

# From tend to involve more than one

[Business](#), [Industries](#)



From the first documented use of prosthetics, (discovered in Italy in 1873 and dated back to around 300B. C.) until now, the development of artificial limbs, during wartime, has been vital to the lives of many veterans. The advancements in the industry have led to the revolutionary prosthetic technology that is seen today.

The industry of prosthetics has evolved and developed greatly since the American Civil War, a long-standing controversy over slavery, broke out in 1861. During the American Civil War, the U. S. government started the “Great Civil War Benefaction”; a scheme that commits to providing prosthetic limbs for all injured veterans. This obligation caused the birth of the modern prosthetics industry.

The main materials for replacement limbs during the American Civil War were wood and steel. These rigid materials meant that few available devices were comfortable and a large number of veterans preferred to use crutches instead. As weaponry is becoming more developed, the injuries sustained in modern warfare tend to involve more than one amputation, which adds additional complexity to the surgical interventions and the prostheses needed. This is demonstrated in injuries acquired in the Afghanistan conflicts, which followed the United States invasion of Afghanistan in 2001. The war code named Operation Enduring Freedom- Afghanistan, ended in 2014, but the Operation Freedom’s Sentinel broke out less than a year later in 2015 and the conflict is still ongoing. The prosthetic limbs available for warfighters today are taking advantage of the latest robotic technologies and enable injured veterans to lead normal lives; sometimes with artificial limbs exceeding natural limitations of biological limbs. The American Civil War was <https://assignbuster.com/from-tend-to-involve-more-than-one/>

one of the of the most traumatic and fatal Wars to ever take place in the United States. Over 70, 000 soldiers lost limbs<sup>27</sup>, making the 1860's an essential period in the evolution of prosthetics.

Before the American Civil War, the very small prosthetics industry, was largely dominated by ideas inspired by the French man Ambroise Paré (1510-1590), the official surgeon to four successive Kings. Prosthetics during the time of Paré were described as “ heavy, crude devices, made of available material - wood, metal and leather.” by surgeon, Philippe Hernigou<sup>24</sup>.

As practices and medicine from the time of Paré were still being used when the American Civil War broke out, new medical advances were needed to keep up with the number of casualties. One of the key drivers of progression in the field of prosthetics, was the availability of new materials with which to make the artificial limbs. Previously, wood and steel were the materials of choice, but the introduction of rubber offered a more attractive alternative to these rigid materials.

It was a much more flexible, resilient material, with a more natural appearance. The person who launched the era of modern prosthetics, was also the first documented amputee of the Civil War - Confederate soldier James Edward Hanger. Less than two days after enlisting with the army, on the 3rd June 1861, 18 year old Hanger lost his leg above the knee, to a cannonball. Hangers' leg was amputated by Dr. James D. Robinson and he was fitted with a wooden peg leg. However, he was unhappy with the awkward appendage and Hanger eventually designed and built a new lightweight leg from whittled barrel staves.

The young engineer used the recent advances in available materials to his advantage and he used rubber bands in ankle prosthesis to replace the role of heavy metal cords. The use of rubber bands, allowed for plantar flexion and dorsiflexion, making the leg more flexible and restoring some of the function of the original limb. The innovative leg was finally patented 'The Hanger Limb' in 1891, thirty years after it was created. In 1863, Dubois L Parmelee made a significant improvement to the attachment of artificial limbs by fastening a body socket to the limb, utilising atmospheric pressure to retain the limb. Although Parmelee was not the first person to use this idea, he was the first to make it practical for everyday use.

As well as featuring a suction socket, Parmelee's advanced prosthesis also had a polycentric knee and a multi-articulated foot. Both of these features allowed the leg to perform similarly to a biological limb. The patent of Parmelee's artificial leg is shown in figure 2. After Parmelee's discovery, in 1868, Using both Hanger's inventions and Parmelee's inventions as a base, Hermann and Prague, two engineers serving in the Union Army Marine Corps, introduced two new groundbreaking prosthetic advancements. These included the use of leather, to cover the wooden joint slip and substituting aluminium for steel, on account of its lightness.

He also made the axis of the leg anterior to that of the thigh, to give the user the impression of walking on the whole foot, instead of merely on the heel, as applied with earlier prosthetics. Aluminium became and still is, the leading material used in prosthetic devices, because of its durability and lightweight. Following developments in weaponry and new gun technology,

injuries were becoming more severe. Therefore, advances in weaponry, fueled advances in medical technology. One major example of developments in weaponry, was invented by Claude-Etienne Minié, a French army officer and called the Minié bullet. One of the first practical rifle bullets. The Minié bullet was a soft lead cylindrical bullet, with a hollow base that expanded when fired.

The Minié bullet had a kill range of 1, 000 yards and it caused horrendous injuries, by crushing bone and ripping arteries and tissue beyond repair. Most physicians of the era were inexperienced in surgery, and 70% of all wounds from the Civil War affected the limbs<sup>2</sup>, making amputation a common procedure in battlefield surgery. In 1864, Surgeon Julian John Chisholm said “The limbs of soldiers are in as much danger from the ardor of young surgeons as from the missiles of the enemy”. The vast number of wounded men made it impossible for surgeons to undertake more delicate and time-consuming procedures, such as building splints for limbs, or carefully removing only part of the broken bone or damaged flesh. Of equal importance to developments in weaponry, are the dramatic advances in medical knowledge and practice, especially in the field of trauma-care as doctors and surgeons had to keep up with the developments in weaponry in order to save the life of as many soldiers and civilians as possible.

The Civil War is thought of, as one of the most important periods of advancement in world history, because it sparked the interest of Government agencies in the whole field of prosthetics. In 1862, Congress passed the great Civil War Benefaction; a commitment to provide prosthetic

limbs to all disabled soldiers or sailors. 2 In addition, any ordinary enlisted man who had both hands amputated, was guaranteed a monthly compensation of \$25. If an enlisted man had lost both feet, or one hand and one foot, he was given \$20 per month for life. Disabled officers received somewhat more generous pensions. With the lure of government support from the Benefaction, entrepreneurs began competing for a share of the growing prosthetics industry.

Many of the new inventors were amputees themselves, who had personal experience of artificial limbs and what designs worked and what didn't. However, despite the Benefaction, there was still a lack of choice of prostheses and they were rarely high quality. In Germany, until after the First World War broke out, there were two types of prosthetic arm; the first and most basic was the work claw. The second was a so-called Sunday arm, that whilst resembling a real arm was purely cosmetic<sup>3</sup>. Unsurprisingly, the prosthetics were often inadequate.

They were "hard to put on and to take off, heavy to wear, poorly fitted and mechanically unreliable, the replacement parts rarely lived up to their promises" 28. Many disabled veterans became ashamed of their prosthesis and only wore them on special occasions such as Sunday church services. The majority of the time, lower limb amputees used a crutch or a wheelchair and were forced to rely on their families, or to beg for subsistence 28. The Federal Government acknowledged this issue and the Veteran Reserve Corps, originally the Invalid Corps, was established in 1863, to employ disabled Veterans in War related work. However, some veterans had access

to artificial limbs but chose not to wear one, as in some communities, a stump was viewed as a mark of courage. Not wearing a prosthesis valorised one's identity in a positive manner.

3