SCIENTIFIC AMERICAN

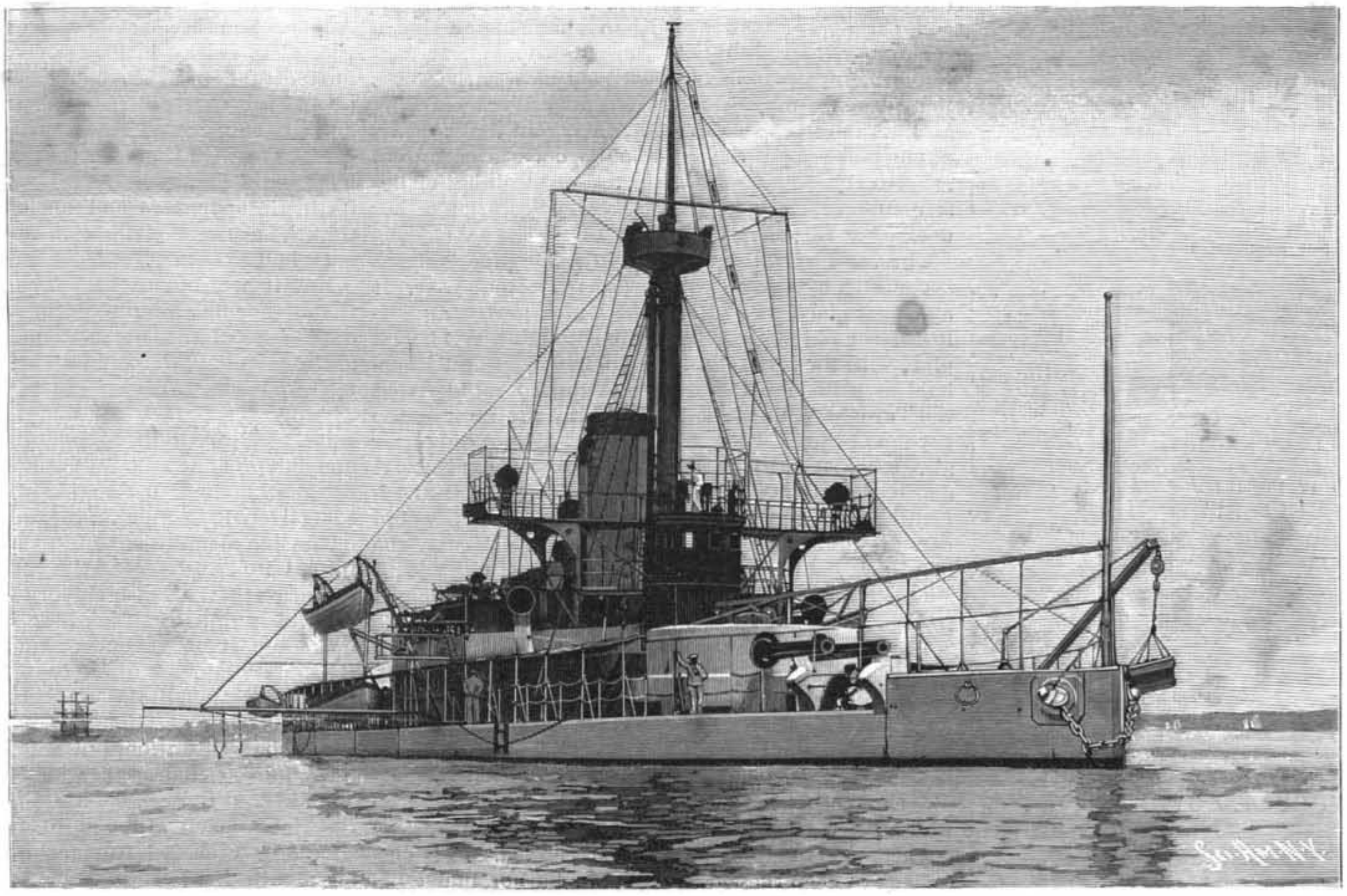
[Entered at the Post Office of New York, N. Y., as Second Class matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXV.—No. 21. ESTABLISHED 1845. | NEW YORK, NOVEMBER 21, 1896. | $3.00 A YEAR. WEEKLY.

