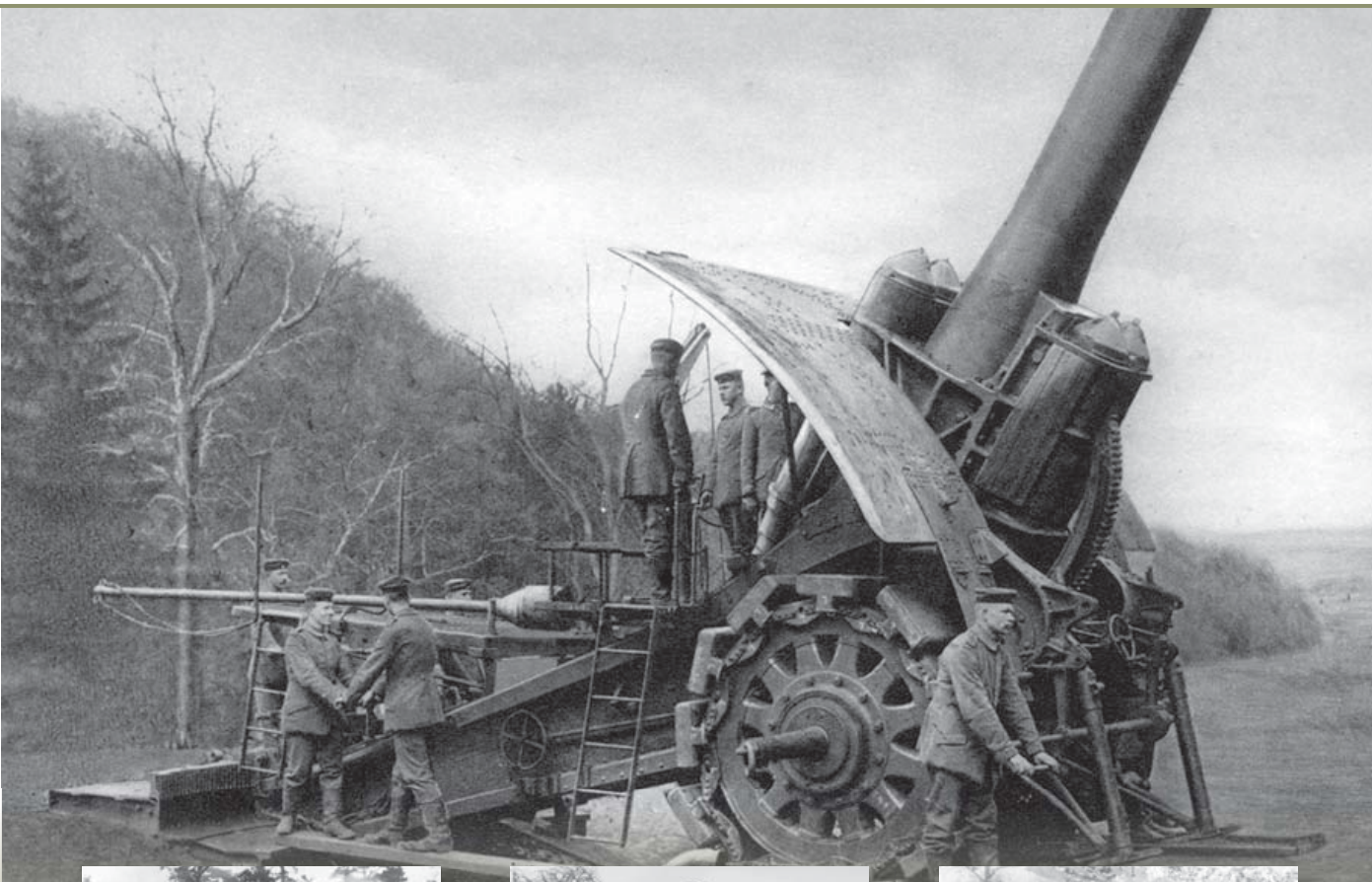
42CM "BIG BERTHA" AND GERMAN SIEGE ARTILLERY OF WORLD WAR I



M. ROMANYCH & M. RUPP ILLUSTRATED BY H. MORSHEAD

NEW VANGUARD 205

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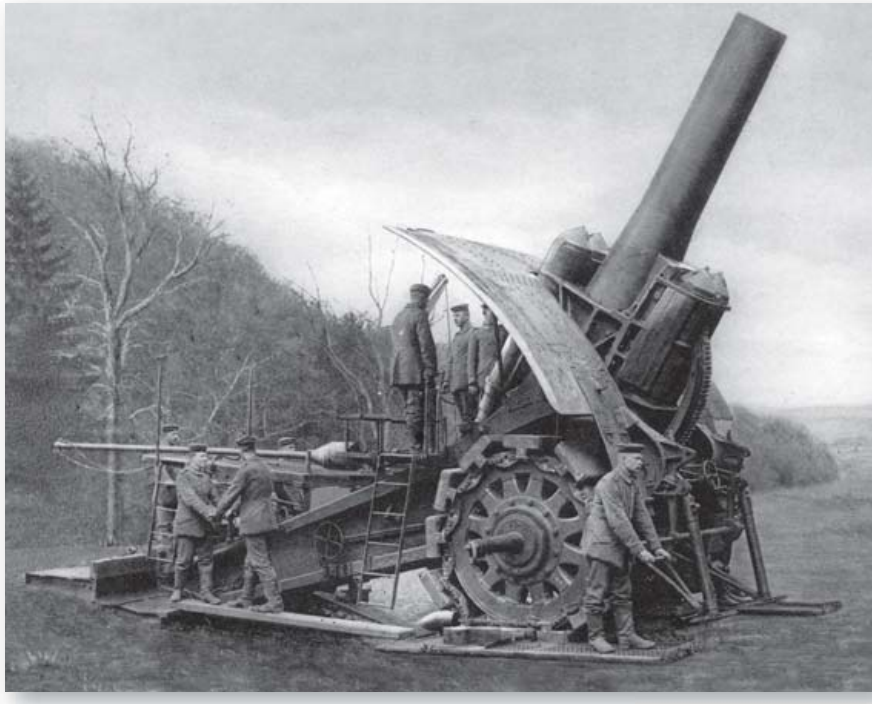
42CM "BIG BERTHA" AND GERMAN SIEGE ARTILLERY OF WORLD WAR I

