



地雷通史

*Mines, a
comprehensive*

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comprehensive**

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Preface

As an important member of the war scene, landmines has played an important role in the war drama in the history of the war. But in these days of relative peace, landmines still exist in old battlefields, they still exist in new battlefields of conflict, they still exist on sand maps in armies..... Ever since its invention, the landmine has never been late and can be attacked or withdrawn in the war. This unique strategic significance makes it impossible to erase in the war, and the scars it leaves on people will not be washed away by time. It is in this way that landmines have left a permanent mark on the development of mankind, whether in the wartorn past or the relatively peaceful present, or in the unpredictable future.

Although most people's impression of landmines today is confined to TV dramas, or the comics and comic books that the older generation used to recite, landmines seem infinitely distant from us. But few would imagine that such minefields still exist, not only in warprone areas but even in peaceful villages. However, the power of landmines in the TV series is only a fraction of that in the real world. It is hard to imagine that landmines with a lethal area of tens of meters are still buried under inaccessible soil on a large

scale. In addition, landmines release toxic carcinogens that contaminate groundwater over time; the potential danger and visible pollution thus created a "life exclusion zone".



Landmine Village

In short, landmines always represent fear and danger, both in war and in peace, and they remain the mark and symbol of war. This book will begin with the history of landmines, introduce the story of landmines, and restore the original appearance of landmines. Firstly, it is briefly introduced that landmines are explosive firearms buried under or laid on the ground. The earliest landmines originated from China. By the early years of the Ming Dynasty, China had real landmines with mechanical ignition devices. There are detailed records of various landmines in Ming dynasty documents, which indicates that the landmines in China had reached a certain level at that time, while the landmines

began to appear in Europe only in the 15th century in defensive fortifications. After the middle of the 19th century, the emergence of various high explosives and deonation techniques led to the standardization and diversification of landmines, thus giving birth to modern landmines.

In the following three volumes, the story of landmines and the development of the war behind its development will be introduced from the three stages of ancient, modern and modern.



Modern Landmines

Upper Volume

Ancient Volume



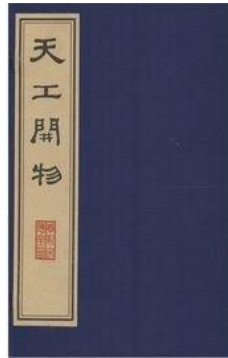
1.The Preliminary Rudiment of Song

Dynasty to Ming Dynasty

Landmines are weapons with a long history that originated in China. In 1130, the Jin army attacked ShanZhou, and the Song army used "gunpowder cannons "(that is, ironshelled mines) planted on the ground to kill and destroy the Jin army, which was the earliest record of large-scale use of landmines in human history. Since the middle of the 19th century, with the progress of science and technology, mankind has invented various high explosives and detonating technologies, making landmines standardized and diversified, thus giving birth to modern landmines. This chapter will begin with the oldest landmines and tell the story of the millennium behind them.

Landmines have been around in our country for more than 500 years. "Bing Zuanwen" said: "Zeng Milling as a landmine, cave more than zhangyu, cabinet medicine in the middle, covered with stone, more covered with sand, to the ground level, fu fire in the ground, the machine on the ground, the past cuter, fire fell off stone flying down to kill, the enemy startled god. The book "The Work of Heaven", written by Song Yingxing in the Ming Dynasty, also introduced landmines, and also drew the structure of landmines, the method of making

them and the shape of the landmines when they exploded. Weapon makers in the Ming Dynasty first invented landmines, which were widely used in wars. The Ming Dynasty military book *Wu Bei Zhi* records the shape, structure and characteristics of more than 10 kinds of mines, and draws the structure map of mines. Most landmines are made of stone, pottery and iron. They are buried in the ground and ignition devices such as treading, tripping, pulling and pointing are used to kill and injure the enemy. Early land-mines were mostly made of stone into a round or square, with deep holes cut in the middle, gunpowder inside, and then ground, leaving a small gap to insert into a thin bam-boo tube or reed tube, which pulled out the fuze, and then sealed with pulp mud, buried in the enemy's only way, when the enemy is near, light the fuze, detonated the landmine. This kind of stone landmine is also called "stone bomb". Its simple structure, easy to draw materials, widely used in combat. But also because the storage amount is small, the ex-plosive force is small, and gradually be renewed. Since then, the shape and structure of mines, especially ignition devices, have been constantly improved, expanding the effective killing range of landmines. Landmines also come in many forms.



Picture of Tiangong Kaiwu



Picture of Wu Bei Zhi

Tiangong Kaiwu Jiabing Volume 15——Firearm

Western gun, cooked copper cast, round like a drum. Within half a mile of being released, the horse and horse died of fright. (the ground Ruo bring about the tear, forward camp party check. Point lead, people go back into the pit, the sound of the cannon in the high head, let go of the party is not killed. Red yi gun, made of cast iron, long zhang Xu, used to defend the city. The iron bomb and powder in several bucket, flying exciting two li, its front for jifen. Within gun Ruo led the burning, the first to sit back force, its a wall to resist, it often wall collapse.

The general, the two generals (i.e. the second red Yi, in China for the giant), and the Buddha langji (water war boat head). Three eye blaster, hundred gun.

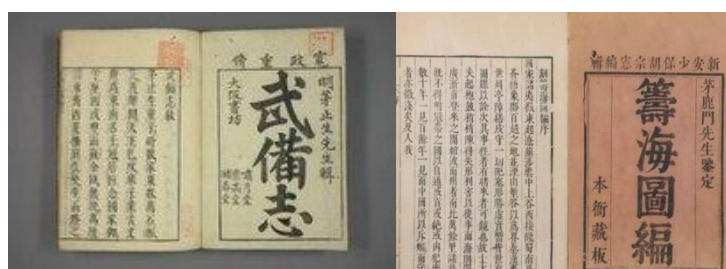
Landmine: in the ambush soil, the bamboo tube passes through, flushes the soil to strike, its body explodes from it to crack.

The so-called horizontal strike, with yellow. (Lead wire with alum oil, muzzle covered with basin.)

Mixed jianglong: painted solid leather gun submerged in the bottom, with index machine on shore. Bag hanging flint, fall, cable machine move, which spontaneous. If the enemy passes in a boat, he is defeated. But this end fool is also.

The above are the official records of the earliest landmines in China. In the early stage of ancient Landmines in China, the structure of landmines was relatively simple. Most of them were stone shells filled with gunpowder. In addition, landmines have developed into tactical strategies in the practice of constant warfare. It is recorded in the end of Ming Dynasty History, The King of Yan rose in rebellion, that in the second year of The Reign of Emperor Jianwen (1400), "in the land of Tibetan firearms, horses and horses met at every turn." Early mines were simple in structure, mostly stone shells filled with gunpowder, plugged into fuzes and buried in the ground, sealed and camouflaged. When the enemy approaches, the fuse fires and the mine explodes. After the middle Ming Dynasty, the use of landmines increased. The shells are mostly made of iron, and the fuze has been improved. Wanli eight years (1580), Qi Jiguang town guard Jizhou, had made steel wheel flint detonating device "steel wheel ignition". It is to install a set of transmission

mechanism in the casing. When the enemy steps on the motor cable, the falling stone in the casing will fall, drive the steel wheel to rotate, and cause rapid friction and ignition with the flint, thus triggering the landmine. This device improves the accuracy and reliability of landmine ignition timing. At the end of the Ming Dynasty, there were more kinds of landmines. According to the records of the Compilation of Charts, The Miscellany of Practical Training Records, and the Records of Military Preparations, there were more than ten kinds of landmines used by the Ming Army. According to the way of detonation, there are combustion hair, pull hair, trip hair, machine hair, etc. In addition to single lightning, there is also a fuze to control the explosion of a group of lightning, a mother detonation detonation of several sublightning "sublightning". Landmines may also be placed on vehicles, in buildings or in anti-personnel landmines as required by operations.



Shadow of Wu Bei Zhi Shadow of The book Chiu Hai Tu Zhi

In the Ming Dynasty, the steel wheel ignition device was improved in the defense against Japanese pirates, and the timing accuracy and reliability of landmine ignition were improved. Compared with the Western countries of the same period, the level of landmine in firearms in China has been the world's leading, and the characteristic landmines such as landmine, landmine and mother landmine are widely used in wars. However, in the late Ming Dynasty, China also absorbed the experience of firearms from the West, and improved landmines by translating and incorporating relevant knowledge of landmines into military works, with specific representatives appearing especially in the Qing Dynasty.



Landmines unearthed in Ming Dynasty

The Landmines unearthed are hollow spheres made of iron, with two sizes: the large one has a diameter of 11cm and a mass of 1.7kg; The small one has a diameter of 8.5cm and a mass of 0.8kg. A conical tube, 0.6~0.7cm high, with a diameter of about 3cm at the lower part and 2cm at the upper part,

and a round hole with a diameter of 0.4~0.5 cm in the middle is protruded from the upper part of the sphere. For the purpose of gunpowder charging and detonation, the rusty hole can be opened to pour out the black powder inside. One of the larger ones was loaded with gray SLATE color and was partly a uniform grain size grain of rice. The granules do not form naturally, but must be "granulated" during the manufacturing process. The sulfur content of black gunpowder at that time accounted for about 20 percent, making it relatively easy to "granulate". After "granulation" treatment, black powder has good fluidity and easy loading, and at the same time has appropriate and definite "loading density". In this way, there will be no parallel layer combustion caused by overloading and no eruption caused by overloading and no small power or dud defect caused by overloading. When detonated, the flame passes through the gap between the particles, igniting all the gunpowder in the landmine at the same time, causing a powerful explosion. According to the Course of Pyrotechnic Medicine, "In 1525 France first began to make powder granulation." This excavation proves that China first carried out the granulation process, and the time was more than 130 years earlier.

The landmine was seriously corroded, and there was not much iron left. According to the estimation, the wall

thickness of the original landmine was about 0.6cm, with 430g of black gunpowder inside, and the explosive energy was equivalent to more than 200 grams of TNT. The small one is 0.4~0.5cm thick, with about 200g of black gunpowder inside, and the explosive energy is equivalent to 100g of TNT explosive. The damage is comparable to today's anti-infantry landmines.

At this point, China's landmines in the Ming Dynasty around the development of the top strategic weapons at that time, sophisticated structure, remarkable power. They have made a great contribution to the development of the world's landmines.

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[4]Pictures from the Internet.

2.The Early Landmines of the Ming and Qing Dynasties

Although the development of landmines in China took the first place in the Ming Dynasty, with the change of the western era, the science and technology related to gunpowder in China was relatively stagnant. It was not until the end of the Qing Dynasty that the new landmine reform was triggered. But by then, the learned technology was far from satisfying the situation at that time.

Continue the previous chapter of the Ming Dynasty advanced landmine manufacturing technology and outstanding military applications. Early landmines were mostly made of stone into a round or square, with deep holes cut in the middle, gunpowder inside, and then ground, leaving a small gap to insert into a thin bamboo tube or reed tube, which pulled out the fuze, and then sealed with pulp mud, buried in the enemy's only way, when the enemy is near, light the fuze, detonated the landmine. This kind of stone landmine is also called "stone bomb". Its simple structure, easy to draw materials, widely used in combat. But also because the storage amount is small, the explosive force is small, and gradually be renewed. Since then, the shape and structure of landmines, especially ignition devices, have been constantly improved,

expanding the effective killing range of landmines. The Ming Dynasty also created the official booth gun and the bureau gun, specially embedded in the hall of the official or the official booth, after the enemy occupation, as long as the firing mechanism, the landmines immediately exploded.