THE COAST DEFENSE MONITOR AMPHITRITE.

The formidable little warship which forms the subject of the accompanying illustrations is one of a group of five similar vessels whose keels were laid as far back as the year 1874. In the official lists of the navy they are described as iron low freeboard coast defense monitors. With the exception of a few small gunboats, they represent the only new construction attempted in the navy during that long twenty years of silence which fell upon the busy navy yards of the country from the close of the civil war to the date of the construction of our modern navy. The build-



THE COAST DEFENSE MONITOR AMPHITRITE.

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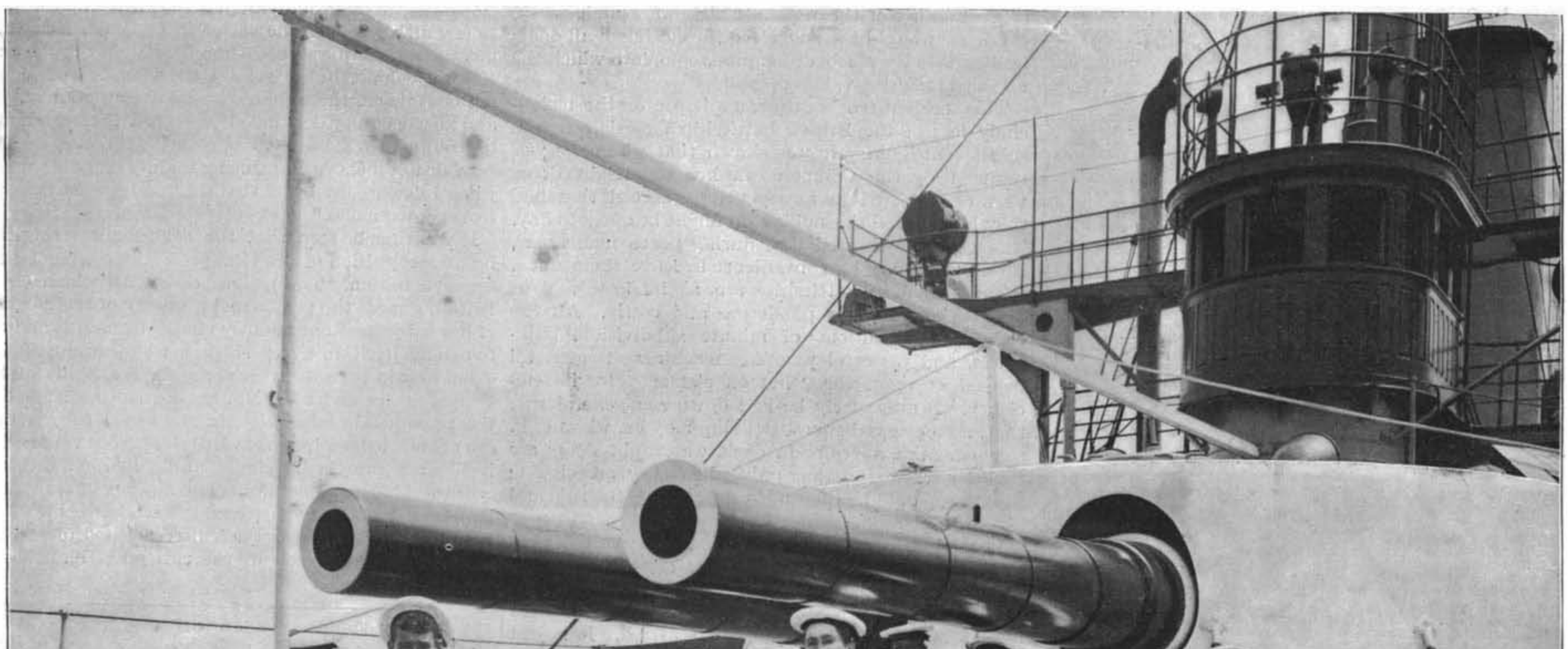


COAST DEFENSE MONITOR AMPHITRITE—THE FORWARD PAIR OF TEN INCH GUNS.

