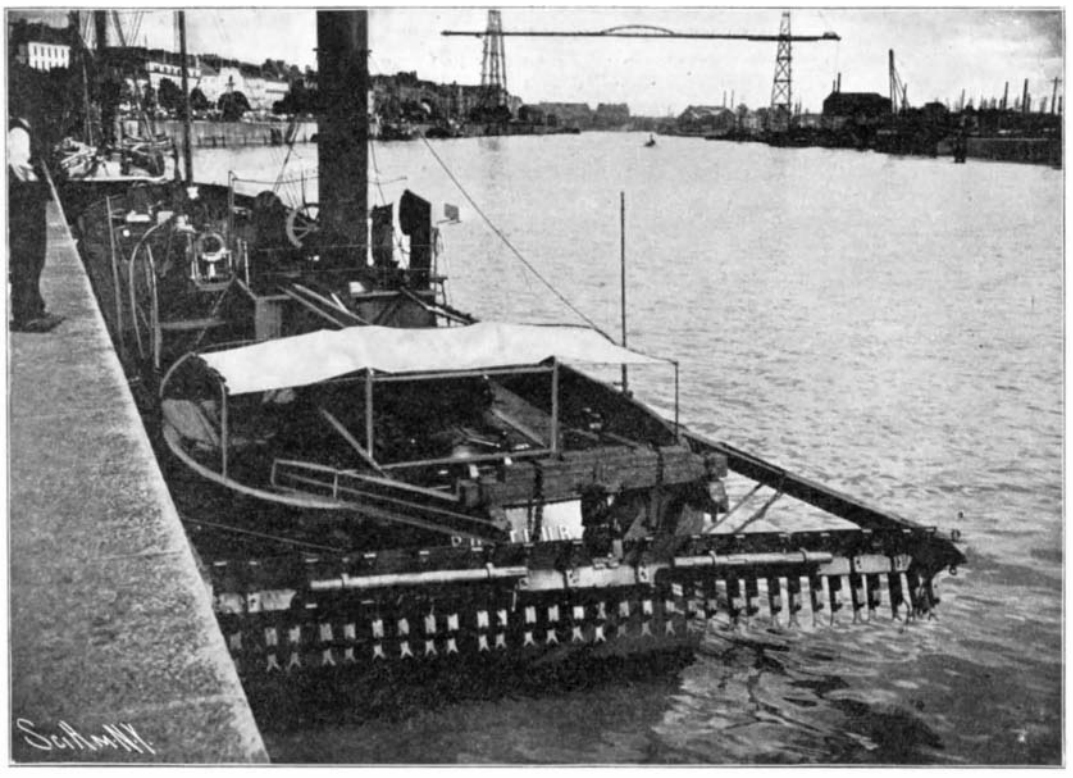
RIVER RAKE FOR CHANNEL DEEPENING.

BY J. PELTIER.

The river Loire is a somewhat capricious stream and by no means favorable for navigation. Its banks are formed of easily displaced and shifting sands, that during winter freshets threaten to fill the channel by the formation of shoals and bars. Engineering skill, however, has succeeded, by the building of suitable works and by continuous and intelligently-applied dredging, and also by the construction of a 10-mile canal around the most difficult portion of the river, in keeping the channel open. Ships drawing about 18 feet of water can reach Nantes at any time of the year, or any condition of the tides. Vessels drawing 20 feet can reach the city during spring tides, and occasionally, during the highest tides, vessels drawing as high as 23 feet of water have been able to deliver cargoes at Nantes.

During the present winter, after a season which witnessed the highest floods of the Loire of the present century, the river has fallen to an elevation as low as that in the year 1822, and the tides, flowing with rapidity up a comparatively shallow channel, carry a large amount of mud in suspension which, at slack water, settles to the bottom in the upper reaches of the Loire, where the water is rendered slack by the shallower portions of the river, which as yet have not been dredged. In order to prevent this accumulation, the Public Works have transformed a steam mud barge into what might be called a steam-rake barge. The barge is 131 feet in length, 23 feet in breadth and has a tonnage of 292 tons. The rake, which is adjusted across the stern, is 36 feet in length and weighs 2 tons. During ebb tide the barge, which has engines of 300 horse-power, takes up a position in the middle of the river and then lets go the rake until it rests on the bottom. The barge then steams from Nantes to the canal and back to Nantes, and continues to rake the muddy bottom until the next time of high water. Steam is delivered to the tines and the upper part of the rake and the agitation serves to loosen up the mud, which is carried in suspension by the ebb tide to sea. The method has proved highly successful.