By the early Ming Dynasty (the 14th century), China had real landmines with mechanics firing devices. JiaoYu in 1413, according to the "dragon" contained in an action: "Fried processing in pig iron casting, on an empty stomach, put medicine pestle, into small bamboo tube, wearing a wire within, external use long term wear tank fire, choose the necessary way to coach, repeatedly tens of buried pit, medicine slot connect steel wheel, soil cover, make the thief don't know, dynamic hair machines, shock, iron such as fly, high flames." It can be seen that "blaster" is not only the earliest firing landmine, but also similar to today's "serial landmines", from which the word "landmine" came. In 1580, when The Ming dynasty general Qi Jiguang was stationed in Jizhou, he made a landmine called "steel wheel ignition". When the enemy stepped on the cable of the motor, the steel wheel turned and the flint rubbed against the fire sharply, which ignited the landmine. The steel wheel ignition device improves the accuracy and reliability of landmine ignition timing. There are detailed records of various landmines in Ming dynasty

documents, which indicates that the landmines in China had reached a certain level at that time, while the landmines began to appear in Europe only in the 15th century in defensive fortifications.



Relevant Records in the Book of Fire Dragons

General Qi Jiguang



Ming Dynasty "Landmines" Unearthed in Inner Mongolia

In Tokto County, 80 kilometers southwest of Hohhot, the capital of Inner Mongolia Autonomous Region, more than 20 iron-shelled mines were unearthed at the same site in the fall of 1999 and spring of 2000, the site of the "Dongshengwei" city in the early Ming Dynasty. These unearthed objects corroborate the ancient written records. The unearthed mines have a round appearance and meticulous workmanship. There is no trace of fitting model or gate, and there is no trace of multiple assembly after careful examination of their structure. That is to say, the whole shell was cast in one piece. Only a charging ignition hole with a thickness of about 0.5cm is connected inside and outside the shell. From the casting technology, the technical difficulty is very big. For traditional sand mold casting, a core with a diameter of 10cm or 7.5cm must be placed in the outer sand mold; The clearance between the mold core and the inner wall is only 0.6~0.5cm. The mold core can only be fixed with the outside by a hole with a diameter of 0.5cm, and it must be subjected to the high temperature and impact of molten iron. Even if the shell can be cast, the core out will be very troublesome, it is difficult to achieve. We conjectured that it might have been cast by centrifugation, a method which sounds like a "fairy tale," but which is possible to speculate upon. Of course, this is only a guess, how exactly

it remains to be proven. In any case, the surprising skill of the ancient craftsmen was astonishing. The detonation method of this landmine can only be manually ignited with a lead or a twist of gunpowder through a "bamboo tube". It was not until the early 16th century that a flint-firing mechanism with a spring turning a steel wheel to rub against the flint was invented. The flint flintfiring mechanism was later invented. A truly reliable and flexible detonating device was not available until the advent of pyrochemicals such as fire caps, but that was in the 19th century. In the eighth year of wanli (1580), Qi Jiguang made steel wheel flint to detonate treading landmine, but it was not popularized for various reasons. Until the end of the Ming Dynasty, when Song Yingxing wrote "The Work of Heaven", the common landmines he saw were still "in the ambush place, the bamboo pipe was opened, and the ground was smashed". Visible lead initiation was the most reliable method at that time.

The landmine was the crystallization of the most advanced science and technology at that time, and reflected the wisdom and wisdom of the Chinese people. It is now housed in The Museum of Toketo County, Inner Mongolia.

Even though the advanced landmine technology was pioneered in the world and maintained for hundreds of years, it did not exert its real strength in the Qing Dynasty. In

the early Qing Dynasty, the rulers paid little attention to the manufacture and use of mines and explosive devices. Until after the Opium War, Ding Shoucun, Huang Mian and other people began to actively develop a variety of landmines, mainly to pull hair thunder and trip thunder. Ding Shoucun had invented a "jump thunder", had taken to Tianjin audition, very effective. This kind of mine is to put a round iron mine into the wooden cabinet. The lower part of the cabinet is filled with gunpowder and connected with the landmine fuse. The wooden cabinet is equipped with a firing device. When using, bury the wooden cabinet into the ground first, beside the wooden cabinet, find a place to turn over the car, connect with the ignition device inside the cabinet. Once the enemy steps over the vehicle by mistake and affects the ignition device, the gunpowder explodes, and the landmine in the cabinet can be thrown to the ground seven or eight feet high, exploding in the air, and its killing range can reach dozens of feet in a square, with great power.

In the 70 years of the late Qing Dynasty, foreign aggression was grave and civil strife was frequent, and war became an important subject. Landmines played a common role in many wars in the late Qing Dynasty, but there are few books to reveal their development and application. Through the excavation of historical materials, we can know that the

development of traditional landmines to Western-style landmines generally went through four stages: the establishment period (the Opium War), the traditional peak period (the Second Opium War and the Taiping Heavenly Kingdom War), the traditional decline period (the Sino-French War and the First Sino-Japanese War), and the completion period of Westernization (after the First Sino-Japanese War). According to the analysis of the historical data of landmines, we can have a deeper understanding of the history of tactics and weapons in the late Qing Dynasty, as well as the rise, fall and change of traditional landmines. From the source, it can be seen that China's traditional military is difficult to save itself, so it must carry out comprehensive westernization transformation. The modernization process of mines in the late Qing Dynasty reflects the general trend of military westernization. The specific process is complex and will not be repeated here. Various historical data show that the landmines of the Qing Army were modernized after the Sino-Japanese War of 1894–1895. The author believes that the Qing army made rapid progress in landmine development during this period, and advanced western electric landmines replaced the backward traditional landmines. On the other hand, the use of western landmines in the Qing army, due to the maintenance and use of the need to introduce basic

scientific knowledge, also prompted the Qing army soldiers modern military quality improvement. In short, the Chinese finally faced up to their backwardness, paid attention to Western law, and eliminated the obsolete weapons and methods of warfare, which promoted the progress of the concept of warfare.



Song Gongbao Dasheng Motianling Qing. Prints



Song Qing, a General of the Qing Dynasty, Won a Great Victory at Motianling by Ambushing
and Landmine Warfare

The second figure above shows the results of the Qing Army in the Korean War during the First Sino-Japanese War. The specific reason why it is drawn like this is a self-evident social and historical issue at that time, but it does reflect the fact that landmines are still in use as a common means.

In related study, the author preliminary study in the late Qing dynasty about landmine after the relevant historical materials, summarized as follows:

1. After the opium war, scholars rather attaches great importance to the technical innovation, to the second opium war and the taiping heavenly kingdom movement, the traditional pinnacle mines technology development, and then because of the change of mode of war, the introduction of weapons technology and tends to decline, west to be being washed out gradually, will soon enter the 20th century, mines has become the main form of regular army mine equipment in the late Qing dynasty. The development process of landmines in the late Qing Dynasty can be summarized as follows: from the old to the new, from the crude to the fine, from the middle to the west.

2. The landmines of the Late Qing Dynasty were very effective in the civil war, but they had few successes in fighting with the western foreign enemies. The reason is probably that the technical level and command level of both sides were at a low

level in the civil war, so they were effective. But in the foreign war, although the Chinese made great efforts to carry out military innovation, it was difficult to make up for the huge gap in military affairs formed for a long time between China and the West. Chiang Tingfu said: "our weapon and army were the medieval army", the same weapon met different enemies, and the result was very different.

3.It should also be pointed out that with the introduction of modern artillery in the West, the weapon of mine gradually took a second place in the war. For example, the traditional method of mine siege is not only time-consuming, but also requires high requirements for the field environment. When artillery could be introduced into China in large quantities in modern times, the tactical status of landmine siege law was reduced, and landmines rarely played a leading role in tough battles. Until the Sino-Japanese War of 1894-1895, landmine siege law had played a minor role in tough battles.

Landmine warfare is fully behind the helpless choice of the late Qing dynasty army, landmines, as a secondary weapon, by the Qing had excessive expectations, blindly take the war experience accumulated during the civil war, the Qing army has a tin ear for the western technology progress, the very big change, after the Sino-Japanese in Beiyang army Chengjun,

modernization of the Qing Army basic completed landmine equipment, a new era of open landmines weapons from now on.

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[4]Pictures from the Internet.

Middle Volume

Modern Volume



1.The Early Landmines of the West



American Civil War oil painting

Compared with the development of landmine technology in China, landmines began to appear in fortress defensive battles in Europe in the 15th century, and gunpowder was introduced into the Middle Ages as the core of thermal weapons. The history of mankind and the transformation of weapons began with this powder. However, the record of landmines at that time was limited to defense and the technology was not yet mature. It was the Civil War that brought them into full play.

This chapter begins with the civil War, the first battle in which landmines were used as a strategy, and reveals the far-reaching consequences of that battle. It is well known that the English colonists brought European rule, ideas, guns and gunpowder with them to the distant Lands of America, and of course all the contradictions that followed. With these foreshadowing, there will be later wars and history.

"We have the honor to inform you that we will be firing on Fort Sumter in an hour." An hour later, the first shots were fired and the Civil War sank into a quagmire that killed hundreds of thousands of people over four years. Fort Sumter was a fort near Charleston, a key point in South Carolina. At that time, Charleston was the fifth largest city in North America and the main port in South Carolina, so its strategic significance was self-evident. After losing Charleston, the North quickly sealed off the city's outer waters with its navy, and there was a fierce naval battle between the North and the South.

It was March 8, 1862, and the Southern Navy saw the appearance of a monster called Virginia, clad in iron plates and almost defenseless. The Virginia went on a killing spree near Hampton Roads. Three Union ships were wounded, grounded, and two sank. During the battle, the steel monster was hit by hundreds of shells without any real impact. The next day, the

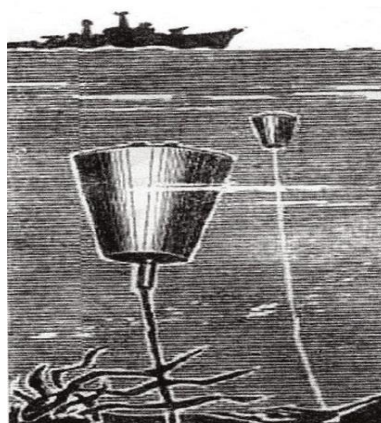
Monite came to the aid of the Union Army. The same steel body, the two steel monsters led to the first ironclad battle in human history. After more than four hours of fighting, in which hundreds of shells were fired but the other could not be seriously wounded, the two sides withdrew from the battle for lack of ammunition. If an ironclad could not sink an ironclad, how could it be won? The weaker Confederates realized that they could build ironclad ships, but they could not compete with the industrial system of the North. More and more Union ironmongers were imposing a powerful blockade of the southern seas, and at any moment the south, heavily dependent on foreign trade, was in danger of being cut off from its lifeline. The Confederacy began experimenting with a "torpedo" design from inventor Fulton's time. This design was completely different from today's torpedoes, except for a long wooden pole on the bow with an explosive bag attached to the top. Desperate, the Southern Navy converted a gunboat into a torpedo boat and named it the Torch. These are maritime landmines, humble as they are, but they are also a landmine strategy against an ironclad ship.



Fulton the engineer



Naval Battle of the Civil War -- the first major war in the Era of ironclad ships

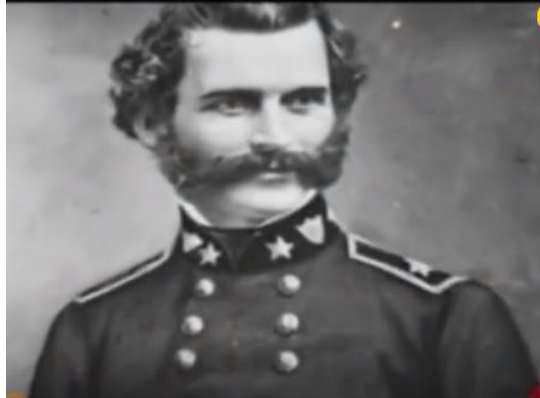


The "Singer" landmine, invented by the Confederate army during the American Civil War, was brilliant and damaged several Union warships.

