Shrapnel's Shell – A Force Multiplier

Nick Lipscombe

Spectator loses leg as five are seriously injured by flying shrapnel in disastrous power plant demolition.

This headline in the *Mail* 'Online' in August 2013 is interesting. The use of the word *shrapnel* is technically wrong but it nevertheless underlines a modern acceptance of the word signifying fragments thrown out by *any* form of explosion. Most dictionary definitions are lagging behind this refinement, continuing to cite that shrapnel consists of fragments from any type of shell, or fragments scattered by a bursting artillery shell, mine, or bomb. The Oxford English Dictionary is the most up to date 'shrapnel is the fragment of a bomb, shell, or other object thrown out by *an* explosion'. However, there is a secondary definition which defines the origin of the word - 'a hollow projectile of the 19th century containing bullets and a bursting charge, designed to explode in the air and shower the target with missiles'. This projectile, named after its inventor, undoubtedly gave the British artillery a distinct advantage over their Napoleonic rivals; a fact that seems to have been underestimated or misunderstood in historical accounts. What was this shell, how did it work and why was it a force multiplier for the Royal Artillery and Wellington's Army?[1]

Major General Henry Shrapnel (RAI)

What was Shrapnel's Shell?

The shell was initially known as spherical case shot and was not titled 'shrapnel' until June 1852, on order of a government select committee, some ten years after the inventor's death.[2] Henry Shrapnel was born on 3 June 1761 the youngest son of nine children and commissioned into the Royal Artillery on 9 July 1779.[3] Following his initial active service in Newfoundland, from 1780 until 1784, he returned to England and began to develop, at his own expense, a hollow shell

filled with lead balls and gunpowder to be initiated by a crude time fuse. His idea was to combine the effects of two existing projectiles, the 'common' shell and the canister round (common case). The former was fired from mortars or howitzers while the latter from guns and howitzers. Shrapnel's intention was to capitalise on the anti-personnel lethality of the canister round with the greater range of the common shell to produce a projectile which could be fired from guns, howitzers and mortars.[4] The shrapnel shell 'originally consisted of a thin iron shell filled with musket or carbine balls, sufficient powder being inserted, with the balls, to cause the bursting of the shell when ignited by a fuze'.[5] A captain who instructed at the Royal Laboratory described that the effect of the shell:

> ... depends in no way upon the bursting charge, which should merely be sufficient to open the shell, and not sufficient to cause an [*sic*] dispersion of the bullets and fragments, but entirely upon the velocity communicated to the pieces of the shell at the moment of rupture.[6]

Shrapnel developed an early prototype that worked quite well although there were significant problems with the premature ignition of the powder (the bursting charge) within the projectile while still inside or just outside the barrel. This problem of shells exploding prematurely was not new and attempts in 1760 to fire common shell from guns on Acton Common led to the conclusion that 'as the shells were found frequently to burst in the guns, it was thought too hazardous to introduce them on board ship of war'.[7] There were two reasons for this these premature explosions in Shrapnel´s shell; specifically, friction between the balls and the gunpowder during the high acceleration along the gun barrel and fuse malfunction.

In 1787 before Shrapnel had completed his initial experiments he was posted to Gibraltar where he spent time studying the Great Siege of 1779-1783 and in particular the use of mortar shells fired from heavy howitzers. Some six months after he arrived he was able to demonstrate his invention to the Garrison Commander. Shrapnel recorded:

> An experiment made at Gibraltar, the 21st December, 1787, before His Excellency Major-General O'Hara, with an 8-inch land service mortar; having it shell loaded with 200 musket balls, and powder only sufficient to open it; fired upon the sea, from an eminence 600 feet above the surface... the shells opened half a second before they would have reached the water.[8]

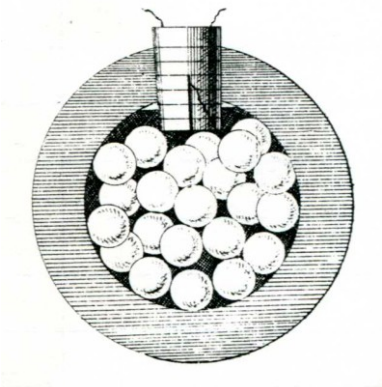


Figure 1: The original spherical case shot. The bullets, which were either musket or carbine balls, were in contact with the bursting charge which caused problems of premature explosion either in transit or in the barrel.
In 1807 it was decided to add the bursting charge on the gun position to alleviate this problem but there were also issues with fuse malfunction causing rounds to burst prematurely, or not at all (blinds).
However, these problems have been overstated by historians and are not entirely supported by eyewitness accounts from the Peninsula and Waterloo. (Illustration: Hughes)

The trials were impressive but Shrapnel was unable to secure senior officer patronage to take the project forward. In early 1791, after four long years on the Rock and three years after his experimental demonstration, he departed for the West Indies, returning to England two years later on his promotion to captain lieutenant. During his time in the Caribbean he submitted his case in writing to the Master General of the Ordnance (MGO) asking for support and the opportunity to demonstrate the projectile to a wider audience:

> I am obliged to have recourse to a shell filled with balls, and containing a small amount of gunpowder, only sufficient to open it, at a short distance previous to its execution; by which means the fire will be equally severe at all distances, and exceedingly practicable in such situations where sufficient time may be allowed for loading. Those officers who are better acquainted with service than I am, may judge the variety of situations when such kind of firing may be serviceable, and I can venture to remark, that it succeeds in the effect which is proposed, having had an opportunity of making an experiment which is now submitted.[9]

The MGO passed Shrapnel's application to a Select Committee of the Ordnance Board (comprising a number of colonels and field officers of the RA) for deliberation and there the matter lay, undecided for a number of years. In early 1793, when Shrapnel arrived back in England from the West Indies, he had no time to lobby the Board of Ordnance for within days he had joined the third Royal Artillery detachment destined to join the Duke of York's expeditionary force to Flanders.[10] Returning to Woolwich in 1795 he immediately resumed his work on the spherical case shot, resubmitting his case to the Board of Ordnance in 1799. Two years later the Board rejected the proposal but in 1803, after continued lobbying by Shrapnel, they finally granted him an opportunity. The Committee reported back to the Board on 7 June 1803:

> Be pleased to inform the Honourable Board of Ordnance that in obedience to their orders conveyed in your letter of the 3rd instant, I convened a Committee of Colonel and Field Officers who attended the experiments carried out by Major Shrapnel in firing shells loaded with ball, and they have to report that the effect of such fire appears to be very considerable, and would doubtless in many instances prove destructive to a great degree.[11]

The Committee then proceeded to pass the responsibility of deciding the finer detail of introducing the shell into general service back to the Board. Despite some continuing problems with premature explosions the results of the subsequent trials were nevertheless encouraging and the spherical case round was approved for production and for inclusion in standard ammunition allocation for use in the field. Following initial operational use, additional modifications were recommended; most notably the decision to provide the 'bursting charge' in a separate small cartridge which was to be poured into the round on the gun position prior to firing.[12] This inconvenience was not as marked as it might at first appear. Napoleonic battles were not high tempo affairs and manoeuvre was relatively limited; it was not unusual for batteries to remain at a single location for the duration of the battle. Close and intimate support to the cavalry by the new horse artillery was best served using canister and grape.

