

## The Valentine

### **Production:**

When WW1 came to a close and WW2 began with Germany's invasion of Poland. British designers knew they needed to create an adequate main battle tank to rival the German panzer divisions. Hence they created the Valentine's first prototype in 1940 for trials and testing. In 1941 "The Mark I set the tone for the entire series of eleven main variants, with many sub-variants, and a staggering total of 8300 units."(1). They closed production in 1945 because the war had ended.

### **Armor:**

The Valentine's overall armor was lackluster compared to its peers. The armor layout was monotonous because it was the same all around with the Valentine's hull sporting 60mm of rolled homogeneous armor as its frontal, sides, and rear. With a small portion having a slope on the front and rear. Therefore in those spots the armor added was decreased but the slope made up for that. The turret was also 60mm all around but with the mantlet having 65mm. Most of the surfaces on the Valentine were flat or 90 degree angles which reflects poor design choices. The internal design of "The Valentine was of conventional layout, divided internally into three compartments; from front to back the driver's position, the fighting compartment with the turret and then the engine and transmission driving the tracks through rear sprockets."(2). Having those internal compartments is important because it provides protection from shrapnel if the tank is penetrated. It's important to have noted that all future variants of the Valentine had the same hull.

### **Armament:**

Early models of the Valentines had a 40mm main cannon until later in the war having them refitted with a variety of new cannons. As the war became more surreal and realization of the power of Nazi Germany's weaponry. The new Valentine variants began being fitted with a 57mm with even later models sporting a 75mm. All the different guns had ammunition with different names but their type and how they interacted with armor was the same. The main ammunition types include the following:

1. AP "*Armor Piercing*" shell or a solid shot shell was a very basic design and also acted as a foundation for other rounds to be created from. It's was able to penetrate a fair amount of armor even on decent angles. Although a major drawback to this shell is the damage it would do once it entered the tank. Equipped with no explosive filler, this round would rely completely on shrapnel created from the penetration to inflict damage. Typically when this round was fired from a Valentine it's it would most likely take a few shots to kill or fully disable due to the size of the shell itself.

2. APCBC "*Armor Piercing Capped Ballistic Capped*" shell .This revolutionary round was design off the basics of the AP Solid Shot. It follows similar dynamics to the AP but was much better at achieving penetration. "The cap transferred energy from the tip of the shell to the sides of the projectile, thereby helping to reduce shattering. In addition, the cap appeared to improve penetration of sloped armor by deforming, spreading and "sticking" to the armor on impact and thereby reducing the tendency of the shell to deflect at an angle."(3).
3. HE "*High-explosive fragmentation*" shell. High-explosive shells lost their use during the war but the Valentine could still be equipped with them. Due to the general increase in armor these low penetration valued rounds that explod on impacted didn't do much against higher armored tanks. Although use for this round was found when light armor targets or infantry in dugouts were present.

### **Overall Strength:**

The Valentine was an under gunned tank in the war and wasn't very effective. Other tanks had better guns, better armor, even access to more effective ammunition. It also wasn't very maneuverable either, so it couldn't flank an enemy tank or squad without taking a considerable amount of time. Although it needs to be brought up that Britain was is an island so the need for a main battle tank wasn't always present or desired. Against Nazi Germany's Tiger VI, the Valentine would be outgunned and out armored. Therefore the Tiger would have no issue taking down a valentine even from range. The USSR's T-34-85 had less applied armor but used slopes and was more maneuverable while also being equipped with more lethal ammunition. Overall the Valentine wasn't a completely bad tank but it wasn't anything outstanding either.

## **The M4 Sherman**

### **Production:**

The M4 sherman was introduced into WW2 as Americans main battle tank because of its easiness and cheapness to produce. As being one of the most famous tanks "This historic status was gained partly thanks to its intrinsic qualities, but also due to the sheer numbers in which they were provided, only surpassed by the Soviet Union's T-34-85, with a staggering 50,000 total delivered."(4). Just like the British Valentine, there are many different varieties of the Sherman with the earliest versions being produced in 1941 & 1942. Production of the Sherman stopped in 1945 when the war ended.

