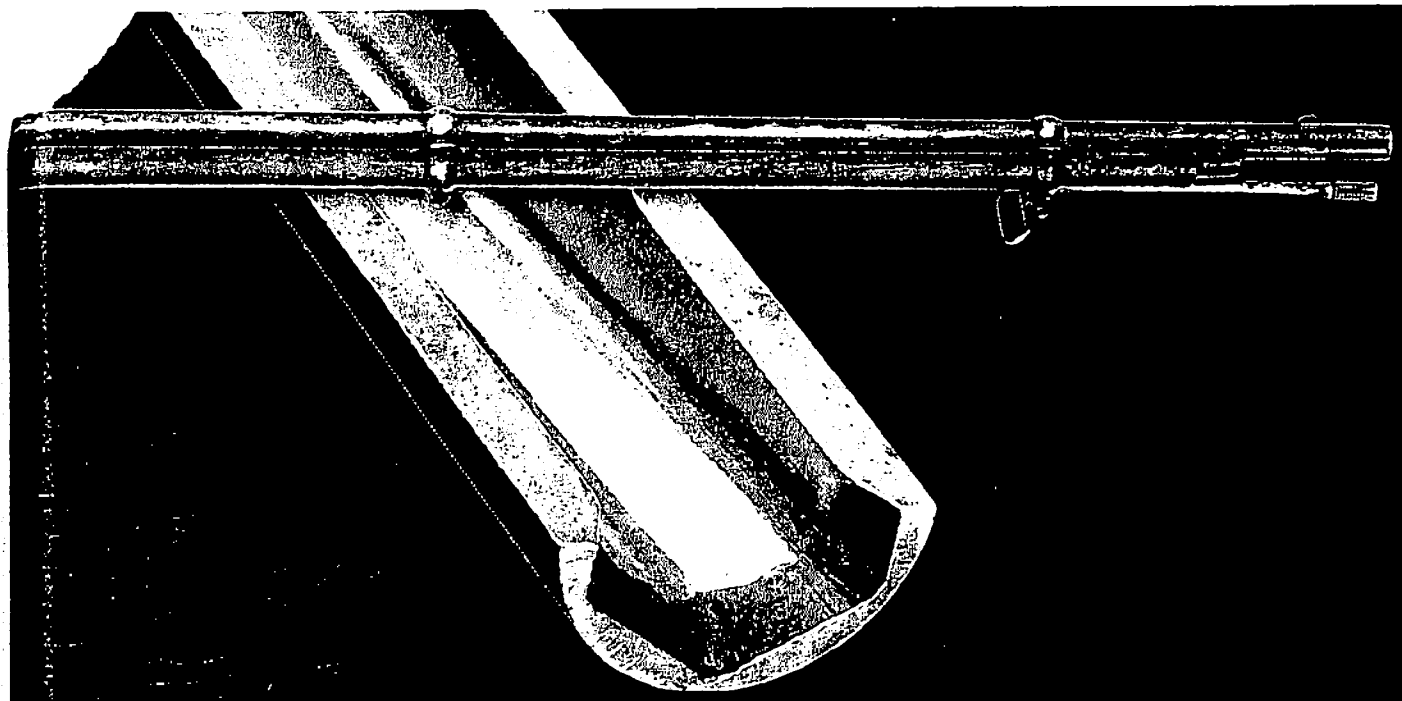


Joseph Whitworth's Deadly Rifle

Southern sharpshooters targeted Yankees with a long-range killer from England

By Fred L. Ray

For Union troops besieging Charleston, South Carolina, the summer of 1863 was a miserable time. Blistering heat and sand fleas were inescapable annoyances to be sure, but the nasty bite of a British-made weapon was what they feared the most. "The least exposure above the crest of the parapet will draw the fire of his telescopic Whitworths," complained a Union engineer, "which cannot be dodged. Several of our men were wounded by these rifles at a distance of 1,300 yards from [Fort] Wagner."

...ENGLAND/SOCIETY/SUPERSTOCK ABOVE LEFT AND TOP: THE ROYAL ARMOURIES UK

The hyperaccurate Whitworth rifles were evidence of radical improvements in range and effectiveness of infantry rifles that came during the 19th century. In 1800 the standard infantry weapon had still been a black powder .75-caliber smoothbore musket like the Brown Bess (which had been in service since 1722), but by 1900 it was the fully modern .30-caliber box magazine repeater, using smokeless powder. Sir Joseph Whitworth, one of the innovators most responsible for this quantum leap in technology, revolutionized long-range shooting. For nearly two decades his Whitworth rifle would reign supreme in any test of long-range accuracy.