There were no firing tables issued at this time; officers were expected to compile their own using available data and operational experience. From the tables (below) of Lieutenant (later Colonel) Jason Nisbet Colquhoun, compiled while on operations in the Peninsula, we can see the array of spherical case shot projectiles and just how much their payload varied.[13] Taking the three key field equipments of the era, the 6 and 9 pounder guns and the 5½ howitzer it can been seen that the payload (column 5) of musket (M) or carbine (C) balls differed quite considerably; from 26 musket balls in a 6 pounder round to 128 in that for a 5½ howitzer.[14] The table also lists the size of the bursting charge in the penultimate column.

Spher.d Case Shot.

Natures.	Diam.r	W.t empty.	Greater Diam.r of Fuze-hole	Contains about M.	C.	For Bursting	Total W.t filled & loaded.
	in.	lb. oz.	in.	–	–	oz.	lb. oz.
6 8 Pounder or 8 Inch	7·85	33 .. 3	1·22	395 or 580		15	62 .. –
42 P.r or French 36	6·7			–		7½	
32	6·105	14 .. 6		178 .. 260		7	28 .. 12
24 — or 5½ Inch	5·55	10 .. 10	·89	128 .. 193		6	21 .. 4
18	5·04	6 .. 15		95 .. 144		5	15 .. 5
12	4·4	5 .. 7		64 .. 95		4½	10 .. 2½
9	4·05	3 .. 12		45 .. 67		3½	7 .. 11½
6	3·55	2 .. 8		26 .. 41		2½	5 .. .. ½
3	2·84	1 .. 7		–		1½	2 .. 9½

Table 1: Details of Spherical Case Shot for different ordnance (Field note book: Lt Colquhoun).

Fuses were a further complication. The fuse for the spherical case shot needed to be far more accurate than those of the common shell. Indeed, many of the premature barrel explosions were a result of fuse failure rather than friction initiation of the bursting charge; Shrapnel was quick to remedy this defect:

> Major Shrapnel having read an account of his experiments for ascertaining the cause of some of his shells failing, and bursting in the bores of the pieces of ordnance, has proved to the Committee as well as by experiments tried before them on the 22nd and 23rd instants, that the chief defect was the fuzes, which he has remedied perfectly to their satisfaction...'[15]

Fuses were made of boxwood with a hollow core filled with a quick match composition that burned at an even rate and were marked off in one second intervals. The gun crew were expected to cut the fuse, using a saw, to the requisite length before driving it into the top of the shell with a mallet. Cutting these fuses was a skill which was in short supply and much of the early use was very much subject to trial and error; Alexander Dickson recorded in the Peninsula that he had been 'employed in burning fuses to establish a table for same'.[16] In 1807 it was decided to upgrade the fuse system and a number of pre-cut fuses were carried in the limber boxes, distinguished by different colours and suitable for short and medium ranges. Furthermore, the tangent scales of the guns were marked with the letter (A to U – except J: I

assume to avoid confusion with I) corresponding to the range, so that the gunner had only to estimate the range and then read off both fuse and elevation without having to be concerned with degrees or minutes and rates of burning – see Table 2.[17]

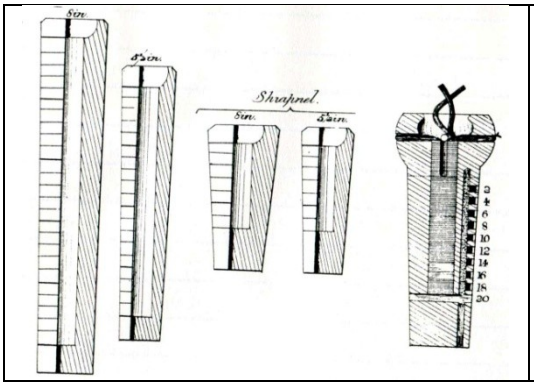


Figure 2: The larger beech wood fuses on the left are for common shell, while those in the centre are for the spherical case shell and that on the right is an example of Captain Boxer's improved fuse which did not enter service until long after the Napoleonic Wars.
All these fuses were initiated by the flash from the propellant powder. (Illustration: Hughes)

Tables of the Ranges &c. of Spher.l Case Shot from Field Guns, with the Round-Shot-Charge {from Practice at Mount's Bay in Cornwall – 1813.

Medium 12 Pr. Weight 18 Cwt.; Length 6½ Ft. or 16·872 Calib.; Charge 4 lbs.					*Medium 9 Pr.* Weight 13½ Cwt.; Length 8 Ft. or 17·1428 Calib.; Charge 3 lbs.				
Letters on the Tangent Scale, and Fuze.	*Elevation.*	*Length of Fuze.*	*Range of Balls and Splinters, from*	*Extent of Effect.*	*Letters on the Tangent Scale, and Fuze.*	*Elevation.*	*Length of Fuze.*	*Range of Balls and Splinters, from*	*Extent of Effect.*
	°	In.	yds. yds.	yds.		°	In.	yds. yds.	yds.
A	1	1	480 to 830	350	A	1	1	460 to 780	320
B	1 3/8	2	660 — 960	300	B		2	640 — 920	280
C	1 7/8	3	820 — 1110	280	C		3	800 — 1060	260
D	2 1/4	4	960 — 1230	270	D		4	930 — 1180	250
E	2 3/4	5	1080 — 1340	260	E		5	1050 — 1290	240
F	3 1/4	6	1195 — 1445	250	F		6	1160 — 1390	230
G	3 3/4	7	1305 — 1545	240	G		7	1260 — 1480	220
H	4 3/8	8	1415 — 1645	230	H		8	1360 — 1570	210
I	5 1/8	9	1520 — 1740	220	I		9	1455 — 1655	200
K	5 3/4	1′	1620 — 1830	210	K		1′	1550 — 1740	190
L	6 3/8	1·1	1720 — 1920	200	L		1·1	1640 — 1820	180
M	7	1·2	1815 — 2005	190	M	7	1·2	1725 — 1895	170
N	7 5/8	1·3	1905 — 2085	180	N		1·3	1805 — 1965	160
O	8 1/4	1·4	1990 — 2160	170	O		1·4	1885 — 2035	150
P	8 3/4	1·5	2070 — 2230	160	P		1·5	1960 — 2100	140
Q	9 3/8	1·6	2140 — 2290	150	Q		1·6	2030 — 2160	130
R	10	1·7	2200 — 2340	140	R	10	1·7	2095 — 2215	120
S	10 3/4	1·8	2260 — 2390	130	S		1·8	2165 — 2275	110
T	11 3/8	1·9	2320 — 2440	120	T		1·9	2220 — 2320	100
U	12	2′	2380 — 2490	110	U	12	2′	2270 — 2360	90

Table 2: Gun Range Tables for Spherical Case Shot (Field note book of Lt Colquhoun).

