THE NEW AMERICAN WAR STEAMER MIANTONOMOH.

The double turreted monitor Miantonomoh represents the latest accession to the United States navy. She is now practically completed, and nothing is left for her full equipment and preparation for war but the introduction of some minor pieces of machinery, and some additional supplies, her crew and much of her ammunition being now on board. She is a typical battle ship. It is believed that there is no ship of war afloat in any water that she could not cope with. In the matter of speed, she is, like all the monitors, somewhat deficient, her rated speed being $10\frac{1}{2}$ knots per hour.

The keel of the Miantonomoh was laid by John Roach & Sons, at their works on the Delaware River, in 1874, and the hull was completed there. In many respects she represents a reproduction of the old wooden monitor Miantonomoh. The present ship is built of iron, except as regards her armor plates, which are of steel. The general dimensions, as given in the official records of the navy, are as follows:

Length, 250 feet; beam, $55\frac{1}{2}$ feet; mean draft, 14 feet $1\frac{3}{4}$ inches; displacement, 3,815 tons; indicated horse power, 1,030. The maximum depth is 17 feet $4\frac{1}{2}$ inches, leaving about 3 feet of freeboard. The engines are of the inclined compound type, and actuate twin screws. The armor of the hull consists of a protective belt 6 feet deep; the upper section is 7 inches thick, and goes 18 inches below the water line. The next section is composed of two superimposed plates, one 3 inches and one 2 inches, and the final strip at the bottom of all is 3 inches thick. The deck, which is almost flat, and non-deflective, is composed of two superimposed plates of $\frac{5}{8}$ inch steel planked over with 4 inch pine.

The outer plating of the turrets is $11\frac{1}{2}$ inches thick. This is backed with 10 inches of wood, which is again backed with two steel plates, each $\frac{1}{2}$ inch thick. The turrets are 24 feet in external diameter, rise a little over 6 feet above the deck, and are each surmounted by a conning tower a little less than 8 feet diameter at the base, and projecting 2 feet above the top of the main turrets. In action, when the turret is struck, rivet heads or splinters are liable to be detached and to fly off with considerable velocity. To protect the firing crew from injury, an inner shield lines the turret. This shield is spaced off 8 inches from the backing, and is composed itself of $\frac{3}{4}$ inch steel plate. The deflective armor of the conning tower is 9 inches thick.

In each turret two 10 inch breech loading rifles are mounted in parallel, and are manipulated by hydraulic gear. Each gun is held in place by hoops upon a saddle, which is free to slide back and forth upon the rails of the carriage. As shown in the cut, the carriage is pivoted to the turret at its front end, so as to be incapable of recoil. The recoil backward of the gun itself is checked by a hydraulic cylinder containing water, through which a piston is driven by the action of the gun on its recoil. A very limited waterway is provided for the escape of the water from behind the piston, so as to bring the gun to a stop without serious shock. With a full charge, the gun recoils about forty inches.

Below the gun deck of the turret the space is utilized for the supply of ammunition. The shells and powder cartridges are brought in, and, by means of a circular railroad, are wheeled around the turret so as to come under the hatch, which, of course, shifts around as the turret turns. An elevator is provided for carrying them up to the gun deck, and there they are shipped on a carriage upon another transverse railroad, which brings them opposite the open breech of the piece. For loading, the breech is dropped, bringing the bore in line with an inclined hydraulic cylinder and rammer in its rear. An approximately vertical hydraulic cylinder and piston permit the breech to drop or raise it, as desired. The shell is pushed home by a hydraulic rammer; next the powder is inserted, bag by bag, and pushed home by the same rammer. Brown perforated hexagonal prismatic powder (Dupont's) is used. It is packed tightly in the cartridge bags, several of which are used for a charge. In the rear of each bag are nine hexagonal grains of priming powder to disseminate the ignition. The breech block, which is of the interrupted screw type, with mushroom and gas check, is inserted and turned home, a copper priming needle is pushed through the axial vent of the breech block, so as to pick a hole in the rear powder cartridge, the primer, which may be frictional, detonating, or electric, is put in place, and the gun is ready for firing. The direction of fire is fixed by rotating the turret. In the conning tower, the firing officer looks out of a little cross-shaped window, which in itself forms the rear sight; forward on the roof of the turret is the front sight. These two are arranged accurately parallel with the vertical planes passing through the axes of the guns. The elevation of the guns is determined by the hydraulic ram just mentioned, and actuated by a lever in the conning tower, and the firing officer has at his side a dial indicating the number of degrees of elevation given each piece.

