Weapons of World War I

1) Bayonet:

According to tradition the bayonet was developed in Bayonne, France, in the early 17th century. That it was still apparently in commonplace use during the First World War may seem incongruous when compared to leaps in technological warfare typified by artillery, grenades and poison gases. Nevertheless the bayonet was used by all sides from 1914-18, even if its use was more psychological than practical.

Used to Stoke the Fire

Veterans of the Great War, when interviewed, tended to play down the impact of the bayonet during the war. Many remarked (partly in jest) that the bayonet was used primarily as a splendid means of toasting bread, and for opening cans, to scrape mud off uniforms, poking a trench brazier or even to assist in the preparation of communal latrines.

It therefore begs the question: was the bayonet of any real significance during the war, and if not why was it carried by virtually all infantrymen in all armies (and most especially by the usually technologically advanced German army)?

Simple Design

The German army developed more types of bayonet than all other armies combined. They produced special adaptors so that captured enemy bayonets could be fitted to the common Gewehr 98 rifle.

In essence a bayonet is simply a blade that is attached to the barrel of a rifle for use in close combat.

Most bayonets were of simple design, of the knife variety, although variations existed. For example the French devised a needle blade for use on Lebel rifles. Notoriously, the German army produced a 'saw-back' blade that, as its name suggests, gave the appearance of a saw with its double row of teeth on the back edge.

Produced chiefly for use by engineering units for specific tasks, the saw-back blade proved a blessing for Allied propaganda purposes. Keen to represent the Germans as ruthless, blood-thirsty 'Huns', the popular press widely propagated the notion that this type of bayonet had been specifically developed as a refinement of German brutality for use in close combat.

Although it could doubtless be put to such use, it was actually designed to be used as a saw when the need arose.

Personified the Offensive Spirit

In many ways the bayonet was a throwback to the concept of an aggressive method of warfare.

Used traditionally by the colonial powers such as France and Britain in combat against far less well-armed adversaries, it was deemed a positive example of a co-called 'offensive spirit'.

Given that the French pre-war blueprint for war, Plan XVII, required an abundance of offensive spirit from the French army in their planned conquest of Alsace and Lorraine, the bayonet must have seemed an ideal weapon for the coming war.

In reality however it transpired that technological advances in defensive warfare had outstripped those of offensive warfare. The machine gun held sway over the battlefield. Infantry advancing with bayonets affixed to rifles were invariably mown down before they reached enemy trenches. The opportunity to use the bayonet was thus much restricted.

Even when a raiding party had reached the enemy position the role of the bayonet was often primarily one of guarding the grenadiers among their party, whose task was to race down the trench lobbing hand grenades into dugouts as they passed. Indeed, bombing parties invariably contained at least two 'bayonet men' whose job was solely to defend the bombers.

One advantage of using a bayonet in close crowded combat, as opposed to a rifle or hand-gun, was its avoidance of risk in injuring one's fellow soldiers. A bullet fired at close range into an enemy could well pass through his body and enter a friend standing (or fighting) behind him.

**Close Combat Fighting**

Of course there were still many occasions when close combat fighting was necessary.

This was the ideal scenario for the use of the bayonet. Nevertheless, while it was seldom actually used, experienced soldiers generally preferring other methods, carrying improvised clubs, blades or knuckledusters.

Curiously the official British bayonet training manual gave poor advice regarding the bayonet's usage. Soldiers were instructed to direct the bayonet at the vulnerable points of the enemy's body: the throat, left or right breast and left or right groin.

Aiming the bayonet blade at the breast ran the risk of driving into the breastbone, making removal of the blade highly problematic. Similarly, aiming the blade at the groin inevitably resulted in excruciating pain to the victim, such that they would often grab the bayonet in an attempt to pull the blade out. In such cases soldiers often had to remove the blade from the rifle simply in order to continue with the attack.

There was undeniably psychological value to the infantry in carrying a bayonet, even if in practice it was seldom used. Bayonets continued to be commonly issued in the Second World War.

**2) Flamethrowers:**

The flamethrower, which brought terror to French and British soldiers when used by the German army in the early phases of the First World War in 1914 and 1915 (and which was quickly adopted by both) was by no means a particularly innovative weapon.

The basic idea of a flamethrower is to spread fire by launching burning fuel. The earliest flamethrowers date as far back as the 5th century B.C. These took the form of lengthy tubes filled with burning solids (such as coal or sulphur), and which were used in the same way as...
blow-guns: by blowing into one end of the tube the solid material inside would be propelled towards the operator's enemies.

The flamethrower was inevitably refined over the intervening centuries, although the models seen in the early days of World War One were developed at the turn of the 20th century. The German army tested two models of flamethrower - or Flammenwerfer in German - in the early 1900s, one large and one small, both developed by Richard Fiedler.

The smaller, lighter Flammenwerfer (the Kleinflammenwerfer) was designed for portable use, carried by a single man. Using pressurised air and carbon dioxide or nitrogen it belched forth a stream of burning oil for as much as 18 metres.

Fielder's second, larger model (the Grossflammenwerfer), worked along the same lines but was not suitable for transport by a single person, but whose maximum range was twice that of the smaller model; it could also sustain flames for a (then) impressive forty seconds, although it was decidedly expensive in its use of fuel.

Having tested the Flammenwerfer in 1900 the German army deployed it for use in three specialist battalions from 1911 onwards.

It was put to initial wartime use against the French in the south-eastern sector of the Western Front from October 1914, although its use was sporadic and went largely unreported.

The first notable use of the Flammenwerfer came in a surprise attack launched by the Germans upon the British at Hooge in Flanders. Springing forward at 0315 on 30 July 1915 the Germans made effective use of the portable Flammenwerfer, with gas cylinders strapped to the back of the men responsible for using the instrument, a lit nozzle attached to each cylinder.

The effect of the dangerous nature of the surprise attack proved terrifying to the British opposition, although their line, initially pushed back, was stabilised later the same night. In two days of severe fighting the British lost 31 officers and 751 other ranks during the attack.

With the success of the Hooge attack, at least so far as the Flammenwerfer was concerned, the German army adopted the device on a widespread basis across all fronts of battle. The Flammenwerfers tended to be used in groups of six during battle, each machine worked by two men. They were used mostly to clear forward defenders during the start of a German attack, preceding their infantry colleagues.

They were undeniably useful when used at short-range, but were of limited wider effectiveness, especially once the British and French had overcome their initial alarm at their use. The operators of Flammenwerfer equipment also lived a most dangerous existence.

Quite aside from the worries of handling the device - it was entirely feasible that the cylinder carrying the fuel might unexpectedly explode - they were marked men; the British and French poured rifle-fire into the area of attack where Flammenwerfers were used, and their operators could expect no mercy should they be taken prisoner. Their life expectancy was therefore short.

The British, intrigued by the possibilities offered by flamethrowers, experimented with their own models. In readiness for the Somme offensive they constructed four sizeable models (weighing
two tons each), built directly into a forward trench constructed in No Man's Land a mere 60 yards from the German line.

Each was painstakingly constructed piece by piece, although two were destroyed by shellfire prior to 1 July 1916 (the start of the Somme offensive). The remaining two, each with a range of 90 yards, were put to use as planned on 1 July. Again highly effective at clearing trenches at a local level, they were of practically no wider benefit. Their use was consequently abandoned.

Similarly the French developed their own portable one-man Schilt flamethrower, of a superior build to the German model. It was used in trench attacks during 1917-18. The Germans produced a lightweight modified version of their Flammenwerfer, the Wex, in 1917, which had the benefit of self-igniting.