Shrapnel's shell received its operational baptism the following year during the attack on the Dutch garrison at Paramaribo (Fort Amsterdam), the capital of Dutch Guiana (Surinam). The contribution made by the projectile was significant and Major William Wilson, commanding the artillery, recorded:

> Shrapnel had so excellent an effect, as to cause the garrison of Fort Amsterdam to surrender at discretion after receiving the second shell. The enemy were so astonished at these shells as not to be able to account how they apparently suffered from musketry at so great a distance...[18]

Notwithstanding the rather questionable resolve of the Dutch defenders, Shrapnel's death cloud had gathered blackness and burst with fury on its operational unveiling. In January 1806 it was used in anger in South Africa during the capture of the Cape Colony and again later that year in July at the Battle of Maida. Then the following year at the ill-fated Buenos Aires expedition and at the Battle of the Köge during the capture of the Danish fleet at Copenhagen. From these operational introductions it soon became apparent that this was 'the greatest artillery discovery of the day, and had our enemies possessed it and not we ourselves, the result of our battles might have been different to what it was'.[19] The scene was perfectly set to capitalise on this force multiplier during the long campaigns in the Peninsula which commenced in 1808.

<u>How did Shrapnel's Shell work on the battlefield?</u>

It is important to understand where Shrapnel's shell fitted in to the array of projectiles available at the commencement of the Napoleonic wars. Round shot, common shell and grape shot were universal but there were two types of canister or case shot.[20] Short range canister was first developed for naval use and consisted of a tin with carbine (later musket) balls, which ruptured soon after leaving the muzzle to produce a shot-gun effect in the immediate frontage of the weapon. Range was increased by altering the size of the shot within the tin but developers soon hit problems with tins rupturing prematurely or the balls fusing together upon initiation. A longer range canister round was developed, with a stronger tin casing containing balls wrapped in sawdust, designed to rupture on impact at range. The effects of long range canister were dubious at best as most of the balls ploughed into the ground while those that continued to the target had questionable velocity and lethality. Most European armies had both rounds and could therefore cover point blank to about 300 metres with short range and up to 750 metres with long range canister.[21] The British, however, only used short range canister and hence lacked a projectile that could *effectively* bridge the middle ground i.e. that beyond canister and the maximum range of round shot.[22]

This is perhaps best seen on the following table, which concentrates on the major ordnance available to and used by the Royal Artillery in the Peninsular War and at Waterloo:

British Field Guns/Howitzer ~ Effective Ranges

Source Compilation: Adaye, The Bombardier & Pocket Gunner, Jones, Journal of Sieges, Hughes, British Smooth-Bore Artillery, Dickson, Manuscripts, Wilkinson-Latham, British Artillery on Land & Sea, Colquhoun, Field Note Book.

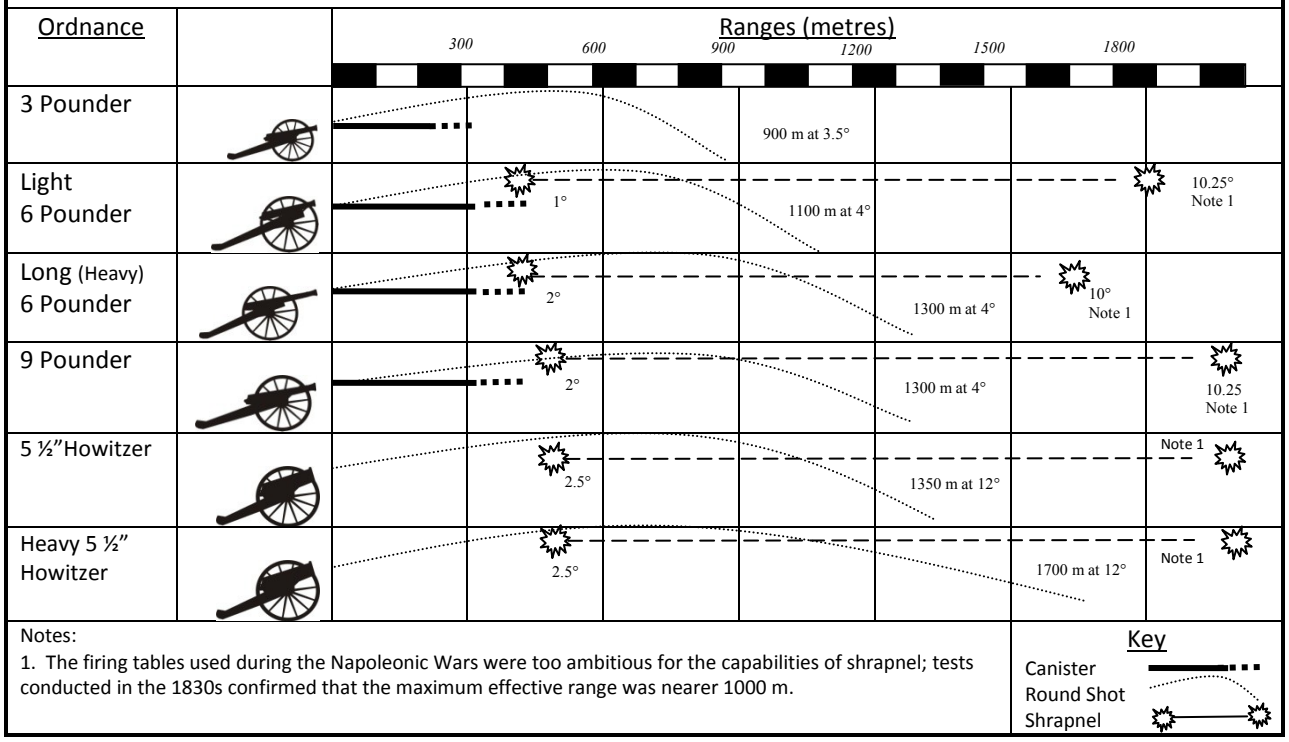


Table 3 - Source: Lipscombe, *Wellington's Guns*.

Table 3 depicts effective ranges, which in artillery firing tables of the era was a relative concept; in other words there were many other factors which influenced effective range. Nevertheless it remains a far better yardstick than maximum range.[23] In this case effective range constitutes the range beyond which the effectiveness of the projectile is 30 per cent or less. Putting aside common shell, which was unreliable, ineffective and could be fired only from howitzers, it can be seen that for most platforms the effective range of canister was about 300 meters and that of round shot anything between 900 for a light gun out to about 1300 meters for the heavier 9 pounder.

Prior to 1804 British gunners had to rely on solid shot against any targets beyond the effective range of common canister. Solid shot was devastating, particularly on hard level ground off which the spherical iron ball would ricochet and plough into the columns causing utter destruction. But it was not cost effective especially when there was a paucity of guns, as experienced by Wellington throughout the Peninsular War and (to a lesser extent) the Waterloo Campaign. Unlike canister, round shot was not an effective anti-personnel weapon and, as such, the British gunners were denied the opportunity of seriously disrupting the enemy's momentum and morale very early in the fight. Shrapnel's shell changed that. It provided an effective anti-personnel weapon which could reach out to the areas where the infantry were first formed up, and was able to continue to bring a hail of bullets and shell fragments down upon them as they commenced their slow advance to contact.