### **Armor:**

The Shermans armor was average compared to some of the opponents it faced. Although most of the time the sherman didn't bounce shells unless shot at the turret so most crews were rather lucky when it did happen. The frontal hull was 50mm thick and up to 100mm on the heaviest armor variant the Jumbo. The Jumbo actually had 2 plates

of rolled homogeneous armor welded together with the inner one being twice thick as the outer. Furthermore all shermans had a 48 degree angle on that upper plate which increased the effective thickness and chance for ricochet. The side armor of the sherman was anywhere from 38mm to 76mm depending on which variant. It's important to know that the lower side armor behind the tracks is 38mm on every variant and only the higher side armor above the tracks is where it was actually modified. The rear armor of the sherman is 38mm just like the lower sides. The turret armor on all the shermans variants is actually pretty decent with the earliest model having a 50mm mantlet and then another slab of armor behind that with 88mm of armor. Later models having anything from that to 177mm mantlet and 152mm side and rear turret armor. For turret armor that was outstanding for the time and really could give the opposition a run for their money if the sherman was hull down. Being "Hull down" is where the hull of the tank cannot be shot and only the turret is exposed. The sherman's interior was well designed with "The main turret being roomy, enough for the three other crew members. The loader sat on the left of the main gun and the gunner on the right, while the commander was at the rear, just behind the loader"(4). The hull was also spacious compared to other tanks so if a shell entered the tank and if it wasn't explosive, a lot of the shrapnel might miss the crew depending where it enters.

#### **Armament:**

Every sherman either had a 75mm, 76mm or a 105mm main cannon. Those were the only guns shermans operated with and the 105mm was a low velocity, and low penetration round that shot primarily HE shells. The 75mm and 76mm were decent for their time but definitely didn't take the crown for highest penetration values or damage upon penetration. The main ammunition types include the following:

1. AP "*Armor Piercing*" shell or a solid shot shell was a very basic type of shell and also acted as a foundation for other rounds to be created from. It's was able to penetrate a fair amount of armor even on decent angles. Although the major drawback to this shell is the damage it would do once it entered the tank. Equipped with no explosive filler, this round would rely completely on shrapnel created from the penetration to do its damage. When this round was fired from a Sherman it would take a few shots to kill or just one depending on where it penetrates. Assuming its the 75mm gun then since the shell is decently bigger than the Valentines early 40mm, it will inflict way more damage with its increased amount of shrapnel.
2. APCBC-HE "*Armor Piercing Capped Ballistic Capped - Explosive Filler*" shell. This revolutionary round was design off the basics of the AP Solid Shot. It follows similar dynamics to the AP but was much better at achieving penetration. "The cap transferred energy from the tip of the shell to the sides of the projectile, thereby helping to reduce shattering. In addition, the cap appeared to improve penetration of sloped armor by deforming, spreading and "sticking" to the armor on impact and thereby reducing the tendency of the shell to deflect at an angle."(3). This shell also has an explosive filler which is extremely deadly and

was highly feared. The way it works is once the shell impacts a certain amount of armor it triggers a fuse which detonates the explosives. So once the shell penetrates it will detonate inside the crew compartment which is a extremely vile, but effective at removing tanks from the battle in one shot. It needs to be stated that this is where having no armor was an advantage because if the shell is set to detonate of the force of hitting 18mm of armor and you have 10mm. The shell will penetrate and pass through the tank without exploding or creating much shrapnel since the shell needs that friction and resisting force to inflict damage if the explosives don't detonate.

3. APCR "*Armor Piercing Composite Rigid*" shell. This shell is purely situational because it has the best flatout penetration values, but with some serious drawbacks. The reason it's penetration value is so high is because its shaped like a needle and is also a solid material. The needle design is effective at flat surfaces but add a small angle and the chance of ricochet grows exponentially. Furthermore if the shell penetrates the opponent it won't do much damage. It won't shrapnel as good as the AP "Solid Shot" the Valentine uses but will penetrate thicker flat armor. What this all means is a longer time to kill. It would take a multitude of shots to completely disable a tank which would give the opposing tank time to fire back or move. Even though the sherman had a 75mm gun, this round wasn't very effective at removing their opposition because it gave the enemy chance to fire back when then revealed their location by shooting.
4. HE "*High-Explosive fragmentation*" shell. High-explosive shells lost their use during the war but the Sherman could still be equipped with them. Due to the general increase in armor these low penetrating rounds with that exploded on impacted didn't do much against higher armored tanks. Although use for this round was found when light armor targets or infantry in dugouts were present. Since one variant had a 105mm and the 75mm or 76mm are still quite big, removing light vehicles and dug in infantry was a possibility.

#### **Overall Strength:**

The Sherman was a great tank to mass produce and overwhelms your enemy in sheer numbers. It's decent armor and gun set a standard for other nations to follow that had inferior tanks. It was also a maneuverable which proved to be one of its biggest attributes. Against its opponents it could dish out some damage with its 75mm or 76mm but would need its numbers to be truly effective. Most of Nazi Germany's tanks it couldn't penetrate from the front so it was imperative that it had the numbers to over run and overwhelm the German forces. But overall it was a formidable tank when you compare it to one of its ally counterparts.