During the war the Germans launched in excess of 650 flamethrower attacks; no numbers exist for British or French attacks.

By the close of the war flamethrower use had been extended to use on tanks, a policy carried forward to World War Two. Flame-throwing equipment, albeit somewhat refined, continues in use to the present day.

3) Grenades:

As with numerous weapons significantly developed upon during World War One, the use of grenades (whose name probably dates from the French word for pomegranate) dated back some hundreds of years - to the fifteenth century in fact.

Grenade Supplies in 1914

Regarded as practical for siege operations only since Napoleonic times however, the grenade came to the attention of German army planners (notable among others) during the Russo-Japanese War of 1904-05.

As with most things at the start of the war in August 1914, the Germans were ahead of the pack in terms of grenade development. Even as war began the Germans had 70,000 hand grenades in readiness, along with a further 106,000 rifle grenades.

Curiously, when many, perhaps most, people are asked to consider the means of trench attack most popular during the First World War, the rifle or bayonet is often suggested as the most likely answer.

Bombing Parties

In fact both of these weapons were to be used chiefly to defend the grenadiers: those men tasked with the bombing of trenches and positions using grenades of various types. Bombing parties grew in number and frequency as the war progressed and formed a major component of any infantry attack by the war's close (although US forces used them less, chiefly on account of supply shortages).
The British bombing team usually consisted of nine men at a time: an NCO, two throwers, two carriers, two bayonet-men to defend the team and two 'spare' men for use when casualties were incurred.

As an attack or raid reached an enemy trench the grenadiers would be responsible for racing down the trench and throwing grenades into each dugout they passed: this invariably succeeded in purging dugouts of their human occupants in an attempt at surrender (often not accepted as they were promptly shot or stabbed).

Not that this was always the case during the war. When Britain entered the war on 4 August it did so with just one type of grenade in its armoury (suitably named 'Mark 1'), and not very many of those. As with the machine gun the British high command could not see much use for the hand grenade.

This situation soon changed however; indeed, within a year Britain was producing up to half a million hand grenades each week (with an average of 250,000).

Even so, British forces outside of the Western Front - which was given first call on grenade supplies - were lacking in supplies of grenades until well into 1916.

The French and Russian armies were rather better prepared than the British, since they fully expected to be in the position of besieging German fortresses: a task ideally suited to the grenade.

**Two Forms of Detonation**

Grenades - either hand or rifle driven - were detonated in one of two ways. They were either detonated on impact (percussion) or via a timed fuse.

Generally speaking, infantrymen preferred timed fuses (of whatever amount of time) to percussion devices, since there remained the constant risk of accidentally jolting a grenade while in a trench and setting off an explosion.

The idea of using a pin, extracted by hand from a grenade, to set off a timed fuse quickly became commonplace and was a feature of most later grenades. Another, earlier, method of igniting the fuse was via the so-called 'stick' grenade, where the fuse was lit when the grenade left the handle (stick) to which it was attached.

Yet another type, cylindrical and referred to as the 'cricket ball' grenade, was ignited by striking the grenade like a match before it was promptly despatched skywards.

**Home-made Grenades**

That first British grenade, the Mark 1 used in 1914, proved highly unpopular with soldiers. Forming a canister with a 16-inch cane handle, it was ignited by removing a safety pin through the top. When thrown, the handle (and attached linen streamers) ensured it landed nose down so that the striker was forced into the detonator.
However the Mark 1 caused widespread distrust given that it was liable to explode prematurely if it came into contact with an object while in the act of being thrown: again entirely feasible in a trench environment.

Consequently many British soldiers - and those based in Gallipoli who had no access to grenades of any type - resorted to the construction of home-made, or 'jam-tin' bombs.

So-named because they were literally made out of jam tins, each was packed with gun-cotton or dynamite, together with pieces of scrap metal.

A length of fuse would project through the top of the tin, with each inch of fuse giving approximately 1.25 seconds delay. Other home-made grenades of differing designs were widespread and were seen in various fronts (including in Arabia and in Russia).

**Grenade Development**

However grenade development soon took off and, at least on the Western Front, ad-hoc types dwindled in numbers as better models appeared.

Rifle grenades were simply attached to a rod and placed down the barrel of a rifle, or instead placed in a cup attached to the barrel, and were launched by the blast of a blank cartridge. Such grenades were never popular however, and were deemed (correctly) as inaccurate. The Germans ceased using rifle grenades in 1916, although they continued to experiment with revised models.

The British and French however persisted with cup grenades. The British, who had pioneered their use, together with the French improved the range of cup grenades from the average 180-200 metres to an impressive 400 metres (using fin grenades).

The Germans belatedly restarted using cup grenades in 1918.

The first truly popular British hand grenade - simply referred to as 'No. 15' - was churned out in huge numbers by the close of 1915, although its lack of performance in wet weather promptly led to a sharp downturn in its popularity. Whereas up to half a million No, 15's were produced in the autumn of 1915, they were seldom used at all beyond the turn of the year.

**The Mills Bomb**

There were innumerable types of grenade designed and produced during the war - well over 50 - but one that endured, and which retains a popular awareness even today, is the Mills bomb, designed by William Mills in 1915.

Actually referred to officially as 'No. 5', the Mills bomb was introduced in May 1915 and became the dominant British grenade for the remainder of the war. Weighing 1.25 lb, the Mills bomb's exterior was serrated so that when it detonated it broke into many fragments: thus, a fragmentation bomb.

To use the Mills bomb the thrower first removed the safety pin while holding down the strike lever beneath it. When the grenade was actually thrown the strike lever ejected and a four-second fuse was set off.
British and Empire soldiers were instructed to lob the Mills bomb using a throwing action similar to bowling in cricket. Classes were taught instructing soldiers how best to do this.

The Mills bomb was improved upon in 1917 with a revised model, No. 36M. This was filled with explosive and then dipped in shellac, which served to seal the grenade and thus prevented rapid deterioration (markedly reducing the number of ‘dud’, i.e. ineffective, devices). Its base plug was also strengthened, for use on a rifle discharger (when its fuse was lengthened to a seven-second delay).

Transported in boxes of twelve with detonators carried separately, British soldiers found that they could not readily carry multiple Mills bombs on their person on account of their closer fitting uniforms. Their Australian allies, with looser clothing, could carry around half a dozen Mills bombs with reasonable comfort. The British took to carrying green canvas buckets filled with Mills bombs (up to 24 at a time) for use in an attack.

The detonators were supposed to be attached to the actual grenade before the boxes of grenades reached the front line. It was not unknown however for a box of Mills bombs to be opened for use only to discover that they were without their necessary detonators.

It has been estimated that during the course of the war approximately 70 million Mills bombs were thrown by the Allies, with perhaps 35 million other types; a testament to the overwhelming popularity of the Mills bomb itself.

**German Models**

The German army, having popularised use of the grenade at the start of the war, developed numerous models over the ensuing four years.

These included the Stielhandgranate (stick bomb), the Diskushandgranate (disc grenade), Eierhandgranate (hand grenade) and Kugelhandgranate (ball grenade, which included the grenade referred to by the British as the 'pineapple grenade').

With the Germans disliking impact (percussion) grenades as much as the Allies, all bar the disc grenade were activated by a time fuse. Those grenades used by storm troopers utilised the shortest time fuse: a mere two seconds (so that their targets were given no time to seek shelter from the resultant explosion).

The Stielhandgranate - stick grenade - proved highly popular among German soldiers. Some exploded on impact but most were set to detonate after either a 5.5 or 7 second delay. German soldiers often carried such grenades in satchels thrown around their necks.