Firing tables for the use of the spherical case shot were never fully proved during the early part of the 19th Century; they changed constantly, based on operational experience, new tests and improvements in production. From Table 3 it can be seen that the maximum effective range, or reach, of shrapnel was generally considered to be about 1800 meters. This was, in fact, too optimistic and in reality the maximum effective range was nearer 1,000 – 1,200 meters.[24] There were a number of reasons for this. The spherical case round was fixed to a wooden sabot, to stabilise it in the barrel; this had a considerable effect upon the ballistic efficiency of the projectile. Secondly, beyond 1,200 meters it was very difficult to tell if the round had burst at the correct point above the target and was, *ipso facto*, effective. Despite the fact that massed infantry presented a large target, it was still difficult to ensure that the spherical case round had been fired at the correct elevation and fuse setting. This can be seen here:

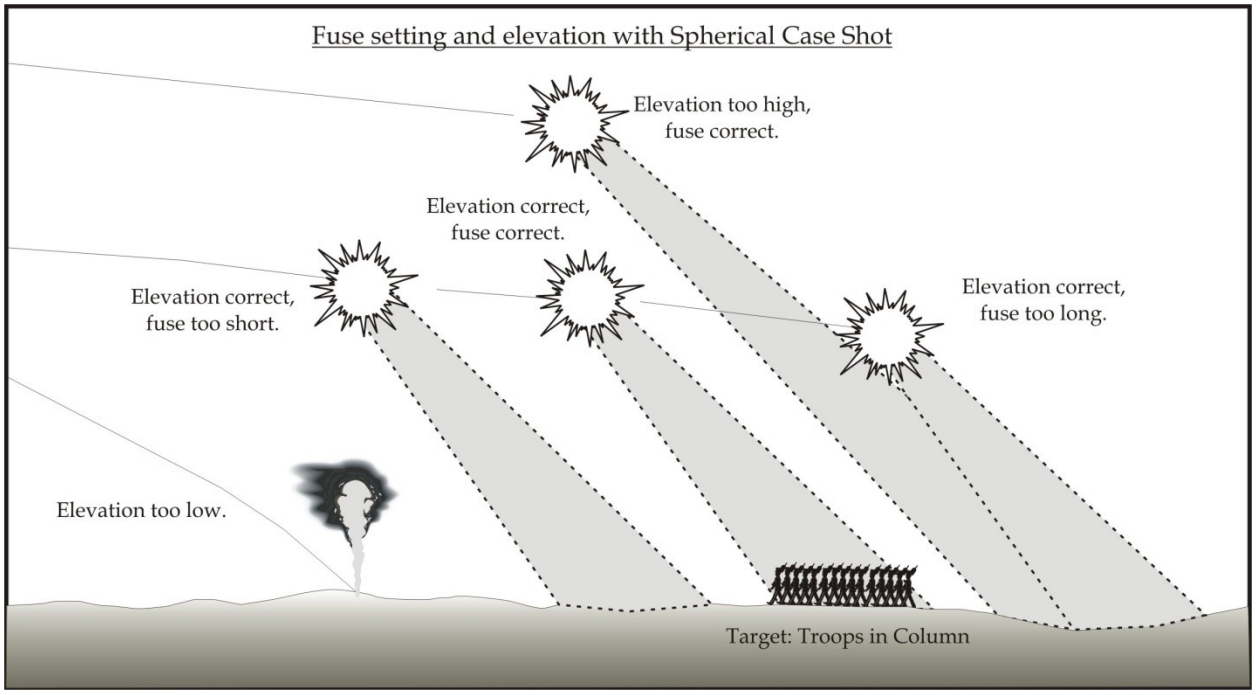
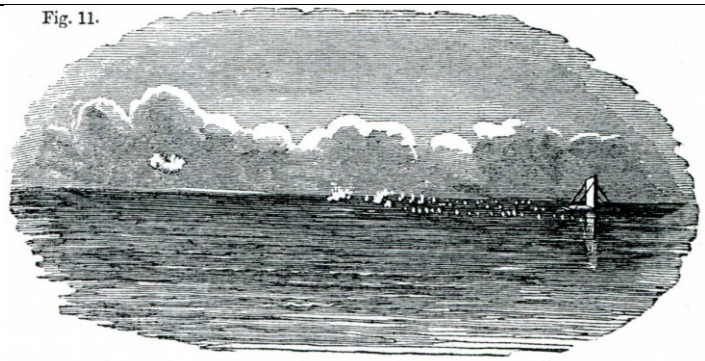
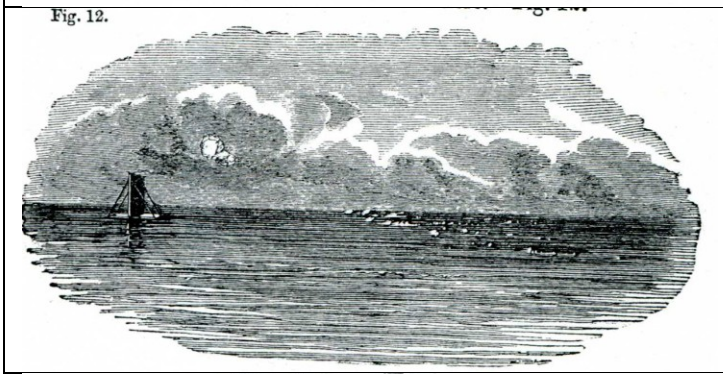
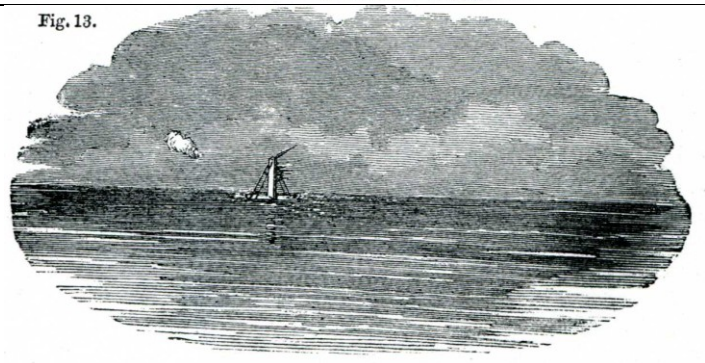


Figure 3: Fuse setting and elevation challenges with Spherical Case Shot (Author).

For simplicity the diagram depicts the trajectory and point of burst at right angles to the line of fire. The gunners would not have had that luxury and confirming the accuracy of elevation and fuse setting from the point of fire was not easy. Firing practice and training was conducted over water to maximise the visual effect of the spray of shrapnel.

	Figure 4: In order to train for firing and adjusting shrapnel shells it was decided (some time after the Napoleonic Wars) to undertake this over water to maximise the visual aspects of firstly rupture, secondly the line of foam or spray and thirdly the target. This round has burst too early, in other words the elevation was too low and the fuse too short.
	Figure 5: In this example the round had travelled over the target and burst beyond indicating a correct elevation but a fuse set too long.
	Figure 6: This final example produces the correct effect with both elevation and fuse set correctly.