Through the center of the turret a hollow spindle runs down the bottom of the ship, through which communication is had from the conning tower to the different mechanism required to be worked therefrom. Without leaving his place, the firing officer can locate the turret to bring his sight to bear upon the object, can raise or depress either or both of the guns to get the range, and can fire them singly or simultaneously, if desired, by the electric primers, simply pressing a bulb to produce the ignition. Immediately after firing, the turret can be rotated so as to present its unperforated side to the enemy, while the guns are being loaded. Levers and valve handles are provided for all the manipulation, within easy reach in the conning tower. By the speaking tubes and bell calls of the central spindle, the officers in the tower can communicate with all parts of the ship, including the other turret.

The water supply for the hydraulic machinery of the turret enters through this center spindle, which, it will be understood, is stationary, the turret rotating around it. Two collars, three sided, or D shaped, in section, encircle its lower part, and, as these collars rotate with the turret, the water is delivered into one and discharged from the other, through the center spindle. The problem to be solved was the introduction of water into machinery in and moving with a rotating turret, through whose center a stationary hollow spindle extends.

The ship is provided with a fighting mast of hollow steel, through whose center ammunition is hoisted to the fighting top. Her armament includes the four 10 inch breech-loading rifles, whose manipulation has been described, and which weigh about 63,000 pounds apiece. One is 27 feet, another 29 feet, and two are 30 feet long. They have a practical range of 7 miles. The service charge is 256 pounds of powder. The projectile is a cast iron shell with soft metal rotating band, weighs 500 pounds, and contains about 12 pounds of shell-exploding powder, contained in 128 cotton bags. Each shell has a percussion primer. The guns are American in their assembling, having been turned out at the Washington navy yard. The shell is $9\frac{95}{100}$ inches diameter, giving only $\frac{1}{20}$ inch total windage. The rotating band, however, fits so tightly as to leave little chance of escape of gas.

A very important feature is the steering mechanism. The ship steers very badly by hand, but is provided with steam steering engines that keep her under perfect control. An electric steering device is to be put in that will enable her to be worked from either conning tower. Thus the ship will be fought entirely from this point, the steering, rotation of the turret, ranging and firing of the guns, being effected therefrom, and within absolute control of a single man if desired.

To prevent water from entering around the turret a diaphragm of leather is provided which encircles the base of the turret and is held down by segmental plates of metal and expansion turnbuckles against a wooden scupper groove. In action the turnbuckles are to be backed up a little to relieve the friction, so that the turret can be turned freely and without injury to the diaphragm.

A double line of teeth encircle the base of the turret, with which the turning engine engages. The turret is carried by 20 forged steel coned rollers, 14 inches diameter and 10 inches thick. Eight small horizontal rollers bear against the interior of the base, to prevent lateral displacement.

The vessel has a double bottom, a clear space of 28 inches existing between the two skins. She is lighted throughout by electricity.

The Coloration of Preserved Foods.*

The time-honored method of imparting a beautiful green color to preserved foods consists in treating the articles to be colored with a solution of copper sulphate, which is quickly poured off and the last traces removed by repeatedly washing with water; the preserved articles are then boiled and the vessels containing them are soldered up. The coloration results from the formation of the copper salt of an acid derived from phyllocyanin. This body is very inert, is insoluble in water, hydrochloric acid and acetic acid, soluble in alcohol, and indifferent to the action of light. As the quantity is quite small, only a few milligrammes in 100 grammes, the author is disposed to tolerate the practice.

The green coloring matter of leaves, etc., is extremely sensitive both to light and to acids of every kind. In order to hinder its decolorization, sodium carbonate is commonly added to green vegetables before cooking, by which treatment free acids are neutralized, and also such salts as potassium acid oxalate. Not only is the action of the acids upon the chlorophyl thus prevented, but a relatively stable sodium salt, green in color, is formed, enhancing the effect. A. TSCHIRCH.