STEAM BARGE WITH HEAVY RAKE AT THE STERN FOR DEEPENING THE CHANNEL OF THE LOIRE.

SKELETON MODELS OF WARSHIPS.

The costly, complicated, naval constructions of the present age are such intricate structures that the ordinary drawings are exceedingly difficult for the practical seaman to comprehend, and models that will show all details of the interior economy are necessary for the personnel on board to handle and fight a modern battleship most efficiently.

The drawings and blue prints that are furnished in the outfit of all vessels are technical productions, which cannot be readily understood by the men and which require even for officers considerable time to study. These plans are usually kept by the captain, executive, and officer in charge of the department of steam engineering. One is almost invariably obliged to go below into the compartment in question to get a correct idea of the situation, the relative space occupied by pipes, valves, etc., in a compartment and its relation to neighboring compartments. Detail drawings generally fail to show the environment of valves, etc., and inspection of the drawings is rarely satisfactory. Even after going below into store rooms the watertight bulkheads prevent direct access there to neighboring compartments, and an exact idea of surroundings cannot readily be obtained even by personal inspection unless one devotes a great deal of time and care to study those features. This is what must be done by those who are specially detailed to carry out the regulations for the care and preservation of our ships, the executive, hull board, etc., but for the other officers and men skeleton models are necessary if they are to know the ship thoroughly. Having seen the skeleton models on board vessels of the German navy, Commander W. H. Beehler, U. S. N., called attention to them while naval attaché and explained the use which the German navy made of these models for instructing the officers and men about the ships in which they were serving. These skeleton models are made of tin and usually on a scale of one quarter of an inch to a foot; they cost, according to the size of the ship, from 2,000 to 10,000 marks, $500 to $2,500, and this money is well invested by an economical administration.

The Bureau of Construction was anxious to have such models, but did not have the money to construct them. But even this sum and ten times that amount would be much more wisely expended for skeleton models than for the ornate models that have been made of all our ships for exhibition in the great expositions at Chicago, Paris, St. Louis, etc., and which only show the exterior appearance of the ships without giving any view of the interior details. How cheaply useful skeleton models can be made has been instructively told by Commander Beehler in the Proceedings of the U. S. Naval Institute, from which publication we abstract the information presented in this article.

Upon his return from duty as naval attaché at Berlin, Vienna, and Rome, Commander Beehler was ordered to the Asiatic Station and took command of the U. S. S. "Monterey" at Canton, China. Shortly after taking command he proceeded with the "Monterey" to Hong Kong, where upon inquiry he soon found a Chinese carpenter whom he engaged to construct a model of the "Monterey" out of wires, paper, and wood. This Chinaman had two assistants who, by taking the blue prints, constructed a complete working skeleton model on the same scale as the plans, one quarter of an inch to a foot. They did all the work on board, as the plans were not allowed to leave the ship. They simply bent a large wire to represent the keel and stem and stern posts, after which they bent wires to shape according to the plans of each frame and secured these wires representing the separate frames to the keel wire and attached the longitudinals in their proper positions. These wires formed the skeleton of the ship. A narrow batten was then secured inside to represent the keelson of a width corresponding to the scale of the depth of the double bottom. The inner bottom was made of cardboard in sections of the interior watertight compartments. The outer skin plating was left off and the spaces along frames were filled in the double-bottom with cardboard representing the bulkheads of the double-bottom compartments. In this manner all the details of the interior of the