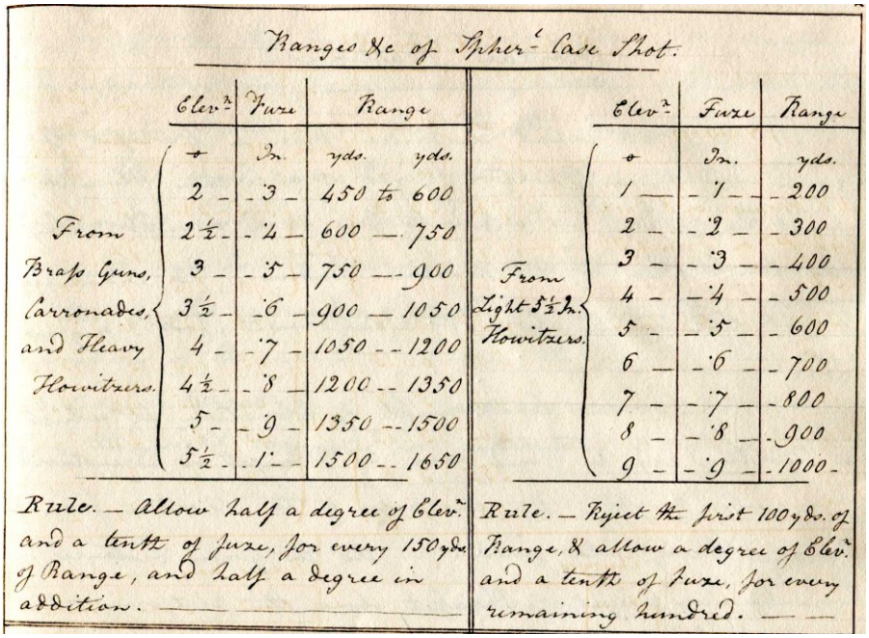
Why Shrapnel's Shell was a Force Multiplier?

Much has been written about the difficulty of perfecting the trajectory and point of burst, particularly in more recent histories and accounts of spherical case in the Napoleonic Wars. Many of these same studies also dwell on the problems of premature explosions, although few address this as anything other than the problem of friction within the shell. It is perfectly true that the latter problems were not entirely eradicated until the 1840s and early 1850s, when Captain Edward Mourrier Boxer RA produced two important modifications to Shrapnel's invention in time for the Crimean War. The apparent shortcomings of complexity of use and technical malfunction have led to a tendency to play down the importance of Shrapnel's invention. It is worth re-examining the efficacy of these shortcomings in turn.

During the back end of the Revolutionary Wars, French infantry tactics were developed and honed. The large number of poorly trained conscripts, considered incapable of more sophisticated manoeuvres, was best controlled in rectangular columns which were formed up about 800 to 1200 metres from the enemy lines. These columns were, for each battalion, about

50 metres wide and about 25 yards (12 ranks) deep. So for a divisional attack, with two brigades up, each brigade with two battalions leading in column, and one (or two) in reserve, would present a target (including gaps between battalions and formations to enable them to deploy into line) of about 500–600 metres wide and half that distance in depth; the whole being preceded by a strong mass of *tirailleurs* (sharpshooters). The main body would then advance to about 300-500 metres from the enemy lines (i.e. short of canister range) and deploy into line, unless column was to be retained for the final assault. This presented a huge target but until those columns had closed to within 100 metres there was only one fighting component that could be brought to bear – the artillery.

Table 2 depicts the range spread of shrapnel. For the 9 pounder gun at about 1,000 yards (915 metres) the range, or extent of effect, is about 260 yards (240 metres). If we return to our target, a (French) division in the attack, this measured about 500 x 250 metres; from this it is immediately apparent that with such a large target the exact trajectory and fuse setting was far less critical than it may at first appear. Of course the spray of shrapnel may not hit the front ranks but this should not be considered a disadvantage. Napoleonic infantry tactics were all about mass, maintenance of momentum and attacking in depth. Shrapnel shells which burst above second lines disrupted that depth, breaking mutual support and upsetting momentum. In front of these massed formations were strong lines of *tirailleurs* operating in small groups who were difficult targets for round shot. However, the same 9 pounder firing spherical case was able to release up to 67 carbine balls (Table 1) and fragments of the shell casing (estimated to be about 20) would rain down on these individual or small groups of infantrymen with obvious consequences. Precision was less of an issue; as long as the round did not plough into the dirt well short of the target, some sort of positive effect would have been achieved.



Ranges &c of Spher.l Case Shot.

From Brass Guns, Carronades, and Heavy Howitzers.

Elev.n	Fuze	Range
°	In.	yds. yds.
2	.3	450 to 600
2½	.4	600 — 750
3	.5	750 — 900
3½	.6	900 — 1050
4	.7	1050 — 1200
4½	.8	1200 — 1350
5	.9	1350 — 1500
5½	1	1500 — 1650

Rule. — Allow half a degree of Elev.n and a tenth of fuze, for every 150 yds. of Range, and half a degree in addition.

From Light 5½ In. Howitzers.

Elev.n	Fuze	Range
°	In.	yds.
1	.1	200
2	.2	300
3	.3	400
4	.4	500
5	.5	600
6	.6	700
7	.7	800
8	.8	900
9	.9	1000

Rule. — Reject the first 100 yds. of Range, & allow a degree of Elev.n and a tenth of fuze, for every remaining hundred.

Table 4: Range and Spread ~ Brass Ordnance and 5 ½ Howitzer (Field note book of Lt Colquhoun).

Table 2 and Table 4 also show the minimum ranges for a spherical case round which would have been necessary, given the spread, to protect friendly forces.[25] For a 6 or 9 pounder gun this was about 420 metres and less than 200 metres for a light 5½ howitzer. With this information we can now depict the options available to a British gunner and compare it with that of his French counterpart:

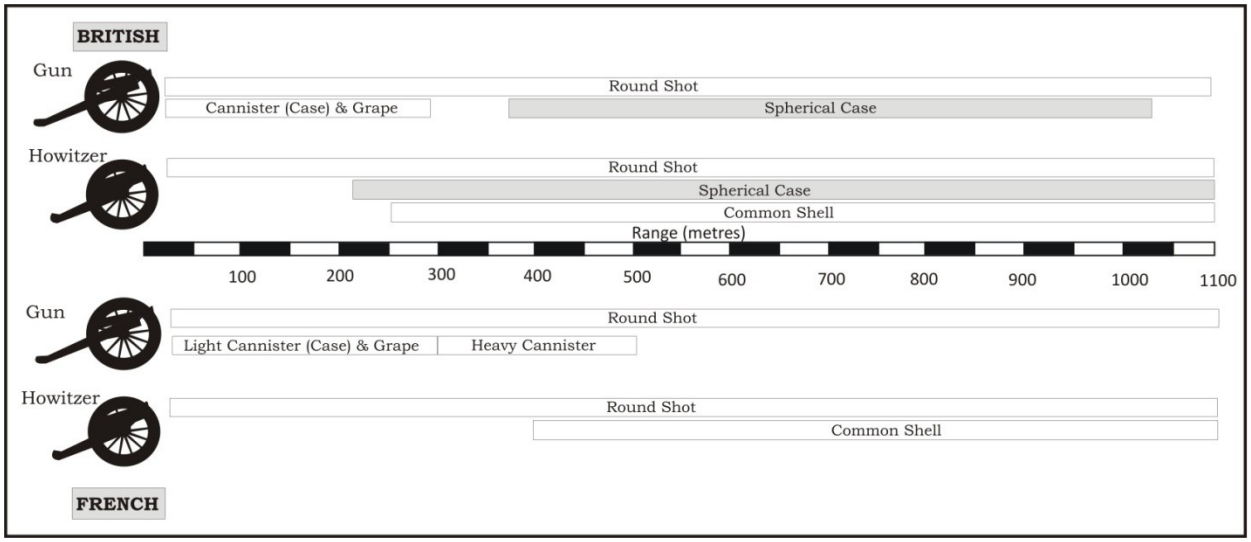


Figure 7: British & French Projectile 'Golf Bag' for various ranges.

