The History of the Twentieth Century
Episode 131
"This Wellsian Wonder"
Transcript

[music: Fanfare]

> *For the life of me I could not take my eyes off of it. The thing—I really do not know how else to describe it—ambled forward with slow, jerky, uncertain movements…It came to a crater. Down went its nose; a slight dip, and a clinging, crawling motion, and it came up merrily on the other side. And all the time as it slowly advanced, it breathed and belched forth tongues of flame…and the Huns, terrified by its appearance, were mown down like corn falling to the reaper's sickle.*
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> *Presently it stopped. The humming ceased. The spell was broken. We looked at one another, and then we laughed. How we laughed! Officers and men were doubled up with mirth as they watched the acrobatic antics of this mechanical marvel—this Wellsian wonder.*

British Army Lieutenant Geoffrey Malins, describing his first sight of a tank.

Welcome to *The History of the Twentieth Century.*

[music: Opening War Theme]

Episode 131. This Wellsian Wonder.

I talked about the development of the internal combustion engine all the way back in episode 57, before the Great War began. (Remember "before the Great War began"? Good times.) The automobile was just coming into its own by 1914, and automobiles were still very expensive in Europe. (They were cheaper in the US, thanks to assembly line manufacturing.) Consequently, as you no doubt recall from the episodes on the early part of the war, Great War armies mostly relied on railroads to move soldiers and supplies. Railroads don't go everywhere of course, and

they especially don't advance into enemy territory, so when soldiers are on the offensive, they walk, and whatever equipment and supplies they can't carry on their own backs go into wagons drawn by horses that trundle slowly behind.

One of the great "what if" scenarios you might want to devise for an alternate history of the Great War is this one: what if Imperial Germany, instead of investing so heavily in dreadnoughts that will prove all but useless once the war comes, invest all that money in trucks instead? Trucks that could have moved German soldiers and their equipment and supplies much more rapidly across northern France in those crucial early weeks of the war when it was still in its mobile phase, and Paris almost fell.

But the Germans didn't do that. And you can understand why. It would have been hugely expensive and the benefits were not as obvious in 1910 as they are today in hindsight. Still, automobiles and trucks did not play a major role in the early part of the war, apart from that moment when the taxicabs moved 6,000 French soldiers from Paris to the front line in an afternoon during the dramatic Battle of the Marne.

As the war continued, trucks and automobiles came increasingly into use, though not to move soldiers. The war had settled into mostly static front lines by this time, and so cars and trucks were typically used for supply, such as at Verdun and during the Russian offensive into eastern Anatolia. But after the mobile phase of the war ended, there were a number of strategists in the Allied countries who began considering the question of whether automobile technology could be employed to break the stalemate on the battlefield.

The first attempt to use self-propelled vehicles not merely for troop transport or supply distribution but as an actual war machine was the armored car, which is exactly what it sounds like, a motorcar with an armored body. I mentioned these back when I told the story of the Italo-Ottoman War in episode 66. The Italians were the first to use them in combat, in Libya. Armored cars are much faster than soldiers or horses, so they proved useful for reconnaissance and for command and communication duties. You can mount machine guns on them, which makes them a formidable anti-infantry weapon. Later, when airplanes become weapons of war, armored cars began turning their machine guns skyward and became mobile anti-aircraft weapons.

Armored cars in those early days had one big disadvantage, though. They ran on pneumatic rubber tires, just like civilian cars do. This worked fine on roads and passably across clear terrain, provided the ground wasn't too bumpy or too soft. But wars are fought on all kinds of terrain, so what was needed was a vehicle that could drive across all kinds of terrain.

Do you know who else besides soldiers needs a vehicle that can drive across all kinds of terrain? Farmers, that's who. I've said repeatedly in this podcast that in the early twentieth century, agriculture in many places still depended on young men and horses. To mechanize agriculture, you're going to need a machine that can propel itself across a plowed field: what today we call a "tractor."

Inventors in Britain and the United States developed first, steam-powered and later, internal combustion tractors. These early machines solved the problem of rolling over soft and uneven ground by using very large metal wheels with heavy metal treads. These wheels could grip even soft soil and were large enough to roll right over most bumps. As it turns out, soil conditions in the Midwestern United States and central Canada were more favorable to these machines than the heavy, sodden soil of England, and so tractors were adopted more quickly on American and Canadian farms, but by the time of the Great War, agriculture was becoming mechanized in all three countries.