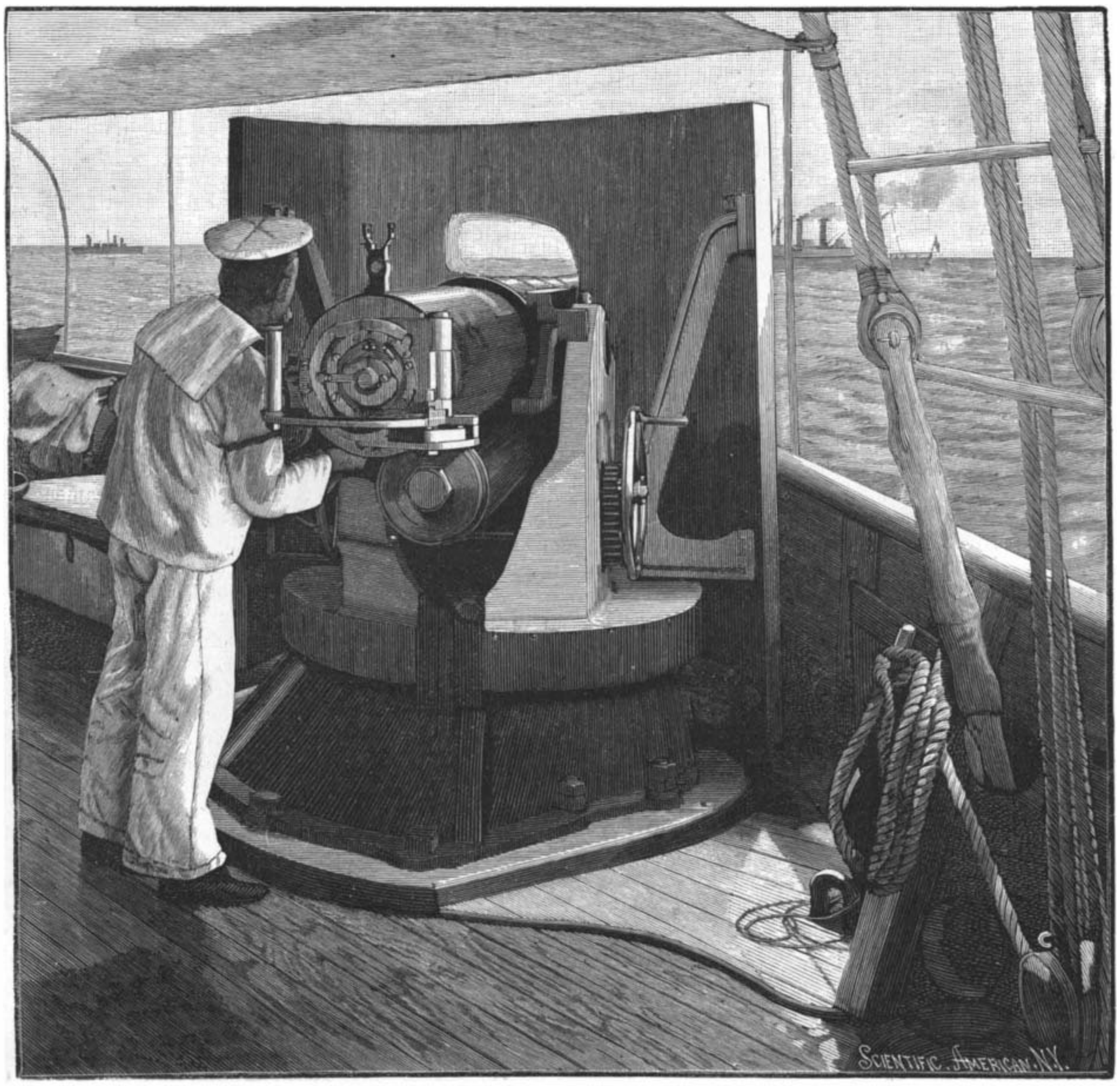
THE COAST DEFENSE MONITOR AMPHITRITE.

(Continued from first page.)

er ships. There is another monitor, the Monterey, similar in design but more modern in construction, which was built by the Union Iron Works, at San Francisco, and is now stationed at that port.

