

ARMOR PLATES FOR SHIPS OF WAR.

No more vitally interesting or exciting question than that of rendering ships of war shot-proof exists in the mechanical, naval, and, we may add, ship-building professions. By the courtesy of Commander H. A. Wise, of the Ordnance Department, Washington Navy Yard, we are furnished from time to time with accurate reports of artillery practice, on the several systems of armor-plating experimented upon at the Washington Navy Yard. These are correct reports, not altered or changed in any respect from the copy furnished by the Government, and we call the especial attention of our readers to the results as herewith presented. The subject of the appended

nesses of half-inch plate iron, then comes a tissue of wire ropes 14 inches thick. The target is mounted on timber 9 inches thick, consisting, first, of two 1-inch boards (one horizontal and one vertical), and then of two layers of timber 3½ inches thick, disposed of vertically and horizontally.

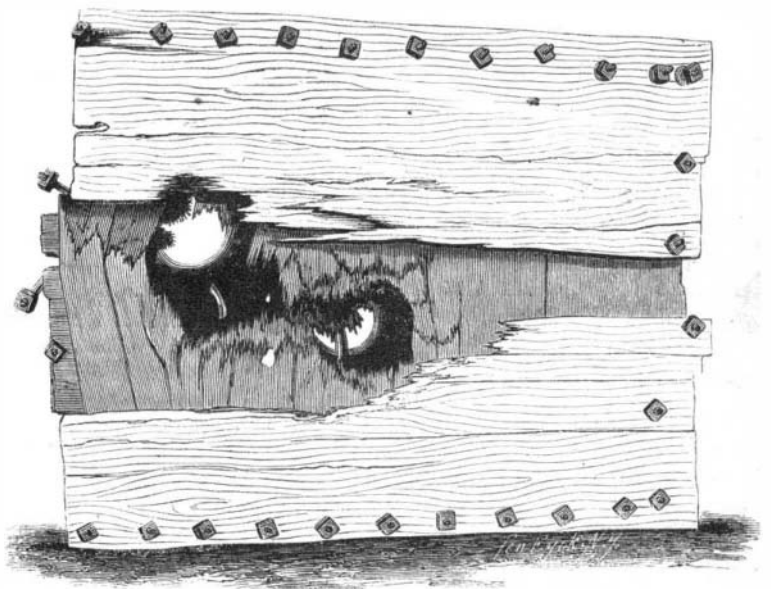
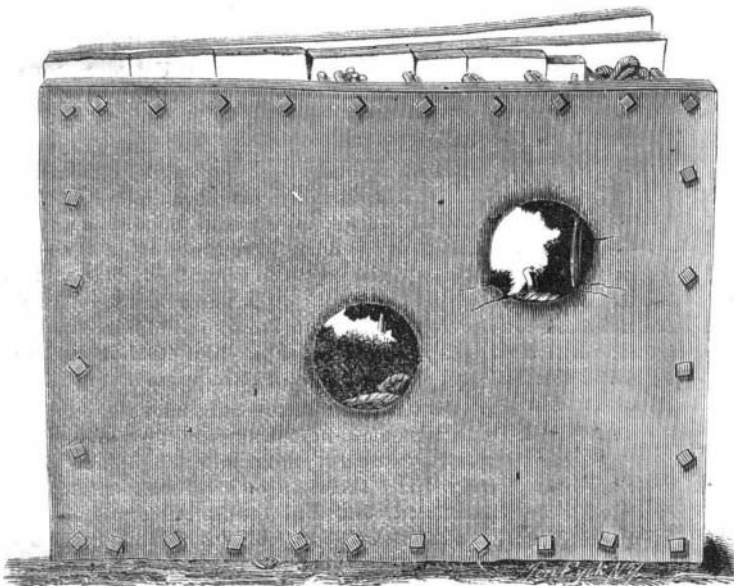
DIMENSIONS OF TARGET.—Length, 67½ inches; width, 50½ inches; iron thickness, 15½ inches; timber, 9 inches.