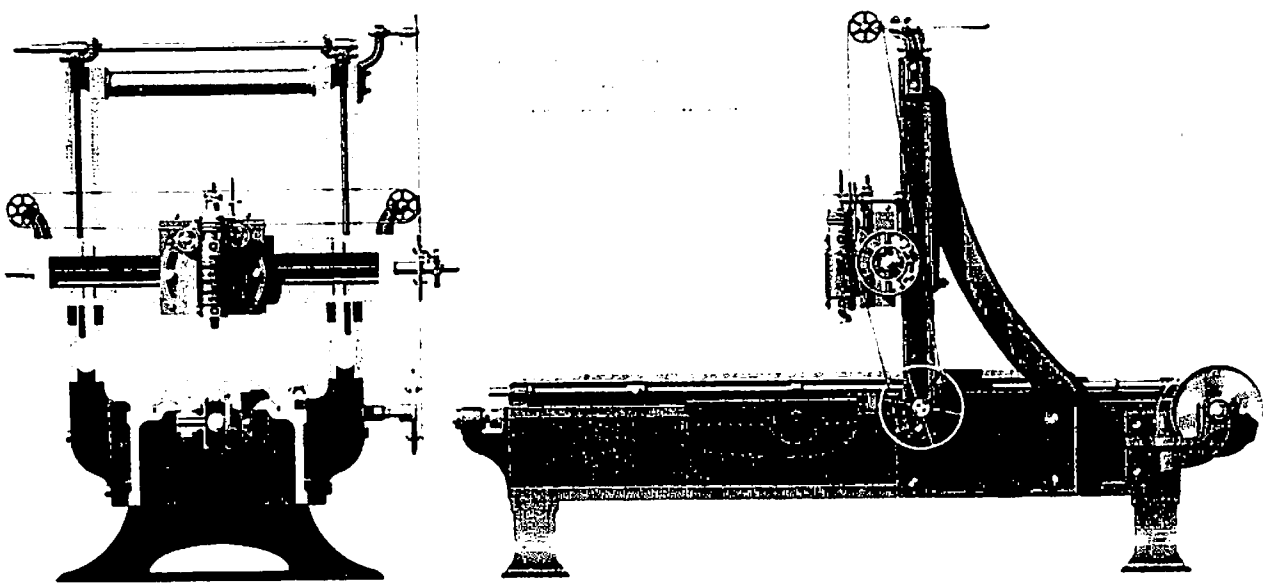
The son of a schoolmaster near Manchester, at age 14 Whitworth was indentured to his uncle, a cotton mill owner in England's industrial heartland. He ran away at 18 to seek more congenial employment, which he found at a machine shop. Eventually he got a job in the London establishment of Henry Maudslay, one of the day's leading mechanics, who was among the first to appreciate the value of standardization in nuts and bolts. Young Joseph Whitworth became one of his star pupils, and would improve on many of Maudslay's concepts.

Whitworth returned to Manchester, where he spent the next 20 years running his own machine shop. Starting out working alone in 1833, by 1854 Whitworth employed a work force of 368. He took out his first patent—the first of 47—in 1834. His "measuring machine"—the prototype of the modern caliper—could detect the difference of a then-incredible two-millionths of an inch, but he also tuned his hand to more pragmatic creations like the street besom, a mechanized, horse-drawn street sweeper, and a knitting machine.

Whitworth worked tirelessly to promote his equipment. His big break came in 1851 at the Great Exhibition in London, where he won several awards. By that time he was also becoming quite wealthy, living on a country estate and hobnobbing with the aristocracy. Still, his origins sometimes showed. Historian Thomas Carlyle's wife, Jane, observed that he "has a face not unlike a baboon, speaks the broadest Lancashire, could not invent an epigram to save his life but has nevertheless 'a talent that might drive the Genii to despair' and when one talks with him one feels to be talking with a real live man."

In 1854, at the request of the British Board of Ordnance, Whitworth turned his attention to firearms, specifically the Enfield P53 .577-caliber service rifle, which he found "wrong in every particular. The diameter of the bullet was too large for the size of the gun, the bullet itself was too short, and the twist of rifling was not one-third of what it should have been." Accordingly Whitworth began work on an improved rifle, his only restrictions being to keep the same weight as a service bullet—530 grains—and the standard 70-grain powder charge.