The Eierhandgranate - egg grenade - was also popular given its great throwing range, up to 50 yards. The German army also made use of gas grenades, containing a poisonous liquid that discharged on impact.

**Greatest Grenade Battle of the War**

Undoubtedly the greatest grenade battle of the war occurred on the Pozieres Heights on the night of 26-27 July 1916.
Lasting for twelve-and-a-half hours without a break the Australians, with British support, exchanged grenades with their German foes (who threw multiple types of grenade: sticks, cricket balls, egg bombs and rifle grenades). The allied contingent alone threw some 15,000 Mills bombs during the night.

Many grenadiers were killed that night, while many others simply fell down due to complete exhaustion.

**World War One and Thereafter...**

With the conclusion of World War One the grenade continued to hold its place firmly within the armoury of every nation's army. During World War Two the US alone manufactured some 50 million fragmentation grenades.

Its development has continued to the present day.

**4) Machine Guns:**

The machine gun, which so came to dominate and even to personify the battlefields of World War One, was a fairly primitive device when general war began in August 1914. Machine guns of all armies were largely of the heavy variety and decidedly ill-suited to portability for use by rapidly advancing infantry troops. Each weighed somewhere in the 30kg-60kg range - often without their mountings, carriages and supplies.

**The Machine Gun in 1914**

The 1914 machine gun, usually positioned on a flat tripod, would require a gun crew of four to six operators. In theory they could fire 400-600 small-calibre rounds per minute, a figure that was to more than double by the war's end, with rounds fed via a fabric belt or a metal strip.

The reality however was that these early machine guns would rapidly overheat and become inoperative without the aid of cooling mechanisms; they were consequently fired in short rather than sustained bursts. Cooling generally took one of two forms: water cooled and, increasingly as the war developed, air cooled. Water jackets would provided for the former (which held around one gallon of liquid) and air vents would be built into the machine gun for the latter.

Water cooled machine guns would still overheat relatively quickly (sometimes within two minutes), with the consequence that large supplies of water would need to be on hand in the heat of a battle - and, when these ran out, it was not unknown for a machine gun crew to solve the problem by urinating into the jacket.

Whether air or water cooled, machine guns still jammed frequently, especially in hot conditions or when used by inexperienced operators.

Consequently machine guns would often be grouped together to maintain a constant defensive position.
Estimates of their equivalent, accurate, rifle firepower varied, with some estimating a single machine gun to be worth as many as 60-100 rifles: a more consensual figure is around 80, still an impressively high figure.

**British Army Rejection**

High enough indeed to make the British army's dismissal of the potential worth of the device in the early 1900s all the more difficult to understand. Hiram Maxim, who designed the machine gun which bore his name in 1884, first offered use of the machine to Britain. Although rapid-firing weapons, such as the 0.50-inch calibre Gatling Gun (invented in 1862), existed many years prior to Maxim's invention, all required some form of manual intervention, e.g. hand cranking.

Unfortunately for Maxim the British army high command could see no real use for the oil-cooled machine gun he demonstrated to them in 1885; other officers even regarded the weapon as an improper form of warfare.

Not so the German army which quickly produced a version of Maxim's invention (the Maschinengewehr 08) in large quantities at a Spandau arsenal; by the time war broke out in August 1914 the Germans had 12,000 at their disposal, a number which eventually ballooned to 100,000.

In contrast the British and French had access to a mere few hundred equivalents when war began.

**Simple Design**

In designing his machine gun, Hiram Maxim utilised a simple concept.

The gas produced by the explosion of powder in each machine gun cartridge created a recoil which served to continuously operate the machine gun mechanism. No external power was needed. His initial design, which was water cooled and belt fed, allowed for a theoretical rate of fire of up to 600 rounds per minute (half that number in practice). It was heavy however, weighing in at 62kg.

**German Enthusiasm**

As already noted the Germans quickly grasped the potential importance of machine guns on the battlefield. From the outset the German army demonstrated the value of the machine gun by creating separate machine gun companies to support infantry battalions.

The British however did not create their Machine Gun Corps until October 1915; until this time the few machine guns available were attached in sections to individual battalions. A mere two guns were allocated to each infantry battalion in 1914.

**Superiority of Defensive Warfare Technology**

When established in fixed strong-points sited specifically to cover potential enemy attack routes, the machine gun proved a fearsome defensive weapon. Enemy infantry assaults upon such positions invariably proved highly costly.
The French in particular found to their cost that the technology of defensive warfare was more advanced than that of offensive warfare. The French pre-war military blueprint, Plan XVII, was founded upon a fundamental assumption of an 'offensive spirit', one which envisaged a rapid war of movement.

Early commanders, such as Charles Lanrezac, were dismissed for apparent failures in their implementation of the offensive spirit. Time was to vindicate Lanrezac's doubts.

The British similarly found to their repeated cost the futility of massed infantry attacks against well-entrenched defensive positions protected by machine gun cover. The first day of the Somme Offensive amply illustrated this, although the lesson appeared to be lost to the British high command. On the opening day of the offensive the British suffered a record number of single day casualties, 60,000, the great majority lost under withering machine gun fire.

**The Machine Gun as an Offensive Weapon**

Understandably most historical accounts of the First World War have tended to emphasise the defensive strengths of the machine gun. Throughout the war efforts were made to produce an infantry assault version, such as the Lewis Light Machine Gun, although these efforts were generally unsatisfactory.

Although lighter at around 12kg they were still considered too heavy and bulky for rapidly advancing infantry. Attempts to transport light machine guns by wheeled carriages or pack animals were ultimately unsuccessful: the infantry invariably outpaced such methods.

By 1918 however one-man portable machine guns (including the formidable Bergmann MP18 submachine gun) were put to some use (each weighing 9-14kg), although maintaining sufficient ammunition supplies remained a difficulty.

Although often not truly portable light machine guns were more readily transported on roads or flat ground by armoured cars.

As the war developed machine guns were adapted for use on tanks on broken ground, particularly on the Western Front (where the majority of machine guns were deployed).

Light machine guns were adopted too for incorporation into aircraft from 1915 onwards, for example the Vickers, particularly with the German adoption of interrupter equipment, which enabled the pilot to fire the gun through the aircraft's propeller blades.

In response to the increasing success of machine guns mounted on aircraft it was perhaps inevitable that machine guns should similarly be developed as anti-aircraft devices (in France and Italy), sometimes mounted on vehicles. Similarly machine guns began to be added to warships as a useful addition to naval armaments.

**5) Pistols:**

The pistol, originally designed as a cavalry weapon, was the staple weapon for a variety of personnel during World War One (and beyond). Traditionally issued to officers of all armies the pistol was also issued to military police, airmen and tank operators.

Reasons for Pistol Use

For men involved in the latter professions the pistol was essentially the only weapon that would serve under their unique environments: the cramped conditions of both the tank and aircraft dictated that the rifle - which was otherwise issued to virtually all regular soldiers - was impractical.

As with the rifle the belligerent armies generally manufactured standard issue pistols, although shortages (as ever) required that a wide variety of models were put to practical use in the field.

Three Basic Types

When war began there were three types of pistol in general use: revolvers, clip-loaded automatics and the so-called 'blow-back' models (where expanding propellant gas caused the gun to reload by forcing the bolt back when fired).

Model by Model

Undoubtedly the most famous wartime pistol was the German Luger, although the British Webley was perhaps not so far behind. The key models in use during 1914-18 - invariably designed in the late nineteenth century (as were most rifles) - are described below.