AN alloy which adheres firmly to glass and can, therefore, be used for joining up glass tubing, is said, by Mr. F. Walter, to be made by adding 5 per cent of copper to 95 per cent of tin. The tin is first melted and the copper added subsequently.

* Read at the sixty-fourth meeting of the Deutsch. Naturforsch. u. Aerzte. Through *Chem. Zeit.*

Correspondence.

The 100 Puzzle.

To the Editor of the Scientific American:

The request of I. W. B. (Dec. 19, 1891) for a solution of the "100" puzzle has, I note, brought out a number of ingenious *evasions* of the terms of the puzzle. The only way in which a study of such problems can be made of use is in trying to discover *why* they are insoluble.

Referring to the table below, the reader can see that the sum of nine consecutive numbers, beginning at 1 (column 1), is equal to 5 nines, 45, and that the transference of any figure to the place of tens (columns 2 and 3) subtracts the amount of the figure from the units and adds it to the tens, thus increasing the total by as many nines as there are units in the figure. The sum of any nine consecutive figures can never be therefore anything but a multiple of nines. The sum of any nine consecutive numbers (columns 4 and 5) will also be as many nines as the lowest figure of the series contains more than one, plus the original 5 nines of the lowest series, and the sum of any two series will differ by as many nines as the difference in their lowest figures.

9	9	9	14	19	9
8	8	8	13	18	8
7	7	7	12	17	7
6	6	6	11	16	6
5	5	5	10	15	5
4	4	4	9	14	4
3	3	3	8	13	3
2	2	20	7	12	2
1	10	1	6	11	1
45	54	63	90	135	45
5 nines.	6 nines.	7 nines.	5 nines + 5 nines.	5 nines + 10 nines.	

Another peculiarity of the nine digits is that shown in column 6, where each of the 5 nines is successively canceled till there is no remainder.

I saw it demonstrated some years ago that all the curious properties of the figure 9 would pertain to the figure 8 if our notation was reckoned by nines instead of by tens. A. C. B.

Frankford Arsenal, Pa.

How to Improve the Acoustics of Halls and Churches.

To the Editor of the Scientific American:

I have read with much interest what Dr. Ephraim Cutter has suggested about getting the key note of an auditorium, all of which is reasonable, but now I will suggest a remedy for a very little trouble with churches and halls where it is most difficult to hear the voice of the speaker distinctly for more than 25 feet distant.

The reason is that the sound is absorbed by the walls and furniture on the same principle that dark surfaces absorb light and heat.

In my long experience in constructing cold storage and refrigerating rooms, I have found, when the rooms were perfectly covered with a jacket of thick cotton rattan, without a single board or piece of wood in sight, that ordinary talking could be easily heard a hundred feet distant.

We now use an artificial board about one inch thick. It is very porous and lighter than cork, and is entirely free from vibration, and thus a perfect non-conductor of sound as well as of heat. If a hall should be finished with this insulating board instead of plaster and wood finish, there would be no trouble for any speaker to be heard in the most remote corners. A. J. CHASE.

Boston, Jan. 26, 1892.

Street Railroads.

It is but a little time, says the *Railway Age*, since all street railways were horse railways, and it is surprising to learn that already more miles of lines are operated by electricity and steam power than by animals, and still more surprising that electricity is even now used for more than half as much mileage as that operated by animal power, as the following statistics of the United States show:

Number of miles operated by animal power	5,443
Number of miles operated by electricity	3,099
Number of miles operated by steam motors	1,918
Number of miles operated by cable	660

The number of horses employed on street railway lines in this country is stated to have decreased 28,681, being now only 88,114, while electricity is still pushing forward at a rapid rate to displace the four-footed motors.

Electric Lighting at the World's Exposition.

The Fine Arts Building is to have no fewer than 12,000 incandescent lights. The grand Manufacturers' Hall is to have 2,000 arc lights of 2,000 c. p. each. The total reached so far for all the buildings is 5,180 arc lights and 14,700 incandescents, with some 10,000 more incandescents for the Administration Building. Allowing 20 cents per night per arc, that means over $1,000 nightly for arc lighting; and should all the 25,000 incandescents burn every evening there will be a further item of another $1,000, assuming a rate of one cent per lamp per hour for four hours. The lighting effects will certainly be the finest the world has ever seen.