INTRODUCTION

In the first days of World War I, Germany unveiled a secret weapon – the mobile 42cm (16.5 inch) M-Gerät howitzer. At the outbreak of the war, two prototype guns were rushed from the factory where they were still undergoing pre-production modifications to the Belgian fortress of Liège. There, they handily demolished two of the forts; one of which – Loncin – blew up in a catastrophic explosion, effectively ending the siege. Jubilant, German soldiers christened the guns "*Dicke Berta*" (Big or Fat Bertha), possibly after Bertha von Krupp, owner of the firm that built the howitzers. Soon after, German newspapers picked up on the nickname and the legend of "Big Bertha" was born.

Shrouded in secrecy, the existence of mobile 42cm howitzers came as a shocking surprise to the Allied Armies. After Liège fell, wild rumors circulated about the guns, and the name "Big Bertha" was commonly used to



At the war's start, the German Army had only two prototype 42cm M-Gerät "Big Bertha" howitzers, both of which were undergoing pre-production modifications. The spoke wheel of the howitzer in this German propaganda photograph indicates that it is one of the prototype guns. (M. Romanych)

A battery of 21cm howitzers prepared for action. Both Belgium and France designed their fortifications to withstand hits by 21cm projectiles, not realizing that the German Army would develop larger caliber mobile siege guns. (M. Romanych)

refer to any large-calibre German artillery piece. Misinformation flourished and the mythology of "Big Bertha" grew, spawning several falsehoods that live on to this day in English-language histories of the war.

FORTIFICATIONS VERSUS ARTILLERY

During the last half of the 19th century, advances in artillery technology and design prompted an "arms race" between artillery manufacturers and fortification engineers. Introduction of breechblocks, recoil mechanisms, and rifled barrels led to a new generation of field guns and howitzers with greatly improved range and accuracy. In response, military engineers completely redesigned permanent fortifications, abandoning large, star-shaped "Vauban-style" bastioned forts in favor of smaller, polygon-shaped forts. Depending on terrain, these forts were often grouped together into ring-fortresses and fortified barriers. Ring-fortresses consisted of several forts arranged in a circle around a city at a distance sufficient to keep enemy artillery out of range of the city (typically about 12 kilometers). Fortified barriers were groups of forts either clustered together to secure a strategic point or arrayed in a line to block an invasion route. In France, ring-fortresses and fortified barriers were combined to create expansive fortification zones.

A second technological advance was the replacement of black powder with more powerful high-explosive propellants and bursting charges. This development led to a new generation of shells equipped with delay fuses that multiplied heavy artillery's firepower against fortifications. Fielding of these improved munitions prompted another round of fortress construction. Fortress engineers hardened existing fortifications by reinforcing or replacing masonry with concrete, covering portions of the forts with earth, adding underground galleries and shelters, and relocating artillery from open ramparts into armored casemates and rotating steel turrets. Completely new fortifications were also designed and built. These so-called "armored" fortifications resembled land-locked battleships and were essentially large fortified artillery batteries purposely designed to defend against artillery bombardment rather than infantry assault.

By the turn of the 20th century, the borders shared by France, Belgium, and Germany were heavily fortified. France's fortifications were by far the most extensive with ring-fortresses at Lille, Maubeuge, Verdun, Toul, Epinal, and Belfort connected by barrier forts into several fortress zones. The capital, Paris, was a fortress protected by a double ring of 41 forts. Likewise, Belgium had ring-fortresses at Liège and Namur, and Antwerp was turned into a national redoubt surrounded by some 50 forts and other smaller fortifications arranged in two concentric rings. For its defense, Germany had two modern fortress zones: one around Metz and Thionville in Alsace and another at Strasbourg in Lorraine. Older fortifications guarded Rhine River crossings at Wesel, Cologne (Köln), Koblenz, Mainz, Germersheim, Neu Breisach, and Istein.

Eastern Europe was also well fortified. Germany had fortified zones in East Prussia at Königsberg (Kaliningrad) and Lötzen (Giżycko) and a series of ring-fortresses along the Vistula, Warthe, and Oder rivers at Danzig (Gdańsk), Marienburg (Malbork), Graudenz (Grudziądz), Thorn (Toruń), Posen (Poznań), Küstrin (Kostrzyn), Glogau (Głogów), and Breslau (Wrocław). Germany's ally, Austria-Hungary, fortified its border with Russia with ring-fortresses at Cracow, Przemyśl, and Lemberg (Lvov). Its border with Italy was defended by a line of barrier forts in the Alps. Russia maintained large ring-fortresses in Lithuania at Kovno (Kaunas) and Grodno, and in Poland at Osowiec, Novogeorgievsk (Modlin), Warsaw, and Ivangorod and a number of barrier forts in between the fortresses to block river crossings. Deeper inside Russia were fortresses at the strategic points of Dvinsk (Daugavpils) and Brest-Litovsk.

DESIGN AND DEVELOPMENT

After winning the Franco-Prussian War, the German Army dismissed the utility of heavy artillery, even though heavy guns had successfully reduced French forts during the sieges of Metz, Strasbourg, and Toul. So strong was the sentiment, that artillery was separated into two branches – the *Feldartillerie* (field artillery) with mobile, light field cannons and the *Fußartillerie* (foot artillery) with heavy mortar and howitzer pieces. Priority was given to the field artillery while foot artillery was allowed to languish.

