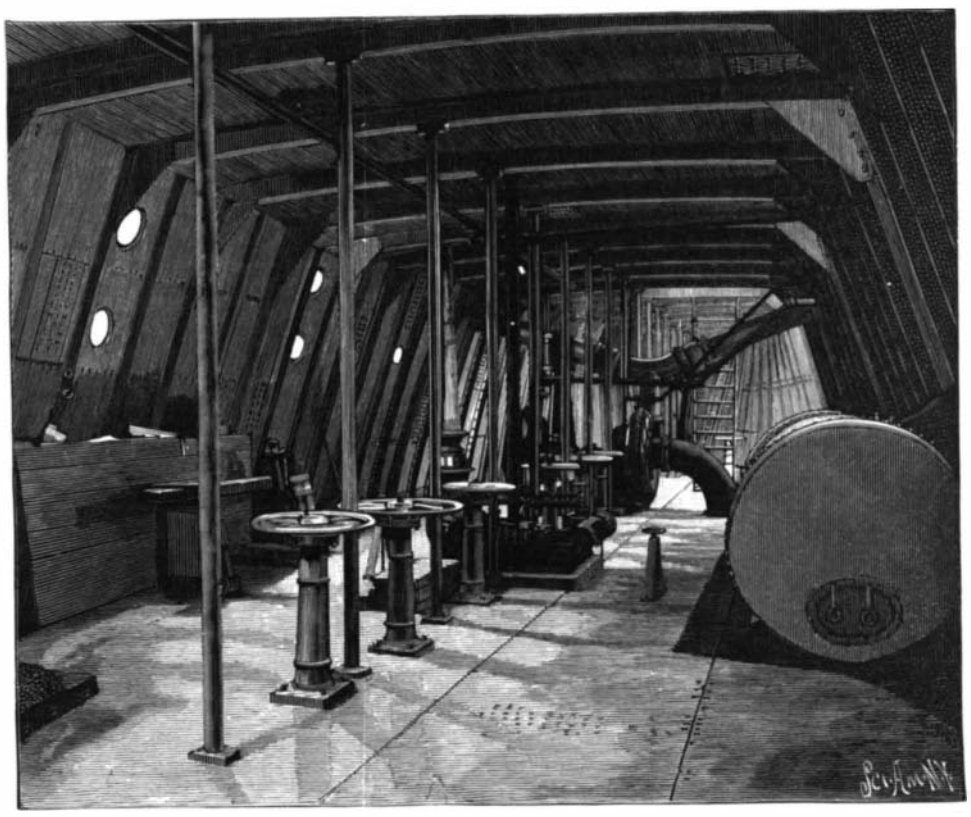
	Length on Coping.	Breadth on Coping.	Depth of Water on Sill.	Material.
Dry dock No. 2.....	500 ft.	130 ft.	25½ ft.	Timber
Dry dock No. 3.....	670 ft.	151 ft.	29 ft.	"

In some of its dimensions the new dock is the largest of its kind in the United States, its nearest competitor being the great Port Orchard dry dock on Puget Sound, an illustrated description of which appeared in the SCIENTIFIC AMERICAN of October 3, 1896. The latter dock is 5 feet longer and has 1 foot greater depth of water on the sill, but it is not so wide. These two docks are among the largest in the world, and they are likely to meet all the needs of our navy and merchant marine for many years to come. The use of timber for dry dock construction is comparatively modern, all the earlier docks having been built of stone. The first timber docks in the United States were constructed over forty years ago, and experience has shown that they are thoroughly reliable. It is true that in those waters which are infested with the teredo the entrances are liable to be eaten away; but the difficulty can be overcome by building these parts of masonry or concrete. There are advantages of increased light and working space in a timber dock, due to the easier slope of the side walls; but the main advantage lies in the rapidity with which it can be constructed and the fact that it is much cheaper to build. This is shown by a comparison of this dock with the stone dry dock at Mare Island, San Francisco. The new dock will have cost about $600,000, whereas the stone dock at Mare Island cost about $3,000,000 complete, although it is over 140 feet shorter and the depth and width are smaller in proportion.

