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(Illustrated articles are marked with an asterisk.)

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For the Week Ending September 9, 1893.

Price 10 cents. For sale by all newsdealers.

THE LATEST ARMOR TRIAL AT INDIAN HEAD.

On Saturday, August 26, a trial of armor took place at the Naval Ordnance Proving Ground, at Indian Head, which resulted in the provisional acceptance of about 370 tons of nickel steel armor from Carnegie, Phipps & Co.

The specimen plate that represented the group, which includes armor for the battleships and the conning tower of the Indiana, was an 8 inch barbette plate for the Oregon. Its curve subtended an arc of 120° on a radius of about 8 feet; it was 10 feet 7 inches horizontally and 5 feet 4 inches high, secured to an oak backing with 13 three-inch bolts. The backing at the medial line of the plate was 47 inches thick. The plate was nickel steel, acid treated, possessing a tensile strength of about 98,000 and an elongation of 20 per cent.

The gun was a modern 6 inch breech-loading rifle, mounted on a central pivot carriage, at a muzzle distance from the plate of 61 feet.

The projectile used was a Carpenter armor-piercing shell weighing 100 pounds.

First Round.—Charge of powder, 37·84 pounds. Dupont's brown prismatic; striking velocity, 1,762 f. s. This round was for the premium cracking test, the conditions of which were that the projectile must not get through, and the plate must not show through cracks to the edge.

The point of impact was 21 inches below the upper edge of the plate and about 18 inches to the right of the medial line, the impact being practically normal.

The projectile struck the point aimed at, got its nose just through and rebounded to the gun platform, where it was picked up near the carriage. The marks on the oak planking showed a spiral movement of the shell when it landed over the boards, where it knocked over a stand of blind projectiles, then returning, came to rest under the gun, with its nose pointing toward the plate. It was apparently undeformed, but decidedly cracked, and its point was highly polished and smeared with melted copper from the rotating band. On cooling, the shell began to flake off around the swell, disclosing a grain of finest metal.

The plate was not cracked and showed no other damage than the hole of impact, the edges of which were turned up with a fringe 2·35 inches high. This round decided the acceptance of the plate for the cracking test, but it failed to win the premium cracking test.

Second Round.—Charge of powder, 48·3 pounds; striking velocity, 2,012 feet per second. This round was for the premium perforation test. The shell must not penetrate the backing. The premium offered was $30 per ton for the whole group represented by the plate.

The shot struck the plate 21 inches to the left and below the first point of impact, on the medial line of the plate, penetrated the plate, 47 inches oak backing and 10 inches of additional wood, where it remained. The plate was not cracked, and showed only a clean, fringed hole.

While the plate failed to win a premium for the contractors, the test was eminently satisfactory to the government inspectors. The trial was conducted by Lieutenant Newton E. Mason, U. S. Navy, in charge of the proving ground, in the presence of Captain W. T. Sampson, the Chief of the Bureau of Ordnance, and a number of prominent steel men and ordnance officers. The Carnegie Company was represented by Mr. Hunsecker and their naval agent, Lieut. Stone.

THE PURIFICATION OF WATER IN WELLS AND CISTERNS.

We have recently described and illustrated an electric purification process for water from the Croton watershed. The existence of vested rights therein involving the disposal of sewage by villages or individual houses has made this object hard to attain. Tracing one source of contamination to a restricted area, the purification process we have alluded to has been applied thereto with considerable success. The process virtually amounts to treatment of the water with hypochlorites and other highly oxidized salts. These decompose the offensive organic matter and make the water quite innocuous.

Liquids form a peculiarly efficient vehicle for the sustenance and dissemination of the lower forms of life forming the dangerous class of "organic matter." The presence in liquids of certain of these germs means disease for those who drink it. While science has not yet reached the point of distinguishing between all safe and unsafe bacteria, it seems to have reached the point of being able to destroy them all cheaply.

