BALLISTIC TEST OF REFORGED ARMOR PLATE FOR THE RUSSIA.

The continued progress made in the manufacture of armor in this country by the Carnegie Steel Company, Limited, is well illustrated by the engravings we present this week of the results of the ballistic test of the last Russian trial plate for the Russian armored cruiser Russia, tested at the naval proving ground at Indian Head, May 13, 1896.

The tough, hard armor manufactured by the Carnegie Company under the patent of W. S. Corey represents the latest development in the manufacture of American armor plate. The combination of the qualities of toughness and hardness is obtained as the result of special chemical composition, work, supercarbonization, reforging, and water hardening. The final operation is the actual face hardening (frequently called tempering), and it consists in the sudden application of a suitable cold liquid.

The plate in question was 16 feet long, 8 feet wide, and tapered from 8 to 4 inches in thickness; and was of nickel steel, face hardened and reforged. It was attached by bolts in the usual manner to a wood backing and was attacked in rapid succession by five 6 inch and three 4 inch Holtzer armor-piercing shell fired at high velocities, the 4 inch projectiles being fired only against the thinnest section of the plate.

The requirements of the test were that four 6 inch projectiles fired at striking velocities of 1,856 foot seconds, and four 4 inch shell at striking velocities of 1,926 foot seconds, should not get entirely through the plate and backing nor crack the plate sufficiently for any portion of it to leave the backing.

Owing to the very great irregularity of the Dupont brown powder employed, the velocity of the third shot was so much below that required that an additional 6 inch projectile was fired at the point marked No. 5, very near to impacts Nos. 1 and 2. But as the plate stood up so well under its repeated battering, the fourth 4 inch shot was waived.

The projectiles were fired in such quick succession that the stresses caused thereby must have seriously taxed the plate. This method of test would certainly discover any lack of uniformity in the plate, while its ability to keep out and completely pulverize a 6 inch Holtzer shell when fired at a striking velocity of 2,149 foot seconds showed what splendid ballistic resistance it possessed.

The proximity of the points of impact to the edges and corners of the plate and to each other; the number, rapidity of attack and high velocities of the projectiles; subjected the plate to such an unusual test that General Mertwago, the president of the Russian inspection commission in the United States, recommended that the remaining armor under manufacture by the Carnegie Company be accepted without further test, which recommendation the Russian government unhesitatingly granted.