Returning to the battlefield on land, primitive traps are still widely used in the jungle with complex terrain, but this simple structure is far from meeting the needs of the time, and increasing the damage and range is the direction of weapon change. Gunpowder joined the underground war, giving rise to the trap that changed then and even today: the landmine. This mysterious killing tool gives the military a huge strategic advantage when it comes to exploiting it. Its use on a large scale creates invisible barriers and limits the movement of the enemy, thereby controlling the war.

In the town of Yorktown, in southeastern Virginia, during the Civil War in 1862, the Confederate Army improvised a landmine out of the shell that Reines had buried beneath the ground to cover the retreat of his troops. The union troops who were following him stepped on a fuse and set off the landmine, which was then blasted into the sky. Landmines have not only brought death and injury, but also fear, crippling the Union Forces. As a result of the success of this tactic, the Confederacy greatly popularized the use of landmines. By 1864, massive landmines had been deployed to fortify the main cities in the south. Then, in 1862, the Northern and Southern Confederates at Hentry, Bermuda, began using mines as a form of war strategy. The landmine strategy was widely

used in the wars of the late 19th century and the First World War.



Confederate General Reince



Priefuestra Soldiers laying landmines

Landmine Log

In May 1862, United States troops marched directly toward Richmond, the rebel capital in the south. Early in the morning of May 4, near Yorkton, the historic battleground of the American Revolution, a fast cavalry regiment appeared.

Suddenly there was an explosion which drowned the sound of horses' hooves, and smoke filled the air. A rider and his horse were thrown into the air by a great wave of air. The terrible force of the explosion, and the unexpected surprise, alarmed the Union cavalry. Was it the enemy shelling? But there was neither the smoke nor the fire of the cannons, nor the sharp cry of the cannonballs! Amid the shrieks and screams of horses, the explosions were repeated. The Union cavalry had to give up their pursuit, and it was three days before they cautiously resumed the road. They seized the legendary "special shells" of Confederate deserters, these seemingly ordinary shells, shallow and attached to trip ropes, that exploded when they moved. Explosions went off even though the Yankees were on alert, and a soldier trying to rest under a tree accidentally hit his tripwire again. Landmines are famous for the first World War.

It was Confederate general Gabrielle Raines who created the successful case in military history of "four landmines" blowing up a squadron of cavalry. A West Point student in 1827, he fought in the Mexican–American War and rose to lieutenant colonel in May 1861. When North Carolina seceded from the Union, he resigned his commission and returned home. The Civil War broke out and the Confederate Government appointed him colonel. The ambush on the morning of May 4

was a desperate attempt to save Reince's life. The artillery, which he commanded, was moving slowly in the muddy road, and was about to be overtaken by the Yankees. As it happens, this man is skilled in the modification of explosive devices. He ordered a load of cannonballs to be put into detonators and buried in the path of the Union Army. Never thought it would work. Since then, Raines open the floodgates, concentrate on developing various explosive devices, from the hand of his explosive devices, style emerge in endlessly, some modified by shell equipped with some buckets or thin neck on glass bottles of explosives, the real mystery in its design is detonator charge formula, this formula is listed as one of confidential patent products in wartime, until after the war. At that time, the Union soldiers, really do not know why these "underground shells" suddenly exploded. For a time, about the Confederate Army invented the "demon machine", in the Union Army spread like wildfire. These landmines, made of local materials, easy to camouflage and resistant to rain, are extremely lethal to infantry and cavalry. The road near Yorkton was strewn with "deadly tripwires that could be touched and killed," according to a report from the Union Army's 85th Volunteer Regiment in Pennsylvania. The record of the 5th Massachusetts Artillery Regiment is even scarier: "Flesh and blood flew from the explosion." General McClellan,

the confederate general at the time, blamed his failure to attack Richmond: "The main obstacle to the operation was the presence of these landmines, and we must proceed with great care and caution." McClellan sent a special telegram to the Secretary of war, denouncing "the most barbaric and despicable ACTS of murder committed by the rebels. Wells, flagpoles, ammunition stores, telegraph stations, flour barrels, you name it."

The Special Ability of Two Shells to Block a Single Army

Raines is finally recognized. Landmines are recognized by both north and south as "the cheapest and most effective defensive weapons." In May 1863, President Davis rushed him to Vicksburg to help. But Grant captured this point on July 4. Raines missed the battle. In September, he showed up at Charleston, South Carolina. The following February, he presided over Bray at Morby. In June he was sent back to Richmond to take charge of laying landmines all over the South. On the road to Richmond, Raines laid 1,300 landmines. At one point, Raines said, "Give me a group of engineers, each with two cannon-balls, two detonators, and a mule, and you can stop an army." This seemed to the defeated Confederate general to be the height of hubris, but it alarmed the Union army. During the Siege of Charleston in July 1863, the

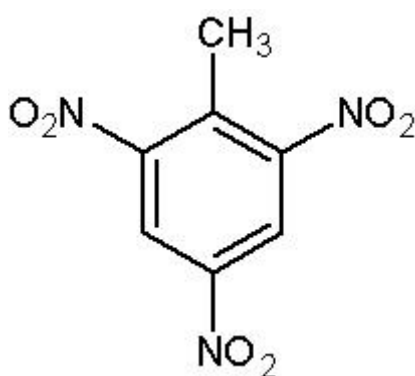
Confederates laid a dense minefield. Attacking troops complain that one or two landmines are brought with them at every step. In the great siege, the Union suffered 1,623 casualties, while the Confederate army suffered only 186. This casualty rate is always repeated where Reince is present.

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2.Origin of the Core of Landmines——

A Brief Description of TNT



TNT structural formula



TNT landmines being disassembled

Trinitrotoluene (TNT) is a white or amaranth light yellow needle crystal, odorless, hygroscopic. This product is a relatively safe explosive, can withstand impact and friction, but any amount of sudden heat can cause an explosion. Refined TNT is very stable. Unlike nitroglycerin, it is not sensitive to friction, or vibration. Even if you're shot at, you're not likely to explode. Therefore, the detonator is required to start. It doesn't react with metals or absorb water. As a result, it can last for many years. But it reacts strongly with the base to form unstable compounds.

TNT produces 4.2 million joules of energy per kilogram. It releases energy quickly because it contains oxygen as a fuel booster and does not require oxygen in the atmosphere.

Today's studies of explosions and energy release often use "kilogramme" or "ton of TNT" to compare the energy of large reactions, such as explosions, earthquakes and planetary impacts.

TNT was invented in 1863 by TJ Wilberland in a failed experiment. Trinitrotoluene is a powerful and relatively safe explosive that will not burn or explode even if a bullet breaks through it. It began to be widely used in the early 20th century to load various munitions and explode, gradually replacing picric acid. Before the end of The Second World War, TNT had been the most comprehensive explosive, known as the "King of explosives".

Deflagration is the attribute of gunpowder, while detonation is the attribute of explosive. With the development of organic chemistry and military technology, the meanings of gunpowder and explosive tend to be fuzzy, representing all kinds of explosives in a broad sense.

Black gunpowder, an ancient and common gunpowder, is made of saltpeter, carbon and sulfur in a certain proportion. Although it has a long history, it has a high maturity and can be used even in modern times. As one of the four great inventions of ancient China, black gunpowder represents the science and technology of ancient China. It was used to make

fireworks to bring people happiness at that time, and then it was introduced to Europe with far-reaching influence.

Nobel, the Swedish scientist, is the father of modern explosives, invented and improved dozens of explosives between 1862 and 1890. Nitroglycerin, namely the glycerol trinitrate hazardous is prone to explode, triggered several accidents make people held out hope for its industrial application, but the Nobel invented by means of and the ratio of black powder nitroglycerine explosives, then by adding, coking modification methods such as explosives, developed industrial explosives with the security, to a certain extent will blast power control in the hands of humans. Since then, Nobel has been involved in the field of military explosives and has made many contributions, but also suffered many disputes and setbacks. With the invention of Explosives by Nobel, the development of explosives has entered a stage of rapid progress and its application in various fields has become more and more extensive. The firelight of gunpowder and explosive brought many advanced technologies and modern industries. In the same period, German chemist Liebig opened the prelude of organic chemistry. With the development of science, various combustion and explosive reactions have been widely studied and applied by human beings.

In 1825, Schefflery had proposed the best chemical reaction equation of gunpowder: $2\text{KNO}_3 + 3\text{C} + \text{S} = \text{K}_2\text{S} + \text{N}_2 \uparrow + 3\text{CO}_2 \uparrow$, according to which, the ratio of nitrate and sulfur carbon of the best gunpowder formula should be 74.84%, 11.84%, 11.32%

Landmine Log

With the development of modern war practice, the ratio, manufacture, storage and performance of gunpowder have been improved constantly. Take Britain as an example, its gunpowder manufacturing industry in the early 19th century had the following characteristics: in terms of raw material processing, advanced industrial equipment was used to refine high-purity nitrate and sulfur; In terms of the ratio of gunpowder, according to the chemical reaction equation proposed by Chevalier in 1825, the composition ratio of sulfur-carbon nitrate is 0.75:0.1:0.15 for the sexual gunpowder in 0.78: 0.08: 0.14. In the manufacturing process, the steam powered drum type device was used to crush and mix the gunpowder in the original section. Then made of hydraulic machine will Jane uniform medicine powder rolling ChengJian countries block, reoccupy granulating cylinder will be made uniform powder grain powder block, in terms of storage, heat the powder grain drying, grinding and polishing

machine will medicine granule surface, remove pores and reduce the hygroscopicity, maintain good dry state, to extend the storage period. It is because of using the new method, makes the powder manufacturing is a world leader in particular at the time of the formula of gunpowder was recognized as the standard formula, it was not until the 19th century, black powder is still the basic propellant of small arms, around 1860, because of the discovery of stage combustion principle, gunpowder has been further improved. It is mainly to make the particle fire dynamic pressure into dense powder particles, so that the combustion speed of gunpowder in the barrel of the gun and the pressure of expanding gas delay, in the projectile along the barrel forward to continue to produce gas so as to reduce the pressure of the barrel, but the initial velocity of the projectile is greatly increased.

The rapid rise of the chemical industry in the 19th century greatly improved the performance of gunpowder and ushered in the era of high-explosive. In 1846, Italian chemist Sobrero invented nitroglycerine. In addition to being used in medicine, this nitro-compound was explosive, much more powerful than black gunpowder, but very dangerous to manufacture and process. In 1860, after learning of this invention, Nobel set out to study how to control the explosion

of nitro-glycerin and make it a good precursor for making explosives. In the autumn of 1866, hundreds of water the test failure before, he invented the mercury fulminate fuse, which is often said of the detonator, used to detonate glycerin, finally succeeded in solving the problem of how to use this kind of explosives, in 1867, he invented the use of diatomite to glycerol methods, make nitroglycerin sensitivity is greatly reduced, thus ending his hand workshop production era of gunpowder, and entered into a big industrial explosives production phase.