Priorities changed in the 1880s, when Chief of the General Staff Generalfeldmarschall von Moltke demanded an artillery solution to what he termed the "fortress dilemma." As he saw it, new permanent fortifications built by France, Belgium, and Russia were hemming in Germany. In a future war, Germany would have to attack and destroy these fortifications. However, the army's largest artillery pieces were the foot artillery's aging 15cm and 21cm pieces, which could not destroy modernized French and Belgian fortifications; hence the dilemma.

The situation grew serious for Germany when France and Russia signed a military alliance in 1893. This meant that in the event of war, the German Army would likely fight both countries simultaneously. In response to the possibility of a two-front war, new Chief of the General Staff, Generalfeldmarschall von Schlieffen, developed a strategy to defend against Russia while attacking France. A key and unsolved component of his plan was the quick reduction of fortifications that blocked invasion routes into France. Lacking any means to destroy the fortifications, the General Staff turned its attention to large-caliber siege artillery as a solution.

Basic Siege Gun Data							
	28cm L/12 i.R. & L/14 i.R.	30.5cm Beta-Gerät	30.5cm Beta-Gerät 09	30.5cm Beta i.R.	30.5cm Beta-M-Gerät	42cm Gamma-Gerät	42cm M-Gerät
Weight (metric ton)	17	30	45	24.5	47	150	42.6
Weight of Heaviest Projectile (kilograms)	285	410	410	330	345	1,160	800
Rate of Fire (rds/hour)	15	15	12	12	8	8	8
Maximum Range (meters)	9,700	8,200	12,000	12,000	20,500	14,000	9,300
Time to Emplace (hours)	3–4	12	12	3–4	7–8	24	5–6

30.5cm Beta-Gerät – The First Siege Gun

The German Army's Artillerie-Prüfungskommission or APK (Artillery Test Commission) supervised development and testing of artillery. In 1893, the APK, in partnership with Krupp, found a possible solution to the fortification dilemma by designing and constructing a 30.5cm (12 inch) mortar. Such large-caliber mortars, termed *Küstenmörser* (coastal mortars), were first developed for use against iron-plated warships. However, it turned out that hitting a moving ship with mortar fire was nearly impossible, and by the 1890s the employment of mortars for coastal defense fell out of favor in most European militaries. Yet, despite the limited utility of mortars for coastal defense, the German General Staff embraced the idea of using heavy mortars to reduce land fortifications after a study showed that 30.5cm projectiles, fired at high angle, could penetrate most, if not all, permanent fortifications in Europe.

Krupp's 30.5cm mortar was of conventional design, although it was the first large-caliber piece in the German Army to have a breech and recoil mechanism. It had a short barrel (about 2.5 meters long) and an old-style gravity recoil system, as opposed to the soon-to-be-developed pneumatic recoil system. Because of its weight – 30 metric tons (30,000 kilograms) – the mortar was designed as a *Bettungsgeschütz* (foundation gun), meaning that the carriage was mounted to a base plate, which, in turn, rested upon a foundation of timber beams laid on the ground. Yet, despite its bulk, the mortar was simple to operate and had a good rate of fire – up to one shell every four minutes. Maximum range was 8,200 meters, which was approximately equivalent to the best Belgian fortress artillery at the time, but less than that of the French.

The APK accepted Krupp's mortar for service in 1897 and designated it as the *schwerer Küstenmörser* (heavy coastal mortar) L/8 or *Beta-Gerät* (Beta-Equipment) as a cover name to conceal its real purpose as a fortress siege weapon. Six pieces were fielded in the spring of 1898, followed by another three by 1906.

However, the Beta-Gerät mortar had two serious shortcomings. First and foremost was its firepower. Although the Beta-Gerät's 30.5cm armored shells were designed to penetrate the armor plate and concrete of Belgian

Fielded in 1897, the 30.5cm Beta-Gerät mortar was the German Army's first siege gun. Simple to operate and reliable, the mortar was employed throughout the war on both the Western and Eastern fronts. (M. Romanych)

and French fortifications, tests conducted in the mid-1890s revealed that its projectiles were now ineffective against recently modernized French forts. In order to avoid designing another gun, an improved projectile was developed, yet doubts still lingered about the Beta-Gerät mortar's destructive power. The second shortcoming was mobility. The mortar was very heavy, more than four times the weight of any other artillery piece in the army. Transport required disassembly into three parts – barrel, carriage, and base plate. To move by rail, each battery needed 12 railcars for the howitzers, associated equipment, and munitions, and 31 railcars when moving all battery personnel and equipment. Once offloaded at a railhead, the mortar's components, munitions, and ancillary equipment had to be carried to firing position by either narrow-gauge railway or road transport wagons pulled by steam-powered tractors. The ground was leveled by hand, wooden foundation beams were put in place, and the mortar's base plate, carriage, and barrel were mated. Although assembly was relatively simple, under ideal conditions, about 12 hours were needed to emplace and prepare a mortar for action.

Fielding Beta-Gerät mortars did not solve the army's fortress dilemma. Yet, interest in a different siege gun remained dormant until rekindled by lessons from the Russo-Japanese War (1904–05). During the siege of Port Arthur, the Japanese Army dismounted 18 28cm (11 inch) Krupp-built coastal defense mortars from shore batteries in Japan and transported them to Manchuria where they helped end the 11-month siege. Although other European armies failed to see the value of the siege guns, both Germany and Austria-Hungary recognized the potential of large-caliber, mobile artillery as a means to quickly capture fortresses that could otherwise tie down large numbers of troops in a prolonged siege.