Germany

Some two million Luger 9mm P08 pistols were manufactured during wartime, and although primarily issued to officers (since the pistol continued to be viewed primarily as an officer's weapon) it was also issued to soldiers engaged in a wide variety of tasks.

The Luger possessed a seven-round magazine loaded via the pistol butt. Recoil-operated the Luger was regarded as both reliable and accurate but was never available in sufficient supplies to meet ever-increasing demand. It was always a popular trophy when captured by Allied troops.

A variant of the Luger, the Parabellum M17, was issued in 1917. Possessing a longer barrel it resembled a machine carbine with its magazine capable of holding 30 rounds.

Given the scarcity of the Luger, other models were consequently produced and substituted, including the Beholla 7.65mm automatic and the Mauser C96 and C10 pistols. In fact the Mauser could lay a claim to being as popular and widespread as the Luger in the German army, and although bulky and somewhat awkward could fire a powerful 7.63mm or 9mm round.

The Mauser also had a wooden holster which, when fitted, effectively turned it into a shoulder-fired carbine rifle. The Mauser Automatic was also widespread (in its original 1894 format) among the Italian army.

Both the Turkish and Bulgarian armies depended upon the Germans for supplies of pistols, using both Mauser and Beholla models.

Britain
The Webley Mk IV revolver, produced by Webley and Scott in Birmingham, was the standard issue British pistol, with some 300,000 produced during wartime.

The Mk IV model, which debuted at the close of the nineteenth century, was a 11.6mm calibre weapon and proved immensely reliable (and consequently popular) in wartime conditions - even among Flanders mud.

The Webley was issued not only to British troops, but also to officers from Empire countries. Soldiers manning machine gun posts were usually equipped with a personal Webley revolver.

Much practice was required however before the Webley could be used accurately since it jumped on firing. Despite its high reputation British officers generally preferred the use of a captured Luger when the opportunity arose, supposedly on account of its longer range.

A variation of the Webley, a self-loading automatic, was available from 1913 but was viewed as overly complex by the army. It was nevertheless utilised by the Royal Navy.

France

The French standard issue weapon was the Pistole Revolveur Modele 1892. It was manufactured by numerous state-owned factories and also in Belgium and Spain.

Popularly referred to as either the 'Lebel' or 'model d'Ordonnance' it resembled the British Webley, although it fired six 8mm rounds. Deemed eminently reliable the Lebel remained in common use throughout the Second World War.

Whereas the Webley was snapped open for the purposes of loading, the Lebel's chamber swung out.

The Serbian army made use of French surplus stock, such as there was, for their own wartime use.

Belgium

The Belgium army was largely issued with two variants of the U.S. Browning revolver, namely the 1900 7.6mm blow-back and (less commonly) the 9 mm Model 1903.

Austria-Hungary & Romania

Both Austria-Hungary and Romania made extensive use of the Steyer Automatic, produced just before the war, in 1912.

The Steyer, which utilised an eight-round clip, fired 9mm bullets, although Hungarian home forces used a separate (Fegyvergyar) design firing 7.65 mm bullets; both were reliable weapons.

United States

The U.S. army (and navy) essentially utilised three pistol models during wartime.

The Colt 0.45-inch Automatic was introduced in 1911 and also used by the British Royal Navy in modified format.

Some 150,000 each of Colt Revolvers and Smith and Wesson Revolvers were manufactured; both fired 0.45-inch calibre bullets. As with the Colt Automatic the British also bought the Colt Revolver for their own use.

**Italy**

Italian forces were issued with the 1910 Glisenti 9mm automatic; at least, they were when it was available - numbers were never produced to meet up with continuing demand.

In some respects similar to the German Luger the Glisenti was notably less durable.

Two other models were often seen in Italian use. The Bodeo Revolver, designed in 1891, fired 0.45-inch calibre bullets; and the Beretta 7.65 mm automatic, produced in 1915, was widespread if unpopular (chiefly for the inaccuracy of its fire, a severe drawback).

**Russia**

Chronically short of revolvers, Russian officers were obliged to make do with whatever they could find.

Officially Russian officers were supposed to be issued either a Mauser Automatic (one of the older models) or the Belgian-designed Nagant revolver.

6) **Poison Gas:**

Considered uncivilised prior to World War One, the development and use of poison gas was necessitated by the requirement of wartime armies to find new ways of overcoming the stalemate of unexpected trench warfare.

**First Use by the French**

Although it is popularly believed that the German army was the first to use gas it was in fact initially deployed by the French. In the first month of the war, August 1914, they fired tear-gas grenades (xylol bromide) against the Germans. Nevertheless the German army was the first to give serious study to the development of chemical weapons and the first to use it on a large scale.

**Initial German Experiments**

In the capture of Neuve Chapelle in October 1914 the German army fired shells at the French which contained a chemical irritant whose result was to induce a violent fit of sneezing. Three months later, on 31 January 1915, tear gas was employed by the Germans for the first time on the Eastern Front.

Fired in liquid form contained in 15 cm howitzer shells against the Russians at Bolimov, the new experiment proved unsuccessful, with the tear gas liquid failing to vaporise in the freezing temperatures prevalent at Bolimov.

Not giving up, the Germans tried again with an improved tear gas concoction at Nieuport against the French in March 1915.

**Introduction of Poison Gas**

The debut of the first poison gas however - in this instance, chlorine - came on 22 April 1915, at the start of the Second Battle of Ypres.

At this stage of the war the famed Ypres Salient, held by the British, Canadians and French, ran for some 10 miles and bulged into German occupied territory for five miles. A combination of French territorials and Algerian troops held the line to the left, with the British and Canadians tending the centre and line to their right.

During the morning of 22 April the Germans poured a heavy bombardment around Ypres, but the line fell silent as the afternoon grew. Towards evening, at around 5 pm, the bombardment began afresh - except that sentries posted among the French and Algerian troops noticed a curious yellow-green cloud drifting slowly towards their line.

Puzzled but suspicious the French suspected that the cloud masked an advance by German infantry and ordered their men to 'stand to' - that is, to mount the trench fire step in readiness for probable attack.

The cloud did not mask an infantry attack however; at least, not yet. It signalled in fact the first use of chlorine gas on the battlefield. Ironically its use ought not to have been a surprise to the Allied troops, for captured German soldiers had revealed the imminent use of gas on the Western Front. Their warnings were not passed on however.

The effects of chlorine gas were severe. Within seconds of inhaling its vapour it destroyed the victim's respiratory organs, bringing on choking attacks. (For a memoir of the first gas attack click [here](http://school.nettrekker.com/goExternal?np=/external.ftl&pp=/error.ftl&evlCode=215270&productName=school&HOMEPAGE=H).)

**A Missed German Opportunity**

Panic-stricken the French and Algerian troops fled in disorder, creating a four-mile gap in the Allied line. Had the Germans been prepared for this eventuality they could potentially have effected a decisive breakthrough. However the results of their experiment caused as much surprise to the German high command as confusion among their opponents.

German infantry did advance into the gap, but nervously and with hesitance. Outflanking the Canadian and British troops to their right, the ensuing fighting was difficult. Although the Germans succeeded in seizing control of a significant portion of the salient the Allies nevertheless managed to re-form a continuous line, though in parts it remained dangerously weak.

**Condemnation - and Escalation**

The Germans' use of chlorine gas provoked immediate widespread condemnation, and certainly damaged German relations with the neutral powers, including the U.S. The gas attacks were placed to rapid propaganda use by the British although they planned to respond in kind.
The attack had one clear benefit at home however, for it brought to an end German hesitancy (and disagreement) over its use. The cat was out of the bag; and the use of poison gas continued to escalate for the remainder of the war.