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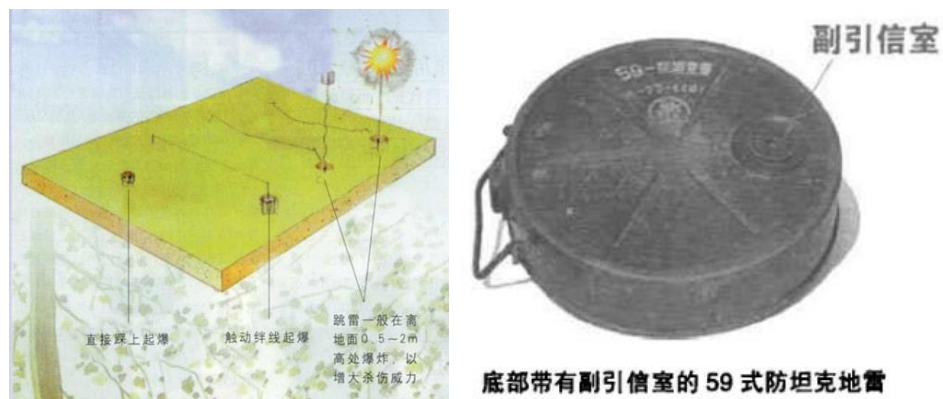
3.The Rise of Standard Landmines

The first landmines to be produced in a standardized manner were anti-infantry landmines developed by Russia around 1930. In 1916, tanks appeared on the battlefields of World War I, which led to the creation of anti-tank landmines. The Germans, who were most threatened by tanks, converted artillery shells into anti-tank landmines in 1818. Later, they developed two kinds of standardized anti-tank landmines, which were used against the tanks of the British and French armies and achieved some successes. Anti-tank landmines have played a huge role in the battlefield. Twenty percent of the tanks destroyed in World War II were caused by anti-tank landmines. The complex changes in the modern battlefield environment and the wide application of modern landmine warfare have made the scope of the use of landmines constantly expanded and the methods more flexible. Landmines have also developed from the earliest anti-infantry landmines into a large family.



Standard landmines

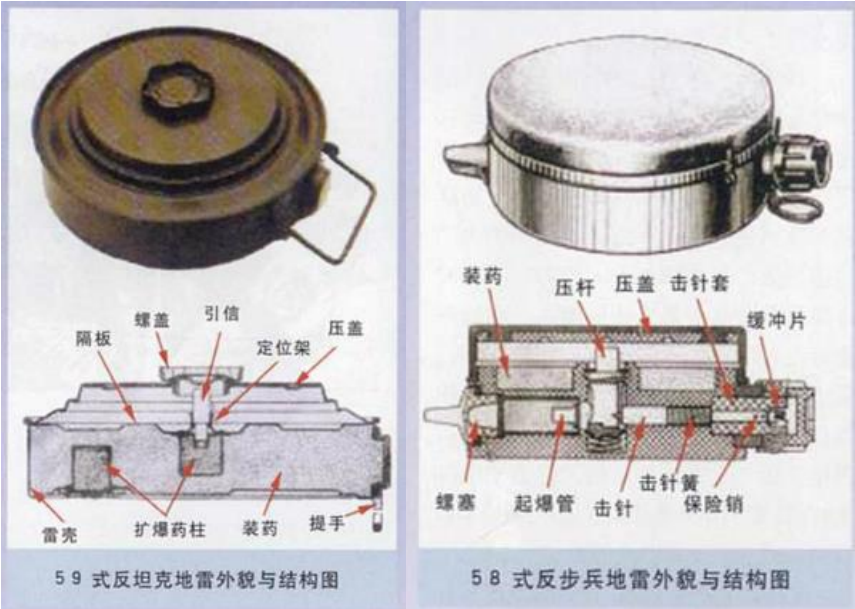
At the same time, landmines are showing great power in the war of resistance against Japanese aggression in China. In the case of material shortage, the anti-Japanese army and people also use stones, clay POTS to make "land thunder", invented a variety of landmine-burying methods, effectively hit the Arrogance of the Japanese army. The German and Italian armies used planes in World War II to land infantry landmines in Africa. 60 s, some countries have set out to develop aircraft, artillery, and rockets and anti-tank landmines, landmine and the federal republic of Germany rocket system USES "lars" light vehicular tube fire churning 36 cannons, a landmine to 36 110 mm rocket launch, each play by containing eight AT-Fried crawler type 1 anti-tank landmine more or less the AT-type 2 shaped sunder armor tanks landmines. A single rocket launcher can disperse 288 AT-1 or 180 AT2 landmines in 8 seconds. A barrage of portal rockets can form a minefield with a width of 2,300 meters, a depth of 300 meters and an area of 6,900 square meters. After the Federal Republic of Germany, the Soviet Union, the United States, China, France and other countries have also successfully developed this rocket landmine system.



Standard landmines

China has a long history of making and using landmines because of its flexible landmine tactics. The tactics of landmine defense, landmine and horse warfare, landmine encircling and landmine propaganda made the Japanese aggressor dare not leave the engineers and go to the countryside to mop up easily, and even the tanks did not dare to act alone. Because our engineers use 75mm mountain artillery shells modified anti-tank landmines, can destroy the Japanese small tank fragile car bottom. This particular type of anti-tank landmine was encountered by the Japanese in Shanxi, where their Type 95 light tank was blown upside down. During the period of resisting the United States and aiding the DPRK, China produced wood-shelled anti-tank landmines, which were later named Type 51 anti-tank landmines. Its simple structure, easy to mass production, in the Korean battlefield played an important role. From the

1950s to the 1960s, China imitated the soviet-style American-style anti-infantry landmines (type 58,59, etc.) and the soviet-style anti-tank landmines. In June 1969, China began to study the localization of landmines. Various landmines and new devices for laying landmines were quickly updated; Thirteen types of landmines were designed and finalized in the 1970s; 12 new types of landmines in the 1980s.





In the 1950s, China's anti-tank and anti-infantry landmines were basically imitation products of foreign countries. During the 1960s and 1970s, China developed explosion-proof type 69 anti-tank landmines, type 72 iron shell and plastic anti-tank landmines, type 69 anti-infantry landmines and Type 72 anti-infantry jumping landmines, which are easy to operate. In the 1980s, a series of new landmines were developed, such as explosion-resistant and anti-corrosion type 81 anti-tank landmine, electromagnetic wave type 84 anti-tank landmine type 85 anti-tank landmine and piezoelectric fuze anti-infantry booby trap landmine. Since then, a complete system of landmines has been formed in our country.

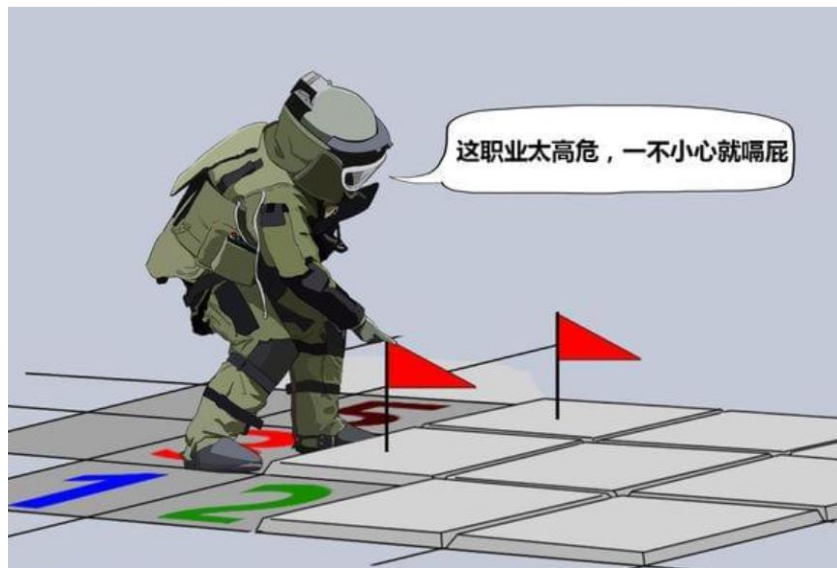


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Middle Volume

Modern Volume



1.Landmines and War



The cost of a standard landmine is \$3~5, and soil is even lower. The world's first anti-infantry landmine was developed in Russia around 1903. This is the earliest standardized production of landmines, the first practical application in the exhausted Russian war, has achieved a certain effect. In 1916, the appearance of tanks gave a major psychological blow to the German army in the West. Facing these iron Kings, the highly skilled Germans converted artillery shells into anti-tank landmines in 1918. Subsequently, they developed two kinds of standardized anti-tank landmines, which were used to deal with the tanks of the British and French armies and achieved certain successes. Anti-tank landmines were widely used in the Second World War. According to statistics, 20 percent of the tanks that were destroyed were the result of tank landmines. Because of their price, power, and strategic characteristics, landmines have become important

players in war. This chapter will introduce the reality of landmines on the battlefield from the famous applications of landmines in world wars.



British forces detonate landmines during the Battle of Mothinis during World War I

World War I and Landmines

This series of landmines and subsequent strikes on the ridges of The Mosinis was perhaps the most carefully planned and commanded battle of the First World War, in which the Allies took only a few hours to capture what the Germans thought was an impregnable line of defense. In June 1917, field Marshal Hager's British expeditionary Force began to form the main force of the Allies, as the collapse of the Nivelles offensive and the resulting mutiny rendered the

French completely incapacitated on the Western front. In order to really open up the German lines, Haig decided to go on a long fishing expedition and put the final attack on Ypres in Flanders once again.



Field Marshal of the British Expeditionary Force Douglas



Haig Ypres position

For a better attack, he first arranged for General Herbert Plummer to lead the Second British Army, which included a small AnZAC corps, to attack The Mothinis Ridge. This plateau, which encircles the town of Mosinis at the southern end of Ypres, is a prominent front of the German position. If the German stronghold could be captured, it would provide the Allies with the most favorable terrain for a major offensive. He had been in Flanders since 1915, and he knew everything there was to know. In any case, Plummer was the perfect choice for a commander. Even before Hagrid had given his orders, he had been ready to attack The Ridge of Mothinis. In the face of the tight German defense, he only said: Give me a few hours. As early as mid-1916, Plummer had arranged for soldiers to lay mines in front of the German trench line. In 1917, he led the British to perfect their attack preparations. Not only did he quietly dig an 8,000-meter-long tunnel under the eyes of the Germans, but he also strapped hundreds of tons of high-explosive bombs to the 22 stress bars supporting the tunnels, only one of which the Germans had discovered and disarmed before the war began. With the British air superiority in Flanders, the Luftwaffe was unlikely to take part in the confrontation, so In order to minimize the loss of its troops in the event of a war, Plummer intended to make full use of artillery, tanks and poison gas. A total of

2,300 heavy guns and 300 mortars took part in the preparatory shelling that began on 21 May, and seven days later the intensity of the shelling increased dramatically. About a week later, the remaining 19 landmines were detonated by the British at 3:10 a.m. on June 7. The blast shattered the shell into hundreds of rays and sent a powerful shock wave into the sky, killing some 10,000 German soldiers in a flash. Nine divisions of the Second Army, under the cover of artillery barrages, launched a full assault on the German positions along a 14.5km line of fire. With the barrages only a short distance from the British front, the Germans, sheltering in the trenches, were scattered before the British could recover. Surviving defenders were this compact hit dizzy, there is no effective defense. The British took advantage of the situation and captured the target position in three hours. The result of the battle was that although the Germans fought hard for the next few days to push the British off the ridge, they grew tired and could not get back to losing ground. On the 14th, the British completely eliminated the Prominent German front and took the strategic plateau of The Mothinis Ridge into their possession.

In World War I, many offensives ended at great cost to the offensives, regardless of victory or defeat. But under the right leadership of Plummer, the battle of Mothenes was an

absolute exception. The British suffered only 17,000 casualties, while the Germans, including 7,500 captives, lost 25,000. This fully reflects the unique strategic significance and strategic role of landmines, and their use in campaigns can even affect the overall trend of the war.



