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## THE WHITWORTH GUN.

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WE have seen that the responsible officers of our naval department concurred in the opinion that it was desirable to have a 35-ton Whitworth gun. We have also seen that the Ordnance Council, after due consideration, recommended that such a gun should be constructed. Directly this course was decided upon, or rather as soon as the mere fact that the Admiralty authorities were moving in favour of the Whitworth gun became known, a violent opposition was raised in other interests. Article after article appeared in the papers, in which the service systems were upheld and the Whitworth decried. These views of the subject emanated from certain young military officers, who showed themselves to be ignorant of mechanical principles. Other military officers who had hitherto resisted the Whitworth system, and had committed themselves to the Armstrong and other arrangements, found a favourable opportunity for renewing their opposition. In Parliament Sir John Hay of course opposed the proposition through thick and thin, his action in overthrowing the Duke of Somerset's order for thirty Whitworth guns, referred to last week, being obviously brought in question. But it is a striking fact that in all this opposition nothing whatever has been advanced by which the merits of the gun, or the eminent mechanical skill of its inventor, are in any way called in question. No one has ventured to claim for any other system of guns or projectiles either the range, accuracy, or penetrating power at long ranges which the Whitworth system has been proved to possess. The opposition in reality is vexatious and frivolous in the extreme, some writers stooping so despicably low as to designate the order a "job," and to insinuate —if not broadly assert—that Sir Joseph Whitworth is desirous of improving the opportunity by making money out of the country. We shall not condescend to debate the question upon such low grounds, merely asking if anyone can reconcile this allegation with the fact that the man against whom it is made but a short while since quietly and unostentatiously gave his country £100,000 in furtherance of one of the greatest necessities of the present time—technical education.

What has really led to the construction of the 35-ton Whitworth gun is a circumstance patent to everyone. Recent practice in the Royal Navy with the present service grooved gun and the studded projectiles has developed some serious defects. Hence, as the "Thunderer" is to be built with the view of carrying a gun of the above weight, it was after all only a matter of common sense on the part of those with whom the responsibility rests, that she should be armed with the best gun that could be procured, be that gun what it may. It happens to be the Whitworth gun, and opposing interests are therefore called into play to bar the course of action with objections of the most flimsy and transparent character. Before, however, proceeding to inquire into the grounds of objection taken by the opponents of the Whitworth system, and to answer their allegations, we think we shall be proceeding more in order if we first point out a few of the facts which led the Admiralty to advise the construction of the Whitworth gun. The reasons are obvious and strong. In the first place the Whitworth metal is more than double the strength of the iron used in the Woolwich gun, this great strength being obtained by the application of immense pressure to the mass of metal while cooling. Upon this point, and as serving to show the relative strength of the Government service guns and the Whitworth guns, we may here refer to some experiments which were made to determine this question. In these experiments it was ascertained that the strength of a gun made on the Government service plan, viz., with a steel tube surrounded with wrought-iron coils, was only as 140 to 275 when compared with a similar gun constructed on the Whitworth system. This may be taken as the highest comparative strength of the Government service gun in question, as the steel and wrought iron were so combined as to ensure the structure having the maximum strength it is capable of developing. The endurance of the Whitworth metal has been so well established at Shoeburyness by the two 9-inch guns that we need not dwell longer on that point.