These monitors are of special interest as forming a link between the early and later systems of turret battleship construction. They embody in their original design the lessons which had been learned in the naval operations of the civil war, and, as their name implies, they are modeled after the pattern of Ericsson's famous Monitor. The chief characteristics of this type of ship are moderate speed, low freeboard, making them a difficult object to hit, thick armor, and an armament of a few exceptionally heavy guns. Sitting low in the water, they are not suited to heavy weather, and their sphere of operations lies within sheltered waters, such as are found in our bays and harbors. This is their proper sphere of action, and to enable them to maneuver in shoal waters they are designed to have as little draught as possible. Strictly speaking, they are floating batteries, and as such they are intended to co-operate with the land batteries in defense o our coasts. But though the monitor is designed specially for harbor defense, it would be quite capable of taking part in a fleet action off the coast in ordinary weather.

The Amphitrite is 259 feet 6 inches long; 55 feet 10 inches beam; and 14 feet 6 inches draught, with a displacement of 3,990 tons. The hull is built of iron and consists of an inner and an outer shell, spaced 3 feet apart and tied together by the ribs or transverse frames, and by the longitudinal girders of the vessel. The intersection of the frames and girders, whose top and bottom flanges are riveted to the inner and outer shells, forms a series of separate, watertight compartments, or "cells," as they are called, which will serve to localize the effect of the blow of a torpedo, and confine the water to the damaged portion of the ship. The double bottom rounds up into the sides of the ship and extends to within about 3 feet of the water line, where it forms a shelf upon which the side armor belt is carried. The steel belt is about 7 feet high, reaching to the main deck, 4 feet above the water line, and it is 9 inches thick amidships, tapering to 5 inches at the ends. The main deck is flush throughout the ship, except where it is broken by the superstructure and the barbettes and turrets of the big guns. It is formed of two layers of plate steel, giving a total thickness of 1¾ inches. Beneath this protective deck and behind the shelter of the continuous belt of solid steel are located the engines and boilers, the working mechanism of the turrets, and the stores of powder and shell.