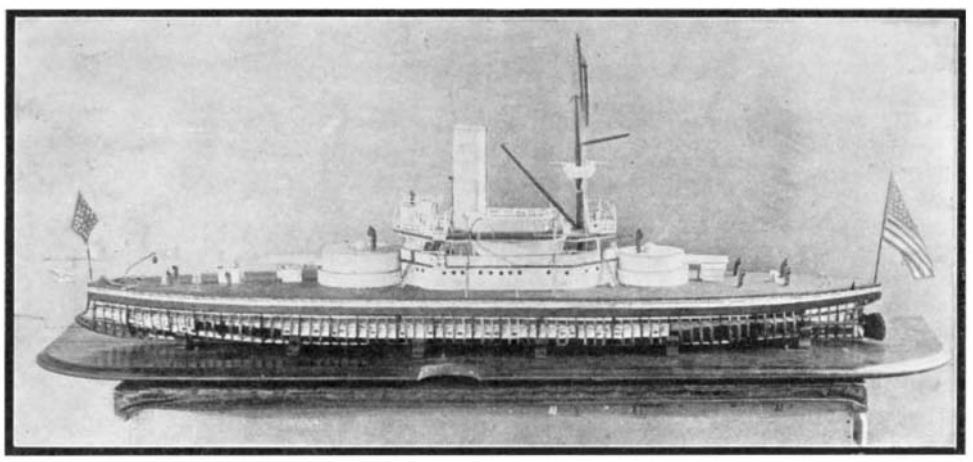


Fig. 1.—The Model Complete.

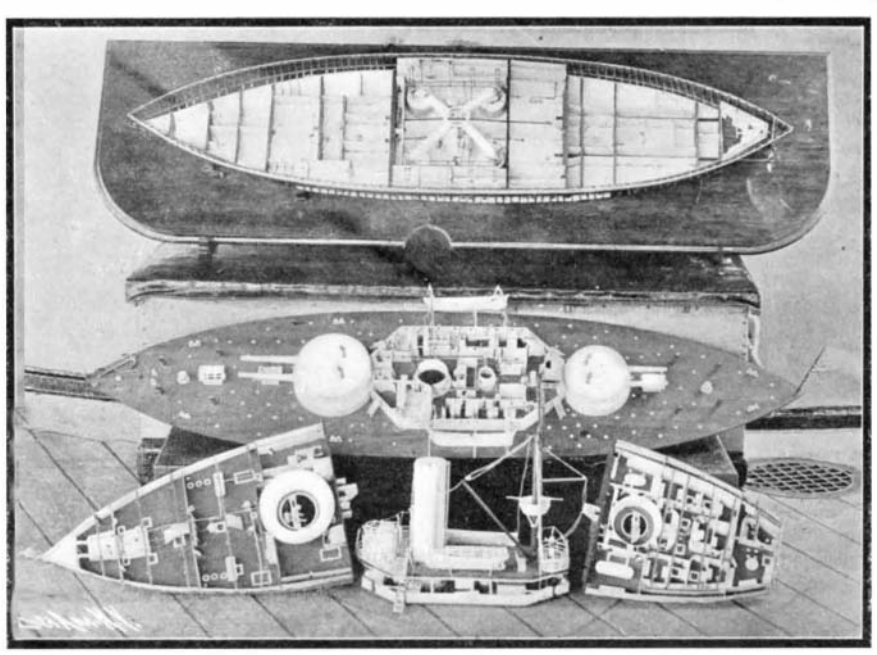


Fig. 2.—Model Dismantled to Show Interior Details.

