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O. D. MUNN, S. H. WALES, A. E. BEACH.

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Contents:

(Illustrations are indicated by an Asterisk.)

ARTILLERY EXPERIMENTS OF THE GOVERNMENT.

From time to time, during the last two months, we have published reports of Government experiments on iron-clad targets; these were accompanied by accurate illnstrations, which were, in many cases, photographed from the targets themselves. The experiments alluded to, were all made with the eleven-inch gun, of Dahlgren, with an average charge of 30 pounds of powder, an average weight of spherical cast-iron projectile equal to 165 pounds, and an average range of 80 feet.

Under the above-named conditions, an experiment was made upon a composite target of iron and india-rubber, backed with timber. The iron was outermost, and was 2 inches thick; the rubber came next, and was $1\frac{3}{4}$ thick; the timber was 19 inches thick—in all $22\frac{3}{4}$ inches. The target was inclined at an angle of 15 degrees; and at the first fire the shot tore through the mass and penetrated the bank behind (a solid clay) 17 feet, being but slightly damaged in its passage.

Another experiment was tried with a $4\frac{1}{2}$-inch solid scrap iron plate, backed with 20 inches of solid oak, and the iron *faced* with rubber, 4 inches thick, the whole placed against a bank of solid clay; this resulted in the destruction of the target at the first fire, the charge being 30 pounds, the projectile, spherical cast-iron, weighing 169 pounds, and the range 87 feet. The shot did not go entirely through the target, but penetrated the plate and rubber, and lodged in the second course of timber behind. The rubber was entirely forced off, by the violence of the concussion, and fell fifteen feet forward of the target.

Still another target was made, of four one-inch wrought-iron plates, backed by rubber 4 inches thick in single sheets of one inch each; the whole backed by 20 inches of solid oak. The first four inches next the timber were composed of alternate rubber and iron, two inches of each; the wrought-iron was on the outer surface of the target when fired at. The whole was placed against a bank of solid clay. The charge was 30 pounds, the shot 169 pounds in weight, and the range 84 feet; at this distance, and under these conditions, the target had two clean, handsome holes bored through it—one of which was but slightly larger than the shot itself, showing it experienced but little resistance in its passage. A repetition of the experiment, with the target inclined at an angle of 45°, produced the same result; the target being penetrated, and much more injured than when vertical. It should have been stated, previously, that the target was 96 inches long, by 42 inches wide. In a comparative experiment, to test the value of india-rubber as a resisting agent, a target was made with with 4 single iron plates, each 1 inch thick; the results, as observed by competent witnesses, did not vary materially from those obtained with rubber, and little value is attached to it as a disperser of the force of shot.

Experiments to ascertain the qualities and value of iron armor faced with wood have also been made at the Washington Navy Yard, and the result has been the complete demolition of targets and theories. Without quoting specific or particular trials, of which there have been a vast number, on targets of all conceivable and inconceivable varieties, it is enough at the present time, to note this prominent feature—the excellence of the eleven-inch gun as a battering piece. During these trials it has developed a new quality which may or may not have been known to its constructors before; but, at all events, the proven ability of the eleven-inch gun to stand consecutive charges of 30 pounds each, must add very greatly to its value as a national weapon. No target of which we have yet any report has been able to withstand the impact of its shot with 30-pound charges, although it is possible to construct one which shall defy even this assault.

The "service" charge of the eleven-inch gun is ordinarily 20 pounds; but for battering iron-plates, 25 pounds is allowed, and not over 500 fires from one vent is permitted; two vents are made in each gun, one clear through to the bore, and the other given a proper lead, and but partially drilled. When one has completed its time of serving, the other one is opened, and when 1,000 fires have been made with the weapon, it is condemned as unsafe.

Doubtless there are other guns which have been tried at the Navy Yard, and have given as good results with less charges, at greater ranges. If so, we have not heard of them; the Government advertised some time ago for wrought-iron guns, and by this time it has doubtless received one or more; whether these have been tested, or what action has been taken with them, is not known to us; but we should be glad to hear that they have proved successful, and are to be adopted. A warrantable prejudice exists against the use of cast-iron ordnance; and many and loud are the complaints, attacks, and abuse which we have received for setting forth facts in relation to it. Such a course in no wise affects us. The tensile strength of the eleven-inch gun is enormous; and it would seem not an unwise plan to strengthen it yet further, for specific purposes, by the addition of a reinforce, carefully made and properly shrunk on.

THE CAUSE OF OUR MANUFACTURING PROSPERITY.

If we enter any industrial establishment, we find the proprietors overwhelmed with orders; and this applies not only to the great manufactories of iron and wool, but all other pursuits, with the exception of the cotton manufacture. Mr. Cobden tells us that all of this apparent prosperity is a delnsion; but, as Mr. Cobden is a sound political economist, we think that if he was more intimately acquainted with the facts of the case, he would change his opinion.