The need for a new siege gun was reaffirmed by Generalfeldmarschall Helmuth von Moltke (the younger) who succeeded Schlieffen as Chief

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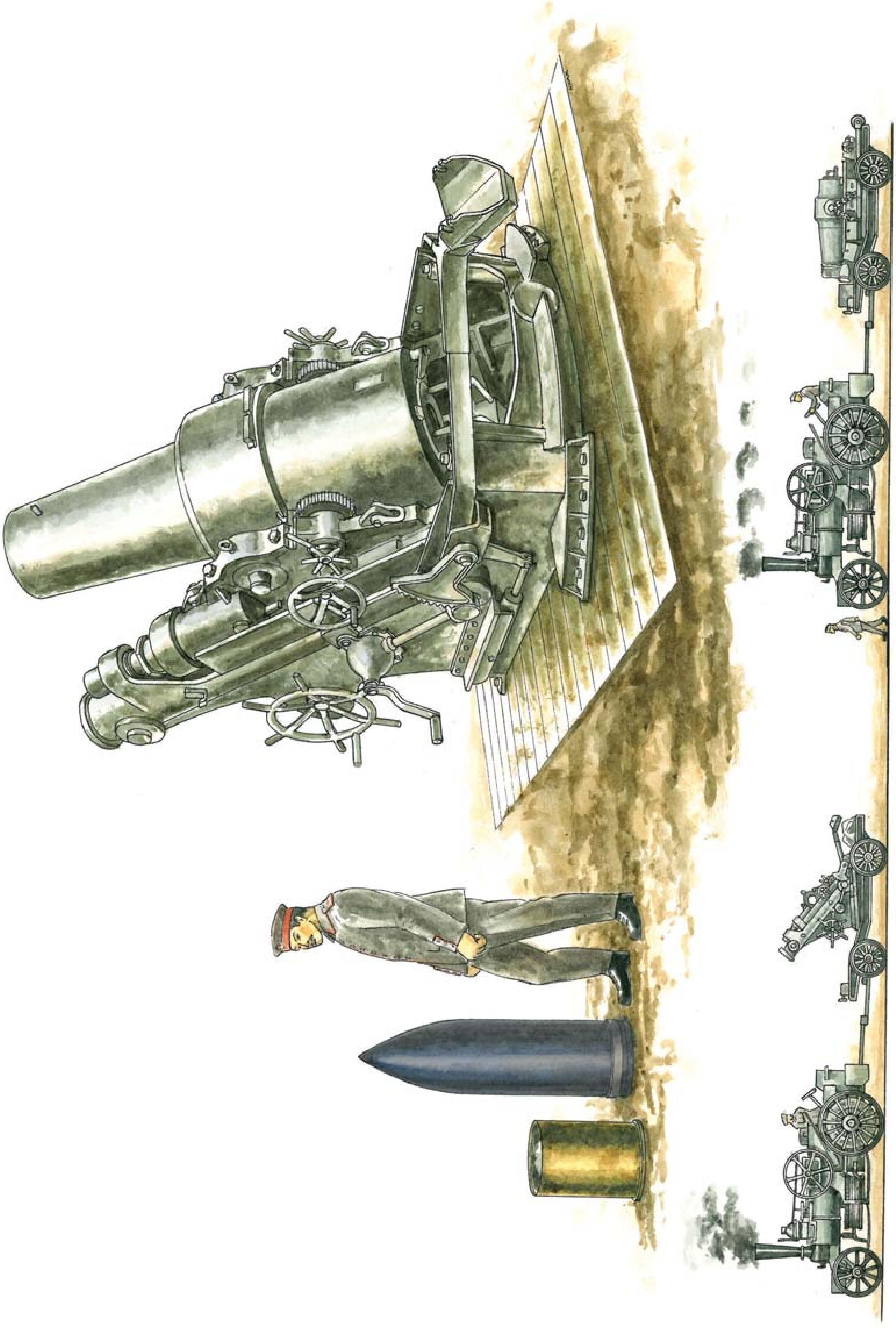
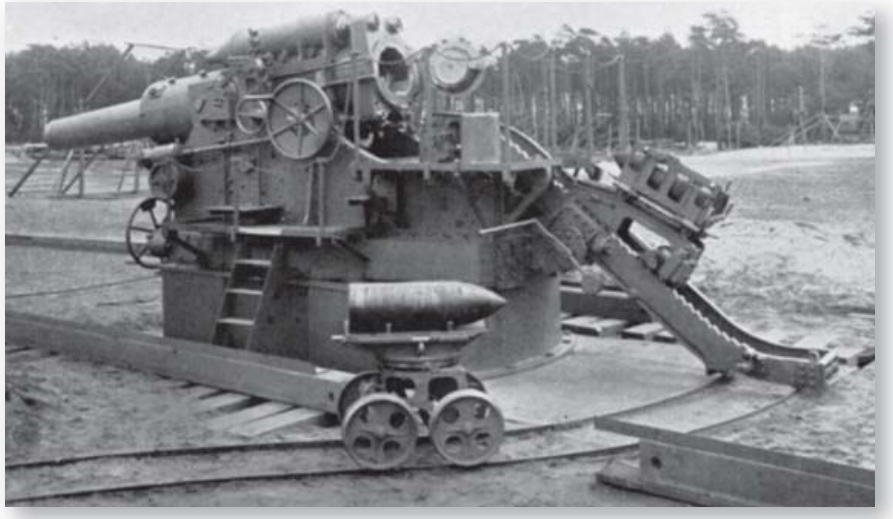
30.5CM BETA-GERÄT MORTAR

The 30.5cm Beta-Gerät mortar was the first large-caliber siege gun fielded by the German Army for the specific purpose of destroying permanent fortifications. It was also the army's first transportable heavy mortar. Nine Beta-Gerät mortars were produced between 1898 and 1906, and because of their reliability, they served as a workhorse of the siege artillery throughout the war. The Beta-Gerät was simple to operate. Direction of fire was set by rotating the turntable in the base plate. The barrel was placed at zero degrees elevation and a projectile and a brass cartridge case containing the propellant charges were loaded in the breech. Range was primarily controlled by adjusting the number of propellant charges loaded with each projectile. However, once the mortar began firing, finer adjustments were made to azimuth and elevation using handwheels located on either side of the carriage. For firing, the barrel was placed between 50 and 60 degrees elevation. For transport, the Beta-Gerät mortar was disassembled into three components: barrel, carriage, and base plate. During the war, various means were used to move the mortar's components. Long-distance movement was accomplished by loading the mortar's components onto standard railway cars. Shorter moves, such as from a rail head to firing position or between firing positions, were accomplished by either narrow gauge (*Feldbahn*) rail, or road wagons towed by steam-powered tractors.