His first step was to build an enclosed 16-by-20-foot gallery 500 yards long, with a series of light paper screens



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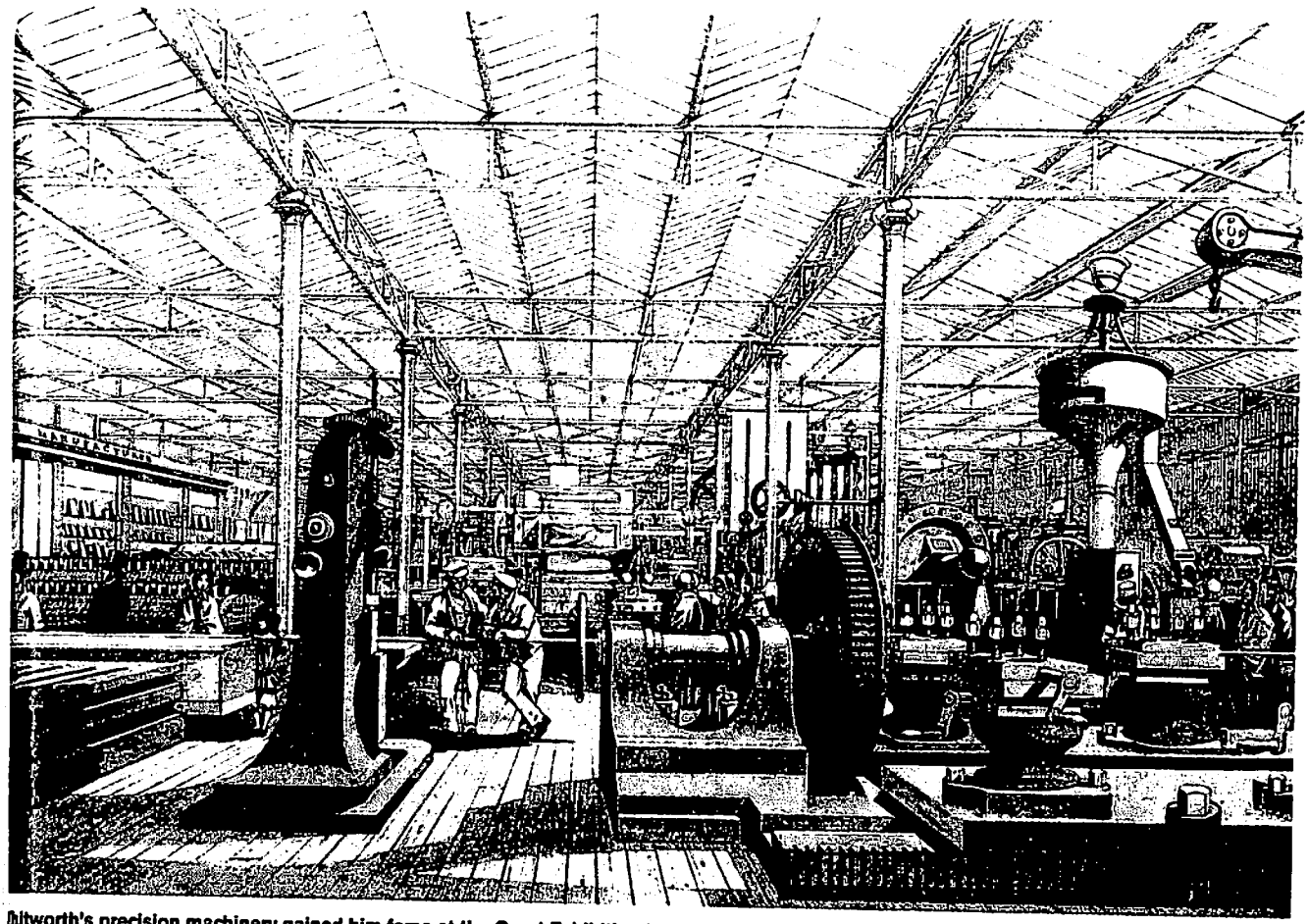
Among Whitworth's patents was one illustrated here for a planing machine, dating from 1839. Altogether he patented 47 of his inventions.