Farmers in the English-speaking world were already accustomed to using combine harvesters to harvest their crops mechanically. These had been invented in the nineteenth century. The earliest of them were horse or mule drawn, but by the early twentieth century, tractors were replacing the horses and mules, and in 1911, the Holt Manufacturing Company of Stockton, California, produced the first self-propelled combine harvester, powered by internal combustion.

Big wheels are one way to get over soft, bumpy ground, but they aren't the only way. By the late nineteenth century, a number of inventors in the United States and Britain—and at least one in Russia—independently developed the caterpillar track and related technologies. They come in various forms, but the underlying principle is that the wheels of the vehicle run on a track that the vehicle itself lays down in front of the wheels and then picks up again after the wheels have passed, typically using a continuous belt of metal plates that circles around the wheels. The first company to offer a tractor with a caterpillar track was, again, the Holt Manufacturing Company of Stockton, California.

By the time the war began, Holt tractors were in use on farms across Britain and France. The French Army began requisitioning them early in the war, and found them useful for moving heavy equipment in the field—equipment like artillery guns. By 1917, the British and the French armies were using thousands of these Holt tractors on the Western Front.

There was another technology developed in England in the early years of the twentieth century called the pedrail wheel. This was a large wheel with a number of small rubber-shod metal feet attached on pivots around its circumference. This particular design never did catch on, but I mention it because it inspired H.G. Wells to write a short story entitled "The Land Ironclads," which was published in *The Strand Magazine* in 1903. The story describes a war between two unnamed nations, one is of strong, rugged fighting men, the other of townspeople—clerks, students, factory workers. The rugged side imagines they'll have no trouble mopping up this collection of wimps until the land ironclads appear. These are huge armored machines, the size of small warships, that move across the open ground on pedrail wheels and make short work of their "rugged" opponents, not to mention allowing Wells to make a point about the superiority of brains over brawn.

If you think all the way back to the Second Anglo-Boer War, episodes 11 and 12, recall how the British built blockhouses where six or so soldiers could hole up behind its impregnable stone walls and fire out of narrow windows to defend railroads and bridges. These were an effective countermeasure against Boer guerilla fighters. But blockhouses can't move, so the British had had to build thousands of them to cover all the points they needed to defend. What if a blockhouse could travel across the ground, roll right up to an enemy position and fire on it, with the soldiers inside protected by its thick walls from enemy counterfire?

Soldiers and inventors have imagined such a thing for centuries. Leonardo da Vinci sketched out something like it, and of course H.G. Wells has written up his land ironclads, but is technology now catching up with imagination?

As you know, the Great War began in 1914 and within weeks the Western Front solidified into stalemate. A British Army engineer, Major Ernest Swinton, was assigned as a war correspondent on the Western Front that year. He saw trench warfare develop, he saw a Holt company tractor, put two and two together, and began lobbying his superiors to build an armored machine on caterpillar treads. He called it a "machine-gun destroyer," because he envisioned it as being mostly useful to take out machine gun emplacements. He described it as "a self-propelling, climbing block-house."

The British War Office proved difficult to convince. In February 1915, the Army tested a Holt tractor at Aldershot, but apparently the generals weren't exactly blown away by what they saw. Was this newfangled machine useful for moving artillery guns around the battlefield? Sure. Was it a weapon of war? Um, no.

Swinton was naturally disappointed. Another Englishman who was disappointed was the First Lord of the Admiralty, Winston Churchill. If the War Office wasn't going to take an interest in this proposal, then, Churchill decided, the Royal Navy would. Churchill created a small group to study the concept. The group came to be known by the wonderfully Wellsian, awesomely science-fiction-y name of the Landships Committee.

The Landships Committee spent the next few months studying the possibilities. As the committee's name implies, they were thinking along the lines of Wells' land ironclads, machines as large as small warships, riding on big wheels fifteen feet high. These ideas when analyzed carefully proved to be not feasible, surprise, surprise.