**Allied Retaliation**

Once the Allies had recovered from the initial shock of the Germans' practical application of poison gas warfare, a determination existed to exact retaliatory revenge at the earliest opportunity. The British were the first to respond.

Raising Special Gas Companies in the wake of the Germans' April attack (of approximately 1,400 men) operating under the command of Lieutenant-Colonel Charles Foulkes, instructions were given to prepare for a gas attack at Loos in September 1915.

Interestingly the men who comprised the British Special Gas Companies were not allowed to refer to the word "gas" in their operations, such was the stigma attached to its use. Instead they referred to their gas canisters as "accessories"; use of the word "gas" brought with it a threatened punishment.

On the evening of 24 September 1915, therefore, some 400 chlorine gas emplacements were established among the British front line around Loos. The gas was released by turning a cock on each cylinder.

**British Setback at Loos**

The retaliatory attack began the following morning at 5.20 am. A mixture of smoke and chlorine gas was released intermittently over a period of about 40 minutes before the infantry assault began.

However, releasing gas from cylinders in this manner meant that the user had to be wary of wind conditions. It was desirable that a light wind exist in the direction of the enemy trenches; if the wind were to turn however, the biter would be bit.

In parts of the British line that morning this is precisely what transpired.

The wind shifted and quantities of the smoke and gas were blown back into the British trenches. It has been estimated that more British gas casualties were suffered that morning than German.

Although the numbers are arguable there is little doubt but that the exercise proved a failure: and the resultant infantry attack similarly failed.

**The Need for a New Delivery Mechanism**

Although it was the British who chiefly suffered on 25 September 1915 all three chief armies - Britain, France and Germany - suffered similar self-inflicted gas reversals during 1915. It became apparent that if gas was to be used a more reliable delivery mechanism was called for.
In consequence experiments were undertaken to deliver the gas payload in artillery shells. This provided the additional benefits of increasing the target range as well as the variety of gases released.

**Phosgene**

Following on the heels of chlorine gas came the use of phosgene. Phosgene as a weapon was more potent than chlorine in that while the latter was potentially deadly it caused the victim to violently cough and choke.

Phosgene caused much less coughing with the result that more of it was inhaled; it was consequently adopted by both German and Allied armies. Phosgene often had a delayed effect; apparently healthy soldiers were taken down with phosgene gas poisoning up to 48 hours after inhalation.

The so-called "white star" mixture of phosgene and chlorine was commonly used on the Somme: the chlorine content supplied the necessary vapour with which to carry the phosgene.

**Mustard Gas**

Remaining consistently ahead in terms of gas warfare development, Germany unveiled an enhanced form of gas weaponry against the Russians at Riga in September 1917: mustard gas (or Yperite) contained in artillery shells.

Mustard gas, an almost odourless chemical, was distinguished by the serious blisters it caused both internally and externally, brought on several hours after exposure. Protection against mustard gas proved more difficult than against either chlorine or phosgene gas.

The use of mustard gas - sometimes referred to as Yperite - also proved to have mixed benefits. While inflicting serious injury upon the enemy the chemical remained potent in soil for weeks after release: making capture of infected trenches a dangerous undertaking.

**Ever Increasing Production**

As with chlorine and phosgene gas before it, the Allies promptly reciprocated by copying the Germans' use of mustard gas. By 1918 the use of use of poison gases had become widespread, particularly on the Western Front. If the war had continued into 1919 both sides had planned on inserting poison gases into 30%-50% of manufactured shells.

Other types of gases produced by the belligerents included bromine and chloropicrin. The French army occasionally made use of a nerve gas obtained from prussic acid.

However three forms of gas remained the most widely used: chlorine, phosgene and mustard.

The German army ended the war as the heaviest user of gas. It is suggested that German use reached 68,000 tons; the French utilised 36,000 tons and the British 25,000.

**Diminishing Effectiveness of Gas**

Although gas claimed a notable number of casualties during its early use, once the crucial element of surprise had been lost the overall number of casualties quickly diminished. Indeed, deaths from gas after about May 1915 were relatively rare.

It has been estimated that among British forces the number of gas casualties from May 1915 amounted to some 9 per cent of the total - but that of this total only around 3% were fatal. Even so, gas victims often led highly debilitating lives thereafter with many unable to seek employment once they were discharged from the army.

In large part this was because of the increasing effectiveness of the methods used to protect against poison gas. Gas never turned out to be the weapon that turned the tide of the war, as was often predicted. Innovations in its use were quickly combated and copied by opposing armies in an ongoing cycle.

**Protection Against Gas**

The types of protection initially handed out to the troops around Ypres following the first use of chlorine in April 1915 were primitive in the extreme. 100,000 wads of cotton pads were quickly manufactured and made available. These were dipped in a solution of bicarbonate of soda and held over the face.

Soldiers were also advised that holding a urine drenched cloth over their face would serve in an emergency to protect against the effects of chlorine.

By 1918 soldiers on both sides were far better prepared to meet the ever-present threat of a gas attack. Filter respirators (using charcoal or antidote chemicals) were the norm and proved highly effective, although working in a trench while wearing such respirators generally proved difficult and tiring.

With the **Armistice**, such was the horror and disgust at the wartime use of poison gases that its use was outlawed in 1925 - a ban that is, at least nominally, still in force today.

7) **Rifles:**

Despite advances in **machine gun**, **mortar** and **grenade** technology, all remained relatively unwieldy and cumbersome in comparison to the rifle, which remained the most crucial, ever-present infantry weapon throughout World War One.

**The Number One Infantry Weapon**

The difficulty with these former weapons were their unwieldiness. While the infantry moved forward during a raid or attack the machine gun invariably proved impractical, both in terms of managing the machine gun itself but as much for the weight of the rounds of ammunition required to keep it serviceable.

As for the mortar, the fact that it was a one-shot weapon reduced its effectiveness. Grenades certainly had their role during a raid, but carrying buckets of supplies quickly proved tiring, and supplies generally ran out quite quickly.
Which left the pistol and the rifle, both key weapons on the battlefield, although the former was used less as an offensive weapon than the rifle, and were generally issued to officers rather than regular soldiery.

**Late 19th Century Development**

The single-shot, bigger-bore rifle was the subject of extensive research and development in the latter portion of the nineteenth century, with the result that the major powers introduced new models that were small-bore, bolt-action weapons capable of firing multiple rounds from a spring-loaded clip inserted into a rifle magazine.

Curiously, despite the intense interest in enhancing rifle capabilities in the years immediately preceding World War One no real developments were introduced during the actual war years - when ordinarily the reverse would be expected to be the case.

Rather, the key armies were chiefly concerned with ensuring that manufacturing of existing (adequate) models was kept at a high pitch. Research and development tended to be dedicated to other areas such as artillery, mortars, grenades and poison gases.

**Rifle Performance**

Although magazine design was clearly a factor in determining rifle performance, a greater impact was dependent upon the training and skill of the rifle operator himself. (Note that the advent of automatic and semiautomatic weapons waited until the last year of the war and beyond.)

Much has been made of the 15 rounds per minute achieved at Mons by riflemen of the British Expeditionary Force. However these were highly trained soldiers of what was then (August 1914) a professional army.

The flood of entrants to the New Armies - of all nations - could not hope to achieve such a sustained accurate rate of fire. The norm was perhaps eight to twelve rounds per minute.

In terms of range, the average during the war was around 1,400 metres, although accuracy could only be guaranteed at around 600 metres.