The illustrations which accompany this article will give a clear impression of the construction of these dry docks and the manner in which a warship is carried upon the keel blocks and shored up by struts which rest upon the altars and are wedged snugly against the hull. One of the views shows the cruiser Columbia entering dock No. 2, the caisson gate having been floated away from the entrance, as will be explained later. Two other cuts show a bow and stern view of the same ship in the dock after the water has been pumped out. It will be remembered that the Columbia and her sister ship the Minneapolis are the two fastest cruisers of their size (7,475 tons) afloat to-day, the former having a record of 22·8 knots per hour and the latter having slightly over 23 knots to her credit. They are also remarkable for their arrangement of triple screws. It only requires a glance at the long, easy sweep of the lines of this ship as shown in the illustration, remembering the fact that within her hull are engines and boilers of 21,500 horse power, to understand how this phenomenal speed was maintained on a four hours' trial.

Before entering into the detailed description of the new dock No. 3, it will be well to refer to the sensational rumors which have appeared in the daily press to the effect that the dock is several inches shallower on the sill and shorter in total length than the contract calls for. If the dock is a few inches short in a length of nearly seven hundred feet, it is a small matter; but if the available depth of water on the sill is four inches less than was designed, it is a matter of most serious moment. By reference to the two drawings showing the work as first designed and as now built, it will be seen that it was at first intended to have a depth of 29 feet 4 inches over the outer sill and 28 feet over the inner sill. Before the contract was let it was decided that the 12 by 16 inch timber which forms the outer edge of the sill and takes the thrust of the caisson gate was not deep enough, and its depth was increased to 16 inches. The difference—4 inches—was deducted from the total depth, leaving it 29 feet in place of 29 feet 4 inches.

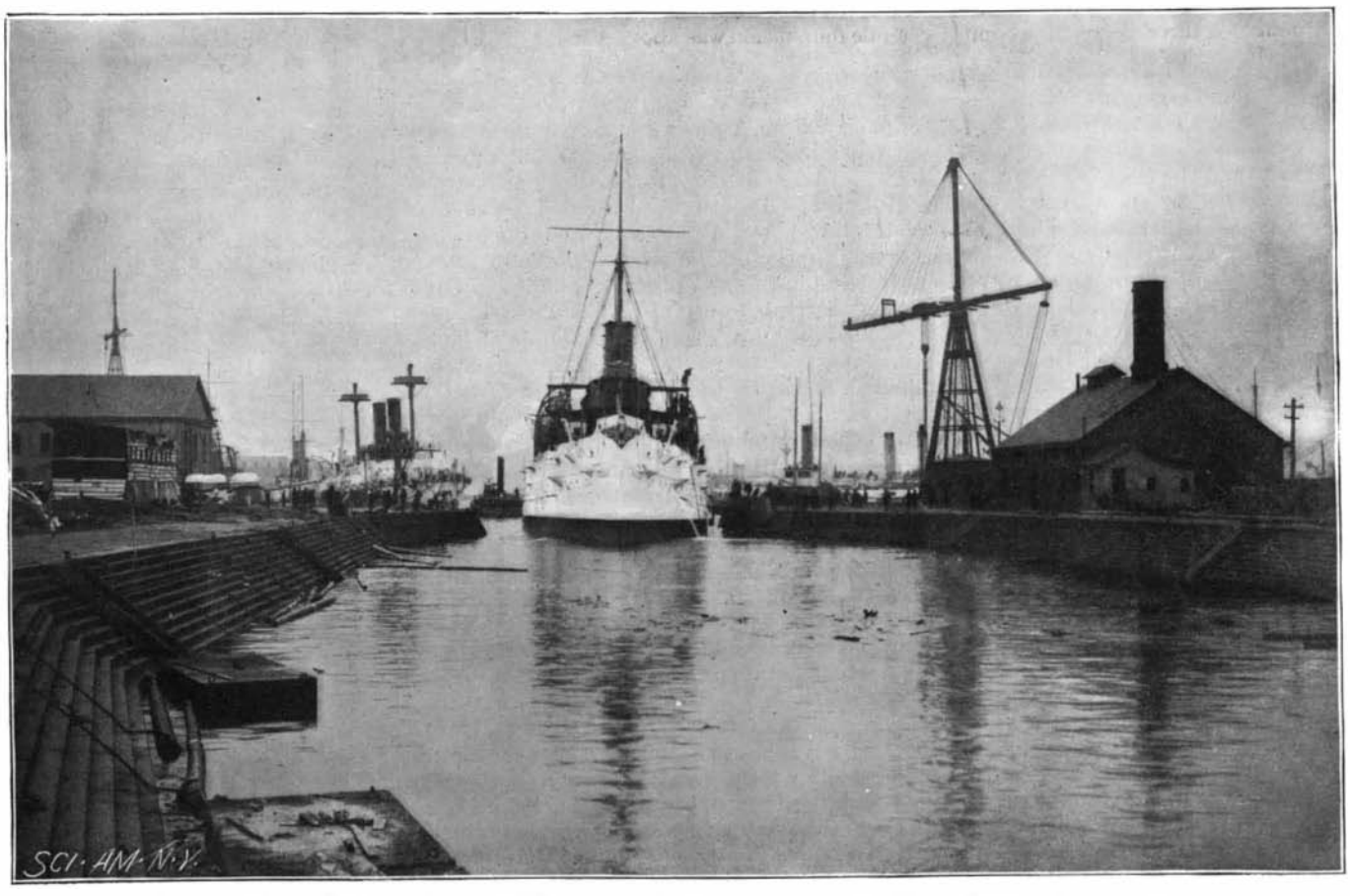
This change did not affect the capacity of the entrance, as this was determined by the inner sill, which was now one foot higher than the outer sill. It was subsequently arranged to lower the inner sill one foot, as shown in the plan, thereby giving a clear depth over both sills of 29 feet, or one foot more instead of four inches less than the original design. The value of this additional foot of depth is incalculable. It would mean that in time of war a crippled and sinking ship would have just that much better chance of crawling into dock before she sank. It is true the present sills are one foot lower than the top keel blocks; but these could be removed and working space could be obtained by taking up the planking on the floor of the dock—an expedient which could easily be carried out and would give 15 inches more head room. As regards the shortage of 20 inches in the length, it may be said that since the work was begun the dock has been lengthened 70 feet and has been moved bodily inshore 64 feet. The piling upon which the structure is built is spaced 4 feet apart longitudinally. The present difference in length is caused by the fact that, when the dock was lengthened, it was built to an even multiple of 4 feet.