Trenches and positions

Landmine Log

Landmine Warfare in World War I



Burying large Numbers of high-explosive munitions in front of the enemy's line of fire is a common tactic in trench warfare. With this tactic, not only can the enemy's defenses be destroyed in an instant, but the blast of the blast can stun any enemy that survives and render them powerless to resist. The first world War saw the beginnings of modern landmines, but the models used were primitive. The Germans first used half-buried, half-exposed mortar shells as landmines, which could blow up enemy tanks. Real mine warfare is far more complex, involving engineers digging a tunnel

under enemy trench lines, filling it with high-explosive bombs and detonating them as they retreat to relative safety. Mining is a very dangerous job. The cave-in or seepage of the tunnel, the leaking gas and the hidden anti-blasting device of the enemy may threaten the safety of the working engineer and bury him in the tunnel dug by himself. Because relatively fixed enemy positions made it easier for engineers to work, and trench warfare changed relatively infrequently among battlefields, the landmines of World War I were mostly fought on the western front.

In late 1914, an Indian brigade was stationed near Festuport, about 16km from the French border. On 20 December, the Germans embedded 11 landmines below the brigade's position and detonated 10 of them—the first use of underground explosive devices and the first appearance of such tactics in World War I. But the British army, which had not mastered the technique of demolitions in 1914, later became the most frequent use of this form of warfare. John NORTON Grievés, a veteran British MP who had first advocated landmine warfare in Parliament that December, was put in charge of tunneling through the clay beneath northern towns. The men whom Grievés hired to do the work were called "moles," a group of men who "carried crosses and played in the mud." When they worked in the tunnel, they sat with their backs to

a cross, their legs toward the side of the tunnel where they were going to dig, and they used their feet like shovels to pull the clay out and throw it behind them, while others carried the earth away. Of course, some troops also use mining machines to dig tunnels, but this method is very little use and very difficult to operate. On February 12, 1915, as one of the first professional tunneling units recognized by the British authorities, the "Royal Technician Excavation Team" numbered 170~178 was formally established, and the first technicians to be recruited were miners who used to work in various landmines. Since then, similar departments have been set up in Australia, Canada and New Zealand. Since the first British landmine detonated on the night of April 17th, at Height 60, near St Iloot, the scale and complexity of mine warfare has grown. The largest landmine battle in military history occurred in mid-1917, when the British began planning for the Battle of Mosinis Ridge on January 6, 1916. The stage for the landmine battle was the Prominent German front south of Ypres. British engineers set off 21 explosions at 12 sites along a 16-kilometer ridge, meaning each site could be detonated in one or two explosions. One of the tunnels was 640 meters long. Once completed, it was filled with the most powerful bomb of the time, Amunna. One tunnel contained more than 43 tons of explosives, and nearly 430

tons of explosives were buried in the German front. On July 7, 1917, the Minefield set up by the British army was officially put into operation. Except for two duds, the other 19 were successfully exploded. Among the craters caused by the explosion, the largest "lone tree crater" was 12 meters deep and 76 meters wide. News soon spread to London and beyond, but no one knew at the time how many Germans had been killed in the first day of the war, and postwar records showed only 10,000 missing that day. Later, the British captured 7,350 German soldiers, most of whom were nearly dumbstruck by the blast.

Flanders Tunnel Warfare and Landmine Warfare

During the war, water turned the Plains of Flanders into hell. The soil of this flat region is made up of clay and ypres sand layers (ypres formed about 50 million years ago), named after the Belgian city of Ypres. The drainage system was destroyed in October 1914, leaving an area full of water-filled craters. The soldiers had to fight in specially latticed trenches. The mountains of Flanders form an arc around the east and south of the Ypres region. These hilly areas were the main battlefields of landmine warfare, including Hooze, Zillebeke, Hill 60, Caterpillar Crater, Saint-Eloi, the Bluff, Wytschaete..... The allied troops' mission was to place up to

40 tons of explosives dozens of meters below the enemy's line and then detonate the explosives to destroy the enemy's defenses. To place the explosives, the army had to dig sloping tunnels from the ground through layers of clay and sand. There is no danger in digging through clay, but a layer of water-filled sand could flood the tunnel, leaving the excavator with no chance of escape. So British and Australian military geologists were called to the front line to study the formations in advance to minimize the risks of excavation. In preparation for the Battle of the Somme, the Allied forces dug numerous underground works into the dry chalk strata tens of meters deep on the north side of the Somme. On July 1, 1916, the battle began with 19 simultaneous massive explosions. South of Labarcella, Welsh miners planted 27 tons of Ammonia 16 meters below the German front, creating a crater 90 meters in diameter and 30 meters deep, which is still visible today.

World War II and Landmines

According to incomplete statistics, since the beginning of the Second World War, more than 400 million land-mines have been laid around the world, of which some 6,500 have been laid since the 1970s. It is reported that up to now, countries around the world have equipped and developed more than 220

kinds of landmines, and there are at least 60 countries around the world with a large number of landmines that hinder the construction of many countries. Before The Second World War, land-mines were generally laid by man. But later, to carry out a campaign, often need to lay millions of landmines, such a huge amount of operation, manpower alone has become powerless. For this reason, a variety of modern ways of landmine came into being. In 1941, in the famous battle of Moscow, the former Soviet Army used the automobile landmine-laying method for the first time, which increased the speed of ground landmine-laying by dozens of times. Since the Second World War, there have been the use of helicopters, fighters, commandos and bombers to landmine the battlefield. On the battlefield in Korea, American aircraft used them to lay large Numbers of anti-infantry landmines shaped like butterflies. In the autumn of 1970, Germany first developed a rocket-propelled grenade system. With this system, nearly 300 landmines can be laid in a matter of seconds in a single shot. In addition, there are also the use of artillery, missiles and other tools to landmine. The Second World War was therefore the stage for landmines and a milestone in their development.



Soldiers demining

Learned the lesson of the last war, various countries also began to research how to guard landmines, at that time, the application of the metal detector can let sell at a discount greatly landmines role, and in order not to let the enemy's engineers find landmines, the Soviet union was to design a kind of strange land mines and the landmines and change the traditional metal shell, but the wooden case, in which put explosives and lead, buried in the soil can avoid the search of a metal detector, so as to give the enemy unexpected blow.



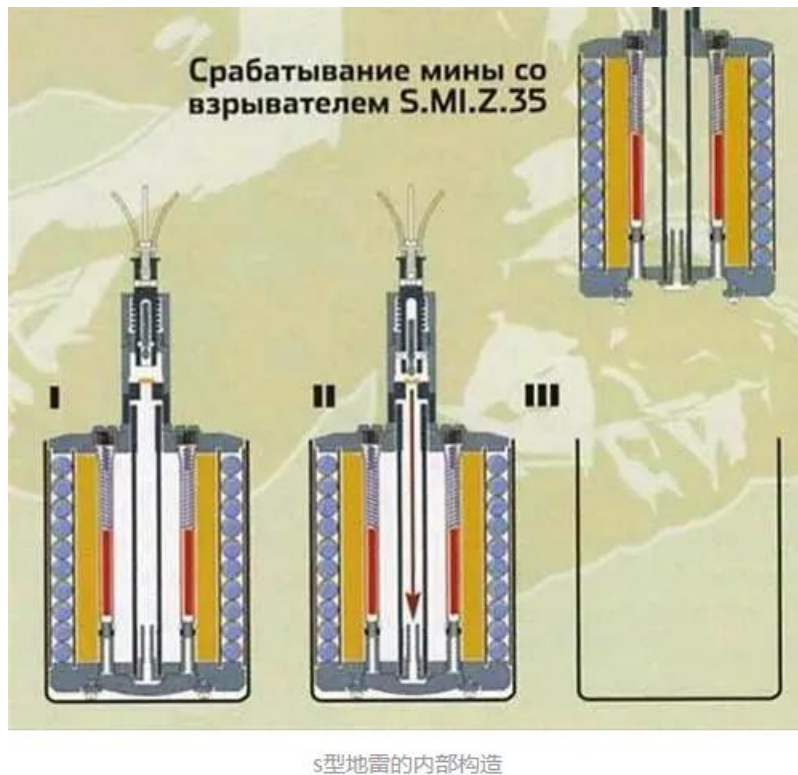
Collection of Soviet wooden landmines

But this kind of wooden landmines, also is mixed, benefit is the landmine avoided by engineers to eliminate the enemy may be great, let the enemy army small-scale operations, the downside is that without the metal case, when the explosion so wooden landmines, the power of pieces of metal landmines, the scope of the explosion with greatly reduced. In order to overcome this weakness, the Soviet union, had been raised in the wooden landmines to add more powder, so as to make up for the inadequacy of explosive power, the soviets later according to this idea, developed an extra large wooden landmines, this kind of material is able to accommodate 8000 grams of TNT, explosion up quite powerful. At the Battle of Stalingrad in 1942, the German army suffered a lot from these oversized wooden landmines. It is said that when an

infantry platoon of about 100 people passed by the mines, the power of the landmine explosion caused more than 30 people to be killed or injured in an instant. At that time, Germany was very worried about this. Later, however, Germany followed the Soviet example and used wooden landmines on a large scale, leading to the use of more than 30 million wooden landmines during World War II. It has to be said, however, that the wood landmines have the advantage of being corroded by the rain for a long time after the war, and the explosives and leads in the distance have already lost their function, which further guarantees the safety of people dealing with the landmines after the war.



Wooden landmine



The German S-type landmines, first commissioned in 1935, were an important part of the third Reich's defence program, developed by Nazi Germany in the 1930s and widely used by German forces during The Second World War. This type of mine is designed to attack unprotected infantry in open areas. During combat, these landmines eject to waist height before exploding and hurl grape-shot bullets horizontally at deadly speed. By the time Germany stopped production after its surrender, it had produced more than 1.93 million Type S landmines, which caused serious casualties and slowed or even stopped the advance of the enemy. The successful, deadly and widely imitated type was a landmark weapon in World War II.

Note: There are two types of S-type landmines, named SMI-35 and SMI-44 according to the date of production. There are only slight differences between the two types. The landmine is also known as "Bouncing Betty".



Japan's thirteen amphibious landmines

The landmines, which use a landmine electrolyte pipe fuse, can be embedded on land or in shallow water to damage enemy landing ships or tanks and explode with enough force to blow up heavy tanks.

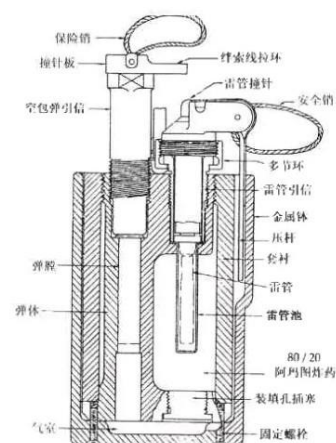
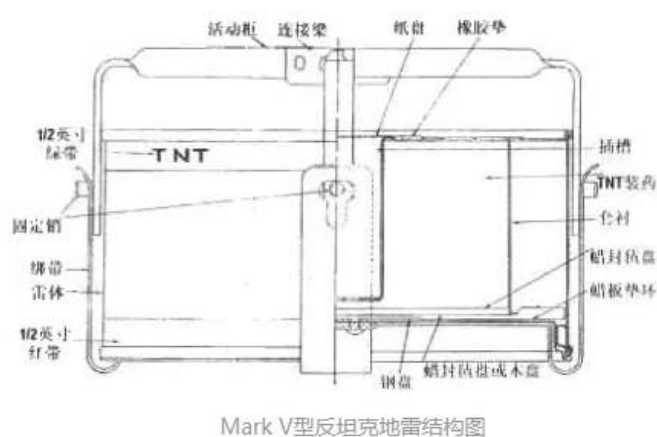


93 anti-combat vehicle ground



US M2 jumping thunder, M2A1, M2A2, M2A3, M2A4 and other models, mainly M2A4 in World War

II



Mark V anti-tank landmines and Mark II anti-infantry jumping landmines in the United Kingdom

Movie Minefield



"Minefields" After World War II, the Danish authorities forced thousands of German prisoners of war to clear landmines laid on Danish beaches. With their bare hands, these young men dug up millions of remaining landmines.