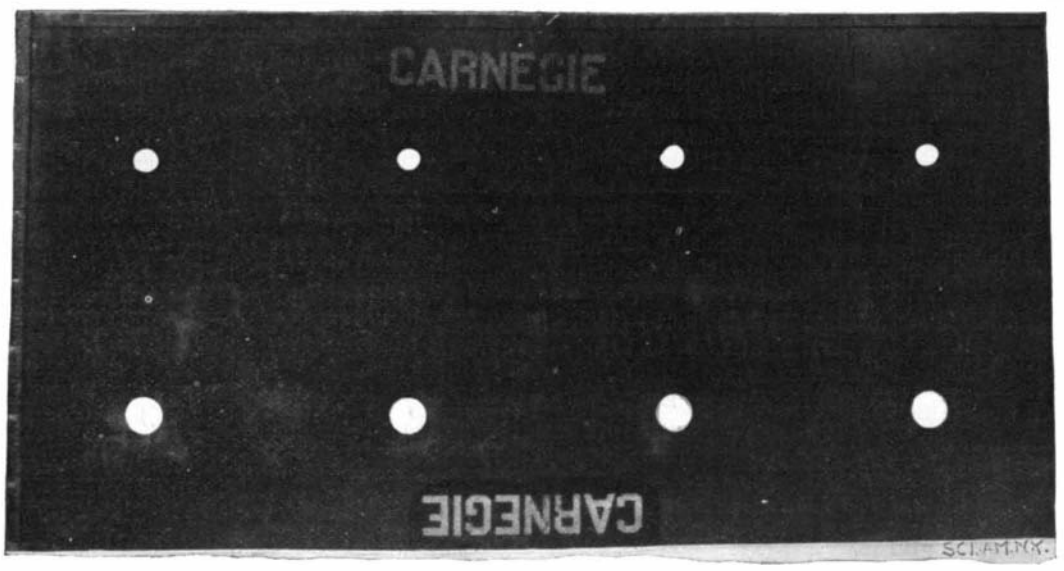
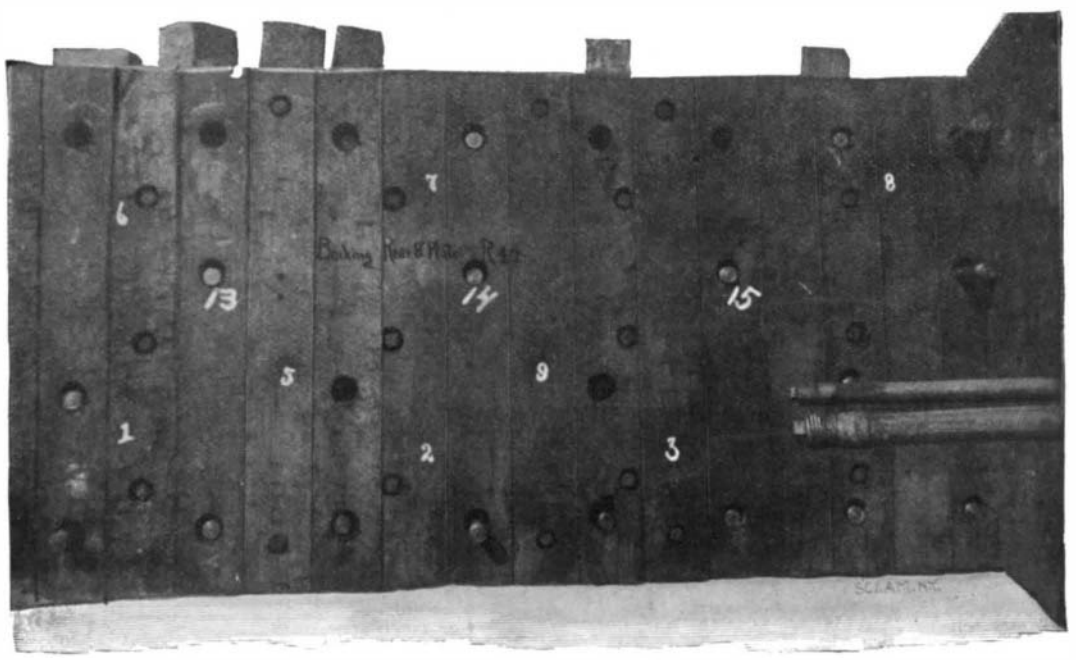
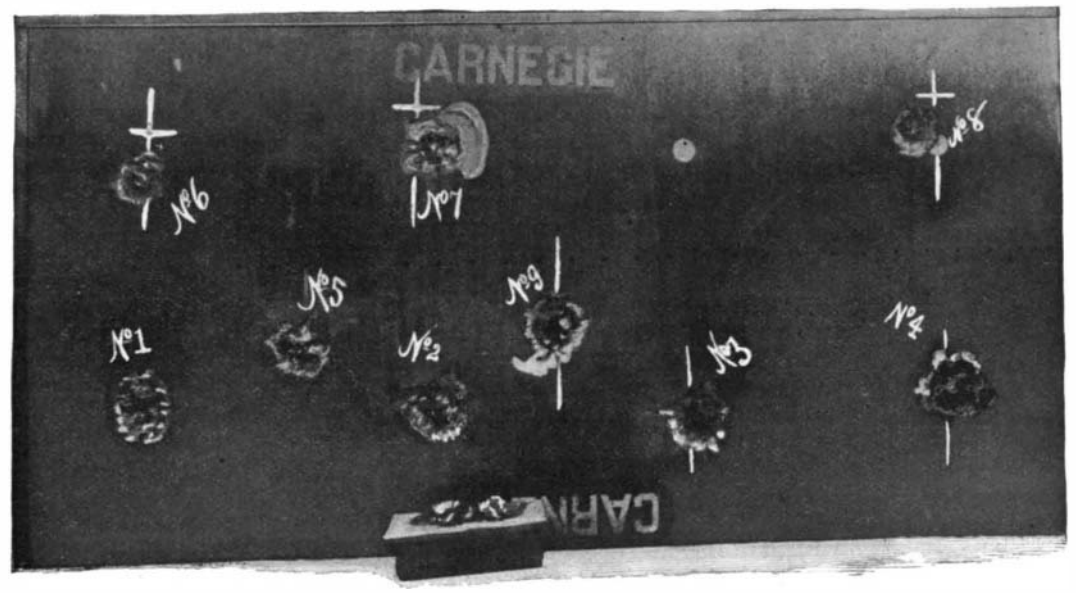