The country districts are notorious among sanitarians for bad water supply. The picturesque well, with its old oaken bucket, is often situated so close to a source of sewage contamination that it becomes a center for the dissemination of typhoid fever, diphtheria, or other deadly malady. In the supply of water for country houses it would seem the sanitary chemist had a good field for his operations. If it is possible to treat one of the affluents of Croton Lake cheaply and effectively, so as to make a marshy and probably sewage-contaminated water pure in the sanitary sense, how much easier an object of attack would be the well of the country boarding house, or of the seashore hotel, now so often overshadowed by at least a suspicion of unhealthfulness. In many cases houses in the country depend upon rain water for the supply. This water collected in subterranean cisterns would seem to have every title to the highest grade of purity, especially if the first rainfall is discarded by a special by-pass. Yet cistern water often acquires a very unpleasant taste, which is traceable to no visible or discernible impurity.

The treatment of such cases would seem to be simple, and a formula for each case based on an examination of the water might easily be deduced. An agent, such as the hypochlorites, added in predetermined quantity might be found applicable. Potassium permanganate or binoxide of hydrogen would also seem available reagents and of undoubted efficiency. The highly colored permanganate salt would be of special advantage, as it might be added to the limit of discoloration, thus in itself supplying its formula of application. We have before this had occasion to describe direct aeration applied to the purification of water; the simple bubbling of air through water is found to remove odor and taste. It is possible that many cases of local trouble with water might be treated by a proper air pump for the injection of atmospheric air through water in the cistern or well.

The chemist's permanganate test for organic matter in water consists in the addition of an acidulated solution of permanganate of potash of known strength in measured volume to the water to be tested. Organic matter in the water destroys the salt. Its solution is of a very strong violet color, the merest trace of it imparting a rose tinge to water. In the test, after addition to the water, the rose-colored mixture is allowed to stand for a definite period. If decolorization takes place, more is added until the water retains a faint red color, when it is assumed that the decolorizing power of the water is exhausted. By calculation the quantity of oxygen absorbed from the permanganate is determined and is reported as oxygen required to destroy organic matter in the water in question. The application of such a process to a cistern or well would seem quite possible under proper management, such as might be formulated by a competent chemical authority. If a colorless salt were used, then of course there would be no direct method of knowing when enough had been added. If, however, a virtually nonpoisonous substance were used, an excess of which would not be disagreeable, then it would be quite possible to devise such a system as we describe to be applied by any person.

The rendering sea water potable by the addition thereto of silver citrate, thus substituting sodium citrate for sodium chloride, has been suggested for use in cases of shipwreck, and the exact formula for its application has been published. As sea water is virtually of constant composition, a formula was of easy preparation. For organic matter in water, something which constantly varies in amount, no universal formula can be produced, and the best that can be done might be the use of some agent which even in excess would not affect the water injuriously, while destroying organic matter.

John Rae.

Dr. John Rae died at his home, in London, on July 24, after a prolonged illness. Dr. Rae was born in the Orkney Islands. He studied medicine at the University of Edinburgh, and after graduation there he took his degree as licentiate of the Royal College of Surgeons before he was twenty-three years of age. He served for a time as surgeon on a ship of the Hudson's Bay Company, and in 1845 accepted the command of an expedition to the Arctic Seas to endeavor to complete the survey of about seven hundred miles of the coast forming the shores of a large bay, which Parry had failed to accomplish. This expedition, which proved successful, was the beginning of a series of voyages of discovery that made Dr. Rae famous as an Arctic explorer. He was a fellow of the Royal Society, fellow of the Royal Geographical Society, honorary correspondent of the Geographical Society of America, and honorary member of the National History Society of Montreal. The Founders' Gold Medal of the Royal Geographical Society was awarded to him several years ago.

IN both France and Germany one-fourth (¼) reduced to a decimal is written as 0,25; in England it is written 0·25 (always with the period at the top of the line), and in the United States in this way, 0.25. France and Germany always use the comma (,), England and the United States the period (.), the only difference being the manner in which it is placed upon the line. Sir Isaac Newton is given the credit of originating the present English method of using the decimal point, his reason being that by placing it at the top of the line it could be distinguished at a glance from the "full stop" punctuation mark. All English mathematicians use the mark in the way proposed by Newton, and the period as a sign of multiplication.