

# Trench Warfare

## **Development**

The first development which was critical for trench warfare was the introduction of massive armies. Prior to this, armies still consisted of small numbers of troops which were unable to defend a large territory for very long—battles were either brief or degenerated into siege warfare. Large armies made it much more difficult for one army to outflank another, but it was still possible with cavalry and infantry charges for one army to break another by a direct assault.

What made this tactic increasingly suicidal was the development of improved firearm technology in the mid-19th century. When the American Civil War opened in 1861, it was fought with the same tactics that had been used in the era of Napoleon and indeed for several centuries. By the time the war drew to a bloody close in 1865, it had become a preview of the First World War, complete with trenches, machine guns, field fortifications, and massive casualties.

Two main factors were responsible for the change. First, the new breech-loading firearms—which were curiously ignored by both sides until mid-way through the conflict—made it possible for a small number of troops to maintain a heavy volume of fire. A handful of defenders sheltering in a trench or behind an improvised obstacle could hold off a large body of attackers indefinitely. Second came the machine gun, which multiplied the power of the defender still further and yet did little for an attacker.

Two other factors played a part. The first was the development of barbed wire, which in itself did little harm to anyone but—crucially—could slow the progress of an attacking force, and thus allow emplaced machine gunners and riflemen time to inflict unacceptable losses.

The second came after the end of the American Civil War, with the invention of modern high-velocity breech-loading artillery. Artillery in one form or another had been a part of warfare since classical times, and from the rise of gunpowder until the development of trench warfare in the 1860s had been a major killing force.

## **Implementation**

Although firearms technology and the conscript army dramatically changed the nature of warfare, most armies were completely unaware of the implications of these changes and unprepared for their consequences. At the start of World War I, most armies prepared for a brief war whose strategy and tactics would have been familiar to Napoleon.

However, as war broke out, German and Allied (mostly French and British) forces soon learned that with modern weapons even a shallow scrape in the soil could be defended by a handful of infantry. To attack frontally was to court crippling losses, so an outflanking operation was essential.

On the Western Front, the small, improvised trenches of the first few months rapidly grew deeper and more complex, gradually becoming vast areas of interlocking defensive works. The space between the opposing trenches was referred to as "no man's land" and

varied in distance depending on the battlefield. On the Western Front it was typically between 100 and 300 yards. On the Eastern Front the areas to be covered were so vast, and the distances from the factories that supplied shells, bullets, concrete and barbed wire so great, that trench warfare in the European style often did not eventuate.

## **Defensive system**

Early in the war the British defensive doctrine suggested a main trench system of three parallel lines with each line connected by communications trenches. The point at which a communications trench intersected the front trench was of critical importance and was usually heavily fortified. The front trench was lightly garrisoned and typically only occupied in force during "stand to" at dawn and dusk. Between 70 and 100 yards behind the front **trench** was located the support (or "travel") **trench** to which the garrison would retreat when the front **trench** was bombarded. Between 300 and 500 yards further to the rear was located the third reserve **trench** where the reserve troops could amass for a counter-attack if the front trenches were captured. This defensive layout was soon rendered obsolete as the power of the artillery grew; however in certain sectors of the front, the support **trench** was maintained as a decoy to attract the enemy bombardment away from the front and reserve lines. Fires were lit in the support line to make it appear inhabited and any damage due to shellfire was immediately repaired.

The Germans made something of a science out of designing and constructing defensive works. They used reinforced concrete to construct deep, shell-proof, ventilated dugouts as well as strategic strong points. They were more willing than their opponents to make a strategic withdrawal to a superior, prepared defensive position.

## **Trench construction**

Trenches were never straight but were dug in a square-toothed pattern that broke the line into bays connected by traverses. This meant that a soldier could never see more than 10 meters or so along the **trench**, consequently the entire **trench** could not be enfiladed if the enemy gained access at one point or if a bomb or shell landed in the **trench**, the shrapnel could not travel far. The side of the **trench** facing the enemy was called the parapet. The rear of the **trench** was called the parados. The parados protected the soldier's back from shrapnel from shells falling behind the **trench**. If the enemy captured the **trench** then the parados would become their "parapet". The sides of the **trench** were revetted with sandbags, wooden frames and wire mesh. The floor of the **trench** was usually covered by wooden duckboards (boards laid along the wet ground.)

Dugouts of varying degrees of luxury would be built in the rear of the support **trench**. British dugouts were usually 8 to 16 feet deep, whereas German dugouts were typically much deeper, usually a minimum of 12 feet deep and sometimes dug 3 stories down with concrete staircases to reach the upper levels.