**Sniper's Friend**

The infantry aside, the rifle was a crucial element of the sniper's armoury: along with a human observer, that is.

Sniping as a military practice had proved its worth through the ages, but it was given an added importance in conditions of trench warfare.

Working day and night, trained marksmen would function essentially as assassins, often targeting any moving object behind enemy lines, even if they were engaged in peaceable tasks (which meant that if a sniper was taken prisoner he could expect no mercy, on either side).

Snipers were by no means specific to the Western Front; their talents were employed on all fronts, including Gallipoli, Italy and Africa.
Although the overall number of casualties claimed by snipers were small (although many snipers kept count of their number of 'kills', often reaching triple figures), they played an important role in sapping enemy morale.

Soldiers knew that they could not walk about freely along exposed trenches; anyone unwise enough to peep above the front line parapet could expect a well-aimed bullet in the head - as often happened.

The types of rifles used by snipers varied, and included the Lee-Enfield on the British side and, on the German, wide usage of the Mauser rifle, whose fitted optical sight rendered it ideal for the purpose.

**Rifle Models**

Given the relentlessly high demand for any and all forms of offensive weaponry during the war - particularly during its earliest days when armament production was only beginning to accelerate - many different types of rifle were pressed into service, including a fair number of ancient models.

However for the most part a core set of models were relied upon by the key belligerent armies.

**German Mauser**

The standard weapon in the German army, the 7.92 mm Mauser Gewehr 98 was designed (as its name suggests) in 1898 by Peter Paul Mauser (1838-1914). Somewhat superior in design to the majority of its contemporaries, it incorporated the clip and magazine into a single detachable mechanism, saving valuable loading time.

It suffered however from the disadvantage of being unsuited to rapid fire (on account of its bolt arrangement), and was limited by a five-cartridge magazine.

Nevertheless it was a thoroughly dependable, well tested and accurate weapon, and with its fitted optical sight, ideal for use in sniping.

**British Lee-Enfield**

Rivalling the Mauser both in terms of use and reputation was the British Lee-Enfield 0.303-inch rifle, which was issued to virtually all British soldiers on the Western Front (and many elsewhere). First produced in 1907 and officially titled the Short Magazine Lee-Enfield (SMLE) Mark III, the name was derived from its designer (James Lee, an American) and its manufacturer (the Royal Small Arms Factory based in Enfield, London).

Unlike the Mauser the Lee-Enfield, with its ten-cartridge magazine, was well suited to rapid fire; a suitably trained soldier could expect to fire twelve well-aimed shots a minute.

The Lee-Enfield proved so sturdy and reliable that its use continued into World War Two. Its design was also incorporated into both U.S. and Canadian models.

**French Lebel**
Just as the Germans adopted the Mauser and the British the Lee-Enfield, so the French opted for the Lebel 8 mm weapon (officially titled the Fusil modele, produced in 1886, and which unusually fired smokeless cartridges) as their rifle of choice during the war years.

Despite its wide use it suffered from a marked practical design flaw. Its eight rounds were loaded, nose to tail fashion, in a tubular magazine placed under the barrel of the rifle. This resulted in slow loading since the operator had to be wary of one round hitting the primer of the cartridge in front, thereby causing a most unwelcome explosion.

Although a better French model, the Berthier (see below), was available from 1916, the Lebel - despite its flaws - continued to be standard issue.

**French Berthier**

As indicated above, the French discovered a serious practical defect in their standard issue Lebel rifle. Thus, two years into the war, the Berthier was issued as an improvement. Officially titled the Fusil d'Infanterie Modele 1907, Transforme 1915, the replacement rifle was, like the Lee-Enfield, clip loaded. The differences with the Lebel did not stop there however. The rifle's sights were different as was its bolt mechanism.

A fine weapon, the original Berthier (designed in 1907) nevertheless suffered, like its predecessor, from a design flaw - its magazine held only three rounds. A modified version, produced in 1915, increased this to five rounds. The result was the Fusil modele 1916, loaded from a six-round clip or charger.

Immediately popular demand was such that certain supplies of the model were produced in the U.S. by the Remington company.

**Carbines**

A carbine (i.e. short-barrelled) version of the Berthier was produced in 1916, titled the Mousqueton modele 1916. Carbines were generally preferred by all armies as being somewhat less unwieldy than longer barrelled rifles.

Indeed, the move towards carbine development was perhaps the only notable advance to rifle technology during the war, although other modifications for trench conditions were undertaken, including the fitting of periscopes and tripods.

**U.S. Springfield**

The Springfield, manufactured in the U.S. (at Springfield, Massachusetts), was the standard wartime rifle of the U.S. army. It was reliable and produced in a short-barrelled version for issue to the American Expeditionary Force. In short supply however around half of U.S. soldiers in the field were issued with the M1917 'American Enfield'.

The performance of the U.S. rifle was comparable to the British Lee-Enfield, and was also produced in a Mk1 automatic version. The Springfield utilised a licensed Mauser action. Derivatives of the Springfield remained in use until the Korean War.
**Austro-Hungarian Steyr-Mannlicher**

Produced in Budapest and Steyr (in Austria), and known as the Repetier Gewehr M95, the standard issue rifle of the Austro-Hungarian army was first produced in 1895.

Considered a strong design, the Repetier Gewehr M95 withstood a so-called torture test of firing 50,000 rounds through a single rifle without lubrication of any kind. It was consequently produced in huge quantities during the war.

At one stage during the war the Austro-Hungarian army gave consideration to using the German Mauser rifle in preference to the Steyr-Mannlicher, before concluding that it was inferior in design to their own weapon.

This model was also subsequently used in large quantities by the Italian army (as World War One reparations).

**8) Tanks:**

No one individual was responsible for the development of the tank. Its design can be drawn back to the eighteenth century.

Rather, a number of gradual technological developments brought the development of the tank as we know it closer until its eventual form was unveiled out of necessity by the British army - or rather, navy, since its initial deployment in World War One was, perhaps surprisingly, overseen by the Royal Navy.

**Evolution of the Tank**

A (brief) history lesson is in order. The caterpillar track, upon which the tank travelled, was designed in its crudest form in 1770 by Richard Edgeworth. The Crimean War saw a relatively small number of steam powered tractors developed using the caterpillar track to manoeuvre around the battlefield's muddy terrain. Thus even in the 1850s the development of the tank seemed tantalisingly close - except that its development dimmed until the turn of the century.

With the 1885 development of the internal combustion engine (by Nikolaus August Otto) a tractor was constructed in the U.S. by the Holt Company which utilised Edgeworth's caterpillar tracks, again to facilitate movement over muddy terrain. It was even suggested at the time that Holt's machine be adapted for military purposes, but the suggestion was never acted upon.

Next up was Frederick Simms. In 1899 he designed what he termed a 'motor-war car'. It boasted an engine by Daimler, a bullet-proof casing and armed with two revolving machine guns developed by Hiram Maxim. Offered to the British army it was - as had the machine gun before it - dismissed as of little use. Lord Kitchener, later Britain's War Minister, regarded it damningly as "a pretty mechanical toy".

Development in related areas continued despite the British War Office's apparent lack of interest in the machine's potential.
Alvin O. Lombard of Penobscot County, Maine, produced and sold the first engine with crawler tracks in May 1901.

A British army officer, Colonel Ernest Swinton, and the Secretary of the Committee for Imperial Defence, Maurice Hankey, remained enthusiastic about what they believed to be the enormous potential of the tank, not least in breaking through enemy trench defences.

While Hankey produced the first official memo concerning the tank (in a memorandum on 'special devices') on 26 December 1914, it was Swinton who organised a demonstration of the Killen-Strait vehicle to senior politicians in June 1915 - almost a year after the war was underway.