The 30.5cm Beta-Gerät 09 howitzer was introduced in 1909. However, production was halted after only two guns were built because of doubts about the 30.5cm projectiles' ability to penetrate the concrete and steel of the Belgian and French forts. (NARA)

of the General Staff in 1906. He directed the General Staff and APK to study the Beta-Gerät's ability to penetrate the strongest French and Belgian fortifications. The study recommended development of a more powerful artillery piece, perhaps as large as 45cm. As a result, several options were considered, after which a long-barrel 30.5cm howitzer and a large-caliber 42cm gun were slated for design and development.

In September 1907, the General Staff ordered Krupp to build an improved 30.5cm gun, and two years later the 30.5cm schwerer Küstenmörser 09, or Beta-Gerät 09 – was introduced. Now there were two versions of the Beta-Gerät – the older design Beta mortar and the new, modern Beta 09 howitzer. Like the Beta mortar, the Beta 09 was a foundation gun emplaced on a foundation of wood beams, but otherwise was a completely different design. It had a much longer barrel (a 5-meter long L/16) with a screw-type breech, a dual-cylinder pneumatic recoil system attached to the barrel, and a large carriage and box base plate to accommodate the barrel's recoil. Because the barrel stood several meters above ground level, two platforms were attached to the carriage for the crew and a hand-cranked munitions lift was mounted to the rear of the carriage to raise munitions from ground to breech level. To fire, the barrel was elevated between 43 and 67 degrees. Maximum range was 12,000 meters.

The Beta 09 was much larger than the Beta mortar, and at 45 metric tons (45,000 kilograms), about one-third heavier. Therefore, transport and assembly of the Beta 09 were even more difficult than the Beta mortar. For rail movement, each howitzer needed five railcars (two more than a Beta mortar) while an entire battery required 37 railcars. For short-distance movements, Beta 09 batteries used either road wagons pulled by steam-powered tractors or *Feldbahn* (narrow-gauge rail). To move by narrow-gauge rail, 12 railcars were needed to carry the components of one howitzer.

Because of its long barrel, the Beta 09 howitzer had greater range, accuracy, and penetrative power than the Beta mortar. Yet, the Beta 09's ballistic characteristics did not dispel concerns about the destructive power of either 30.5cm siege gun against the strongest permanent fortifications. As a result, in the spring of 1910 production of Beta 09 howitzers was halted after only two howitzers were built.

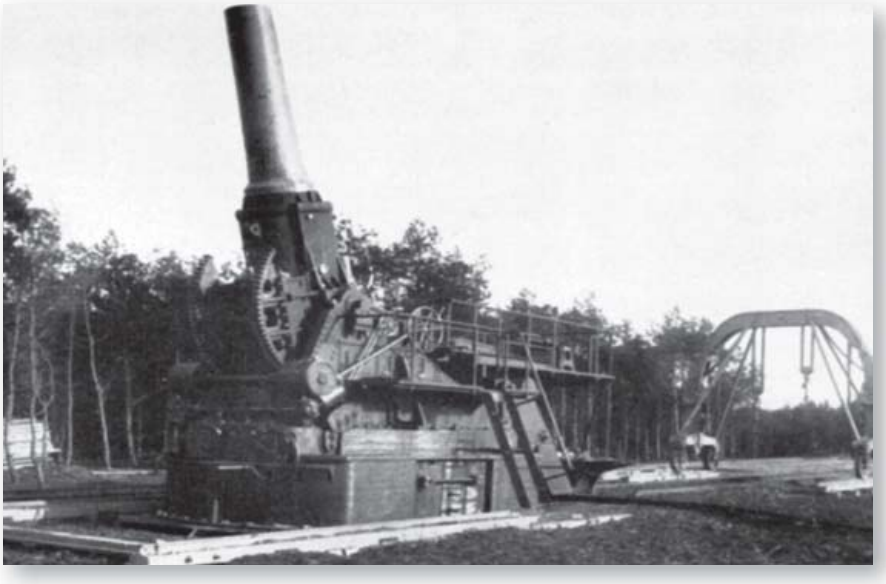
The 30.5cm siege guns were organized into five batteries, designated *schwere Küstenmörser*, or SKM batteries. Batteries 1–4 were each equipped with two Beta mortars, while Battery 5 had the two Beta 09 howitzers. One Beta mortar was not assigned to a battery. Initially, all SKM batteries were equipped with narrow-gauge railway wagons and rails. In 1912, to increase mobility, Batteries 2 and 5 were equipped with road wagons towed by steam-powered tractors.