Char B1/B1 bis

**Production:**

The Char was an outdated tank in WW2 but was the best the French had at the time. France had a lackluster amount of good designs for tanks and since WW2 was underway they needed to make something so they didn't have nothing when they fought the Germans. Therefore "Production started in 1935, with Renault building 182 Chars B, AMX -a Schneider subsidiary- 47, FCM 72 and FAMH 70. At 1.5 million francs apiece, it was by far the costliest tank ever built en masse. Consequently, the original order of 1000 was reduced to 400."(5). The production stopped in 1940 when France fell to Nazi Germany. Due to the poor design, a lot of armor was added to the hull and along with that came the weight of that armor. Hence this tank needed a big engine, big tracks to distribute the weight, and a lot of fuel. Building this really reduced the spending power France had to put forth on other things. It can be concluded that absent production of an effective and efficient tanks was one of France's major downfalls in WW2.

**Armor:**

The B1 had a lot of armor and was a huge tank with most of its armor being flat surfaces. This tank could definitely bounce incoming shells to a extent but also has a massive weakness. The frontal hull of the Char has a multitude of slightly vertically angled slabs of 60mm rolled homogeneous armor. The sides have 2 sets of 55mm armor with the first slab being connected to the hull and the second being spaced out to so that its positioned inside the tracks while being outside the wheels and the drive gear that support and apply power to the tracks. With the side armor being spaced like that, the frontal armor of 60mm also extends to inside the tracks. The interior 55mm slab actually is hollow in the center because the tanks ammunition and fuel tank spread into that space inside the tracks. The rear armor is a flat 50mm that also extends into the tracks like the front does to make the interior space. The turrets of the Char is oddly shaped while being 56mm thick all around besides a hatch in the back which is 38mm thick. The mantlet is also 56mm with the turret armor itself behind it to create an effective thickness of 112mm. Due to the massive metal plates on the sides and their spacing, made the front weaker than the sides. In an attempt to fix this "The B1 ter was a late attempt to radically improve the design. The main features were new 75mm (2.95 in) armor welded with slopes to the hull, a new 350 bhp engine to deal with this added weight (36.6 tons) and some simplification in the design for mass-production in 1940, like the omittance of the Naëder transmission."(5). The interior design of this tank provided the crew with a small amount of room. The whole back of the tank is taken up by the engine, fuel tanks, and transmission besides on the right side. The strangest thing is there is actually a walkway inside the tank with ammunition being stored on the floor and walls from the inside. The tank is still cramped just because the front where all the actions are performed is very tight and close quarters. Which also means any type of shell that enters the Char in the crew department will almost indefinitely injure or kill one or more crew members.

**Armorment:**

The Chars main cannon is in a rather odd spot as well it being a short barrel which provide minimal time to achieve a high velocity which is what provides accuracy. The armament consisted of "The machine-gun turret which was equipped with an antitank 47 mm (1.85 in) gun. The main gun was a 75 mm (2.95 in) howitzer, in a low hull sponson."(5). The velocity of the 75mm was so bad that the penetration values of the 47mm were better therefore the secondary gun had a better chance of inflicting damage to the enemy tank. Not even to mention it had a turret and could aim freelee while the 75 was limited to anything but what was straight ahead of the of tank. The ammunition types for the 47mm consisted of:

- APC "*Armor Piercing Capped*" shell. This type of shell is very similar to the APCBC shot as in it has a cap to help with penetrating angles. APC has a solid blunt cap, not a ballistic cap. The Ballistic cap "BC" is to provide a needled nose to cut through the air until reaching the target where it then smashes away revealing the blunt APC round behind it. The APC just has a hard blunt head specifically designed to smash sloped armor but since the front is blunt it loses effectiveness over range. This could be wrapped up by saying that APC is the poor man's APCBC.

The 75mm gun has the following shot:

- APHE "*Armor Piercing High Explosive*" shell is a very basic shell. It's an AP with explosive filler, set with a fuse to detonate once its made contact with the required amount of armor. This shell fares poorly at angles because of its sharp nose. Once this shell penetrates the explosive filler would make short work of the crew inside.

Both guns on the Char have the following shot:

- HE "*High-explosive fragmentation*" shell. High-explosive shells lost their use during the war but the Char could still be equipped with them. Due to the general increase in armor these low penetrating rounds with that exploded on impacted didn't do much against higher armored tanks. Although use for this round was found when light armor targets or infantry in dugouts were present. Since the Char has a 75mm, that gun could be used to take out infantry in a house or a dug in. Light armored targets would prove difficult due to its low velocity and accuracy. Furthermore since it is mounted to the hull, it would be a extreme challenge to shoot an enemy moving at speed.