A Danish and German co-production based on real events from World War II. After the Surrender of The Nazis in May 1945, a group of young German prisoners were handed over to

the Danish authorities and sent to the west Coast. There they must use their own hands to landmine the landmines. During World War II, the Germans laid more than two million landmines along the coast. Led by Danish officer Carl Leobald Rasmussen (Roland Moore), the boys embark on this extremely dangerous task. According to historical records, a total of 2,000 German prisoners were forced to undergo artificial landmine removal, half of them lost their lives or became disabled.

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2.The New Differentiation of Landmines



The new "spider" anti-infantry landmine developed by the US army

The new U.S. landmine development program has been the subject of intense international opposition. International human rights groups and the United Nations are demanding a complete ban on the use of landmines, mainly because many of them are not mapped at all and cannot be completely destroyed after the war ends, resulting in the death and injury of many innocent civilians. According to the United Nations, there are 11 million unexploded anti-infantry landmines in 68 countries, with Afghanistan, Angola and Cambodia the worst affected. According to Human Rights Watch,

there are currently U.S.-made landmines in 29 countries. The spider landmine, developed by the United States, has the ability to detonate itself, apparently in violation of the international treaty banning landmines. The United States stopped producing landmines in 1992, and the last time landmines were used was during the 1991 Gulf War. In 2004, Bush reiterated that the United States would not join the Ottawa Convention, supported the repeal of the Clinton-era policy of abandoning anti-infantry landmines altogether, encouraged the Pentagon to develop alternative landmines and allow the production and equipping of so-called inert landmines that harm civilians less. The Pentagon is preparing to use a new generation of "spider" anti-infantry landmines to protect South Korea from a possible Attack by north Korea. The Pentagon believes that the narrow area south of the Demilitarized Zone on the Korean Peninsula is the best place to deploy anti-infantry landmines, which would effectively halt the advance of large infantry units of the Korean People's Army. In addition, the U.S. military is using some of the technology from the Spider project to develop another landmine system, the "Torch," in which soldiers control minefields through several remote-controlled transmissions that could be deployed against ANTI-AMERICAN forces in Iraq. Today, landmines have been unanimously rejected by people

all over the world, not only because of the casualties they cause in wars, but also because many have inflicted heavy casualties on innocent civilians. Yet landmines are still evolving, and their development and fragmentation will continue as long as military needs remain.

Researchers at Textron Systems, a U.S.-based company responsible for the spider landmine program, said the new landmines are equipped with special features to keep civilians safe in the countries where the landmines are used. The spider landmine has a self-destruct device inside it that will self-destruct after 90 days. In addition, the batteries in the landmines will be depleted within 30 days, when the mines will enter an inert state and will not detonate automatically. Although the function of the "spider" and the traditional on all anti-personnel landmines no difference, but the development staff insist that this weapon cannot be called a landmines, but a "ammunition" network, composed of remote monitoring system, prevent anyone to infiltrate a region, if the visitors into the minefield, would detonate landmines to be killed, if people in the region of the killer, controllers will be warned. The Spider landmine system will lay 84 landmines in the controlled area, dividing it into 14 small minefields, with an average of six landmines per cell. When the tripwire is triggered, one or all landmines will be

detonated according to the system Settings. In addition, landmine charges could be replaced with plastic bullets, making them a non-lethal weapon.

According to Charles Chaplin, director of the Network Ammo division at the U.S. Army's Piagatini Research Center in New Jersey, the new generation of "spiders" —smart mines designed to replace long-acting mines that have been phased out—are significantly different from traditional anti-infantry landmines. The main difference between them and conventional anti-infantry landmines is that the new mines are remotely controlled by a computer by the operator, who, upon detection of a person approaching or entering the minefield, issues a warning or activates the system using a computer to detonate the landmine. Of course, the landmine also has an automatic detonation function, which allows the minefield to enter an automatic state and respond to various situations according to the system Settings. However, a Pentagon spokesman stressed that minefields are activated automatically only in exceptional circumstances, under orders from senior officials.

The Israeli aerospace industry company RAMTA is developing systems that can semi-actively detect and detonate mines and improvised explosive devices (Ieds), with operational prototypes expected by the end of 2014.

The Landmine and Improvised Explosive Device Detection System (MIDS) is equipped with the metal detector currently under development by Ramta and The Ground penetrating Radar (GPR) by Elbit Systems. When an unburied landmine is detected, the MIDS can place the landmine to the side. For landmines planted, MIDS will mark the area to allow troops to pass safely through the hazardous area. MIDS are also equipped with weapon systems capable of detonating roadside ieds. Ramta is currently writing software for data fusion between sensors that will be integrated into ground-penetrating radar. MIDS can be controlled remotely from a distant vehicle or programmed with navigation points for semi-active operations. If the customer wants full initiative capability, the IAI department can do it. MIDS can also be directly linked to drones to receive intelligence and monitoring data on road changes caused by roadside obstacles or landmines. In MIDS fast scan mode, the MIDS can scan the road at speeds of up to 15 km/h. In query mode, MIDS ground penetrating radar is capable of detecting 30 cm of anti-personnel landmines and 45.7 cm of anti-tank landmines. The MIDS model was installed on a Caterpillar Unmanned Multi-Terrain Loader (MTL) at the 2013 Association of the Army exhibition.

Back to the United States. The United States is racing to develop a new type of smart landmine called Herkas. Western military strategists see this as a "breakthrough" in the technology of landmines, transforming them from a traditional passive offensive weapon into an active one. Such landmines are primarily intended to counter the threat posed by clustered tanks and attack helicopters. It is composed of active seeking device, rocket propulsion device, iFF device and computer control system, and has the ability to accurately capture the target, calculate the trajectory and actively attack the target. Not only can it be deployed on the ground, killing large groups of infantry units, but it can also be projected from the air by aircraft. After the drop, with the help of booster rockets and electric boosters, the landmine's acoustic and electro-optical sensors can quickly and automatically locate the target within a radius of 500 to 1,000 meters. Once the target is found, its control system fires small rockets connected to the mine body, causing the landmine to precisely hit the target. In addition to dealing with clustered tanks, the landmines could also be used for attack helicopters, as long as they solve some technical difficulties with booster rockets, according to a U.S. spokesman.



US M18 anti-infantry landmine

US troops in Iraq will begin to be equipped with a smart landmine called Matrix. The new generation of smart landmines, which can be detonated remotely, is expected to reduce casualties among troops when equipped, U.S. military sources said. The first to be equipped with the Matrix mines is expected to be the Stryker Rapid Reaction Brigade deployed in the Iraqi city of Mosul. Engineers from the Stryker Brigade will be able to detonate pre-planted smart mines from hundreds of meters away using laptops, according to the report.

American military experts say this would effectively eliminate enemy fighters who cannot be killed by snipers. The system, which can be controlled over a wireless local area

network (WLAN), can be controlled globally from a laptop computer and activated as needed to ensure that mines do not detonate if the US army accidentally touches them. According to the US military command, the Matrix is a new development in the field of landmine development and will help reduce the risk of accidental casualties when compared with traditional landmines. The landmines successfully passed tests in September 2004 and are now in active service.

Instead of using conventional landmines, the soldier in charge of the landmine can choose which type to detonate according to different mission requirements—such as the M18 Claymore landmine, which is loaded with steel balls, or the M5 landmine, which is a non-lethal type of ammunition and is loaded with rubber bullets. In particular, maj. Joe Hitt, co-director of the Matrix intelligent landmine program, said: "The new intelligent landmines are very easy to operate and require very little special training." The "Matrix" intelligent landmine was developed by Alliant Technical Systems Inc. and Textron Systems Inc., based in the United States, under orders from the Pentagon. According to a PENTAGON spokesman, the landmines will first be used to defend key installations and sites such as military bases, airfields and landing fields, but also to carry out offensive operations. Some human rights groups have expressed concern

about the presence of the "Matrix" landmines, as TOP U.S. military officials have refused to give details on the landmines, citing confidentiality. A spokesman for Right Watch points out that the US military's so-called "smart" landmines can be easily adapted from previously manufactured conventional landmines, which means there is no reduction in the risk of accidental injury. Moreover, because soldiers operate landmines from hundreds of meters away, civilians may be accidentally bombed by mistake, mistaken for militants.

Of course, the devil may rise even higher. Along with more and more advanced landmine technology, landmine clearance and detection technology is also being optimized and upgraded. Scientists have found that rats can be trained to detect and locate landmines made of a variety of materials, which are safe, fast, reliable and cheap to train. Bart Vitynes of a Belgian landmine clearance research institute says he's been experimenting with 300 giant kangaroos in the mountains of Tanzania.



Elf rat's younger brother is trained in ground penetrating



New landmine detection vehicle of PLA

Comprehensive landmine exploration rover can be equipped with a variety of detection equipment, not only including traditional landmine detection system, can also be equipped with ground penetrating radar (GPR), the infrared detection system, the underground target detection, especially it can take advantage of the detection system to obtain the surface below target image, and then through the image analysis system to landmines and soil background respectively, thus found the buried landmines, this comprehensive landmines rovers will break through the traditional landmine detector can detect metal mines this limitation, can detect plastic landmines etc. Nonmetal landmines, and it has realized the mechanization, automation, landmine detection work is increased exponentially, These integrated landmine rovers

have been developed by the major military powers to accompany mechanized troops in mobile operations.

In the 1980 s, China's relevant units with landmines against foreign technology development trends, to comprehensive landmine detection system research, through long-term research, at the beginning of new century developed the domestic first generation integrated landmine rovers, it adopts the domestically produced 2.5 tons of truck chassis, the car is equipped with a landmine detection system, information processing system, can automatically brake after found landmine, in order to avoid gori, from the point of information, the domestic comprehensive landmine rovers rover with foreign landmines, using the comprehensive detection system, including traditional landmine detector, such as ground penetrating radar (GPR) system, System adopts the pulse electromagnetic induction, metal radiation, microwave detection technology, has the strong ability landmine detection, and can automatically complete the landmine detection, location, and the landmines are identified, for the subsequent forces forward and landmine clearance index, the first generation of comprehensive land rovers, successful development suggests that China has already mastered comprehensive landmine detection technology, mechanization and automation detection ability,

can wipe out a new generation of plastic and nonmetallic landmines, is a breakthrough in the field of landmine against China.

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3.The Decline of Landmines

In early January 2019, on a cargo ship off the coast of the Netherlands, searchers found World War II landmines and other possible munitions in the clearance area while searching for and removing missing containers. Because of the size of the area covered, the Royal Dutch Navy requested NATO's Mine Protection Team I (SNMCMG 1) to support a "beneficial cooperative operation" to clear the landmines in order to continue the clearance operation. As a NATO standing Response Force consisting of landmine hunters from different countries, SNMCMG 1 stands ready to bring the capability, skills and expertise to remove underwater explosives and secure the area at a short time.

The operation involved the identification and possible safe destruction of 26 objects. The landmines were found using sonar and identified by underwater robots and divers. SNMCMG 1 consists of many different vessels with different capabilities, and by combining all available assets, the overall success of the operation. Pipelines, cables and protected areas require the removal of many landmines before they can be removed, a difficult and delicate task. During the five days of the operation, 14 landmines were found and cleared, allowing the clean-up to continue and making Dutch waters

safer for local fishermen and seafarers. The successful removal of landmines by the expert group demonstrates the readiness, cooperation and professionalism of the NATO standing forces.

SNMCMG 1 is led by commander Peter Krogh of the royal Danish navy and consists of the flagship of the royal Danish navy HDMS Thetis, the German navy shocker FGS Dillingen, the Norwegian navy landmine hunter Hnoms Hnuey, the royal navy landmine hunter HMS Ramsey, the Belgian navy landmine hunter BNS Bellis, the Dutch navy landmine hunter HNLMS Zierikzee and two Danish landmine hunters.