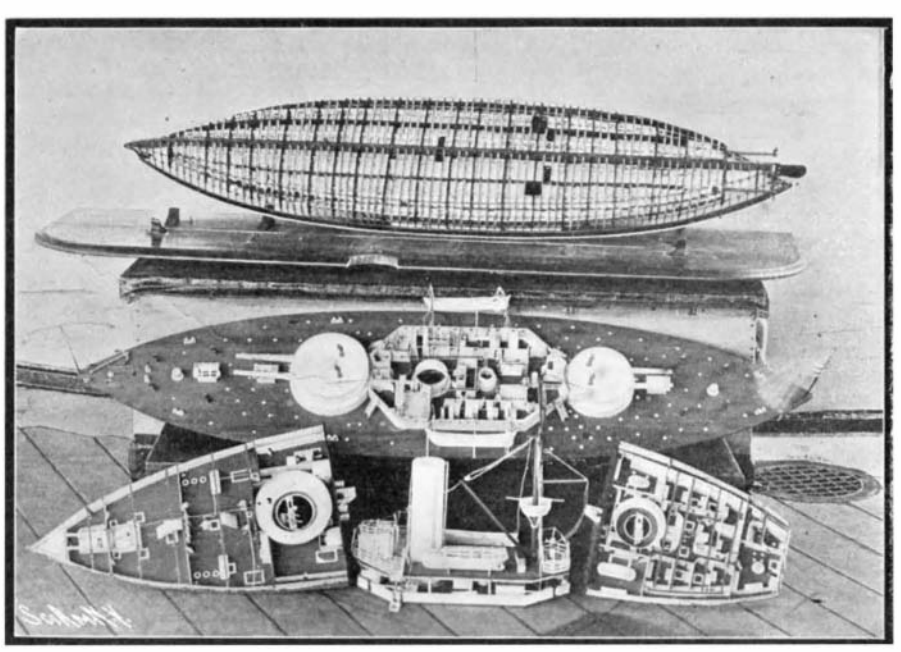


Fig. 3.—A View Showing Double Compartments.

SKELETON MODEL OF THE MONITOR "MONTEREY."

ship were made of cardboard glued in and all exactly to scale.

Wires painted red, green, gray, etc., as adopted in the service, were used in proper places to show the piping, fire mains, and draining system, in the double-bottoms, also the ventilating pipes. All the watertight bulkheads are painted black and all details of the drainage and ventilation of the different compartments and means of access thereto are clearly indicated.

The accompanying illustrations taken from photographs of the model convey a good idea of the scheme as carried out.

The first is a side elevation of the model when assembled. All the essential characteristics of the ship that are given by the expensive exhibition models are hereby shown, besides the side view of the double-bottom, the depth and extent of the armor belt, and the structural support given by the numerous compartment bulkheads constituting the cellular system of naval construction.

In the second figure the model is represented as taken apart to show the interior details. The upper part of this shows the holds, etc., with upper decks removed. The watertight compartments of the holds to the left, showing under the forward berth deck all the arrangements of the store rooms, magazines, etc., next the coal bunkers that envelop the fire rooms and engine rooms. The six boilers, four Ward and two Scotch boilers, are seen in their positions with their uptake connections to the smoke pipe, also pipes that lead to these boilers and to emergency valves in wing passages and above to within the superstructure. The engines are not represented in the model, since on such a small scale the intricate details could not be so well represented and for the practical uses of this kind of a model it was not necessary to go to such details. In fact, other minor details, such as the hand railing around the deck, awning stanchions, some boat davits, etc., are likewise omitted as not being essential to represent; though in the exhibition toy models such details are made as accurately as is goldsmiths' work. In a naval engagement such details would all have to be cleared away, and skeleton models are for practical instruction to enable the personnel to fight the ship most efficiently. Further to the right the store rooms, shaft alleys, magazines, etc., under the after berth deck, are seen, and abaft that the steering engine compartment is seen; this last steering engine compartment also lifts out and shows the trimming tanks beneath.

In the middle part of the view there is the "Monterey's" spar deck with the superstructure deck removed. Here are seen the arrangement of the rooms, the galley, armory, machine shop, offices, etc.

In the foreground there are three sections, the first being the forward berth deck with handling room platform deck. In the center there is the upper part of the superstructure with the two bridges, masts, and smokepipe. To the right the after berth deck, officers' quarters, ward room, and cabin.

The third engraving shows very much the same as the second, except that the upper view represents the ship upside down, reversing the top view of the second illustration. This shows the double compartments, sea valves, and the drainage system, both main and secondary drains being represented by wires.

Such models should be kept on board of the ship of which they should serve as supplementary plans, as did that of the "Monterey." An example of its use will be understood by the fact that when the board appointed by the commander-in-chief of the Asiatic fleet had to consider the question as to a change in the type of the boilers that would be suitable to replace the Ward boilers, they found the model showing the space in the two fire-rooms a valuable guide for them in recommending a suitable type of boiler that would fit. Exact dimensions were of course given, but the model gave solution at a glance and was tangible evidence much better than any other.

The Current Supplement.

The current Supplement, No. 1510, contains as its leading article a contribution by the English correspondent of the Scientific American on the electrification of the North-Eastern Railroad of Great Britain. Excellent pictures accompany the text. In many industries it is necessary to force heavy, viscous liquids through pipes. This involves difficulties not encountered in ordinary pumping, to overcome which two forms of pumps have lately made their appearance. These are described in the Supplement. Mr. Clifford Richardson presents a valuable paper on the constitution of Portland cement from a physico-chemical standpoint. His paper will be concluded in the next Supplement. M. Emile Guarini describes some very ingenious apparatus for charging and discharging gas retorts. "A New Theory of the Origin of Species" is a subject discussed ably by A. Dastre. The paper on "Current Wheels; Their Use for Lifting Water in Irrigation" is continued. The usual electrical notes and engineering notes are also published.