In the next place the range of the Whitworth gun far exceeds that of the Woolwich guns. If we turn to the report of the Whitworth and Armstrong Committee we find it stated at page 57 as follows:—"It further appears from the table of ranges, combined with an inspection of the probable rectangles, that the Whitworth gun made good practice up to a range of 8,000 yards, which is about 2,000 yards in excess of the ranges attained by either of the Armstrong guns at the same elevation of 21deg." Since the report from which the foregoing is extracted was written, some of the most extraordinary results for range ever known have been obtained with a 9-inch Whitworth gun at Shoeburyness. On the 20th of November, 1868, a range of 10,300 yards was attained with a 250lb. shot, a 50lb. powder charge, and a maximum elevation of 33deg. On the following day this gun beat even its previous performance, inasmuch as with 33deg. 5min. elevation, and a 50lb. charge, it threw a 310lb. shell 11,127 yards to the first graze.* This was about 1,000 yards further than any projectile was ever hurled by any other gun. Another important consideration is the extreme accuracy of the Whitworth gun. This feature is referred to by the Whitworth and Armstrong Committee, at page 23 of their report, in the following terms:—"The advantage of the Whitworth gun in respect of accuracy with solid shot as compared with the breech-loading Armstrong gun, is very marked throughout. The accuracy of the Whitworth gun, with solid shot, is greater than that of the muzzle-loading Armstrong gun in most cases; this is so in a very marked degree at ranges beyond 3,000 yards." With regard to the question of penetration we turn to page 12 of the report from which we have already quoted. We there find it stated that "The experiments with Mr. Whitworth's gun had developed a superiority over Sir W. Armstrong's gun in penetrative effect against iron plates, the greatest penetration up to January, 1863, having been attained by a projectile from Mr. Whitworth's 120-pounder iron gun. On this subject the committee refer to the evidence of Captain Harrison, Royal Artillery, secretary to the Iron Plate Committee, who stated that until the experiments were made with Mr. Whitworth's projectiles it was 'considered that the "Warrior" target, against any one shot, was invulnerable'; and as regarded shell, no such thing was thought of as penetrating the target. In point of fact, up to that time we had only seen the 'Warrior' target penetrated by shot from the 10·5in. smooth-bore gun; the target had been penetrated by that, but otherwise it was invulnerable, and it was not until the Whitworth experiments that the target was penetrated, but since that time the target had been equally penetrated by shell made by Sir W. Armstrong."

Having thus disposed of the five leading points of strength, endurance, range, accuracy, and penetration, let us now turn to the question of projectiles, which follows here in natural sequence. Here a great number of advantages present themselves to view. In the first place the Whitworth shot and shell penetrate armour more effectually at short distances, and much more effectually still at long ranges, than studded shot. In fact, the grooves and studs of the Woolwich system are utterly inadequate to give the proper amount of rotation to large shot and shell. The Whitworth projectiles also penetrate armour when striking at an angle, where the Woolwich shot and shell glance off comparatively harmless. They will also penetrate a ship below water, and as they fly with a lower trajectory than those of the Woolwich pattern, they are therefore much superior for chasing purposes at sea, where distances are not known. Moreover, the Whitworth gun will fire rifled spheres, which are of great value for ricochet firing at sea. Again turning to the Whitworth and Armstrong report, page 42, we find it recorded that "the experiments made by the committee have clearly demonstrated that with the form of rifling proposed by Mr. Whitworth when applied to a mild steel or homogeneous metal gun, hard metal projectiles can be fired from 12-pounder rifled guns without the intervention of any soft metal between the projectile and the bore; that they do not damage the bore, are equally accurate in their flight, less liable to injury from rough usage, and also possess the advantage of greater economy as compared with the projectiles fired from Sir W. Armstrong's shunt gun, which, as the cost of the ammunition is a continually recurring expense, is an item of great importance: on the other hand, the system of soft metal studs as applied in Sir W. Armstrong's shunt gun, empowers the use of the cylindrical or most capacious form of projectile, which, however, in field guns is of no great importance; it also provides the projectile with a certain power of self-adjustment." The committee also state with reference to some experiments in which case shot were used that "the superiority of Mr. Whitworth's case shot was very marked throughout this practice; and the committee are of opinion that it is an invention of very great value to Her Majesty's service."

It is to be observed that the projectiles are made on the Whitworth system by the one simple process of casting, whereas the Woolwich shot and shell have to be operated upon by numerous machines in order to fit them up with their rotating studs of a different metal from the body of the projectile. This simplicity of manufacture of the Whitworth projectiles points to a very great economy in the production of the vast quantities of shot and shell required for the service. It would enable the navy to supply itself with them by simple means on foreign stations, where the machinery required to produce the studded projectiles could not be obtained. Upon this point the committee make the following comparative observations:—"Making every allowance for reduction in hand labour consequent on the systematic establishment of the manufacture, the committee are of opinion that, considering the compound nature of Sir W. Armstrong's projectiles, these projectiles must be more expensive than the Whitworth projectile, and both will be very considerably less expensive than the breech-loading projectile."

Such, then, are some of the leading advantages possessed by the Whitworth gun, and which are positive and absolute. It was upon the clearest evidence on all these points, and under the deepest conviction of the superiority of this system over that at present in use in

* For details of these experiments see the MECHANICS' MAGAZINE, Vol. 2, 1868, pp. 421 and 441.