Gun, XI. inches, No. 214, C. A. & Co., mounted on wooden pivot carriage in front of battery; charges, cannon powder, 1862. Projectiles; first, one wrought-iron, and, second, one cast-iron solid shot. Primers friction.

pedoes brought up by the *Mount Washington* from Hampton Roads, as follows:—

These torpedoes are, in material and workmanship, rather inferior; however, would seem to answer the purpose of exploding a certain quantity of gunpowder under water. They are made of tin and are encased in square wooden boxes indicated by the engraving. In the lower end of these boxes hooks are driven, to which pig iron is fastened which keeps the torpedoes in their upright position.

The cylinder, A, holds about 25 lbs. of gunpowder, which is lighted by quick-match leading up through the tube, B, to slow-match, with which the smaller tube, C, is filled. The tube, C, is of two thicknesses



engravings is Mr. Hodge's target, composed of wire rope or cables, placed behind a wooden facing of a certain thickness. The first engraving represents the target as it stood when fired at, the second a side view of the same target, and the third a rear view of the same target. The official report is herewith submitted. It is proper that we should add

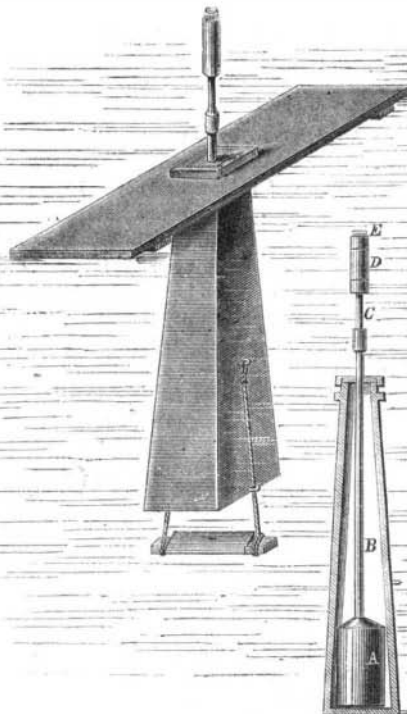
No. from Gun.	No. to day.	Charge.	Weight of Piece of tin.	Insert'n.	Recoil.	Time Fir. ed.	Distance to target.	REMARKS.
		lbs.	lbs.	in.	ft.	P. M. h. m.	ft.	
101	1	25	156	106	7	11 28	83	
102	2	15	165	108	6	11 39		

First shot hit direct, passing clear through the target into the bank. Penetration not determined. Second shot hit direct, passing clear through the plate and penetrated the bank a distance of 9 feet 6 inches.

A NEW REBEL TORPEDO.

NAVY ORDNANCE YARD,
Washington City, Nov. 21, 1863.

COMMANDER H. A. WISE, Chief of Bureau of Ordnance,
Navy Department:—



SIR:—Conforming to direction contained in telegram of Nov. 19th, I beg to report about the tor-

pedoes brought up by the *Mount Washington* from Hampton Roads, as follows:—

The cylindrical tube, D, is nothing but a common night-lantern of tinner's make: it protects the burning match from being extinguished by the waves, conceals the light and supplies oxygen to the combustion by means of the small smoke-stack, E.

Most likely they were set adrift intended to be carried to the ship's sides by the action of the tide; a plank five feet long, floating on the water, giving the direction to the torpedo.

Respectfully submitted,
(Signed) Wm. N. JEFFERS,
Inspector of Ordnance.

REPORT OF THE CHIEF OF THE BUREAU OF ORDNANCE.

BUREAU OF ORDNANCE,
Navy Department, October 20, 1863.