DRY DOCK NO. 3 AT THE BROOKLYN NAVY YARD—INTERIOR OF CAISSON.

The plan of the dock approximates to the form of a ship, the sides tapering toward the ends and sloping toward the floor. The inner end is formed by a transverse wall which has the same slope as the side walls and the outer end is closed by a hollow steel caisson of a general boatlike form, whose keel and stems conform exactly to the cross section of the dock entrance and fit against a bottom sill and side abutments, a watertight joint being secured by means of a rubber gasket. The problem in building such a dock is to provide a deep, watertight basin which shall be able to withstand the pressure of the water when it is full, and to carry the concentrated weight of the ship and prevent seepage of water from without when it is empty.

The floor of the dock, which is 626 feet 8 inches long by 64 feet 4 inches wide, is carried upon 12 inch spruce piles 45 to 50 feet long. They are spaced 4 feet between centers except beneath the keelway, where eight piles are driven close together to take the enormous weight which is concentrated on the keel of the ship. After the piles had been cut off to the same level they were capped with 12 × 12 inch longitudinal timbers, drift-bolted to the piles, and above these over each row of piles are lateral timbers extending across the full width of the floor. Above this is laid the floor of 3 inch planking. To render the floor watertight a complete bed of concrete 4 feet thick is laid beneath it, its surface being level with the top of the longitudinal piles. Within the concrete is formed a system of drains leading to the pump well. To render the floor thoroughly secure against leakage, a complete wall of sheet piling formed of 8 × 12 timbers, tongued and grooved, was driven entirely around the outer edge of the floor. This extends 35 feet below the floor level, and the concrete beneath the floor is finished off carefully against it. The sloping side walls are carried upon brace piles which are driven 6½ feet from center to center laterally, and 4 feet between centers longitudinally. Securely notched and drifted to these are the sloping timbers forming the altar supports, which butt at their lower end against the transverse floor timbers before mentioned. Directly upon these are bolted the 8 × 13 inch stringers which form the "altars," as the steps of the side walls are termed. To prevent leakage through the side walls, over 3 feet of puddled clay are carefully tamped in around the piles and up to the underside of the altars. Back of the coping there are driven five rows



THE CRUISER COLUMBIA ENTERING DRY DOCK NO. 2 AT THE BROOKLYN NAVY YARD.

of coping piles, and 26 feet back from the coping of the side walls is driven a second wall of sheet piling. This extends 50 feet below grade, and completely encircles the dock, the bottom edge of this outer wall being 15 feet below the dock floor. This is done to prevent seepage of water through the side walls, and it is assisted in this by several transverse walls of sheet piling.