In June of that year, Sir John French, then still commander of the BEF, became a supporter of Swindon's idea. He wrote to the War Office, prodding them to continue their investigation, which led to the War Office and the Admiralty to combine their teams. With the big wheel landships having proved impractical, their attention turned back to smaller vehicles along the lines Swinton had been talking about all along. It would still need to be pretty big as land vehicles go. The Army laid out the criteria for what they would want in such a machine: it would need to be capable of crashing through no-man's land, flattening the barbed wire fences as it

went, then motoring over the enemy parapets and right across a trench potentially as wide as eight feet, and keep right on going.

A small demonstration model was ready by September 1915, and it was nicknamed Little Willie, and no, I am not making this up. Little Willie just didn't measure up to the Army's specifications, which led to a modified design called Mother. Or sometimes Big Willie. And no, I am not making that up, either.

Big Willie made people take notice. It was demonstrated to the Landships Committee and members of the Cabinet in early 1916, when it ran a test course over simulated battlefield obstacles. War minister Kitchener was skeptical, but most of the other Cabinet members present were impressed, including Arthur Balfour, the man who had replaced Churchill as First Lord of the Admiralty, and also David Lloyd George, whose Ministry of Munitions took on the job of producing 150 of these machines, which they were now calling "tanks."

That was a code name. The name "landships" was judged to give away too much information to potential German spies. Calling them "tanks" was part of a cover story that explained away the ungainly machines as self-propelled water tanks that were being developed for use in the deserts of the Middle East.

These early "tanks," designated "Mark I," were not quite big enough to earn the label "landships," but by the same token, they were quite a bit more than just an armored car. They were about 25 feet long, not counting the wheeled tail they dragged behind themselves for stability. The treads ran in an exaggerated rhomboidal shape that allowed them to climb over obstacles like craters and parapets. Unlike what you probably imagine when you think of a tank, they did not have a turret on the top. The center of gravity needed to be low for the sort of obstacle climbing the machine was expected to do, and so nothing on the tank extended higher than the tops of the treads. They sported two versions, armed with cannons or machine guns. These projected from the sides of the machine, through the middle of the tread belt loop.

And they were horrible. Inside, there was no engine compartment. The engine and the crew shared the interior space, meaning with every breath the crew were inhaling gasoline fumes and carbon monoxide. The machines also got very hot inside, so much so that early tank crews were prone to passing out. They had no radios, since the crew wouldn't have been able to hear a radio over the noise of the engine anyway, so instead each machine was equipped with two carrier pigeons to send messages.

And I can only guess how the carrier pigeons felt about being driven around inside those contraptions.

They made their first appearance on the Western Front during the Battle of the Somme on September 15, 1916; forty-nine of them, to be exact, all that were available to the British Army at that time. They drew cheers from the Tommies and frightened the Jerries. British newspaper

reporters on the front lines went into grandiloquent convulsions in their attempts to describe to the readers back home exactly what they had seen. Keep in mind that this was in an era when battlefield photojournalism was in its infancy. It actually took two months, until mid-November, before the first British newspaper—*The Daily Mail*, of course—published an actual photograph of one of these machines. In the meantime, artists at British newspapers and magazines did their best to visualize what the dispatches from the front were describing. And it didn't take long for editors to dig up that thirteen-year old story from *The Strand*, "The Land Ironclads," and begin to quote from it, or reprint it in its entirety. And here is the moment that the now 51-year old H.G. Wells acquires his reputation as a visionary.

Beyond that, the tank represented for the British doses of hope and inspiration, two therapeutics that were in short supply in 1916. Hope that these new machines might at last end the deadlock on the Western Front; inspiration in the form of reassurance that British industry, British invention, and good old British mettle still counted for something even in the midst of this monstrous war.

Only, here's the thing. These tanks didn't really accomplish much. They were still experimental. Some of them broke down. Some of them got stuck. Some tank drivers got lost—navigating a tank isn't easy. You can only see your surroundings through narrow slits, and the only way to turn a tank is by varying the speeds of its two treads, so it's a little more complicated than going out for a drive on a Sunday afternoon. And there is one reported case of a tank that became stymied because its crew refused to run their machine over the dead bodies that littered its path.