Sponsored by Winston Churchill

In attendance at the demonstration of the Killen-Strait tractor were two future British Prime Ministers: David Lloyd George (who achieved the highest office by the end of the year) and the current First Lord of the Admiralty, Winston Churchill (who had to wait another 25 years before he finally became Prime Minister, in the next world war).

During the demonstration the tractor successfully demonstrated its ability to cut through a barbed wire entanglement. Both Churchill and Lloyd George came away impressed by its potential.

It was Churchill who, on Colonel Swinton's urging (and backed by Hankey), sponsored the establishment of the Landships Committee to investigate the potential of constructing what amounted to a new military weapon. The name of the committee was derived from the fact that, at least initially, the tank was seen an extension of sea-going warships - hence, a landship.

The Birth of the Landship - or Tank

Together the Landships Committee and the Inventions Committee, working with Colonel Swinton, agreed to go ahead with the design of the new weapon, which at that time remained nameless.

They therefore commissioned Lieutenant Walter Wilson of the Naval Air Service and William Tritton of William Foster & Co., based in Lincoln, to produce the first landship in secrecy. Its codename, given because the shape of the shell resembled water carriers, was 'tank'; the name, assigned in December 1915, stuck.

Swinton laid down certain key criteria that he argued must be part of the finished design. The tank must boast a minimum speed of four miles per hour, be able to climb a five foot high obstacle, successfully span a five foot trench, and - critically - be immune to the effects of small-arms fire. Furthermore, it should possess two machine guns, have a range of twenty miles and be maintained by a crew of ten men.

This first tank was given the nickname 'Little Willie' (soon followed by 'Big Willie') and, as with its predecessors, possessed a Daimler engine. Weighing some 14 tons and bearing 12 feet long track frames, the tank could carry three people in cramped conditions. In the event its top speed was three miles per hour on level ground, two miles per hour on rough terrain (actual battlefield conditions in fact).
The 'Little Willie' was notably restricted in that it was unable to cross trenches. This handicap was however soon remedied under the energetic enthusiasm of Colonel Swinton.

**The Role of the Royal Navy**

The tank was in many ways merely an extension of the principle of the armoured car. Armoured cars were popular on the Western Front at the start of the war, since at that stage it was very much a war of movement. Their use only dwindled with the onset of static trench warfare, when their utility was questionable.

The Royal Navy's role in tank development may seem incongruous but was in fact merely an extension of the role they had played thus far in the use of armoured cars. The navy had deployed squadrons of armoured cars to protect Allied airstrips in Belgium against enemy attack. It was this experience that Churchill drew upon when offering his department's support for the 'landship'.

**Production of the Tank**

The first combat tank was ready by January 1916 and was demonstrated to a high-powered audience. Convinced, Lloyd George - the Minister of Munitions - ordered production of the heavy Mark I model to begin (the lighter renowned 'Whippets' entered service the following year).

Meanwhile the French, who were aware of British tank experimentation, proceeded with their own independent designs, although they remained somewhat sceptical as to its potential; their focus at the time was firmly on the production of ever more battlefield artillery.

Nevertheless the French had their own Colonel Swinton, a man named Colonel Estienne.

He managed to persuade the French Commander in Chief, Joseph Joffre, of the battlefield potential of the tank as an aid to the infantry.

Joffre, ever a champion of the 'offensive spirit', agreed with the result that an initial order for 400 French Schneider (their first tank, named after the factory which produced them) and 400 St. Chaumond tanks was placed, although they were not used until April 1917.

Five months after its combat demonstration to the British, in June 1916 the first production line tanks were ready, albeit too late for use at the start of that year's 'big push' - the Battle of the Somme, which began on 1 July 1916.

**Early Use of the Tank**

Initially the Royal Navy supplied the crews for the tank. History was made on 15 September 1916 when Captain H. W. Mortimore guided a D1 tank into action at the notorious Delville Wood.

Shortly afterwards thirty-six tanks led the way in an attack at Flers. Although the attack was itself successful - the sudden appearance of the new weapon stunned their German opponents - these early tanks proved notoriously unreliable.

In part this was because the British, under Commander in Chief Sir Douglas Haig, deployed them before they were truly battle ready in an attempt to break the trench stalemate. They often broke down and became ditched - i.e. stuck in a muddy trench - more often than anticipated.

Conditions for the tank crews were also far from ideal. The heat generated inside the tank was tremendous and fumes often nearly choked the men inside. Nevertheless the first tank operators proved their mettle by operating under what amounted to appalling conditions.

The first battle honour awarded to a tank operator went to Private A. Smith, awarded the Military Medal for his actions at Delville Wood on 15 September 1916.

In April 1917 the French deployed 128 tanks in their Aisne Offensive along the Chemin-des-Dames; unfortunately however they did not distinguish themselves in this battle, once again proving highly unreliable (more so than the early British models). Similarly, at Bullecourt in April/May 1917 the Australians pronounced great dissatisfaction with the tank's performance.

Tanks were even deployed during the notorious, almost swampy, conditions of the Third Battle of Ypres (more commonly known as 'Passchendaele'). They promptly sank in the mire and were entirely without benefit.

**Tank Successes**

In what many regard as the first truly successful demonstration of the potential of the tank, the entire British Tank Corps (consisting of 474 tanks) saw action at the Battle of Cambrai on 20 November 1917 (although the French can lay claim to its earlier successful use at Malmaison).

In a sweepingly successful start to the battle twelve miles of the German front was breached, with the capture of 10,000 German prisoners, 123 guns and 281 machine guns.

Unfortunately for the British this enormous initial success was effectively cancelled out in German counter-attacks because the British did not possess sufficient infantry troops to exploit the breach they had created.

Nevertheless the successful use of tanks at Cambrai restored dwindling faith in tank development. The U.S. army took note and undertook development of its own tank series.

It also acted as a stimulus to the curiously hesitant German army, who had expressed continuing doubts as to the battlefield value of the tank.

They too began to hasten production of their own models, although they never pretended enthusiasm for their cause.

The U.S. Tank Corps adopted the use of French Renault tanks, light six-ton vehicles designed for close infantry support. Around 200 of these were used in action at St. Mihiel and again at the Battle of Meuse-Argonne during late September/early October (although losses were high in the latter action).

**Tank Versus Tank**

The first successful display of German tanks came on 24 April 1918, when thirteen German models, chiefly A7V's, engaged British and Australian infantry at Villers Bretonneux.

Successful in driving back the British and Australians this encounter was to become famous as the site of the first tank versus tank engagement. Three British Mark IVs fought three German A7Vs south of Villers Bretonneux, the British succeeding in driving off the German tanks. (Click here for a memoir of that encounter.)

**An Aid to the Infantry**

On 4 July 1918 the tank was used in a manner that helped to fashion the method in which it was deployed in future battles. General John Monash, commander of the Australian Corps, launched an attack at Le Hamel by unleashing a co-ordinated barrage of tanks, artillery and warplanes, all designed to clear a path for advancing infantry.

Monash saw no point in attempting to gain ground by using infantry to storm enemy machine gun positions. Rather he believed in using technology to facilitate a relatively uneventful infantry advance, with tanks at their head.

His view vindicated, Monash achieved victory at Le Hamel in just 93 minutes. Other commanders took note.

Tanks were increasingly used during the Allied advance of summer 1918.

During the French attack at Soissons from 18-26 July no fewer than 336 Schneiders, St Chamonds and Renaults were deployed to support combined French and American infantry.