In looking for the real causes of this prosperity, the first consideration is the great and rapidly increasing power of the country to produce wealth. When the only inhabitants of the land were Indians, there were no modes of producing wealth, but hunting, fishing, and the rude cultivation of a few very small patches of tobacco, potatoes and Indian corn. On the settlement of the continent by Englishmen, all the arts of Europe as they then existed were introduced; and the power of producing wealth was multiplied many thousand fold. But since that time these arts have been so revolutionized that it may be a question, whether our power of producing wealth does not bear as large a proportion to that of the first settlers as their's bore to that of the Indians. In spinning the material of our clothes, the spindles are turned by steam or water; one man attending 2,000, each of which spins more yarn than a spindle turned by hand. In preparing the material for our houses, the boards are smoothed by a revolving plane; one man finishing more flooring in a day than several hundred men could "jack down" in the olden time. In the great labor of transportation by means of canals, steamboats and railroads, one day's labor accomplishes more than thousands of days' work could effect without these aids. In short, in every department of industry, the great forces of nature, operating through means of mechanism, have multiplied from 10 to 10,000 fold the power of producing wealth.

A very large portion of this increased production is consumed as fast as it is produced. Only a small fraction of the community will save anything, whatever their incomes. But a considerable portion is saved; causing a rapid accumulation of wealth. In 1840 the inhabitants of Connecticut were worth an average of 450 dollars apiece; in 1860 the whole property of the State, if equally distributed, would have given 900 dollars to every man, woman and child. In no other country in the world was so large a portion of the accumulations invested in labor-saving machinery, manufactories, and other means of augmenting the annual product. A large portion was devoted to increasing the size of our cities; this mode of investment has been generally suspended, and the revenues have been diverted to the purchase of Government bonds.

Our manufactories and workshops are not turning out froth. Their products are as solid, substantial values as were ever produced. There is no delnsion about it. The simple cause of our prosperity is the vast aggregate power of the nation to produce wealth; and that has resulted from the ingenuity of inventors, and the enterprising spirit of our people, which has put those inventions in operation.

THE ENGINES OF THE NEW FRIGATES.

The new frigates about to be built by Government—the *Wampanoag*, *Ammonoosuc*, and *Nishaminny*—are intended to be very fast; they are to have fine models and enormous engine power, and are expected to be a great acquisition to the Navy Department. The vessels themselves are of an entirely different class from any previously built for the service; being immensely larger than the new sloops, with heavier engines and larger boilers than any war vessel afloat, not excepting the *Dunderberg* and *Puritan*. The size of the cylinders and stroke of piston remains the same in all the ships just named, but the plans of the engines necessitate an immense additional weight which might be dispensed with. They also occupy nearly the whole of the lower part part of the ship—247 feet out of 340 being devoted to the engines and boilers alone.

DIMENSIONS OF THE VESSELS.

The hulls are 340 feet over all, 17 feet depth of hold from water-line, and 44 feet 6 inches beam. They are not iron-clads. The models are intended to be good for speed, this quality being the first consideration. The floors are nearly flat, and there is but little bilge where the sides rise. The frames of the *Wampanoag*, building at the Navy Yard in Brooklyn, are all up; and it was intended to have launched the vessel early in the spring; but the matter is somewhat delayed, we are told, at present, and no period is fixed for the time of completion.

THE ENGINES.

The plan of the engines is horizontal. They are also geared to the screw shaft at about 2 to 1, or twice as many turns of the propeller as the engine shaft makes. The cylinders are two in number, 100 inches in diameter by 4 feet stroke of piston, and are placed horizontally, working athwart ships. The connecting-rod proceeds directly from the crosshead, as in all other horizontal engines, and takes hold of the crank-pin in the same manner. On this shaft there is a large spur-wheel, built up in 9 sections, each section being one wheel itself, having teeth of lignum vitæ, or young hickory, boiled in oil. The diameter of this wheel is 10 feet 3 and 5-16ths inches at pitch line. The pinion this wheel works in is on the main screw shaft, and is 5 feet and 5-16ths of an inch diameter at the pitch line. There is one surface condenser, which is common to both engines, and is situated between them; in this there are to be 7,168 tinned brass tubes, 6 feet $3\frac{1}{2}$ inches long. The main steam valves are slides, worked by a Stevenson link. The valve face is on the side of the cylinder, and has an enormous area—the dimensions being $84\frac{1}{2}$ inches wide by 5 feet 6 inches in length. The valve is of the doubled-ported variety, and is carried on 17 hardened steel rollers, $2\frac{1}{2}$ inches diameter and 4 inches long. These rollers run on guides, and are intended to relieve the stem from the enormous weight and friction of the valve. The steam ports are 82 inches long by $2\frac{1}{4}$ inches wide, and the exhaust ports 4 inches by the same length, of course. The central exhaust is 18

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