Removal of mine

Landmine Ban Convention

These are just a few examples of today's demining activities, which show that international peace is still the theme of The Times and that people are trying to smooth out the scars left by war. As a representative of the "excellence"

of war, landmines ended their brilliance at the end of the 20th century.

On 17 September 1997, the International Mine Conference was held in Oslo, Norway. The Conference adopted the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Antipersonnel Mines and on their Destruction. On December 3 of the same year, representatives of 121 countries signed the Convention in Ottawa, Canada, hence the name of the Convention, the Ottawa Convention. The Convention entered into force on 1 March 1999 after being ratified by 45 States. At present, there are 162 States parties. By the early 1990s, antipersonnel landmines had caused serious medical, humanitarian and social crises in almost all cases where they were used. At that time, the International Committee of the Red Cross stated that, in medical terms, anti-personnel landmines had caused a serious "epidemic" of serious injury, death and suffering.

Anti-personnel landmines, by their very nature, do not distinguish between civilians and soldiers and the principle of distinction is a basic requirement of international humanitarian law. Anti-personnel landmines continue to explode, mostly indiscriminately, long after the end of the conflict, resulting in the death and disability of civilians. The injuries caused by antipersonnel landmines are

particularly terrible and are considered by war-tested surgeons to be the most difficult to heal. Those who survive mine explosions typically have their limbs shattered and require amputation, multiple operations and a long physical recovery. They are disabled for life and endure the social, psychological and economic effects of their disability. The consequences of anti-personnel landmines are not "accidental" : these weapons are designed to crush limbs and lives beyond repair.

Frontline surgeons of the International Committee of the Red Cross have seen first-hand the widespread and terrible suffering caused by anti-personnel landmines to civilians worldwide. It was in response to the "epidemic" of injuries caused by anti-personnel landmines that the International Committee of the Red Cross called for a global ban on anti-personnel mines 10 years ago. The organization's appeal was echoed by national Red Cross and Red Crescent societies and brought to the attention of the International Campaign to Ban Mines, which had first issued a similar appeal. In view of growing public outrage over the horrific injuries inflicted on civilians by anti-personnel landmines, governments, led by Canada, began consultations in 1996 and adopted the Convention on the Prohibition of Anti-personnel Mines a year later. The Ottawa ban treaty review conference for the first

time in Nairobi, Kenya, representatives from more than 100 countries parties reviewed the performance of the convention, the meeting adopted the 2005–2009 in Nairobi, action plan and the declaration of 2004 in Nairobi called on the international community to work together, to solve various problems posed by the landmines. The purpose of the Ottawa Convention is an immediate and complete ban on anti-personnel mines. The Convention provides that States parties shall not under any circumstances use, develop, produce, acquire, retain or transfer antipersonnel landmines, with the exception that States may retain or transfer a small number of antipersonnel landmines for mine-clearance training purposes; All existing anti-personnel landmines will be destroyed within four years of the entry into force of the Convention, and existing minefields will be cleared within 10 years; Each State party shall submit an annual report to the Secretary-General of the United Nations on its measures to implement the Convention, details of its stocks and landmines in its territory and plans for their destruction; If doubts arise between States parties concerning the implementation of the treaty, requests for clarification may be made, or even for a "fact-finding mission" to that country. States parties to the Ottawa Convention include all The States of the European Union except Finland and Poland, all the States

of the Americas except Cuba and the United States, and all the African States except Egypt, Libya, Morocco and Somalia. China recognizes and agrees to the Ottawa Convention, but it has not acceded to it. China, the United States and Russia, the major military powers, have not acceded to the Anti-mine Convention, mainly because these major powers have developed military industries. If they actually accede to the Convention, they cannot produce landmines and will suffer economic losses. And once acceded, there are many difficult situations that must be resolved in accordance with the Convention. But China, Russia and the United States have used a large number of landmines in the past, and now they simply do not have the capacity or money to eliminate the impact of these remaining landmines. Nor will they be willing to destroy large stocks of mines. So I can only say that I agree with the spirit expressed by the convention, but it is difficult to do so and I did not join.

The Campaign to Ban Landmines Has a Long Way to Go



Icon of international landmine ban movement

The International Campaign to Ban Landmines (ICBL) was founded in October 1992. It's run by Handicap International, Human Rights Watch, Medico International, The Mines Advisory Group, Physicians for Human Rights and the Vietnam Veterans of America Foundation, a coalition of six nongovernmental organizations. The obligations agreed upon by States parties include:

1. Never to use anti-personnel landmines and never to develop, produce, otherwise acquire, stockpile or retain such weapons;
2. Destruction of stocks of anti-personnel mines within four years of the entry into force of the Convention;
3. To remove all minefields from its territory within 10 years;
4. Implement mine-awareness program in mine-affected countries and ensure that mine victims are cared for, rehabilitate and reintegrate into their communities;
5. Provide assistance to other States parties, such as assistance to survivors and demining program;
6. To enact national legislation to ensure the implementation of the provisions of the Convention within the national territory.

In the end, the United States did support the mine convention. Although it did not participate in the convention and refused to sign on to the mine ban Convention, it

promised not to use landmines. At one point, it promised to destroy all landmines. Because of the great threat posed by landmines to personnel, especially after war, landmines that remain a huge hazard, causing indiscriminate and potentially permanent injury to anyone on a non-sub regional basis. As a result, the demand for a ban on landmines, especially anti-personnel landmines, was so strong that in 1997, the Ottawa Convention was formed. More than 160 countries signed the treaty, and the United States was one of the few that did not.



The United States army is training to use landmines

Although the United States refused to sign, but in order to face good-looking, also publicly expressed his stance against landmines, in practice, are willing to comply with the relevant requirements, at the same time, the us has been to mine clearance items and provide medical support for victims, no less, in 2014, President Obama has signed a ban in place to ensure that "no longer production or in other ways for researchers to kill your mines", then announced that it would destroy all mines inventory with destruction, it is said that the inventory for millions, even more than 10 million, in order to join the mine-ban treaty, is a big step forward. Although the United States once promised to abide by the restrictions on the use of landmines, it still did not constitute a default. The United States did not sign a contract at all, but only made empty promises without any binding force. The so-called constraint was a ban signed by the President, but it was lifted by the President's signature, so there was no problem of default. The United States sees nothing wrong with its actions. It believes that the use of landmines, supported by advanced technology, can not only reduce American casualties, but also reduce the risk of accidental harm to civilians. Unfortunately, the so-called measures are not reliable at all. The biggest problem with landmines is that, first, they are difficult to remove. Second,

the low cost, so-called high technology is the time fuze, let the ground after how long to set up, the self-detonation, unfortunately for many old landmines ineffective, will not carry out such an upgrade, and the reliability of the time fuze is not high, will leave a lot of landmines.

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Epilogue

The vanishing landmine culture



Harrison Forman, an American photographer, goes to the Anti-Japanese Base area in North China during World War II. During the War, the anti-Japanese guerrillas hold homemade landmines and prepare to lay them to hit the Japanese army.

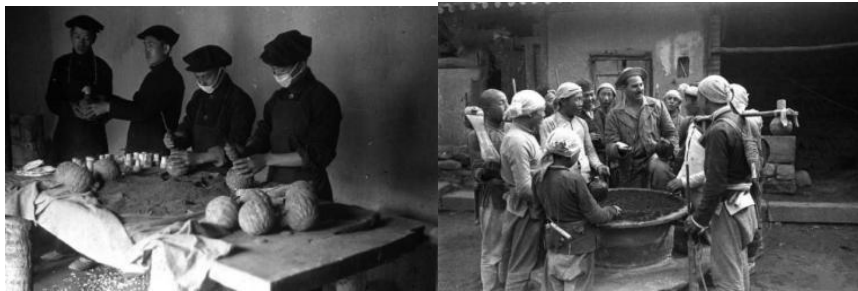
Landmine warfare during the Anti-Japanese War is one of China's militia is the most important methods of warfare, according to the historical relic, the landmine warfare tactics form and is compiled in the December 28, 1942, the author byline Liu Ding, book named the landmine book, the book is divided into ten classes, the first class "always said mines" summarizes the general situation of the landmine warfare too south region, the book, the landmine warfare was first born in too south region. By 1941, tactics had been developed, compiled into books and then circulated to other regions. Anti-Japanese War, landmines to show great power, not only in Shandong Haiyang people wrote a glorious page in the history of revolutionary struggle history (Haiyang militia, in Shandong province, is not the first invention and use of landmines, but in practice, Haiyang militia invented and created dozens of mines, mine warfare of Haiyang in Shandong province is one of the most famous, it in the Anti-Japanese War and the liberation war played a huge role), and on the Jiaodong KangZhanShi coated with a thick. During the eight-year war of Resistance against Japanese Aggression, Haiyang militia fought more than 2,000 times, killed and wounded more than 1,500 enemies, captured more than 600 weapons of various kinds, and emerged more than 500 heroes and models above county level. The 1962 film The War of

Mines, produced by the August 1 Film Studio of the People's Liberation Army, is a classic and influential work.

In the early 1940s, the Haiyang militia had no landmines and no experience in striking enemies with landmines. In the spring of 1943, the county people's Armed Committee held a meeting of the directors of each district armed committee in Nanbu Village, Xiaoji District. County armed committee director Luan Jinjie introduced the Pingdu County Daze mountain militia minefield killing the enemy experience, staff Yang Zhaolong taught the method of mine buried, and issued several iron landmines in each district, Haiyang militia began to know the landmines, and landmines. In May of the same year, Xiaoji Ruiyu village militia deputy captain Yu Fengming in Ruiyu, east village between the road planted two landmines, killed and wounded from the village to grab wheat from the Japanese elves 5, opened the prelude to the Haiyang land landmine war.



Manual landmines



During the War of Resistance against Japan, the guerrilla units in North China had to make landmines by themselves according to the local law and resist the Japanese army with limited firepower. Photo taken in August 1944 by Harrison Forman in the Shansi-Suiyuan Border area of North China.

Ranzhuang, which is famous for tunnel warfare, not only has complete tunnels, but also a considerable number of landmines are planted at the entrance of the village, along the edge of the well, near the entrance of the tunnel and even at the branches of the tunnel. This move, can let the Japanese in looking for, excavate the tunnel when the mousetrap, also let the tunnel into a defensive system of both attack and defense. Even if the Japanese break into the tunnel, it does not mean victory. For in that dimly lit tunnel there was no knowing where guns were pointing in the darkness, no knowing where landmines might have been laid. What's more, the Anti-Japanese Army and people at this juncture, often through tunnels other export transfer, or take advantage of tunnel system, extending in all directions to combat team or

individual lientang the enemy by surprise, is often play a gun in one place, both points against potential, received a "relieve the state of Zhao by besieging the state of Wei" effect, and where I beat the Japanese army main force is. The combination of malleable warfare and ground landmine warfare can also play a great power in the attack. In 1944, the 5th company of the 38th Regiment once ambushed in advance on two heights near the enemy's strongholds of Xixue Slope and Zhaipo, and formed a cross fire net with machine guns and rifles. From the commanding position, they suddenly attacked the Japanese aggressors who were reciting "the Emperor's holy precepts" and ran away after the attack. Such as the rage of the Japanese with guy pursuit, and stepped into our army secretly buried in the minefield, was blown up. In this battle, our army killed more than 40 Japanese soldiers. Landmine warfare has brought into play a great advantage in guerrilla warfare.



The story of veterans in the landmine war



The museum of the Landmine War



Landmine warfare culture (film and television works, comic books, etc.)