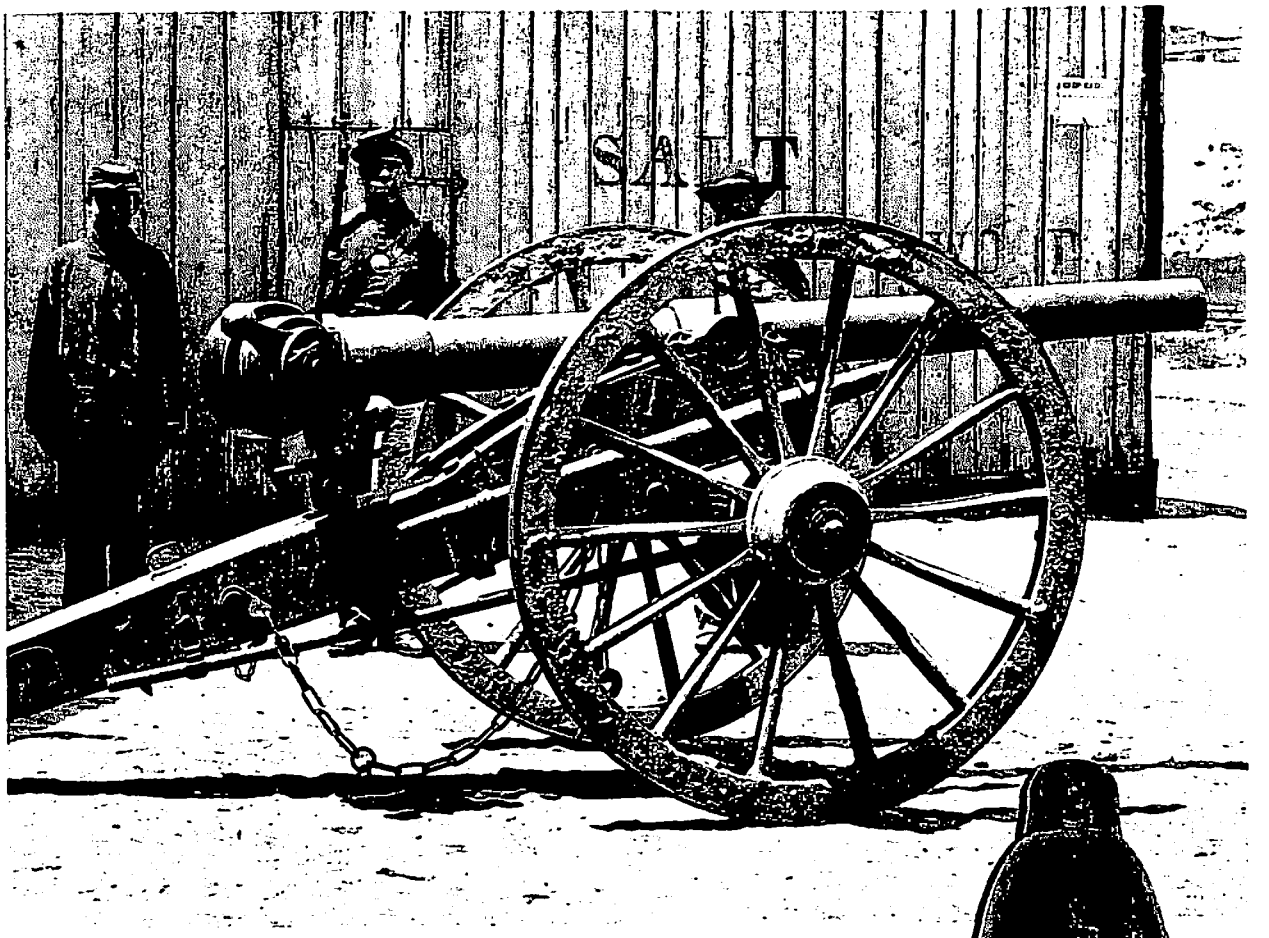
hitworth's precision machinery gained him fame at the Great Exhibition in London's Crystal Palace, which attracted 6.2 million visitors in 1851.

) record the trajectory of a bullet. After much experimen- tion he reduced the caliber to .45, which allowed him to retch the projectile to three times its diameter. He gave an extremely fast spin—one turn in 20 inches, as pposed to one in 78 inches for the Enfield.