That this work has been well done is proved by the fact that the leakage into the dock was only 3 inches in twenty-four hours. This leakage was due to the fact that the trench for the suction pipe was open for alterations, and when this trench is closed the dock will be perfectly dry.

The methods adopted by the contractors, T. & A. Walsh, of New York, in excavating this great dock were entirely novel, and are of considerable interest. Excavation was begun at the inshore end, and the work of excavating and pile driving was carried out in sections. As each section was being excavated it was inclosed by sheet piling and flooded with water. This enabled floating pile drivers and excavators to be used, and the trouble and expense of continually shifting the land pile drivers avoided. After a section had been excavated and the piles driven, it was pumped out and finished off, the plant being moved to a new section.

The steel caisson which forms the gate to the dock is of special interest. It is the largest in the world, exceeding that at the entrance to Puget Sound dock. It is shaped like a double-ended boat, its length on deck being 108 feet 8 inches; depth, keel to deck, 35 feet 4 inches; length on keel, 71 feet 1⅛ inches; and greatest breadth, 25 feet. The keel is 24 inches wide by 17 inches deep, and on each side of it and on each side of stems are strips of plank, to which are fastened rubber gaskets 1½ inches thick by 6 inches wide. These bear against the side abutments and the bottom sill, and under the enormous pressure of the water make a tight joint. The framing consists of 4 × 4 inch angles, spaced 2 feet apart, and the plating varies from ¾ inch at the garboards to ⅜ inch at the sheer strake.

The caisson is strengthened by longitudinal stringers from 20 to 24 inches deep, which are riveted to the frames. Twelve feet above the keel is the lower deck, which consists of 8 inch deck beams, riveted to every other frame, and tied together by longitudinal stringers of ⅝ by 24 inch plate. Each beam is tied to the bottom framing by three 3 inch stanchions. Twelve feet above the lower deck is the main deck, which is the one shown in our accompanying view of the interior of the caisson. It is covered with plating ½ inch and ⅝ inch thick. Above this is a top deck of wood, which is level with the coping of the dock.

In the bottom are placed 200 tons of concrete ballast, to give the caisson stability when it is floated away from the abutments. The space below the main deck is utilized for water ballast which is taken in for regultaing the draught. Water is admitted by two 16 inch gate valves, one at each end of the caisson, and it is removed by the 12 inch centrifugal pump seen in the engraving of the interior. The donkey engine in the center of the deck operates a capstan on the upper deck which serves for warping the gate into position.

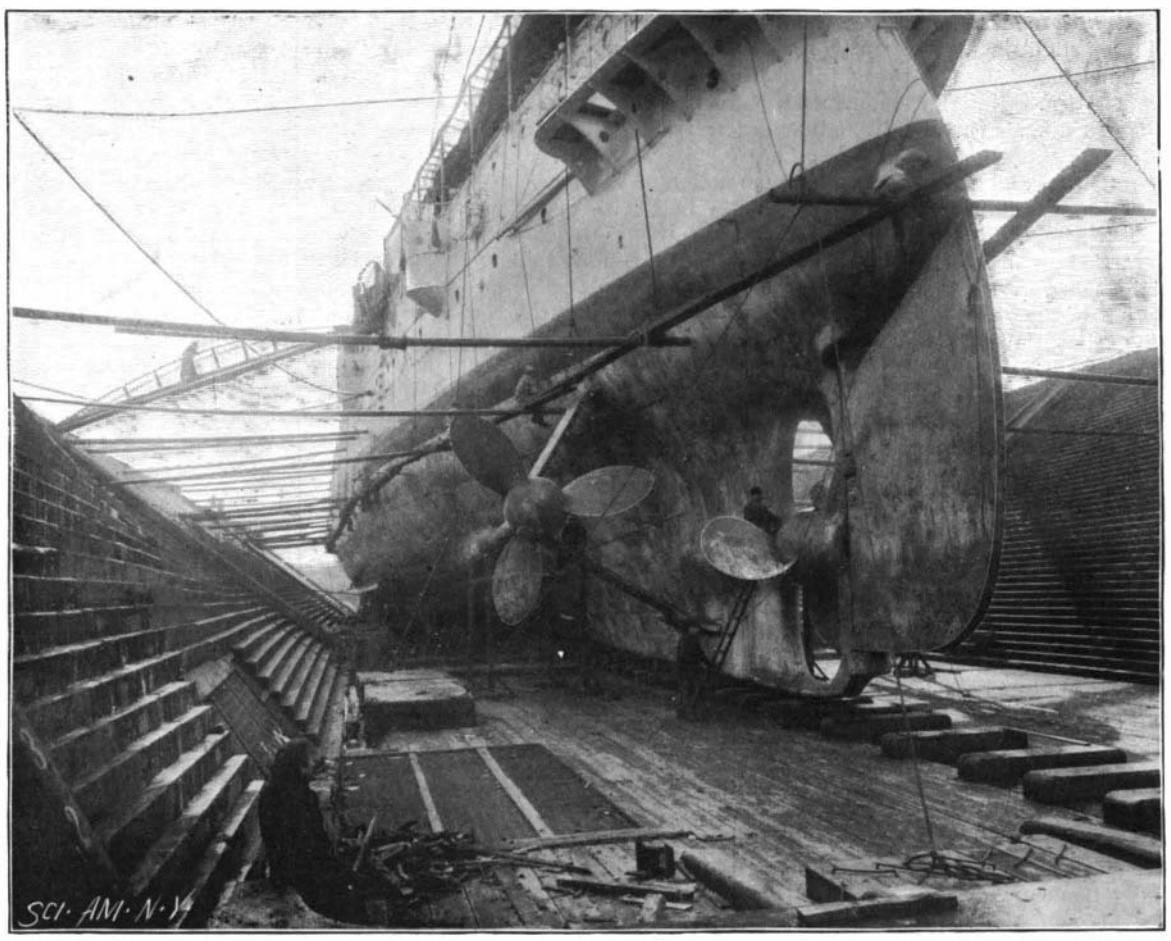
Arranged down the center of the deck are twelve hand wheels which operate as many large gate valves for admitting water to the dock when a vessel is ready to leave. The valves are placed midway in a dozen pipes, which pass clear through the caisson. They are in two rows, the lower pipes being 24 inches and the upper row 20 inches in diameter. The large tank seen in the foreground holds 20,000 gallons of fresh water for the boiler, which is located on the main deck. The caisson was built by T. S. Marvel & Company, of Newburg, N. Y.