Engineering Notes.

During the trial trip of the new turbine passenger steamer "Manxman," that has been constructed for the Heysham and Isle of Man service of the Midland Railroad of Great Britain, the highest speed that has ever been recorded by a turbine vessel constructed for mercantile purposes was attained. The "Manxman" is propelled by three Parsons turbines, and in these trials upon the River Clyde the vessel attained a speed of 23 knots per hour. Hitherto steam pressures for turbines have never exceeded 150 pounds per square inch, but on this vessel a steam pressure of 200 pounds per square inch has been provided, and this improvement has resulted not only in the development of higher speed, but in more economic working.

Rapid progress is being maintained in the construction of the bridge that is being thrown across the Zambesi River immediately below the Victoria Falls in South Africa. All the materials have been shipped from England to the point of erection. The bridge consists of a single span of 500 feet, the actual distance from bank to bank being about 600 feet, and the height 400 feet above the river. A special cableway has been thrown across the river for the purpose of handling the material, and construction. The cable is electrically operated, and has a carrying capacity of 10 tons. The work is attended with many difficulties, and the men carrying out the actual constructional work will be enveloped in the penetrating, blinding spray of the falls for eight months. It is anticipated that the structure will be available for traffic, in connection with the Cape to Cairo Railroad, which is now being rapidly pushed forward from the northern bank of the river, by May, 1905.

Another water tower failure has occurred, this time at Cuthbert, Ga. The structure consisted of a tank 20 feet in diameter and 50 feet high, elevated on a 70-foot tower. It was erected nine years ago by a Chattanooga firm. The accident occurred on July 28. The tank was then full of water, and the failure occurred by the bottom dropping out, according to City Engineer Chas. Taunton. The structure was completely wrecked. In a later letter he states that the accident is attributed to failure to follow the plans for the bottom of the tank and to the material used. The opinion of this journal concerning such accidents was expressed so recently that it is hardly necessary to go over the ground again. Elaborate drawings and photographs of towers which have given up the ghost simply befog the real lesson of these accidents. When a tower or tank has to be built the work should not be undertaken by those without experience in structural steel-work and a knowledge of the limitations of shop work. Such information is not secured from wrecked structures.—Eng. Record.

An experiment is to be made in London to ascertain the wearing and durability of camphor wood for road paving. A section of the Buckingham Palace road for a distance of 450 feet is to be paved with this wood. If within four years the new material proves unsatisfactory, it is to be replaced by creosoted deal blocks. This experiment is entirely new, for camphor wood has never been used before for this purpose. The wood comes from East India, and is of a rich brown color and close grained. Trials are also being made with various other woods for this selfsame purpose. The roadway in the Haymarket, one of the busiest West End thoroughfares, is being closely watched. Some eighteen months ago it was laid with four different kinds of wood—boxwood, tallow wood, blackbutt, and algaroba. The first three hail from New South Wales, and the last named from Brazil. All four are just beginning to show signs of wear, though it is yet too early to determine which is the best suited for the purpose.

Superheated steam is now being used with considerable success in Europe for the engines of some of the smaller vessels. Among the most recent examples may be cited some new boats which have lately been constructed in Germany. The Mannheim Touring Company have installed superheaters of the Schmidt pattern upon the sidewheelers "Johannes Kessler" and "Mannheim VIII." two large towboats built at the Berninghaus docks, Duisburg. These vessels are 230 feet long and draw 3 feet of water. The engines and boilers were put in by Escher, Wyss & Co., of Zurich. These are triple expansion engines with three inclined cylinders of 22, 32, and 52 inches diameter respectively and 66-inch stroke. The upper part of the boiler, which is made in two parts, is provided with a set of U-tubes which serve as superheaters. The first trials were made with the boats towing a load of 2,800 tons between Duisburg and Mannheim, and all went very successfully. The indicated horse-power of the engines ranged from 800 to 1,000. Superheaters are also used on the Delphin, of Breslau, belonging to Ch. Wohlheim. They are also of the Schmidt pattern. The boat is a smaller one than the preceding, and has a double helice. It uses about 180 pounds of coal per hour for 90 indicated horse-power. As in the above case, the temperature of the steam is 270 deg. C. The same firm mounted a set of superheaters on a side-wheeler using a 320-horse-power engine. With a temperature of only 250 deg. C., the comparative tests with other boilers using saturated steam showed an economy of 15 per cent of coal in favor of superheating. It is also reported that superheated steam is now being used on the passenger boats which circulate around Lake Leman, belonging to the Compagnie Général de Navigation. These are side-wheelers, and the new system gives much better results than the old.