Whitworth's rifle also featured an unorthodox bore con- guration—a six-sided hexagonal spiral rather than the nventional arrangement of lands and grooves. This ar- ngement allowed him to use a bullet fitted to the bore ther than relying on the principle of the more-famous linié ball, in which the base of a soft lead bullet expand- l when fired to grip the rifling. As he put it: "It is per- ctly easy to form a mechanically-fitting bullet adapted) the hexagonal rifling, on account of the simplicity of e form, but quite impracticable to obtain an accurate fit tween the bullet and the bore of the rifle where any stem of grooves is adopted." Since the bullet did not ed to expand, it could be made of a harder and denser aterial such as an alloy of tin and lead or even of steel, ving it markedly increased penetrative power. The hex- re design caused less friction, allowing a considerably gher muzzle velocity (1,300-1,400 feet per second vs. 0-900 feet per second). Whitworth also discovered that a bullet's long-range performance could be improved by tapering its rear end, a feature later called the "boattail."

Field trials in 1859 showed the Whitworth was overwhelmingly superior to the Enfield, especially at long ranges. The Whitworth's "figure of merit" (a measure of the average hit dispersion) was slightly better at 1,400 yards than the Enfield at 500. In penetration tests, the hard alloy bullet passed through 34 half-inch elm planks, while the Enfield's soft lead projectile cleared only 12. Nevertheless the ordnance board rejected his rifle on the dubious grounds that the .45-caliber bore was too small for military use. (Ironically, a similar board would conclude 10 years later that this caliber was optimal for a service rifle.) That decision ignited a long-running feud between Whitworth and the ordnance officials.

Some of the resulting ill will may have been Whitworth's own fault. A self-made man, he was prone to say exactly what he thought, and the board—many of whom had aristocratic backgrounds—likely expected more deference from a commoner, no matter how good an engineer he might have been. According to one account, "He would



Whitworth's 'Fiendish' Cannon

JOSEPH WHITWORTH also scaled up the hex-bore design that he used for his rifle into a 12-pounder gun with a 2.75-inch bore. It could be loaded from the breech or muzzle and could, at maximum elevation, throw an 8.875-inch-long solid "bolt" nearly six miles. The distinctive noise it produced in flight terrified some soldiers. One Union man claimed the "fiendish Whitworth projectile" sounded like "which-one?—which-one?" in flight. The Whitworth cannon's most famous hour likely came at Gettysburg, where its shells were fired as signals to began the Rebel bombardment that preceded Pickett's Charge.

Still, Whitworth's artillery suffered from some of the same shortcomings as his rifles. Rebels loved the Whitworth's range and accuracy, and sometimes used it for special "sharpshooting" counterbattery fire, but they complained that the breech mechanism easily got out of order and "its efficiency was impaired by its weight and the very cumbrous English carriage on which it was mounted." In addition, the powder charge of the shell was too small to allow it to do much damage, and there was no canister round for close work against infantry. Much of the increased range was wasted in an era when there was no way to adjust fire beyond the sight of the gunners.

The Union Army also had a battery of Whitworth cannons on hand. But after a bit of field service during the 1862 Peninsula Campaign, the big guns ended up in the defenses of Washington for the remainder of the war.

Union soldiers, above, guard a captured Confederate Whitworth cannon in Richmond in April 1865. The cannon's unique shell, right, spun so rapidly that it made a distinctive sound in flight.

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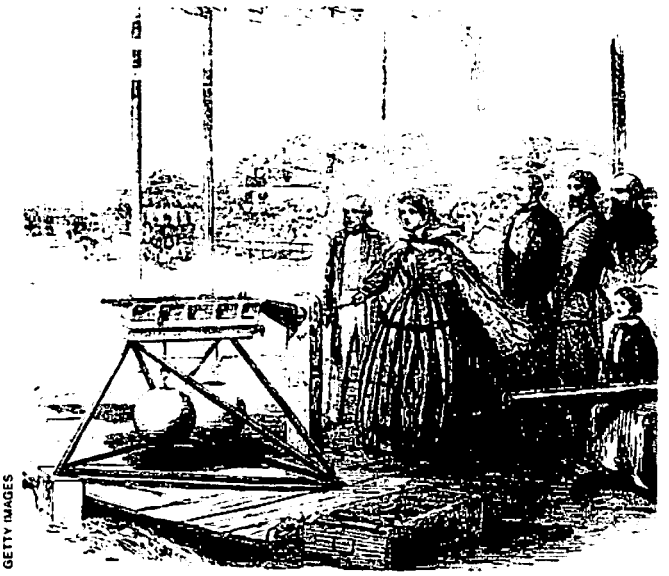
not modify a model which he knew to be right out of deference to committees, who, he considered, were incomparably his inferiors in technical knowledge, and who, being officials, were liable to take offence at the plain speaking of one who regarded official and infallible as far from synonymous."