To allow a soldier to see out of the **trench** without exposing his head, a **loophole** would be built into the parapet. A loophole might simply be a gap in the sandbags or it might be fitted with a steel plate. German snipers used armor-piercing bullets that allowed them to penetrate loopholes. The other means to see over the parapet was the **trench** periscope — in its simplest form, just a stick with two angled pieces of mirror at the top and bottom.

There were three standard ways to dig a trench; entrenching, sapping and tunneling. Entrenching, where a man would stand on the surface and dig downwards, was most efficient as it allowed a digging party to dig the length of the trench simultaneously. However, entrenching left the diggers exposed above ground and hence could only be carried out when free of observation such as in a rear area or at night. Sapping involved extending the trench by digging away at the end face. The diggers were not exposed but only one or two men could work on the trench at a time. Tunneling was like sapping except that a "roof" of soil was left in place while the trench line was established then removed when the trench was ready to be occupied.

In most places, the water table was only a meter or so below the surface, meaning that any trench dug in the ground would quickly flood. Consequently, many "trenches" in Flanders were actually above ground and constructed from massive breastworks of sandbags.

## Life in the trenches

An individual soldier's time in the front line trench was usually brief; from as little as one day to as much as two weeks at a time before being relieved. A typical British soldier's year could be divided as follows:

- 15% front line
- 10% support line
- 30% reserve line
- 20% rest
- 25% other (hospital, traveling, leave, training courses, etc.)

Even when in the front line, the typical soldier would only be called upon to engage in fighting a handful of times a year — making an attack, defending against an attack or participating in a raid. The frequency of combat would increase for the men of the "elite" fighting divisions.

Some sectors of the front saw little activity throughout the war, making life in the trenches comparatively easy.

During the day, snipers and artillery observers in balloons made movement perilous so the trenches were mostly quiet. Consequently, the trenches were busiest at night when cover of darkness allowed the movement of troops and supplies, the maintenance and expansion of the barbed wire and trench system, and reconnaissance of the enemy's defenses. Sentries in listening posts out in no man's land would try to detect enemy patrols and working parties or indications that an attack was being prepared.

Raids were carried out in order to capture prisoners and "booty" — letters and other documents that provide intelligence about the unit occupying the opposing trenches. As the war progressed, raiding became part of the general British policy, the intention being to maintain the fighting spirit of the troops and to deny No-Man's Land from the Germans.

## Death in the trenches

The intensity of World War I trench warfare meant that about 10% of the fighting soldiers were killed. This compared to 5% killed during the Boer War and 4.5% killed during World War II. For British and Dominion troops serving on the Western Front, the proportion of killed was 12% while the total proportion of troops who became casualties (killed or wounded) was 56%. Considering that for every front-line infantryman there were about 3 soldiers in support (artillery, supply, medical, etc.) it was highly unlikely for a fighting soldier to survive the war without sustaining some form of injury. Indeed many soldiers were injured more than once during the course of their service.

Medical services were primitive and life-saving antibiotics undiscovered. Relatively minor injuries could prove fatal through the onset of infection and gas gangrene. The Germans recorded that 12% of leg wounds and 23% of arm wounds resulted in death, mainly through infection. The Americans recorded that 44% of casualties that developed gangrene died. Half of those who were wounded in the head died and only 1% of those wounded in the abdomen survived.

Three quarters of the wounds inflicted during the war came from shell fire. The wound resulting from a shell fragment was usually more traumatic than a gunshot wound. A shell fragment would often introduce debris making it more likely that the wound would become infected. These factors meant that a soldier was three times more likely to die from a shell wound to the chest than from a gunshot wound.

As in many other wars, World War I's greatest killer was disease. Sanitary conditions in the trenches were quite poor, and common infections included dysentery, typhus, and cholera. Many soldiers suffered from parasites and related infections. Poor hygiene also led to conditions such as trench mouth and trench foot. Another common killer was exposure, since the temperature within a trench in the winter could easily fall below zero degrees Celsius.

Burial of the dead was usually a luxury that neither side could easily afford. The bodies would lie in no man's land until the front line moved, by which time the bodies were often unidentifiable. On some battlefields the bodies were not buried until after the war.

## **Weapons of trench warfare**

### **Infantry weapons**

The common infantry soldier had three weapons at his disposal in the trenches: the rifle, bayonet, and grenade.