And it isn't only a question of getting these behemoths to work properly. Once you've got them working, you still need to know what to do with them. What we are seeing here is the birth of armored warfare tactics. At the Battle of the Somme, the British used their tanks in teams of two or three to assault German machine gun positions and cover the advance of infantry behind them. This is not the optimal use of tanks on the battlefield, but let's be fair. It's going to take another 25 years and a couple more wars before European military commanders get a real handle on how to use these things. Oops, I gave away a spoiler there…

[music: *Terzetto*]

That other modern marvel made possible by internal combustion engines, the airplane, followed a similar path to becoming a war machine. Like the armored car, the story begins with reconnaissance.

Aerial reconnaissance had proved its worth in those dramatic early days of the war, particularly at the Battle of Tannenberg, episode 87, and the Battle of the Marne, episode 88. In the first instance, German reconnaissance helped spot the Russian Second Army's vulnerability. General von Hindenburg would say later, *"Ohne Flieger, kein Tannenberg,"* that is, "Without pilots, no Tannenberg." At the Battle of the Marne, aerial reconnaissance helped French commanders spot

the fateful turn that allowed the flank attack that broke the German offensive. If either of these battles had gone the other way, the Great War would indeed have been over by Christmas.

There are many cases reported of enemy reconnaissance pilots simply waving to each other as they passed in flight during those early days. Presumably they were thinking that flying one of those airplanes was quite risky enough, without people shooting at each other too, a very sensible attitude, if you ask me.

But it wasn't only reconnaissance. Airplanes could also be used to drop bombs, something you'll recall that the Italians had also experimented with during their war with the Turks. Early attempts at aerial bombing produced mixed results, but still, you didn't have to be H.G. Wells to see the potential. Similarly, once you begin to envision the dangers presented by enemy aircraft observing your army's movements or dropping explosives on your soldiers, you will soon begin to see the advantage in knocking down enemy aircraft before they get the chance to make this kind of trouble.

Soldiers on the ground began firing their rifles at airplanes almost at once. Some of the first British units into France in those early days were from the Royal Flying Corps, who soon discovered the French *penchant* for firing on unmarked planes, which many French soldiers took to be German. The French marked their own warplanes with a distinctive circular pattern: a blue dot in the middle, with a white circle around it, and a red circle around that, in imitation of the blue, white, and red of the French tricolor. Later, when the British Expeditionary Force arrived in France, Royal Flying Corps pilots began to joke that the only difference the arrival of the BEF made was that now the British were also shooting at their planes. Shortly afterward, the RFC adopted the French solution, mimicking the pattern but reversing the colors: a red dot in the middle, with a white circle around it, and a blue circle around that, in imitation of the red, white, and blue of the Union Flag.

Small arms and machine guns aren't terribly effective against aircraft and artillery guns are too big and too slow. What works best is some kind of gun that by accident or design is intermediate in size: small enough to aim and fire rapidly, like a machine gun, but firing larger and heavier shells. Exploding shells work best. That way you actually don't have to hit the aircraft, just get the shell to burst somewhere near it. In the case of balloons, everyone was using hydrogen gas at that time. Hydrogen gas explodes if you so much as look at it cross-eyed, so exploding shells take care of balloons very nicely. The aircraft of the time were light, fragile, and mostly made of wood, so exploding shells could do quite a number on them, too. At the beginning of the war, only France and Germany and the Royal Navy had weapons that were the right caliber to attack enemy aircraft, but soon everyone was scrambling to design and produce more of them.

In truth, it would be anti-aircraft guns on the ground that would be responsible for most of the aircraft shot down during the Great War, but when you think of military aircraft in the Great

War, the first thought that probably comes to mind is aerial combat between airplanes, or "dogfights," as people were calling them by as early as 1915.

The first instance of an airplane brought down by the action of an enemy airplane occurred on September 8, 1914, just five weeks into the war. A Russian pilot named Pyotr Nesterov brought down an Austrian reconnaissance plane over Galicia by the simple expedient of ramming it with his own plane. The two planes crashed, killing everyone aboard both of them. Now obviously, you don't want to keep doing it that way. You'd like to find a way to bring down the enemy airplane without sacrificing your own plane, and especially your own life. Some pilots tried drawing their sidearms and firing single shots at enemy planes, but this hardly ever worked, not least because aiming and firing a pistol or rifle while piloting one of these early flying-machine-slash-deathtraps at the same time was a pretty tricky business.