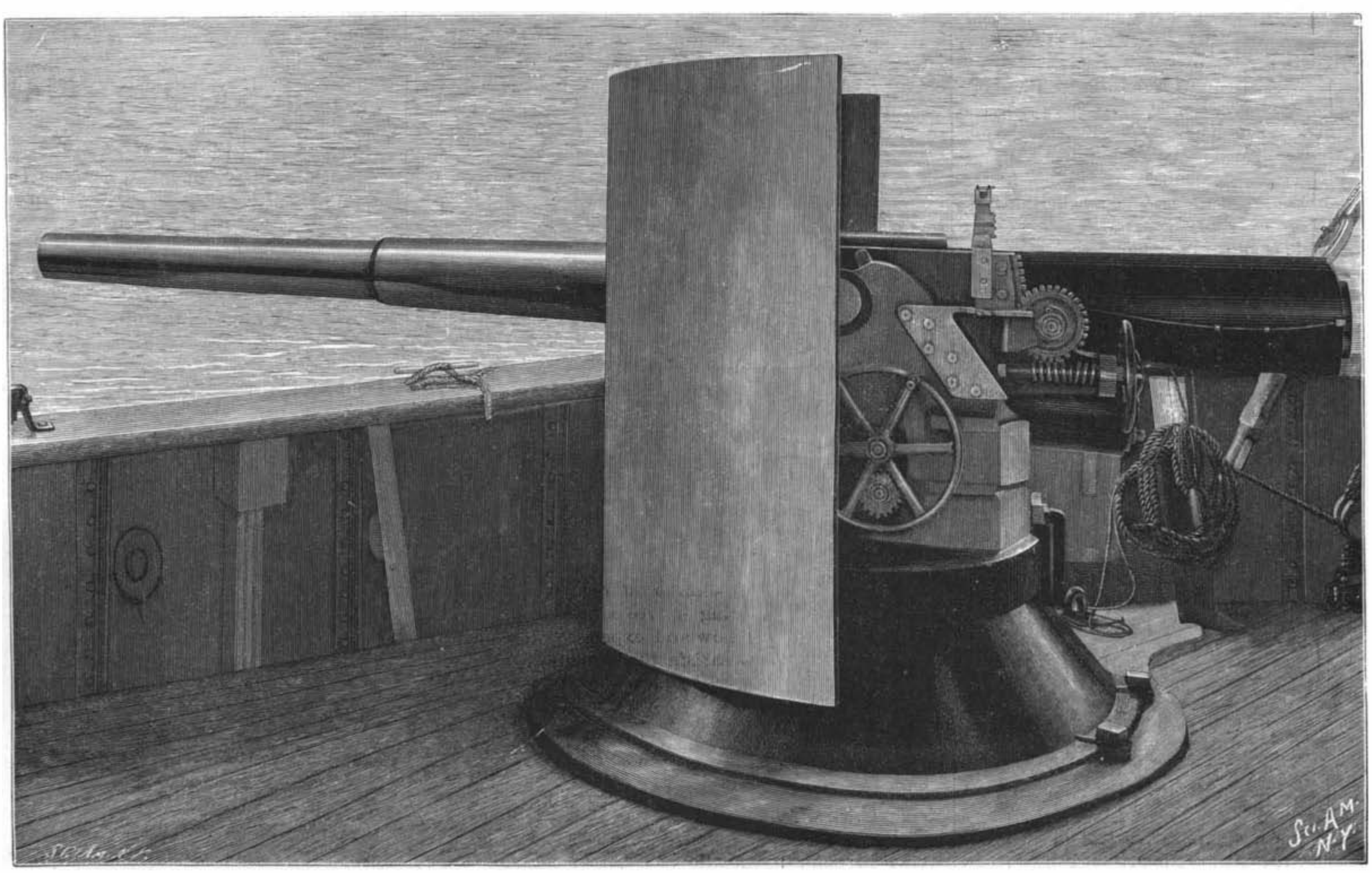


SIGHTING A FOUR INCH RAPID FIRE GUN ON THE COAST DEFENSE MONITOR AMPHITRITE.

The turrets are formed of 7½ inch Harvey steel, and their bottom edge revolves just within and near the top edge of the barbettes, which may be described as circular forts projecting 4 feet 9 inches above the main deck. The barbettes are built of Harvey steel, 11½ inches thick, and within their shelter are placed the turntables upon which the turrets revolve, and the turning gear. The protection afforded to the gun crew by the 7½ inch Harvey steel of the turret walls is further increased by a roof of 1½ inch steel which will keep out fragments of shell and the bullets from the rapid fire guns in the enemy's tops.

Just abaft the forward turret and beneath the chart house is the conning tower, with walls of 9 inch Harvey steel. It has electric and telephone communication with the handling rooms, where the ammunition is passed up to the big guns in the turrets, with the firing stations, and with the engine room. Here the captain will take up his position during an engagement, and control every movement of the ship. Above the chart house is seen the flying bridge, from which the navigation of the ship is usually carried out. Behind this is the tall steel military mast surmounted by the tops, a small circular platform, upon which are placed two Hotchkiss rapid fire guns, whose deadly hail of bullets will sweep the decks of the enemy. This will be the most perilous position on the ship, as it makes a conspicuous mark for the enemy. It is reported that at the Yulu one of the tops of a Chinese war ship was struck by a single rapid fire shell, which killed every one of the seven men that it contained.

The superstructure deck carries two 4 inch rapid fire guns, two 6 pounder, two 3 pounder, and two 1 pounder



FOUR INCH RAPID FIRE GUN WITH REVOLVING SHIELD, COAST DEFENSE MONITOR AMPHITRITE.

rapid fire guns. We give two illustrations of the 4 inch guns, which, although they are of comparatively small size, are among the most effective and handy weapons in the navy. They are mounted on steel carriages which rotate on a circle of rollers, carried by a cast steel pedestal which is itself firmly bolted to the deck. A semicircular shield, 2 inches thick, is attached by brackets to the top carriage and rotates with the gun. The shield reaches well down over the pedestal and affords full protection to the gun mount and the crew. The gun, carriage and shield are so evenly balanced that the piece can be raised or lowered with the greatest ease. The illustration taken from the rear shows the breech mechanism, the recoil cylinder beneath the gun, and the sights. The training is effected by the crank wheel at the side and the elevation by the worm and pinion, which can be seen in the side view of the gun. The 4 inch gun fires a 33 pound shell with a velocity of 2,000 feet a second and will penetrate 13 inches of iron at the muzzle. The destructive power of this gun lies in the great rapidity of fire, which runs up as high as 20 shots per minute with a good gun crew.

