THE STORY OF THE SEVEN-INCH GUN.

Admiral Sir Lopold M'Clintock, F R. S., Superintendent of the Portsmouth Dockyard, presided at a meeting of the officers of the two services at Portsmouth Dockyard, on Friday, 17th instant, when commander William Davison, R. N. told the story of the 7 inch gun. He said:—The ablest artillery authorities are agreed that a new system of rifling must be sought for the heavier guns if they are to throw shells of adequate length and to endure rapid continuous fire, such as they will be subject to in well-contested naval actions or in bombardments. It behooves artillerists, then to study the mechanical principles which distinguish the few systems of rifling which have been successfully tested, with a view to observing their relative merits, and to forming intelligent opinions on such schemes as may be presented for adoption. Now, seamen have great opportunities of close observation, and if they will only collect and collate numerous facts, may add greatly to the stores of knowledge, and they may enable artillerists to deduce from those facts some of the true principles of science. After the expenditure of two and a half millions sterling in five years, the Duke of Somerset confessed in 1863, that the country had no better gun than the 68 pounder; and although the Armstrong projectiles had been tried, there was no prospect of supplying our ironclads with heavy rifled guns, and in despair, the Admiralty insisted on having various heavy smooth-bores. Thus matters stood, when in 1863 a heavy gun competition was determined upon with a view of ascertaining which of five competing systems of firing—viz., the Bashely Britten, Jeffery, Lancaster, Scott and the French or Woolwich—should be preferred, For land service 7-inch guns of 7½ tons were, accordingly rifled on these principles. From various causes the competition dwindled down to a trial between the French and the Scott gun. And of these it was reported that "the shooting qualities of these guns are so nearly alike that the committee feel they may rest their recommendations of the one or the other system upon other and more general considerations, and they have finally determined to record their unanimous opinion in favor of the so-called French system; 1st, because of the simplicity of studding on the projectiles; 2nd, the simplicity of the grooving; and 3rd, from a disposition to admit of the advantage of an increasing over a uniform spiral, which has been strengthened by the present trial. This advantage can best be realised with a short bearing on two points." The French gun itself gave a somewhat different report, for, being examined by the Inspector of Ordnance after the 567th round, the upper grooves was found cracked for eight inches in length, just where the upper foremost stud struck it in starting; dents were found in the lands and grooves, about the same spot; the loading side of the lower groove, for a length of twelve inches just where the lower stud in coming into bearing inflicts a heavy blow on the rifling, was much worn; about the same point, viz, from the bottom of the bore, the bore was enlarged as much as ·049 inch; and such other injuries were inflicted by its wobbling projectiles that (the inspector said) "this gun should, in future, be fired "under percaution." Thus, at the 567th round, the gun with the three merits enumerated was added to the "Cemetry of Suicides." On the other hand, the Scott gun which had fired 517 iron ribbed centering projectiles, had its grooves and lands as perfect as when it came out of the factory—the only damages being those common to both, and due to the conical form of chamber, the destructive qualities of which were not then understood. The Admiralty (advised no doubt by the captain of the *Excellent*, the present Admiral, A. Cooper Key) preferring the report which the projectiles had written in their respective guns to that emanating from the committee, asked to have Scott's gun sent to the *Excellent* for further trial; but the president of the committee, anticipated the application by boring up the gun to 30·3 in. bore, by which it was rendered utterly useless for any purpose whatever from that day to this. After describing the "simplicity," of the Scott centering iron bearing projectile, and the peculiarities of its construction Commander Dawson proceeded. The distribution of strain and the perfect centering in the bore fully account for the grooves having been as perfect at the end of the competition as when the gun left the factory. It also explains why the centering shot of the same weight, fired with similar charges, escaped out of its gun so much more readily than the French or Woolwich one, striking a far more heavy blow. Thus, with 110 lb. shot, the Scott gun struck, with a 25lb. charge, a muzzle blow 133 foot tons heavier than its rival; with a 20lb. charge, it struck a blow 121 foot tons heavier; and with a 12 lb. charge, it struck a blow 27 foot tons heavier. No wonder the committee reported that the French gun had decidedly the lowest velocities." Thwarted in their desire to test the Scott gun on board the *Excellent*, the Admiralty next objected in 1865, to the increasing spiral, which had no doubt aided in producing such deplorable results in the French competitive gun; and, "at the request of his Grace the Duke of Somerset who desired to test the relative qualities of increasing and uniform twists," two 7-in. 6½ ton guns were tried