The French gunner was able to engage targets from just in front of the gun out to beyond one kilometre. However, given the questionable efficiency of both heavy canister and common shell, he had to rely on solid shot beyond 300 yards, the effective range of light canister and grape. The British gunner conversely was able to call upon spherical case and this gave him an enormous advantage as the large number of eyewitness accounts and battle dispatches confirm.

The round was first used on a significant scale at Roliça and Vimeiro in August 1808, when Arthur Wellesley (later the Duke of Wellington) landed with his small expeditionary force to recapture Portugal from Junot's invading French force at the start of the Peninsular War. The artillery commander, Lieutenant Colonel William Robe, had this to say following the engagements:

> I have waited a few days to collect what information I could as to the effects of your Spherical Case in two actions which have taken place with the enemy on the 17th and 21st instant, and can now tell you it is admirable to the whole army..... I should not do my duty to the service were I not to attribute our good fortune to a good use of that weapon with which you have furnished us. I told Sir A Wellesley I meant to write to you and asked if it might be with his concurrence, his answer was "you may say anything you please, you cannot say too much, for never was artillery fired with better effect".[26]

The Military Secretary to the force, Lieutenant Colonel Henry Torrens, also wrote to Shrapnel:

> I have seen this destructive arm used with great effect against the Enemy at Roleia [sic] and at the battle of Vimeira [sic] in Portugal, and I have no hesitation in attributing the success of our arms to the amazing impression made upon his ranks by this weapon... I do not hesitate to express my conviction that the Invention is a military object of Great National importance and deserving of every possible attention that can facilitate its *General Use* upon actual service.[27]

The new weapon's 'national importance' was not lost on politicians and military men alike, although the Board of Ordnance seemed slow to realise the significance of the shell, seemingly irritated by the young inventor's zeal. The foreign secretary, Lord Canning, was convinced that 'no future expeditions would sail without them'. However, Shrapnel was acutely aware of the sensitivity of too much publicity and he wrote that he was anxious 'that the invention should not be made public in any way, lest its importance should thus be signified to the enemy'.[28]

That Shrapnel´s shell was a matter of national security is reinforced by Captain J. Morton Spearman, author of *The British* Gunner, who wrote as late as 1812 that he had been:

> ... restricted from saying anything on the subject of these shells, or spherical case-shot as to the prejudice of the ingenious inventor... this prohibition has arisen from a very proper desire to retain in our own hands the secret of this destructive missile; and the author thereupon proceeds to cite the statements of one Captain Decker of the Prussian Army and his French translators as evidence that no foreigner as yet understood either the effect or manufacture of Henry Shrapnel´s invention.[29]

Captain Frederick Clayson of the 43rd Regiment was with Anstruther's Brigade atop Vimeiro Hill, where the fighting was fiercest. He felt compelled to write to the John Roebuck, a civil engineer in the employ of the Board of Ordnance [italics in original]:

> That the execution which the Shrapnel Shells did on the columns of the enemy advancing was astonishing; it would have delighted you to have remarked the superiority of our artillery to that of the French. If you think that this unsolicited homage to the merits of that *extraordinary Invention* will be pleasing to its distinguished *author*, *I* shall rejoice in its being made known to him; indeed so much were the French dismayed at the *effect* of this novel *Instrument of War*, that many of their Grenadiers who were made prisoners declared, that they could not *stand it*, and were literally taken lying down on the ground or under cover of bushes, and the high banks of some ditches in the field.[30]

The French were simply astounded at being engaged at so great a range in such a devastating manner. They quickly nicknamed the round 'black rain'; the same term used by the Iraqi soldiers when referring to the MLRS bomblets during the First Iraq War 1990-91. Colonel Maximilien-Sebastien Foy was commanding a battery of 10 guns that day and was astonished by the effect of the new projectile and unable to account for the effect produced by it:

> ...their hollow cannonballs at the first discharge struck down the files of the leading platoon, and then exploded in the platoon that followed; the artillery of the first division and that of the reserve responded but weakly.[31]

These few reports from the relatively limited actions at Roliça and Vimeiro are but a mere soupçon of the mass of references to Shrapnel's shell in the Peninsular War. It is worth noting that there are fewer references from the Battle of Waterloo although I am unable to account for this anomaly. Nevertheless, the mass of reports and references that have come to light are universal in their unequivocal praise of Shrapnel's invention. These eyewitness accounts do not support reports of the difficulties associated with this new weapon system; in fact entirely the opposite appears true. Problems with rounds exploding prematurely certainly prevailed but detailed tests in 1819 indicated that the failure rate was about 8 per cent burst in the bore and 11 per cent blinds (i.e. the fuse fails to work and the shell is not detonated).[32] These figures sit very comfortably alongside similar statistics for other ammunition natures. Furthermore, within the mass of eyewitness accounts I have not unearthed a single reference to a round detonating prematurely and certainly not one which caused friendly casualties or fatalities.

Endorsements of Shrapnel's projectile were penned not just by Gunner officers, they came from divisional and brigade commanders, infantry and cavalry officers, rank and file and, perhaps most telling of all, from the quills of the French who had suffered the consequences.

> I am now writing from the scene of the action. Shrapnel's Shells again played hell among the enemy – Captain Henry Bowyer Lane, near Bella Formosa, 8 May 1811.
>
> Pray thank Colonel Shrapnel from me for his spherical case. They did wonders – Colonel Alexander Duncan, Barrosa 26 March 1811.
>
> Colonel Shrapnel's Shells laid the enemy in heaps, and some of the poor wounded had five or six balls in them – Captain John Cator, Barrosa 26 March 1811.
>
> I understand from the Spaniards that the French complained much of the 'Shrapnel Case Shot' which they said were new to them, and that the English must have poisoned the balls, as the men hit by them never recovered from the effects of their wounds – Lieutenant Daniel Bourchier, Badajoz 10 April 1812.
>
> With this exploding projectile that the enemy has found the means and will to deliver us considerable pain; while not having the means to respond we put in our shells about sixty bullets, what succeeds us well enough – Governor General Louis-Emmanuel Rey, San Sebastian 7 August 1813.
>
> These projectiles are the cause of considerable pain to us. There is no doubt that we needed a response in our arsenal – Jacques Belmas, Defence of San Sebastian (Paris, 1837).

