

Doubly-loaded Guns.

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The conclusions at which the committee of investigation into the cause of the bursting of the 38-ton gun on board Her Majesty's ship *Thunderer* arrived are well known. Briefly stated, they are that the gun was doubly loaded—the first charge being 110lb. of powder and a Palliser 700lb. shot, and the follower 85lb. of powder and a common shell weighing 590lb. and that, being fired under these conditions, the gun burst, owing to the exceptional pressure exerted by the second, or forward charge, upon a portion of the gun which was not intended to receive, and which consequently was not constructed to resist, such a strain. It is equally well-known that the correctness of these conclusions has been questioned by several, but by none more persistently and consistently than Sir William Palliser. The conclusions at which he arrived after careful investigation and experiment were that there was only one charge in the *Thunderer's* gun when it burst, and that that charge consisted of 85lb. of powder and the common shell with a papier-mâché disc 1in. thick and 12in. in diameter; that when the gun was fired the shell overran the disc, which caused the former to jam and to force open the steel tube, the pressure of the powder gases completing the destruction of the weapon. In order to demonstrate whether or not the committee on the *Thunderer* explosion were in error in supposing that the front charge in a doubly-loaded gun would exert any exceptional pressure, and, consequently, whether double-loading was or was not the cause of the bursting of the *Thunderer's* gun, Sir William Palliser organized and last week successfully carried out an interesting series of experiments with a doubly-loaded gun. The trials took place at Messrs. Eastons and Anderson's works at Frith, and attracted a large number of Government officials and others interested in artillery operations. Among the company present were General Younghusband, C.B., R.A., General Crawley, Major Fairfax Ellis, R.A., Major Montagu Lambert, R.E., Captain Morley, R.A., Captain Downes, R.A., Colonel Moncrieff, E.M.A., Captain Edward Palliser, Captain Lowrie, and others representing the military branch of the service, the naval branch being represented by Admiral Hamilton, C.B., Admiral Hoskins, Captain Cyprian Bridge, R.N., and Commander Custance, R.N. There were also present the military and naval representatives of various foreign Governments, including those of France, Germany, and Japan. Sir William Palliser personally conducted the experiments. Mr. Palliser, C.M.G., and Mr. Anderson being also present.

The gun used in the experiments was one on Sir William Palliser's converted system, and was made for him by Sir William Armstrong and Co., about 12 years since. It is one of the two which were then made at the request of the late Ordnance select Committee for the purpose of competing with two wrought-iron guns made in the Royal Gun Factories. One of the two Palliser guns having been the successful competitor, the second has remained the property of Sir William ever since. This weapon is a 64-pounder rifled gun, of 71 cwt., with a 6.3 inch calibre, the bore being 103½ inches in length. It was mounted on a wooden slide, 6½ ft. long, and carried on a timber platform with rails 20ft. long and laid with an ascent towards the rear of 1 in 12, or a total rise of 20 inches in the whole length. The recoil was checked by breeching ropes connected with indiarubber buffer springs. The gun thus mounted was placed in a strong timber-built chamber about 30ft. long, 7ft. high, and 7ft. wide, surrounded and well covered with earth, except, of course, at the front. Facing this chamber, and at 15 yards range, was an earth mound or butt, into which the projectiles were fired. The charges consisted of pebble powder and 6½lb. solid round-headed proof shot, made of cast-iron, and without studs. The service charge for this gun is 8lb. of this powder and a 6½lb. projectile. Five rounds were fired with the gun doubly loaded, the first round consisting of 6lb. of powder and a 6½lb. shot, and then another 6lb. of powder and a second 6½lb. shot, giving a total of 12lb. of powder and 128lb. of shot in two

charges. After the gun had been fired the recoil was found to have been 11ft. The powder charges were increased at each round by 1lb. in each cartridge or 2lb. in the gun, the two remaining of the same weight each time, until at the fifth round the double charge was 20lb. of powder—or a total of 12 more than the service charge—and 128lb. of shot. The recoil at the second round was 12ft., at the third round 14ft., which was the practicable limit of recoil, springing forward 1ft. 8in. At the fourth round the recoil was again to the full extent at the rebound 2ft. 8in., and it was practically the same at the fifth round. The length of the first double charge was 31in., and this length was increased at each round by 2in., or at the rate of 1in. per lb. of powder, until at the fifth round the front charge reached to within half an inch of the axis of the trunnions of the gun. The gun was examined after each round, but no signs of flaw or damage could be perceived.

In order to combat the theory advanced by some that the bursting of the *Thunderer's* gun was due to the circumstance of an air space having been left between the powder charge and base of the projectile, Sir William Palliser next fired a couple of rounds under that condition. In the first round the charge consisted of 10lb. of the same powder as before, and another the same projectiles placed in the gun with a 2ft. space between its base and the front of the powder charge. On firing the charge the shot was simply driven from the gun into the barrel the gun recoiling 2ft. up the incline. A second round with the same quantity of powder and a similar shot, but with a 5ft. space, which brought the nose of the projectile within 21in. of the muzzle of the gun, was fired with a similar result, except that the recoil this time was but 6in. This terminated the experiments for the day; but Sir William expressed his intention of carrying them still further with studded projectiles on a future occasion.

To artilleryists the results of these experiments will speak for themselves; but there are others to whom their practical value will be rendered more apparent by a comparison between some of the conditions under which they were made and those under which the *Thunderer's* gun is supposed to have burst. Under the assumption that two charges were fired in the *Thunderer's* gun, the nose of the front projectile would extend some distance forward beyond the trunnion of the gun. In the Palliser gun the front charge barely reached to the centre of the axis of the trunnion. But then the *Thunderer's* gun has a light calibre and consequently the trunnions are comparatively near the breech; whereas the Palliser gun has a heavy muzzle, and the trunnions have to be placed well forward. The bore of the *Thunderer's* 38-ton gun was 12in. and the thickness of metal at the centre of burst 15in. or a calibre and a quarter. The calibre of the Palliser gun is 6.3in., and the thickness of metal round the front charge 7½in., or about 1 1-7 calibre. The weight of the Palliser gun is 3 tons 11cwt., while that of the *Thunderer's* gun was 38 tons, or about 11 times the weight of the Palliser weapon. The charges alleged to have been fired in the *Thunderer's* gun when it burst were 110lb. of powder and a 700lb. shot, and 85lb. of powder and a 590lb. shell, the weight being 195lb. of powder and 1,290lb. of projectiles. The last double charge fired from the Palliser gun consisted of 20lb. of powder and 128lb. of shot. It will thus be seen that the total charge here was about 1-10th that of the supposed *Thunderer's* double charge, while the weight of the Palliser gun was about 1-11th that of the *Thunderer's* gun. Hence the conclusions to be drawn from the recent experiments would appear to be confirmatory of the correctness of Sir William Palliser's opinions.

EXPERIMENTS AT FRITH.—A 64-pounder Palliser rifled gun yesterday fired at Messrs. Easton and Anderson's works double charges of pebble powder, service gas checks being attached to each of the projectiles. The first round was with two charges of 6lb. of powder, and two projectiles each weighing their gas checks, 6½lb. In the second round two 8lb. charges, and the third two 10lb. charges were used. The total charge in the third round thus amounted to 20lb. of powder and projectiles weighing 128lb. The gun withstood the trial perfectly, but it was found that the test was very severe.