The main fighting power of the Amphitrite lies in her four big 10 inch guns, which are mounted in pairs within the main turrets. This gun weighs 25 tons and fires a 500 pound shell at a velocity of 2,000 feet per second. It can penetrate 18·75 inches of steel at the muzzle, 16·82 inches at 1,000 yards, and 15 inches at 2,000 yards. The ammunition is brought up to the guns from the magazines by means of hydraulic hoists. It is placed in a cage containing three pockets, the charge in two packages being placed in the lower and the shell in the upper pocket. When the cage has been run up opposite the breech, the charge is thrust into the gun by a hydraulic rammer.

The Amphitrite is driven by the original twin screw engines designed in 1870. They are of the direct acting, inclined, compound type, and the arrangement of the cylinders and cranks is very interesting, as showing how the designers contrived to stow away such large machinery below the level of the protective deck. The cylinders which drive the port propeller shaft are located above the starboard shaft, and vice versa, the engines thus crossing each other diagonally. They are of 1,426 indicated horse power, and will drive the Amphitrite at a speed of 12 knots per hour. She carries a complement of 176 all told, and her commander, Capt. W. C. Wise, by whose courtesy we were enabled to prepare our illustrations, has the greatest confidence in this class of ship, his conviction being based upon his practical experience of the monitors during the naval operations of the civil war.

Corn Pith Cellulose.

The annual meeting of the Society of Naval Architects and Engineers, begun November 10 at 12 West Thirty-first Street, New York City, brought together a distinguished gathering of marine architects and naval constructors, who listened with interest to the reading of a number of papers upon naval and maritime subjects by acknowledged authorities.

The first business transacted was the election of officers of the society for the year 1896-97. Clement A. Griscom, president of the International Navigation Company, succeeded himself as president. Naval Constructor Frank L. Fernald was elected a vice-president, to serve with nine others who were re-elected.

The paper that created the widest interest was that read in the afternoon by Henry W. Cramp, of the shipbuilding firm of William Cramp & Sons, on "American Corn Pith Cellulose." Marine engineers understand by corn pith cellulose a substance similar in appearance to ground cork that is packed behind the armor of a vessel or at the edges of her protective decks. When a hole is shot in the armor or deck and the water enters, the corn pith cellulose swells and closes up the hole so effectively as to stop the leak entirely. According to Mr. Cramp's paper, the corn pith is an American invention, and like most American ideas in naval construction, is superior to the cellulose made of cocoa fiber that has been used by the French naval constructors for a similar purpose.

Cellulose has been used in the construction of the New York, the Columbia, and the Olympia, and Mr. Cramp recommends its use for all further vessels that may be built by this government. Of the naval tests of the American improvement in cellulose, Mr. Cramp said:

"The cellulose at first used by our Navy Department was manufactured in Philadelphia. It was made of the husks of cocoanut; the cellulose proper looking like bits of ground cork, being separated from the fiber by specially built machines, and after certain processes intended to preserve it from decay and render it incombustible, it was packed in cofferdams mixed with a certain amount of fiber to hold it together. The tests to which this cellulose was subjected in our navy were such as to produce an article superior to that made in France.