The Onyx Industry in Mexico.

In the vicinity of Cuernavaca, State of Morelos, Mexican Republic, the well-known winter resort of the Americans living at Mexico city, recently an Aztec onyx quarry has been re-discovered by Carl Ludloff, a geologist living at that place.

Seemingly the quarry has not been used for hundreds of years; it is partly filled up, grown over by brush and grass, but still a slide may be seen on the mountain-side, laid out and carefully paved with smooth stones on which the precious rocks had been brought down to the valley. The quarry shows that it had been worked for many, even hundreds of years.

This old quarry, about 400 to 500 feet wide and long, on the slope of a steep hill, is close to the Mexico, Cuernavaca & Pacific Railroad track, and shows an extensive deposit of a kind of onyx which bids fair to become something quite new and very attractive for architectural and many other kinds of ornaments and a numerous series of implements of different use in the household and arts.

It is a kind of chalcedony. A white, yellowish-gray, or violet core is enveloped by bright red or dark brown concentric strata or layers of different thickness and color. The size of these rocks, which break naturally in cubes or almost rectangular pieces, varies from a few inches up to several feet in diameter. When sawed in slabs, the strata show designs of the most wonderful color and variety; they resemble picture frames, fortifications, the grain of wood, bands or strips of the most variable alternation. Each piece shows a distinctly different design. The stone may be easily shaped to any form and polished. It is softer than flint or quartz and considerably harder than the marble used in the arts.

The "Fool-Killer" and Its Inventor-Victim.

Readers of the Scientific American will doubtless recall the illustrated articles published in these columns, describing a queer craft which its inventor, Peder Nissen, christened the "Fool-Killer," with a fitness that was prophetic. Nissen started out in his craft on November 29 from Chicago to cross Lake Michigan. He was picked up thirty-six hours later dead—a victim of his own felicitously named invention. A hastily scrawled note conveyed the information that he had been suffocated to death.

A few years ago Nissen went over Niagara Falls in a barrel. For months after that he boasted of his ability to roll across Lake Michigan in a balloon-like apparatus inflated with air and propelled by the wind. He made the attempt last summer and failed. This second experiment proved fatal.

The craft may be described as a canvas bag 30 feet long and 22 feet in diameter tapering to blunt ends which were provided with port holes. Within the bag a shaft extended longitudinally from which braces radiated to stiffen the bag and preserve its shape. Suspended from the shaft between the braces was a basket in which Nissen was wont to take his seat. The craft was steered by sliding the basket from one end of the shaft to the other.

Experimental Electro-Chemistry.

A Practical Series of Papers on Laboratory Practice in Electrochemistry, by N. Monroe Hopkins, M.Sc., Ph.D., Assistant Professor of Chemistry in the George Washington University, Washington, D. C., are appearing every two weeks in the Scientific American Supplement.

The subject of electrochemistry is dealt with from the theoretical and practical standpoints, and the chemist as well as the electrician is taught the art of uniting chemistry and electricity in the modern and rapidly-growing art of electrochemistry.

Although a fair working knowledge of chemistry and electricity must be presupposed in a series of articles on this subject, all abstruse mathematics are avoided, and the subject throughout is treated in the clearest possible manner.

Excellent illustrations accompany each article—illustrations that picture the apparatus and describe processes with clearness.

The North German Lloyd steamship "Lahn," which was sold to Russia early in September, has been reconstructed and will serve as a captive balloon ship. Her mizzenmast has been unstepped to accommodate gas generators, and she has been fitted out with wireless telegraph apparatus and powerful searchlights.