Whitworth's rifle was not without its faults. Its tight-fitting bore was more prone to fouling than that of the service rifle, especially if used with inferior powder. And while it was manufactured with unheard-of precision (the best Birmingham gunsmiths worked tolerances to 1/350th of an inch, while Whitworth's high-tech facility maintained a then-incredible 1/5,000th of an inch), it cost four or five times as much the sturdy, less-sophisticated Enfield and was more likely to be put out of action by the inevitable mud, grit and neglect of a military campaign.

Although the French Army bought some of his rifles and the British Army's Rifle Brigade briefly adopted them, military sales were disappointing. Whitworth produced a "Trials" version for commercial sale, and though expensive it found a ready market on the target and match circuit and in the sporting community. By then well-heeled marksmen were clamoring for the latest in rifle technology. Long-range matches of up to 1,000 yards were common, with thousands of spectators. In the summer of 1860, Queen Victoria kicked off a match held at Wimbledon by firing the first shot. Her Majesty took a silken cord from Whitworth's hand and gave it a tug, putting a bullet from one of his rifles (mounted on a mechanical rest) within an inch and a quarter of the center of a target that was 400 yards away.

Whitworth's rifles came to dominate the matches, and other rifle makers rushed to imitate his principles—small bore (.45-caliber), elongated bullet (3 to 3½ times longer than its diameter) and a very fast twist. Copying the rifling system was a bit harder, since Whitworth held a patent on that. Some produced licensed copies of the hex-bore design, while others developed their own more conventional rifling systems.

Whitworth's rifles soon attracted the attention of Southern arms buyers. Confederate Major Edward Anderson visited the factory on July 2, 1861, and bought two rifles for evaluation. He was impressed by their quality but shocked by the price, noting in his diary that "he asks enormously for them." Indeed each Whitworth rifle—cased with accessories, telescope and 1,000 rounds of ammunition—was said to have cost the Confederacy over $1,000, with the bare rifle itself going for just under $100. Enfields, by contrast, were priced at just $12 to $25 each. Nevertheless, Whitworth's hex-bored wonder soon found a role as a sharpshooter's rifle on the American battlefields.



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Queen Victoria pulls a silken string attached to a Whitworth rifle, firing the first shot of the "Great Rifle Shooting Match" in 1860.

Whitworths appear on blockade-runner manifests as early as December 1862, though the first references to field use come in 1863, when Confederate ordnance chief Colonel Josiah Gorgas dispatched "20 Whitworth (Telescopic) Rifles" to the Army of Tennessee on May 29. "These arms are reported to be very effective at 1200 yards," he wrote. "I have the honor to request that they may be placed in the hands of careful and reliable men only as they are very costly, so costly indeed that it is not deemed expedient to increase the number already brought in. Ammunition and a copy of the instructions will accompany the arms."

An equivalent number also seem to have gone to the Army of Northern Virginia. Ben Powell, a sharpshooter in Lee's army, remembered receiving his Whitworth just before the Battle of Gettysburg. Major General Patrick Cleburne reported using them during his retreat from Wartrace, Tenn., late in June 1863.

Whitworth produced his rifle in a number of variations, all with an extremely high level of fit and finish more appropriate for fine civilian sporting pieces. They came with or without bayonet attachments and with a 33-inch or 36-inch barrel, which made for an overall length of 49 to 52½ inches. "Typical 'Confederate Whitworths,'" according to firearms expert John Anderson Morrow, "featured a 33-inch barrel, two Enfield pattern barrel bands, iron mounts of the military target rifle pattern, and Enfield-type lock with no safety bolt and an Enfield-style hammer; open sights, with a blade front being adjustable for windage allowance, and a stock which extends to

within a short distance of the muzzle, giving the rifle a snub-nosed appearance." The Confederate government also bought a small number of guns marked "2nd Quality," apparently a less expensive version.

A few rifles sported a four-power telescopic sight, designed by British colonel D. Davidson, fitted in an adjustable mount on the gun's left side. This allowed the scope to drop as far as needed independently of the barrel without requiring the shooter to raise his head from the buttstock. A rifleman could easily detach Davidson's scope, and it didn't interfere with his iron sights. While the skinny iron 14 5/8ths inch-by-15/16ths inch telescope was primitive by today's standards, it was state-of-the-art in 1864—though it had drawbacks. "After a fight those who used them had black eyes," said one sharpshooter, "as the end of the tube rested against the eye while taking aim, and the 'kick,' being pretty hard, bruised the eye."

