AMERICAN ARMOR PLATE FOR A RUSSIAN BATTLESHIP.

By the courtesy of the Carnegie Company we are enabled to present the accompanying illustrations of certain armor plates which were recently tested by the naval authorities at the Indian Head proving grounds. The plates were manufactured under two different processes and were subjected to two different kinds of tests. The two plates which show the long, horizontal scoring form part of a large number which were manufactured for the flat portions of the protective deck of the new Russian battleship "Retvizan," which is now under construction for the Russian government at the Cramp Shipyard, Philadelphia. The third plate showing the mark of five separate impacts represents the side plating for protecting the rapid-fire battery of the same vessel.

If our readers will turn to the SCIENTIFIC AMERICAN for November 5, 1898, they will find illustrations and a description of this vessel, from which it will be learned that she is protected with a 9-inch belt at the water line associated with a protective deck, which will be 4 inches thick on the slopes and 2 inches on the flat portion. Above the 9-inch belt and between the protective and the gun decks will be another belt of 6-inch armor extending between the main barbettes, and above this, protecting the broadside battery, will be a wall of 5-inch plating. The plates shown in Figs. 2 and 3 represent a lot manufactured for the 2-inch protective deck, while the test plate shown in Fig. 1 was taken at random from the 5-inch plates for the protection of the secondary battery.

The test carried out upon the 2-inch plating was arranged to represent the conditions under which a shell would strike the flat portions of a protective deck in actual warfare. Should a shell pass through the side of a ship at the ordinary fighting ranges it would strike at a sharp angle with the deck, and this condition was represented in the test by firing a number of 6-inch armor-piercing projectiles at angles of about 15 degrees to the plates. The plate shown in Fig. 2 was 2 inches thick. It will be seen that two of the shots made long indentations and bulged the plate considerably, and only one got through. The plate shown in Fig. 3 was made up of two 1-inch plates, and the projectiles were 6-inch armor-piercing Carpenter projectiles, the striking velocity in the case of the lower impact being 1,160 feet per second. The first shot deeply scored the outer plate, but the plate was not broken. In the case of the second shot, the outer plate was cut through for a length of 26 inches, the opening being 1⅛ inches wide at the middle of the fracture, but the second or backing plate was not cut or even scarred. These plates are of ordinary soft nickel steel treated by the Carnegie system and the results, considering the energy of the projectile and the angle of impact, are very satisfactory.

Fig. 1 is one of the most remarkable photographs of armor-plate test ever taken. The plate was manufactured under the Krupp patents by a process which is a development of the American Harveyized process, and has shown results which are a great advance in respect of hardness of face, depth of hardening and the general toughness of the body of the plate. The first shot fired from a 5-inch rapid-fire gun struck in the center of the plate with a velocity of 2,060 feet a second and broke up, the penetration being only 2 inches, and the point of the shell remained embedded. The velocity of the second shot was 2,086 feet per second, of the third 2,057 feet per second, and of the fourth 2,089 feet per second, and the last shot struck with a velocity of 2,060 feet per second. In every case the projectile failed to penetrate more than about 2 inches, and left its point welded into the face of the plate. Had the ordinary Harveyized armor been used the penetration would have been more than twice as much, or about 4·4 inches. It will be noticed that not only did the plate resist penetration and break up the projectiles, but it had sufficient toughness to hold together without cracking or fracture. The result is positively astonishing to anyone who has not kept close touch of the progress which is being made in armor plate manufacture under the Krupp process. In spite of the enormous increase of late years in the power of naval guns, the victory in the struggle between the gun and the plate rests to-day with the latter. We commend this photograph to the thoughtful and intelligent attention of the two or three Congressmen who have been endeavoring only too successfully to prevent the country from using Krupp armor upon its ships. Had this plate been of the kind which they are anxious to force upon the navy, it would probably, under such a fierce attack as the above, have been cracked from end to end. We would also draw their attention to the fact that this plate was made in America to be placed upon the sides of a ship which is being built in this country for the Russian navy, and we would ask whether it is desirable that we should place the best armor upon foreign ships and clothe our own with armor of a distinctly inferior grade.

Fig. 1.—TEST OF 5-INCH KRUPP PLATE FOR RUSSIAN BATTLESHIP "RETVIZAN."

Impact No. 5 by 5-inch, 50-pound projectile; striking velocity, 2,082 feet per second; striking energy, 1,502 tons. Projectile smashed, point welded to plate, penetration 2 inches. Penetration on similar Harveyized plate would have been 4·4 inches.

Fig. 2.—TEST OF 2-INCH NICKEL-STEEL PLATE.

Attacked by 6-inch projectiles fired at an angle of 15 degrees with the plate. Impact No. 3, by 6-inch projectile; striking velocity, 1,639 feet per second.

Fig. 3.—TEST OF TWO 1-INCH PLATES.

The lower impact made by 6-inch projectile; striking velocity, 1,160 feet per second; cut through outer plate but failed to injure second plate.

Effect of Heat on Scorpions.

An interesting question has from time to time been discussed by naturalists and physiologists, as to whether the scorpion commits suicide by stinging himself with his own venomous dart. Experiments have often been made, which consist in surrounding the scorpion with a circle of fire, usually formed by small pieces of burning coals. One may then see the animal agitate his tail in the air, waving his dart to and fro over his head in a desperate movement, and finally fall dead, appearing to have decided that he could not escape from the flames and to inoculate himself with his own venom. This idea is now, however, found to be erroneous, as it has been proved that the scorpion is not affected by his own venomous fluid, and the hypothesis of his suicide cannot be maintained. It appears from later observations made upon the death of the scorpion under the conditions in question, that a more simple explanation is to be found. The scorpion is, in fact, very sensitive to heat, and is easily killed by a temperature not exceeding 50° C. If one concentrates the solar rays upon its back by means of a lens one may observe that he tries by means of his tail to remove the cause of discomfort. It is this movement of defense which has hitherto been mistaken for one of suicide, and in reality the scorpion has been killed by the heat to which he has been exposed under such circumstances.