Belmas wrote some time after the war had ended but he was, nevertheless, expressing the widely held view of French officers in the Iberian theatre. The French did, in fact, capture a spherical case round in 1806 at Maida and Napoleon had ordered that tests should be carried out of the shell. However, the French were never able to perfect the fuse and their attempts to bring an effective long range anti-personnel projectile into service was never realised. Other nations also

tried to and tested similar ammunition with mixed results; the Russians produced an exploding case (canister) shot which showed some promise and was fielded in 1812.

To Wellington's Army, however, the distinct advantages of Shrapnel's invention were immediately and abundantly apparent; ammunition allocation in first and second line holdings increased from 9% to over 20% of stock in guns and over 40% in field howitzers. [33] Wellington, having been enthusiastic about the capabilities of the round following Roliça and Vimeiro, seemed to lose faith in its effectiveness thereafter. This was an uncharacteristic but understandable failure by Wellington, who was not a technical officer and did not therefore understand the technical characteristics of this projectile and the challenges associated with its use in the field. His rather dismissive remarks after the battles of Buçaco and Fuentes de Oñoro have been pounced upon by (similarly non-technical) historians and used to downplay the importance of this ground breaking munition.[34]

At Waterloo, Augustus Fraser's use of Bull's Troop RHA to fire shrapnel to clear the wood south of Hougoumont Farm was as pivotal to the outcome of the Battle as Lieutenant Colonel James Macdonell's action in closing of the north gate. John Townsend was a subaltern with the Troop and recalled:

> They (shrapnel) were used with very considerable effect, both at the wood and orchard of Hougoumont, as also upon the masses of Jerome's columns. I can bear in mind most fully how efficacious they were, both in clearing the wood at Hougoumont, as also the chasms made in the French attacking columns.[35]

The effect of Shrapnel's shells on the field at Waterloo was not confined to the woods to the south of Hougoumont. Colonel Sir George Wood commanding the artillery wrote after the Battle to Shrapnel where he outlined the significant effect at Hougoumont and went on:

> Then the Duke ordered your (shrapnel) shells to be fired in and about the farm house [of La Haye Sainte], and thus succeeded in dislodging them from this formidable position, to which if Buoanaparte had once been able to bring up his artillery, the Duke must have lost the battle.[36]

Perhaps Wood is overstating the case, for La Haye Sainte was captured late in the day and the battle was not lost; nevertheless, Shrapnel's shells played a noteworthy part in breaking down the numerous French attacks throughout that momentous day. Perhaps the best way of understanding this is to overlay the (effective *not* maximum) reach of the shell on a Waterloo map. See Figure 8, grey indicating the coverage of spherical case and yellow depicting canister.

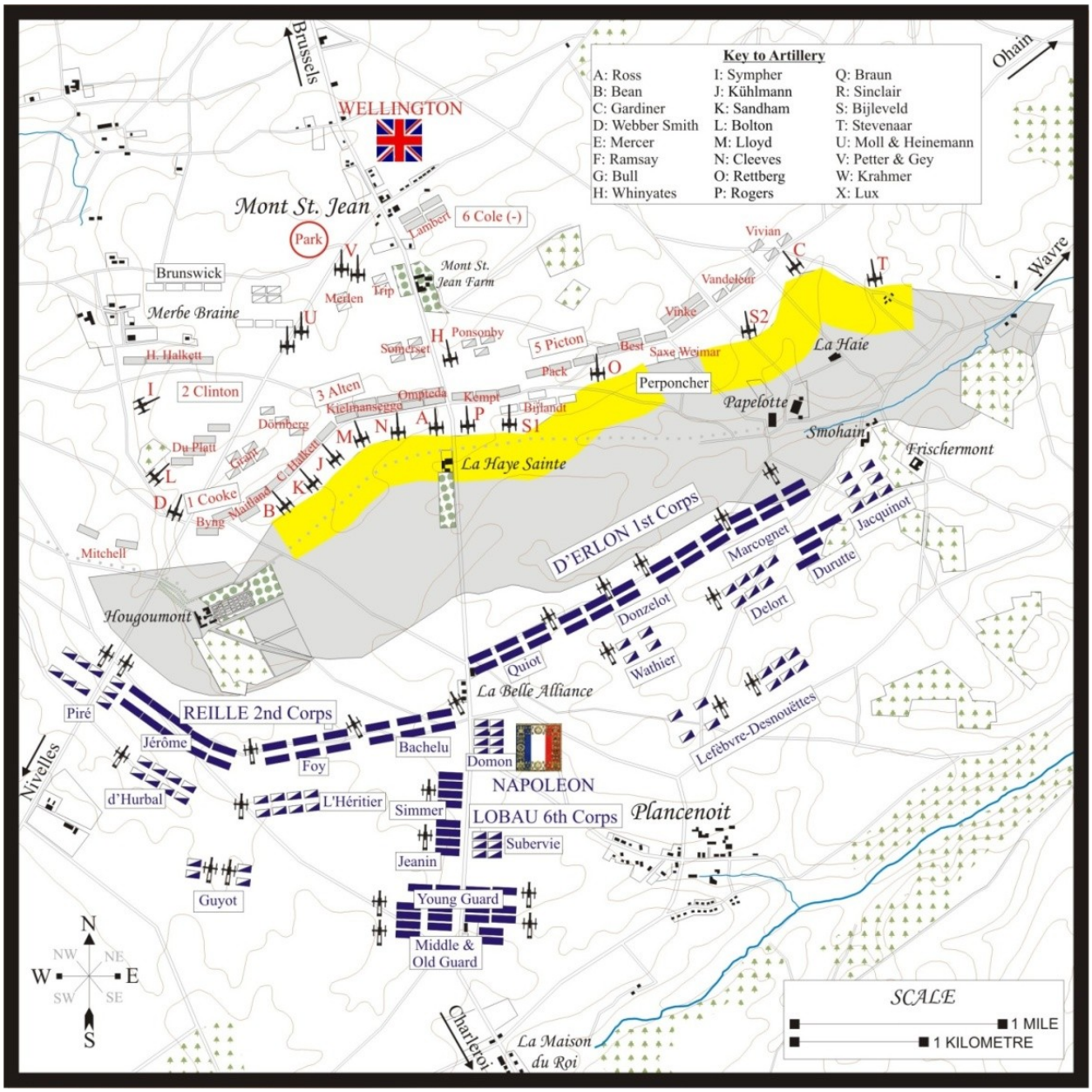


Figure 8: Map of the Battle of Waterloo depicting the coverage and influence of Shrapnel's Shell.

In 1814 Henry Shrapnel was awarded a not inconsiderable pension of £1,200; although bureaucratic constraints on the award ensured that he enjoyed scant financial gain. He was promoted to major general in 1819, retired from the Service in 1825 and died at his home, Peartree House, Southampton in 1842. Ten years after his death, following strong lobbying by his eldest son Henry Needham Scrope, the government ordered that spherical case be known officially as 'Shrapnel' in honour of its inventor.

Captain Boxer made some significant adjustments to the round in time for the Crimean War but by this time the shell was in the arsenals of every modern army of the era. With the advent of breach loading guns with rifled barrels, the projectile changed out of all recognition. The

bursting charge, now located at the rear of the shell, imparted additional velocity on the shrapnel bullets and shell fragments and range increased from 3,000 to 7,000 yards. Massed Napoleonic artillery tactics in the direct fire role evolved into the 'hidden' indirect fire synonymous with the great artillery concentrations of the First World War. Artillery was no longer a fighting component in its own right, providing instead (direct and indirect) combat support. This evolution was driven by products of the Industrial Revolution, both in terms of infantry and artillery weapons as well as developments in smokeless powder (facilitating gun concealment) and high explosive.