42cm Gamma-Gerät – More Firepower

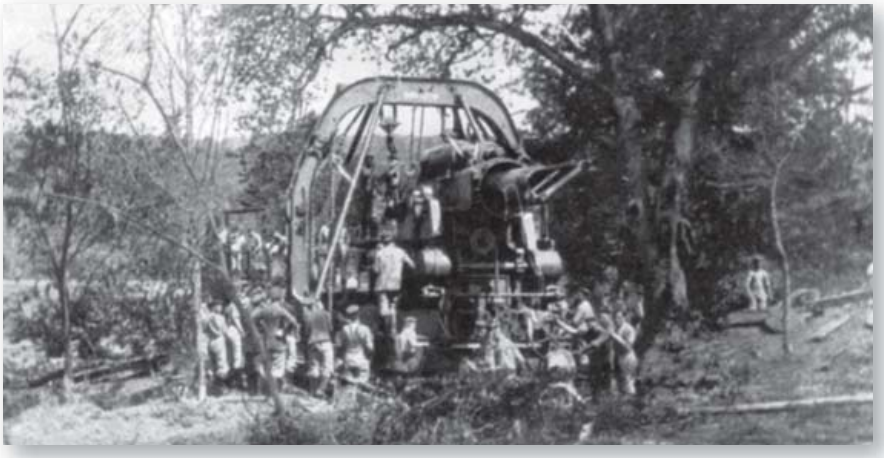
In 1906, Krupp and the APK initiated design and construction of a 42cm howitzer. The first example was delivered three years later for testing (in May 1909). Despite initial problems penetrating 30cm thick armored plate, it passed testing the next year and was accepted for service in the spring of 1911 under the pseudonym 42cm *kurze Marinekanone* (short naval cannon) 12 or *Gamma-Gerät* (Gamma-Equipment). However, at twice the size and more than three times the weight, transportation and emplacement of the Gamma were far more difficult than either model of the Beta-Gerät. Yet, despite its immobility, the Gamma was accepted by the APK because, at the time, firepower was the primary consideration for siege artillery.

The Gamma-Gerät was basically an upscaled version of the 30.5cm Beta 09. It too was a foundation gun with a massive carriage and base plate to accommodate the recoil of its 6.7-meter long L/16 barrel. When emplaced the howitzer stood more than 4 meters above ground and weighed about 150 metric tons. Because of its bulk, the carriage required a solid foundation made of steel and timber set into a 2.25-meter deep rectangular pit. The howitzer had five major components – base plate, turntable, carriage, barrel, and munitions lift and platform – which were assembled using a special 25-ton rail-mounted gantry crane.

Gamma howitzers could only move by standard rail and were always emplaced near permanent rail lines. For transport, the howitzers were disassembled into seven loads, each weighing between 20 and 25 metric tons, loaded onto railcars, moved to the new firing site, offloaded, and then reassembled. To facilitate movement, railcars were arranged in the order



The 42cm Gamma-Gerät howitzer was accurate and had good range, but its massive size and weight meant it was better suited for positional rather than maneuver warfare. Ten Gammas were built before and during the war. (NARA)



KMK Battery 1 assembling one of its Gamma howitzers in preparation for shelling of the Dannemarie railroad viaduct in May 1915. This view, taken from the front of the howitzer, shows the barrel being slid into the cradle. (M. Romanych)

needed to emplace the howitzer: (1) wood for the foundation, (2) steel rails for the gantry crane, (3) gantry crane, (4) rear half of foundation, (5) front half of the foundation, (6) base plate, (7) carriage with turntable, (8) cradle for barrel, (9) barrel, and (10) munitions lift and platform. A battery with two howitzers needed 20 railcars for the guns and associated equipment, plus several more for battery gear, horses, vehicles, munitions, and personnel.

Preparing a firing position for a Gamma-Gerät was a major engineering feat. Construction began with building a standard-gauge rail spur from the nearest main railroad line to the firing site and laying switching tracks for