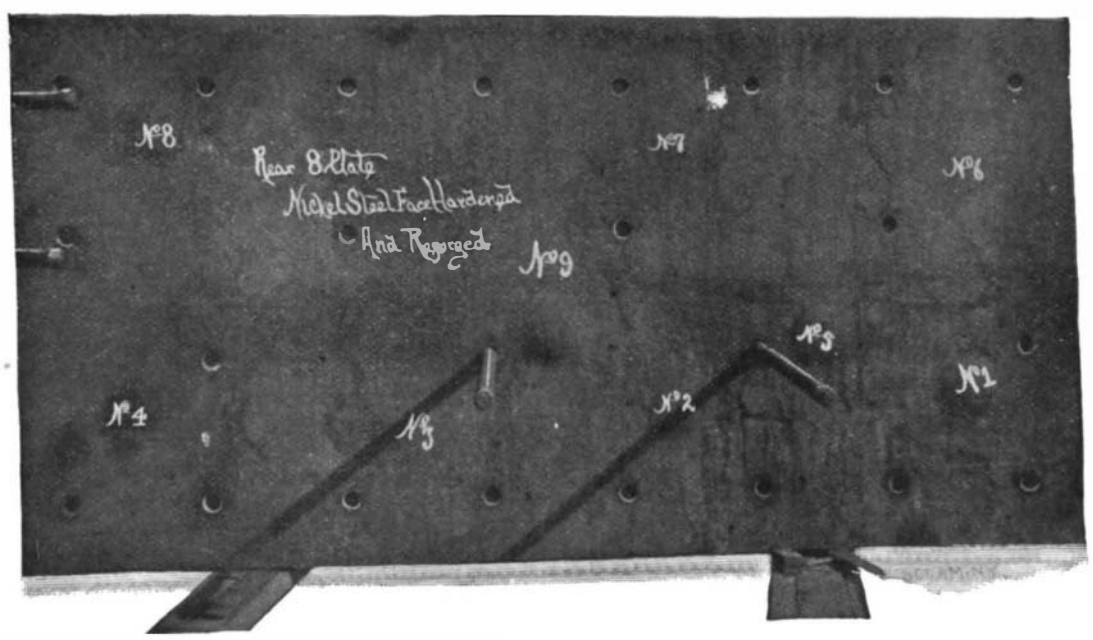
PLATE IN POSITION FOR TEST.



FRONT FACE OF BACKING AFTER TEST—PLATE REMOVED.



FRONT FACE OF PLATE AFTER TEST.



REAR FACE OF PLATE AFTER REMOVAL FROM BACKING.

BALLISTIC TEST OF NICKEL-STEEL, REFORGED ARMOR PLATE FOR THE RUSSIAN GOVERNMENT.

In fact there seems to be no doubt that the plate would have kept out any projectile of a caliber equal to the thickness of the plate at the point of impact if fired at service velocities. This certainly is an excellent protection for any ship. Both Russia and the Carnegie Company are to be congratulated.

The following table gives the details of the test:

Impact No.	Projectile, Holtzer, caliber inches.	Striking velocity, foot seconds.	Striking energy, foot tons	Estimated penetration, inches.	Condition of projectile.	Condition of plate.
1	6	1887	2484	5	Broke up.	No cr'ks.
2	6	1826	2311	5	"	"
3	6	1856	2480	5	"	"
4	6	1846	2362	6	"	"
5	6	1866	2413	6	"	"
6	4	1991	907	2	"	"
7	4	1958	877	2	"	"
8	4	1959	878	2	"	"
9*	6	2149	3221	7	"	"

* This round fired at the request of the Carnegie Company, the group of armor having been accepted after the eighth shot.

Water Pressure at Two Hundred Feet.

A crushed mass of iron now lying in a scrap yard at Pittsburg demonstrates the tremendous pressure of water at a great depth. It was constructed for a diving bell, and was intended for use in Lake Michigan. As originally constructed it was a cube about six feet square, tapering slightly at both ends. The material was phospor bronze, five-eighths of an inch thick. Each plate was cast with a flange, and they were bolted together, the bolts being placed as closely together as was consistent with strength. The side plates were further strengthened by ribs an inch thick and two inches wide, and the entire structure was strongly braced. The windows, intended to be used as outlooks by the divers inside, were three inches square, fortified with iron bars and set with glass plates one inch thick. The entire weight of the bell was 23,000 pounds. When completed it was sent to Milwaukee and towed out into the lake about twelve miles, where there was over two hundred feet of water, and was sent down for a test. The manufacturer of the bell was so confident of its strength that he wanted to go down in it on the test trip. It was well he did not. When it reached a depth of about two hundred feet, strong timbers which had been attached to it came to the surface in a splintered condition. Suspecting an accident, the bell was hauled up and found to be crushed into a shapeless mass. The inch thick plate glass bull's eyes were pulverized and the entire body of the bell forced inward until none of its original outlines remained. On a basis of two hundred feet depth, the pressure that crushed this seemingly invulnerable structure was 86·8 pounds per square inch, or 353,924 pounds to each side of six feet square. The total pressure, therefore, on the cube was 2,723,548 pounds, or 1,361·7 tons.—Indianapolis Journal.