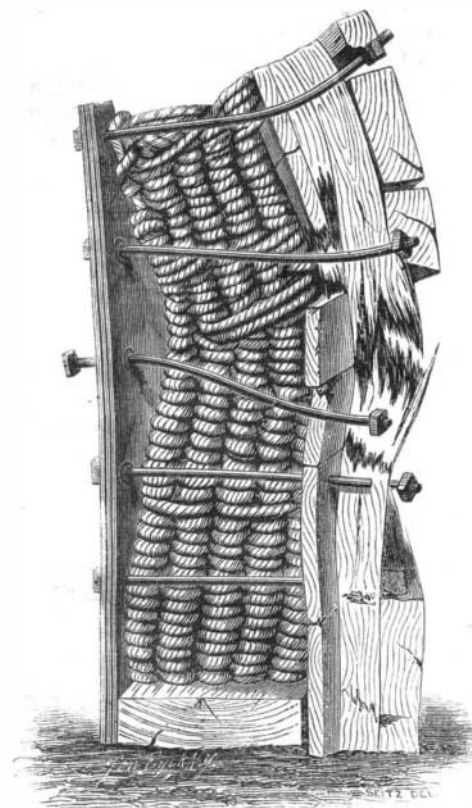
SIR:—In your last annual report, under the head of "bureaus," you were pleased to make the following remarks:

"Like every other branch of the public service that of ordnance was wholly unprepared for the great crisis that befel the country in 1861; and one of the most embarrassing difficulties at the commencement of our national troubles was that of procuring ordnance as rapidly as was required for our increasing navy. To remedy the deficiencies and wants when our vessels were multiplying, we were compelled for a time to revert to old artillery which had been discarded, and to avail ourselves of extraordinary means to meet the then existing necessities. These difficulties have been, in a measure, overcome, and our ordnance is greatly improved and improving."

In the report which I now have the honor to present, I shall endeavor to show briefly, yet as clearly as possible, how much this branch of the public service was unprepared for the great crisis of 1861, and in what manner and to what extent the existing difficulties have been overcome, and our ordnance of the navy increased in numbers and improved in character.

Not a single ship or squadron has ever been delayed in its movements for the want of ordnance or ordnance supplies.

From the record it appears that the ordnance of the navy, at the commencement of 1861, consisted



that these illustrations will be continued in future numbers of the SCIENTIFIC AMERICAN, showing the effect of shot upon targets of all descriptions, faced with rubber, backed with rubber, wood, &c. &c.

PRACTICE AT Mr. HODGE'S WIRE TARGET No. 1.
[OFFICIAL.]

PENCOZE BATTERY, May 7, 1862.

The front of the target consists of three thick-

of 2,468 heavy guns and 136 howitzers, of the following calibres: 32 pounders, 8-inch, 10-inch (old model), X inch (Dahlgren), XI-inch (Dahlgren), and XII-inch (Dahlgren).

The old system of armament is represented in this table by the classes of 10-inch, 8-inch, and 32-pounders; the new system by the rifled pieces and the smooth-bore IX-inch, X-inch, and XI-inch guns of Rear-Admiral Dahlgren, and the rifled-guns of Dr. Parrott, to which are added the ponderous and powerful XV-inch guns introduced by Assistant Secretary Fox, as the special armament of the monitors and other turreted vessels.

Of the new system it is probable that over 700 guns of different calibers that are now in process of fabrication will be completed and added to the number given in the table by the end of the current year.

In arming our vessels the primary object has always been, recently, to place on board of them the heaviest and, consequently, the most effective guns which they could safely carry without reducing their speed, or endangering their sea-going qualities.

The only establishments in the country which were repaired for the work of founding heavy cannon when the rebellion took place were the South Boston, Fort Pitt, and the West Point founderies.

Right nobly did they come to the rescue in the hour of need, and thus afforded time for the bureau to seek other manufacturers who might be willing to undertake the work of supplying the navy with cannon.

In addition to the above-named founderies, the bureau has now, as sources of supply, the establishment at Providence, R. I., known as the Builders' Iron Foundry, the founderies of Messrs. Hinkley, Williams & Co., of Boston, and the Portland Co., of Portland, Me., and at Reading, Pennsylvania, the Scott Foundry of Messrs. Seyfert, McManus & Co.

In procuring cannon for the navy the same conditions have been exacted from all these founderies, as regards the character of metal and every other element necessary to constitute good and reliable guns. No gun has been accepted, as a standard, which has not been subjected to the ordeal of 1,000 rounds of service charges. With this standard thus established, all the guns of a contract must coincide in their composite elements.