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42CM GAMMA-GERÄT HOWITZER

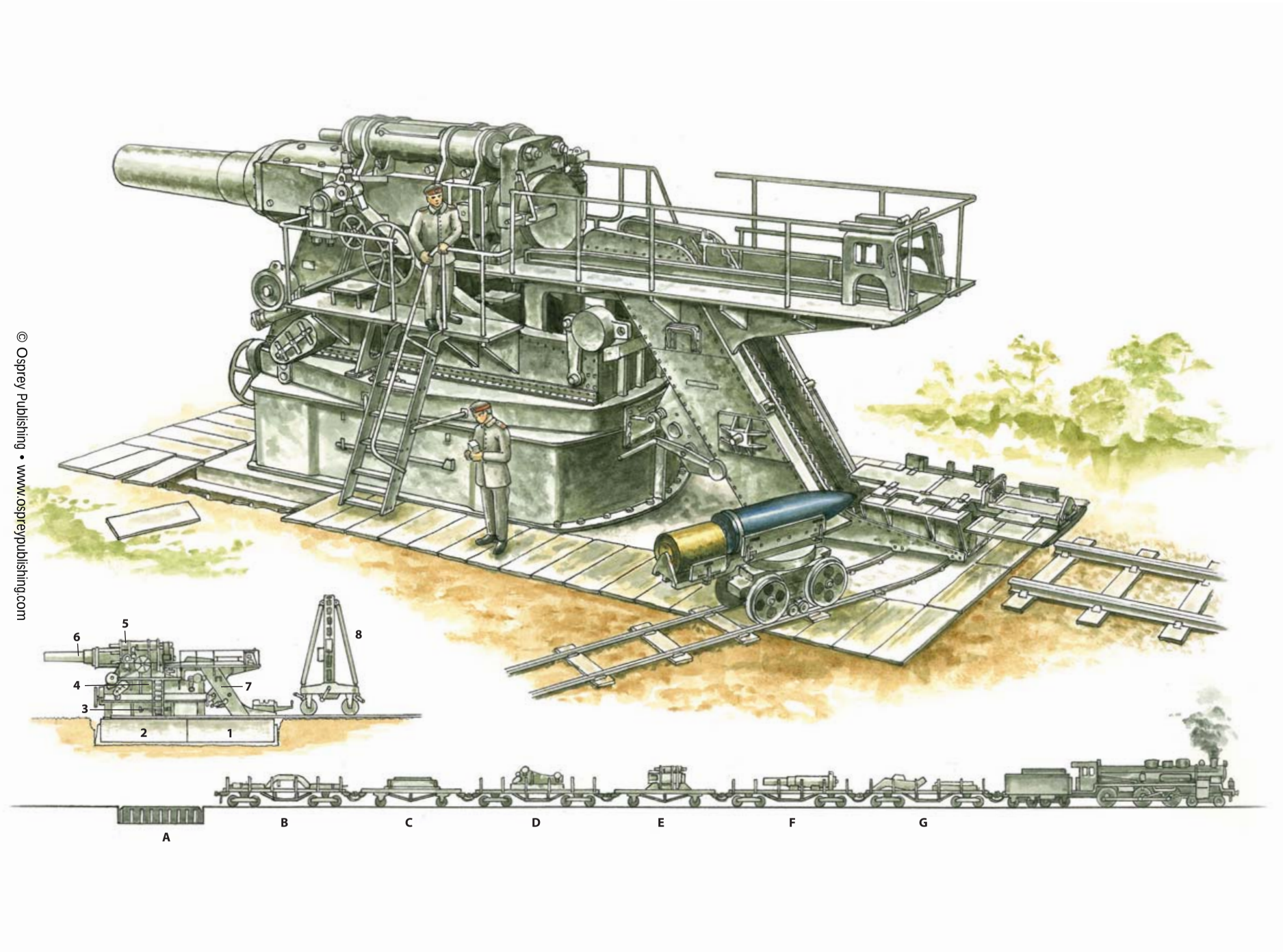
The 42cm Gamma-Gerät howitzer was the most powerful siege gun employed by the German Army in World War I. It was also the largest and least mobile siege gun, measuring 13.5 meters long and 4.25 meters high. Because of its weight – 150 metric tons – the Gamma-Gerät was emplaced on an elaborate foundation made of steel and timber set into a deep excavated pit. A 25-ton rail-mounted gantry crane was used to assemble and disassemble the howitzer. After assembly, the howitzer was set on target using an optical sight mounted on the left side of the carriage. Coarse azimuth adjustments were made using a large handwheel mounted on the front of the howitzer and then refined using a smaller handwheel mounted on the carriage. Barrel elevation for firing was between 43 and 66 degrees. A safety mechanism ensured that the howitzer could only fire when the barrel was elevated. A handwheel on the carriage moved a series of worm gears that raised and lowered the barrel. The recoil system was hydro-pneumatic with two large recuperators mounted above the barrel and two air recoil brakes and air tanks underneath. Munitions were delivered to the howitzer using a four-wheel cart mounted on a short section of narrow-gauge rail. A hand-cranked elevator on the rear of the carriage lifted the projectiles and cartridge cases (with powder charges) from ground level to the breech. The howitzer was fired by a lanyard-actuated striker that drove a firing pin into a percussion primer located in the base of the cartridge casing.

COMPONENTS OF THE GAMMA-GERÄT

1. Rear half of the foundation
2. Front half of the foundation
3. Base plate
4. Carriage with turntable
5. Cradle
6. Barrel and breach
7. Munitions elevator and platform
8. Gantry crane

GAMMA-GERÄT HOWITZER ON RAIL CARS

A. Foundation
B. Gantry crane
C. Base plate
D. Carriage with turntable
E. Cradle
F. Barrel and breech
G. Munitions elevator and platform



By 1916, Gamma howitzers were fitted with armored cabs to protect the crew in the event that the gun was shelled by enemy counter-battery fire. This howitzer is emplaced near Biache-Saint-Vaast in October 1917. (M. Romanych)

maneuvering the railcars during emplacement. Meanwhile, battery personnel cleared the firing position of vegetation and dug the pit for the foundation. Once spur tracks and the foundation pit were completed, the first railcar with wood for the foundation was moved into position and offloaded. Some of the wood was used to line the walls of the pit and keep the surrounding earth from collapsing into it. With the retaining walls in place, 50cm square timber beams were placed in the bottom of the pit and bolted together into a lattice footing and timber jacks were set on each side of the pit to support the steel rails for the gantry crane. The second railcar with rails for the gantry crane was moved in position and the rails were offloaded and placed on either side of the foundation pit and along the spur rail line so the gantry crane could straddle both the foundation and the spur line. In this way, it could roll back and forth between the railcars and foundation. When work on the rails was completed, the railcar carrying the gantry crane was moved into place and the crane was offloaded, assembled, and placed on its rails so it could move loads from the railcars. Once preliminary site work was done, assembly of the howitzer could begin. Under ideal conditions, aside from time needed to lay the rail line to the firing positions, 12 hours were needed to dig and prepare the foundation hole.

Another 12 hours were needed to put the howitzer together. Assembly began with the crew using the gantry crane to offload the rear and front halves of the foundation from the fourth and fifth railcars, and placing them into the pit on the timber beams. Lifting loads from the railcars was time consuming, taking 16 crew members working two hand cranks, one on each side of the crane, about an hour to move a single load from a railcar. The foundation halves were joined into a single unit and leveled. Next, the gantry crane unloaded the howitzer's base plate from its railcar. The base plate was placed on the foundation and bolted down. Next, the turntable and carriage were unloaded and bolted to the base plate. Then the cradle was installed on the carriage, followed by the barrel, which was slid into and attached to the cradle. Lastly, the munitions lift and platform for the crew were offloaded and attached to the howitzer.

The 28cm L/12 i.R. howitzer was essentially a large version of the heavy artillery's 21cm howitzer. Only one prototype howitzer was built and fielded in 1914 with SKM Battery 7. (M. Rupp)

Because of its long barrel and stable foundation, the Gamma was very accurate and, with a maximum range of 14,000 meters, it could outrange both Belgian and French fortress artillery. Rate of fire was one round about every seven minutes (eight rounds per hour), although the highest reported rate of fire for one howitzer was an astounding 19 rounds in one hour, and 30 rounds in an hour by a two-howitzer battery, although these rates could be maintained for only a very short time.