Since manufacturing hexagonal bullets was beyond the South's capabilities, each Whitworth rifle came with a bullet mold to cast a cylindrical lead projectile that formed itself to the bore when fired. The rifle's leaf sight was graduated "H" on one side for hexagonal bullets and "C" on the other for cylindrical ones. "Accuracy appears to have been roughly equal with either slug," noted firearms expert Joe Bilby, "and both types have been recovered...although the cylindrical are far more common."

The Army of Northern Virginia issued one or two Whitworths to each of its sharpshooter battalions; thus in the approximately 36 infantry brigades of Lee's army there were most likely between 36 and 72 of these rifles. The Army of Tennessee utilized its Whitworths differently, concentrating the imported rifles in specialized units at division and corps level, as did the Army of Northern Virginia's First Corps.

Private Sam Watkins described how the Whitworths were distributed. Soldiers wanting to be sharpshooters shot three rounds at a mark 500 yards away. "Every shot that was fired hit the board," Watkins recalled, "but there was one man who came a little closer to the spot than any other one, and the Whitworth was awarded to him." While records are scarce, the South apparently imported around 250 Whitworth rifles of all types, although some of these may have been "clones" made by others.

The issue of how far the black powder Whitworth could effectively shoot has divided commentators ever since the war ended. But modern testing tends to confirm some of the soldiers' stories. "The claim of 'fatal results at 1,500 yards' was no foolish boast," concluded one modern expert. Two high-ranking Union officers who are reasonably well documented as having been killed by Whitworth sharpshooters are Brig. Gen. William Lytle at Chickamauga and Maj. Gen. John Sedgwick at Spotsylvania. Sedgwick is known to have fatally misjudged the range of the new weapons—his last words were, "they couldn't hit an elephant at this distance."

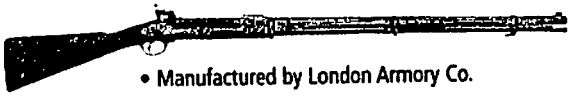
Whitworth had no better success now with officialdom than he had before, losing out in 1858 to his rival William Armstrong on artillery sales to the British military. Although Armstrong's guns were not nearly as technically advanced or accurate as Whitworth's, their conventional design was more readily accepted by a conservative military—and Armstrong, who had begun his career as a lawyer, proved more adept at working within the estab-

Sceptered Isle Imports

Whitworth Rifle

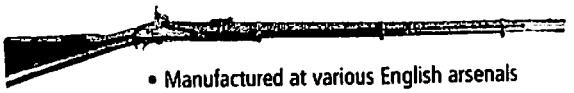
- Manufactured in Manchester, England
- .451-caliber
- Cartridge, 70 to 85 grains of powder
- 33- or 36-inch barrel

Kerr Rifle

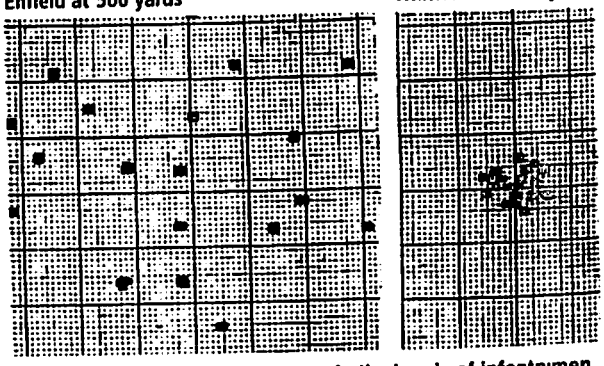


- Manufactured by London Armory Co.
- .446-caliber
- Cartridge, 68 grains of powder
- 37-inch barrel

Enfield P53 Rifle



- Manufactured at various English arsenals
- .577-caliber
- Cartridge, 68 grains of powder
- 39-inch barrel



The Enfield made a sturdy weapon in the hands of infantrymen, but it couldn't match the more refined Whitworth's accuracy.