The only exception to this rule has been in the case of the XV-inch guns cast upon the plan of Major Rodman, of the United States army. Time did not permit of this proof being applied, and the guns were necessarily accepted and put into service, after having endured, however, somewhat more than the tests prescribed by the army regulations.

It is most gratifying to know that the judgment of the Navy Department has been sustained by the result of the further test which has been applied to the first gun of this class made for the navy, and which is still undergoing a series of experimental trials after being modified in form. All doubt is thus removed of the ability of the Fort Pitt foundry to produce guns of this great size which can safely be relied upon; and the power thereby added to the force of our monitors has been most fully exemplified in the capture of the *Atlanta*.

In the summer of 1862 the bureau, in conjunction with the army ordnance, directed a 100-pounder Parrott gun to be subjected to a series of 1,000 service rounds.

The gun stood the test without bursting, and its accuracy and range were considered sufficiently good to warrant the adoption of these rifled guns as a permanent part of our naval armament.

Finally, from personal inspection, and witnessing the firing of over one hundred rounds from these guns at the West Point foundry recently, the bureau is satisfied that whenever attention is paid to details and even moderate skill in the manner of loading and firing is attained, they will prove the most serviceable rifle guns that have ever been introduced into any service.

It should be remarked also that the average cost of these guns is much below that of any others which have been offered to the Government.

The projectiles now commonly used in the navy may be divided into two classes, the smooth and the rifled, and are used almost exclusively in their respective guns.

For the smooth-bores we have the shot, shell,

shrapnel, grape, and canister, and the same for the rifles, excepting the grape and canister, which are not generally provided. The former are spherical; the latter elongated and of different forms and devices, as embraced in the systems of Parrott, Hotchkiss, Schenkl, and others.

It is hardly possible to state with exactness the number of each kind of projectiles on hand and available March 1, 1861. Since that time upwards of 5,170 tons of shot of all classes have been provided for the use of the navy.

Since the outbreak of the rebellion the navy has been amply supplied with powder from the various mills engaged in its manufacture in the loyal States, and has not been compelled to seek it in a foreign market.

So great has been the consumption for naval purposes that the bureau has been obliged to order no less than 2,980 tons since March 1, 1861. This vast amount has been promptly furnished, of the most approved quality, and in conformity with the established tests, by the Messrs. Dupont, of Wilmington, and the Schaghticoke, Hazard, American, and Union Powder Companies. For uniform strength, density, and hygrometric qualities, no better powders can be found anywhere.

So far as the navy is concerned, the above-named mills are fully capable of supplying all the demands.

The same difficulties were experienced in supplying the navy with small arms at the commencement of the war as with heavy guns; for it had been customary to rely mainly upon the army for the limited number required in the ordinary operations of a time of peace. The navy was, consequently, obliged to make use of every available description of arm in its possession, and to buy at once such as could not be obtained from the army.

Hence the present stock is made up of a number of different styles and calibers, partly breech-loaders, and the want of uniformity in this respect is felt to be very embarrassing.

The proposition will be to adopt one caliber of musket and one of carbine—the former being a muzzle-loader, the latter a breech-loader for boat service; and this it is at present believed will be best obtained by using altogether the "Plymouth" pattern of musket (ten thousand of which are now being delivered by Mr. Whitney, of Connecticut), and the Sharp & Hankins breech-loading carbine.

The powder magazines for the use of the navy on the Atlantic border are now situated at Portsmouth, N. H.; Boston, New York, Fort Mifflin, on the Delaware; Washington, and Fortress Monroe.

The capacity of the first five named is about 500 tons each; of the one at Fortress Monroe 3,000 barrels. At Baltimore there is also a small magazine rented from private parties which will contain about 200 barrels.

In times of peace, although danger still existed, the chances of disaster were very much reduced because the magazines contained moderate quantities, and were only required to be opened and work performed in them to supply occasionally the wants of a cruiser. Now the demand for powder and magazine stores is unceasing, and the chances of disaster are multiplied proportionally.