The 28cm howitzer L/14 i.R. in service with SKM Battery 8. This gun and the 28cm L/12 i.R. howitzer of SKM Battery 7 were valued on the Eastern Front for their mobility and high rate of fire. (M. Romanych)

Although the Gamma howitzer had the destructive power required by the General Staff, it was much less mobile than either of the Beta-Gerät mortars. The emerging German war plan required siege guns to keep pace with the advance of the army and swiftly reduce permanent fortifications. Bound to the rail system, which could be easily disrupted by enemy action, and needing 24 hours or more to emplace, there was no guarantee that the Gamma batteries could get into battle in time. Yet, even though worries persisted about the Gamma howitzer's immobility, the APK ordered the first howitzer in 1910, followed by a second in 1911 and three more in 1912, making five Gamma howitzers, organized as two batteries with a howitzer in reserve, available at the beginning of the war. Another five howitzers were built during the war, for a total of ten, along with 18 extra barrels.

42cm M-Gerät – Greater Mobility

The immobility of the Beta and Gamma howitzers remained a vexing problem. For the APK, the solution lay in mounting the next-generation siege gun on a *Räderlafette* (wheeled carriage). As early as 1907, Krupp began studying the concept of road-transportable siege guns. Technical tests satisfactorily demonstrated the feasibility of hauling siege guns mounted on wheeled carriages over roads and solid ground. The result of the tests was a series of wheeled carriage prototypes that eventually became forerunners to the mobile 42cm howitzer. The first design was a 28cm (11.2 inch) howitzer L/12 *in Räderlafette*, or i.R., which was similar in design to the Krupp 21cm howitzer. The howitzer had a range of 9,700 meters with a good rate of fire (15 rounds per hour). It was a detachable howitzer, separated into two loads – barrel and carriage with cradle – for transport. Krupp also made a longer-barreled version of the 28cm howitzer, designated the 28cm howitzer L/14 i.R., which was comparable to the L/12 howitzer except for its longer barrel and blast shield. At the same time, the firm of Erhardt built a 28cm howitzer to sell to the Russian Army. It too was a detachable howitzer, but it had a shorter range (6,000 meters). Both firms offered their howitzers to the APK, but because the APK wanted a wheeled 30.5cm howitzer, none of the 28cm guns went into production. Meanwhile, between 1910 and 1912, Krupp built a 30.5cm howitzer L/17 *in Räderlafette*, or Beta i.R. The design was based on the wheeled 28cm L/12 i.R. howitzer. Unusual for the Beta i.R. – as a siege gun – was its large blast shield meant to shelter the gun crew from the muzzle

The German Army's first large-caliber siege gun mounted on a wheeled carriage was the 30.5cm Beta i.R. howitzer. The design of the howitzer incorporated features from both the 28cm L/12 i.R. and L/14 i.R. howitzers. (M. Romanych)

A production model M-Gerät howitzer assigned to KMK Battery 10. The development and employment of the M-Gerät howitzers were closely held secrets. (M. Romanych)

blast. For transport, the Beta i.R. was disassembled into three pieces; barrel, carriage, and shield. Three to four hours were needed for assembly and emplacement. Maximum range was 12,000 meters. However, despite its good mobility and range, the howitzer did not go into production because it too lacked the firepower needed to guarantee success against the strongest French and Belgian fortifications. All three of Krupp's prototype wheeled siege howitzers saw service with the German Army during the war.

In autumn 1911, the APK and Krupp developed specifications for a wheeled 42cm howitzer and within a few months Krupp delivered a design. This howitzer was designated the 42cm *kurze Marinekanone* 14 L/12 *in Räderlafette* or M-Gerät (M-Equipment). The "M" stood for *Minenwerfer* (mine launcher), which literally meant a gun that fired a large explosive round at a high trajectory over a short range. The idea of naming the howitzer after a *Minenwerfer* came from demonstrations of short-range mine launchers built by Erhardt for the *Pionier* (engineer) troops. In fact, the M-Gerät was the logical successor to the 30.5cm Beta i.R. howitzer.

Except for its caliber, the M-Gerät had nothing in common with the Gamma howitzer. The M-Gerät was mounted on a large two-wheeled carriage and was much lighter. At 42 metric tons it weighed two-thirds less than the Gamma. The reduction in weight was achieved by redesigning the barrel – shortening

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MOBILE SIEGE GUNS

Beginning in 1907, the German Army explored the possibility of mounting siege guns on wheeled carriages (*in Räderlafette*, or i.R.). Three prototypes – two 28cm and one 30.5cm –howitzers were built. The 28cm L/12 (top) and L/14 (centre) i.R. guns were forerunners to the 30.5cm Beta i.R. (bottom) , which in turn was the predecessor to the wheeled 42cm M-Gerät howitzer. All the three prototype howitzers shared several common design features, although there were also distinct differences such as the 28cm L/12 howitzer's recoil mechanism with its three recoil cylinders, and the 28cm L/14 and 30.5cm Beta i.R. howitzers' blast shields. Because of their weight – between 17 and 24 metric tons – the howitzers had to be disassembled and transported in several loads pulled by motor truck or tractor. For off-road movement, the howitzers' wheels were fitted with articulated feet known as *Radgürtel* (wheel belts). When emplaced, the wheels rested on a mat of iron tubes (*Rohrmatten*), which were transported in rolls and laid out to create a firm foundation. Special equipment was used to handle the munitions. Shells were brought to the howitzers by a two-wheel handbarrow and then transferred to a wheeled tray which was pushed to the breech along rails mounted to the upper edge of the carriage. A long ramrod was used to seat the projectiles and cartridge cases. Loading the howitzers required a crew of six to eight men. None of these howitzers were put into production, but once the war began, all three were assigned to siege batteries and sent to the Front.