### **Overall Strength:**

The Char is a really lackluster tank for its time. The guns it sported and the costliness of the tank's production really dampen its abilities. Being such a large tank with so much armor made it slow and cumbersome which made the German tactic the blitzkrieg even more effective. The 75mm is really useless with its low penetration values and limited range of fire. The 47mm doesn't have enough firepower to do any considerable damage if any. This tank falls on the bottom of the list and would be easily squashed by its peers like M4 Sherman and T-34-85.

## The T-34-85

### **Production:**

The T-34-85 was a great tank for the soviets for many reasons. It housed a new weapon that could combat the German 88mm cannons. It was mobile, had average armor, and easy to produce. The predecessor of the T-34-85 was "The T-43 shared, to ease production, a major part of its components with the T-34, including its 76.2 mm (3 in) F-34 gun. However, the tests performed at the Kubinka proving grounds showed that the T-43 did not have the required mobility (it was slower than the T-34) and, at the same time, could not resist an 88 mm (3.46 in) shell impact."(6) Early versions of the T-34 weren't as effective as needed, so after the T-43s failure, the T-34-85 became the main focus. Furthermore since it was so easy and effective to produce, the "Soviet industry would eventually produce over 80,000 T-34s of all variants, allowing steadily greater numbers to be fielded as the war progressed despite the loss of tens of thousands in combat against the German Wehrmacht."(6). Production of the T-34-85 ended in 1945 at the war's end with a lot left over. They had the same method that the Americans had with their Shermans of just producing so many that they could overwhelm the German forces. Although for the russian the production of these T-34-85s was life or death since the battles raged in their front yard.

### **Armor:**

The overall armor of the T-34-85 is actually decent due to its angles. The hull is 45mm of rolled homogeneous all around with the front having a slope of 60 degrees. That brings the armor value up to around 60 to 80 depending on the angle of the round coming in. The sides were also sloped but at a much less 39 degrees. Finally with the rear having a 49 degree slope for the upper portion. All these slopes really make APCR ineffective against this tank. The turret is 90mm in the front and on the cheeks as well has having a 90mm mantlet. The side section of turret is 75mm and the rear is 52mm, all of which are at a minor angle. The overall design of the T-34-85 is take advantage of angles to increase its armor effectiveness. Although APCBC or APC will still have an easy time penetrating this tank's hull. One interesting modification about the T-34-85 armor is "Apart from the turret, the hull was almost unchanged except for the turret ring. It had to be enlarged from 1.425 m (56 in) to 1.6 m (63 in) to give a more stable and sturdy base, but this made the entire upper hull more fragile. The space between the huge turret and hull was also quite large and created natural shot traps."(7). These "shot traps" are one of the flaws to having the bottom of the turret angled. When a round hits that angle and ricochets, it ricochets downward into the top armor of the tank. That top armor is usually pretty thin and there for the left over energy of that round can pierce through and inflict damage upon the crew. Typically if it's just a solid shot then it would kill the driver or machine gunner, but if its a round with explosive filler it could disable the

tank all together. This is also one place where if HE was used correctly could be extremely effective.

### **Armorment:**

The T-34-85's armorment is substantial because of its 85mm and the ammunition types in its load out. The penetration values are also very good and are almost on par with some of the German 88mm. Since the T-34-85 in every version has the same gun or just an 85mm in general, each variety can be expected to perform practically the same. The ammunition types that are loaded out are the following:

1. APHE "*Armor Piercing High Explosive*" shell is a very basic shell. It's an AP with explosive filler, set with a fuse to detonate once its made contact with the required amount of armor. This shell fares poorly at angles because of its sharp nose because it will be more prone to ricochet. Once this shell penetrates the explosive filler would make short work of the crew inside.
2. APHEBC "*Armor Piercing High Explosive with Ballistic Capped*" shell. This shell follows the same fundamentals as APCBC but has an explosive filler. One interesting fact about the T-34-85s APHE shell is that it has one of the biggest amounts of explosive filler compared to its peers.
3. APCR "*Armor Piercing Composite Rigid*" shell. This shell is purely situational because it has the best flatout penetration values but with some serious drawbacks. The reason it's penetration value is so high is because its shaped like a needle and is also a solid material. The needle design is effective at flat surfaces but add a small angle and the chance of ricochet grows exponentially. Furthermore if the shell penetrates the opponent it won't do much damage. It won't shrapnel as good as the AP "Solid Shot". What this all means is a longer time to kill. It would take a multitude of shots to completely disable a tank which would give the opposing tank time to fire back or move.
4. HE "*High-explosive fragmentation*" shell. High-explosive shells lost their use during the war but the T-34-85 could still be equipped with them. Due to the general increase in armor these low penetrating rounds with that exploded on impacted didn't do much against higher armored tanks. Although use for this round was found when light armor targets or infantry in dugouts were present.