"In order to make a comparative test of this new corn pith cellulose, the Navy Department made two cofferdams of steel plates, stiffened by angles, 6 feet high, 6 feet wide and 3 feet thick. In one was placed 832½ pounds of cocoa cellulose and fiber mixed to the usual proportions, corresponding to a density of 7·7 pounds to the cubic foot. The other cofferdam was packed with corn cellulose containing 702 pounds, corresponding to a density of 6·5 pounds per cubic foot. These cofferdams were sent to the Indian Head proving grounds and were fired at on June 10, 1895. The first shot was fired at the cocoa cofferdam. A 6 inch shot, having a velocity of 1,000 feet per second, was fired into the cocoa cellulose with a gun at a distance of 314 feet. The hole made at the point of entry was the diameter of the shot and that at the point of exit at the rear of the cofferdam was an irregular jagged hole 7½ by 8½ inches. Water was applied to the front of the cofferdam, the level being five feet above the hole. In ten minutes the first drop of water appeared through the hole. The flow increased gradually, and in a few minutes had become comparatively steady, running about twelve gallons in one-half hour. The flow of one-half gallon a minute then became approximately constant.

"In the meantime the cofferdam containing the corn cellulose was fired at under similar conditions. Water was turned on as before and left for one and a half hours, during which time no water whatever appeared at the hole in the rear of the cofferdam, nor at the end of the time had the corn cellulose at the mouth of the hole in the rear become damp. The cofferdam containing cocoa cellulose was then fired at with a 250 pound 8 inch shell, at the same distance and with the same velocity as that of the 6 inch shell. The water was then turned on with a head of about five feet, as before. In twenty-five seconds a few drops appeared at the hole in the rear, and about twelve gallons had passed through in thirty minutes. Under similar conditions an 8 inch projectile was fired at the corn cofferdam. The water was turned on, and after waiting forty-five minutes no water appeared at the hole in the rear of the cofferdam, nor was the corn at the rear damp. No water had appeared at the 8 inch hole which had previously been made, nor was it damp at the completion of the experiment."

To Experiment with Different Alloys for Coinage.

In the short period that will elapse before Congress convenes again in December a series of interesting experiments in coinage will be conducted at the mint in this city, says the Philadelphia Record. Metals and alloys heretofore untried for the purpose will be tested and stamped into token coins. Their availability as substitutes for the alloys of which the minor coins—nickels and cents—are now made will be ascertained and samples submitted to Congress.

Of all the countless possible alloys to be obtained from copper, tin, nickel and aluminum in different combinations, perhaps fifteen or twenty may be found fairly satisfactory. It is possible that one or two of these may advantageously be brought into use for general coinage. No fault has been found with the present one cent and five cent pieces. The experiments are merely ordered to keep in touch with the times and to gain a knowledge of resources. The Philadelphia mint, while having no experimental department, is well equipped to make the tests.

Aluminum, which has never yet found a place in the currency of any nation, is to be worked up into trial coins. It is also to be given a chance in new alloys. Aluminum is a metal of which but little has been known until recently, and it has been found useful in so many ways that a sort of popular idea prevails that it would be good for coins. Chief among its advantages would be its very light weight. Cents made of it could readily be distinguished from coins of the same size by this remarkable lightness alone.

Dr. D. K. Tuttle, the chief refiner at the mint, who knows all about the properties of metals, is somewhat skeptical, however, as to whether aluminum will come out of the proposed test with flying colors. It is extremely difficult to anneal, and when heated will suddenly run like butter instead of becoming plastic. There would be trouble in rolling it into the long strips from which disks are cut preparatory to stamping. Of course, it can be worked, but not with sufficient ease and rapidity to make it practicable for coining on a large scale.

Pure nickel has recently been coined in Switzerland, but it has been found just as difficult to handle as aluminum, though for a different reason. Such great heat is necessary to bring it into condition for coining that the operation is slow and expensive. While pure nickel coins might be satisfactorily made in the mints of Switzerland, it does not follow that the same would be true at the Philadelphia mint, which is called upon to turn out fifty times as many 5 cent pieces as the mints of that country, and could not spare the time to work over them.

The 5 cent coin now in use contains only 25 per cent of nickel, the remaining 75 per cent being of copper. Nickel, more than any other metal, has the property of giving its color to an alloy. Even an alloy of 90 per cent of copper and 10 per cent of nickel will be nearly white. The advantage of using a greater proportion of nickel in the 5 cent piece is therefore not apparent, especially as more than 25 per cent of it makes the alloy refractory.