with French or Woolwich rifling, but with the two kinds of spirals each ending in one turn in 37 calibres. It was found that by adopting a uniform spiral the velocity or muzzle blow of the French rifled gun, using 115½lb. shot, and 22lb. charges, might be increased 21·2 feet, or 56 foot tons; and that then "the blow struck by the one shot on leaving the muzzle would be to that struck by the other, as 100 to 103." Even then the muzzle blow of the uniform spiral 7.inch French gun was 196 foot tons less than that given by the Scott gun—albeit, this French gun was one ton lighter. Strange to say, the committee still held to their third merit of the French gun viz., "a disposition to admit of the advantage of an increasing over a uniform spiral." But the Admiralty, backed no doubt by the captain of the *Excellent*, and encouraged by dissentient artillery officers, were obdurate, and would not have what was then regarded as the only heavy broadside gun rifled with an increasing spiral. The War Department though silenced as to the 7-inch gun, was not convinced; "and persisting in "the disposition to admit of the advantage of an increasing over a uniform spiral," ultimately succeeded in having their own way with the heavier guns subsequently introduced. Though the adoption of the uniform spiral in seven inch French rifled guns has prolonged their lives far beyond that of their illustrious ancestor, the disabled competitive gun, it has not wholly counteracted the decay of nature. The grooves of the 7-inch guns of the *Favourite* were found marked by the over riding of studs, when that ship returned from the West Indies. The 7-in. gun of the *Redwing* was found split at the muzzle at the 881st round; another in the *Warrior* had its bore dented by its projectiles: and a fourth in the *Royal Oak*, was found similarly injured. A 7 inch 68-pr. of 95 cwt. had the inner part of its grooves enlarged by the action of its studs, in 1871: and in 1870 another similar gun was, by the action of its wriggling projectile burst violently at the first round into 70 pieces which were thrown over an area of 580 yds by 150 yds. Still as compared with the original 7 inch gun with increasing spiral, the endurance may be regarded as very tolerable. But endurance is not the only quality required in a good naval gun. The problem is, "how to evolve the maximum amount of useful work out of a given weight of gun" Now a shell perforated with two rings of holes, each three inch deep, and 1·6 inch diameter, into which gun metal studs are wedged cold, and upon which the whole effort of rotation is concentrated, must have much thicker walls, and consequently much smaller powder capacity, to be equally strong with a shell that has no such weakening holes, but has iron-flanges or strengthening buttresses cast upon its outside Again the object of rifling a gun at all is to spin the projectile so perfectly that it shall "sleep," like a boys pegtop when well spun and not wobble like the same top when badly spun. A well-spun shot flies through the air point foremost, making a sharp whizzing sound peculiar to every rifleman A sharp "whiz" indicates that the bullet has been centred in the bore, and that the rifling has done its work well. But an intermittent "puffing" noise in the air indicates eccentric gyrations, which have been impressed upon the projectile while still in the gun. A "puffer" in the air is necessary a "wobbler" in the gun; and though the "puffer reaches its destination in due time, its range is decreased by the expenditure of effort in "dancing" instead of walking the distance. Thus it so happened that when Scott spoilt his iron-ribbed shot by putting on it a soft zinc facing, it gave, with 20lbs charge, eleven feet less initial velocity than the "French" or Woolwich one; but it was so much better rotated that at 5° elevation it reached 97 yards further, showing that the Woolwich studded shot had been expending much of its force in the "giddy dance," whilst the Scott one was sticking to its work with becoming sobriety of demeanor. The original cause of difficulty of escape and of disproportionate range is not far to seek. As the Woolwich projectile sits in its seat in front of the powder charge, it rests upon the two lower studs, no other part of the shot touching the bore The centre shot is, therefore below the centre of the bore, and there is a considerable space above the shot, the loading side of the two lower studs touching that side of the lower groove. When the charge is united a horizontal blow is inflicted on the base of the shot above its centre, and the gases escaping above it strike also a downward blow on the rear. The shot being balanced on two studs has its rear struck downwards and its front tipped upwards by the escaping gases. This originates a vertical hammering action, which shows itself sometimes by flattening the lower rear stud, by spiking the lower grooves about twelve inches forward of the spot over the seat of the fore stud, by scoring the base of the shot, or by flattening in certain cases the seat of the shot. Moreover, the lower studs resting at the bottom of the curved groove necessarily come into bearing on the driving side before the other studs, which have a less deep hold of the other grooves. Each set of studs comes thus into driving bearing successively, imparting a succession of blows which results in a lateral wrigling motion. Should the lower rear stud have been flat