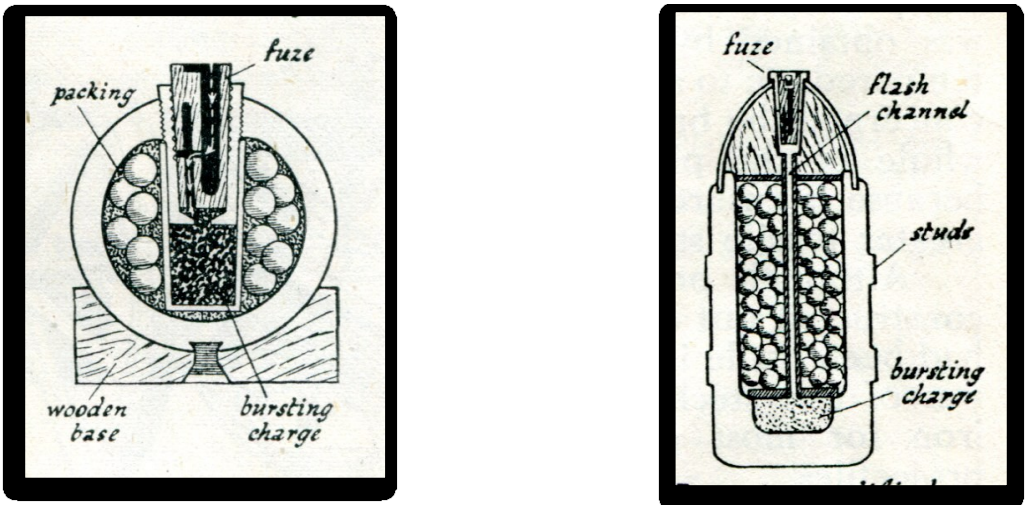


Figure 9: Boxer's Improvements ~ Time Fuse circa 1849 with a diaphragm separating the bursting charge and bullets (left); the detonating device circa 1870 used following the advent of breach loading guns (right).

Nevertheless, the 13 and 18 pounder field guns that arrived in France in 1914 with the British Expeditionary Force (BEF) were supplied only with shrapnel shells; the howitzers had the new high explosive rounds.[37] However, it was quickly apparent that the effect of shrapnel on static trench systems was minimal and when the Germans strengthened their barbed wire, rendering it less susceptible to cutting by shrapnel, the writing was on the wall for Shrapnel's invention and no further rounds were developed for any post World War I guns.

It is curious why the indisputable value of Shrapnel's invention during the Napoleonic Wars, both on land and sea, has not been properly recognised and/or recorded. Perhaps it was because of Wellington's lukewarm endorsement, fuelled by a suspicion (and lack of understanding) of the technical military matters of the scientific corps and their separate chain of command. Perhaps the initial reports and assessments were played down for reasons of national security. Perhaps the Board of Ordnance were, not for the first time, slow on the uptake. Perhaps it is because it was never recorded properly in the first instance and historians have a tendency to repeat one another. Whatever the reason, or reasons, the fact remains that Shrapnel's invention was the greatest killer of men on the field of battle for well over half a century and it provided

Wellington and his army a force multiplier whose contribution to the defeat of Napoleon's *Grande Armée* has been decidedly understated.

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[1] A force multiplier, in military usage, refers to an attribute or a combination of attributes which make a given force more effective than that same force would be without it.

[2] This committee reported in response to a letter dated 17 May 1852 from the Shrapnel family petitioning that the shell should be called a *shrapnel shell* in preference to *spherical case shot*. Synopsis of Select Committee Reports – Shrapnel shell, pp. 83-4.

[3] The family name appears incorrectly as Shrapnell in a number of contemporary sources, including Wellington's Dispatches.

[4] There is no evidence of mortar spherical case rounds being supplied, or used, by the RA on operations in the Peninsula or at Waterloo.

[5] Synopsis of Select Committee Reports – Shrapnel shells, p. 5.

[6] Majendie, Proceedings of the Royal Artillery Institution, vol. III, p. 400.

[7] Ibid, p.388.

[8] Shrapnel Papers MD 871.

[9] Ibid.

[10] He was wounded at the unsuccessful siege of Dunkirk in September 1793.

[11] Proceedings of the Royal Artillery Institution, vol. V. p.391.

[12] Ibid, p.424.

[13] This is one of a number of areas which has been misunderstood and misrepresented in historical accounts and in contemporary descriptions of British artillery and ammunition of the era.

[14] In 1813 Wellington insisted that all spherical case shells only had musket balls and Dickson wrote back to Woolwich asking for Wellington's request to be complied with. Dickson Manuscripts, vol. V, p. 907.

[15] Ibid, p.393.

[16] Dickson Manuscripts, vol. II, p. 145.

[17] See Proceedings of the Royal Artillery Institution, vol. V. p.396 and Franklin, pp.91-92.

[18] Ibid, p.400.

[19] Ibid, p.397.

[20] Dawson, Dawson and Summerfield p. 246, detail only the long range canister – this is an error. But it worth reading this to see how ineffective the round was, based on Russian tests of the era.

[21] Lipscombe, *Wellington's Guns* p.26.

[22] The British did not fire grape from brass ordnance; its use was restricted, in the main, to naval iron guns.

[23] Other factors included meteorological conditions, powder consistency, cartridge consistency, windage, shell (and sabot) manufacturing tolerances, barrel wear and 'hot gun' effect.

[24] Hughes, BS p. 56 and p. 78.

[25] In response to the French tirailleurs, the British deployed (in increasing numbers) skirmishers ahead of the defensive lines. These were often the green jacketed men of the 95th Rifles armed with the infinitely superior and longer ranged Baker Rifle.

[26] Robe to Shrapnel, from Torres Vedras 25 Aug 1808.

[27] Torrens to Shrapnel, Horse Guards dated 5 Mar 1812 – Sir Henry Torrens was Military Secretary to the force but this letter was penned some time later when he had assumed the role at Horse Guards.

[28] Proceedings of the Royal Artillery Institution, vol. V. p.403.

[29] Glover p. 75 citing Spearman (Woolwich, 1828): interestingly my copy of Spearman (dated 1844) does not contain this text.

[30] Clayson to Roebuck dated 12 Jan 1809. I found a transcribed version of this letter in the Shrapnel Papers MD 871 but curiously I cannot find a Lt F. L. Clayson in Challis's database.

[31] Foy, p. 521.

[32] Hime, p. 95.

[33] Proceedings of the Royal Artillery Institution, vol. V. p.408 and Franklin, appendix D.

[34] See Lipscombe, *Wellington's Guns* p. 134.

[35] Proceedings of the Royal Artillery Institution, vol. V. p.422. Extraordinarily, this letter did not appear in any of Siborne's subsequent correspondence on the Battle.

[36] Shrapnel Papers.

[37] Farndale, p. 1.

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