The pumping machinery for emptying the dock is located in a building near the dock entrance. It was put in when dock No. 2 was built and will now be doing double duty. It consists of two 42 inch centrifugal pumps driven by two vertical engines with cylinders 28 inch diameter by 24 inch stroke. The plant was built by the Southwark Foundry and Machine Company, of Philadelphia, and the pumps have shown a service capacity of 95,000 gallons per minute. There is also a 15 inch pump with a capacity of 7,000 gallons per minute for drainage.

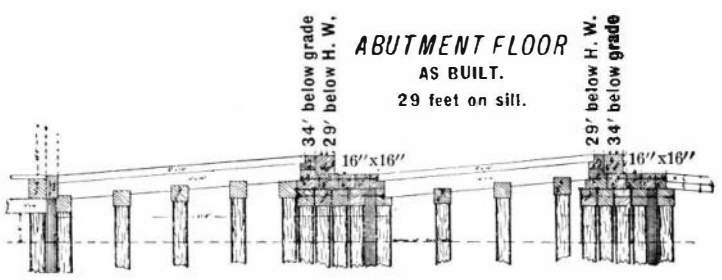
The figures of the total quantities are necessarily large for a dock of this size. They are as follows:

Twelve inch spruce piles	18,000
Twelve inch oak piles	290
Yellow pine timber	2,893,446 B. M.
White pine timber	115,000 "
Oak timber	128,000 "
Screw bolts and drift bolts	657,000 pounds.
Cast iron suction pipe	290,000 "
Barrels of cement	8,600