The solution was the fighter airplane, pioneered by the French. The first fighters were conventional aircraft with a machine gun bolted on, which presented problems of its own. The ideal place to mount the machine gun is right in front of the pilot, which makes it easy for the pilot to aim and fire, but you can already see the problem with this: it would mean the machine gun would be firing through the arc of the propeller blades, which means every now and then, one of those bullets is going to hit the propeller, and remember that in this period the propellers are made out of wood.

Alternatively, you could mount the machine gun above the propeller or on the wing, but that makes it much harder for the pilot to aim. The French experimented with a propeller shielded with metal armor at the points where a bullet might strike it, but that didn't work so well either.

Enter the colorful and charismatic 25-year old Anthony Fokker. Fokker was the son of a wealthy Dutch plantation owner in the East Indies, who, like our old friend Alberto Santos-Dumont, had the wealth and leisure to indulge an interest in airplanes. In 1912, he moved to Berlin and established an aircraft factory, which the German government requisitioned at the beginning of the war. Fokker spent the war managing the factory for the government, designing and building military aircraft. In April 1915, Fokker introduced the *Eindecker*, which simply means "monoplane" in German. It was the first purpose-built fighter aircraft. It was lightweight, a single-seater that used steel tubing instead of wood to support the fuselage. As a monoplane, it gave the pilot greater visibility and maneuverability, and best of all, Fokker had designed a mechanism that synchronized the machine gun with the propeller so that it only fired when the propeller blades were safely out of the way.

The Fokker *Eindecker,* flown by pioneering pilots like Oswald Bölcke and Max Immelmann was unmatched by anything the Allies could put into the air, and for a period of nearly a year in the latter half of 1915 and early 1916, Germany had unquestioned air superiority. Allied reconnaissance flights needed heavy escort to perform the simplest of missions. German flyers pioneered new tactics to take advantage of the Eindecker's capabilities. Oswald Bölcke literally

wrote the book on aerial combat, the first manual on the subject, which was distributed to all German flyers. Max Immelmann devised a maneuver in which he climbed rapidly, then turned rapidly, which put his plane into a rapid descent in the opposite direction. This allowed him to make a quick and surprising second attack against an enemy airplane he'd already strafed once, and this maneuver became known as the "Immelmann."

In September 1915, Fokker introduced an improved version of the *Eindecker* that was even deadlier, with a more powerful engine and twin machine guns. On October 31, Oswald Bölcke shot down his sixth plane, and was awarded a knighthood for it. A week later, Max Immelmann duplicated both accomplishments.

On the Allied side, the French aviation instructor and test pilot Adolphe Pégoud was already a celebrated aviator before the war. He volunteered for military service and after he shot down his fifth enemy plane, the French newspapers began referring to him as an "ace," and this is the origin of the custom of calling a pilot with five confirmed kills an "ace." Pégoud would shoot down a sixth plane before being downed and killed himself on August 31, 1915, ironically by a German pilot who had been one of his students before the war.

German Fokker planes so dominated the skies during this period that it has come to be known as the "Fokker Scourge." Germany's top pilots were also becoming celebrities, a fact which was brought home to Oswald Bölcke one day when he shot down a British plane behind German lines, then landed near it to assist the crew, who had survived the experience, only to discover that his enemies knew who he was. He later visited them in hospital, which made the front page in newspapers across Germany, which only added to his notoriety.

On January 12, 1916, Bölcke and Immelmann both scored their eighth kill on the same day, which led to Kaiser Wilhelm presenting both of them with the *Pour le Mérite*, Germany's highest military decoration. From this grew the custom in Germany that eight kills earned you this award, and its distinctive blue cross would become a German fighter pilot's must-have fashion accessory as the other aviators scrambled to match the two pacesetters. That medal would later come to be known as the "Blue Max" in honor of Max Immelmann.

By March 1916, both Bölcke and Immelmann had scored their tenth kills, and it became the custom in Germany to call to call a pilot with ten or more kills an *Überkanone*, which you could loosely translate into English as "top gun." Since the most successful fighter pilots were now routinely getting knighthoods after their sixth victory, this led the more romantic and aristocratically minded Germans to conceive of these elite pilots as a sort of twentieth-century knighthood of knights who had exchanged horse and lance for airplane and machine gun, who admired skilled fighting even from their foes, and who exhibited the modern version of chivalry in gestures such as visiting their wounded opponents in the hospital.