The standard British rifle was the .303 Short Magazine Lee-Enfield, which was originally developed as a cavalry carbine and had an effective range of 1400 yards, though in the hands of the average soldier, 200 yards was about the limit of accurate fire. British infantry training emphasized rapid fire rifle shooting rather than accuracy.

The British soldier was equipped with a 21-inch sword bayonet, which was too long and unwieldy to be particularly effective in close quarters combat. However, bayonet use was safer than firing the rifle which, in a melee, might strike an ally instead of an enemy. British figures recorded that only 0.3% of wounds were caused by bayonets, however, a strike from a bayonet was highly likely to result in death. The bayonet was used to finish

off wounded enemy during an advance, saving ammunition while reducing the possibility of being attacked from the rear.

The grenade came to be the primary infantry weapon of trench warfare. Both sides were quick to raise specialist bombing squads. The grenade enabled a soldier to engage the enemy indirectly (without exposing himself to fire) and it did not require the precise accuracy of rifle fire in order to kill or maim.

## **Machine guns**

The machine gun is perhaps the signature weapon of trench warfare, with the image of ranks of advancing infantry being scythed down by the withering hail of bullets. The Germans embraced the machine gun from the outset—in 1904, every regiment was equipped with one machine gun—and the machine gun crews were the elite infantry units.

The British High Command were less enthusiastic about machine gun technology, supposedly considering the weapon too "unsporting", and they lagged behind the Germans in adopting the weapon.

The heavy machine gun was a specialist weapon, and in a static trench system was employed in a scientific manner, with carefully calculated fields of fire, so that at a moment's notice an accurate burst could be laid upon the enemy's parapet or at a break in the wire. Equally it could be used as light artillery in bombarding distant trenches. Heavy machine guns required teams of up to eight to move them, maintain them and keep them supplied with ammunition.

## **Mortars**

Mortars, which lobbed a shell a relatively short distance, were widely used in trench fighting for harassing the forward trenches and for cutting wire in preparation for a raid or attack.

The main British mortar was the Stokes mortar. To fire the Stokes mortar, the round was simply dropped into the tube, where the cartridge was ignited automatically when it struck the firing pin at the bottom.

## **Artillery**

Artillery dominated the battlefield of trench warfare in the same way the air power dominates the modern battlefield. An infantry attack was rarely successful if it advanced beyond the range of its supporting artillery. In addition to bombarding the enemy infantry in the trenches, the artillery would engage in counter-battery duels to try to destroy the enemy's guns.

Artillery mainly fired shrapnel, high explosives or, later in the war, gas shells.

Artillery pieces were of two types; guns and howitzers. Guns fired high velocity shells over a flat trajectory and were often used to deliver shrapnel and to cut barbed wire. Howitzers lofted the shell over a high trajectory such that it plunged into the ground. The

biggest artillery were usually howitzers. The German 420 howitzer weighed 20 tons and could fire a one ton shell over six miles.

## **Gas**

Tear gas was first employed in August 1914 by the French but this could only disable the enemy. In April 1915, chlorine was first used by Germany. A large enough dose could kill but the gas was easy to detect by scent and sight. Those that were not killed on exposure could suffer permanent lung damage.

Phosgene, first used in December 1915, was the ultimate killing gas of World War I — it was 18 times more powerful than chlorine and much more difficult to detect. However, the most effective gas was mustard gas, introduced by Germany in July 1917. Mustard gas was not as fatal as phosgene but it was hard to detect and lingered on the surface of the battlefield and so could inflict casualties over a long period. The burns it produced were so horrific that a casualty resulting from mustard gas exposure was unlikely to be fit to fight again. Only 2% of mustard gas casualties died, mainly from secondary infections.

## **Helmets**

During the first year of the war, none of the combatant nations equipped their troops with steel helmets. Soldiers went into battle wearing simple cloth or leather caps that offered virtually no protection from the damage caused by modern weapons. Once the war entered the phase of trench warfare, the number of lethal head wounds that troops were receiving from shrapnel increased dramatically.

The French were the first to see a need for greater protection and began to introduce the first steel helmets in the summer of 1915.

None of the standard helmets could protect the face or eyes, however. Special face-covers were designed to be used by machine-gunners, and the Belgians tried out goggles made of louvers to protect the eyes.

## **Wire**

The use of barbed wire was decisive in slowing infantry traveling across the battlefield. Without it, fast moving infantry (or cavalry) might cross the lines and reach the enemy machine gun posts and artillery. Slowed down by the barbed wire, they were much more likely to be shot down by the machine guns or infantry men.