However tank deployment on the grand scale was reached on 8 August 1918, when 604 Allied tanks assisted an Allied 20 mile advance on the Western Front.

**Tank Numbers**

By the time the war drew to a close the British, the first to use them, had produced some 2,636 tanks. The French produced rather more, 3,870. The Germans, never convinced of its merits, and despite their record for technological innovation, produced just 20.

With the French tanks proving more serviceable than their British equivalents they continued to be used beyond wartime.

The French Renault F.T. tank continued to grow in popularity as the concept of the tank as a close aid to advancing infantry prospered.

Both the U.S. and Italy produced their own tank designs which were based on the French Renault model, a testament to its design strengths. The Italians produced the Fiat 3000 and the U.S. the M1917.

Tank design continued to improve beyond the war and the tank, which helped to make trench warfare redundant, restored movement to the battlefield. Its widespread use continues to the present day.

9) Trench Mortars:

As with the grenade the mortar was yet another old weapon which found a new lease of life during World War One.

The Mortar: A Definition

A mortar is essentially a short, stumpy tube designed to fire a projectile at a steep angle (by definition higher than 45 degrees) so that it falls straight down on the enemy.

From this simple description it will be immediately apparent that the mortar was ideally suited for trench warfare, hence the common application of the 'trench' prefix.

Its Advantages Over Artillery

The chief advantage of the mortar was that it could be fired from the (relative) safety of the trench, avoiding exposure of the mortar crews to the enemy. Furthermore, it was notably lighter and more mobile than other, larger artillery pieces. And, of course, the very fact that the mortar bomb fell almost straight down meant that it would (with luck) land smack in the enemy trench.

Just as the mortar was another example of an ancient weapon given fresh reign, so too it was predictable that the German army, so better prepared for war than any of its counterparts in 1914, should have spotted the enormous potential of the mortar some years ahead of the Great War.

The State of Mortar Readiness in 1914

Indeed, German military observers of the Russo-Japanese War of 1904-05 not only came away with a new respect for hand grenades, but with fresh ideas for the use of the mortar bomb they had seen deployed.

In fairness to the Allied powers the Germans had a specific use for the mortar when they began to stockpile it in the immediate pre-war years. In short, they envisaged its use against France's eastern fortresses. Consequently by the time war arrived in August 1914 the Germans had some 150 mortars available.

And what of the French themselves? The re-birth of the mortar caught the French army entirely by surprise, as it did the British. At least the French could scramble to put into use ancient century-old Napoleonic mortars (referred to by the British as Toby mortars in honour of the British officer who had been struck with the idea of securing such old stockpiles of the weapon from the French).

The British however were entirely without supplies of the mortar, it having not been used at all during the South African War of 1899-1902. Even once its merits had been demonstrated by the Germans there were elements within the British high command who argued that it was without much worth. It took David Lloyd George (Prime Minister from late 1915) to push through manufacture of the weapon for it to be taken seriously.

However, as with the grenade, once the British finally grasped the manifest merits of the mortar it was embraced wholeheartedly, and its design much improved upon. Just as the British Mills

bomb became the war's most famous hand grenade, so the Stokes bomb became the best-known mortar.

**The German 1914 Mortar**

First things first however.

The German mortars at the start of the war - translated into German as 'minenwerfer' (literally 'mine-thrower') had been designed in 1908-09 and, at a monster-size 25 cm, were rifled mortars mounted upon field carriages (each mortar of this size weighed approximately 95 kg).

In fact the Germans had three sizes of mortar available. Aside from the huge 25 cm type (the heavy mortar), they had a light mortar (at 7.6 cm) and a medium mortar (17 cm).

Having first put these initial supplies into use on the French front, and having witnessed their results with satisfaction, minenwerfers were quickly put into mass production.

**The First British Mortar**

In late 1915 the British succeeded in hastening production of their first mortar. It was not of an impressive design, being little more than a 4-inch pipe, without rifling, sighting or recoil.

A simple cylindrical bomb was dropped base first into the pipe so that it fell on to a projecting pin at the pipe's base. This detonated the firing charge and so propelled the missile.

Mortars fired from this device had a maximum range of 1,500 yards and featured a built-in 25-second fuse, although this was soon changed to a percussion (impact) fuse.

**The Stokes Mortar**

Given that the Germans were considerably ahead in mortar preparedness it is remarkable that the British - and therefore the other Allied armies, since the British shared production of the mortar - caught up so quickly and surpassed the Germans in mortar excellence.

A Mr F.W.C. Stokes - later to become Sir Wilfred Stokes KBE - saved the day for the British in January 1915. That month he designed a mortar of brilliant simplicity. It became the standard issue for the British army for several decades and was the most widely used mortar among the Allied armies. Indeed, most mortars in use today are direct descendants of the Stokes mortar.

Stokes' design was simple but highly effective. It consisted chiefly of a smooth metal tube fixed to a base plate (to absorb recoil) with a light bi-pod mount. When a bomb was dropped into the tube an impact sensitive cartridge at the base of the bomb would make contact with a firing pin at the base of the tube, thereby ejecting the bomb.

3-inches in size the cast-iron mortar bomb itself weighed around 4.5 kg. It was fitted with a modified hand grenade fuse on the front, with a perforated tube (with minor propellant charge) and impact-sensitive cap at the back.
The Stokes mortar could fire as many as 22 bombs per minute and had a maximum range of 1,200 yards.

In addition to the light Stokes mortar the British also produced a 2-inch medium mortar and a 9.45-inch heavy mortar (bizarrely nicknamed 'Flying Pigs' by the British soldier) among other models.

By the final year of the war each British division possessed 24 light Stokes mortars, 12 medium and several heavy models.

**Mortar Tactics**

Mortars were undeniably effective in terms of trench warfare. Soldiers would often strain their ears to catch the "plop!" sound that indicated the firing of an enemy mortar, and consequently hasten into cover.

Inevitably, mortar positions rapidly came under fire from enemy artillery once their presence was detected. For this reason they were unpopular when sited among a given group of infantrymen, for it almost guaranteed a busy time along the trench.

Mortars were variously used to take out enemy machine gun posts, suspected sniper posts or other designated features. Larger mortars were occasionally used to cut enemy barbed wire, generally in situations were field artillery could not be used.

**Allied Use of Mortars**

Once the Stokes mortar had established itself as a highly successful model, Britain's allies - notably the French - borrowed the design. The British and French in particular worked together on mortar design throughout the war, each improving the other's designs.

Eventually mortar technology had advanced to the point where mortar bombs could be thrown up to around 2 km, but these models required large crews to manoeuvre them around the battlefield.

Another type of mortar - the oddly-named Vickers 1.75-inch 'toffee apple' - possessed a solid shaft surmounted by a spherical bomb.

Designed to land on its nose and explode on impact, these often proved unreliable, simply breaking into two pieces on many occasions.

The Canadians (namely Major-General G.L. McNaughton) invented a 91 kg mortar bomb, 9.45-inch in diameter, which the Canadian infantry nick-named the 'blind pig'. Generally unreliable and with a short range of 400 yards it nevertheless provided a boost to Canadian morale.

**The Central Powers**

Germany's allies by and large relied upon German minenwerfer designs throughout the war, which were always skilfully-produced.
Special minenwerfer battalions were created at the outset of the war that were used to reinforce given sectors at short notice at the disposal of GHQ. In addition to these special battalions, regular divisional and battalion minenwerfer companies were soon established.

By the war's end both sides possessed a full range of mortar bombs, each roughly equivalent in effectiveness to that designed by their enemy - and all potentially highly deadly.