These pilots were becoming so famous and so popular that they were discovering they couldn't appear in public without being mobbed and they were inundated with what there was not yet a

name for in 1916, but a decade later would be known as “fan mail.” They sometimes got hundreds of letters a day, more than a single person could possibly reply to.

More important, from a military point of view, these early German fighter pilots were doing nothing less than developing the tactics of air-to-air combat which would be in use for the rest of the century.

By mid-1916, though, Germany’s technological edge in air-to-air combat was diminishing. French and British aircraft designers were following the German example in designing their own purpose-built fighting planes. During the Battle of the Somme, the combined French and British air forces substantially outnumbered the Germans with better quality airplanes, though at this point the Germans still hold the edge in combat experience. Perhaps the most telling fact is the death of Max Immelmann on June 18, 1916, after his plane crashed. The Royal Flying Corps took credit for shooting him down, although the Germans claimed it was friendly fire.

In fact, only a few of the big name fighter pilots of the Great War will survive it. Overall, the loss rate was on the order of one airplane per 100 sorties, and could get worse during periods of heavy fighting. Being a member of this modern-day knighthood was a very dangerous business.

These high-tech weapons of the Great War, the tank and the airplane, were expensive to build and required serious industrial capacity. At the end of the day, German industry just won’t be able to keep up. It’s something of an industrial marvel that the Germans were able to keep their soldiers supplied with rifles and bullets and their artillery forces with guns and shells as well as they did. They couldn’t keep up in production of airplanes and especially of tanks. After British tanks first appeared at the Battle of the Somme, the Germans built their own prototype, but Germany would only manage to construct a grand total of fifteen tanks by the end of the war.

Between the tank and the airplane, I would have to name the tank as the single most important military innovation of the twentieth century. Some might say the airplane, but we can split the difference and point to the internal combustion engine as the power source that makes both of these new weapons possible. And don’t forget the armored car, the tractors that move the artillery guns, and the humble trucks that move supplies around so much faster than horse-drawn wagons can. Later in the century, you can add to this list the bulldozer, the jeep, the armored personnel carrier, the self-propelled artillery gun, the jet, the helicopter…but I’m getting ahead of myself.

We’ll have to stop there for today. Thanks for listening, and I’d especially like to thank Clinton for making a donation, and Brandon, for becoming a patron of the podcast. If you’d like to become a patron, or make a one-time contribution, go to the website, historyofthetwentiethcentury.com, where you will find buttons to suit your needs, be they PayPal or Patreon. And I’m grateful to all of you who have already donated.

And I hope you'll join me next week, on *The History of the Twentieth Century,* as we turn our attention to a couple of related topics. One is efforts to end the Great War peacefully. With the belligerent governments unwilling to talk peace, various private groups—what we today would call "non-governmental organizations"—took it upon themselves to campaign for an end to the fighting. One of these efforts was led by Henry Ford, so we'll want to get caught up on his doings, too. The campaign to end the war, next week, on *The History of the Twentieth Century.*

Oh, and one more thing. I said that the German pilots still held the advantage in training and experience by mid-1916. I also said that the loss rate was pretty appalling. You can see how that loss rate implies the Germans are going to have a hard time holding onto that advantage in experience.

After the death of Immelmann, Kaiser Wilhelm ordered Oswald Bölcke grounded for a month. The loss of Immelmann was a blow to morale, and the Kaiser felt that losing Bölcke too soon afterward would be devastating.

Bölcke would return to the air later in the war, but now as commander of a new kind of unit, what the Germans called a *Jagdstaffel,* or in English, a fighter squadron. Bölcke hand-picked his pilots and trained them himself, now emphasizing formation flying and coordinated combat. This, plus the introduction of an improved fighter plane, the Fokker *Albatros,* kept the Germans competitive in aerial combat for a while longer, despite the disparity in numbers.

Bölcke and his squadron became remarkable for the number of ace pilots they would produce: 25 in all, including the most famous fighter pilot of the war: Manfred von Richthofen, universally known as "The Red Baron."

[music: Closing Theme]