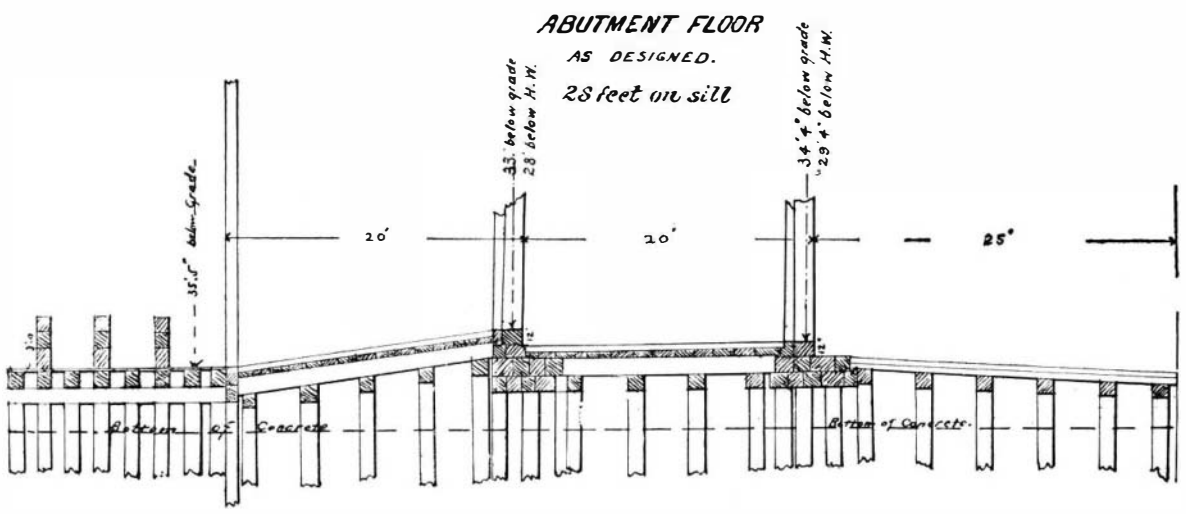
The total cost of the dock including the track around the coping and pile foundation was about $600,000. We are indebted for our particulars to the courtesy of Mr. C. M. Bird, the engineer for the contractors.



CRUISER COLUMBIA IN DRY DOCK NO. 2, BROOKLYN NAVY YARD, SHOWING THE ARRANGEMENT OF TRIPLE SCREWS.



CROSS SECTION OF DOCK ENTRANCE AS BUILT.



CROSS SECTION OF DOCK ENTRANCE AS DESIGNED.

A Rope from the Ocean.

The largest marine plant, and probably one of the highest plants known on this globe, is a gigantic seaweed, the nereocystis, the stem of which has been found to grow as much as 300 feet long, says the Mining and Scientific Press. It was first discovered not far from the Alaskan coast, but has since been found floating in various parts of the Pacific Ocean along the American and Asiatic shores. This seaweed grows in a very curious manner. Large quantities of it are found at a little distance from shore, and at depths not exceeding 300 feet. On loamy bottom large thickets of this plant take root, and a stem of the thickness of ordinary cord grows upward. At its top there is a pear-shaped balloon, which grows with the stem, and when it reaches the surface of the water it often measures 6 feet and more in length, with a diameter of 4 feet 6 inches. This balloon has, of course, an upward tendency, and keeps the stem growing until it floats on the surface of the water. From the top of this balloon a large tuft of strong, thick, spade-like leaves grows out, which originally are not more than 2 feet long, and which grow and split until from the balloon a rose-like growth of from 50 to 65 feet in diameter covers the water. This gigantic weed grows in such quantities that near the shore large meadow-like islands are formed, which impede navigation. The natives of the Aleutian Islands make manifold usage of this plant. From the strong dried stems they make rope 250 feet and more long, while balloons of this weed furnish them with large vessels after they are dried, the smaller ones being used in their boats to bail out water. The long leaves, after being dried, are cut into narrow strips and used for wickerwork, the making of baskets and similar furniture.

Minerals in Servia.

According to the Revue d'Orient, Servia is rich in mineral products. Gold is found in a pure state in the beds of some rivers. such as Thenarcka, Pek, Timok, Rasina and Poustarek, streams in the neighborhood of Pirot. All the mineral districts of Servia contain silver in a greater or less proportion, in lead, arsenic, manganese, zinc and copper. Quicksilver is found chiefly in quartz and serpentine, the chief vein being near the village of Ripany. There is a little copper almost everywhere, but chiefly near Pojarevatz and Valievo. The antimony is good, and is found in the provinces of Belgrade and Valievo. Zinc exists in all the mineral districts most frequently mixed with sulphur. Nickel is also found, but in small quantities, mixed with quicksilver. Chrome has been discovered in serpentine, and the government works a mine of iron chrome near Valievo, of which great things are predicted. Coal is met with in nearly all tertiary formations of the kingdom, and all the Servian coal fields have by no means been yet explored; there are very few parts where researches have not brought new beds to light. Hitherto the best coal has been found at Verkachanka, between the Pek and the Timok. This is coal of excellent quality, in seams four to sixteen meters thick. The mine is connected with the Danube by a railway.

A MEMORIAL statue to Dr. Parke, who was the surgeon of Stanley's expedition in Africa, has been erected at the south side of Leinster Lawn in Dublin.