An Irreparable Pain

As a weapon used in war, landmines undeniably serve as an instrument of killing on the battlefield. However, the

widespread use of landmines has brought great disasters to the whole world, especially to those countries and people who have been and are in the midst of war. Landmines are certainly terrible in war, but what is even more terrible is that those landmines that have not been completely cleared have become a nightmare for many countries and peoples that have achieved peace after the war.

Longer is landmine this weapon damage human fatal reason after the war, because of electronic technology is not widely used in landmines, and other countries in the development of landmines, but starting from the effect of battlefield, for mine is not easy to detect, it is difficult to rule out valid for long, so landmine destruction and obstacles role does not end with the end of the war, landmines itself unique to this long-term legacy for the war a lot of difficult to eliminate the hidden trouble, long-term harm the civilian life and property safety, severe obstruction of post-war economic recovery and development, for example, after world war ii, the French left within the territory of 300000 hectares of landmines, Ten years later, despite repeated sweeps by the French government, normal development in the area is still restricted; After the Falklands War, Britain spent more than 7 million pounds on landmine clearance, but the effect was not obvious. According to the analysis of data, to clear the

existing landmines on the earth, it would cost more than 85 billion DOLLARS. According to the current method of landmine clearance, it would take at least 300 years to clear all the existing landmines.

The postwar landmines became the most terrible war brought about by the heritage, landmines have been the world's only cannot eliminate war, according to the UN, since the second world war, more than four hundred million landmines were buried around the world, at present there are 64 countries around the world on the territory of buried landmines, the number up to 110,000,000. According to the United Nations, Afghanistan is the most mined country in the world, with 850 square kilometers of minefields, which experts estimate will take at least 20 years to clear. In Afghanistan, one in five people is killed by stepping on a landmine, and 10 people are maimed every day as a result of mine explosions, one-third of whom are women and children. Today, in many parts of the world, in Iraq, Mozambique, Somalia, Afghanistan, Cambodia, Bosnia and Herzegovina, innocent civilians are killed and wounded almost daily by landmines. Information shows that over the past 15 years, 1 million people in the world have been injured, maimed and 450,000 killed by landmines; International Red Cross statistics show that landmines kill between 24,000 and 24,000 civilians every year.

Landmine disarmament: a long way to go



Reference:

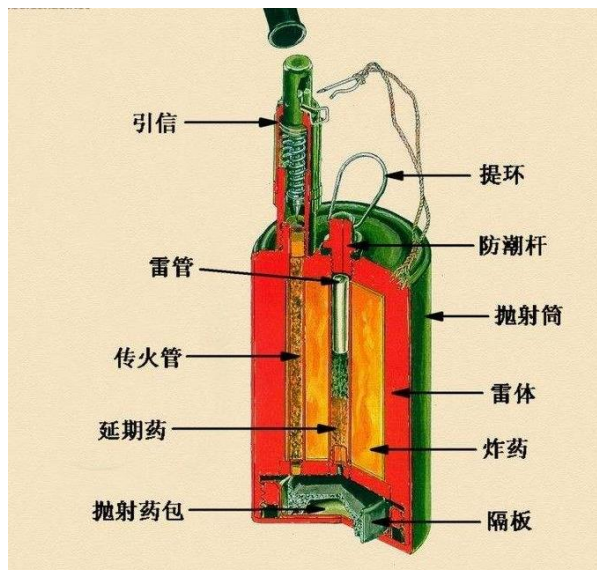
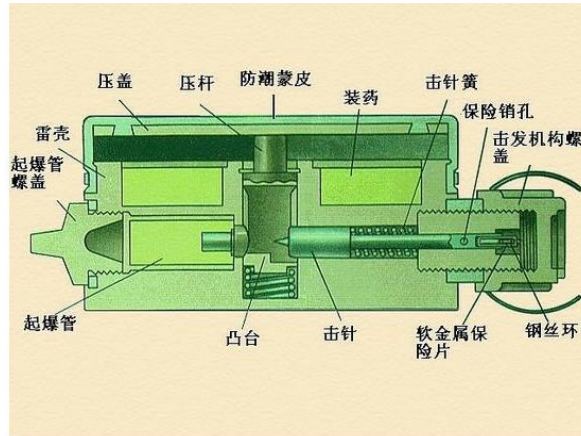
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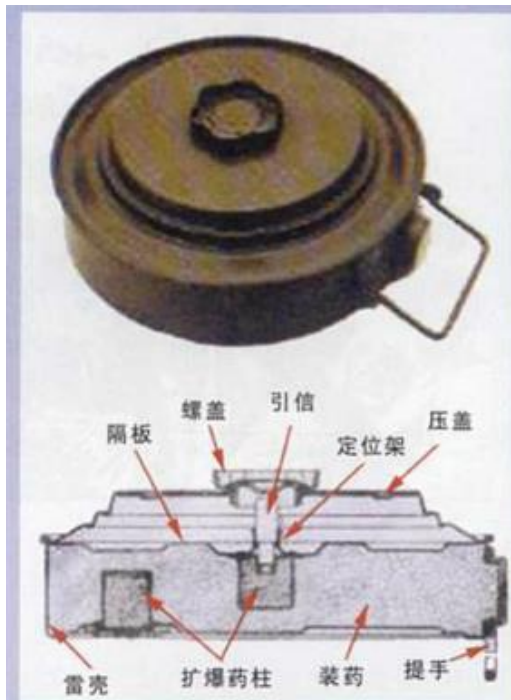
Appendix

Map of Common Landmines

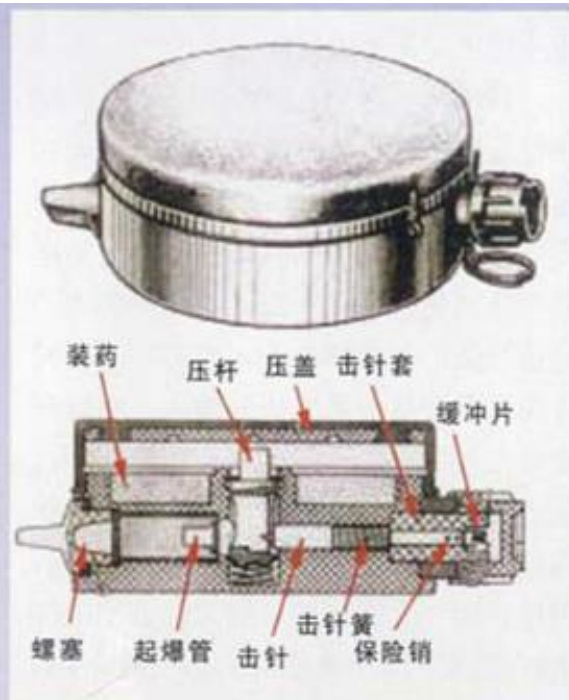


Anti-infantry jump landmine

Landmine Atlas



59 式反坦克地雷外貌与结构图



58 式反步兵地雷外貌与结构图



59 式反步兵绊发雷 (左) 及其拉发引信



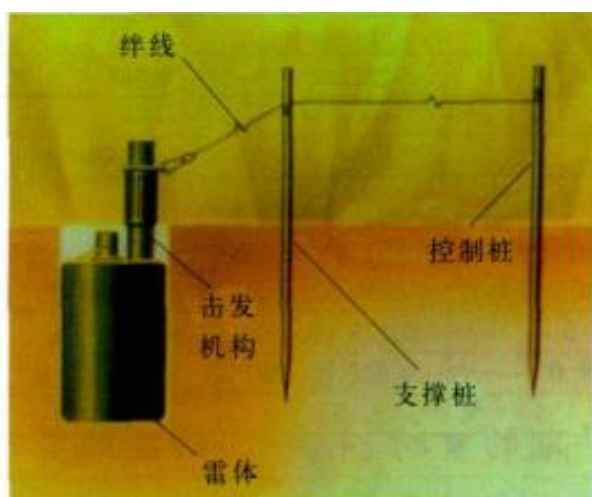




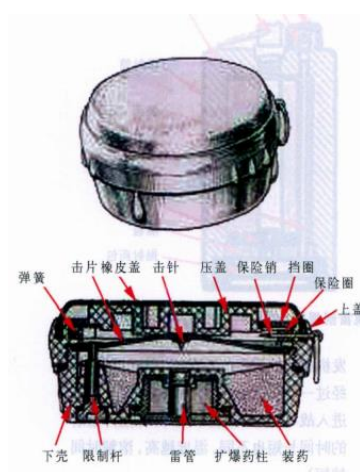
69 式反步兵跳雷剖视图



72 式反步兵跳雷



绊发方式的 69 式反步兵跳雷 (示意图)



72 式反步兵地雷。A、B 型定时自毁反步兵地雷的外形与其完全相同



72 式反坦克磁性手雷

72 式反坦克磁性手雷 II

72 式磁性反坦克地雷







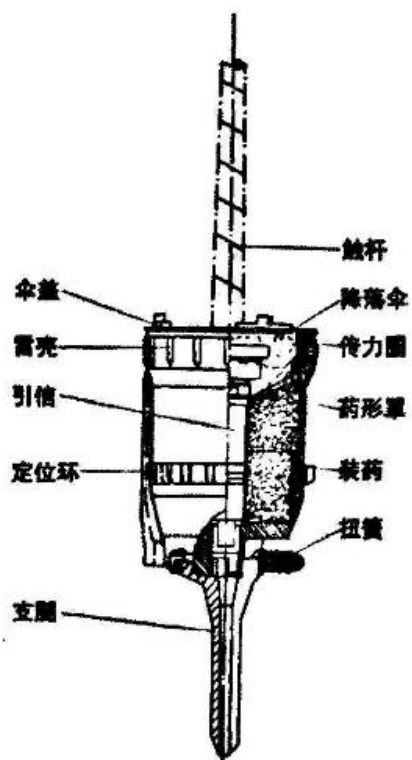
69 式防坦克地雷



72 式塑料壳防坦克地雷



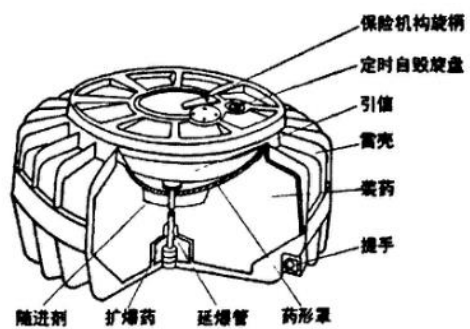
81 式防坦克地雷



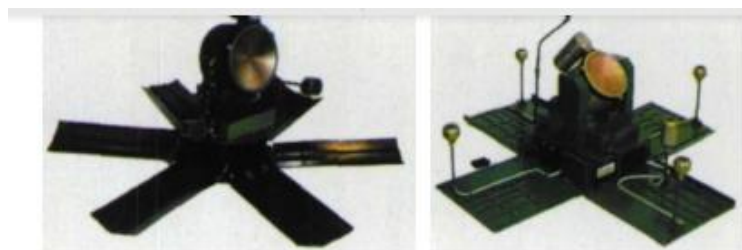
84 式触发炸车底防坦克地雷



GLD230 型防坦克地雷



87 式防坦克地雷



↑ 俄罗斯“速度20” (TEMP 20) 反直升机地雷。左：运输平台布设；右：直升机布设。



Reference:

- [1]Pengfei Xu. The previous life of Landmine[J]. NATIONAL DEFENSE SCIENCE & TECHNOLOGY, 2002(10): 81-86.
- [2]Qin Yanjing. The thunder roared and the enemy fled: standard landmine of New China (top) (bottom)[J]. SMALL ARMS, 2008.
- [3]Yawei Wang. Ammunition Family: New Land Mines[J]. MODERN MILITARY AFFAIRS, 2004(3): 68-70.
- [4]Picture from the Internet.