The importance of this subject will be sufficiently felt by reflecting on the terrific consequences of the explosion of five hundred tons of gunpowder in the vicinity of a city like Boston, New York, or Philadelphia. Words can hardly do justice to the disastrous effects of such an event. It would level spire and dome with the earth, and shake either of those cities to their very foundations. By an explosion of a far less quantity of powder than that named, an entire quarter of the city of Leyden was destroyed in 1807, and 150 persons perished in the ruins.

It will be seen from the foregoing brief and imperfect account of the state of our naval ordnance at the commencement of the rebellion, and of its present condition, how great an advance has been made in placing it not only on a footing commensurate with our present necessities, but also in preparing it for further and more extended operations; and it may be said that in general efficiency it now equals, and, in some respects, far excels the ordnance of any other navy. The record of its rapid progress during the past two years from comparative weakness in numbers and appointments to power and un-

rivalled excellence, is but another evidence of the vast resources of the loyal States, and of the skill, energy, and patriotism of their inhabitants.

H. A. WISE, Chief of Ordnance.

The "Warrior" in Bad Condition:

We find in the *London Times* the following account of the condition of the frigate *Warrior*, from which it appears that that famous vessel is practically useless for the present:—

"The ship's bottom, as she now lies in dock, has the appearance of a well-made thrummed-mat, being covered with a fine crop of tuft-weed, which must have grown at the rate of about three-quarters of an inch per month, since the ship has been afloat, to reach its present condition. The vitreous sheathing had less of this weed upon it than the compositions, and they have adhered to the ship's bottom with two exceptions.

"It is impossible, however, to say how far these small plates (which are about twelve or fourteen inches in length and about four inches in width, and are attached to the ship's bottom by a hot cement) have protected the iron until they have been removed, and the surface has been laid bare and examined. The same remark will also apply to the compositions, for there are signs of corrosion over the lines of rivet heads at the ship's bows that require to be very closely looked into. There are existing indications of mischief to the rivet-heads at the bows of the ship to warrant a careful scraping and examination of every part of the ship's bottom from keel to water-line."

Cornish Pumping Engines.

It appears from a tabular statement prepared by the proprietor of *Lean's Engine Reporter*, for the years 1841 to 1860 inclusive, that the average duty of these engines has fallen off from sixty-eight millions in 1844 to fifty-two millions in 1860, or 25 per cent; also that less interest was now felt in the performance of these engines, as while fifty were reported in 1841, only fifteen were reported in 1858, and twenty-five in 1860. Although the nominal, or reported duty, showed this marked diminution, it was not asserted that there had been an actual falling off to the extent thus indicated—for the duty paper did not take into account the quality of the coal, which was certainly inferior to that used twenty years ago; besides which the present practice of sinking the engine shaft, for the whole, or part of its depth, in an inclined direction upon the course of the lode, must have tended to increase the friction of the pitwork, and the mines were also deeper than formerly. Nor was expansion of steam adopted to so great an extent now as it was some years ago; it was then carried further than was compatible with safety, as was evidenced by the repeated breakages of the main rod, the piston rod, and the other principal parts of the engine. But after allowing for all these legitimate causes of the falling off of duty, it was thought that the average duty of the county was still at least ten millions below what it should be.

Safety Valves Dangerous.

The *London Engineer*, in alluding to our remarks upon Professor Airy's paper on boiler explosions, says: "It is dangerous to open a large safety valve suddenly." The general idea of safety connected with the use of a safety valve is that when the steam in the boiler attains to a certain fixed rate of pressure, it shall open suddenly and allow the steam to escape so as to reduce the dangerous pressure. It is known to engineers that if a safety valve is raised suddenly, under great pressure, the water is liable to foam and flow out with the steam, in the same manner that soda-water or spruce beer in a bottle, charged with carbonic acid gas, will be carried out with the gas when the cork is drawn. It is upon this principle seemingly that Clark has founded his projectile theory of boiler explosions. No other danger is entertained by engineers in raising the safety valve suddenly than the escape of water from the boiler.

SOMETHING FOR THE PHOTOGRAPHERS.—In consequence of a prize having been offered in France for the invention of a substitute for albumen prepared from hens' eggs, an albumen equal in quality, and much cheaper, has been discovered, which is made from fish roe.