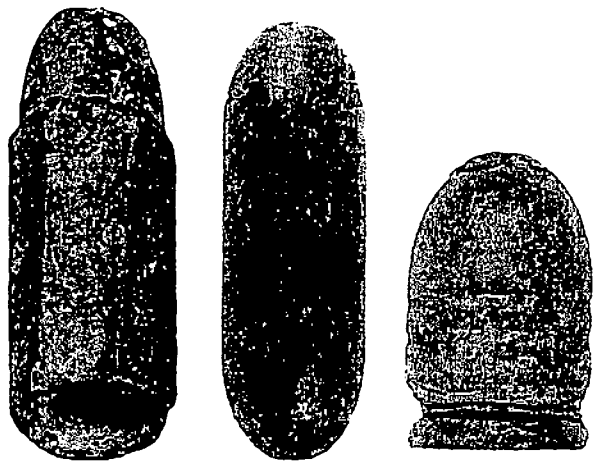
ALL ARTIFACTS, EXCEPT OPPOSITE LEFT, WWW.HISTORICALIMAGEBANK.COM; OPPOSITE LEFT, COURTESY OF JOHN A. MORROW

Whitworth's Better Bullet

IN CONTRAST TO THE STUMPY Minié ball (far right), which could tumble and lose accuracy after being fired, Whitworth's long, narrow .451-caliber bullets remained true in flight. The bullet that functioned best in Whitworth's rifle was the hex-shaped round (near right) manufactured in England, which fit perfectly in the deadly musket's hex rifling.

The Confederacy imported some of those bullets, but Rebel arms manufacturers didn't have the proper equipment to produce them locally. Southern armories instead produced a simplified smooth version (middle) that also proved to be very accurate.

Critics of Whitworth's bullet design argued that .451-caliber was too light for a military round. But the elongated mass more than made up for the ammunition's small diameter.



lishment. Whitworth did make substantial sales to the Confederacy and also to Brazil, which used his artillery to good effect in the War of the Triple Alliance (1865-70).

Created a baronet in 1869, Sir Joseph Whitworth continued his experiments but neglected his machine tool business. He still regarded the shop as his personal fiefdom and permitted no changes that he had not approved. He reportedly sacked a long-time foreman for doing just that and replaced him with another man "whose only qualification for his position was entire subserviency to Mr. Whitworth." He also fired skilled workers when they had the temerity to strike, replacing them with ordinary laborers—and unlike his mentor Maudslay did not train underlings up to become first-class mechanics after him.

American engineer Charles Porter, who worked briefly with Whitworth, remembered: "Mr. Whitworth was not only the most original engineering genius that ever lived. He was also a monumental egotist. His fundamental idea was always prominent, that he had taught the world not only all that it knew mechanically, but all it ever could know. His fury against tool-builders who improved on his plans was most ludicrous. He drew no distinction between principles and details. He must not be departed from even in a single line. No one in his works dared to think."

That attitude made him somewhat of a reactionary later in life, and as a result much of the latter half of the Industrial Revolution passed Whitworth by. By the end of the 1860s, the Whitworth rifle had begun to lose ground to more advanced designs such as the Henry and Metford, which continued to use a fast twist and an elongated, streamlined bullet but incorporated a more conventional rifling system with very shallow grooves. These eventually proved superior to Whitworth's hex-bore system and were much easier to manufacture.

By the early 1870s, the Whitworths had been displaced from winner's circles. But the final indignity came in 1871, when the British Army adopted the Martini-Henry, a .45-caliber service rifle that vindicated the principles that Whitworth had advocated all along, but used Henry's (and later Medford's) rifling.

Whitworth's principles for long-range shooting remain as valid today as when he discovered them in the 1850s. For example Barrett Firearms, famous for their long-range .50-caliber sniper rifles, recently introduced a .416 cartridge that features a 395-grain solid brass boattail bullet nearly five times as long as its diameter, spun with a 1:12 twist and propelled by smokeless powder to 3,250 feet per second. Even polygonal bores are making something of a comeback.

Whitworth continued to innovate long after most men would have retired. One of his most important inventions, showcased in Paris in 1883 (when he was 80), was a method of compressing steel in the molten state, eliminating pinholes and allowing for considerably stronger gun casings, especially for artillery. His health declined after that, and he died four years later at Monte Carlo. Ten years later his company, which had by that time fallen on hard times, was absorbed by his archrival Armstrong to become Armstrong-Whitworth. Since Sir Joseph had no children and few close relatives, much of his fortune went to universities and educational charities. Some of these, such as the Whitworth Society, which awards scholarships to engineering students, continue today.

Fred Ray, who writes from Asheville, N.C., is the president of CFS Press and author of Shock Troops of the Confederacy *and numerous articles on the war. For more on firearms, turn to "Resources," P. 70.*