### **Overall Strength:**

The T-34-85 stacks up as one the topic dogs against its components, although it isn't in the number one spot. The armor and gun on this tank made for a great pair and could dish out a lot of explosive damage while possibly bouncing shells due to its sloped nature. The Germans Tiger VI could still penetrate the T-34-85s hull under when in range but otherwise the front hull could sustain such a hit. Since the gun of the T-34-85 was similar to that of the 88mm it could compete when in range as well. Furthermore it had great mobility and could provide one shot one kills, due to amount of explosive filler in the APHEBC or APHE. This is why the the soviets had one of the top contenders for WW2 tanks.



## Tiger VI

### **Production:**

The Tiger VI, one of the or thee best tank in WW2 for armor and firepower. Nazi Germany created the Tiger VI in a need for an elite tank that could handle whatever the ally's would throw their way. The Tigers were engineered to perfection so that they could always be reliable. "Tiger Tanks produced (only 1346), to the more than 120,000 T-34s and Shermans combined, one can appreciate the psychological impact of this model, at least from the Allied tank crew perspective. In its concept laid the very core of the German conception of a heavy tank."(8). The production of these tanks was very slow and costly but that wasn't a concern because they believed that quality > quantity.

### **Armor:**

The Tiger's armor is one of the best out of all the nations during that time. The frontal hull was sporting 102mm of rolled homogeneous armor at 10 degrees which was impenetrable to many tanks. The upper side armor is 82mm and the bottom is 62mm with the tracks adding an addition amount of armor along the sides. The rear is also a staggering 82mm thick with no slope. Furthermore the turret is like the Valentines because it has 82mm all around the sides and back. The mantlet is complicated but ranges from 90mm to 200mm from various regions. That is a lot of armor and is exactly why the ally's struggled to kill this tank. Even though a lot of the tank isn't sloped so APCR could penetrate, the round doesn't do a lot of damage therefore the tiger could fire back and kill.

### **Armorment:**

Some models of the Tiger had 75mm cannons but very soon after they were all fitted with the infamous 88mm. "The Tiger I gave the wehrmacht its first armoured fighting vehicle that mounted the 8.8 cm KwK 36 gun (not to be confused with the 8.8cm Flak 36)"(9). The 88mm could penetrate lots of armor from distance and became a notorious sniper because of it. The ammunition load out for the variety include:

1. APCBC "*Armor Piercing Capped Ballistic Capped*" shell .This revolutionary round was design off the basics of the APC Solid Shot. It follows similar dynamics to the blunt APC but was much better at achieving penetration. "The cap transferred energy from the tip of the shell to the sides of the projectile, thereby helping to reduce shattering. In addition, the cap appeared to improve penetration of sloped armor by deforming, spreading and "sticking" to the armor on impact and thereby reducing the tendency of the shell to deflect at an angle."(3).
2. APCR "*Armor Piercing Composite Rigid*" shell. This shell is purely situational because it has the best flatout penetration values but with some serious drawbacks. The reason it's penetration value is so high is because its shaped like a needle and is also a solid material. The needle design is effective at flat

surfaces but add a small angle and the chance of ricochet grows exponentially. Furthermore if the shell penetrates the opponent it won't do much damage. It won't shrapnel as good as the AP "Solid Shot". What this all means is a longer time to kill. It would take a multitude of shots to completely disable a tank which would give the opposing tank time to fire back or move.

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### **Overall Strength:**

The Tiger VI is superior to all its peers with its armor and gun. The only bad things are in the production of the tank besides the fact its mobility. Otherwise the Tiger will out range any other tank with penetrating shots and also out bounce any other tank when it comes to incoming rounds. The Tiger VI could penetrate and one shot all of its competitors right through the frontal hall. Overall the Tiger VI is unmatched with its ability to dish out damage while receiving it.

I don't know if im suppose to site where I get the armor values from because i'm quoting someone's words or philosophy. It's a fact that can be found many places and no one owns the right to say the tiger has a 102mm in the front.

### **Websites used for Quotations**

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