The experiments at the mint will include different combinations of nickel, copper and zinc, forming the alloys known under the head of German silver; copper and tin, which produce bronze; aluminum and copper, which make aluminum bronze. German silver has been used for coins by one of the small South American states, and proved fairly adapted for the purpose. Bronze is commonly used for coins of small value. It is doubtful if aluminum bronze in any form will be found acceptable, as it is hard to work, and has a yellow, brassy appearance, resembling gold, which is to be avoided in all coins of small denomination.

Statistics of the Sea.

The statistical summary of vessels totally lost, condemned, etc., shows that during 1895 the gross reduction in the effective mercantile marine of the world amounted to 1,237 vessels of 806,278 tons, excluding all vessels of less than 100 tons. Of this total 310 vessels of 372,463 tons were steamers, and 927 of 433,815 tons were sailing vessels. These figures exceed the average of the preceding four years by 62 steamers of 81,519 tons and by 55 sailing vessels of 42,940 tons.

As regards steamers owned in the United Kingdom, the return is also above the average, while as regarding sailing vessels it is somewhat below. The increase in the case of the former is due, not to actual wrecks, but to the large tonnage broken up, condemned, etc. Apart from such cases, the United Kingdom steam tonnage lost during 1895 is only equal to the average of the last four years, notwithstanding since 1891 the tonnage owned was increased by 1,500,000 tons.

The summary exhibits interesting data as to the relative frequency of the different kinds of casualty, etc., which conclude the existence of vessels. Strandings and kindred casualties, which are comprised under the term "wrecked," are much the most prolific cause of disaster. To such casualties are attributable about 40 per cent of the losses of both steamers and sailing vessels. The next most frequent termination of a vessel's career is by condemnation, dismantling, etc.; 20 per cent of the vessels removed from the merchant fleets of the world are accounted for in this manner.

Of the remaining causes of loss, collision is the most general for steamers (16 per cent), and abandonment at sea for sailing vessels (15 per cent). Cases of abandoned, foundered, and missing vessels may, perhaps, be regarded as frequently more or less similar in the circumstances of loss. If these be taken collectively, they comprehend 18 per cent of the losses of steamers and nearly 30 per cent of the losses of sailing vessels. The percentages here given are based on the present return alone, but the order of frequency of the several classes of casualty appears to be normal.

The return has been compiled in such a manner as to enable a comparison to be made between the percentages of loss suffered by each of the principal merchant navies of the world. Great as the absolute annual loss of the vessels belonging to the United Kingdom appears to be, it is seen to form a very moderate percentage of the mercantile marine of the country and to compare favorably with the losses sustained by other leading maritime countries. The merchant navies which exceed a total of 1,000,000 tons are those of the United Kingdom, the British colonies, the United States of America, France, Germany, and Norway.

Of these countries, the United Kingdom shows the smallest percentage of loss, viz., 3 per cent of the vessels and 2·4 per cent of the tonnage owned; the British colonies follow, with 3·4 per cent of vessels and 3·7 per cent of tonnage, and Norway is the highest, with 7·4 per cent of vessels and 6·5 per cent of tonnage. As regards steamers, the percentage of loss for the six countries is 2·5, while the percentage of the United Kingdom stands at 2·33. For sailing vessels the six countries give a percentage of 6·3, as compared with 4·5 per cent for the United Kingdom.—London Times.

A Horse Cycle.

President L. S. Woodbury, of the Great Falls Iron Works, Montana, says a Western contemporary, has in contemplation the construction of what he chooses to term a horse cycle, whereby a horse can propel a four-wheeled vehicle on ordinary ground at the rate of one mile in fifty-nine seconds. The proposed machine can be made in two forms, either one of which Mr. Woodbury thinks will fill the bill.

The first is in the form of an ordinary buggy. Instead of being hitched ahead, the horse will occupy a position between the four wheels and operate a sort of treadmill. Should the velocity be so great as to attract too much air, then it is proposed to inclose the entire machine—horse, rider, and all—in a whaleback or torpedo-cut shell, the propelling operation to remain the same. The seat of the rider will be directly behind or above the horse. President Woodbury is so confident of success that he is willing to back his bonds against silver that a mile can be made in fifty-nine seconds or better.